HALEY ALDRICH

www.haleyaldrich.com

FEASIBILITY STUDY
EAST STATION FORMER MANUFACTURED GAS PLANT SITE
(SITE #828204)
ROCHESTER, NEW YORK

by
Haley & Aldrich of New York
Rochester, New York

for
Rochester Gas & Electric Corporation
Rochester, New York

File No. 135502
May 2021

HALEY & ALDRICH OF NEW YORK
200 Town Centre Drive
Suite 2
Rochester, NY 14623
585.359.9000

4 May 2021
File No. 0135502-002

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau C, 11th Floor
625 Broadway
Albany, New York 12233-7014

Attention: Salvatore F. Priore, P.E.
Project Manager

Subject: Feasibility Study
Rochester Gas & Electric Corporation
East Station Former Manufactured Gas Plant Site (Site #828204)
Rochester, New York

Dear Mr. Salvatore F. Priore:

Rochester Gas and Electric Corporation (RG&E) retained Haley & Aldrich of New York to complete this Feasibility Study for the East Station Former Manufactured Gas Plant Site located in Rochester, New York. The work was completed in accordance with the requirements of the Multi-Site Order on Consent (Index #CO 8-20180517-48) dated 13 July 2018 between RG&E and the New York State Department of Environmental Conservation.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

Douglas C. Allen, P.G.
Senior Project Manager

Scott A. Underhill, P.E.
Senior Environmental Remediation Engineer

Enclosures

c:
Rochester Gas and Electric Corporation; Attn: Jeremy Wolf
New York State Department of Health; Attn: Anthony Perretta
New York State Department of Health; Attn: Justin Deming

\\haleyaldrich.com\share\man_common\36492_East_Station\Feasibility Study\Final\report.HW828204.2021-05-04.FS.docx

Executive Summary

Haley & Aldrich of New York (Haley & Aldrich) prepared this Feasibility Study (FS) on behalf of Rochester Gas and Electric (RG&E) for the East Station Former Manufactured Gas Plant (MGP) Site (Former MGP Site or Site) located on Suntru Street in Rochester, New York.

BACKGROUND

The Former MGP Site is located in an industrial/commercial area at the foot of Suntru Street in Rochester, New York, north of the downtown area. The approximate 13.4-acre parcel is currently owned by RG&E and is bordered to the west by the Genesee River, to the north by a former Bausch & Lomb manufacturing facility (B&L Property), to the east by the Genesee River gorge wall and Suntru Street, and to the south by the Bausch Street Bridge. The Genesee Brewing Company operates a beverage brewing facility south of the Bausch Street Bridge on the eastern side of the Genesee River.

Four investigations and two Interim Remedial Measures (IRMs) were previously completed at the Former MGP Site.

- A 1992 Site Investigation (Atlantic Environmental Services, Inc., 1993) identified the presence of MGP residuals in the Former MGP Site's surface soil, subsurface soil, and groundwater.
- In 1998 and 2000, a Focused Remedial Investigation (Ish, Inc. and Meta Environmental, Inc., 2000a and 2000b) identified the presence of light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL) in soil and bedrock beneath the Former MGP Site. A thin layer of DNAPL was identified along the overburden and bedrock interface. Non-aqueous phase liquid (NAPL) was also observed along the Site's shoreline.
- In 2004 and 2005, the structure and contents of a former tar well, located in the southeast portion of the Former MGP Site, were excavated and removed (URS, Inc., 2006).
- In 2007 and 2008, in-situ solidification (ISS) was completed along the western side of the Former MGP Site to mitigate the migration of NAPL to the Genesee River (Ish, Inc., 2009). A barrier wall and gravel recovery trench were installed on the eastern (upgradient) side of the ISS area, along with NAPL collection wells.
- In 2008 and 2009, a sediment investigation identified NAPL and sheen in sediment adjacent to the Former MGP Site and B&L Property (GEI Consultants, Inc., 2010).
- From 2010 to 2014, a Remedial Investigation (RI; Haley & Aldrich of New York, 2015) was completed at the Site. The RI delineated the nature and extent of MGP-related impacts, including the presence of NAPL in soil, overburden and bedrock groundwater, and sediment at the Former MGP Site and B&L Property. A qualitative exposure assessment was completed as part of the RI.

GEOLOGIC AND HYDROGEOLOGIC OVERVIEW

The Former MGP Site is underlain by approximately 10 to 20 feet (ft) of unconsolidated deposits consisting of fill materials over a discontinuous layer of alluvial deposits. Fill is found across the Former MGP Site and contains ash-like material (ALM), clinker-like material (CLM), slag, cinders, brick, purifier box material, coke, coal, and building rubble. Fill placed during post-MGP operations is generally

encountered in the central and southern portion of the Former MGP Site and consists of sandy loam material with some concrete, rebar, wire, pipe, and asphalt. Former MGP foundation structures are present beneath many portions of the Former MGP Site, particularly in the northeast, southeast, and southwest quadrants of the property. A large former gas holder foundation slab is visible at ground surface on the western portion of the Former MGP Site.

The alluvial deposits beneath the fill material and former MGP structures consist of orange-brown to grayish-brown silty sand with gravel ranging in thickness from one to 10 ft, where present. Alluvial deposits tend to be thicker along the eastern property boundary and generally become thinner or pinch out in the western portion of the Former MGP Site.

Overburden soil on the B&L Property is similar, with fill material typically consisting of silt, sand, and gravel with variable amounts of glass fragments, ALM, CLM, coke breeze, and brick. A large former B&L manufacturing plant floor slab is present in the southern portion of the property. The fill thickness ranges from approximately 20.5 ft in the southeast corner of the B&L Property to not present along the Genesee River, where alluvial deposits were observed at ground surface. The alluvial deposits consist of gravel, sand, silt, and clay and range in thickness from 32 ft in the southeast corner of the B&L Property to 8.5 ft along the Genesee River.

Overburden groundwater is typically encountered six to 20 ft beneath the Former MGP Site. Groundwater elevation contours indicate that the groundwater flow direction is to the west towards the Genesee River. Since the overburden groundwater elevation in monitoring wells adjacent to the river is nearly equivalent to the elevation of surface water in the Genesee River, overburden groundwater likely discharges to the Genesee River. A westerly overburden groundwater flow direction was also documented on the B&L Property.

The top of weathered bedrock surface generally slopes gently to the north and west toward the Genesee River. Weathered bedrock consists of rock fragments and gravel with silt and sand approximately one to three ft thick. Weathered bedrock was observed across the upland portions of the Former MGP Site. Weathered bedrock encountered directly beneath overburden soil consists of the Rochester Shale below the majority of the Former MGP Site, and the Irondequoit Limestone below the northwest portion of the Former MGP Site and the majority of the B&L Property.

Nine bedrock formations are present beneath the Former MGP Site and/or B&L Property:

- Rochester Shale – a gray calcareous mudstone;
- Irondequoit Limestone – a light to dark gray dolostone to limestone;
- Williamson Shale – a dark green to greenish-gray shale with limestone interbeds;
- Lower Sodus Shale – a light to dark gray shale with limestone interbeds;
- Reynales Limestone – a light to medium gray limestone with greenish-gray shale interbeds with a layer of reddish-brown hematitic limestone (Furnaceville Hematite) present near the base of the formation;
- Maplewood Shale – a green or gray shale;
- Kodak Sandstone – a grayish-green and reddish-brown mottled medium grained sandstone;

- Grimsby Sandstone – a reddish-brown and grayish-green banded or mottled fine-grained sandstone; and
- Queenston Shale – a brown to reddish-brown fine-grained siltstone with green mottling.

The bedrock borings were typically advanced approximately 120 to 150 ft into bedrock to the top of the Queenston Shale. Bedrock groundwater-bearing transmissive features were observed as near-horizontal joints or bedding plane partings. The transmissive features could be mapped by visual core observations and downhole geophysical logging between bedrock core holes completed on the Former MGP Site and B&L Property.

The Genesee River, a Class B waterway, flows south to north past the Former MGP Site and B&L Property, eventually discharging to Lake Ontario to the north. Along the western boundary of the Former MGP Site, Genesee River sediment forms a thin wedge adjacent to the southern portion of the parcel, typically consisting of coarse sand and gravel deposits along the shoreline ranging in thickness from less than one foot to a few ft. The sediment is present directly on bedrock. Sediment deposits are sparse adjacent to the central portion of the Former MGP Site, likely caused by scouring. Moving downstream, sand and gravel deposits are present adjacent to the northern portion of the Former MGP Site and southern portion of the B&L Property, extending farther out from the shoreline. Finer grain sediment, including sand and silt, is present along the central and northern portion of the B&L Property.

DISTRIBUTION OF MGP-RELATED IMPACTS

Relative to the distribution of MGP-related impacts to the subsurface, the results of the on-Site overburden investigations completed on the Former MGP Site indicated the following:

- Structures associated with the former MGP operations are present in the Former MGP Site subsurface but do not appear to be sources of impacts to soil and groundwater.
- NAPL is present in the overburden in three areas of the Former MGP Site – the Former Purifier Area in the northeast quadrant of the property; in the vicinity of the Former Oil Tanks, Former Tar Well, and Former MGP Plant in the southeastern quadrant; and the Former Light Oil Plant in the southwest quadrant, including an area north of the Former Light Oil Plant west of the ISS area. NAPL was typically observed near the weathered bedrock and overburden interface in these areas.
- NAPL was not typically observed in the overburden material in the northwest quadrant of the Former MGP Site; much of this area was previously solidified as part of the ISS IRM.
- Limited amounts of NAPL in overburden monitoring wells, which were constructed with sumps to collect NAPL, if present, and the absence of NAPL in the collection wells east of the ISS area suggest that NAPL in the overburden is not currently mobile horizontally or its mobility is severely limited or retarded in this area.
- Volatile organic compounds (VOCs) polycyclic aromatic hydrocarbons (PAHs), metals, and cyanide are present in overburden fill material at concentrations exceeding New York Codes, Rules, and Regulations Chapter 6 (6 NYCRR) Part 375 Commercial Soil Cleanup Objectives (SCO) beneath most portions of the Former MGP Site. VOCs and PAHs are also present in alluvial soil present beneath the fill material and above bedrock.
- VOCs, PAHs, metals, and/or total cyanide are present at concentrations exceeding New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance

Series (TOGS) 1.1.1 Class GA Water Quality Standards in overburden groundwater beneath most areas of the Former MGP Site.

The results of the off-Site overburden investigation completed on the B&L Property indicated the following:

- MGP-related NAPL is present in the overburden in the southeastern portion of the B&L Property and appears to be contiguous with NAPL observed in the area located north of the Former Purifier Area in the northeastern quadrant of the Former MGP Site.
- MGP-related NAPL was not observed in overburden in other portions of the B&L Property. Areas of apparent petroleum-related impacts, including potential petroleum NAPL not considered to be associated with the former MGP Site, were observed in the south-central portion of the B&L Property.
- PAHs and metals are present beneath the former B&L manufacturing plant floor slab in an area where subsurface gas distribution pipes are shown on historical plans. A layer of fill containing ALM is present directly beneath the floor slab in this area.
- PAHs, metals, and cyanide are also present in fill material at concentrations exceeding Commercial SCOs in the southern portion of the B&L Property. The fill material content appears to be typical of urban fill and not the result of migration or transport from the Former MGP Site.
- VOCs, PAHs, metals, and cyanide were not detected in overburden soil at concentrations exceeding Commercial SCOs in the northern portion of the B&L Property.
- VOCs, PAHs, metals, and total cyanide are present at concentrations exceeding Class GA Water Quality Standards in overburden groundwater beneath the southern portion of the B&L Property.

The results of the Former MGP Site and B&L Property bedrock investigation indicated the following:

- Varying amounts of MGP-related NAPL and sheen are present in competent bedrock beneath the Former MGP Site and B&L Property to a maximum depth of approximately 154 ft below ground surface (bgs) in the Grimsby Sandstone. The limited quantity of NAPL and sheen were observed in thin, discrete, nearly horizontal bedding plane partings that appear to be laterally continuous.
- NAPL and sheen were not observed at the interface of the Grimsby Sandstone and Queenston Shale or within the upper portion of the Queenston Shale at any of the bedrock coring locations, thus defining the lower vertical extent of MGP-related impacts to bedrock.
- VOCs, PAHs, metals, and total cyanide are present at concentrations exceeding Class GA Groundwater Quality Standards in bedrock beneath the Former MGP Site and B&L Property. The presence of NAPL in bedrock, as described above, likely contributes to dissolved-phase concentrations in bedrock groundwater.

The results of the sediment investigation indicated the following:

- Visual NAPL and PAH concentrations exceeding sediment screening levels are present in sediment along the southern portion of the Former MGP Site adjacent to the Former Light Oil

Plant, which is adjacent to an upland portion of the Former MGP Site where NAPL has been observed in the overburden.

- NAPL was not observed in sediment immediately north of the Former Light Oil Plant, since soft sediment is not present in this area.
- A small area of NAPL blebs (i.e., discontinuous droplets of NAPL within the sediment matrix) was observed in sediment north of the RG&E and B&L Property boundary adjacent to the B&L Property. This small area does not appear to be linked to an upland source and was fully delineated by completing additional sediment cores (i.e., vibracores).

The eastern horizontal extent of MGP-related impacts to overburden soil is limited by the presence of the gorge wall, which limits the physical extent of overburden. Although no explorations were completed south of the RG&E's southern property boundary, the Bausch Street Bridge was in place prior to construction on the Former MGP Site. Historical plans and drawings do not indicate that MGP operations or disposal occurred south of the RG&E's southern property boundary. However, post-confirmation sampling will be used to confirm that there is no residual NAPL or MGP contamination present. The western extent of MGP-related impacts to overburden is limited by the presence of the Genesee River, which flows along the western property boundary. To the north, MGP-related impacts to overburden appear to extend to the southeastern portion of the B&L Property, which is located north of the Former Purifier Area on the Former MGP Site.

Given the consistent east to west overburden groundwater hydraulic gradient, MGP-related impacts to groundwater are limited to on-Site areas within the Former MGP Site property boundaries and the B&L Property within and downgradient (west) of the MGP-impacted overburden described above. Based on comparison of overburden groundwater elevations with surface water elevation of the Genesee River, overburden groundwater likely discharges to the River.

EXPOSURE ASSESSMENT

Based on the results of the on-Site, off-Site and Genesee River sediment investigations, a qualitative exposure assessment was completed. The exposure assessment concluded the following regarding potential exposure to MGP-related materials:

- For the Former MGP Site, complete exposure pathways to surface soil were identified for the following current and future scenarios: an on-Site RG&E employee working at the Former MGP Site, a utility worker, a trespasser, and a future construction worker under the scenario that a building is constructed on the property. A complete exposure pathway to subsurface soil and overburden groundwater was identified for a current and future utility worker under the scenario of completing subsurface work and a future construction worker under the scenario that a new building is constructed at the Former MGP Site. Complete current and future exposure pathways for overburden groundwater were identified for an RG&E employee and trespasser under the scenario of inhaling vapors from impacted overburden groundwater.
- For the B&L Property, exposure pathways were evaluated for MGP-related compounds of potential concern only. A complete exposure pathway to subsurface soil and overburden groundwater was identified for a current and future utility worker under the scenario of completing subsurface work and a future construction worker under the scenario that a new building is constructed at the B&L Property. Complete current and future exposure pathways for

overburden groundwater were identified for a B&L employee and trespasser under the scenario of inhaling vapors from impacted overburden groundwater.

- For Genesee River sediment adjacent to the Former MGP Site and B&L Property, complete exposure pathways to sediment were identified for future and current trespassers accessing and disturbing sediment at certain limited locations along the Genesee River shoreline.

FEASIBILITY STUDY

This FS was conducted in accordance with NYSDEC guidance to identify and evaluate potential remedial actions to mitigate risks of exposure to MGP-impacted media by potential receptors identified by the exposure assessment. The following remedial alternatives were identified and evaluated:

- **Alternative 1 – No Further Action:** Alternative 1 generally consists of institutional controls to establish operations, maintenance, and monitoring (OM&M) requirements for fences and to protect from potential future exposure to soil and groundwater; OM&M of existing IRMs at the Site; engineering controls (fencing, signage) to restrict Site and River access; long-term overburden and bedrock groundwater monitoring; and passive NAPL recovery at the Former MGP Site.
- **Alternative 2 – Soil Capping, Near-River Soil Excavation, Full Sediment Excavation, and Hydraulic Containment (Slurry Wall):** Alternative 2 generally consists of surface soil excavation and asphalt-capping surface soil at the Former MGP Site and B&L Property, excavating subsurface near-River soil, excavating sediment, and installing a slurry wall at the Former MGP Site to mitigate groundwater flow off Site. Engineering controls would include existing fencing to restrict Site access. Institutional controls would be implemented to establish OM&M requirements for caps and fences and to protect from potential future exposure to subsurface soil and groundwater via an environmental easement. Long-term overburden and bedrock groundwater monitoring and passive NAPL recovery would also be conducted.
- **Alternative 3 – Full Excavation of On-Site and Off-Site Soil, Near-River Soil Excavation, and Full Sediment Excavation:** Alternative 3 generally consists of excavating surface and subsurface near-River and upland soil at the Former MGP Site and the MGP-impacted area of the B&L Property. The upper 10 ft of soil would be stockpiled for sampling to confirm compliance with 6 NYCRR 375-6.7 (d) and Commissioner Policy-51 (CP-51) in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site; impacted soil would be treated or disposed of off Site. Site sediment would be excavated for off-Site disposal/thermal treatment. Monitored natural attenuation (MNA) of groundwater, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery would also be conducted.
- **Alternative 4 – Partial Excavation of On-Site Soil, Full Excavation of Off-Site Soil, Near-River Soil Excavation, and Full Sediment Excavation:** Alternative 4 generally consists of excavating Former MGP Site surface soil, partially excavating subsurface soil near River and upland source areas at the Former MGP Site and the MGP-impacted area of the B&L Property, and constructing a vegetated two-foot clean soil cover with a demarcation layer. The upper 10 ft of soil would be stockpiled for sampling to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site; impacted soil would be treated or disposed of off Site. Sediment containing MGP residuals would be excavated for off-Site treatment/disposal. Engineering controls would include fencing to restrict Site access and a vegetated two-foot clean soil cover

with a demarcation layer. Institutional controls would be implemented to record the presence of covered areas; to establish OM&M requirements for soil covers and fences; and to protect from potential future exposure to subsurface soil and groundwater via an environmental easement. MNA of groundwater, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery would also be conducted.

- **Alternative 5 – Partial On-Site Excavation (Upper 10 feet), Partial On-Site ISS, Off-Site ISS, Near-River Soil Excavation, and Full Sediment Excavation:** Alternative 5 generally consists of excavating Former MGP Site surface soil and excavating the upper 10 ft of soil at the Former MGP Site upland source areas and the MGP-impacted area of the B&L Property. Near-River soil at the Former MGP Site would be excavated to competent bedrock. The soil would be stockpiled for sampling to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site; impacted soil would be treated or disposed of off Site. Source area subsurface soil below 10 ft would be treated by ISS. Sediment containing MGP residuals would be excavated for off-Site treatment/disposal. Institutional controls would be implemented to record the presence of covered areas; to establish OM&M requirements for soil covers; and to protect from potential future exposure to subsurface soil and groundwater via an environmental easement. Engineering controls would include existing fencing to restrict Site access and a vegetated two-foot clean soil cover with a demarcation layer. MNA of groundwater, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery would also be conducted.
- **Alternative 6 – Partial On-Site Excavation (Upper 10 feet), Partial On-Site ISS, Off-Site Excavation, Near-River Soil Excavation, and Full Sediment Excavation:** Alternative 6 generally consists of excavating Former MGP Site surface soil and the upper 10 ft of soil at the Former MGP Site upland source areas. Near-River soil at the Former MGP Site and the MGP-impacted area of the B&L Property would be excavated to competent bedrock. The soil would be stockpiled for sampling to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site; impacted soil would be treated or disposed of off Site. Former MGP Site source area subsurface soil below 10 ft would be treated by ISS. Sediment containing MGP residuals would be excavated for off-Site treatment/disposal. Engineering controls would include a vegetated two-foot clean soil cover with a demarcation layer. Institutional controls would be implemented to record the presence of covered areas; to establish OM&M requirements for the soil cover; and to protect from potential future exposure to subsurface soil and groundwater via an environmental easement. MNA of groundwater, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery would also be conducted.

RECOMMENDATIONS

Alternative 4 is recommended for implementation at the Site based on a comparative analysis of the six alternatives using eight evaluation criteria presented in this FS; community acceptance will be evaluated during the Proposed Remedial Action Plan (PRAP) process when the public will have the opportunity to review and comment on the proposed remedy. The development and evaluation of the remedial alternatives are described in detail in this FS Report. Pre-design investigations, including the sampling of the side slopes along Suntru Street down to the Site as well as to the south along the Bausch Street Bridge, NAPL gauging, and a constructability assessment are recommended prior to full-scale

remediation. The remedial design will determine siting of NAPL recovery and long-term monitoring wells.

Table of Contents

Page

Executive Summary i
List of Tables xii
List of Figures xiii
List of Abbreviations and Acronyms xiv
Engineering Certification xvi

1. Introduction 1

1.1 PURPOSE 1
1.2 SITE DESCRIPTION 1
1.3 SITE HISTORY 2
1.3.1 Former MGP Site 2
1.3.2 Off-Site Properties 3
1.4 SUMMARY OF INVESTIGATIONS/INTERIM REMEDIAL MEASURES 4
1.4.1 1992 Site Investigation 4
1.4.2 1998 and 2000 Focused Remedial Investigation 4
1.4.3 2004 and 2005 Tar Well Removal IRM 5
1.4.4 2007 and 2008 ISS IRM to Mitigate NAPL Seeps 5
1.4.5 2008 and 2009 Sediment Investigation 5
1.4.6 2010 to 2014 Remedial Investigation 6

2. Summary of Remedial Investigation 9

2.1 GEOLOGY AND HYDROGEOLOGY 9
2.1.1 Geology 9
2.1.2 Hydrogeology 11
2.1.3 Site Sediment Geology and Hydrogeology 12
2.2 NATURE AND EXTENT OF CONTAMINATION 13
2.2.1 On-Site Overburden 13
2.2.2 Off-Site Overburden 14
2.2.3 On-Site and Off-Site Bedrock 14
2.2.4 Sediment 15
2.2.5 Soil Vapor 16
2.2.6 NAPL 16
2.3 QUALITATIVE EXPOSURE ASSESSMENT 16

3. Remedial Goals and Remedial Action Objectives 18

3.1 GOAL OF THE REMEDIAL PROGRAM 18
3.2 STANDARDS, CRITERIA, AND GUIDANCE 18
3.3 REMEDIAL ACTION OBJECTIVES 19
3.4 MEDIA AND LOCATIONS REQUIRING RESPONSE ACTIONS 20

Table of Contents

Page

4. Identifying and Screening Remedial Technologies 22

4.1 GENERAL RESPONSE ACTIONS 22
4.2 APPLICABLE REMEDIAL TECHNOLOGIES AND ACTIONS 22
4.2.1 Surface Soil 22
4.2.2 Subsurface Soil 24
4.2.3 Near-River soil 26
4.2.4 Groundwater 26
4.2.5 Sediment 28

5. Evaluating Remedial Alternatives 30

5.1 EVALUATION CRITERIA 30
5.2 ASSEMBLY AND ANALYSIS OF ALTERNATIVES 30
5.2.1 Alternative 1 – No Further Action 31
5.2.2 Alternative 2 – Soil Capping, Near-River soil Excavation, Full Sediment Excavation, and Hydraulic Containment (Slurry Wall) 34
5.2.3 Alternative 3 – Full Excavation of On-Site and Off-Site Soil, Near-River Soil Excavation, and Full Sediment Excavation 39
5.2.4 Alternative 4 – Partial Excavation of On-Site Soil, Full Excavation of Off-Site Soil, Near River-Soil Excavation, and Full Sediment Excavation 44
5.2.5 Alternative 5 – Partial On-Site Excavation (Upper 10 feet), Partial On-Site ISS, Off-Site ISS, Near-River Soil Excavation, and Full Sediment Excavation 49
5.2.6 Alternative 6 – Partial On-Site Excavation (Upper 10 feet), Partial On-Site ISS, Off-Site Excavation, Near-River Soil Excavation, Full Sediment Excavation 56

6. Comparison of Remedial Alternatives 63

6.1 OVERALL PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT 63
6.2 COMPLIANCE WITH STANDARDS, CRITERIA, AND GUIDANCE 64
6.3 LONG-TERM EFFECTIVENESS AND PERFORMANCE 65
6.4 REDUCTION OF TOXICITY, MOBILITY OR VOLUME 66
6.5 SHORT-TERM IMPACT AND EFFECTIVENESS 66
6.6 IMPLEMENTABILITY 67
6.7 COST 68
6.8 LAND USE 68
6.9 COMMUNITY ACCEPTANCE 69

7. Recommended Remedial Alternative 70

7.1 RECOMMENDED REMEDY COMPONENTS 70
7.2 BASIS FOR RECOMMENDATION 70
7.3 ADDITIONAL PRE-DESIGN INVESTIGATIONS 70

References 71

Table of Contents

Page

Tables
Figures
Appendix A - Cost Estimation Spreadsheet

List of Tables

Table No.	Title
I	Summary of Qualitative Exposure Assessment
II	Screening of Remedial Technologies
III	Summary of Remedial Action Alternative Analysis
IV	Summary of Remedial Action Alternative Costs
V	Summary of Remedial Action Alternative Comparative Analysis

List of Figures

Figure No.	Title
1	Project Locus
2	Existing Site Conditions
3	Historic Site Conditions
4	Summary of Previous Exploration Locations and IRMs
5	On-Site Remedial Investigation Exploration Locations
6	Off-Site Remedial Investigation Exploration Locations
7	Sediment Probe and Vibracore Locations – 2013
8	Top of Bedrock Contours
9	TarGOST®, Soil Boring, and Test Pit Observations
10	Sediment NAPL/ Sheen Observations – 2013
11	Media and Locations Requiring Response Actions
12	On-Site Remedy Slurry Wall and Asphalt Cap (Alternative 2)
13	Off-Site Remedy Asphalt Cap (Alternative 2)
14	Sediment Remedy Full Excavation (All Alternatives)
15	On-Site Remedy Full Excavation (Alternative 3)
16	Off-Site Remedy Excavation (Alternatives 3, 4, & 6)
17	On-Site Remedy Partial Excavation (Alternative 4)
18	Off-Site Remedy In-Situ Solidification (Alternative 5)
19	On-Site Remedy Partial In-Situ Solidification (Alternatives 5 & 6)

List of Abbreviations and Acronyms

Abbreviation	Definition
6NYCRR	New York Codes, Rules, and Regulations Chapter 6
ALM	Ash-like material
B&L	Bausch & Lomb
B&L Property	Bausch & Lomb manufacturing facility
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CLM	Clinker-like material
COC	Contaminants of concern
COPC	Contaminant of potential concern
CWG	Carbureted water gas
cu yd	cubic yard
DNAPL	Dense non-aqueous phase liquid
Former MGP Site	East Station Former Manufactured Gas Plant
FS	Feasibility Study
ft	foot/feet
ft bgs	feet below ground surface
GEI	GEI Consultants, Inc.
GGBFS	Ground granulated blast-furnace slag
Haley & Aldrich	Haley & Aldrich of New York
HAZWOPER	Hazardous Waste Operations and Emergency Response
IRM	Interim Remedial Measure
ISS	In-situ solidification
lf	linear foot
LNAPL	Light non-aqueous phase liquid
MGP	Manufactured gas plant
MNA	Monitored natural attenuation
MOC	Material of concern

Abbreviation	Definition
NAPL	Non-aqueous phase liquid
NPV	Net present value
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM&M	Operations, maintenance, and monitoring
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PFAS	Per- and polyfluoroalkyl substances
Phase 2 Data Summary Package	GEI Consultants' 2010 "Phase 2 Data Summary Package - Assessment of MGP-Related NAPL Residuals in Sediments in the Genesee River Project Area"
ppm	parts per million
PRAP	Proposed Remedial Action Plan
RAO	Remedial Action Objective
RG&E	Rochester Gas & Electric
RI	Remedial Investigation
RIR	Remedial Investigation Report
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SGV	Sediment Guidance Values
Site	East Station Former Manufactured Gas Plant
SMP	Site Management Plan
sq ft	square feet
SVOC	Semi-volatile organic compound
TarGOST®	Tar-specific green optical screening tool
TNT	Trinitrotoluene
TOGS	Technical and Operational Guidance Series
VOC	Volatile organic compound

Engineering Certification

I, Scott Underhill, certify that I am currently a New York State registered professional engineer and that this Feasibility Study was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Respectfully submitted,
Haley & Aldrich of New York

Scott G. Underhill — MAY 3, 2021

Scott Underhill, PE
Registered Professional Engineer
New York License No. 075332

Date

1. Introduction

1.1 PURPOSE

Haley & Aldrich of New York (Haley & Aldrich) prepared this Feasibility Study (FS) on behalf of Rochester Gas & Electric (RG&E) for the East Station Former Manufactured Gas Plant (MGP) Site (Former MGP Site or Site) located on Suntru Street in Rochester, New York. The purpose of the FS is to identify, evaluate, and select a remedy for addressing MGP-related impacts to the soil, overburden and bedrock groundwater, and sediment identified in the Remedial Investigation Report (RIR).

1.2 SITE DESCRIPTION

The Former MGP Site is located at the foot of Suntru Street in Rochester, New York (Figure 1) on the eastern bank of the Genesee River and downstream of the High Falls dam and upstream of the Middle Falls dam. The parcel is currently owned by RG&E and is in an industrial/commercial area of the City north of downtown. The approximate 13.4-acre parcel is bordered to the north by a former Bausch & Lomb (B&L) manufacturing facility (B&L Property), to the east by the Genesee River gorge wall and Suntru Street, and to the south by the Bausch Street Bridge. The Genesee Brewing Company operates a beverage brewing facility south of the Bausch Street Bridge on the eastern side of the Genesee River. A Monroe County office building is located east of Suntru Street at the top of the gorge wall. A 2.25-acre parcel owned by New York State is located west of the Site along the Genesee River (Figure 2). According to RG&E's legal counsel, the New York State Office of General Services asserts ownership and the right to license or permit the use of the shoreline of navigable waters that were initially part of New York State, which includes the Genesee River. An abstract of the title for this parcel has been ordered and is forthcoming.

The majority of the Former MGP Site is open space with four RG&E buildings located in the northern portion of the parcel (Figure 2). These buildings are no longer occupied and may be demolished in the future. A high-pressure gas main is located in the central portion of the Former MGP Site, while a natural gas regulator station is located in the northeastern quadrant.

The B&L Property located immediately north of the Former MGP Site covers approximately 7.8 acres and is currently vacant and free of buildings except for some concrete floor slabs and a few sub-slab vaults and basement areas on the western half of the parcel. The B&L Property is gently graded with a raised, uneven area of soil piles in the southeast portion of the property (a former remediation biopile installed by B&L to treat petroleum-impacted soil) and a steep, four to eight foot (ft) high embankment and retaining wall in the western portion of the property along the Genesee River. The Former MGP Site and B&L Property are separated by a chain link fence, locking gates, and Suntru Street.

According to the City of Rochester, both the Former MGP Site and B&L Property are zoned M-1 Industrial. Municipal water is available at both properties. The buildings located on the Former MGP Site are connected to an on-Site septic system that consists of two septic tanks, a dosing chamber, and a leach field. A stormwater conveyance line runs down Suntru Street.

1.3 SITE HISTORY

This section discusses the historical use of the Former MGP Site with an emphasis on the former MGP operations (Figure 3) and summarizes previous environmental activities completed at the Former MGP Site. It also provides a brief summary of the B&L Property history.

1.3.1 Former MGP Site

The Former MGP Site history has been described in several previous reports, including the Preliminary Site Review completed in 1986 by Morrison-Knudson Engineers, Inc. (1986), the Site Investigation Report completed in 1993 by Atlantic Environmental Services, Inc. (1993), the Focused Remedial Investigation Report completed in 2000 by Ish, Inc. and Meta Environmental, Inc. (2000a), and the RIR completed in 2015 by Haley & Aldrich. These reports as well as other documentation provide the basis for the Former MGP Site history provided below.

A coal carbonization plant was constructed at the Former MGP Site in 1872 by Citizen's Gas Works; it consisted of a single building that housed the gas retorts and one below-ground gas holder located in the southeastern portion of the Former MGP Site north of the Bausch Street Bridge (formerly known as the Vincent Place Bridge). The below-ground holder was later used for tar storage and is referred to as the Former Tar Well.

Two additional gas holders, one below-ground and one aboveground and referenced on historical RG&E maps as Gas Holders #7 and #8, respectively, as well as an oil tank near Suntru Street, a purifying house, a retort house, a generator and boiling house, coal and tool sheds, and an exhaust stack were added between 1888 and 1892. The gas holders were located in the west-central portion of the Former MGP Site approximately 150 ft from the Genesee River. Gas production using the carbureted water gas (CWG) process began in the southeastern portion of the Former MGP Site in 1903.

By 1910, one additional aboveground gas holder (Gas Holder #9) was added to the western portion of the Former MGP Site north of the two existing gas holders. Around this time, an additional oil tank was added to the area near the purifying house in the western portion of the property, and a coal storage and handling facility was constructed east of the retort house. A 1911 Sanborn map shows a second oil tank east of the purifying house and tar tanks north of the machine shop. An historical RG&E plot plan shows a third waste oil tank west of Gas Holder #8. During the 1920s or 1930s, a fourth aboveground gas holder (Gas Holder #11) was installed adjacent to the Genesee River west of the three gas holders already present at the Former MGP Site.

By the mid-1920s, gas production operations at the East Station facility were reduced once the West Station MGP was constructed on the western bank of the Genesee River upstream and south of the East Station MGP. Gas produced at the West Station MGP was piped to the East Station Site for purification and storage. Foundation elements of the pipeline that crossed the Genesee River are still visible today upstream of the East Station MGP, south of the Bausch Street Bridge.

A light oil facility (i.e., Light Oil Plant) was constructed in the southwestern corner of the Former MGP Site adjacent to the Genesee River and used to produce trinitrotoluene (TNT) compounds during World War I and was then later used to produce Bengas, a gasoline substitute.

With the arrival of natural gas, coal gas manufacturing at the Former MGP Site ceased around 1952. A catalytic reforming process was used at the Former MGP Site for combining natural gas and manufactured gas produced at the West Station MGP for customer distribution. The catalytic reformation plant, built around 1951, was located in the southern portion of the property west of the coal carbonization plant. The catalytic reformation plant was active for approximately 25 years, until gas operations ceased at the Former MGP Site in 1976.

Other manufacturing processes at the Former MGP Site included but were not limited to recovering tars and oils (i.e., Light Oil Plant); distilling MGP by-products to manufacture chemicals, fertilizers, and pesticides; and manufacturing creosote, pitch, ammonium thiocyanate, and ammonium sulfate. In addition to debris from the MGP and related manufacturing operations, fill materials in the overburden present at the Former MGP Site consists of utility excavation spoils that were brought in from other parts of the city after the MGP structures were razed.

1.3.2 Off-Site Properties

Property use to the north, east, and south of the Former MGP Site have been generally consistent over time. The Frank Ritter furniture manufacturing facility and later the C.D. Brown & Company Tannery were located north of the Former MGP Site along the Genesee River. The parcel south of the Former MGP Site was occupied by the Bartholomay Brewing Company and later the Genesee Brewing Company, which still operates. The areas northeast and east of the Former MGP Site were occupied by the B&L Optical Company.

Sanborn Maps dated 1892, 1911, 1950, and 1971 (Appendix B of the RIR) were reviewed to better understand the history of the B&L Property located north of the Former MGP Site. No buildings are shown on the 1892 Sanborn Map, and a small “glass pressing” facility, labeled as Building No. 6, is shown just north of the C.D. Brown & Company Tannery on the 1911 Sanborn Map.

According to historical documentation (David Williams Company, The Iron Age, 1916), Building No. 6 was partially destroyed by fire in 1915. No documentation was found describing the extent of the fire damage or disposal of fire debris. Building No. 6 was replaced by a one-story, 136- by 222-foot brick building. The new plant building was used for “glass making, and the storing of chemicals used in glass production.”

By 1950, several buildings, including a large manufacturing plant, were present on the B&L Property. Manufacturing areas inside the building are labeled as glass molding, glass pressing, and inspecting and gaging. The 1950 Sanborn Map shows a dust collector building west of the plant and along the Genesee River, a storage warehouse and polishing and grinding building east of the plant, and an unlabeled building north of the plant. The 1950 Sanborn Map also shows a separate building immediately south of the plant and the polishing and grinding building. Further to the south, the former Brown Tannery building is labeled as a B&L warehouse. An RG&E Site plan dated August 1951 (Appendix B of the RIR) indicates that the two buildings located south of the plant were leased to B&L. An “auto house” is located north of Suntru Street and east of the polishing and grinding building on the B&L Property.

The plant configuration on the 1971 Sanborn Map is similar to the 1950 map, except the building immediately south of the plant and the polishing and grinding building, previously leased to B&L, is no longer present. The buildings were razed in the 1980s and RG&E was informed by B&L that the demolition was limited to above-grade improvements.

The Sanborn Maps indicate that both coal and natural gas were used as fuel at the B&L plant at the time of operation. The coal storage and furnace locations are unknown. An historical plan provided by RG&E depicts manufactured gas lines entering the B&L Property from the south, conveying gas in subsurface piping located between the plant and storage warehouse, and entering the plant on the western side of the B&L plant (Appendix B of the RIR).

In addition to the Former MGP Site and B&L Property, the surrounding areas along the Genesee River have a long history of industrial and commercial use. Prior to and during the period of MGP operations, property uses along the Genesee River upstream or adjacent to the Former MGP Site included (but were not limited to) operating a City trash incinerator, petroleum storage, tool manufacturing, landfilling, and foundry operations.

1.4 SUMMARY OF INVESTIGATIONS/INTERIM REMEDIAL MEASURES

Four investigations and two interim remedial measures (IRMs) as well as supporting investigations have been completed at the Former MGP Site since 1992. Historic sample and IRM locations are shown on Figures 4 through 7. The RIR provides a comprehensive summary of the work completed at the Site to date.

1.4.1 1992 Site Investigation

The 1992 Site Investigation was performed by Atlantic Environmental Services, Inc. (1993). The investigation included a soil gas survey, test pit excavations, surface and subsurface soil sampling, soil and bedrock borings, monitoring well installations, and groundwater sampling to evaluate Former MGP Site conditions. The 1992 Site Investigation identified the presence of MGP residuals in surface soil, subsurface soil, and groundwater. Additional subsurface explorations were recommended to further characterize the Former MGP Site conditions.

1.4.2 1998 and 2000 Focused Remedial Investigation

The 1998 and 2000 Focused Remedial Investigation was conducted by Ish, Inc. and META Environmental, Inc. (2000a and 2000b) to identify sources of non-aqueous phase liquid (NAPL) found along the Genesee River shoreline adjacent to the Former MGP Site, identify preliminary remedial alternatives, characterize the contents of the tar well, identify remedial alternatives for the tar well, and further evaluate groundwater quality. The Focused Remedial Investigation included a shoreline survey to identify areas of NAPL seeps. It consisted of soil and bedrock borings, subsurface soil sampling, installing piezometers and monitoring wells, test pit excavations, and groundwater sampling.

The Focused Remedial Investigation identified the presence of light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL) in soil and bedrock beneath the Former MGP Site. While LNAPL was observed at a few locations typically in the southwestern quadrant of the Former MGP Site, DNAPL was observed in several on-Site borings distributed across the Former MGP Site. A thin layer of DNAPL was identified along the overburden and bedrock interface. NAPL was also observed along the Site's shoreline.

1.4.3 2004 and 2005 Tar Well Removal IRM

An IRM to address coal-tar impacts in the Former Tar Well area was performed between 2004 and 2005. The IRM included the removal of approximately 20,000 tons of impacted soil/fill material and the removal of the Former Tar Well structure in the southeastern quadrant of the Former MGP Site. IRM activities also included the construction of a circular perimeter slurry wall surrounding the tar well, soil excavation immediately outside the tar well to the inside of the slurry wall, and excavation dewatering and off-Site disposal of approximately 978,000 gallons of groundwater. IRM activities are described in the *Final Engineering Report* for IRM by URS, Inc. in 2006. Figure 2 shows the location of the tar well IRM.

1.4.4 2007 and 2008 ISS IRM to Mitigate NAPL Seeps

An IRM to mitigate seeps along the bank of the Genesee River was completed in 2007 and 2008 and included in-situ solidification (ISS) of approximately 18,000 cubic yards (cu yd) of soil to immobilize MGP residuals (including NAPL) in the overburden material near the riverbank and the installation of a slurry wall and DNAPL collection trench with 22 NAPL recovery/monitoring wells east of the ISS area. Approximately 27,000 tons of overburden soil containing purifier box material was also removed and transported to an off-Site disposal facility as part of the project. Construction details are described in the *Phase IV Interim Remedial Measure Implementation Report* (Ish, Inc., 2009).

Once the ISS IRM had been completed, NAPL and water quality in the ISS recovery wells and bedrock groundwater monitoring wells underneath the ISS columns have been monitored annually. Measurable NAPL thicknesses were found for the first time during the May 2010 monitoring event in recovery well RW-5 (1.35 ft thick), and in shallow bedrock monitoring wells DW-3R (0.33 ft thick) and MW-5R (0.21 ft thick) near the former Light Oil Plant area. More recent NAPL measurements completed in October 2018 indicated that only trace NAPL was present in DW-3R, and measurable NAPL was not present in wells RW-5 and MW-5R.

1.4.5 2008 and 2009 Sediment Investigation

Sediment investigations were completed in the Genesee River by GEI Consultants, Inc. (GEI) in 2008 and 2009. The investigation included portions of the Genesee River adjacent to the Former MGP Site. Sediment conditions were described in the *Phase 2 Data Summary Package - Assessment of MGP-Related NAPL Residuals in Sediments in the Genesee River Project Area* by GEI dated 31 March 2010 (Phase 2 Data Summary Package). The Phase 2 Data Summary Package reported the following findings regarding sediment conditions adjacent to the Former MGP Site and B&L Property:

- Sediment deposits form a narrow wedge along the shoreline, thinning and disappearing toward the center of the channel where bedrock is predominant;
- NAPL was found in sediment immediately along the shoreline at the southern portion of the Former MGP Site;
- Trace to moderate sheens were found at two sediment probe location downstream of the NAPL locations; trace sheens were also found in several other locations;
- Trace sheen was observed in sediment at one vibracore location adjacent to the Former MGP Site and B&L Property boundary; and

- A limited area of NAPL was observed in sediment adjacent to the B&L Property downstream of the Former MGP Site and B&L Property boundary.

1.4.6 2010 to 2014 Remedial Investigation

The Remedial Investigation was performed between December 2010 and August 2014 to build upon past investigations, IRMs, and monitoring completed at the Former MGP. The overall field investigation consisted of test pit excavations, the use of the Tar-specific Green Optical Screening Tool, or TarGOST®, to investigate and define the distribution of NAPL in the subsurface, soil borings, installing overburden wells, drilling bedrock core holes, and installing bedrock monitoring wells, collecting groundwater samples, sediment probing, and sediment coring.

The results of the on-Site overburden investigations completed on the Former MGP Site indicated the following:

- Structures associated with the former MGP operations were present in the Former MGP Site subsurface but do not appear to be sources of impacts to soil and groundwater.
- NAPL was present in the overburden in three areas of the Former MGP Site: the Former Purifier Area in the northeast quadrant of the property; in the vicinity of the Former Oil Tanks, Former Tar Well and Former MGP Plant in the southeastern quadrant; and the Former Light Oil Plant in the southwest quadrant, including an area north of the Former Light Oil Plant west of the ISS area. NAPL was typically observed near the weathered bedrock and overburden interface in these areas.
- NAPL was not typically observed in the overburden material in the northwest quadrant of the Former MGP Site; much of this area was previously solidified as part of the ISS IRM.
- Limited amounts of NAPL in overburden monitoring wells, which were constructed with sumps to collect NAPL, if present, and the absence of NAPL in the collection wells east of the ISS area suggested that NAPL in the overburden was not currently mobile horizontally or its mobility was severely limited or retarded in this area.
- Volatile organic compounds (VOCs), polycyclic aromatic hydrocarbon (PAHs), metals, and cyanide were present in overburden fill material at concentrations exceeding New York Codes, Rules, and Regulations Chapter 6 (6NYCRR) Part 375 Commercial Soil Cleanup Objectives (SCOs) beneath most portions of the Former MGP Site. VOCs and PAHs were also present in alluvial soil beneath the fill material and above bedrock.
- VOCs, PAHs, metals, and/or total cyanide were present at concentrations exceeding New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Water Quality Standards in overburden groundwater beneath most areas of the Former MGP Site.

The results of the off-Site overburden investigation completed on the B&L Property indicated the following:

- MGP-related NAPL was present in the overburden in the southeastern portion of the B&L Property and appeared to be contiguous. NAPL was also observed in the northeastern quadrant of the Former MGP Site in the area located north of the Former Purifier Area.

- MGP-related NAPL was not observed in overburden in other portions of the B&L Property. Areas of apparent petroleum-related impacts, including potential petroleum NAPL, were observed in the south-central portion of the B&L Property, but were not considered to be associated with the former MGP Site, due to other possible petroleum sources identified on the B&L Property.
- PAHs and metals were present beneath the former B&L manufacturing plant floor slab in an area where subsurface gas distribution pipes are shown on historical plans. A layer of fill containing ash-like material (ALM) was present directly beneath the floor slab in this area.
- PAHs, metals, and cyanide were also present in fill material at concentrations exceeding Commercial SCOs in the southern portion of the B&L Property. The fill material content appeared to be typical of urban fill and not the result of migration or transport from the Former MGP Site.
- VOCs, PAHs, metals, and cyanide were not detected in overburden soil at concentrations exceeding Commercial SCOs in the northern portion of the B&L Property.
- VOCs, PAHs, metals, and total cyanide were present at concentrations exceeding Class GA Water Quality Standards in overburden groundwater beneath the southern portion of the B&L Property.

The results of the Former MGP Site and B&L Property bedrock investigation indicated the following:

- Varying amounts of MGP-related NAPL and sheen were present in competent bedrock beneath the Former MGP Site and B&L Property to a maximum depth of approximately 154 feet below ground surface (ft bgs) in the Grimsby Sandstone. The limited volumes of NAPL and sheen were observed in thin, discrete, nearly horizontal bedding plane partings that appeared to be laterally continuous.
- NAPL and sheen were not observed at the interface of the Grimsby Sandstone and Queenston Shale or within the upper portion of the Queenston Shale at any of the bedrock coring locations, thus defining the lower vertical extent of MGP-related impacts to bedrock.
- VOCs, PAHs, metals, and total cyanide were present at concentrations exceeding Class GA Groundwater Quality Standards in bedrock beneath the Former MGP Site and B&L Property. The presence of NAPL in bedrock, as described above, likely contributed to dissolved-phase concentrations in bedrock groundwater.

The results of the sediment investigation indicated the following:

- NAPL and PAH concentrations exceeding visual and sediment screening guidance values, respectively, were present in sediment along the southern portion of the Former MGP Site adjacent to the Former Light Oil Plant, which is adjacent to an upland portion of the Former MGP Site where NAPL had been observed in the overburden;
- NAPL was not observed in sediment immediately north of the Former Light Oil Plant, since soft sediment was not present or observed in this area above the bedrock; and
- A small area of NAPL blebs (i.e., discontinuous droplets of NAPL within the sediment matrix) were observed in sediment north of the RG&E and B&L Property boundary adjacent to the B&L Property. This small area does not appear to be linked to an upland source and was delineated by completing additional vibracores.

The eastern horizontal extent of MGP-related impacts to overburden soil is limited by the presence of the gorge wall, which limits the physical extent of overburden. Although no explorations were completed south of the RG&E southern property boundary, the Bausch Street Bridge was in place prior to constructing the MGP. Historical plans and drawings do not indicate that MGP operations or disposal occurred south of the RG&E's southern property boundary. However, if MGP wastes are observed in this area during remedial activities, they will be remediated, and post-excavation samples will be taken. The western extent of MGP-related impacts to overburden is limited by the presence of the Genesee River, which flows along the western property boundary. To the north, MGP-related impacts to overburden appear to extend to the southeastern portion of the B&L Property, which is located north of the Former Purifier Area on the Former MGP Site.

Given the consistent east to west overburden groundwater hydraulic gradient, MGP-related impacts to groundwater are limited to on-Site areas within the Former MGP Site's property boundaries, and the B&L Property within and downgradient (west) of the MGP-impacted overburden described above. Based on a comparison of overburden groundwater elevations with surface water elevation of the Genesee River, overburden groundwater likely discharges to the Genesee River.

2. Summary of Remedial Investigation

2.1 GEOLOGY AND HYDROGEOLOGY

2.1.1 Geology

The Former MGP Site is underlain by approximately 10 to 20 ft of unconsolidated deposits consisting of fill materials over a discontinuous layer of alluvial deposits. Fill is found across the Former MGP Site and contains ALM, clinker-like material (CLM), slag, cinders, brick, purifier box material, coke, coal, and building rubble. Fill placed during post-MGP operations is generally encountered in the central and southern portion of the Former MGP Site and consists of sandy loam material with some concrete, rebar, wire, pipe, and asphalt.

Former MGP foundation structures are present beneath many portions of the Former MGP Site, particularly in the Former Purifier Area, the Former Retort Area, and the Former Light Oil Plant. Large Former Gas Holder foundations are present in the northwest and southwest quadrants of the Former MGP Site. The foundation for Former Gas Holder #11 is visible at ground surface.

Alluvial deposits below the fill and foundation structures consist of orange-brown to grayish-brown silty sand with gravel ranging in thickness from one to 10 ft, where present. Alluvial deposits tend to be thicker along the eastern property boundary and generally become thinner or pinch out in the western portion of the Former MGP Site. In the areas where alluvial deposits are not present, fill material was observed directly above weathered bedrock. The property footprint likely expanded to the west (towards the River) as fill material was added to the riverbank.

The top of weathered bedrock surface generally slopes gently to the north and west toward the Genesee River. The competent bedrock slopes slightly to the south. Weathered bedrock consists of rock fragments and gravel with silt and sand approximately one to three ft thick. Weathered bedrock was observed across the upland portions of the Former MGP Site. Weathered bedrock encountered directly beneath overburden soil consists of either the Rochester Shale for the majority of the Former MGP Site or the Irondequoit Limestone in the northwest portion of the Former MGP Site. The Rochester Shale is likely absent in the northwest portion of the Former MGP Site as a result of the Genesee River eroding the exposed bedrock surface over geologic time.

A depression in the bedrock surface is present in the southwest corner of the Former MGP Site at approximately 45 ft below the typical top of bedrock surface (Figure 8). This depression in the top of bedrock surface may be a former plunge pool geologic feature and, based on information obtained from borings completed near the depression, appears to be limited in horizontal extent. The depression is not related to former MGP structures depicted on historical Site plans and drawings from the time of MGP operation and does not appear to be impacted by NAPL.

A concrete floor slab associated with a former manufacturing plant is visible at ground surface in the western portion of the B&L Property. Apparent vault structures and drainage features were also observed adjacent to or within the floor slab footprint. In the southeastern portion of the B&L Property, a hummocky area of soil piles reportedly associated with a former biopile operated by B&L to manage petroleum-impacted soil is present on an elevated area north of Suntru Street.

A retaining wall is present along the western boundary of the B&L Property adjacent to and parallel with the Genesee River. The retaining wall is approximately four to eight ft high and runs the length of the B&L Property. With minor exceptions, the Genesee River is generally inaccessible from the upland portion of the B&L Property given the presence of the retaining wall, a chain link fence, and thick vegetation.

Similar to the Former MGP Site, the B&L Property is underlain by approximately 8.5 to 32 ft of unconsolidated deposits typically consisting of fill material over a discontinuous layer of alluvial deposits. Fill material encountered beneath the B&L Property typically consisted of silt, sand, and gravel with variable amounts of glass fragments (including eyeglass lenses), ALM, CLM, apparent coke breeze, and brick. Some of the ash noted in the subsurface may be from the 1915 fire that destroyed a portion of the former manufacturing plant. Fill material observed beneath the former plant floor slab indicates placement of at least some of the fill prior to or during the construction of the former manufacturing plant. The fill thickness ranges from approximately 20.5 ft in the southeast corner of the B&L Property to not present at borings completed along the Genesee River where alluvial deposits were observed at ground surface.

Alluvial deposits including clay, silt, sand, and gravel beneath the B&L Property are typically present below the fill material and overlie weathered bedrock. The alluvial deposits typically range from not present to approximately 16 ft thick.

Nine bedrock formations are present beneath the Former MGP Site and B&L Property:

- Rochester Shale (absent in northwestern portion of the Former MGP Site and a majority of the B&L Property) – a gray calcareous mudstone, which also forms the sidewalls of the gorge in the vicinity of the Former MGP Site and B&L Property;
- Irondequoit Limestone – a light to dark gray dolostone to limestone;
- Williamson Shale – a dark green to greenish-gray shale with limestone interbeds;
- Lower Sodus Shale – a light to dark gray shale with limestone interbeds;
- Reynales Limestone – a light to medium gray limestone with greenish-gray shale interbeds and a layer of reddish-brown hematitic limestone (Furnaceville Hematite) present near the base of the formation;
- Maplewood Shale – a green or gray shale;
- Kodak Sandstone – a grayish-green and reddish-brown mottled medium grained sandstone;
- Grimsby Sandstone – a reddish-brown and grayish-green banded or mottled fine-grained sandstone; and
- Queenston Shale – a brown to reddish-brown fine-grained siltstone with green mottling.

While the undulating weathered bedrock surface beneath the Former MGP Site and B&L Property generally slopes gently to the north and west, the bedding plane of the underlying bedrock formations dip gently to the south, which is typical for Rochester-area bedrock. NAPL recovery wells and monitoring wells will be sited during the Remedial Design/Remedial Action to maximize NAPL collection.

The Rochester Shale is immediately present beneath overburden for the majority of the Former MGP Site while the Irondequoit Limestone, located stratigraphically beneath the Rochester Shale, is present immediately beneath overburden for the majority of the B&L Property. This change in rock type beneath overburden is likely the result of the slight southerly dip of the bedrock contacts and the erosional downcutting of the Genesee River into bedrock over geologic time.

2.1.2 Hydrogeology

The Former MGP Site is uniquely situated at the base of the Genesee River Gorge with gorge sidewalls bordering the property to the east and to the west beyond the Genesee River. Surface water drainage is to the west toward the Genesee River. The Genesee River flows south to north on the western boundary of the Former MGP Site, eventually discharging to Lake Ontario. The upland portion of the Former MGP Site is separated from the Genesee River by a chain link fence and vegetation.

The bedrock in the City of Rochester is incised by the Genesee River, which flows south to north through the City and over three waterfalls (High Falls, Middle Falls, and Lower Falls) before reaching Lake Ontario to the north. The High Falls is located approximately one-half mile south of the Former MGP Site and flows over the Lockport Dolomite capstone, incising the Rochester Shale below. The Genesee River flows past the Former MGP Site and B&L Property with the Rochester Shale or Irondequoit Limestone (bedrock) creating the river bottom in areas where sediment is not present. Surface water adjacent to the Former MGP Site and B&L Property is partially impounded behind the RG&E Station 5 hydroelectric generation plant dam located at the Middle Falls, approximately three quarters of a mile downstream of the Former MGP Site. The Genesee River is classified by the State of New York as Class B surface water (suitable for recreation and fishing, but not drinking) in the vicinity of the Former MGP Site. New York State lists the lower Genesee River as an impaired waterway (New York State, 2014).

Overburden groundwater is typically encountered six to 20 ft beneath the Former MGP Site. Groundwater elevation contours indicate that the groundwater flow direction is to the west toward the Genesee River with no seasonal variation to the overall flow direction. Since the overburden groundwater elevation in monitoring wells adjacent to the Genesee River is nearly equivalent to the elevation of surface water in the River, overburden groundwater likely discharges to the Genesee River. The surface water elevation of the Genesee River in the vicinity of the Former MGP Site typically has a dam-controlled pond elevation of approximately 391.5 ft (Barge Canal Datum). Based on the hydraulic conductivity measured in overburden wells and the observed hydraulic gradient, the groundwater velocity beneath the Former MGP Site ranges from approximately 0.02 to 1.4 ft per day.

Overburden groundwater beneath the B&L Property is typically encountered five to 16 ft bgs. Similar to conditions at the Former MGP Site, overburden groundwater elevation contours indicate that groundwater flows east to west beneath the B&L Property toward the Genesee River. Hydraulic conductivity testing results for the overburden monitoring wells on the B&L Property and the observed hydraulic gradient indicate that the velocity for groundwater ranges from 0.02 to 0.28 ft per day.

A downward hydraulic gradient is present between the overburden and competent bedrock groundwater-bearing units across the Former MGP Site and B&L Property. Water levels in the weathered bedrock, which separates competent bedrock from the overburden, are comparable to the overburden groundwater-bearing unit. This observation indicates that the weathered bedrock is likely hydraulically connected to the overburden, and groundwater flow in the weathered bedrock likely follows the general east to west groundwater flow direction.

Bedrock groundwater elevations indicate that the hydraulic gradient of the bedrock groundwater in similar bedding plane intervals of the bedrock is nearly flat. Overall, the bedrock groundwater elevations indicate that a small downward hydraulic gradient is present in bedrock, although movement of groundwater would be limited to transmissive fracture or joint features cross-cutting the bedding plane features.

Rock core visual observations, water loss during drilling, geophysical testing, and packer testing indicate that transmissive zones are present at a variety of depths in the bedrock units beneath the Former MGP Site and B&L Property. Transmissive zones are typically observed as planar or gently undulating joints or bedding planes with some visual indications of weathering, such as reduced hardness or mineral deposits. Many features are laterally continuous and can be followed from core hole to core hole using rock core visual observations and downhole geophysical logging.

The results of the RIR indicate a wide range of hydraulic conductivity values for the bedrock water-bearing units. The packer tests indicate that some portions of the bedrock are nearly impermeable, consistent with rock core observations and downhole geophysical logging results. Water-bearing intervals, such as the Maplewood Shale at on-Site bedrock monitoring well DW-12-06M, have an estimated hydraulic conductivity value greater than 28 ft per day.

2.1.3 Site Sediment Geology and Hydrogeology

Site sediment changes in grain size and distribution from the area adjacent to the southern portion of the Former MGP Site to the area adjacent to the B&L Property. Coarse sand and gravel sediment form a thin wedge along the riverbank adjacent to the southern portion of the Former MGP Site and beneath the Bausch Street Bridge. Bedrock is present at the river bottom in areas where sediment is not present closer to the center of the channel.

Moving further downstream to the area adjacent to the central portion of the Former MGP Site, adjacent to Former Holder #11, the sediment deposits are sparse with bedrock present at the river bottom. The river channel slightly narrows in this area, potentially creating higher surface water velocities and increased sediment scour.

Sand and gravel deposits are present in the areas adjacent to the RG&E and B&L property boundary and areas adjacent to the southern portion of the B&L Property. The sand and gravel deposits extend farther out from the riverbank towards the center of the channel, as expected on the inside portion of a river bend.

Finer grain sediment, including sand and silt, are present in the areas adjacent to the central and northern portion of the B&L Property. The finer sediment may be present due to the wider channel in this area, which results in decreased surface water velocities, reduced scour, and possible sediment deposition.

The water depth in the sediment study area ranges from less than one ft to greater than 10 ft. The soft sediment thickness, when present, ranges from less than one ft to greater than seven ft. Overall, the sediment thickness was typically one to two ft.

2.2 NATURE AND EXTENT OF CONTAMINATION

This section describes the distribution of MGP-related impacts in overburden soil, overburden groundwater, bedrock, bedrock groundwater, and sediment, taking into consideration historical operations, observations during subsurface investigations, and laboratory analytical results.

The sampling locations for the soil borings, rock corings, test pits, and overburden and bedrock monitoring wells installed at the Former MGP Site from 1993 through 2008 are shown on Figure 4. The sampling locations from the 2010 to 2014 RIR are shown on Figures 5 to 7. Refer to Figures 9 and 10 for the RIR observations of MGP-related impacts.

2.2.1 On-Site Overburden

MGP residuals, including NAPL, sheen, and staining are encountered in Former MGP Site overburden soil. While minor staining was observed in fill material throughout the Former MGP Site, NAPL and sheen observations were limited to certain areas of the parcel, typically as blebs and stringers within the lower portion of the fill material, alluvial deposits, and/or weathered bedrock. NAPL was typically found in the following three areas:

- The northeast quadrant of the Former MGP Site in the vicinity of the Former Purifier Area;
- The southeast quadrant of the Former MGP Site in the vicinity of the Former Oil Tanks, Former Tar Well, and Former MGP; and
- The southwest quadrant and southern portion of the northwest quadrant of the Former MGP Site in the vicinity of the Former Light Oil Plant and along the riverbank west of the ISS area.

Former MGP structures accessed during the Remedial Investigation (RI) do not appear to be a significant contaminant source and NAPL, if present, was not typically observed in significant quantities that would be considered source material.

Soil samples across the Former MGP Site collected at a variety of depths exceed Commercial SCOs for PAHs, metals, and total cyanide. Soil with metals at concentrations greater than Commercial SCOs are generally limited to fill soil and do not typically exceed SCOs in the natural alluvial soil. The PAH concentrations in soil exceed Commercial SCOs in both fill and alluvial materials. VOC detections exceeding Commercial SCOs were limited to fill material sampled at two soil boring locations in the vicinity of the Former Light Oil Plant and along the riverbank west of the ISS area.

Overburden groundwater across the Former MGP Site exceeds Class GA Water Quality Standards for VOCs (typically benzene, toluene, ethylbenzene, and xylenes [BTEX]), PAHs, several metals, and total cyanide. VOC and PAH concentrations in groundwater are typically lowest in the northwestern portion of the Former MGP Site, which generally agrees with the distribution of MGP residuals observed in overburden soil. The presence of NAPL in the subsurface likely contributes to impacts to groundwater.

NAPL has been measured in overburden wells in the southwestern portion of the Former MGP Site in the vicinity of the Former Light Oil Plant. Accumulating NAPL has not been detected in passive recovery wells installed in the gravel collection trench west of the ISS area. The absence of accumulating NAPL in the recovery wells suggests that NAPL present in overburden soil and highly weathered bedrock is not

mobile or its mobility is severely limited. NAPL volume and mobility were decreased by removing the Former Tar Well contents, which removed the primary NAPL source.

2.2.2 Off-Site Overburden

On the B&L Property, MGP-related impacts appear to be limited to the southeast portion of the property located north of the Former Purifier Area at the Former MGP Site. In the southeast portion of the B&L Property, apparent MGP residual material, including sheen, and/or NAPL blebs, was observed in overburden soil at depths typically greater than 10 ft bgs. The apparent MGP residual material was typically observed in the overburden soil directly above and within weathered bedrock. NAPL migration from the Former Purifier Area to the southeast portion of the B&L Property along the overburden and bedrock interface is a possible transport mechanism from the Former MGP Site to the B&L Property.

In the central portion of the B&L Property, petroleum-like odor and sheen are present at depths typically at and below the water table. The apparent petroleum impacts appear to be unrelated to the MGP residual material observed in the southeast portion of the property. These were analyzed and identified as diesel/petroleum-related impacts from other possible sources at the B&L Property and their operations. Minor apparent petroleum-related impacts, such as petroleum-like odor or minor sheen, were observed in borings completed to the east of the former plant floor slab and in two borings completed along the Genesee River west of the retaining wall.

Similar to the Former MGP Site, the samples that exceed SCOs for PAHs are distributed throughout the fill material in the southern portion of the B&L Property and in soil along the Genesee River. The origin of the fill material used at the Former B&L Property, including fill material observed beneath the floor slab, is unknown. Glass, presumably related to former B&L manufacturing operations, was found in fill material on the B&L Property. The use of coal as a fuel source in the former B&L plant buildings, as indicated on Sanborn Maps, may explain ALM observed in the fill. Residuals from the 1915 fire that destroyed a portion of the former B&L manufacturing facility may also contribute to PAHs in overburden on the B&L Property.

Soil exceedances for metals, including cadmium, lead, and barium, are most prevalent in soil borings completed west of the former B&L plant floor slab. The presence of these metals in soil does not appear to be related to the former MGP operations or MGP waste material.

PAHs and metals were also detected in one location completed beneath the B&L plant floor slab, TG-14-06C, where a possible void was noted below a layer of fill material with ALM while advancing the direct-push boring. This boring was completed in an area where historical drawings indicate gas conveyance pipes from the MGP entered the former B&L manufacturing plant. However, test pits completed in the vicinity of the subsurface pipes on the eastern side of the former plant floor slab found no evidence of past or ongoing release of MGP residuals.

2.2.3 On-Site and Off-Site Bedrock

MGP-related impacts, including sheens and NAPL, are present in competent bedrock at several discrete depths, typically limited in vertical and horizontal extent to the transmissive features described in Section 2.1.1.

NAPL, when present, was typically encountered as blebs and was observed in deep bedrock at five locations:

- BR-10-08 (Reynales Limestone from 68 to 76 ft bgs) and BR-10-07 (Reynales Limestone at 94 ft bgs and Maplewood Shale from 96 to 101 ft bgs) in the southern portion of the Former MGP Site;
- BR-10-02 (Maplewood Shale from 86 to 89 ft bgs) on the Former MGP Site along the RG&E and B&L boundary; and
- BR-12-01 (Reynales Limestone from 63 to 67 ft bgs) and BR-12-02 (Irondequoit Limestone at 37 and 40 ft bgs) in the southern portion of the B&L Property.

A depression in the bedrock surface observed at BR-10-07, in the southwest corner of the Former MGP Site, did not appear to be collecting and retaining DNAPL, though sheen and trace NAPL were observed in drilling fluid. Sheen was observed at several locations at discrete depth intervals.

NAPL and sheen were not observed at the Grimsby Sandstone and Queenston Shale interface, or at the top of the Queenston Shale, which defines the lower vertical extent of visual/olfactory impacts. The vertical extent of NAPL and sheen appears to be limited to the transmissive features observed in the Grimsby Sandstone and overlying bedrock formations.

In the vicinity of the three areas of the Former MGP Site and B&L Property where MGP-related NAPL is present in overburden soil, NAPL or sheen are typically observed in shallow bedrock similar to the impacts to the Irondequoit Limestone at BR-10-01 and BR-12-02 near the Former Purifier Area. This information suggests that NAPL impacts in the overburden likely migrated downward into bedrock through bedrock fracture and joint features, cross-cutting bedding plane partings, and migrated horizontally along the bedding plane partings.

MGP-related dissolved-phase constituents in bedrock exceed Class GA Water Quality Standards for VOCs (typically BTEX), PAHs (typically naphthalene), metals, and total cyanide at several bedrock monitoring well locations and at several depth intervals. Wells that had no exceedance of MGP-related dissolved-phase constituents included DW-5 in the southeast quadrant of the Former MGP Site near the southern property boundary, and MW-6D, DW-10-01M, and DW-10-01R, located in the northeast quadrant of the Former MGP Site east of the Former Purifier Area. The presence of NAPL and sheen in bedrock is likely the source of dissolved-phase impacts to bedrock groundwater.

2.2.4 Sediment

NAPL impacts to sediment related to former MGP operations appear to be limited to an area along the southern portion of the Former MGP Site adjacent to the Former Light Oil Plant. A discrete area of NAPL blebs was observed adjacent to the B&L Property located approximately 210 ft north (downstream) of the RG&E and B&L property boundary.

The NAPL observed in sediment adjacent to the Former Light Oil Plant correlates with upland impacts to overburden along the overburden and bedrock interface. Previous NAPL migration from the overburden likely contributed to the current impacts observed in sediment in the vicinity of the Former Light Oil Plant. Alternatively, erosion of the eastern riverbank may have exposed NAPL that was already present in the overburden. Sediment cores collected during the investigation indicated that sediment thickness

was limited in the vicinity of the Former Light Oil Plant, with soft sediment thickness ranging from one to 3.5 ft in the area where NAPL was observed. Where observed, NAPL was present in sediment consisting of sand or sand and gravel at the top of bedrock at elevations similar to adjacent upland soil borings. Since no apparent upland source of the small area of NAPL observed in sediment adjacent to the B&L Property was identified during the RI, the NAPL may have been mobilized and deposited from an upstream source. The NAPL was observed near the top of the 4.5-ft core sample, immediately below a 0.8-ft-thick layer of sandy fluvial deposits. The NAPL bleb was co-located with glass, wood, and shells.

Analytical testing indicated that sediment with the highest PAH concentrations were co-located with areas of visual and olfactory impacts.

2.2.5 Soil Vapor

A soil vapor investigation was not conducted at the Site.

There are no occupied buildings at the Former MGP Site. The two laboratory buildings located in the northern portion of the Former MGP Site off Suntru Street were previously the only occupied buildings at the Former MGP Site. There are no buildings on the B&L Property. The two laboratory buildings on the Former MGP Site are equipped with industrial ventilation systems associated with the laboratory's operations. Vapors migrating from soil or groundwater into the buildings would have been mitigated given the high indoor air exchange rate produced from the ventilation systems. As a result, vapor intrusion into the two formerly occupied structures is not considered a complete exposure pathway. Furthermore, if future construction occurred at the Former MGP Site or B&L Property, a vapor intrusion evaluation would be conducted. Therefore, vapor intrusion into future buildings was not considered to be a complete exposure pathway in this exposure assessment. The laboratory buildings are currently not used or occupied by RG&E and may be demolished in the future.

2.2.6 NAPL

A sample of NAPL collected from the bottom of bedrock monitoring well DW-10-07M was tested for density, viscosity, interfacial tension, and water content. The tests were performed at 12 degrees Celsius to simulate the in-situ ground temperature. The physical properties tests were completed to better understand potential NAPL mobility and provide parameters for future remedial alternative evaluation. The NAPL sample had a density of 1.0447 grams per milliliter, which confirms the NAPL is a DNAPL, a viscosity of 37.44 centistokes, which is a viscosity similar to vegetable oil, an interfacial tension of 18.4 dynes per centimeter, and a water content of 5.85 percent.

2.3 QUALITATIVE EXPOSURE ASSESSMENT

A qualitative exposure assessment was completed based on the results of the on-Site, off-Site, and sediment investigations. Potential receptors, transport mechanisms, and complete exposure pathways are provided in Table I. A detailed summary of this assessment can be found in the RIR. The complete exposure pathways identified by the exposure assessment are listed below.

- Former MGP Site
  - Surface soil:
    - A current and future on-Site RG&E employee;

        - A future construction worker under the scenario that a new building is constructed at the Former MGP Site;
        - A current and future utility worker; and
        - A current and future trespasser.
    - Subsurface soil:
        - A future construction worker under the scenario that a new building is constructed at the Former MGP Site; and
        - A current and future utility worker under the scenario of completing subsurface work.
    - Overburden groundwater:
        - A current and future on-Site RG&E employee working at the Former MGP Site under the scenario of inhaling vapors from impacted overburden groundwater;
        - A future construction worker under the scenario that a new building is constructed at the Former MGP Site;
        - A current and future utility worker under the scenario of completing subsurface work; and
        - A current and future trespasser under the scenario of inhaling vapors from impacted overburden groundwater.
- For the B&L Property:
    - Subsurface soil
        - A future construction worker under the scenario that a new building is constructed at the B&L Property; and
        - A current and future utility worker under the scenario of completing subsurface work.
    - Overburden groundwater
        - A current and future B&L employee under the scenario of inhaling vapors from impacted overburden groundwater;
        - A future construction worker under the scenario that a new building is constructed at the B&L Property;
        - A current and future utility worker under the scenario of completing subsurface work; and
        - A current and future trespasser under the scenario of inhaling vapors from impacted overburden groundwater.
    - Note that exposure pathways at the B&L Property were only evaluated for MGP-related contaminants of potential concern (COPC).
- Sediment adjacent to the Former MGP Site and B&L Property:
    - A future and current trespasser accessing and disturbing sediment at certain limited locations along the shoreline.

3. Remedial Goals and Remedial Action Objectives

3.1 GOAL OF THE REMEDIAL PROGRAM

The goal of the remedial program is to eliminate the current and future exposure pathways to human receptors and the environmental threats identified in the RIR by eliminating or reducing the MGP-related contaminants of concern (COCs) or MGP-related material of concern (MOC; e.g., NAPL) in surface and subsurface soil, groundwater, and sediment.

3.2 STANDARDS, CRITERIA, AND GUIDANCE

Standards, Criteria and Guidance (SCG) refer to standards and criteria that are generally applicable, consistently applied, and officially promulgated that are either directly applicable or not directly applicable but relevant and appropriate to be applicable to Site remediation. SCGs for evaluating the Site remedial alternatives are briefly described below:

- 6 NYCRR Part 375 – Environmental Remediation Programs (NYSDEC, 2006) includes chemical-specific SCOs documented in Subpart 375-6 Remedial Program Soil Cleanup Objectives that soil concentrations of individual compounds can be compared to. Part 375 also requires the removal or treatment of all source areas, which are defined as a portion of the site where a substantial quantity of NAPL or grossly contaminated media exists. For the purpose of this FS, source material is defined as soil from borings that has been identified as containing either mobile or immobile NAPL.
- TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (NYSDEC, 1998) provides standards and guidance values for which individual metal and organic compounds detected in surface water and groundwater can be compared to.
- Commissioner Policy-51 (CP-51) Soil Cleanup Guidance (NYSDEC, 2010c) provides a soil cleanup level of 500 parts per million (ppm) for total PAHs for subsurface soil (i.e., beneath a permanent structure, pavement, or similar cover system, or at least one foot of soil cover) in lieu of achieving all of the PAH-specific SCOs in 6 NYCRR Part 375 for non-residential use sites (i.e., commercial or industrial use sites).
- Technical Guidance for Screening and Assessment of Contaminated Sediments (NYSDEC, 2014) provides Sediment Guidance Values (SGV) for metals and organic compounds (VOCs and semi-volatile organic compounds [SVOCs]), including a total PAH value of 4 ppm for Class A freshwater sediment.
- Guidance for Evaluating Soil Vapor Intrusion in the State of New York (New York State Department of Health [NYSDOH], 2006, updated 2017) provides framework for determining if soil vapor intrusion is a concern at a site and methods for mitigating exposure concerns.
- DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010a) provides guidance on remedy evaluation and selection.
- DER-4 Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment (NYSDEC, 2002) outlines the criteria wherein coal tar waste and soil and sediment contaminated with coal tar waste from former MGP sites exhibiting only toxicity characteristics for benzene (D018) may

be conditionally excluded from the hazardous waste requirements under 6 NYCRR Parts 370-374 and 376 when thermally treated.

Media	Applicable Criteria
Surface Soil (top two ft)	• Remove surface soil containing site-related chemicals above commercial use SCOs, if the site remains commercial; or unrestricted use SCOs, if the intent is to have unrestricted use of site (6 NYCRR Part 375)
Subsurface Soil	• Remove/treat source material, or soil from borings that have been identified as containing either mobile or immobile NAPL (6 NYCRR Part 375) • Remove/treat subsurface soil containing total PAHs of 500 ppm or higher as can be applied to commercial or industrial use sites (CP-51) • Remove soil containing site-related chemicals above unrestricted use SCOs, if the intent is to have unrestricted use of site (6 NYCRR Part 375)
Groundwater	• Remove/treat groundwater containing NAPL (6 NYCRR Part 375) • Remove/treat groundwater to levels below drinking water standards (TOGS 1.1.1).
Sediment	• Remove/treat source material or sediment that has been identified as containing either mobile or immobile NAPL (6 NYCRR Part 375) • Remove/treat sediment above Class A freshwater sediment guidance values
Soil Vapor	• New York State does not have any standards, criteria, or guidance values for VOCs in subsurface vapors; however, the NYSDOH has a guidance document for indoor air and sub-slab soil vapor (2006, updated 2017).

References to the SCOs throughout the report are intended to encompass both the criteria under 6 NYCRR Part 375 and CP-51.

3.3 REMEDIAL ACTION OBJECTIVES

The following Remedial Action Objectives (RAOs) have been selected based on the observations and analytical results completed during the RIR, the outcome of the qualitative exposure assessment presented in the RIR, and in accordance with Chapter 4 of the DER-10 Technical Guidance for Site Investigation and Remediation. RAOs have been selected for the Former MGP Site and include the Site sediment and B&L Property. The table below contains a summary of the evaluation of potential exposure pathways to MGP-impacted media conducted during the qualitative health risk assessment.

Media	Contaminants or Material of Concern	Remedial Action Objectives
Surface Soil (top two feet)	COCs: VOCs, PAHs, metals (arsenic, copper, lead, and mercury), and cyanide	• Prevent ingestion/direct contact with contaminated surface soil.
Soil	COCs: VOCs, PAHs, metals (arsenic, barium, cadmium, copper, lead, and mercury), and cyanide MOC: NAPL	• Prevent ingestion/direct contact with contaminated subsurface soil. • Prevent inhalation of or exposure to contaminants volatilizing from contaminants in soil. • Prevent contaminant migration that would result in groundwater or surface water contamination.

Media	Contaminants or Material of Concern	Remedial Action Objectives
Groundwater	COCs: VOCs, PAHs, metals (antimony, arsenic, barium, iron, lead, magnesium, manganese, mercury, selenium, and sodium), and total cyanide MOC: NAPL	• Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards. • Prevent contact with, or inhalation of volatiles, from contaminated groundwater. • Prevent contaminant discharge to surface water or sediment. • Restore groundwater quality to within NYSDEC standards. • Remove the source of groundwater contamination.
Sediment	COCs: PAHs MOC: NAPL	• Prevent ingestion/direct contact with contaminated sediment. • Prevent impacts to biota from ingestion/direct contact with sediment causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain. • Restore sediment to pre-release/background conditions to the extent feasible.
Soil Vapor	COCs: VOCs	• Mitigate impacts to public health resulting from existing or potential soil vapor intrusion into future buildings at the site.

3.4 MEDIA AND LOCATIONS REQUIRING RESPONSE ACTIONS

The following media and locations were identified to require remedial actions based on the conclusions presented in the RIR and the presence of MGP-related impacts. These areas are shown on Figure 11.

- Surface Soil: Completed pathways for potential current and future exposure to MGP-related impacts to surface soil were identified in the RIR in the following locations:
  - Former MGP Site.
- Subsurface Soil: Completed pathways for potential current and future exposure to MGP-related impacts to subsurface soil were identified in the RIR in the following locations:
  - Former MGP Site, including:
    - The Former Purifier Area in the northeast quadrant;
    - The vicinity of the Former Oil Tanks, Former Tar Well, and Former MGP Plant in the southeast quadrant; and
    - The Former Light Oil Plant in the southwest quadrant, including an area north of the Former Light Oil Plant west of the ISS area.
  - The southeastern portion of the B&L Property. These MGP impacts appear to be contiguous with NAPL observed in the northeast quadrant of the Former MGP Site associated with the Former Purifier Area.

- Overburden Groundwater: Completed pathways for potential current and future exposure to MGP-related impacts to overburden groundwater were identified in the RIR in the following locations:
  - Former MGP Site; and
  - The southern portion of the B&L Property.
- Bedrock Groundwater: Completed pathways for potential current and future exposure to MGP-related impacts to bedrock groundwater in the following locations were identified in the RIR:
  - Former MGP Site; and
  - The southern and northern portions of the B&L Property.
- Sediment: Completed pathways for potential current and future exposure to MGP-related impacts to sediment were identified in the RIR in the following locations:
  - Along the southern portion of the Former MGP Site adjacent to the Former Light Oil Plant; this area is adjacent to an upland portion of the Former MGP Site where NAPL has been observed in the overburden at a similar elevation; and
  - A small area north of the RG&E and B&L Property boundary adjacent to the B&L Property.

The following media and/or locations were identified to either have incomplete exposure pathways or to be affected by non-MGP-related impacts and are therefore excluded from evaluation in the FS.

- Off-Site Subsurface Soil: Non-MGP-related impacts to subsurface soil were identified beneath portions of the B&L Property but are excluded from this FS evaluation as they are not related to the Former MGP Site.
- Surface Water: Completed pathways for potential current and future exposure to MGP-related impacts to surface water were not identified in the RIR.
- Soil Vapor: No completed exposure soil vapor intrusion pathway was identified in the RIR; however, if future construction occurred at the Former MGP Site or B&L Property, a vapor intrusion evaluation would be conducted.

4. Identifying and Screening Remedial Technologies

This section identifies potentially applicable remedial technologies to address MGP-related impacts to surface soil, subsurface soil, sediment, and groundwater.

4.1 GENERAL RESPONSE ACTIONS

Based on the RAOs identified in Section 3, the following General Response Actions were developed to address impacted media at the Site:

- No Further Action;
- Institutional Controls;
- Engineering Controls;
- In-Situ Containment;
- In-Situ Treatment;
- Removal; and
- Off-Site treatment.

4.2 APPLICABLE REMEDIAL TECHNOLOGIES AND ACTIONS

Remedial technology types applicable for addressing impacted media at the Site (surface soil, subsurface soil, sediment, and groundwater) were identified based on discussions with RG&E, experience working on similar sites, and review of the following guidance documents:

- DER-15 Presumptive/Proven Remedial Technologies (NYSDEC, 2007);
- DER-31 Green Remediation (NYSDEC, 2010b); and
- CP-51 Soil Cleanup Guidance (NYSDEC, 2010c).

Table II summarizes the screening of potentially applicable technologies for impacted soil, sediment, and groundwater. The technologies retained following the screening presented in Table II are described below for areas containing media with MGP-related impacts.

4.2.1 Surface Soil

- **On Site (Former MGP Site):** The following potential actions were retained for further evaluation for on-Site implementation.
  - No Further Action: No further action was retained for use as a baseline.
  - Engineering Controls (Fencing): Fencing would be an effective measure for controlling access. However, fencing would not reduce Site workers' potential exposure to surface soil. Fencing may not be effective or desirable in the long term because of operation and maintenance requirements and limitations that the presence of a fence may place on future use and redevelopment of the Site.

- Institutional Controls/Environmental Easement: An environmental easement can be effective in preventing activities (e.g., construction, excavation, or utility work) that could result in exposure to surface soil. An environmental easement would need to be coupled with a containment remedy to prevent exposure of current Site workers to surface soil. The presence of institutional controls may limit future use or redevelopment of the Site.
- Capping/Containment: Containment by capping could be effective if implemented in conjunction with institutional controls to restrict on-Site activities such as utility or construction work that could result in exposure to impacted surface soil. Institutional controls would record the lateral limits of the cap, establish operations, maintenance, and monitoring (OM&M) requirements for the cap, and restrict land uses that may compromise the integrity of the cap. In particular, a Site Management Plan (SMP) would be required for future cap OM&M and maintenance of the high-pressure subsurface gas line in the southern portion of the Former MGP Site. An asphalt or concrete cap or impermeable membrane with an appropriate cover would prevent infiltration and withstand limited traffic at the Site associated with current Site use. An asphalt cap was assumed for costing purposes, but the specific cap material and construction would be determined during the remedial design phase.
- Excavation: Excavation would remove surface soil impacted by MGP-related constituents, as well as metals above SCOs and eliminate potential current and future risk of exposure to those impacted soils. Impacted soil from the Site would be disposed of at an appropriate off-Site treatment or disposal facility. Alternatively, MGP-impacted soil could be treated on Site via thermal desorption and reused as Site backfill at the Former MGP Site in accordance with DER-10 Section 5.4(e) and with the concurrence of NYSDEC. Stockpiled soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 prior to reuse. The use of on-Site thermal treatment could be evaluated during the remedial design phase.

- **Off Site (B&L Property):** The following potential actions were retained for further evaluation for off-Site implementation.
  - No Further Action: No further action was retained for use as a baseline.
  - Engineering Controls (Fencing): Fencing would be an effective measure for controlling access. Fencing may not be effective or desirable in the long term because of OM&M requirements and limitations that the presence of a fence may place on future use and redevelopment of the Site.
  - Institutional Controls/Environmental Easement: An environmental easement can aid in preventing activities that could result in exposure to surface soil (e.g., construction, excavation, or utility work). The presence of institutional controls may limit future use or redevelopment of the Site, which may not be agreeable to the property owner. The legality of applying an institutional control at an off-Site property would need to be further evaluated.
  - Capping/Containment: Capping can effectively preclude potential risk of exposure to surface soil. Caps may consist of clean soil, asphalt, and/or a geomembrane liner. Institutional controls would need to be implemented in conjunction with a cap to record the lateral limits of the cap, establish OM&M requirements for the cap, and restrict land uses that may compromise the integrity of the cap. The cap would be installed over the

portion of the B&L Property where MGP impacts were observed. The presence of a cap may limit future use or redevelopment of the Site, which may not be agreeable to the property owner. An asphalt cap was assumed for costing purposes, but the specific cap material and construction would be determined during the remedial design phase.

- Excavation: Excavation would remove surface soil impacted by MGP-related constituents, as well as metals above SCOs and eliminate potential current and future risk of exposure to those impacted soil. MGP-impacted soil from the Site would be disposed of at an appropriate off-Site disposal/thermal treatment facility. Alternatively, MGP-impacted soil could be treated on Site via thermal desorption and reused as backfill at the Former MGP Site in accordance with DER-10 Section 5.4(e) and with the concurrence of NYSDEC. Stockpiled soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 prior to reuse. For costing purposes, it was assumed that 75 percent of material from the B&L Property would be transported for off-Site disposal and 25 percent of material would be transported for off-Site thermal treatment. The use of on-Site thermal treatment could be evaluated during the remedial design phase.

4.2.2 Subsurface Soil

- **On Site (Former MGP Site):** The following potential actions were retained for further evaluation for on-Site implementation.
  - No Further Action: No further action was retained for use as a baseline.
  - Institutional Controls/Environmental Easement: An environmental easement that would reduce the potential for future exposure to subsurface soil by utility or construction workers could be readily implemented. An SMP would be required for maintaining the high-pressure gas line and regulator station located at the Site as well as the on-Site septic system located in the northwestern quadrant. A remedy based solely on the use of institutional controls would not address the source of impacts to groundwater.
  - In-Situ Solidification: ISS is a proven, effective remedy for soil impacted by MGP residuals, including NAPL, and has been successfully implemented as an IRM at the Site. Fully implementing ISS may be somewhat difficult because of the buried and surface structures, including foundations and large debris, that would require demolition/ removal and off-Site disposal. ISS could not be completed beneath or adjacent to the high-pressure gas line and regulator station and other on-Site facilities (e.g., septic system); however, this infrastructure could potentially be relocated to allow for complete solidification. Pre-excavating the ISS area would be required to contain the expanded solidified soil. Temporarily relocating Site infrastructure may be logistically challenging. ISS could be cost-effective, as off-Site disposal/thermal treatment costs would be reduced. Previous bench-scale test results could help support ISS design. MGP residuals in the impacted soil, which are the current source of impacts to groundwater quality, would be immobilized within the solidified soil mixture. Institutional controls (e.g., environmental easement and SMP) would be required given the presence of solidified soil on Site. The Site could be developed for commercial use following the treatment of soil via ISS.
  - Excavation: Excavation to remove subsurface soil could be readily implemented and effective in mitigating potential future risks related to subsurface soil and in removing

the source of impacts to groundwater. Historic surface and subsurface MGP structures would be removed or remediated (e.g., contents removed) in conjunction with the excavation, though there are significant subsurface structures remaining at the Site. The deep excavations (i.e., greater than five to 10 ft bgs) would require lateral earth support and dewatering. The steep slope along the eastern border of the Site as well as the abutments for the Bausch Street Bridge would also require extensive support during excavation. Excavation design may have to incorporate a replacement septic system or connect to a sanitary sewer. Soil containing NAPL would likely be treated off Site by thermal desorption. Soil impacted by PAHs, VOCs, metals, and total cyanide could be disposed of at either a permitted landfill or a permitted thermal desorption facility. Alternatively, MGP-impacted soil could be treated on Site via thermal desorption and reused as backfill at the Former MGP Site, along with non-impacted Site soil, in accordance with DER-10 Section 5.4(e) and with the concurrence of NYSDEC. Stockpiled soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 prior to reuse. For costing purposes, it was assumed that unimpacted upper soil (top 10 ft bgs) would be reused, if meeting commercial SCOs, on Site and the remaining material would be transported for off-Site disposal at a regulated landfill (75 percent of material) or treated at a low temperature thermal desorption facility (25 percent of material). The use of on-Site thermal treatment could be evaluated during the remedial design phase. The Site could be developed for commercial use following excavation and backfill.

- **Off Site (B&L Property):** The following potential actions were retained for further evaluation for off-Site implementation.
  - No Further Action: No action was retained for use as a baseline.
  - Institutional Controls/Environmental Easement: An environmental easement could be effective in preventing activities (e.g., construction, excavation, or utility work) that could result in exposure to subsurface soil. The presence of institutional controls may limit future use or redevelopment of the Site, which may not be agreeable to the property owner. The legality of applying an institutional control at an off-Site property would need to be further evaluated.
  - In-Situ Solidification: ISS is a proven, effective remedy for soil impacted by MGP residuals, including NAPL, and has been implemented as an IRM at the Former MGP Site. ISS would be conducted in conjunction with excavation and off-Site disposal of varying depths of surface soil to allow the solidified soil to expand. ISS could be cost-effective, as off-Site disposal/thermal treatment costs would be reduced. Previous bench-scale test results could help support the ISS design. MGP residuals in the impacted soil, which are the current source of MGP-related impacts to groundwater quality, would be immobilized within the solidified soil mixture. The B&L Property could potentially be developed for commercial use following remediation of the MGP-impacted areas by ISS. Institutional controls (e.g., environmental easement and SMP) would be required given the presence of solidified soil on Site.
  - Excavation: Excavation to remove subsurface soil could be readily implemented and effective in mitigating potential future risks related to subsurface soil and in removing the source of impacts to groundwater. The deep excavations (i.e., greater than five to 10 ft) would require lateral earth support and dewatering. Soil containing NAPL would likely be treated off Site by thermal desorption. Soil impacted by PAHs, metals, and cyanide could be disposed of at either a landfill or thermal desorption facility, whichever

is more cost-effective. Alternatively, MGP-impacted soil could be treated on Site via thermal desorption and reused as backfill at the Former MGP Site, along with non-impacted Site soil, in accordance with DER-10 Section 5.4(e) and with the concurrence of NYSDEC. Stockpiled soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 prior to reuse. For costing purposes, it was assumed that material from the B&L Property would be transported for off-Site disposal at a regulated landfill (75 percent of material) or treated at a low temperature thermal desorption facility (25 percent of material). The use of on-Site thermal treatment could be evaluated during the remedial design phase.

4.2.3 Near-River Soil

- **On Site (Former MGP Site):** The following potential actions were retained for further evaluation for implementation along the River and west of the existing ISS IRM.
  - No Further Action: No further action was retained for use as a baseline.
  - Institutional Controls/Environmental Easement: An environmental easement that would reduce the potential for future exposure to subsurface soil by utility or construction workers could be readily implemented. A remedy based solely on the use of institutional controls would not address the source of impacts to groundwater.
  - In-Situ Solidification: ISS is a proven, effective remedy for soil impacted by MGP residuals, including NAPL, and has been successfully implemented as an IRM at the Site. Fully implementing ISS may be somewhat difficult because of the buried and surface structures, including foundations and large debris, that would require demolition/ removal and off-Site disposal. Pre-excavating the ISS area would be required to contain the expanded solidified soil. ISS could be cost-effective, as off-Site disposal/thermal treatment costs would be reduced. Previous bench-scale test results could help support ISS design. MGP residuals in the impacted soil, which are the current source of impacts to groundwater quality, would be immobilized within the solidified soil mixture. Institutional controls (e.g., environmental easement and SMP) would be required given the presence of solidified soil on Site. The Site could be developed for commercial use following soil treatment by ISS.
  - Excavation: Excavation to remove surface and subsurface soil could be readily implemented and effective in mitigating potential future risks related to soil located along the River and in removing the source of impacts to groundwater and sediment. Near River excavation would likely require lateral earth support and dewatering. Treatment and disposal options for excavated material are similar to those detailed for on-Site subsurface soil.

Excavation has been selected as a presumptive remedy for near-River soil.

4.2.4 Groundwater

- **Overburden Groundwater:** Remedial approaches were developed for overburden groundwater impacted by VOCs (typically BTEX), PAHs, several metals, and total cyanide. The following potential remedial actions were retained for further evaluation to address overburden groundwater impacts from the Former MGP Site.

- No Further Action: No further action was retained for use as a baseline.
- Institutional Controls: The Site is served by municipal water, so exposure to impacted groundwater by Site workers is not expected. However, prohibitions on groundwater use would be effective in preventing both present and future exposure to impacted groundwater by Site workers. Groundwater restriction would not prevent exposure to impacted groundwater by utility and construction workers. An SMP would be required to manage impacted groundwater during work on Site. The presence of institutional controls may limit future use or redevelopment of the Site.
- Groundwater Monitoring/Monitored Natural Attenuation: Monitored natural attenuation (MNA) would be a suitable remedy for use in conjunction with an effective remedy for impacted subsurface soil. MNA is a proven and cost-effective remedial action for benzene, naphthalene, and other VOCs/PAHs. Periodic groundwater monitoring would be required to evaluate the migration and natural attenuation of dissolved-phase contaminants. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.
- NAPL Recovery: Passive NAPL gauging and recovery associated with the 2008 ISS IRM is currently conducted annually at the Former MGP Site. NAPL recovery would be a suitable remedy in conjunction with an effective remedy for impacted subsurface soil. However, the volume of NAPL recovered in NAPL collection wells adjacent to the ISS IRM to date has been minimal, suggesting that NAPL volume and mobility may be limited in that area. NAPL collected from the recovery wells at Site source locations would be treated/disposed of at an off-Site facility.
- Containment: Containment via a bentonite slurry wall would be a suitable remedy in conjunction with a remedy for impacted surface soils and subsurface soils. The bentonite slurry wall would be installed from ground surface down to the top of bedrock. The slurry wall would reduce the flow of groundwater into and out of the Site. An overflow weir would be installed on the downgradient side of the slurry wall to maintain a maximum groundwater elevation and prevent groundwater mounding. Groundwater containment would also include an impermeable cap to reduce surface water infiltration and further minimize potential vertical migration of contaminated groundwater and NAPL. A groundwater flow model could be developed during the remedial design phase to assess groundwater migration pathways associated with the containment remedy.

A presumptive remedy of MNA and passive NAPL recovery is included in all alternatives for overburden groundwater. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term. A prohibition on groundwater use would be required for the presumptive overburden groundwater remedy until such a time as when groundwater standards are obtained.

- **Bedrock Groundwater:** Remedial approaches were developed for bedrock groundwater impacted by VOCs (typically BTEX), PAHs (typically naphthalene), metals, or total cyanide. The following potential actions were retained for further evaluation to address bedrock groundwater impacts from the Former MGP Site.
  - No Further Action: No further action was retained for use as a baseline.

- Institutional Controls/Environmental Easement: The Site is served by municipal water; therefore, exposure to impacted groundwater by Site workers is not expected. However, prohibitions on groundwater use would be effective in preventing both present and future exposure to impacted groundwater by Site workers. The presence of institutional controls may limit future use or redevelopment of the Site.
- Groundwater Monitoring/Monitored Natural Attenuation: MNA would be a suitable remedy for use in conjunction with an effective remedy for impacted subsurface soil. MNA is a proven and cost-effective remedial action for benzene, naphthalene, and other VOCs/PAHs. Periodic groundwater monitoring would be required to evaluate the migration and natural attenuation of dissolved-phase contaminants. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.
- NAPL Recovery: Passive NAPL recovery would be a suitable remedy in conjunction with an effective remedy for impacted subsurface soil and overburden groundwater. NAPL collected from the recovery wells would be treated/disposed of off-Site by thermal desorption.

A presumptive remedy of MNA and passive NAPL recovery is included for bedrock groundwater. A prohibition on groundwater use would be required for the presumptive bedrock groundwater remedy. In addition, a contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

4.2.5 Sediment

Remedial approaches for sediment impacted with NAPL located adjacent to the Site and the B&L Property in the Genesee River retained for further evaluation include the following.

- No Further Action: No further action was retained for use as a baseline.
- Institutional Controls: A local ordinance would prohibit activities (e.g., wading/swimming, mooring/anchoring boats) that could result in exposure to impacted sediment. This approach could require public notice and be subject to input by the City and community stakeholders.
- Engineering Controls: Perimeter fencing would be an effective measure to restrict River access from the Site. Signage would be a moderately effective measure to control access from the River. Signage would discourage wading/swimming and mooring/temporarily anchoring watercraft in the area of impacted sediment but may not prevent these activities. Engineering controls may not be effective or desirable in the long term because of OM&M requirements.
- Capping/Containment: Subaqueous capping is a proven and effective measure for isolating MGP-impacted sediment and other contaminated sediment from potential exposure to humans using waterways. Subaqueous capping is also effective in preventing the resuspension of impacted material within the waterway. However, high water velocities in the Genesee River may make it difficult to install and/or maintain a cap. An armored cap would protect against scour in areas of increased erosion. An amended cap would immobilize contaminants in the underlying sediment and prevent them from entering into the overlying water body. An OM&M program for the cap would include regular inspections, repairs, and monitoring.

- Excavation: Excavation would effectively remove visibly impacted sediment (stain, sheen) and sediment containing NAPL. Excavation could be readily implemented and effective in mitigating potential future risks related to recontamination and migration of NAPL identified in sediment emanating from the Site to the Genesee River. Coffer dams may be required to reduce water inflow into the excavation areas. The volume of sediment is expected to be limited based on the shallow bedrock and scour along the shore. Excavated sediment would be managed on the Former MGP Site by dewatering and transporting off Site for disposal or treating by thermal desorption. For costing purposes, it was assumed that 75 percent of material would be transported for off-Site disposal and 25 percent of material would be transported for off-Site thermal treatment. Restoring the riverbank and bottom would be determined during the remedial design phase, based upon permit requirements and regulatory input.

5. Evaluating Remedial Alternatives

5.1 EVALUATION CRITERIA

In accordance with the DER-10 Technical Guidance for Site Investigation and Remediation, the following evaluation criteria have been established for evaluating remedial alternatives:

- **Overall protectiveness of human health and the environment**: The ability of a remedial alternative to protect public health and the environment by removing, treating, containing, or implementing engineering or institutional controls.
- **Compliance with Standards, Criteria and Guidance**: The ability of a remedial alternative to conform to officially promulgated standards and criteria that are directly applicable or that are relevant and appropriate.
- **Long-term effectiveness and permanence**: The ability of a remedy to maintain long-term effectiveness once implemented.
- **Reduction of toxicity, mobility, or volume**: The ability of a remedy to reduce the toxicity, mobility, or volume of a contaminant, with a preference given to remedies that provide a permanent and significant reduction.
- **Short-term impact and effectiveness**: The potential for a remedy to create short-term adverse environmental impacts or human health exposure when implementing the remedy and the length of time that would be required to implement the remedy and achieve remedial objectives.
- **Implementability**: The technical, logistical, and administrative feasibility of implementing a remedy.
- **Cost-effectiveness**: The overall cost of a remedy, including the capital cost of implementation (construction) and long-term operations and maintenance, with considerations towards the overall effectiveness of the remedy.
- **Land Use**: Evaluate the current, intended, and reasonably anticipated future use of the Site and surroundings as related to a remedy that does not achieve unrestricted levels.
- **Community Acceptance**: The expected level of acceptability of the remedial alternative is evaluated based on the above criteria, with particular consideration regarding overall protectiveness of human health and the environment and short-term impacts on the community that are likely to be affected by the remedial action. This criterion is further evaluated after the public review of the Feasibility Study as part of the remedy selection and approval process.

5.2 ASSEMBLY AND ANALYSIS OF ALTERNATIVES

Combinations of remedial technologies/approaches retained during the screening described in Section 4.2 were assembled in the remedial alternatives to address each of the media and locations affected by MGP residuals. Remedial Alternatives developed for the Former MGP Site and B&L Property are summarized below. A summary of the remedial action alternative analysis is provided in Table III.

The Alternatives will be evaluated and reviewed by the NYSDEC and NYSDOH. Thereafter, the NYSDEC in consultation with the NYSDOH will present the preferred remedial alternative to the public, during the Proposed Remedial Action Plan (PRAP) process.

5.2.1 Alternative 1 – No Further Action

5.2.1.1 Alternative 1 Assembly

Alternative 1 includes the following components:

- Institutional controls (e.g., an environmental easement and SMP) to establish OM&M requirements for fences and to protect from potential future exposure to soil and groundwater;
- Fencing (engineering control) to restrict Site and River access;
- Signage (engineering control) to restrict recreational use in the River; and
- Long-term overburden and bedrock groundwater monitoring, MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery at the Former MGP Site.

5.2.1.2 Alternative 1 Analysis

The no further action alternative provides a baseline for comparison with the other alternatives and is included in the evaluation for consistency with NYSDEC guidance (NYSDEC, 2010a). No active remediation would be conducted under this alternative. NAPL monitoring and recovery would be implemented at existing wells across the Site. Institutional controls for the Former MGP Site and groundwater monitoring at both properties are included in this alternative. Engineering controls would consist of perimeter fencing to prevent access to both properties, as well as signs posted on the portion of the Genesee River containing MGP-impacted sediment to prohibit swimming, wading, and anchoring/mooring watercraft. Fences and signage would require periodic inspection and repair/replacement.

The no further action alternative would not impair overall current or anticipated future land use of the Former MGP Site. Exposures to soil would be mitigated through an environmental easement, worker health and safety training, and soil management planning in conjunction with potential future utility work or construction. Installing perimeter fencing would limit access to this area by trespassers. Potential exposure to impacted soil at the B&L Property would be inhibited by the existing perimeter fence.

Groundwater in the area of the Site is not used as a source of potable water. With the availability of municipal drinking water in the Former MGP Site's area, future use of the groundwater as a water supply is unlikely. However, a groundwater use prohibition would be included as an institutional control. Groundwater quality monitoring, MNA, and NAPL recovery, as required, would occur using existing monitoring and recovery wells, as appropriate. New NAPL recovery wells may also be installed to enhance the remedial objectives.

Institutional controls such as a local ordinance to prohibit wading/swimming and anchoring/mooring watercraft in affected areas could be included in Alternative 1 if such measures are available or can be enacted in the City of Rochester.

5.2.1.3 Overall Protectiveness of Human Health and the Environment

Perimeter fencing would provide further protection from potential exposure to MGP-impacted soil at both properties. Potential future exposures to impacted soil at both properties could be mitigated by institutional controls requiring soil management in the event of future excavations for utilities or construction for future Site development. It appears unlikely that this area would be developed in the future; however, the gas line and regulator station at the Former MGP Site are expected to require excavation for future repairs and maintenance. Requirements for maintaining fences would need to be included in institutional controls.

Institutional controls prohibiting groundwater use would protect future users from potential exposures to groundwater. However, the continued presence of NAPL in the subsurface soil and bedrock would be a continuing source of impacts to groundwater quality and may be considered a long-term risk to the environment. NAPL recovery is expected to be minimal at this time.

Engineering controls to prohibit uses that could result in direct contact with impacted sediment may be generally protective of human health because the Genesee River is not easily accessed for recreational use in the vicinity of the Site. Access to this portion of the waterway is generally limited from the River, given the presence of dams upstream and downstream from the Site and the high flow rate of the River in this area. Installing a perimeter fence would further limit access to the area of affected sediment from the shore. Although engineering and institutional controls appear somewhat protective of human health, impacts to sediment by NAPL would likely be considered a potential long-term risk to the environment.

5.2.1.4 Compliance with SCGs

Institutional controls included in Alternative 1, an environmental easement, groundwater use prohibition, and NAPL monitoring and recovery would not comply with SCGs related to direct contact and ingesting impacted soil and groundwater at the Site. Compliance with SCGs to attain Class GA standards would not be achieved because the NAPL in subsurface soil would remain as a continuing source of impacts to groundwater quality. Extensive groundwater monitoring would involve compliance with requirements for managing investigation-derived wastes from the monitoring program.

Both engineering and institutional controls would not result in compliance with SCOs related to impacted surface and subsurface soil but would prevent exposure to these media to the extent practicable.

5.2.1.5 Long-Term Effectiveness and Permanence

Access restrictions and institutional controls requiring long-term maintenance of a fence and implementing an environmental easement for subsurface disturbance would be necessary for Alternative 1 to be effective over the long-term relative to potential exposure to soil.

Groundwater use prohibitions and monitoring would likely be effective in providing long-term prevention of exposure to impacted groundwater. NAPL monitoring and recovery have been employed at the Site and have been minimally effective in collecting and removing NAPL in overburden. MNA and NAPL recovery are not likely to restore groundwater quality to Class GA Water Quality Standards within

30 years. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

Engineering controls consisting of signage to establish use restrictions related to potential exposure to Site sediment may not be effective over the long term and would not be considered a permanent remedial solution.

5.2.1.6 Reduction of Toxicity, Mobility or Volume

No reduction in the toxicity, mobility, or volume of impacted media would result from implementing Alternative 1. NAPL present in subsurface soil and bedrock would continue to be a source of impacts to groundwater quality. Passive NAPL recovery has the potential to reduce the volume of impacted groundwater over a long period of time; however, available data suggest the NAPL is not highly mobile, and it is unlikely that a significant volume can be recovered.

5.2.1.7 Short-Term Impact and Effectiveness

Alternative 1 would have no short-term effects on users of the Former MGP Site, the B&L Property, or the Genesee River adjacent to the Site. Groundwater monitoring, MNA, and NAPL monitoring and recovery would have no short-term effects and would require implementing a groundwater sampling and recovery program over the long term (estimated 30-year period).

5.2.1.8 Implementability

Alternative 1 would be readily implementable and generally consistent with current land uses.

Engineering and institutional controls at the B&L Property would require legal review and approval from the property owner to implement.

5.2.1.9 Cost

The estimated 30-year net present value (NPV) probable cost for Alternative 1 is approximately $1,006,000, based on the following:

- Engineering controls consisting of posting signage at the Genesee River area and perimeter fencing estimated at approximately $227,000 and OM&M totaling approximately $67,000;
- Institutional controls estimated at $34,000 and OM&M totaling approximately $56,000;
- Groundwater monitoring consisting of sampling and VOC and PAH analysis at monitoring wells on a semiannual basis for a period of 30 years, which was estimated at $267,000. For costing purposes eight wells were assumed. The final number will be determined during remedial design; and
- Installing bedrock NAPL recovery wells and OM&M of the existing system estimated at approximately $356,000. For costing purposes 10 wells were assumed. The final number will be determined during remedial design.

A summary of costs is provided in Table IV. The cost estimation spreadsheet is provided in Appendix A.

5.2.1.10 Land Use

The Former MGP Site would remain in commercial use with restrictions on uses that may result in exposure to impacted surface and subsurface soil. The B&L Property could be developed for commercial use with restrictions on future uses that may result in exposure to impacted surface and subsurface soil.

Access to the MGP-impacted area of the B&L Property would be restricted by existing fencing with warning signs to exclude trespassers, limiting future use of the property. However, the B&L Property is currently vacant with access restricted by a perimeter fence.

Perimeter fencing and institutional controls over a portion of the B&L Property would reduce the area of the property available for future use and redevelopment. Future use of the B&L Property could be restricted to commercial use with restrictions to preclude activities that may result in exposure to surface and subsurface soil.

Certain recreational uses of portion of the Genesee River with impacted sediment would be restricted by signage.

Potable use of groundwater would be restricted; however, municipal water is in use in the area.

5.2.2 Alternative 2 – Soil Capping, Near-River Soil Excavation, Full Sediment Excavation, and Hydraulic Containment (Slurry Wall)

5.2.2.1 Alternative 2 Assembly

Alternative 2 includes the following components:

- Excavating the upper two ft of surface soil;
- Backfilling the excavated areas with clean granular fill;
- Capping impacted soil at the Former MGP Site upland area and the MGP-impacted portion of the B&L Property;
- Installing a bentonite slurry wall around the perimeter of the Former MGP Site upland area to mitigate impacted overburden groundwater from migrating off Site;
- Fencing (engineering control) to restrict Site access; and
- Institutional controls (e.g., an environmental easement and SMP) to record the presence of capped areas, establish OM&M requirements for caps and fences, and protect from potential future exposure to subsurface soil and groundwater.

Alternative 2 also includes the following components identified as presumptive remedies:

- Excavating on-Site near-River soil; the upper 10 ft of soil would be sampled for potential reuse to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site. The soil from 10 ft bgs down to competent bedrock is assumed to be impacted and would be transported off Site for disposal/thermal treatment.

- Full excavation and off-Site disposal/thermal treatment of Site sediment.
- Long-term overburden and bedrock groundwater monitoring, MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery at the Former MGP Site.

Alternative 2 is shown conceptually on the following figures:

- On-Site upland and near River remedy on Figure 12;
- Off-Site upland remedy on Figure 13; and
- Sediment remedy on Figure 14.

The remedial extent at the Former MGP Site, shown on Figure 12, was developed to address soil that exceeds the commercial SCOs. The remedial extent at the B&L Property, shown on Figure 13, was developed to contain MGP-impacted soil that exceeds the unrestricted use SCOs.

5.2.2.2 Alternative 2 Analysis

Excavation of the upper two ft of surface soil at the Former MGP Site (43,900 cu yd) and B&L Property (3,200 cu yd) would be conducted to remove shallow MGP impacts. Additional excavation would be completed to competent bedrock at the near-River soil area of the Former MGP Site (28,400 cu yd). The upper 10 ft of surface and subsurface near-River soil from the Former MGP Site would be stockpiled on Site for future sampling and reuse, if applicable. Stockpiled soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse as backfill at the Former MGP Site. Clean soil from an off-Site source would be imported for backfill at the Former MGP Site and the B&L Property. Unacceptable soil for reuse would be transported off Site for disposal/thermal treatment.

The surface of the Former MGP Site and B&L Property would be restored with an impermeable cover over approximately 592,900 square feet (sq ft) and 43,400 sq ft, respectively. A 2,100 linear foot (lf) bentonite slurry wall would also be installed around the northern, southern, and eastern perimeter of the Former MGP Site upland area. The slurry wall would extend to competent bedrock and tie into the existing slurry wall previously installed along the Genesee River as part of a previous IRM. An overflow weir, constructed as a funnel and gate system, would be installed within a section of the slurry wall near the River to mitigate groundwater mounding within the capped slurry wall cell. The overflow weir would be filled with granular activated carbon. Any MGP-related contaminants dissolved in the groundwater would be removed by the granular activated carbon prior to exiting the weir.

Excavation would remove Site sediment along the Genesee River to shallow bedrock or to the bedrock scour elevation in the River, capturing visibly impacted sediment observed in sediment borings and sediment containing NAPL during the RI. Approximately 2,500 cu yd of Site sediment would be excavated, dewatered on Site, and shipped off Site for disposal or treatment by thermal desorption.

Engineering controls would include perimeter fencing to restrict access to the Former MGP Site, the B&L Property, and the Site shoreline.

Institutional controls would consist of an environmental easement to restrict subsurface activities (e.g., new utility or construction work) to prevent exposure to subsurface soil and groundwater. An SMP

would be generated to outline how to manage the remaining contamination on Site during future work, including future maintenance of the high-pressure subsurface gas line and regulator station at the Former MGP Site. The SMP would also include as-built surveys of the locations of the caps, slurry wall, and fences. The SMP would include annual visual inspections and repairs to damages identified during the inspections.

Overburden and bedrock groundwater quality would be improved via MNA following source containment and periodic NAPL recovery. Long-term groundwater monitoring would be conducted on both the Former MGP Site and B&L Property. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.2.3 Overall Protectiveness of Human Health and the Environment

Alternative 2 remedial actions would effectively protect users of the Former MGP Site and the B&L Property from exposure to impacted surface soil and users of the Genesee River from contact with Site sediment. Institutional controls would be effective in protecting future users from potential exposure to subsurface soil and groundwater. An SMP would outline how to manage remaining contamination on Site during future work.

Alternative 2 does not include measures for removing the upland subsurface soil, which is a continuing source of impacts to groundwater quality. A bentonite slurry wall with funnel and gate system and cap would effectively reduce the source of groundwater impacts at the Former MGP Site by mitigating the off-Site horizontal migration of NAPL and dissolved contaminants in the overburden groundwater and reducing the infiltration of precipitation to groundwater.

Excavating affected sediment would be effective in preventing direct contact exposure with MGP-impacted sediment and would eliminate the long-term risk to the environment posed by the presence of NAPL in sediment.

Long-term overburden and bedrock groundwater monitoring does not involve measures for protection of human health and the environment; however, institutional controls to prohibit the use of groundwater for potable water in the Site's area would prevent potential exposure to groundwater. Groundwater quality, especially outside of the containment area, would be improved over time via source containment, MNA, and NAPL recovery. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.2.4 Compliance with SCGs

Excavating heavily impacted sediment would attain SCGs related to potential direct contact exposures and long-term protection of the environment. Capping and installing a bentonite slurry wall around the Former MGP Site complies with SCOs related to contact with impacted surface soil in the affected areas.

Compliance with SCGs to attain Class GA Water Quality Standards would not be achieved because the NAPL in subsurface soil at the Former MGP Site would remain as a continuing source of impacts to groundwater quality.

5.2.2.5 Long-Term Effectiveness and Permanence

Excavating MGP-impacted sediment is a permanent and effective measure for preventing exposure to sediment over the long term. Constructing caps over impacted soil in combination with installing a bentonite slurry wall and implementing engineering and institutional controls have been proven, effective measures for preventing direct contact with or ingesting impacted soil over the long term. However, significant OM&M would be required to maintain the protectiveness of the caps over the long term.

Access and use restrictions have generally been demonstrated as effective long-term measures for protection from potential exposures at contaminated sites. However, institutional controls consisting of an environmental easement at the B&L Property may not be possible.

Groundwater use prohibitions and monitoring would likely be effective in providing long-term prevention of exposure to impacted groundwater and are likely to remain in effect over the long term. NAPL monitoring and recovery have been employed at the Site and have been minimally effective in collecting and removing NAPL in overburden. While groundwater quality would be improved over time by containment, MNA, and NAPL recovery, it is unlikely that groundwater quality would be restored to Class GA Water Quality Standards within 30 years. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.2.6 Reduction of Toxicity, Mobility, and Volume

Implementing Alternative 2 would not reduce the toxicity or volume of wastes existing in the Former MGP Site upland area and B&L Property overburden, though it would reduce the volume of wastes in near-River soil at the Former MGP Site. Capping would reduce the mobility of impacted soil by eliminating the potential for erosion. The bentonite slurry wall with funnel and gate system and cap would effectively reduce the source of groundwater impacts at the Former MGP Site by mitigating the off-Site horizontal migration of NAPL and dissolved contaminants in the overburden groundwater and reducing the infiltration of precipitation to groundwater. Sediment excavation would reduce the volume of MGP-impacts existing in Site sediment. NAPL collection wells would effectively collect and remove NAPL impacts from the bedrock.

Minimal reduction in the toxicity or volume of impacted groundwater would result from implementing Alternative 2; however, the mobility of impacted overburden media and impact to overburden groundwater would be contained within the bentonite slurry wall. NAPL present in subsurface soil and bedrock would continue to be a source of impacts to groundwater quality. Passive NAPL recovery has the potential to reduce the volume of impacted groundwater over time.

5.2.2.7 Short-Term Impact and Effectiveness

Implementing Alternative 2 would have short-term impacts on the community and Site workers, though these impacts could be mitigated by initiating standard industrial practices such as the use of an air monitoring program and employing the Hazardous Waste Operations and Emergency Response (HAZWOPER) program for Site workers covered under Occupational Safety and Health Administration (OSHA) standard 29 CFR Part 1910.120. Plans to control truck traffic and construction emissions, and restrictions on work hours to control noise would be necessary to avoid risk and nuisance conditions in the vicinity of the Site.

The slurry wall installation, capping, and restoration activities would require 1 to 1.5 years or more depending on the sequencing of the work. The sediment can be excavated within a reasonable timeframe but could be impacted by River conditions, challenges to access, and permits for work in a waterway.

5.2.2.8 Implementability

Constructing caps and bentonite slurry walls in land areas is a common practice that would be readily implementable. Permits would likely be required for constructing the caps and bentonite slurry walls in the land areas; however, the permits would likely be readily attainable.

The active utilities located on Site present challenges when performing remediation. An active regulator station is present in the northern portion of the Former MGP Site. Active gas mains enter and exit the Site to the south and north. The locations of the gas mains would affect the installation of the bentonite slurry wall in close proximity to the gas main. Water service, stormwater conveyance, and overhead electric lines are also present on Site. The overhead electric lines would need to be protected when installing the bentonite slurry wall. The water service and stormwater conveyance would need to be temporarily disconnected during remediation, and the service would need to be reestablished once the remediation has been completed.

Excavating sediment may risk the release of COCs during that work and disturb the benthic community, if present. Engineering controls may minimize the risk of releasing COCs during construction. Permitting requirements for work in the River may cause schedule delays.

Institutional and engineering controls included in Alternative 2 are common measures that would be readily implementable; however, the legality of engineering and institutional controls at the B&L Property needs to be reviewed and such controls would require approval from the property owner.

5.2.2.9 Costs

The estimated 30-year NPV probable cost for Alternative 2 is approximately $29,363,000, based on the following:

- Excavating and off-Site disposal/thermal treatment of approximately 44,000 cu yd and 3,200 cu yd of surface soil at the Former MGP Site and B&L Property, respectively;
- Excavating and managing approximately 28,400 cu yd of near-River soil from the Former MGP Site;
  - Approximately 5,600 cu yd of near-River soil that meets unrestricted SCO would be segregated and sampled for on-Site reuse; and
  - A minimum of 22,800 cu yd of MGP-impacted near-River soil would be transported off Site for disposal/thermal treatment.
- Constructing approximately 592,900 sq ft and 43,400 sq ft of impermeable cap at the Former MGP Site and B&L Property, respectively;
- Constructing approximately 2,100 lf of bentonite slurry wall with funnel and gate system;

- Excavating, dewatering, and off-Site disposal/thermal treatment of approximately 2,500 cu yd of Site sediment;
- Implementing engineering controls consisting of perimeter fencing estimated at approximately $206,300 and OM&M totaling approximately $42,200;
- Implementing institutional controls estimated at $23,000 and OM&M totaling approximately $37,200;
- Groundwater monitoring consisting of sampling and VOC and PAH analysis at monitoring wells on a semiannual basis for a period of 30 years, which was estimated at $267,000. For costing purposes eight wells were assumed. The final number will be determined during remedial design; and
- Installing bedrock NAPL recovery wells and OM&M of the existing system estimated at approximately $356,000. For costing purposes 10 wells were assumed. The final number will be determined during remedial design.

A summary of costs is provided in Table IV. The cost estimation spreadsheet is provided in Appendix A.

5.2.2.10 Land Use

The Former MGP Site would remain in commercial use with restrictions on uses, activities, or structures that may affect the cap and bentonite slurry wall or result in exposure to impacted subsurface soil and groundwater. The B&L Property could be developed for commercial use with restrictions on uses or activities that may affect the cap covering a portion of the Site or that may result in exposure to MGP-impacted surface and subsurface soil. Fencing and institutional controls over a portion of the B&L Property would reduce the area of the property available for future use and redevelopment. Note that the remainder of the B&L Property unimpacted by former MGP-operations is excluded from this FS.

Potable use of groundwater would be restricted; however, municipal water is in use in the Site area.

5.2.3 Alternative 3 – Full Excavation of On-Site and Off-Site Soil, Near-River Soil Excavation, and Full Sediment Excavation

5.2.3.1 Alternative 3 Assembly

Alternative 3 includes the following components:

- Excavating surface and subsurface soil at the Former MGP Site upland area and the B&L Property;
- Off-Site disposal/thermal treatment or on-Site treatment/potential reuse of impacted soil;
- Stockpiling non-impacted soil for sampling/reuse at the Former MGP Site (soil from the B&L Property would be disposed/treated off Site);
- Backfilling and restoring the Site with clean granular fill; and
- Milling and repaving Suntru Street to accommodate heavy truck traffic.

Alternative 3 also includes the following components identified as presumptive remedies:

- Excavating on-Site near-River soil; the upper 10 ft of soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site., while soil from 10 ft bgs down to bedrock is assumed to be impacted and would be transported off Site for disposal/thermal treatment;
- Full excavation and off-Site disposal/thermal treatment of Site sediment; and
- Long-term overburden and bedrock groundwater monitoring, MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery at the Former MGP Site.

Alternative 3 is shown conceptually on the following figures:

- On-Site upland and near River remedy on Figure 15;
- Off-Site upland remedy on Figure 16; and
- Sediment remedy on Figure 14.

The remedial extent at the Former MGP Site, shown on Figure 15, was developed to address the full Site, regardless of criteria. The remedial extent at the B&L Property, shown on Figure 16, was developed to remove MGP-impacted soil related to the MGP operations that exceeds the unrestricted use SCOs.

5.2.3.2 Alternative 3 Analysis

Excavations would be conducted to the top of competent rock, which is at depths of up to 30 ft bgs at the Former MGP Site and up to 24 ft bgs at the B&L Property, as feasible. The excavations would remove the Former Purifier Area, the Former Light Oil Plant, the former gas holders, other underground structures, residual MGP wastes, and the near-River soil. The excavations would generally be completed to competent bedrock, as feasible. Lateral earth support and excavation dewatering would be required. Dust and odor controls would be required when excavating the MGP-impacted soil, and a perimeter air monitoring program would be implemented to monitor the effectiveness of, or establish the need for, more aggressive measures for dust and odor suppression.

Approximately 33,400 cu yd of off-Site MGP-impacted soil and 443,700 cu yd of on-Site MGP-impacted soil would be excavated. The upper 10 ft of surface and subsurface soil (approximately 197,600 cu yd) from the Former MGP Site would be stockpiled on Site for future sampling and reuse, if applicable. Stockpiled soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse as backfill at the Former MGP Site. Clean soil from an approved off-Site source would also be imported for backfill at the Former MGP Site and the B&L Property. Off-Site soil and on-Site soil deemed unacceptable for reuse would be transported off Site for disposal/thermal treatment. The surface restoration of the Former MGP Site and B&L Property would be consistent with anticipated future land use.

Excavation would remove impacted sediment along the Site to shallow bedrock or scour. Approximately 2,500 cu yd of Site sediment would be excavated, dewatered on Site, and transported off Site for disposal or treatment by thermal desorption.

Overburden and bedrock groundwater quality would be improved via MNA following source removal and periodic NAPL recovery. Long-term groundwater monitoring would be conducted on both the Former MGP Site and B&L Property. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.3.3 Overall Protectiveness of Human Health and the Environment

Implementing Alternative 3 would effectively address current and future potential exposures to impacted media and potential long-term risks to the environment.

Excavation would effectively remove the source of MGP-related groundwater impacts on the Former MGP Site and B&L Property by removing MGP-impacted soil. NAPL monitoring and passive recovery could reduce the presence of NAPL in bedrock. Overburden and bedrock groundwater quality may be restored over time by MNA and NAPL recovery. Institutional controls to prohibit use of groundwater for potable water in the Site area would prevent potential exposure to groundwater. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.3.4 Compliance with SCGs

Actions to remove impacted surface and subsurface soil and reuse soil that meet unrestricted SCOs would comply with SCOs related to surface and subsurface soil. Removing Site sediment would attain SCGs related to potential direct contact exposures and long-term protection of the environment.

Following source removal, Alternative 3 may attain Class GA Water Quality Standards for overburden and bedrock groundwater through MNA and NAPL recovery.

5.2.3.5 Long-Term Effectiveness and Permanence

Excavating surface and subsurface soil and sediment is an effective and permanent measure for preventing potential human exposure to the impacted area. The source of overburden groundwater impacts on the Former MGP Site and B&L Property would be removed. NAPL present in bedrock would be monitored and recovered. Over time, MNA and NAPL recovery may restore groundwater quality to within Class GA Water Quality Standards. Groundwater use prohibitions and monitoring would provide long-term prevention of exposure to impacted groundwater and would likely remain in effect over the long term. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.3.6 Reduction of Toxicity, Mobility, and Volume

Implementing Alternative 3 would effectively remove the majority of impacted surface and subsurface soil and sediment. Approximately 443,700 cu yd and 33,400 cu yd of MGP-impacted soil would be removed from the Former MGP Site and B&L Property, respectively. Approximately 2,500 cu yd of impacted sediment would be removed from the Genesee River for off-Site disposal/thermal treatment.

Overburden and bedrock groundwater quality at the Former MGP Site and B&L Property would improve over time, with mass reduction through MNA processes and NAPL recovery. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.3.7 Short-Term Impact and Effectiveness

Implementing Alternative 3 would have short-term impacts on the community and Site workers, though these impacts could be mitigated by initiating standard industrial practices such as the use of an air monitoring program and employing the HAZWOPER program for Site workers. Plans to control truck traffic and construction emissions, and restrictions on work hours to control noise would be necessary to avoid risk and nuisance conditions in the vicinity of the Site.

The excavation and restoration activities would require 4 to 5 years to implement. The sediment could be excavated within a reasonable timeframe but may be impacted by River conditions, challenges to access, and permits for work in a waterway.

5.2.3.8 Implementability

Surface and subsurface soil excavation, sediment excavation, and restoration activities identified in Alternative 3 are common remedial measures. Although excavation would pose some challenges, each of the actions can be readily implemented.

The depth of excavation can extend to competent bedrock at a maximum depth of approximately 30 ft bgs. Pre-trenching and hoe-ramming or other demolition methods would be required within the sheeting alignments to demolish and remove the subsurface structures that would prevent sheeting installation to the top of bedrock. The gorge wall along the eastern perimeter of the Site, the buildings located within the excavation area, and the Bausch Street Bridge would require additional support and monitoring for settlement. Suntru Street and the abutting retaining wall and building may require support and settlement monitoring during construction activities and repair or replacement once the work has been completed.

Subsurface soil stockpiled on Site would require frequent sampling during remediation to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse as backfill on Site. Sampling and testing stockpiled soil for VOCs, PAHs, metals, polychlorinated biphenyls (PCBs)/pesticides and per- and polyfluoroalkyl substances (PFAS) are typically performed at a specified frequency during excavation. If the stockpiled soil does not meet the specified testing criteria, the soil would be sent to an off-Site disposal/thermal treatment facility.

The active utilities located on Site present challenges when performing remediation. An active regulator station is present in the northern portion of the Site. Active gas mains enter and exit the Site to the south and north and would therefore be within the excavation footprint. The gas mains and regulator station could potentially be relocated prior to initiating the excavation to remove impacts to the greatest extent practicable.

A water service, stormwater conveyance system, and overhead electric lines are also present on Site. The overhead electric lines and water service would need to be disconnected or relocated and the stormwater conveyance system plugged or rerouted during excavation. An active septic system also services the buildings on Site and would require removal during remediation. The buildings on Site are not occupied and will likely be demolished so temporary sewer management options will not need to be implemented. Once the excavation has been completed, Site services do not need to be reestablished.

State and local permits may be required for large-scale excavations and discharge of extracted groundwater. Local ordinances for excavation, noise, emissions standards, and work hours may apply to the work. These permits are expected to be readily available.

Excavating sediment may risk the release of COCs during that work and disturb the benthic community, if present. Engineering controls may minimize the risk of releasing COCs during construction. Permitting requirements for work in the River as well as instituting more controls may cause schedule delays.

Institutional controls included in Alternative 3 are common measures that would be readily implementable.

5.2.3.9 Costs

The estimated 30-year NPV probable cost for Alternative 3 is approximately $89,873,000, based on the following:

- Excavating and managing approximately 443,700 cu yd of soil from the Former MGP Site and 33,400 cu yd of MGP-impacted soil from the B&L Property;
  - Approximately 197,600 cu yd of on-Site soil from the Former MGP Site that meets unrestricted SCOs would be segregated and sampled for on-Site reuse; and
  - A minimum of 246,000 cu yd of MGP-impacted soil from the Former MGP Site and 33,400 cu yd of MGP-impacted soil from the B&L Property would be transported off Site for disposal/thermal treatment.
- Excavating, dewatering, and off-Site disposal/thermal treatment of approximately 2,500 cu yd of Site sediment;
- Backfilling excavated areas with clean granular fill;
- Milling and repaving Suntru Street to accommodate heavy truck traffic;
- Implementing institutional controls estimated at $11,500 and OM&M totaling approximately $18,600;
- MNA and groundwater monitoring consisting of sampling and VOC and PAH analysis at monitoring wells on a semiannual basis for a period of 30 years, which was estimated at $267,000. For costing purposes eight wells were assumed. The final number will be determined during remedial design; and
- Installing bedrock NAPL recovery wells and OM&M of the system estimated at approximately $356,000. For costing purposes 10 wells were assumed. The final number will be determined during remedial design.

A summary of costs is provided in Table IV. The cost estimation spreadsheet is provided in Appendix A.

5.2.3.10 Land Use

The Former MGP Site could be developed for unrestricted use. While the remediated area of the B&L Property would meet unrestricted use SCGs, the remainder of that property would not be remediated under this FS and may not meet the unrestricted use requirement.

Potable use of groundwater will be restricted; however, municipal water is in use in the Site area. Over time, MNA and NAPL recovery may restore groundwater quality to within Class GA Water Quality Standards. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.4 Alternative 4 – Partial Excavation of On-Site Soil, Full Excavation of Off-Site Soil, Near River-Soil Excavation, and Full Sediment Excavation

5.2.4.1 Alternative 4 Assembly

Alternative 4 includes the following components:

- Excavating the upper two ft of surface soil at the Former MGP Site to commercial SCOs and the B&L Property to unrestricted SCOs;
- Excavating subsurface soil at the Former MGP Site upland source areas and B&L Property to commercial and unrestricted SCOs, respectively;
- Off-Site disposal/thermal treatment or on-Site treatment/potential reuse of impacted soil;
- Stockpiling non-impacted soil for sampling to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site (soil from the B&L Property would be disposed/treated off Site);
- Backfilling and restoring with clean granular fill;
- Constructing a vegetated two-foot clean soil cover with a demarcation layer at the Former MGP Site;
- Fencing (engineering control) to restrict access to covered areas;
- Implementing institutional controls (e.g., an environmental easement and SMP), to record the presence of covered areas; establish OM&M requirements for covers and fences; and to protect from potential future exposure to subsurface soil; and
- Milling and repaving Suntru Street to accommodate heavy truck traffic.

Alternative 4 also includes the following components identified as presumptive remedies:

- Excavating on-Site near-River soil; the upper 10 ft of soil would be sampled for potential reuse at the Former MGP Site, while the soil from 10 ft bgs down to competent bedrock is assumed to be impacted and would be transported off Site for disposal/thermal treatment;
- Full excavation and off-Site disposal/thermal treatment of Site sediment; and
- Long-term overburden and bedrock groundwater monitoring, MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery at the Former MGP Site.

Alternative 4 is shown conceptually on the following figures:

- On-Site upland and near River remedy on Figure 17;
- Off-Site upland remedy on Figure 16; and

- Sediment remedy on Figure 14.

The remedial extent at the Former MGP Site, shown on Figure 17, was developed to remove soil that exceeds the commercial use SCOs and prevent exposure to residual MGP-impacts. However, the remedial extent at the B&L Property, shown on Figure 16, was developed to remove MGP-impacted soil that exceeds the unrestricted use SCOs.

5.2.4.2 Alternative 4 Analysis

Excavations would be conducted to the top of competent rock, which is at depths of up to 30 ft bgs at the Former MGP Site and up to 24 ft bgs at the B&L Property, as feasible. The excavation would remove the Former Purifier Area, the Former Light Oil Plant, a former gas holder, other underground structures, residual MGP wastes, and near-River soil. Lateral earth support and excavation dewatering would be required at the Former MGP Site and B&L Property. Internal bracing or tiebacks may be required for lateral earth support. Dust and odor controls would be required when excavating the MGP-impacted soil, and a perimeter air monitoring program would be implemented to monitor the effectiveness of, or establish the need for, more aggressive measures for dust and odor suppression.

Approximately 33,400 cu yd of off-Site MGP-impacted soil and 299,500 cu yd of on-Site MGP-impacted soil would be excavated. The upper 10 ft of surface and subsurface soil from the Former MGP Site (approximately 251,600 cu yd) would be stockpiled on Site for future sampling and reuse, if applicable. Stockpiled soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse as backfill at the Former MGP Site. Clean soil from an approved off-Site source would also be imported for backfill at the Former MGP Site and the B&L Property. Off-Site soil and on-Site soil deemed unacceptable for reuse would be transported off Site for disposal/thermal treatment.

The surface restoration of the B&L Property would be consistent with unrestricted land use (43,400 sq ft) and would apply only to the MGP-area remediated on the B&L Property. The surface of the Former MGP Site would consist of a vegetated two-foot clean soil cover with a demarcation layer (approximately 592,900 sq ft).

As part of the presumptive remedy, Alternative 4 would include excavation and off-Site disposal/thermal treatment of 2,500 cu yd of impacted sediment and restoration in-kind.

Institutional controls would consist of an environmental easement to restrict subsurface activities (e.g., new utility or construction work) to prevent exposure to subsurface soil and groundwater. An SMP would be generated to outline how to manage the remaining contamination on Site during future work, including future maintenance of the high-pressure subsurface gas line and regulator station at the Former MGP Site. The SMP would also include as-built surveys of the locations of the caps, completed excavations, and fences. The SMP would include annual visual inspections and repairs to damages identified during the inspections.

Overburden and bedrock groundwater quality would be improved by MNA and periodic NAPL recovery following targeted source removal. Long-term groundwater monitoring would be conducted on both the Former MGP Site and B&L Property. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.4.3 Overall Protectiveness of Human Health and the Environment

Implementing Alternative 4 would effectively remove the potential for direct exposure to impacted soil on the B&L Property, the remediated source areas of the Former MGP Site, and Site sediment. Alternative 4 does not include measures for removing the subsurface soil in the northwestern quadrant of the Former MGP Site; however, the soil cover would prevent exposure to this soil.

Sediment excavation would be effective in preventing direct contact exposure with MGP-impacted sediment and would eliminate the long-term risk to the environment posed by the presence of NAPL.

Excavation would effectively eliminate the source of groundwater impacts on the Former MGP Site and B&L Property by removing heavily impacted soil. NAPL monitoring and passive recovery could reduce the presence of NAPL in bedrock. Overburden and bedrock groundwater quality may be restored over time by MNA and NAPL recovery. Institutional controls to prohibit the use of groundwater for potable water in the Site area would prevent potential exposure to groundwater. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.4.4 Compliance with SCGs

Actions to remove impacted surface and subsurface soil at the B&L Property would comply with SCOs related to surface and subsurface soil. Removing soil at source areas at the Former MGP Site would not completely attain SCOs. Minimal impacts would remain in subsurface soil in the northwestern quadrant of the Site and would be controlled by institutional controls to mitigate potential future exposures. Constructing a vegetated two-foot clean soil cover with a demarcation layer over surface soil at the Former MGP Site would comply with SCOs related to contact with impacted surface soil in the affected areas.

Excavating heavily impacted sediment would attain SCGs related to potential direct contact exposures and long-term protection of the environment.

Following source removal, Alternative 4 may attain Class GA Water Quality Standards for overburden and bedrock groundwater through MNA and NAPL recovery.

5.2.4.5 Long-Term Effectiveness and Permanence

Excavating surface and subsurface soil and sediment is an effective and permanent measure for preventing potential human exposure to impacted media. Constructing soil covers over impacted soil in combination with engineering and institutional controls have been proven, effective measures for preventing direct contact with or ingesting impacted surface soil over the long term. However, OM&M would be required to maintain the protectiveness of the cover over the long term.

The source of overburden groundwater impacts on the Former MGP Site and B&L Property would be reduced; however, impacts at the Former MGP Site would remain. NAPL present in bedrock and residual NAPL in overburden would be monitored and recovered with passive NAPL recovery wells. Over time, MNA may restore groundwater quality to within Class GA Water Quality Standards. Groundwater use prohibitions and monitoring would provide long-term prevention of exposure to impacted groundwater and would likely remain in effect over the long term. However, a contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.4.6 Reduction of Toxicity, Mobility, and Volume

Implementing Alternative 4 would reduce the mobility and volume of waste at the Site. Alternative 4 involves the excavation of approximately 44,000 cu yd and 3,200 cu yd of surface soil from the Former MGP Site and B&L Property, respectively; and approximately 255,600 cu yd and 30,200 cu yd of subsurface soil from the Former MGP Site and B&L Property, respectively. Removing impacted surface soil and a soil cover at the Former MGP Site would eliminate the mobility and volume of impacted surface soil.

Approximately 2,500 cu yd of impacted sediment would be removed from the Genesee River for off-Site disposal/thermal treatment. Excavation of impacted sediment would eliminate potential transport of NAPL to other locations.

Alternative 4 does not include measures for reducing contaminant mass or toxicity in subsurface soil and groundwater in the northwestern quadrant of the Former MGP Site, which would not be remediated but would be included in Site-wide groundwater monitoring. Impacts in the northwestern quadrant are minimal and disparate; there are no completed exposure pathways to these media under current Site use.

Overburden and bedrock groundwater quality at the Former MGP Site and B&L Property would improve over time, with mass reduction through MNA processes and NAPL recovery. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.4.7 Short-Term Impact and Effectiveness

Implementing Alternative 4 would have short-term impacts on the community and Site workers, though these impacts could be mitigated by initiating standard industrial practices such as the use of an air monitoring program and employing the HAZWOPER program for Site workers. Plans to control truck traffic and construction emissions, and restrictions on work hours to control noise would be necessary to avoid risk and nuisance conditions in the vicinity of the Site.

The excavation and restoration activities would require 2.5 to 4 years or more depending on the sequencing of the work. The sediment could be excavated within a reasonable timeframe but may be impacted by River conditions, challenges to access, and permits for work in a waterway.

5.2.4.8 Implementability

Surface and subsurface soil excavation, capping/soil cover, sediment excavation, restoration activities, and NAPL recovery identified in Alternative 4 are common remedial actions. Although excavation would pose some challenges, each of the actions can be implemented.

The depth of excavation can extend to competent bedrock at a maximum depth of approximately 30 ft bgs. Pre-trenching and hoe-ramming or other demolition methods would be required within the sheeting alignments to demolish and remove subsurface structures that would prevent sheeting installation to the top of bedrock. The gorge wall along the eastern perimeter of the Site and the Bausch Street Bridge would require additional support and monitoring for settlement. The building located within the excavation area will likely be demolished since it is unoccupied. Suntru Street and the

abutting retaining wall may require support and settlement monitoring during trucking and repair or replacement once the work has been completed.

Subsurface soil stockpiled on Site would require frequent sampling during remediation to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse as backfill on Site. Sampling and testing stockpiled soil for VOCs, PAHs, metals, PCBs/pesticides, and PFAS are typically performed at a specified frequency during excavation. If the stockpiled soil does not meet the specified testing criteria, the soil would be sent to an off-Site disposal/thermal treatment facility.

The active utilities located on Site present challenges when performing remediation. An active regulator station is present in the northern portion of the Site. Active gas mains enter and exit the Site to the south and north and would be within the excavation footprint. The gas mains and regulator station could potentially be relocated prior to initiating the excavation to remove impacts to the greatest extent practicable.

A water service, stormwater conveyance system, and overhead electric lines are also present on Site. The overhead electric lines and water service would need to be disconnected or relocated and the stormwater conveyance system plugged or rerouted during the excavation. An active septic system also services the buildings on Site. However, since the buildings are unoccupied, they would not need services during remediation. Once the excavation has been completed, Site services would likely not need to be reestablished.

State and local permits may be required for large-scale excavation and discharging dewatering effluent. Local ordinances for excavation, noise, and work hours may apply to the work. These permits are expected to be readily available.

Constructing soil covers and excavations in land areas are common practice that would be readily implementable. Permits would likely be required for constructing soil covers and excavating in the land areas; however, the permits would likely be readily attainable.

Excavating sediment may risk the release of COCs during that work and disturb the benthic community, if present. Engineering controls may minimize the risk of releasing COCs during construction. Permitting requirements for work in the River as well as instituting more controls may cause schedule delays.

Institutional and engineering controls included in Alternative 4 are common measures that would be readily implementable.

5.2.4.9 Costs

The estimated 30-year NPV probable cost for Alternative 4 is approximately $47,747,000, based on the following:

- Excavating and managing approximately 299,500 cu yd of soil from the Former MGP Site and 33,400 cu yd of MGP-impacted soil from the B&L Property;
  - Approximately 251,600 cu yd of soil from the Former MGP Site that meets unrestricted SCOs would be segregated and sampled for on-Site reuse; and

  - A minimum of 47,900 cu yd of MGP-impacted soil from the Former MGP Site and 33,400 cu yd of MGP-impacted soil from the B&L Property would be transported off Site for disposal/thermal treatment.
- Backfilling excavated areas with approved clean granular fill;
- Constructing approximately 592,900 sq ft of vegetated two-foot clean soil cover with a demarcation layer at the Former MGP Site;
- Excavating, dewatering, and off-Site disposal/thermal treatment of approximately 2,500 cu yd of Site sediment;
- Milling and repaving Suntru Street to accommodate heavy truck traffic;
- Implementing engineering controls consisting of perimeter fencing estimated at approximately $123,400 and OM&M totaling approximately $23,600;
- Implementing institutional controls estimated at $23,000 and OM&M totaling approximately $37,200;
- MNA and groundwater monitoring consisting of sampling and VOC and PAH analysis at monitoring wells on a semiannual basis for a period of 30 years, which was estimated at $267,000. For costing purposes eight wells were assumed. The final number will be determined during remedial design; and
- Installing bedrock NAPL recovery wells and OM&M of the system estimated at approximately $356,000. For costing purposes 10 wells were assumed. The final number will be determined during remedial design.

A summary of costs is provided in Table IV. The cost estimation spreadsheet is provided in Appendix A.

5.2.4.10 Land Use

The Former MGP Site would be remediated to meet commercial use SCOs with restrictions on uses or activities that may affect the soil cover or result in exposure to impacted soil left in-place. While the remediated area of the B&L Property would be remediated to meet unrestricted use SCOs. The remainder of the B&L Property would not be remediated under this FS and may not meet the unrestricted use requirement.

Potable use of groundwater would be restricted; however, municipal water is in use in the area. Over time groundwater quality may be restored to within Class GA Water Quality Standards via MNA and NAPL recovery. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.5 Alternative 5 – Partial On-Site Excavation (Upper 10 feet), Partial On-Site ISS, Off-Site ISS, Near-River Soil Excavation, and Full Sediment Excavation

5.2.5.1 Alternative 5 Assembly

Alternative 5 includes the following components:

- Excavating the upper two ft of surface soil at the Former MGP Site and B&L Property;

- Excavating and stockpiling potentially impacted upland subsurface soil (upper 10 ft) for sampling/potential reuse at the Former MGP Site;
- Excavating and transporting and disposing MGP-impacted surface soil from the B&L Property off Site, as necessary;
- ISS of impacted subsurface soil at the Former MGP Site upland source areas and B&L Property;
- Backfilling excavated areas and above solidified soil with approved clean granular fill;
- Constructing a vegetated two-foot clean soil cover with a demarcation layer at the Former MGP Site and over solidified soil at the B&L Property;
- Implementing institutional controls to record the locations of soil treated by ISS, manage solidified soil if excavated in the future, establish OM&M requirements for the soil cover, and protect from potential future exposure to subsurface soil and groundwater;
- Providing an environmental easement and SMP to limit the property to commercial use and prohibiting groundwater use; and
- Milling and repaving Suntru Street to accommodate heavy truck traffic.

Alternative 5 also includes the following components identified as presumptive remedies:

- Excavating on-Site near-River soil; the upper 10 ft of soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site, while the soil from 10 ft bgs down to bedrock is assumed to be impacted and would be transported off Site for disposal/thermal treatment;
- Full excavation and off-Site disposal/thermal treatment of Site sediment; and
- Long-term overburden and bedrock groundwater monitoring, MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery at the Former MGP Site.

Alternative 5 is shown conceptually on the following figures:

- Off-Site upland remedy on Figure 18;
- On-Site upland and near River remedy on Figure 19; and
- Sediment remedy on Figure 14.

The remedial extent at the Former MGP Site, shown on Figure 19, was developed to remove or treat soil that exceeds the commercial use SCOs and prevent exposure to residual MGP-impacts. The remedial extent at the B&L Property, shown on Figure 18, was developed to treat MGP-impacted soil that exceeds the unrestricted use SCOs.

5.2.5.2 Alternative 5 Analysis

The upper 10 ft of surface and subsurface soil would be excavated from the Former MGP Site source area and stockpiled on Site for future sampling and reuse, if applicable. Near-River soil would also be

excavated as part of the presumptive remedy. Excavation methods and controls would be consistent with those described for Alternatives 3 and 4.

Surface soil would be removed from the B&L Property for off-Site disposal/thermal treatment in advance of ISS. Removing surface soil is necessary to accommodate the increased volumes of subsurface soil resulting from ISS and for constructing a two-foot clean soil vegetated cover with demarcation layer and surface restoration over solidified soil. Approximately 3,200 cu yd of surface soil would be excavated and shipped off Site for landfill disposal/thermal treatment from the B&L Property. Approximately 43,900 cu yd of surface soil would be excavated, stockpiled, and sampled for reuse from the Former MGP Site.

Approximately 6,000 cu yd of subsurface soil from the B&L Property would be excavated in advance of ISS for landfill disposal/thermal treatment. Approximately 96,200 cu yd of subsurface soil from the Former MGP Site would be excavated from the near-River area and select upland source areas in advance of ISS. This material would be stockpiled and sampled for potential reuse from the Former MGP Site or off-Site disposal/thermal treatment. Construction and monitoring requirements similar to those described in Alternatives 3 and 4, such as lateral earth support and dust and odor controls, would be employed.

ISS would be performed on impacted subsurface soil to the top of competent bedrock, which is at depths of up to 30 ft bgs at the Former MGP Site and up to 24 ft bgs at the B&L Property, as feasible. Approximately 144,200 cu yd of subsurface soil at the Former MGP Site and 24,100 cu yd of subsurface soil at the B&L Property would be treated by ISS. Because of the presence of debris and buried structures, pre-clearing with an excavator would be required to remove obstructions.

The ISS design mix, most likely a combination of Portland cement and ground granulated blast-furnace slag (GGBFS) and possibly other additives, would be determined by bench-scale testing using representative samples of on-Site soil containing NAPL. The mix design would establish targets for physical parameters such as unconfined compressive strength and hydraulic conductivity that would result in a mixture of relatively low strength and high NAPL stabilization. This would allow future excavation and low hydraulic conductivity and would limit infiltration and the flow of groundwater that could leach contaminants from the solidified mixture. In addition to meeting the performance standards, the selected ISS mix design would also take into account the size of the environmental footprint (i.e, green remediation per DER-31).

Once the ISS at the Former MGP Site has been completed, stockpiled soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse. If deemed acceptable for reuse, the stockpiled soil would be placed above the solidified soil. Approved clean backfill would be placed above solidified soil if the quantity of reusable soil is insufficient. Approved off-Site backfill would be placed above solidified soil at the B&L Property. A vegetated two-foot clean soil cover with a demarcation layer would be placed above the solidified soil at both the Former MGP Site (approximately 592,900 sq ft) and B&L Property (approximately 43,400 sq ft).

Institutional controls would consist of an environmental easement to restrict subsurface activities (e.g., new utility or construction work) to prevent exposure to subsurface soil and groundwater. An SMP would be generated to outline how to manage the remaining contamination on Site during future work, including future maintenance of the high-pressure subsurface gas line and regulator station at the

Former MGP Site. The SMP would also include as-built surveys of the locations of the caps, ISS monolith, and fences. The SMP would include annual visual inspections and repairs to damages identified during the inspections.

As part of the presumptive remedy, Alternative 5 would include excavation and off-Site disposal/thermal treatment of 2,500 cu yd of impacted sediment and restoration in-kind.

Engineering controls would consist of fencing around the Former MGP Site to restrict access to the Site, a vegetated two-foot clean soil cover with a demarcation layer, MNA, and NAPL recovery systems.

Overburden and bedrock groundwater quality would be improved by MNA and periodic NAPL recovery following source removal. Long-term groundwater monitoring would be conducted on both the Former MGP Site and B&L Property. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.5.3 Overall Protectiveness of Human Health and the Environment

Implementing Alternative 5 would effectively remove the potential for direct exposure to MGP-impacted soil on the B&L Property, the source areas of the Former MGP Site, and Site sediment. Alternative 5 includes installation of a vegetated two-foot clean soil cover with a demarcation layer prevent exposure to subsurface soil in the northwestern quadrant of the Former MGP Site.

Excavation would be effective in preventing direct contact exposure with MGP-impacted sediment and soil and would eliminate the long-term risk to the environment posed by the presence of NAPL in sediment and soil.

ISS would eliminate the source of overburden groundwater impacts on the Former MGP Site and B&L Property by immobilizing NAPL sources. NAPL recovery would reduce the presence of NAPL in bedrock. Overburden and bedrock groundwater quality may be restored over time by MNA and NAPL recovery; however, institutional controls to prohibit use of groundwater for potable water in the Site area would protect from potential exposure to groundwater until groundwater standards are met. In addition, a contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.5.4 Compliance with SCGs

Actions to remove MGP-impacted surface soil, reuse subsurface soil that meets unrestricted soil SCOs, and solidify subsurface soil at the B&L Property would comply with SCOs related to mitigating the potential direct exposure to surface and subsurface soil. ISS of the Former MGP Site source areas would not directly attain SCOs, since impacts would remain in some soil on Site and would rely on institutional controls to mitigate potential future exposures. Excavating sediment would attain SCGs related to potential direct contact exposures and long-term protection of the environment. Engineering controls such as a two-foot soil cover with a demarcation layer would be included for soil that did not otherwise meet SCOs.

Once the source has been stabilized, Alternative 5 may attain Class GA Water Quality Standards for overburden and bedrock groundwater through MNA and NAPL recovery.

Institutional controls in Alternative 5 would include an environmental easement with a groundwater use prohibition to mitigate the risk of direct contact and ingesting impacted soil, solidified soil, and groundwater.

5.2.5.5 Long-Term Effectiveness and Permanence

Excavating surface soil, subsurface soil, and sediment and ISS of subsurface soil are effective and permanent measures for preventing potential human exposure to the impacted area. Constructing soil covers over impacted soil in combination with engineering and institutional controls have been proven, effective measures for preventing direct contact with or ingesting impacted soil over the long term. However, OM&M are required to maintain the protectiveness of the cover over the long term.

ISS would be effective in immobilizing the source of overburden groundwater impacts at the Former MGP Site and B&L Property; however, minimal impacts at the Former MGP Site would remain. NAPL present in bedrock and residual NAPL in overburden would be monitored and recovered. Over time, MNA and NAPL recovery may restore groundwater quality to within Class GA Water Quality Standards. Groundwater use prohibitions and monitoring would provide long-term prevention of exposure to impacted groundwater and would likely remain in effect over the long term. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.5.6 Reduction of Toxicity, Mobility, and Volume

Implementing Alternative 5 would reduce the mobility and volume of waste at the Site. Alternative 5 would solidify approximately 144,200 cu yd of subsurface soil at the Former MGP Site and 24,100 cu yds of subsurface soil at the B&L Property.

Alternative 5 would also remove approximately 43,900 cu yd of surface soil and approximately 96,200 cu yd of MGP-impacted subsurface soil at the Former MGP Site, and 3,200 cu yd of MGP-impacted surface soil and 6,000 cu yd of MGP-impacted subsurface soil at the B&L Property. Approximately 2,500 cu yd of sediment would also be excavated. Removing surface soil and constructing a vegetated two-foot clean soil cover with a demarcation layer would eliminate the potential mobility of impacted surface soil via migration by erosion and wind. Excavating impacted sediment and near-River soil would reduce the volume of contaminated material. Residual MGP wastes within the Former Purifier Area, Former Light Oil Plant, the Former Gas Holders, and other former MGP structures would be removed or rendered immobile within the solidified soil mixture, thereby eliminating their toxicity.

Alternative 5 does not include measures for reducing contaminant mass or toxicity in the northwestern quadrant of the Former MGP Site that are not excavated or treated; however, there are no complete exposure pathways to these media under current Site use.

Overburden and bedrock groundwater quality at the Former MGP Site and B&L Property would improve over time, with mass reduction through MNA processes and NAPL recovery. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.5.7 Short-Term Impact and Effectiveness

Implementing Alternative 5 would have short-term impacts on the community and Site workers, though these impacts could be mitigated by initiating standard industrial practices such as the use of an air

monitoring program and employing the HAZWOPER program for Site workers. Plans to control truck traffic and construction emissions, and restrictions on work hours to control noise would be necessary to avoid risk and nuisance conditions in the Site vicinity.

The excavations, ISS, and restoration activities would require 2.5 to 4 years to implement. The sediment could be excavated within a reasonable timeframe but may be impacted by River conditions, challenges to access, and permits for work in a waterway.

5.2.5.8 Implementability

Surface and subsurface excavation, sediment excavation, ISS, construction of the soil cover, restoration activities, and NAPL collection and recovery identified in Alternative 5 are common remedial actions. Though ISS and excavation may pose some challenges, each of the actions can be readily implemented.

Samples of the ISS/soil mixture would require frequent testing during remediation to evaluate whether the mix was conforming with the specified design parameters necessary to meet the remedial goals. Sampling and testing for strength, hydraulic conductivity, and leachability, as well as field parameters such as density and slump, are typically performed at a specified frequency during the remedial action. If the soil mixture does not attain the specified testing criteria, remixing and/or replacement of failed areas is typically required.

The depth of ISS could extend to competent bedrock at a maximum depth of approximately 30 ft bgs, as feasible. Obstructions and foundations encountered during ISS would require hoe-ramming or other demolition methods to size the objects for removal or properly incorporated into the ISS monolith; however, shallow obstructions and foundations (less than 10 ft bgs) would be removed from the Former MGP Site during on-Site excavation. Similar to Alternatives 3 and 4, excavation may require demolition to install sheeting alignments for lateral support systems, though extensive dewatering is not expected. The buildings located within the ISS treatment area on the Former MGP Site are unoccupied and likely to be demolished. The Bausch Street Bridge would possibly require additional support and monitoring for settlement. Suntru Street and the abutting retaining wall and building may require support and settlement monitoring during trucking and repair or replacement once the work has been completed.

Active utilities on Site, including the active regulator station, buried gas mains, and overhead electric lines may present challenges during remediation. The gas mains and regulator station could potentially be relocated prior to initiating the excavation to remove impacts to the greatest extent practicable.

State and local permits may be required for large-scale excavations and construction. Local ordinances for excavation, noise, construction emissions, and work hours may apply to the work. These permits are expected to be readily available. Permits would likely be required for constructing soil covers in the land areas; however, the permits would likely be readily attainable.

Excavating sediment may risk the release of COCs during that work and disturb the benthic community, if present. Engineering controls may minimize the risk of releasing COCs during construction. Permitting requirements for work in the River as well as instituting more controls may cause schedule delays.

Institutional and engineering controls included in Alternative 5 are common measures that would be readily implementable.

5.2.5.9 Costs

The estimated 30-year NPV probable cost for Alternative 5 is approximately $48,454,000, based on the following:

- Excavating and managing approximately 140,100 cu yd of soil from the Former MGP Site and 9,200 cu yd of MGP-impacted soil from the B&L Property;
  - Approximately 116,800 cu yd of soil from the Former MGP Site that meets unrestricted SCOs would be segregated and sampled for on-Site reuse; and
  - A minimum of 23,300 cu yd of MGP-impacted soil from the Former MGP Site and 9,200 cu yd of MGP-impacted soil from the B&L Property would be transported off Site for disposal/thermal treatment.
- ISS of approximately 144,200 cu yd of subsurface soil at the Former MGP Site source areas and 24,100 cu yd of MGP-impacted subsurface soil at the B&L Property;
- Backfilling excavated areas and above solidified soil with approved clean granular fill;
- Constructing a vegetated two-foot clean soil cover with a demarcation layer at the Former MGP Site (approximately 592,900 sq ft) and the B&L Property (approximately 43,400 sq ft);
- Excavating, dewatering, and off-Site disposal/thermal treatment of approximately 2,500 cu yd of Site sediment;
- Milling and repaving Suntru Street to accommodate heavy truck traffic;
- Implementing institutional controls, including an environmental easement, to record the soil locations treated by ISS at the Former MGP Site and B&L Property and the location of the soil cover at the Former MGP Site; institutional controls estimated at $23,000 and OM&M totaling approximately $37,200;
- MNA and groundwater monitoring consisting of sampling and VOC and PAH analysis at monitoring wells on a semiannual basis for a period of 30 years, which was estimated at $267,000. For costing purposes eight wells were assumed. The final number will be determined during remedial design; and
- Installing bedrock NAPL recovery wells and OM&M of the system estimated at approximately $356,000. For costing purposes 10 wells were assumed. The final number will be determined during remedial design.

A summary of costs is provided in Table IV. The cost estimation spreadsheet is provided in Appendix A.

5.2.5.10 Land Use

The Former MGP Site would remain in commercial use with restrictions on uses or activities that may affect the soil cover or result in exposure to impacted subsurface soil left in-place. The B&L Property could be developed for commercial use, though the remainder of that property that is not impacted with MGP materials will not be remediated under this FS. Institutional controls identifying the presence and locations of soil treated by ISS and future management/disposal of excavated solidified soil would be implemented at both the Former MGP Site and B&L Property.

Potable use of groundwater would be restricted; however, municipal water is in use in the area. Over time, MNA and NAPL recovery may restore groundwater quality to within Class GA Water Quality Standards. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.6 Alternative 6 – Partial On-Site Excavation (Upper 10 feet), Partial On-Site ISS, Off-Site Excavation, Near-River Soil Excavation, Full Sediment Excavation

5.2.6.1 Alternative 6 Assembly

Alternative 6 includes the following components:

- Excavating the upper two ft of surface soil at the Former MGP Site and B&L Property;
- Excavating and stockpiling potentially impacted subsurface soil for sampling to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site upland source areas;
- ISS of impacted subsurface soil at the Former MGP Site upland source areas;
- Backfilling excavated areas and above solidified soil with approved clean granular fill;
- Providing a vegetated two-foot clean soil cover with a demarcation layer at the Former MGP Site;
- Excavation and off-Site disposal/thermal treatment of MGP-impacted surface and subsurface soil at the B&L Property;
- Implementing institutional controls, including an environmental easement, to record the soil locations treated by ISS, manage solidified soil if excavated in the future, establish OM&M requirements for the soil cover, and protect from potential future exposure to subsurface soil and groundwater;
- Providing an environmental easement and SMP to limit the property to restricted commercial use and prohibiting groundwater use; and
- Milling and repaving Suntru Street to accommodate heavy truck traffic.

Alternative 6 also includes the following components identified as presumptive remedies:

- Excavating on-Site near-River soil; the upper 10 ft of soil would be sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse at the Former MGP Site, while the soil from 10 ft bgs down to bedrock is assumed to be impacted and would be transported off Site for disposal/thermal treatment;
- Full excavation and off-Site disposal/thermal treatment of Site sediment; and
- Long-term overburden and bedrock groundwater monitoring, MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and passive NAPL recovery at the Former MGP Site.

Alternative 6 is shown conceptually on the following figures:

- Off-Site upland remedy on Figure 16;
- On-Site upland and near River remedy on Figure 19; and
- Sediment remedy on Figure 14.

The remedial extent at the Former MGP Site, shown on Figure 19, was developed to remove or treat soil that exceeds the commercial use SCOs and prevent exposure to residual MGP-impacts. The remedial extent at the B&L Property, shown on Figure 16, was developed to remove MGP-impacted soil that exceeds the unrestricted use SCOs.

5.2.6.2 Alternative 6 Analysis

Similar to Alternative 5, the upper 10 ft of surface and subsurface soil would be excavated from the Former MGP Site and stockpiled on Site for future sampling and reuse, if applicable. Alternative 6 would also remove surface soil from the upland areas of the Former MGP Site for off-Site disposal/thermal treatment in advance of ISS to treat impacted subsurface soil. Removing surface soil would be necessary to accommodate the increased volumes of subsurface soil resulting from ISS and for constructing a vegetated two-foot clean soil cover with a demarcation layer with surface restoration over solidified soil. Near-River soil would also be excavated as part of the presumptive remedy. Excavation methods and controls would be consistent with those described for Alternatives 3, 4, and 5.

Approximately 43,900 cu yd of surface soil would be excavated, stockpiled, and sampled for potential reuse from the Former MGP Site. Approximately 96,200 cu yd of subsurface soil from the Former MGP Site would be excavated from the near River area and upland source areas in advance of ISS. This material would be stockpiled and sampled for potential reuse from the Former MGP Site or off-Site disposal/thermal treatment. Construction and monitoring requirements similar to those described in Alternatives 3 to 5, such as lateral earth support and dust and odor controls, would be employed.

ISS would be performed on impacted subsurface soil to the top of competent bedrock at the Former MGP Site source areas, which is at depths of up to 30 ft bgs. Approximately 144,200 cu yd of subsurface soil would be treated by ISS. Given the presence of debris and buried structures, pre-clearing with an excavator would be required to remove obstructions. Similar to Alternative 5, an ISS design mix would be determined by bench-scale testing using representative samples of on-Site soil containing NAPL.

Once ISS at the Former MGP Site has been completed, stockpiled soil deemed acceptable for reuse would be placed above the solidified soil. Approved clean backfill would be placed above solidified soil if the quantity of reusable soil is insufficient. A vegetated two-foot clean soil cover with a demarcation layer would then be placed above the solidified soil at the Former MGP Site (approximately 592,900 sq ft).

Excavations would be conducted up to approximately 24 ft bgs at the B&L Property, as deep as competent bedrock. Approximately 3,200 cu yd of MGP-impacted surface soil and 30,200 cu yd of MGP-impacted subsurface soil would be excavated from the B&L Property for off-Site disposal/thermal treatment. Lateral earth support and excavation dewatering would be required at the B&L Property. Internal bracing or tiebacks may be required for lateral earth support. Excavated soil would be shipped off Site for landfill disposal/thermal treatment. Dust and odor controls would be required when

excavating MGP-impacted soil, and a perimeter air monitoring program would be implemented to monitor the effectiveness of or establish the need for more aggressive measures for dust and odor suppression.

Institutional controls would consist of an environmental easement to restrict subsurface activities (e.g., new utility or construction work) to prevent exposure to subsurface soil and groundwater. An SMP would be generated to outline how to manage the remaining contamination on Site during future work, including future maintenance of the high-pressure subsurface gas line and regulator station at the Former MGP Site. The SMP would also include as-built surveys of the locations of the caps, slurry wall and fences. The SMP would include annual visual inspections and repairs to damages identified during the inspections.

As part of the presumptive remedy, Alternative 6 would include excavation and off-Site disposal/thermal treatment of 2,500 cu yd of impacted sediment and restoration in-kind.

Overburden and bedrock groundwater quality would be improved via MNA following source removal and periodic NAPL recovery. Long-term groundwater monitoring would be conducted on both the Former MGP Site and B&L Property. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.6.3 Overall Protectiveness of Human Health and the Environment

Implementing Alternative 6 would effectively remove the potential for direct exposure to MGP-impacted soil on the B&L Property, the source areas of the Former MGP Site and Site sediment. Alternative 6 does not include measures for removing/solidifying the subsurface soil in the northwestern quadrant of the Former MGP Site; however, the soil cover with a demarcation layer would prevent exposure to this soil.

Excavation would be effective in preventing direct contact exposure with MGP-impacted sediment and soil and would eliminate the long-term risk to the environment posed by the presence of NAPL in sediment and soil.

ISS would effectively eliminate the source of groundwater impacts at the Former MGP Site by immobilizing NAPL. NAPL recovery could reduce the presence of NAPL in bedrock. Overburden and bedrock groundwater quality may be restored over time by MNA and NAPL recovery; however, institutional controls to prohibit the use of groundwater for potable water in the Site area would protect from potential exposure to groundwater until groundwater standards are met. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.6.4 Compliance with SCGs

Actions to remove impacted surface and subsurface soil at the B&L Property would meet SCOs related to surface and subsurface soil. Reusing soil that meets unrestricted soil SCOs would comply with SCOs related to surface and subsurface soil at the Former MGP Site. ISS of Former MGP Site source areas would not directly attain SCOs, since impacts would remain in some soil on Site and would rely on institutional controls to mitigate potential future exposures. Sediment excavation would attain SCGs related to potential direct contact exposures and long-term protection of the environment. Engineering

controls such as a two-foot clean soil cover with a demarcation layer would be included for the remaining soil that does not meet SCOs.

Once the source areas have been solidified or excavated, Alternative 6 may attain Class GA Water Quality Standards for overburden and bedrock groundwater through MNA and NAPL recovery.

Institutional controls in Alternative 6, would include an environmental easement with a groundwater use prohibition to mitigate the risk of direct contact and ingesting impacted soil, solidified soil, and groundwater.

5.2.6.5 Long-Term Effectiveness and Permanence

Excavating surface soil, subsurface soil and sediment, and ISS of subsurface soil are effective and permanent measures for preventing potential human exposure to the impacted area. Constructing soil covers over impacted soil in combination with engineering and institutional controls have been proven, effective measures for preventing direct contact with or ingesting impacted soil over the long term. However, OM&M would be required to maintain the protectiveness of the cover over the long term.

ISS and excavation would be effective in reducing and immobilizing the source of overburden groundwater impacts at the Former MGP Site and B&L Property; however, minimal impacts at the Former MGP Site would remain. NAPL present in bedrock and residual NAPL in overburden would be monitored and recovered. Over time, MNA and NAPL recovery may restore groundwater quality to within Class GA Water Quality Standards. Groundwater use prohibitions and monitoring would provide long-term prevention of exposure to impacted groundwater and would likely remain in effect over the long term. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.6.6 Reduction of Toxicity, Mobility, and Volume

Implementing Alternative 6 would reduce the mobility and volume of waste at the Site. Alternative 6 would solidify approximately 144,200 cu yd of subsurface soil at the Former MGP Site.

Alternative 6 would also remove approximately 43,900 cu yd of surface soil and approximately 96,200 cu yd of MGP-impacted subsurface soil at the Former MGP Site. Approximately 3,200 cu yd of MGP-impacted surface soil and 30,200 cu yd of MGP-impacted subsurface soil would be removed at the B&L Property. Approximately 2,500 cu yd of sediment would also be excavated. Removing surface soil and installing a vegetated two-foot clean soil cover with a demarcation layer would eliminate the potential mobility of impacted surface soil via migration by erosion and wind. Excavating impacted sediment and near-River soil would reduce the volume of contaminated material. Residual MGP wastes within the Former Purifier Area, the Former Light Oil Plant, the Former Gas Holders, and other former MGP structures would be removed or rendered immobile within the solidified soil mixture, thereby eliminating their mobility and reducing their toxicity.

Alternative 6 does not include measures for reducing contaminant mass or toxicity in the northwestern quadrant of the Former MGP Site that are not excavated or treated; however, there would be no complete exposure pathways to these media under current Site use. Overburden and bedrock groundwater quality at the Former MGP Site and B&L Property would improve over time, with mass

reduction through MNA processes and NAPL recovery. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

5.2.6.7 Short-Term Impact and Effectiveness

Implementing Alternative 6 would have short-term impacts on the community and Site workers, though these impacts could be mitigated by initiating standard industrial practices such as the use of an air monitoring program and employing the HAZWOPER program for Site workers. Plans to control truck traffic and construction emissions, and restrictions on work hours to control noise would be necessary to avoid risk and nuisance conditions in the Site vicinity.

The excavations, ISS, and restoration activities would require 2.5 to 4 years to implement. The sediment could be excavated within a reasonable timeframe but may be impacted by River conditions, challenges to access, and permits for work in a waterway.

5.2.6.8 Implementability

Surface and subsurface excavation, sediment excavation, ISS, soil cover construction, restoration activities, and NAPL collection and recovery identified in Alternative 6 are common remedial actions. Although ISS and excavation may pose some challenges, each of the actions can be readily implemented.

The ISS/soil mixture would require frequent testing during remediation to evaluate whether the mix was conforming with specified design parameters necessary to meet remedial goals. Sampling and testing for strength, hydraulic conductivity, and leachability, as well as field parameters such as density and slump, are typically performed at a specified frequency during the remedial action. If the soil mixture does not attain specified testing criteria, remixing and/or replacement of failed areas is typically required.

Similar to Alternative 5, the depth of ISS could extend to competent bedrock at approximately 30 ft bgs, as feasible. Obstructions and foundations encountered during ISS would require hoe-ramming or other demolition methods to size the objects for removal or properly incorporate into the ISS monolith; however, shallow obstructions and foundations (less than 10 ft bgs) would be removed from the Former MGP Site during on-Site excavation. Similar to Alternatives 3 to 5, excavation may require demolition to install sheeting alignments for lateral support systems. Dewatering would be expected when excavating at the B&L Property. The buildings located on the Former MGP Site within the ISS treatment area are unoccupied and likely will be demolished. The Bausch Street Bridge would possibly require additional support and monitoring for settlement. Suntru Street and the abutting retaining wall and building may require support and settlement monitoring during trucking and repair or replacement once the work has been completed.

Active utilities on Site, including the active regulator station, buried gas mains, and overhead electric lines, may present challenges during remediation. The gas mains and regulator station could potentially be relocated prior to initiating the excavation to remove impacts to the greatest extent practicable.

State and local permits may be required for large-scale excavations and construction. Local ordinances for excavation, noise, and work hours may apply to the work. These permits are expected to be readily available. Permits would likely be required for constructing the soil covers in the land areas; however, the permits would likely be readily attainable.

Excavating sediment may risk the release of COCs during that work and disturb the benthic community, if present. Engineering controls may minimize the risk of releasing COCs during construction. Permitting requirements for work in the River as well as instituting more controls may cause schedule delays.

Institutional and engineering controls included in Alternative 6 are common measures that would be readily implementable.

5.2.6.9 Costs

The estimated 30-year NPV probable cost for Alternative 6 is approximately $53,362,000 based on the following:

- Excavating and managing approximately 140,100 cu yd of soil from the Former MGP Site and 33,400 cu yd of MGP-impacted soil from the B&L Property;
  - Approximately 116,800 cu yd of excavated soil from the Former MGP Site would be segregated and sampled to confirm compliance with 6 NYCRR 375-6.7 (d) and CP-51 in accordance with DER-10 Section 5.4(e) and receive the concurrence of NYSDEC prior to reuse on-Site; and
  - A minimum of 23,300 cu yd of MGP-impacted soil from the Former MGP Site and 33,400 cu yd of MGP-impacted soil from the B&L Property would be transported off Site for disposal/thermal treatment.
- ISS of approximately 144,200 cu yd of subsurface soil at the Former MGP Site source areas;
- Backfilling excavated areas and above solidified soil with clean granular fill;
- Constructing approximately 592,900 sq ft of vegetated two-foot clean soil cover with a demarcation layer at the Former MGP Site;
- Excavating, dewatering, and off-Site disposal/thermal treatment of approximately 2,500 cu yd of Site sediment;
- Milling and repaving Suntru Street to accommodate heavy truck traffic;
- Implementing institutional controls, including an environmental easement, to record the location of soil treated by ISS and the soil cover at the Former MGP Site; institutional controls estimated at $23,000 and OM&M totaling approximately $37,200;
- MNA and groundwater monitoring consisting of sampling and VOC and PAH analysis at monitoring wells on a semiannual basis for a period of 30 years, which was estimated at $267,000. For costing purposes eight wells were assumed. The final number will be determined during remedial design; and
- Installing bedrock NAPL recovery wells and OM&M of the system estimated at approximately $356,000. For costing purposes 10 wells were assumed. The final number will be determined during remedial design.

A summary of costs is provided in Table IV. The cost estimation spreadsheet is provided in Appendix A.

5.2.6.10 Land Use

The Former MGP Site would be remediated to commercial use SCOs with restrictions on uses or activities that may affect the soil cover or result in exposure to impacted subsurface soil left in-place. The B&L Property could be developed for commercial use, though the remainder of that property that is not impacted with MGP impacts would not be remediated under this FS. Institutional controls, including an environmental easement, identifying the presence and locations of soil treated by ISS and future management/disposal of excavated solidified soil would be implemented at the Former MGP Site.

Potable use of groundwater would be restricted; however, municipal water is in use in the area. Over time, MNA and NAPL recovery may restore groundwater quality to within Class GA Water Quality Standards. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

6. Comparison of Remedial Alternatives

This section of the FS provides a comparative analysis of the six remedial alternatives for the East Station Former MGP Site and B&L Property presented in Section 5.2. The eight evaluation criteria on which each alternative was evaluated are used in the comparative analysis; community acceptance will be evaluated during the PRAP process when the public will have the opportunity to review and comment on the proposed remedy. A summary of the comparative analysis is presented in Table V.

6.1 OVERALL PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT

The no further action alternative (Alternative 1) is least protective of the human health and the environment. The current surface cover of the Former MGP Site and B&L Property would provide little protection from direct contact with surface soil impacts. Engineering controls (fencing) included with the no further action alternative would provide protection from exposure to surface soil impacts at the Former MGP Site and B&L Property. The fencing would extend along the Genesee River shoreline, but impacted sediment would still be accessible from the Genesee River. Additional engineering controls would include posting signs on the Genesee River to prohibit wading/swimming and mooring/temporarily anchoring watercraft in the area of impacted sediment.

Implementing institutional controls (e.g., an environmental easement and SMP) to restrict uses that may result in potential future exposure to subsurface soil are common and generally accepted measures of protection. Alternative 1 does not include measures for restoring overburden and bedrock groundwater quality; however, there is no completed pathway for exposure to impacted groundwater, and an ordinance prohibiting potable use of groundwater would be an effective institutional control. NAPL recovery would be effective in reducing NAPL impacts and MNA processes would result in some improvement in the groundwater quality, though Class GA Water Quality Standards would not be attained within 30 years. Long-term risk to the environment posed by the presence of NAPL at the Former MGP Site and B&L Property subsurface soil and sediment in the Genesee River are not addressed by Alternative 1.

Alternative 2 (soil capping, near-River soil excavation, full sediment excavation, and hydraulic containment [slurry wall]) is protective with respect to exposures to impacted surface soil and sediment and moderately protective with respect to exposures to subsurface soil at the Former MGP Site. This Alternative includes institutional controls that are protective of potential future exposure to subsurface soil. Alternative 2 uses containment technologies to restrict additional impacts from migrating off Site. NAPL recovery would be effective in reducing NAPL impacts and MNA processes would result in some improvement in groundwater quality, though Class GA Water Quality Standards would not be attained within 30 years.

Alternative 3 (full excavation of on-Site and off-Site soil, near River soil excavation, and full sediment excavation) is the most protective of the alternatives with respect to MGP-impacted soil and NAPL source areas. Current and potential future risks to human health and the environment would be eliminated by removing impacted soil and sediment, including the source of groundwater impacts. Implementing Alternative 3 would restore the Former MGP Site to conditions suitable for unrestricted future use within the applicable zoning designation. However, implementing Alternative 3 would also have negative environmental impacts given the significant energy and resources involved in excavating

large volumes of impacted soil from the Site; transporting, treating and/or disposing of impacted soil; excavation dewatering; and importing clean excavation backfill.

Alternative 4 (partial excavation of on-Site soil, full excavation of off-Site soil, near-River soil excavation, and full sediment excavation) provides a level of protection that is slightly lower than Alternative 3 but with less significant impacts associated with implementation because a smaller volume of soil would be excavated. A limited volume of MGP-impacted subsurface soil left on Site at the Former MGP Site would be restricted by a vegetated two-foot clean soil cover with a demarcation layer and institutional controls. Current and future risks to human health and the environment would be reduced by removing impacted soil from the Former MGP Site source areas, including the source of groundwater impacts; removing MGP-impacted soil at the B&L Property; removing Site sediment; and constructing a soil cover at the Former MGP Site. The B&L Property would be suitable for continued commercial use within the applicable zoning designation. Implementing Alternative 4 would have similar environmental impacts to Alternative 3, though to a lesser degree given the reduced excavation volume. Implementing MNA and NAPL recovery would restore overburden and bedrock groundwater quality and may attain Class GA Water Quality Standards over time. In addition, a contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

Alternative 5 (partial on-Site excavation [upper 10 ft], partial on-Site ISS, off-Site ISS, near River soil excavation, and full sediment excavation) would provide a level of protection less than Alternative 3. Alternative 5 provides the same level of protection as Alternative 4 with respect to potential future exposure to subsurface soil and protection of the environment from long-term risks associated with the presence of NAPL in subsurface soil. Alternative 5 would have less significant environmental impacts than Alternatives 3 and 4 because of the limited off-Site disposal. Implementing MNA and NAPL recovery would restore overburden and bedrock groundwater quality and may attain Class GA Water Quality Standards over time. In addition, a contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

Alternative 6 (partial on-Site excavation [upper 10 ft], partial on-Site ISS, off-Site excavation, near-River soil excavation, and full sediment excavation) would provide a level of protection that is generally comparable to Alternative 5 and less than Alternative 3. Alternative 6 provides generally the same level of protection as Alternatives 4 and 5 with respect to potential future exposure to subsurface soil and protection of the environment from long-term risks associated with the presence of NAPL in subsurface soil. Alternative 6 provides a slightly higher level of protection than Alternative 5 with respect to subsurface soil at the B&L Property. Alternative 6 would have less significant environmental impacts than Alternatives 3 and 4. Implementing MNA and NAPL recovery would restore overburden and bedrock groundwater quality and may attain Class GA Water Quality Standards over time. In addition, a contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term.

Alternatives 2 through 6 are equally protective with respect to sediment and near-River soil.

6.2 COMPLIANCE WITH STANDARDS, CRITERIA, AND GUIDANCE

Alternative 1 is the least compliant with SCGs related to remediating impacted soil, groundwater, and sediment. Engineering and institutional controls would be implemented to address potential direct exposure to surface soil. Alternative 2 would partially comply with SCGs related to direct exposures to surface soil and containment of impacts on Site but would not comply with Class GA Water Quality

Standards or address impacts to subsurface soil. Alternative 3 would comply with SCGs related to each of the impacted media and include MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and NAPL recovery to improve groundwater quality to meet regulatory standards over time. Alternative 3 meets and exceeds the commercial use SCGs outlined in Section 3.2; Alternative 3 would also meet unrestricted SCGs. Alternatives 4, 5, and 6 would result in substantial compliance with SCGs but would rely on a vegetated two-foot clean soil cover with a demarcation layer and an environmental easement to preclude contact with limited remaining impacted soil at the Former MGP Site. Similar to Alternative 3, Alternatives 4, 5, and 6 would include MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and NAPL recovery to improve groundwater quality to meet regulatory standards over time. Alternatives 4, 5, and 6 satisfy the commercial use SCGs outlined in Section 3.2. Each Alternative would include engineering and institutional controls.

6.3 LONG-TERM EFFECTIVENESS AND PERFORMANCE

Alternative 1 is the least effective and permanent measure because no active remediation would occur and protection from exposure relies on maintaining engineering controls (fencing) and enforcing institutional controls.

Alternative 2 includes measures for protection from exposures associated with contact with both surface and subsurface soil. Alternative 2 addresses exposure to and potential long-term risks to the environment related to Site sediment. Alternative 2 restricts overburden groundwater flow off Site through containment at the Former MGP Site. Both overburden and bedrock groundwater impacts would be reduced through MNA, or a contingent technology outlined in the remedial design if MNA is not effective. Bedrock groundwater impacts would be further managed through a groundwater use prohibition.

Alternatives 1 and 2 do not include measures for addressing long-term impacts to the environment resulting from NAPL in subsurface soil. These Alternatives are therefore not likely permanent solutions. Given their reliance on engineering and institutional controls, these Alternatives would have limited effectiveness over the long term as compared to other Alternatives.

Alternative 3 addresses current and future potential human exposure to soil and sediment and potential long-term risks to the environment via source removal. NAPL present in bedrock groundwater would be reduced through passive NAPL recovery and managed through a groundwater use prohibition.

Alternatives 4, 5, and 6 are equally effective and permanent over the long-term. These Alternatives address potential current and future exposures to surface soil, subsurface soil containing NAPL and total PAHs greater than 500 ppm, and sediment. However, minimally COC-impacted subsurface soil (less than 500 ppm total PAHs) would remain on Site at the northwest quadrant of the Former MGP Site. These Alternatives would rely on engineering and institutional controls to monitor the soil cover installed at the Former MGP Site. Alternatives 5 and 6 would also rely on engineering and institutional controls to record the presence and locations of solidified soil and managing solidified soil if excavated in the future. Under Alternative 6, controls related to solidified soil would not be required at the B&L Property, as it includes excavation for off-Site areas. Source removal and stabilization along with MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and NAPL recovery would support the potential restoration of overburden and bedrock groundwater quality to Class GA Water Quality Standards over a long period of time.

6.4 REDUCTION OF TOXICITY, MOBILITY OR VOLUME

Alternatives 1 and 2 would not reduce the volume or toxicity of on-Site impacted soil. Alternative 1 would not reduce the mobility of impacted media.

Through capping and sediment excavation, Alternative 2 would reduce the mobility of impacted soil via erosion and the potential transport of impacted sediment. Containment would reduce the mobility of impacts within subsurface soil; however, NAPL would still exist in subsurface soil and bedrock at the Former MGP Site and B&L Property. Passive NAPL recovery would reduce the volume of NAPL present in the overburden and bedrock groundwater over time.

Alternative 3 would remove impacted soil and sediment to the greatest extent feasible. Alternative 3 would further reduce contaminant mass in overburden and bedrock groundwater over time via MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and NAPL recovery. Alternative 3 is the most effective with respect to reducing toxicity, mobility, or volume.

Alternative 4 would remove impacted soil from the B&L Property, remove soil containing observable NAPL and total PAHs greater than 500 ppm on the Former MGP Site, and remove impacted sediment. The mobility of surface soil would be reduced by vegetated two-foot clean soil cover with a demarcation layer. Alternative 4 would further reduce contaminant mass in overburden and bedrock groundwater over time via MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and NAPL recovery. Alternative 4 is slightly less effective than Alternative 3 because some COC-impacted subsurface soil would remain at the Former MGP Site; however, Alternative 4 meets the SCGs for the Site. The volume of subsurface soil remaining at depth would be minimal and have a minimal potential human health exposure.

Alternative 5 would reduce the mobility and volume of contaminants by excavating and solidifying soil in source areas at the Former MGP Site and solidifying impacted soil at the B&L Property. Alternative 5 would reduce contaminant mass in overburden and bedrock groundwater over time via MNA, or a contingent technology outlined in the remedial design if MNA is not effective, and NAPL recovery. Alternative 5 is less effective than Alternative 3 because some COC-impacted subsurface soil would remain at the Former MGP Site; however, Alternative 5 would also meet the SCGs. The volume of subsurface soil remaining at depth would be minimal and have a minimal potential human health exposure.

Alternative 6 would reduce the mobility and volume of contaminants similar to Alternative 5. Alternative 6 would excavate impacted soil at the B&L Property, which would be a greater volume reduction than Alternative 5. Alternative 6 is less effective than Alternative 3 because COC-impacted subsurface soil would remain at the Former MGP Site; however, Alternative 6 meets the SCGs. The volume of subsurface soil remaining at depth would be minimal and have a minimal potential human health exposure.

6.5 SHORT-TERM IMPACT AND EFFECTIVENESS

Alternative 1 would have the lowest level of short-term impact to the public and on-Site workers because no active remediation would occur on the Site. Access and potential exposure of trespassers to the Former MGP Site and B&L Property would be restricted by fencing.

Alternative 2 would have greater short-term impacts than Alternative 1 because of the excavation, and the construction of the caps and the bentonite slurry wall. Controls would be needed to mitigate potential impacts by increased noise, construction emissions and dust generated by excavation and construction of the caps, and odors generated during excavation and bentonite slurry wall construction. Alternative 2 would involve an environmental easement similar to Alternative 1. The estimated time to complete remediation is anticipated to be in the range of 1 to 1.5 years.

Alternative 3 would have the greatest short-term impacts to the public and Site workers given the large soil volume requiring excavation. Truck traffic, dust, noise generation, and construction emissions would be substantially greater than would occur with other alternatives. Excavating MGP-impacted soil, residual MGP wastes related to buried structures, and sediment would generate odors that would require the use of suppressants and implementing an extensive perimeter air monitoring program. Truck traffic involved in removing and replacing approximately 281,900 cu yd of soil would be substantially greater than Alternatives 4, 5, and 6. The estimated time to complete remediation is anticipated to be in the range of 4 to 5 years.

Alternative 4 would also have significant short-term impacts to the public and Site workers. Alternatives 3 and 4 would have similar impacts associated with surface and subsurface excavation, sediment excavation, and Site restoration. However, Alternative 4 would produce less truck traffic given the smaller volume (up to 83,700 cu yd) of soil to be disposed of off Site. The estimated time to complete remediation is anticipated to be in the range of 3 to 4 years.

Alternatives 5 and 6 have similar short-term impacts to the public and Site workers. ISS when implementing Alternatives 5 and 6 could generate significant amounts of dust when mixing and handling the cement/GGBFS or other ISS agents that would require mitigation. Significant noise and emissions would be generated from on-Site equipment operation. While Alternative 6 includes additional excavation at the B&L Property, the impacts would not differ greatly because pre-ISS excavation is required under Alternative 5. Impacts related to surface soil and sediment excavation, and Site restoration would be similar to those of Alternatives 3 and 4. The estimated remediation time for Alternatives 5 and 6 is in the range of 3 to 4 years.

6.6 IMPLEMENTABILITY

Alternatives 1 through 6 involve readily implementable engineering and institutional controls that may include prohibitions on groundwater use, environmental easements, and activity restrictions. Institutional controls documenting the locations of solidified soil for Alternatives 5 and 6 are also readily implementable.

Alternative 2 would have some challenges associated with working around active utilities when installing the bentonite slurry wall. Excavating surface soil and installing a slurry wall are readily implementable.

Alternative 3 would be implementable but technically and logistically challenging. Likely challenges include the presence of buried structures, water infiltration, internal bracing, or tieback of lateral earth support, monitoring for potential ground loss and adjacent structure settlement, and working around or temporarily relocating the active gas main on Site. Alternative 3 would generate a substantial quantity (479,500 cu yd) of impacted soil and require significant testing to characterize soil for on-Site reuse and off-Site disposal/thermal treatment. Excavation dewatering is expected and would require testing and managing effluent treatment and disposal.

Alternative 4 would be implementable and include similar technical and logistical challenges as Alternative 3 but to a lesser degree. Alternative 4 would generate a substantial quantity (335,300 cu yd) of impacted soil and require testing to characterize soil for on-Site reuse and off-Site disposal/thermal treatment. Excavation dewatering is expected and would require testing and managing effluent treatment and disposal.

Alternative 5 would also have some challenges associated with incorporating buried structures and debris into the ISS mixture at the Former MGP Site and B&L Property; however, ISS has been proven to be effective at similar depths and in similar subsurface conditions. Additional challenges would include monitoring for adjacent structure settlement and solidifying soil around the regulator station and active gas mains. Bench-scale testing would be required to establish an effective mix design, and field testing during construction would be necessary to conform with the ISS mix design.

Alternative 6 would involve ISS of a smaller volume of soil than Alternative 5 and excavation/off-Site disposal/thermal treatment of a smaller quantity of soil than Alternatives 3 and 4.
Implementability concerns related to sediment excavation (a presumptive remedy) are the same for Alternatives 2 through 6. Excavating sediment is a common practice but may have difficulties associated with obtaining permits, sediment resuspension and turbidity, and managing water and flows.

6.7 COST

A comparison of probable costs for each alternative is presented in Table IV. The opinions of probable costs were developed on a 30-year NPV basis using the description of alternatives and estimated quantities described in Section 5.2. Detailed cost spreadsheets are provided in Appendix A.

A brief comparison of estimated probable costs is provided below:

Alternative	Total Alternative Cost
1	**$ 1,006,000**
2	**$ 29,363,000**
3	**$ 89,873,000**
4	**$ 47,747,000**
5	**$ 48,454,000**
6	**$ 53,362,000**

Alternative 1 has the lowest cost at approximately $1 million. Alternative 3 has the highest cost at approximately $89.87 million.

6.8 LAND USE

Alternatives 1 and 2 would impose the greatest restrictions on land use; however, each of the remedies could be implemented with continued commercial use of the Former MGP Site.

Alternative 3 would allow for unrestricted future use of the Former MGP Site and continued commercial use of the B&L Property in accordance with local zoning and ordinances.

Alternative 4 would include limited use restrictions at the Former MGP Site and continued commercial use of the B&L Property.

Alternative 5 would include limited use restrictions at the Former MGP Site and continued commercial use of the B&L Property with limited institutional controls placed on both properties (i.e., recording the presence/potential future management of solidified soil).

Alternative 6 would include limited use restrictions of the Former MGP Site and continued commercial use of the B&L Property with limited institutional controls placed on the Former MGP Site only (i.e., recording the presence/potential future management of solidified soil).

Alternatives 1 through 6 rely on institutional controls (e.g., an environmental easement) for the Site.

6.9 COMMUNITY ACCEPTANCE

Community acceptance will be evaluated during the PRAP process when the public will have the opportunity to review and comment on the proposed remedy.

7. Recommended Remedial Alternative

7.1 RECOMMENDED REMEDY COMPONENTS

Based on the evaluations conducted for this FS and the data presented in the RI report, Alternative 4 is recommended for implementation at the Site.

7.2 BASIS FOR RECOMMENDATION

Alternative 4 is recommended because it is a permanent solution that addresses each complete pathway for human health exposure identified at the Site, it eliminates potential long-term risk to the environment, and allows for the continued commercial use of the Former MGP Site and B&L Property. Alternative 4 is also cost-effective, SCGs would be achieved, and remaining MGP-impacted material would not pose a significant risk. Alternative 4 is also likely to be an acceptable remedy to the community and B&L Property owner.

7.3 ADDITIONAL PRE-DESIGN INVESTIGATIONS

The lateral and vertical extent of impacts to soil, sediment, and groundwater were well established during the RI. The following pre-design investigations are recommended:

- Gauge overburden and bedrock monitoring wells at B&L Property for the presence of NAPL;
- Determine siting of NAPL recovery wells and long-term monitoring wells;
- Install additional soil borings and sampling at the B&L Property to refine the remedial area;
- Engage a remedial contractor to complete a constructability assessment;
- Evaluate the feasibility of on-Site thermal treatment of MGP-impacted soil; and
- Evaluate the structural stability of Suntru Street with regards to truck and construction traffic, including sampling the slide slopes along Suntru Street down to the Site as well as to the south along the Bausch Street Bridge.

References

1. Atlantic Environmental Services, Inc., 1993. Site Investigation Report.

2. David Williams Company, 1916. The Iron Age. February.

3. GEI Consultants, Inc., 2010. Phase 2 Data Summary Package - Assessment of MGP-Related NAPL Residuals in Sediments in the Genesee River Project Area. 31 March.

4. Haley & Aldrich of New York, 2015. Remedial Investigation Report.

5. Ish, Inc. and Meta Environmental, Inc., 2000a. Focused Remedial Investigation Report.

6. Ish, Inc. and Meta Environmental, Inc., 2000b. Addendum to the Focused Remedial Investigation.

7. Ish, Inc., 2009. Phase IV Interim Remedial Measure Implementation Report.

8. Morrison-Knudson Engineers, Inc., 1986. Preliminary Site Review.

9. New York State, 2014. List of Impaired Waters Requiring TMDL/Other Strategy. September.

10. New York State Department of Environmental Conservation, 1998. Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June.

11. New York State Department of Environmental Conservation, 2002. DER-4 Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment. 11 January.

12. New York State Department of Environmental Conservation, 2006. 6 NYCRR Part 375 Environmental Remediation Programs. 14 December.

13. New York State Department of Environmental Conservation, 2007. DER-15 Presumptive/Proven Remedial Technologies. 27 February.

14. New York State Department of Environmental Conservation, 2010a. DER-10 Technical Guidance for Site Investigation and Remediation. 3 May.

15. New York State Department of Environmental Conservation, 2010b. DER-31 Green Remediation. 11 August.

16. New York State Department of Environmental Conservation, 2010c. Commissioner Policy-51 (CP-51) Soil Cleanup Guidance. 21 October.

17. New York State Department of Environmental Conservation, 2014. Screening and Assessment of Contaminated Sediment. 24 June.

18. New York State Department of Environmental Conservation, 2020. Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS). October.

19. New York State Department of Health, 2006. Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October.

20. New York State Department of Health, 2017. Soil Vapor/Indoor Air Matrix. May.

21. URS, Inc., 2006. Final Engineering Report for IRM.

TABLES

TABLE I
SUMMARY OF QUALITATIVE EXPOSURE ASSESSMENT
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

Media		Surface Soil								Subsurface Soil								Overburden Groundwater						Sediment		
Exposure		Dermal Contact		Ingestion		Inhalation of dust in outdoor air		Inhalation of vapors in outdoor air		Dermal Contact		Ingestion		Inhalation of dust in outdoor air		Inhalation of vapors in outdoor air		Dermal Contact		Ingestion		Inhalation of vapors in outdoor air		Dermal Contact	Ingestion	Inhalation of vapors in outdoor air
Period		Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	Current/ Future	Current/ Future	Current/ Future
Location	**Receptor**																									
On-Site: Former MGP Site	RG&E Employee	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No (note 3)	No (note 3)	No (note 3)	No (note 3)	No (note 3)	No (note 3)	No (note 3)	No (note 3)	No (note 3)	No (note 3)	No (note 3)	No (note 3)	**Yes**	**Yes**	n/a	n/a	n/a
	Construction Worker	No	**Yes**	No	**Yes**	No	**Yes**	No	**Yes**	No	**Yes**	No	**Yes**	No	**Yes**	No	**Yes**	No	**Yes**	No	**Yes**	No	**Yes**	n/a	n/a	n/a
	Utility Worker	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	n/a	n/a	n/a
	Trespasser	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	**Yes**	**Yes**	n/a	n/a	n/a
Off-Site: B&L Property	B&L Employee	--	--	--	--	--	--	--	--	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	**Yes**	**Yes**	n/a	n/a	n/a
	Construction Worker	--	--	--	--	--	--	--	--	No	**Yes**	No	**Yes**	No	**Yes**	No (note 5)	No (note 5)	No	**Yes**	No	**Yes**	No	**Yes**	n/a	n/a	n/a
	Utility Worker	--	--	--	--	--	--	--	--	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No (note 5)	No (note 5)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	n/a	n/a	n/a
	Trespasser	--	--	--	--	--	--	--	--	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	No (note 4)	**Yes**	**Yes**	n/a	n/a	n/a
Genesee River	Trespasser	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**Yes**	**Yes**	No (note 6)

Notes and Abbreviations:

1. "n/a" = not applicable.
2. "--" = not evaluated; MGP residuals were not observed in B&L Property surface soil.
3. Vapor intrusion into buildings, direct exposure to surface water, and exposure to bedrock groundwater is not a complete exposure pathway. See RIR.
4. This receptor does not conduct intrusive subsurface activities and is not exposed to subsurface soil or directly to groundwater.
5. VOCs were not detected in B&L Property soil, therefore, exposure to vapors in outdoor air from soil is not a complete exposure pathway.
6. Exposure to vapors in outdoor air from sediment is not considered to be complete because the sediment are covered with continuously flowing water.

TABLE II
SCREENING OF REMEDIAL TECHNOLOGIES
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

SURFACE SOIL:

Technology	Description	Conclusion	
		On-Site	**Off-Site**
No Action	No remedial measures taken	**Retain** as a baseline for comparison with other alternatives	**Retain** as a baseline for comparison with other alternatives
Engineering Controls	Restricts access through the usage of fencing	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Institutional controls	Addresses potential risks by restricting property uses to non-residential and through an Environmental Easement and Soil Management Plan	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Capping/Containment	Maintain a cover (e.g., vegetated soil, stone, pavement) over impacted areas	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Excavation	Excavate impacted soil, transport off-site for treatment and/or disposal or treat on-site via thermal desorption and potentially reuse treated soil as backfill	**Retain** for further evaluation	**Retain** for further evaluation

SUBSURFACE SOIL:

Technology	Description	Conclusion	
		On-Site	**Off-Site**
No Action	No remedial measures taken	**Retain** as a baseline for comparison with other alternatives	**Retain** as a baseline for comparison with other alternatives
Institutional Controls	Addresses potential risks by restricting property uses to non-residential and through an Environmental Easement and Soil Management Plan	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Surface Cover/Capping	Maintain a cover (e.g., vegetated soil, stone, pavement) over impacted areas	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
In-situ Solidification	Reduce mobility of constituents in-place by mixing with a binding agent and solidification	**Retain** as a technology to eliminate source of impacts to groundwater quality	**Retain** as a technology to eliminate source of impacts to groundwater quality
In-situ Biological Treatment	Reduce constituent concentrations in-place by enhancing natural biodegradation	**Eliminate** - not effective at addressing NAPL impacts in the unsaturated zone	**Eliminate** - not effective at addressing NAPL impacts in the unsaturated zone
In-situ Chemical Oxidation	Chemical destruction of adsorbed constituents through injection of reagents	**Eliminate** - not effective at addressing impacts within the unsaturated zone	**Eliminate** - not effective at addressing impacts within the unsaturated zone
Excavation	Excavate impacted soil, transport off-site for treatment and/or disposal or treat on-site via thermal desorption and potentially reuse treated soil as backfill	**Retain** for further evaluation	**Retain** for further evaluation

NEAR RIVER SOIL:

Technology	Description	Conclusion	
		On-Site	**Off-Site**
No Action	No remedial measures taken	**Retain** as a baseline for comparison with other alternatives	Not applicable
Institutional Controls	Addresses potential risks by restricting property uses to non-residential and through an Environmental Easement and Soil Management Plan	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies	Not applicable
In-situ Solidification	Reduce mobility of constituents in-place by mixing with a binding agent and solidification	**Eliminate** - other technology selected as presumptive remedy	Not applicable
Excavation	Excavate impacted soil, transport off-site for treatment and/or disposal or treat on-site via thermal desorption and potentially reuse treated soil as backfill	**Presumptive remedy**	Not applicable

OVERBURDEN GROUNDWATER:

Technology	Description	Conclusion
No Action	No remedial measures taken	**Retain** as a baseline for comparison with other alternatives
Institutional Controls	Address risks by restricting groundwater use	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Groundwater Monitoring Monitored Natural Attenuation (MNA)	Groundwater sampling and analyses to evaluate potential migration and natural attenuation of dissolved phase constituents. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
NAPL Recovery	NAPL gauging and passive recovery for source removal.	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Containment	Use of slurry wall to provide containment of dissolved phase constituents	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
In-situ Biological Treatment	Enhancement of natural attenuation by addition of oxygen, and nutrients if needed, to increase biodegradation of constituents	**Eliminate** due to implementability constraints and effectiveness limitations
In-situ Chemical Oxidation	Chemical destruction of adsorbed and dissolved phase constituents through injection of reagents	**Eliminate** due to implementability constraints and effectiveness limitations
Groundwater Extraction and Treatment	Groundwater extraction system with treatment and discharge	**Eliminate** due to effectiveness limitations

TABLE II
SCREENING OF REMEDIAL TECHNOLOGIES
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

BEDROCK GROUNDWATER:

Technology	Description	Conclusion
No Action	No remedial measures taken	**Retain** as a baseline for comparison with other alternatives
Institutional Controls	Address risks by restricting groundwater use	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Groundwater Monitoring Monitored Natural Attenuation (MNA)	Groundwater sampling and analyses to evaluate potential migration and natural attenuation of dissolved phase constituents. A contingent technology will be outlined in the remedial design if MNA is not proven effective in the long term	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
NAPL Recovery	NAPL gauging and passive recovery for source removal	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
In-situ Biological Treatment	Enhancement of natural attenuation by addition of oxygen, and nutrients if needed, to increase biodegradation of constituents	**Eliminate** due to implementability constraints and effectiveness limitations
In-situ Chemical Oxidation	Chemical destruction of adsorbed and dissolved phase constituents through injection of reagents	**Eliminate** due to implementability constraints and effectiveness limitations
Containment	Use of limited groundwater extraction to provide containment of dissolved phase constituents	**Eliminate** due to implementability constraints in bedrock and effectiveness limitations
Groundwater Extraction and Treatment	Groundwater extraction system with treatment and discharge	**Eliminate** due to implementability constraints in bedrock and effectiveness limitations

SEDIMENT:

Technology	Description	Conclusion
No Action	No remedial measures taken	**Retain** as a baseline for comparison with other alternatives
Engineering Controls	Restricts access through the use of signage along the waterway	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Institutional Controls	Address risks by restricting access to impacted sediment areas of river	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Capping/ Physical Containment	Installation of a physical barrier (e.g., soil cap) to provide containment of MGP-related constituents	**Eliminate** as a stand-alone technology, but **retain** as a component with other technologies
Excavation/Dredge	Dredge impacted soil, transport off-site for treatment and/or disposal or treat sediment at the Site	**Presumptive remedy**

Notes:
1. Retained technologies may be combined for the alternatives evaluation.

TABLE III
SUMMARY OF REMEDIAL ACTION ALTERNATIVE ANALYSIS
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

CRITERIA	ALTERNATIVE 1 No Further Action	ALTERNATIVE 2 Soil Capping, Near River Soil Excavation, Full Sediment Excavation, and Hydraulic Containment (Slurry Wall)	ALTERNATIVE 3 Full Excavation of On-Site and Off-Site Soil, Near River Soil Excavation, and Full Sediment Excavation
Overall Protectiveness of Human Health and the Environment	- LOW - No active remediation	- LOW/MODERATE - Impermeable cap and fencing reduce potential exposure to surface soil - On-site hydraulic containment reduces off-site migration of and potential exposure to overburden groundwater - Sediment excavation reduces potential exposure to NAPL in sediment and potential long-term risk to the environment - Institutional and engineering controls reduce potential exposure to subsurface soil and groundwater - Groundwater quality would be improved over time via containment, and MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery (inside of slurry wall)	- HIGH - Surface soil removal and restoration eliminates potential exposure - Subsurface soil removal and restoration eliminates potential exposure and reduces source material on-site - Sediment excavation eliminates potential exposure to NAPL in sediment and potential long-term risk to the environment - Institutional and engineering controls reduce potential exposure to groundwater - Groundwater quality would be restored over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery
Compliance with Standards, Criteria and Guidance (SCGs)	- LOW - Soil SCOs and sediment and groundwater SCGs not addressed - Groundwater SCGs potentially addressed over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery	- LOW/MODERATE - Surface soil SCOs and sediment SCGs addressed - Subsurface soil SCOs partially addressed through near River soil excavation and containment - Groundwater SCGs potentially addressed over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery	- HIGH - Surface and subsurface soil SCOs and sediment SCGs addressed - Groundwater SCGs addressed over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery
Long-term Effectiveness and Permanence	- LOW - Contamination remains after remedy is in place - Engineering controls include fencing and signage - Institutional and engineering controls consist of restricted use of site, groundwater and river - Requires long-term monitoring of sediment, groundwater, NAPL and engineering controls	- LOW - Majority of contamination remains after remedy in place - Engineering controls include caps; slurry wall; fencing - Institutional and engineering controls consist of restricted use of site and groundwater - Requires long-term monitoring of groundwater, NAPL and engineering controls	- HIGH - Soil and sediment contamination removed during remedy - Institutional and engineering controls consist of restricted use of groundwater - Requires long-term monitoring of groundwater, NAPL and engineering controls
Reduction of Toxicity, Mobility or Volume	- LOW - Limited reduction in toxicity, mobility and volume of impacted media; reduction due to natural processes	-LOW/MODERATE - Eliminates volume of impacted surface soil - Reduces volume of impacted subsurface soil (near River and off-site) - Reduces mobility of impacted subsurface soil (on-site upland) - Eliminates volume of impacted sediment - Reduces mobility of impacted groundwater	- HIGH - Eliminates volume of impacted surface soil, subsurface soil, and sediment - Reduces toxicity of impacted groundwater over time
Short-term Impact and Effectiveness	- LOW - No effect on community or workers because no active remediation - No environmental impacts - Implemented immediately	- MODERATE - Risk to workers associated with construction of cap and slurry wall - Risk to community due to dust, noise and air emissions, and truck traffic - Damage to benthic community during sediment excavation activities; risk of release of COCs during sediment work - Above can be managed using PPE and engineering controls - Remedial action should be completed within 1 to 1.5 years	- HIGH - Risk to workers associated with deep excavation - Risk to community due to dust, noise and air emissions, and truck traffic - Risk to community due to off-site disposal/treatment of impacted soil and sediment - Damage to benthic community during sediment excavation activities; risk of release of COCs during sediment work - Above can be managed using PPE and engineering controls - Remedial action should be completed within 4 to 5 years
Implementability	- LOW DIFFICULTY TO IMPLEMENT - Fencing and signage are readily implementable engineering controls - On-site institutional and engineering controls are implementable - Engineering and institutional controls at the B&L Property will require approval from the Site owner	- LOW TO MODERATE DIFFICULTY TO IMPLEMENT - Surface soil excavation, asphalt cap, and slurry wall are implementable but present logistical challenges with slurry wall construction (subsurface obstructions, working around gas main) - Sediment excavation is implementable but presents logistical challenges (re-suspension of COCs, water velocity, permitting) - On-site institutional and engineering controls are implementable - Engineering and institutional controls at the B&L Property will require approval from the Site owner	- HIGH DIFFICULTY TO IMPLEMENT - Soil excavation is implementable but presents logistical challenges (support of excavation, significant off-site disposal, materials handling for beneficial reuse onsite, work around regulator station and gas line, possible temporary re-location of gas line) - Dewatering will require management, treatment and disposal, permitting - Soil reuse is readily implementable - Sediment excavation is implementable but presents logistical challenges (re-suspension of COCs, water velocity, permitting) - Limited on-site institutional and engineering controls are implementable
Cost	- LOW Capital: $333,600 Annual OM&M (30 year): $54,300 Net Present Value (NPV): $1,006,000	- LOW/MODERATE Capital: $28,584,000 Annual OM&M (30 year): $62,800 NPV: $29,363,000	- HIGH Capital: $88,791,500 Annual OM&M (30 year): $87,200 NPV: $89,873,000
Land Use	- HIGH RESTRICTIONS - The Former MGP Site and B&L Property limited to Commercial Use - Use of B&L property limited by fence around MGP-impacted soil - Groundwater use restricted until standards met - Use of portions of the Genesee River would be restricted	- HIGH RESTRICTIONS - The Former MGP Site and B&L Property limited to Commercial Use - Use of B&L property limited by cap around MGP-impacted soil - Groundwater use restricted until standards met	- LOW RESTRICTIONS - Unrestricted use of Former MGP Site - Continued commercial use of B&L Property - Groundwater use restricted until standards met
Community Acceptance	The Alternative will be presented to the public during the Proposed Remedial Action Plan (PRAP) public review and comment period. Comments will be collected to gauge the amount of community acceptance; Record of Decision (ROD) will be issued thereafter.	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.

TABLE III
SUMMARY OF REMEDIAL ACTION ALTERNATIVE ANALYSIS
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

CRITERIA	ALTERNATIVE 4 Partial Excavation of On-Site Soil, Full Excavation of Off-Site Soil, Near River Soil Excavation, and Full Sediment Excavation	ALTERNATIVE 5 Partial On-Site Excavation (Upper 10-ft), Partial On-Site ISS, Off-Site ISS, Near River Soil Excavation, and Full Sediment Excavation
Overall Protectiveness of Human Health and the Environment	- MODERATE/HIGH - Surface soil removal, restoration, soil cover, and fencing eliminate potential exposure to surface soil - Partial on-site subsurface soil removal and restoration reduces potential exposure and greatly reduces volume of source material on-site - Full off-site subsurface soil removal and restoration eliminates potential exposure and reduces source material off-site - Sediment excavation eliminates potential exposure to NAPL in sediment and potential long-term risk to the environment - Institutional and engineering controls reduce potential exposure to subsurface soil left in place, soil cover, and groundwater - Groundwater quality would be restored over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery	- MODERATE - Surface soil removal, restoration, soil cover, and fencing eliminate potential exposure on-site - Subsurface soil solidification reduces source material volume and mobility, reduces potential exposure - Sediment excavation eliminates potential exposure to NAPL in sediment and potential long-term risk to the environment - Institutional and engineering controls to record presence of solidified soil, potential future management of solidified soil and subsurface soil left in place, soil cover, and groundwater - Groundwater quality would be restored over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery
Compliance with Standards, Criteria and Guidance (SCGs)	- MODERATE/HIGH - Surface soil SCOs and sediment SCGs addressed - Subsurface soil SCOs addressed at MGP-impacted area of B&L Property - Subsurface soil SCOs substantially addressed on-site - Groundwater SCGs addressed over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery	- MODERATE/HIGH - Surface soil SCOs and sediment SCGs addressed - Subsurface soil SCOs substantially addressed on-site and at MGP-impacted area of B&L Property - Groundwater SCGs addressed over time via source isolation (ISS), MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery
Long-term Effectiveness and Permanence	- MODERATE/HIGH - Limited contamination remains on-site after remedy in place - Engineering controls include soil cover and fencing - Institutional and engineering controls consist of restricted use of site and groundwater - Requires long-term monitoring of groundwater, NAPL and engineering controls	- MODERATE/HIGH - Limited contamination remains after remedy in place - Engineering controls include soil cover and fencing - Institutional and engineering controls consist of restricted use of groundwater - Requires long-term monitoring of groundwater, NAPL and engineering controls
Reduction of Toxicity, Mobility or Volume	- MODERATE/HIGH - Greatly reduces volume and mobility of impacted surface and subsurface soil at Former MGP Site - Eliminates volume of MGP-impacted soil at B&L Property - Eliminates volume of impacted sediment - Reduces toxicity of impacted groundwater over time	- MODERATE - Reduces volume and mobility of impacted surface and subsurface soil at Former MGP Site - Reduces volume and mobility of MGP-impacted surface and subsurface soil at B&L Property - Eliminates volume of impacted sediment - Reduces toxicity of impacted groundwater over time
Short-term Impact and Effectiveness	- MODERATE/HIGH - Risk to workers associated with construction of soil cover and deep excavation - Risk to community due to dust, noise and air emissions, and truck traffic - Risk to community due to off-site disposal/treatment of impacted soil and sediment - Damage to benthic community during sediment excavation activities; risk of release of COCs during sediment work - Above can be managed using PPE and engineering controls - Remedial action should be completed within 2.5 to 4 years	- MODERATE/HIGH - Risk to workers associated with construction of soil cover, excavation (upper 10-ft), and ISS - Risk to community due to dust, noise and air emissions, and truck traffic - Risk to community due to off-site disposal/treatment of impacted soil and sediment - Damage to benthic community during sediment excavation activities; risk of release of COCs during sediment work - Above can be managed using PPE and engineering controls - Remedial action should be completed within 2.5 to 4 years
Implementability	- MODERATE DIFFICULTY TO IMPLEMENT - Excavation is implementable but presents logistical challenges (support of excavation, significant off-site disposal, materials handling for beneficial reuse onsite, work around regulator station and gas line, possible temporary re-location of gas line) - Dewatering will require management, treatment and disposal, permitting - Soil reuse and cover are readily implementable - Sediment excavation is implementable but presents logistical challenges (re-suspension of COCs, water velocity, permitting) - On-site institutional controls are implementable	- MODERATE DIFFICULTY TO IMPLEMENT - ISS and excavation (upper 10-ft) are implementable but present logistical challenges (on-site batch plant, subsurface obstructions, materials handling for beneficial reuse onsite, possible off-site disposal, work around regulator station and gas line, possible temporary re-location of gas line) - Soil reuse and cover are readily implementable - Sediment excavation is implementable but presents logistical challenges (re-suspension of COCs, water velocity, permitting) - On-site institutional controls are implementable - Implementability of institutional controls off-site requires further review
Cost	- MODERATE Capital: $46,623,600 Annual OM&M (30 year): $90,600 NPV: $47,747,000	- MODERATE Capital: $47,353,000 Annual OM&M (30 year): $88,700 NPV: $48,454,000
Land Use	- LOW/MODERATE RESTRICTIONS - The Former MGP Site limited to Commercial Use with limited institutional and engineering controls - Continued commercial use of B&L Property - Groundwater use restricted until standards met	- MODERATE RESTRICTIONS - The Former MGP Site limited to Commercial Use with limited institutional controls - Continued commercial use of B&L Property with limited institutional and engineering controls - Groundwater use restricted until standards met
Community Acceptance	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.

TABLE III
SUMMARY OF REMEDIAL ACTION ALTERNATIVE ANALYSIS
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

CRITERIA	Alternative 6 Partial On-Site Excavation (Upper 10-ft), Partial On-Site ISS, Off-Site Excavation, Near River Soil Excavation, and Full Sediment Excavation
Overall Protectiveness of Human Health and the Environment	- MODERATE/HIGH - Surface soil removal, restoration, and soil cover eliminate potential exposure on-site - Subsurface soil solidification reduces source material volume and mobility, reduces potential exposure on-site - Full subsurface soil removal and restoration eliminates potential exposure and reduces source material off-site - Sediment excavation eliminates potential exposure to NAPL in sediment and potential long-term risk to the environment - Institutional and engineering controls to record presence of solidified soil, potential future management of solidified soil and subsurface soil left in place, soil cover, and groundwater - Groundwater quality would be restored over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery
Compliance with Standards, Criteria and Guidance (SCGs)	- MODERATE/HIGH - Surface soil SCOs and sediment SCGs addressed - Subsurface soil SCOs addressed at MGP-impacted area of B&L Property - Subsurface soil SCOs substantially addressed on-site - Groundwater SCGs addressed over time via source isolation (ISS), MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery
Long-term Effectiveness and Permanence	- MODERATE/HIGH - Limited contamination remains on-site after remedy in place - Engineering controls include soil cover - Institutional and engineering controls consist of restricted use of site and groundwater - Requires long-term monitoring of groundwater, NAPL and engineering controls
Reduction of Toxicity, Mobility or Volume	- MODERATE/HIGH - Reduces volume and mobility of impacted surface and subsurface soil at Former MGP Site - Eliminates volume of MGP-impacted soil at B&L Property - Eliminates volume of impacted sediment - Reduces toxicity of impacted groundwater over time
Short-term Impact and Effectiveness	- MODERATE/HIGH - Risk to workers associated with construction of soil cover, deep excavation, and ISS - Risk to community due to dust, noise and air emissions, and truck traffic - Risk to community due to off-site disposal/treatment of impacted soil and sediment - Damage to benthic community during sediment excavation activities; risk of release of COCs during sediment work - Above can be managed using PPE and engineering controls - Remedial action should be completed within 2.5 to 4 years
Implementability	- MODERATE DIFFICULTY TO IMPLEMENT - ISS and excavation are implementable but present logistical challenges (on-site batch plant, subsurface obstructions, materials handling for beneficial reuse onsite, possible off-site disposal, work around regulator station and gas line, possible temporary re-location of gas line) - Dewatering will require management, treatment and disposal, permitting - Soil reuse and cover are readily implementable - Sediment excavation is implementable but presents logistical challenges (re-suspension of COCs, water velocity, permitting) - On-site institutional and engineering controls are implementable
Cost	- MODERATE Capital: $52,261,000 Annual OM&M (30 year): $88,700 NPV: $53,362,000
Land Use	- LOW/MODERATE RESTRICTIONS - The Former MGP Site limited to Commercial Use with limited institutional controls - Continued commercial use of B&L Property - Groundwater use restricted until standards met
Community Acceptance	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.

TABLE IV
SUMMARY OF REMEDIAL ACTION ALTERNATIVE COSTS
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

			OPINION OF PROBABLE COSTS				
			Capital Costs	Annual O&M Costs	Present Worth of O&M	Total Option Cost	TOTAL ALTERNATIVE COST
ALTERNATIVE 1: No Action							
Groundwater	Groundwater Monitoring	GW-MNA	$ -	$ 11,013	$ 136,658	$ 137,000	
Bedrock Groundwater	Groundwater Monitoring	BRGW-MNA	$ -	$ 10,508	$ 130,399	$ 130,000	
Groundwater	Engineering Controls (Passive NAPL Recovery)	GW-NAPL	$ 72,183	$ 22,881	$ 283,933	$ 356,000	
On-Site Soil	Engineering Controls (Fencing)	SS-FR-Fence	$ 123,446	$ 1,902	$ 23,598	$ 147,000	
Off-Site Soil	Engineering Controls (Fencing)	SS-OS-Fence	$ 82,838	$ 1,500	$ 18,614	$ 101,000	
On-Site Sediment	Engineering Controls (Signage)	Sed-Signs	$ 20,589	$ 2,000	$ 24,818	$ 45,000	
On-Site Soil	Institutional Control/Land Use Restriction	SS-FR-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
Groundwater	Institutional Control/Groundwater Use Restriction	GW-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
On-Site Sediment	Institutional Control/River Use Restriction	Sed-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
TOTAL			**$ 333,557**	**$ 54,304**	**$ 673,861**	**$ 1,006,000**	**$1,006,000**
ALTERNATIVE 2 : Soil Capping, Near River Soil Excavation, Full Sediment Excavation, and Hydraulic Containment (Slurry Wall)							
On-Site Shallow Soil	Shallow Excavation	SS-FR-Exc	$ 6,440,509	$ -	$ -	$ 6,441,000	
Off-Site Shallow Soil	Shallow Excavation	SS-OS-Exc	$ 561,986	$ -	$ -	$ 562,000	
On-Site Shallow Soil	Asphalt Cap	SS-FR-Asp	$ 5,174,906	$ 9,656	$ 119,826	$ 5,295,000	
Off-Site Shallow Soil	Asphalt Cap	SS-OS-Asp	$ 455,947	$ 2,324	$ 28,832	$ 485,000	
On-Site Sediment	Presumptive Sediment Remedy	Sed-Dredge	$ 5,190,679	$ -	$ -	$ 5,191,000	
On-Site Soil	Slurry Wall	S-FR-Cont	$ 5,470,348	$ -	$ -	$ 5,470,000	
On-Site Soil	WIRM Excavation	S-FR-WIRM	$ 4,988,175	$ -	$ -	$ 4,988,000	
Groundwater	Groundwater Monitoring	GW-MNA	$ -	$ 11,013	$ 136,658	$ 137,000	
Bedrock Groundwater	Groundwater Monitoring	BRGW-MNA	$ -	$ 10,508	$ 130,399	$ 130,000	
Groundwater	Engineering Controls (Passive NAPL Recovery)	GW-NAPL	$ 72,183	$ 22,881	$ 283,933	$ 356,000	
On-Site Soil	Engineering Controls (Fencing)	SS-FR-Fence	$ 123,446	$ 1,902	$ 23,598	$ 147,000	
Off-Site Soil	Engineering Controls (Fencing)	SS-OS-Fence	$ 82,838	$ 1,500	$ 18,614	$ 101,000	
On-Site Soil	Institutional Control/Land Use Restriction	SS-FR-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
Groundwater	Institutional Control/Groundwater Use Restriction	GW-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
TOTAL			**$ 28,584,017**	**$ 62,784**	**$ 779,087**	**$ 29,363,000**	**$29,363,000**
ALTERNATIVE 3 : Full Excavation of On-Site and Off-Site Soil, Near River Soil Excavation, and Full Sediment Excavation							
On-Site Shallow Soil	Full Excavation with Potential Reuse	SS-FR-Reuse	$ 1,533,169	$ -	$ -	$ 1,533,000	
Off-Site Shallow Soil	Excavation	SS-OS-Exc	$ 561,986	$ -	$ -	$ 562,000	
On-Site Soil	Full Excavation with Potential Reuse (Inclusive of WIRM)	S-FR-ExcR	$ 68,729,139	$ -	$ -	$ 68,729,000	
Off-Site Soil	Excavation	S-OS-Exc	$ 9,331,063	$ -	$ -	$ 9,331,000	
On-Site Shallow Soil	Suntru Street Upgrades	SS-FR-Suntru	$ 146,649	$ -	$ -	$ 147,000	
On-Site Shallow Soil	Soil Cap	SS-FR-Cap	$ 2,935,934	$ 39,580	$ 491,149	$ 3,427,000	
Off-Site Shallow Soil	Soil Cap	SS-OS-Cap	$ 279,169	$ 1,714	$ 21,272	$ 300,000	
On-Site Sediment	Presumptive Sediment Remedy	Sed-Dredge	$ 5,190,679	$ -	$ -	$ 5,191,000	
Groundwater	Groundwater Monitoring	GW-MNA	$ -	$ 11,013	$ 136,658	$ 137,000	
Bedrock Groundwater	Groundwater Monitoring	BRGW-MNA	$ -	$ 10,508	$ 130,399	$ 130,000	
Groundwater	Engineering Controls (Passive NAPL Recovery)	GW-NAPL	$ 72,183	$ 22,881	$ 283,933	$ 356,000	
Groundwater	Institutional Control/Groundwater Use Restriction	GW-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
TOTAL			**$ 88,791,472**	**$ 87,197**	**$ 1,082,026**	**$ 89,873,000**	**$89,873,000**
ALTERNATIVE 4 : Partial Excavation of On-Site Soil, Full Excavation of Off-Site Soil, Near River Soil Excavation, and Full Sediment Excavation							
On-Site Shallow Soil	Full Excavation with Potential Reuse	SS-FR-Reuse	$ 1,533,169	$ -	$ -	$ 1,533,000	
Off-Site Shallow Soil	Excavation	SS-OS-Exc	$ 561,986	$ -	$ -	$ 562,000	
On-Site Soil	Partial Excavation with Potential Reuse (Inclusive of WIRM)	S-PR-ExcR	$ 26,426,356	$ -	$ -	$ 26,426,000	
Off-Site Soil	Excavation	S-OS-Exc	$ 9,331,063	$ -	$ -	$ 9,331,000	
On-Site Shallow Soil	Suntru Street Upgrades	SS-FR-Suntru	$ 146,649	$ -	$ -	$ 147,000	
On-Site Shallow Soil	Soil Cap	SS-FR-Cap	$ 2,935,934	$ 39,580	$ 491,149	$ 3,427,000	
Off-Site Shallow Soil	Soil Cap	SS-OS-Cap	$ 279,169	$ 1,714	$ 21,272	$ 300,000	
On-Site Sediment	Presumptive Sediment Remedy	Sed-Dredge	$ 5,190,679	$ -	$ -	$ 5,191,000	
Groundwater	Groundwater Monitoring	GW-MNA	$ -	$ 11,013	$ 136,658	$ 137,000	
Bedrock Groundwater	Groundwater Monitoring	BRGW-MNA	$ -	$ 10,508	$ 130,399	$ 130,000	
Groundwater	Engineering Controls (Passive NAPL Recovery)	GW-NAPL	$ 72,183	$ 22,881	$ 283,933	$ 356,000	
On-Site Soil	Engineering Controls (Fencing)	SS-FR-Fence	$ 123,446	$ 1,902	$ 23,598	$ 147,000	
On-Site Soil	Institutional Control/Land Use Restriction	SS-PR-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
Groundwater	Institutional Control/Groundwater Use Restriction	GW-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
TOTAL			**$ 46,623,635**	**$ 90,598**	**$ 1,124,238**	**$ 47,747,000**	**$47,747,000**

TABLE IV
SUMMARY OF REMEDIAL ACTION ALTERNATIVE COSTS
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

			OPINION OF PROBABLE COSTS				
			Capital Costs	Annual O&M Costs	Present Worth of O&M	Total Option Cost	TOTAL ALTERNATIVE COST
ALTERNATIVE 5 : Partial On-Site Excavation (Upper 10-ft), Partial On-Site ISS, Off-Site ISS, Near River Soil Excavation, and Full Sediment Excavation							
On-Site Shallow Soil	Full Excavation with Potential Reuse	SS-FR-Reuse	$ 1,533,169	$ -	$ -	$ 1,533,000	
Off-Site Shallow Soil	Excavation	SS-OS-Exc	$ 561,986	$ -	$ -	$ 562,000	
On-Site Soil	Partial ISS	S-PR-ISSR	$ 27,153,549	$ -	$ -	$ 27,154,000	
On-Site Soil	WIRM Excavation	S-PR-WIRM	$ 5,033,653	$ -	$ -	$ 5,034,000	
Off-Site Soil	ISS	S-OS-ISS	$ 4,423,001	$ -	$ -	$ 4,423,000	
On-Site Shallow Soil	Suntru Street Upgrades	SS-FR-Suntru	$ 146,649	$ -	$ -	$ 147,000	
On-Site Shallow Soil	Soil Cap	SS-FR-Cap	$ 2,935,934	$ 39,580	$ 491,149	$ 3,427,000	
Off-Site Shallow Soil	Soil Cap	SS-OS-Cap	$ 279,169	$ 1,714	$ 21,272	$ 300,000	
On-Site Sediment	Presumptive Sediment Remedy	Sed-Dredge	$ 5,190,679	$ -	$ -	$ 5,191,000	
Groundwater	Groundwater Monitoring	GW-MNA	$ -	$ 11,013	$ 136,658	$ 137,000	
Bedrock Groundwater	Groundwater Monitoring	BRGW-MNA	$ -	$ 10,508	$ 130,399	$ 130,000	
Groundwater	Engineering Controls (Passive NAPL Recovery)	GW-NAPL	$ 72,183	$ 22,881	$ 283,933	$ 356,000	
On-Site Soil	Institutional Control/Land Use Restriction	SS-PR-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
Groundwater	Institutional Control/Groundwater Use Restriction	GW-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
TOTAL			**$ 47,352,972**	**$ 88,697**	**$ 1,100,639**	**$ 48,454,000**	**$48,454,000**
ALTERNATIVE 6 : Partial On-Site Excavation (Upper 10-ft), Partial On-Site ISS, Off-Site Excavation, Near River Soil Excavation, and Full Sediment Excavation							
On-Site Shallow Soil	Full Excavation with Potential Reuse	SS-FR-Reuse	$ 1,533,169	$ -	$ -	$ 1,533,000	
Off-Site Shallow Soil	Excavation	SS-OS-Exc	$ 561,986	$ -	$ -	$ 562,000	
On-Site Soil	Partial ISS	S-PR-ISSR	$ 27,153,549	$ -	$ -	$ 27,154,000	
On-Site Soil	WIRM Excavation	S-PR-WIRM	$ 5,033,653	$ -	$ -	$ 5,034,000	
Off-Site Soil	Excavation	S-OS-Exc	$ 9,331,063	$ -	$ -	$ 9,331,000	
On-Site Shallow Soil	Suntru Street Upgrades	SS-FR-Suntru	$ 146,649	$ -	$ -	$ 147,000	
On-Site Shallow Soil	Soil Cap	SS-FR-Cap	$ 2,935,934	$ 39,580	$ 491,149	$ 3,427,000	
Off-Site Shallow Soil	Soil Cap	SS-OS-Cap	$ 279,169	$ 1,714	$ 21,272	$ 300,000	
On-Site Sediment	Presumptive Sediment Remedy	Sed-Dredge	$ 5,190,679	$ -	$ -	$ 5,191,000	
Groundwater	Groundwater Monitoring	GW-MNA	$ -	$ 11,013	$ 136,658	$ 137,000	
Bedrock Groundwater	Groundwater Monitoring	BRGW-MNA	$ -	$ 10,508	$ 130,399	$ 130,000	
Groundwater	Engineering Controls (Passive NAPL Recovery)	GW-NAPL	$ 72,183	$ 22,881	$ 283,933	$ 356,000	
On-Site Soil	Institutional Control/Land Use Restriction	SS-PR-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
Groundwater	Institutional Control/Groundwater Use Restriction	GW-LUR	$ 11,500	$ 1,500	$ 18,614	$ 30,000	
TOTAL			**$ 52,261,035**	**$ 88,697**	**$ 1,100,639**	**$ 53,362,000**	**$53,362,000**

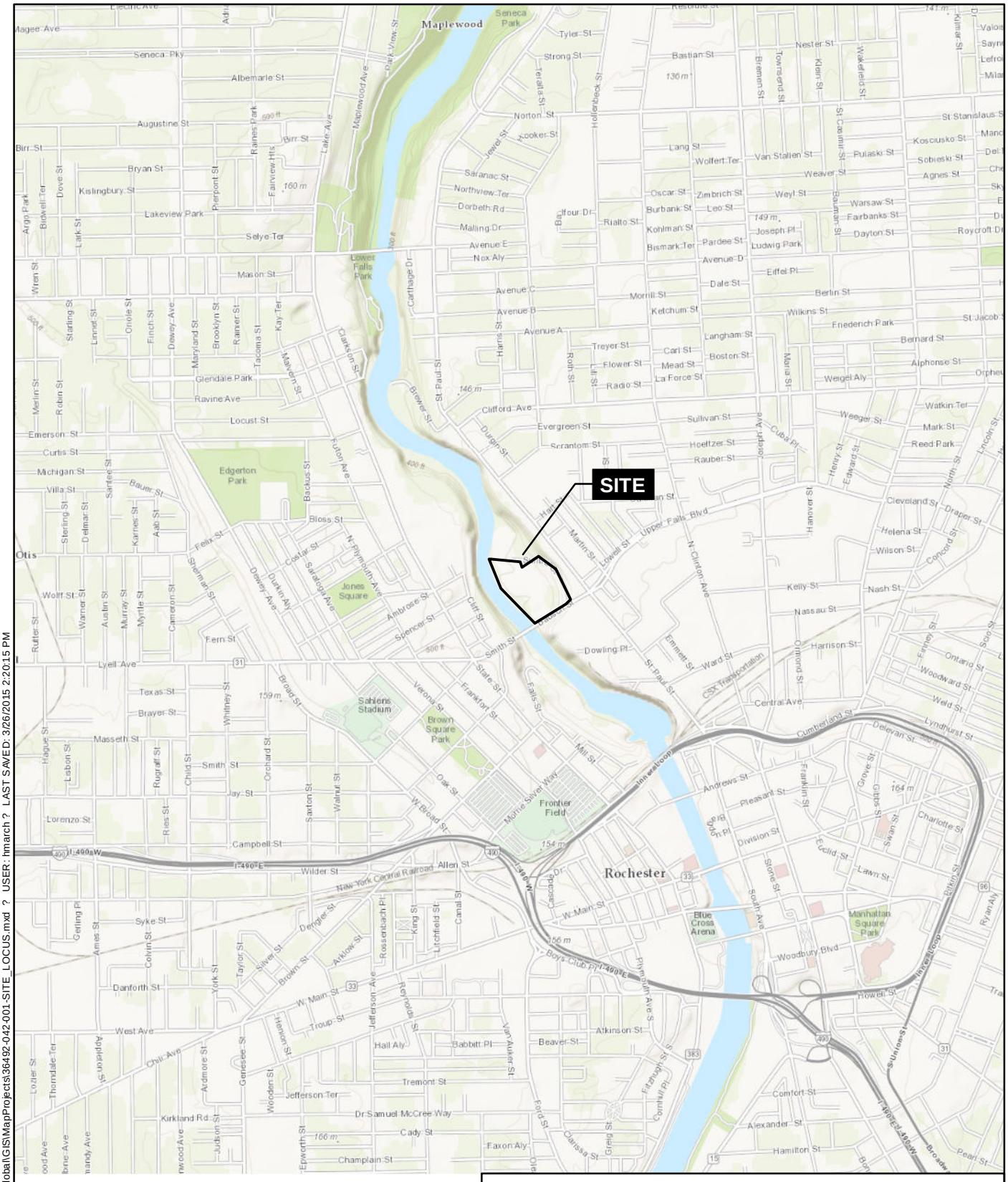
TABLE V
SUMMARY OF REMEDIAL ACTION ALTERNATIVE COMPARATIVE ANALYSIS
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

CRITERIA	ALTERNATIVE 1 No Further Action	ALTERNATIVE 2 Soil Capping, Near River Soil Excavation, Full Sediment Excavation, and Hydraulic Containment (Slurry Wall)	ALTERNATIVE 3 Full Excavation of On-Site and Off-Site Soil, Near River Soil Excavation, and Full Sediment Excavation	ALTERNATIVE 4 Partial Excavation of On-Site Soil, Full Excavation of Off-Site soil, Near River Soil Excavation, and Full Sediment Excavation
Overall Protectiveness of Human Health and the Environment	Least protective due to no active remediation.	More protective than Alternative 1 due to the removal of impacted sediment, near River soil, hydraulic containment, and soil capping. Hydraulic containment would effectively reduce migration of impacts in on-site subsurface soil. Does partially addresses subsurface soil impacts at Former MGP Site in near River soil only. Does not directly address subsurface soil impacts at Former MGP Site or B&L Property. Restricts overburden groundwater flow off-site through containment at the Former MGP Site but does not address source of impacts to overburden and bedrock groundwater. Groundwater impact not addressed. Alternatives 2 through 6 are equally protective with respect to sediment and near River soil.	Most protective due to removal of surface and subsurface soil and sediment. Addresses potential long-term risks to the environment posed by NAPL in Former MGP Site and B&L Property subsurface soil and sediment. Large volume of impacted soil generated for off-site treatment and disposal and large volume of clean backfill required will have negative impact on environment due to energy expended and disposal facility/landfill capacity consumed. Groundwater impacts addressed via source removal, MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery. Alternatives 2 through 6 are equally protective with respect to sediment and near River soil.	Similar to Alternative 3 for the B&L Property. More protective than Alternatives 1 and 2 due to the removal of surface soil, sediment, subsurface soil at the B&L Property, and subsurface soil in source areas at the Former MGP Site. Addresses potential direct contact exposure to impacted subsurface soil. Volume of impacted soil generated for off-site treatment and disposal, and volume of clean backfill required will have negative impact on environment due to energy expended and disposal facility/landfill capacity consumed. Groundwater impacts addressed via source removal, MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery. Alternatives 2 through 6 are equally protective with respect to sediment and near River soil.
Compliance with Standards, Criteria and Guidance (SCGs)	Impacts to surface and subsurface soil, sediment and groundwater would not be addressed except for limited groundwater monitoring and NAPL recovery.	Impacts to surface soil, near River subsurface soil, and sediment would be addressed. Impacts to subsurface soil and overburden/bedrock groundwater would not be directly addressed.	Addresses impacts to surface soil, subsurface soil, and sediment. Impacts to overburden/bedrock groundwater would be addressed via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery.	Impacts to surface soil, subsurface soil on B&L Property, subsurface soil at source areas on the Former MGP Site, and sediment would be addressed. Impacts in subsurface soil in non-source areas not directly addressed but meet substantial compliance with SCOs. Impacts to overburden/bedrock groundwater would be addressed via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery.
Long-term Effectiveness and Permanence	Institutional and engineering controls would limit exposure to surface soil and sediment.	Sediment removal would eliminate exposure to impacted media. Near River soil excavation would reduce exposure to impacted soil. Caps, fencing, and signage would limit exposure to surface soil but require long-term OM&M. Hydraulic containment and NAPL recovery would reduce mobility of impacts on-site. Would not address source of groundwater impacts and potential long-term risk to the environment posed by NAPL in subsurface soil.	Effective in the long term due to full soil and sediment removal. MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery would accelerate restoration of groundwater quality. Requires long-term NAPL recovery and groundwater monitoring during MNA.	Effective in the long-term due to source area soil removal, sediment removal, and soil cover. Requires long-term OM&M of soil cover, fencing, NAPL recovery, and groundwater monitoring during MNA.
Reduction of Toxicity, Mobility or Volume	Provides no reduction.	Provides minimal reduction by limiting erosion or wind transport of surface soil, eliminating impacted sediment and near River surface and subsurface soil, and reducing mobility of impacted groundwater.	Eliminates impacted soil and sediment, removes source of groundwater impacts, and reduces contaminant mass in groundwater via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery.	Eliminates impacted surface soil, MGP-impacted subsurface soil at the B&L Property, near River soil, and sediment. Significantly reduces volume of contaminated subsurface soil at Former MGP Site. Reduces toxicity and contaminant mass in impacted groundwater via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery. Partial excavation allows for targeted hot spot removal/chasing of impacted materials, if needed.
Short-term Effectiveness	Very little short term impacts.	Limited impacts to the community and site workers during surface soil excavation, cap installation, and slurry wall installation.	Impacts to community and site workers during soil excavation. Traffic, noise, odors and dust/fugitive emission generation will be greater in duration and magnitude than for other Alternatives. Large quantities of soil and backfill will generate significant traffic.	Impacts to community and site workers during soil excavation. Traffic, noise, odor and dust/fugitive emission generation will be greater in duration and magnitude than for Alternatives 1 and 2, but less than Alternative 3. Large quantities of soil and backfill will generate significant traffic, though less than Alternative 3.
Implementability	Readily implementable.	Surface soil excavation and slurry walls are implementable, but would have some logistical challenges due to subsurface structures/obstructions and presence of active gas main/regulator station. Impermeable caps readily implementable. Would require perimeter air monitoring. Upland work requires construction permitting. Sediment excavation implementable, but work in the River and permitting may be challenging. Engineering and institutional controls at the B&L Property will require approval from Site owner.	Excavation implementable, but presents logistical and technical challenges. Substantial and deep excavation will require lateral earth support, treatment/discharge of dewatering effluent, dust/fugitive emission/odor suppression, perimeter air monitoring, settlement monitoring, and work around the gas line/regulator station. Upland work requires construction permitting. Sediment excavation implementable, but work in the River and permitting may be challenging.	Excavation implementable, but presents logistical challenges. Substantial and deep excavation will require lateral earth support, treatment/discharge of dewatering effluent, dust/fugitive emission/odor suppression, perimeter air monitoring, settlement monitoring, and work around the gas line/regulator station. Land-based soil covers would be readily implementable. Upland work requires construction permitting. Sediment excavation implementable, but work in the River and permitting may be challenging.
Cost	Low capital cost. Low to moderate long term operation, maintenance and monitoring (OM&M) cost.	Moderate capital costs. Low to moderate long term OM&M costs.	Higher capital cost for soil excavation and disposal/reuse of large quantity of soil. Moderate cost for annual monitoring of MNA of impacted groundwater and NAPL recovery.	Moderate capital cost for soil excavation and disposal/reuse of source area soil. Moderate cost for annual monitoring of MNA of impacted groundwater and NAPL recovery.
Land Use	Limits the use of the Former MGP Site and B&L Property.	Limitation on future use of Former MGP Site and B&L Property due to institutional/engineering controls. B&L Property future use would be limited by and cap.	Potential for unrestricted future use of Former MGP Site. Groundwater use restricted until standards met. Continued commercial use of B&L Property.	Continued commercial use of B&L Property. Institutional controls would restrict future use of the Former MGP Site to preclude potential future exposure to impacted soil. Groundwater use restricted until standards met.
Community Acceptance	The Alternative will be presented to the public during the Proposed Remedial Action Plan (PRAP) public review and comment period. Comments will be collected to gauge the amount of community acceptance; Record of Decision (ROD) will be issued thereafter.	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.
Overall Summary	Not an effective or protective remedy. Used as a baseline for comparison with other alternatives.	Remedy would effectively prevent potential future exposures by direct contact and would reduce migration of contaminants from the Former MGP Site. Would require long-term OM&M to remain effective. Would not address NAPL at the Former MGP Site and B&L Property that is a source of impacts to groundwater and a potential long-term risk to the environment.	Most protective and effective long term, but high cost, high level of disruption to community during construction, and higher environmental impact due to significant volume of soil disposal and backfill	Protective and effective over the long term. More effective and provides a higher level of protection than Alternatives 1, 2, 5 and 6. Provides a comparable level of protection to on-site soils/sediments and groundwater remediation as Alternative 3, however with less cost and environmental impact. Would require long-term OM&M to remain effective. Would address NAPL at the Former MGP Site that is a source of impacts to groundwater and a potential long-term risk to the environment. But, a slightly higher environmental impact due to moderate volume of soil disposal and backfill.

TABLE V
SUMMARY OF REMEDIAL ACTION ALTERNATIVE COMPARATIVE ANALYSIS
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

CRITERIA	ALTERNATIVE 5 Partial On-Site Excavation (Upper 10-ft), Partial On-Site ISS, Off-Site ISS, Near River Soil Excavation, and Full Sediment Excavation	Alternative 6 Partial On-Site Excavation (Upper 10-ft), Partial On-Site ISS, Off-Site Excavation, Near River Soil Excavation, and Full Sediment Excavation
Overall Protectiveness of Human Health and the Environment	More protective than Alternatives 1 and 2 due to the removal and solidification of known impacted subsurface soil and installation of soil cover at the Former MGP Site and B&L Property. Similar level of protection as Alternative 4 because addresses potential direct contact exposure to impacted subsurface soil (on- and off-site) and sediment, and protects environment from long-term risks associated with the presence of NAPL in subsurface soil. Groundwater impacts addressed via source stabilization, MNA, and NAPL recovery. Alternatives 2 through 6 are equally protective with respect to sediment and near River soil.	Similar to Alternatives 3 and 4 for the B&L Property. More protective than Alternatives 1 and 2 due to the removal and solidification of known impacted subsurface soil and installation of soil cover at the Former MGP Site. Similar level of protection as Alternatives 4 and 5 because addresses potential direct contact exposure to impacted subsurface soil (on- and off-site) and sediment, and protects environment from long-term risks associated with the presence of NAPL in subsurface soil. Groundwater impacts addressed via source stabilization, source removal, MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery. Alternatives 2 through 6 are equally protective with respect to sediment and near River soil.
Compliance with Standards, Criteria and Guidance (SCGs)	Impacts to surface soil, subsurface soil on B&L Property, subsurface soil at source areas on the Former MGP Site, and sediment would be addressed. Impacts in subsurface soil in non-source areas not directly addressed but meet substantial compliance with SCOs. Impacts to overburden/bedrock groundwater would be addressed via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery.	Impacts to surface soil, subsurface soil on B&L Property, subsurface soil at source areas on the Former MGP Site, and sediment would be addressed. Impacts in subsurface soil in non-source areas not directly addressed but meet substantial compliance with SCOs. Impacts to overburden/bedrock groundwater would be addressed via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery.
Long-term Effectiveness and Permanence	Effective in the long term due to soil removal, soil solidification, and sediment removal. Requires institutional controls for land-based remedies (principally recording of ISS and soil cover locations) at Former MGP and B&L Property. Source of impacts to groundwater quality would be addressed with excavation and ISS, and groundwater quality would be restored over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery. Requires long-term OM&M of fencing, soil cover, NAPL recovery, and groundwater monitoring during MNA.	Effective in the long term due to soil removal, soil solidification, and sediment removal. Requires institutional controls for land-based remedies (principally recording of ISS and soil cover locations) at Former MGP. Source of impacts to groundwater quality would be addressed with excavation and ISS, and groundwater quality would be restored over time via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery. Requires long-term OM&M soil cover, NAPL recovery, and groundwater monitoring during MNA.
Reduction of Toxicity, Mobility or Volume	Eliminates impacted surface soil, near River soil, and sediment. Reduces toxicity and mobility of contaminants in subsurface soil at Former MGP Site and B&L Property. Reduces toxicity and contaminant mass in impacted groundwater via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery.	Eliminates impacted surface soil, MGP-impacted subsurface soil at the B&L Property, near River soil, and sediment. Reduces toxicity and mobility of contaminants in subsurface soil at Former MGP Site. Reduces toxicity and contaminant mass in impacted groundwater via MNA or a contingent technology outlined in the remedial design if MNA is not totally effective, and NAPL recovery.
Short-term Effectiveness	Impacts to community and site workers during ISS construction and soil excavation. Traffic, noise, odor and dust/fugitive emission generation would be lower in magnitude than Alternatives 3 and 4, but greater than Alternative 2.	Impacts to community and site workers during ISS construction and deep soil excavation. Traffic, noise, odor and dust/fugitive emission generation would be lower in magnitude than Alternatives 3 and 4, but greater than Alternatives 2 and 5.
Implementability	Implementable, but ISS would have some logistical challenges due to subsurface structures/obstructions, dust/fugitive emission/odor generation, perimeter air monitoring, and settlement monitoring. Work around the gas line/regulator station would be limited. Requires bench scale testing prior to remediation construction. Land-based soil covers would be readily implementable. Upland work requires construction permitting. Sediment excavation implementable, but work in the River and permitting may be challenging. Institutional controls at the B&L Property will require approval from Site owner.	Implementable, but ISS would have some logistical challenges due to subsurface structures/obstructions, dust/fugitive emission/odor generation, perimeter air monitoring, and settlement monitoring. Work around the gas line/regulator station would be limited. Requires bench scale testing prior to remediation construction. Land-based soil covers would be readily implementable. Upland work requires construction permitting. Sediment excavation implementable, but work in the River and permitting may be challenging.
Cost	Moderate capital cost for ISS and soil excavation & disposal/reuse of source area soil. Moderate cost for annual monitoring of MNA of impacted groundwater and NAPL recovery.	Moderate capital cost for ISS and soil excavation & disposal/reuse of source area soil. Moderate cost for annual monitoring of MNA of impacted groundwater and NAPL recovery.
Land Use	Continued commercial use of B&L Property with limited controls regarding solidified soil. Institutional controls would restrict future use of the Former MGP Site to preclude potential future exposure to impacted soil and solidified soil. Groundwater use restricted until standards met.	Continued commercial use of B&L Property. Institutional controls would restrict future use of the Former MGP Site to preclude potential future exposure to impacted soil and solidified soil. Groundwater use restricted until standards met.
Community Acceptance	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.	The Alternative will be presented to the public during the PRAP public review and comment period. Comments will be collected to gauge the amount of community acceptance; ROD will be issued thereafter.
Overall Summary	Remedy would effectively prevent potential future exposures by direct contact and would reduce migration of contaminants from the Former MGP Site. Would require long-term OM&M to remain effective. Would address NAPL at the Former MGP Site that is a source of impacts to groundwater and a potential long-term risk to the environment.	Remedy would effectively prevent potential future exposures by direct contact and would reduce migration of contaminants from the Former MGP Site. As effective as Alternatives 3 and 4 at the B&L Property. Would require long-term OM&M to remain effective. Would address NAPL at the Former MGP Site that is a source of impacts to groundwater and a potential long-term risk to the environment.

FIGURES



HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

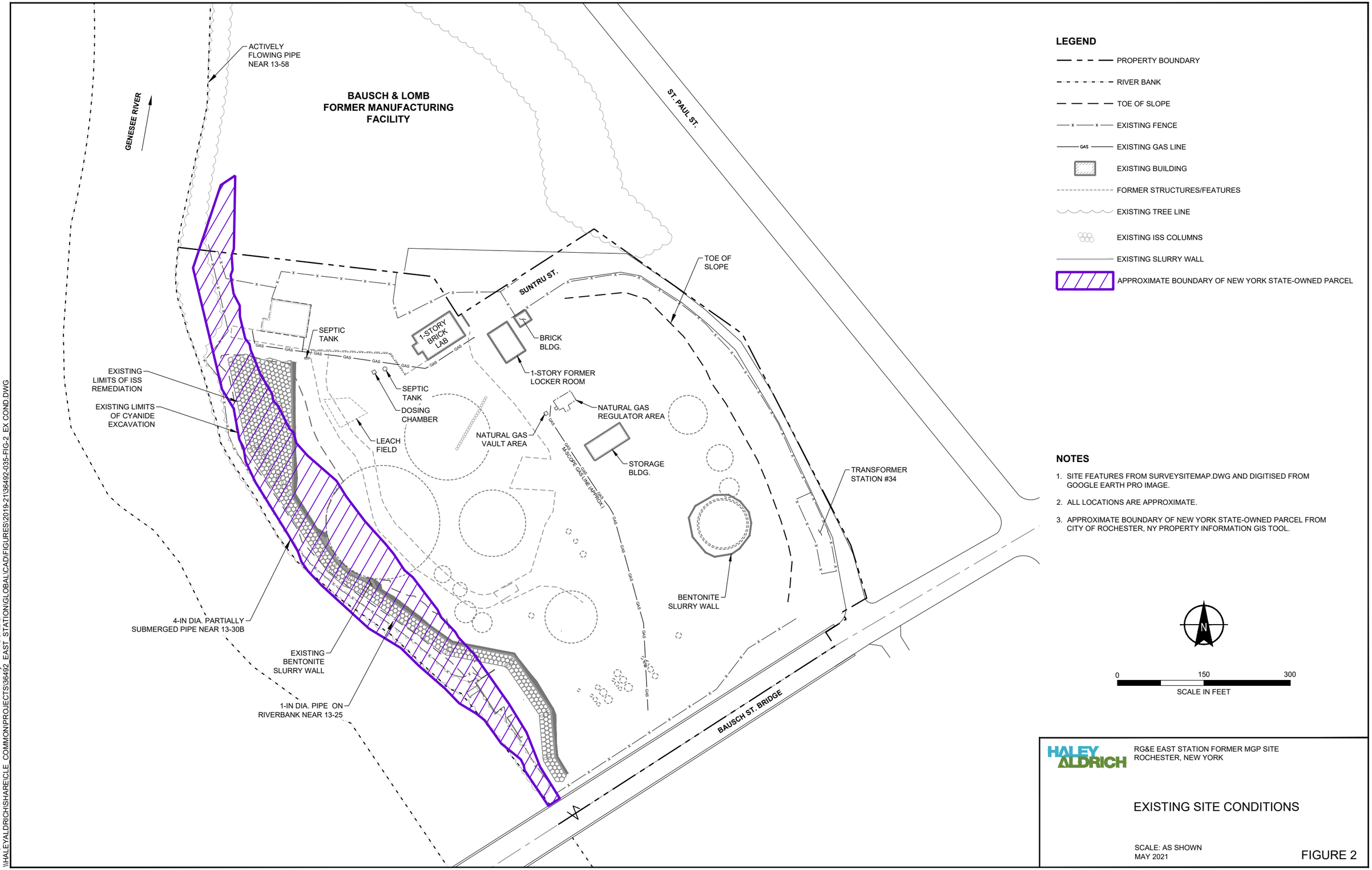
PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2,000 FT
MAY 2021

FIGURE 1

MAP SOURCE: ESRI

GIS FILE PATH: G:\36492_East_Station\Global\GIS\MapProjects\36492-042-001-SITE_LOCUS.mxd ? USER: hmarch ? LAST SAVED: 3/26/2015 2:20:15 PM



LEGEND

- PROPERTY BOUNDARY
- RIVER BANK
- TOE OF SLOPE
- EXISTING FENCE
- EXISTING GAS LINE
- EXISTING BUILDING
- FORMER STRUCTURES/FEATURES
- EXISTING TREE LINE
- EXISTING ISS COLUMNS
- EXISTING SLURRY WALL
- APPROXIMATE BOUNDARY OF NEW YORK STATE-OWNED PARCEL

NOTES

1. SITE FEATURES FROM SURVEYSITEMAP.DWG AND DIGITISED FROM GOOGLE EARTH PRO IMAGE.
2. ALL LOCATIONS ARE APPROXIMATE.
3. APPROXIMATE BOUNDARY OF NEW YORK STATE-OWNED PARCEL FROM CITY OF ROCHESTER, NY PROPERTY INFORMATION GIS TOOL.

N

0 150 300

SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

EXISTING SITE CONDITIONS

SCALE: AS SHOWN
MAY 2021

FIGURE 2

VARI, KATALIN Printed: 4/26/2021 12:13 PM Layout: FIGURE 2
\\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBAL\CAD\FIGURES\2019-21\36492-035-FIG-2_EX COND.DWG

BAUSCH & LOMB FORMER MANUFACTURING FACILITY

BAUSCH & LOMB BUILDING FOUNDATION
1-STORY BRICK BLDG.
1-STORY BRICK LAB
SUNTRU ST.
Dumper
BRICK BLDG.
1-STORY FORMER LOCKER ROOM
TOE OF SLOPE
ST. PAUL ST.
GAS LINE (APPROX.)
SEPTIC TANK
SEPTIC TANK
DOSING CHAMBER
GRAVEL
Gravel
LEACH FIELD
Drip House
2,000,000 C.F. Gas Holder #9
Stand of Catalpa
Drip Houses
Drip House
Drip House
12" Corrugated
5,000,000 cu. ft. GAS HOLDER #1N
1,000,000 cu. ft. Gas Holder #8
RIP RAP
GABIONS
STONE DRIVEWAY
M-SCOPE GAS LINE (APPROX.)
Oxide Purifier Beds
NATURAL GAS VAULT AREA
Oxide Purifier Beds
Purifier Tanks
Scrubbers
No. 39 Oil Tank
BOTTOM OF BANK
STORAGE BUILDING
Lab
Tar Precipitator
No. 38 Oil Tank
Ammonia Liquor Storage
Purifier House
Dehydrating Tar Tanks
Ammonia Tanks
Cyanogen Tower
Former Tar Well
TRANSFORMER STATION #34
Machine Shop
Ammonia Room
Lab
Retort House
Water Gas Plant
Light Oil/ Ammonia Scrubbers
Waste Oil Tanks
Oil Pump House
Drip Pit
Gasoline Tank
Naphtha Tank
Drip Pit
Light Oil
400,000 cu. ft. Gas Holder #7
Coal Bunker
Condenser
Generator House
Waste Heat Boilers
Condenser
Tanks
Surge Tanks
Condenser
Catalyst Chamber
Wash Box
Cndnsr
Waste Heat Boilers
Combustion Chambers
Cooling Coils
Light Oil Plant
Oil/Naphtha Tanks
RIP RAP
GABIONS
Percolator House
BUILDING FOUNDATIONS
Oil/Naphtha Tanks
BAUSCH ST. BRIDGE
GENESEE RIVER

LEGEND

- PROPERTY BOUNDARY
- RIVER BANK
- TOE OF SLOPE
- EXISTING FENCE
- EXISTING GAS LINE
- EXISTING BUILDING
- FORMER STRUCTURES/FEATURES
- EXISTING TREE LINE
- EXISTING ISS COLUMNS

NOTES

1. SITE FEATURES FROM SURVEYSITEMAP.DWG AND DIGITISED FROM GOOGLE EARTH PRO IMAGE.
2. ALL LOCATIONS ARE APPROXIMATE.

N

0 120 240
SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

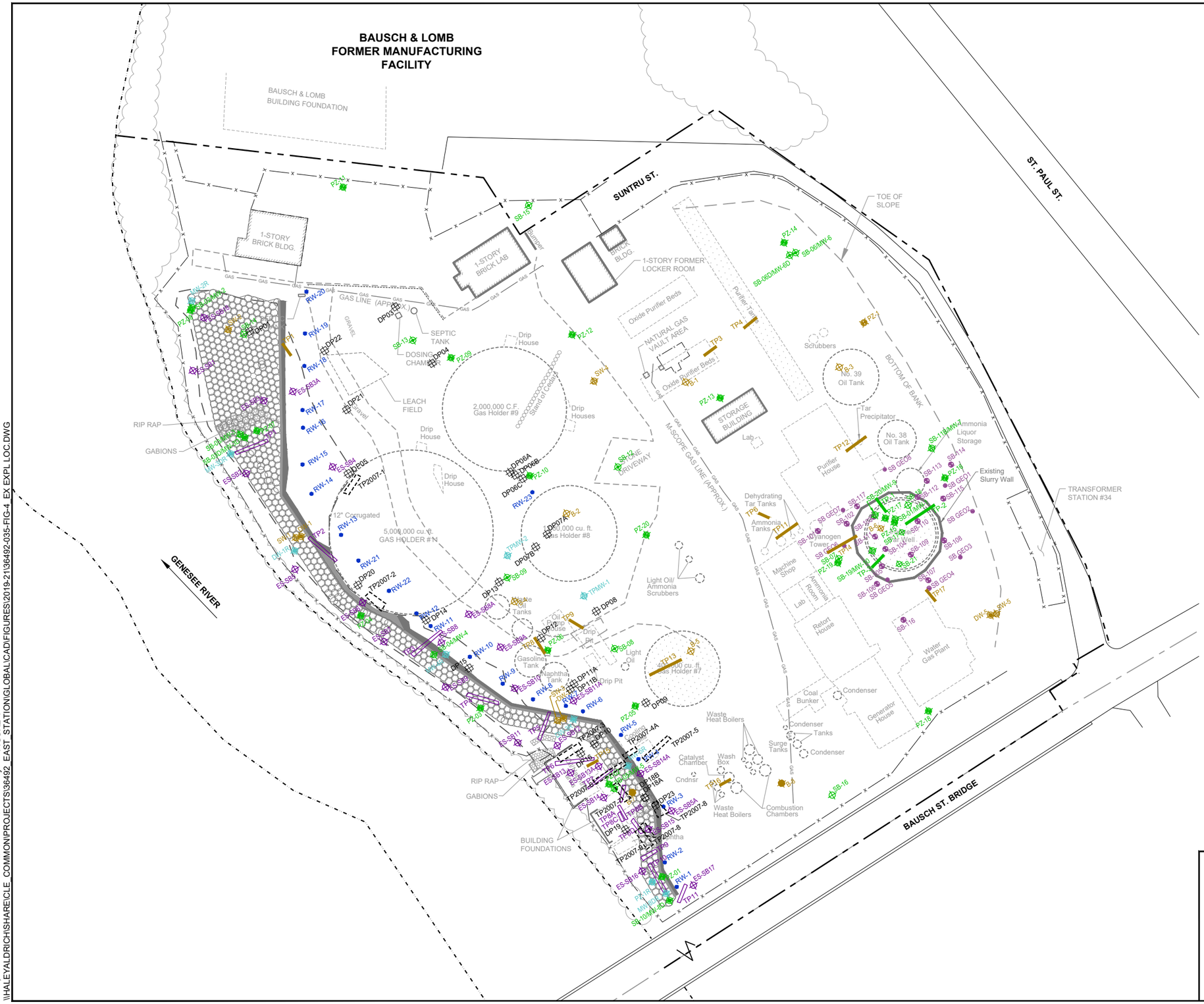
HISTORIC SITE CONDITIONS

SCALE: AS SHOWN
MAY 2021

FIGURE 3

VARI, KATALIN Printed: 4/26/2021 12:13 PM Layout: FIGURE 3
\\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBAL\CADFIGURES\2019-2\136492-035-FIG-3_HIST CONDITIONS.DWG

BAUSCH & LOMB FORMER MANUFACTURING FACILITY



LEGEND

1993 SITE INVESTIGATION REPORT, ATLANTIC ENVIRONMENTAL SERVICES, INC.

- B-6 — B-SERIES, SOIL BORINGS
- SW-2 — SW-SERIES, SOIL BORING/MONITORING WELLS
- DW-1 — DW-SERIES, BEDROCK BORING/MONITORING WELLS
- PZ-1 — PZ-1, OVERBURDEN PIEZOMETERS
- TP1 — TP-#, TEST PITS

1998/2000 FOCUSED REMEDIAL INVESTIGATION, ISH, INC. AND META ENVIRONMENTAL, INC.

- SB-13 — SB-SERIES, SOIL BORINGS
- SB-14 — SB-SERIES, BEDROCK BORINGS
- SB-06/MW-6 — SB- AND MW-SERIES, SOIL BORING/MONITORING WELLS
- SB-06D/MW-6D — SB-##D AND MW-SERIES, BEDROCK BORING/MONITORING WELLS
- TP-1 — TP-1 THROUGH TP-3, TEST PITS (TAR WELL AREA)
- PZ-13 — PZ-01 THROUGH PZ-20, DRIVE POINT PIEZOMETERS

2004 IRM PHASE I REMEDIAL DESIGN INVESTIGATION, ISH, INC.

- ES-SB8 — ES-SB#-SERIES, SOIL BORINGS
- TP8C — TP#-SERIES, TEST PITS (ALONG RIVERBANK),

2004 PRE-REMEDIATION CHARACTERIZATION OF TAR WELL/GAS HOLDER AREA, ISH, INC. AND META ENVIRONMENTAL, INC.

- SB-106 — SB101 THROUGH SB116, ES 117, SOIL BORINGS
- SB GEO4 — SB GEO-#, SOIL BORINGS

2007 REMEDIATION DESIGN INVESTIGATIONS, ISH, INC. AND META ENVIRONMENTAL, INC.

- DP01 — DB-SERIES, SOIL BORINGS
- TP2007-1 — TP2007-SERIES, TEST PITS

2009 PHASE IV IRM IMPLEMENTATION REPORT, ISH, INC.

- TPMW-1 / PZ-1R / MW-2R / MW-3DR — REPLACEMENT WELLS (OVERBURDEN - MW-2R, -4R, PZ-01R, TPMW-1, TPMW-2; AND BEDROCK - MW-3DR,DW-1R, DW-3R, MW-5R, MW-8R)
- EXISTING ISS COLUMNS
- EXISTING SLURRY WALL

NOTES

1. SITE FEATURES FROM SURVEYSITEMAP.DWG AND DIGITISED FROM GOOGLE EARTH PRO IMAGE.
2. ALL LOCATIONS ARE APPROXIMATE.

N

0 120 240

SCALE IN FEET

HALEY ALDRICH

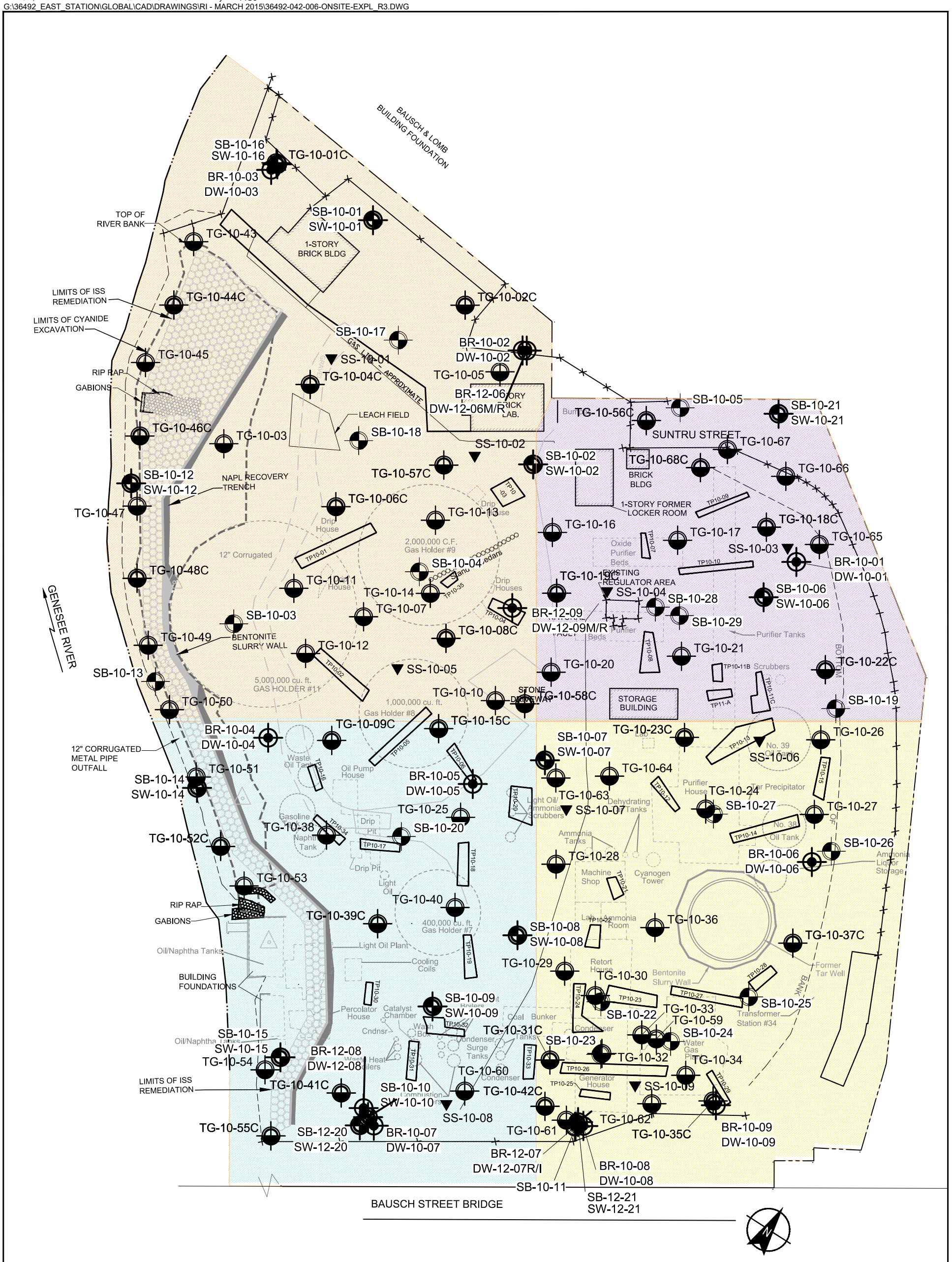
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

SUMMARY OF PREVIOUS EXPLORATION LOCATIONS AND IRMs

SCALE: AS SHOWN
MAY 2021

FIGURE 4

VARI, KATALIN Printed: 4/26/2021 12:13 PM Layout: FIGURE 4
I:\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\136492_EAST_STATION\GLOBAL\CAD\FIGURES\2019-2\136492-035-FIG-4_EX EXPL LOC.DWG



LEGEND

- SOIL BORING LOCATION
  SB = SOIL BORING
- SOIL BORING/OVERBURDEN MONITORING WELL LOCATION
  SW = SHALLOW (OVERBURDEN) WELL
- BEDROCK MONITORING WELL LOCATION
  BR = BEDROCK CORING, DW = DEEP (BEDROCK) WELL
- TARGOST LOCATION
  TG = TARGOST
- TARGOST WITH CONFIRMATION SOIL BORING
  TG-10-XXC
- TEST PIT
- SUFACE SOIL LOCATION

NOTES

1. NORTHING AND EASTING COORDINATES HEREIN ARE BASED ON SURVEYSITEMAP.DWG. SITE EXPLORATIONS AND HISTORICAL STRUCTURES FROM SURVEYSITEMAP.DWG AND MULTIPLE OTHER SOURCES.

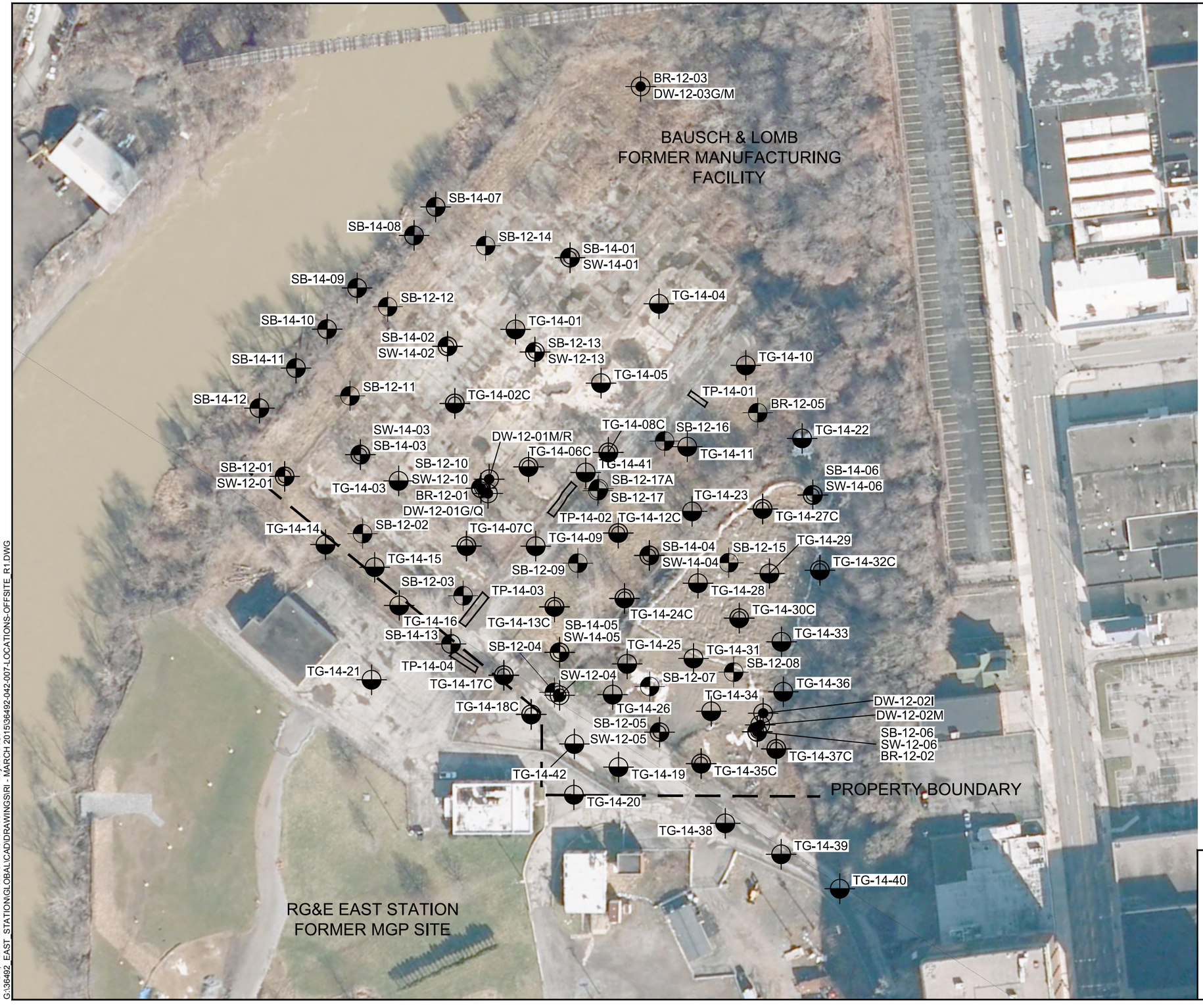
HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

ON-SITE REMEDIAL INVESTIGATION EXPLORATION LOCATIONS

SCALE: AS SHOWN
MAY 2021

FIGURE 5



LEGEND

- SOIL BORING LOCATION
  SB = SOIL BORING
- SOIL BORING/OVERBURDEN MONITORING WELL LOCATION
  SW = SHALLOW (OVERBURDEN) WELL
- BEDROCK MONITORING WELL LOCATION
  BR = BEDROCK CORING, DW = DEEP (BEDROCK) WELL
- TARGOST LOCATION
  TG = TARGOST
- TARGOST WITH CONFIRMATION SOIL BORING
  TG-14-XXC
- TEST PIT

NOTES

1. AERIAL PHOTE DATED APRIL 2009 OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE OPERATED BY THE STATE OF NEW YORK.
2. SOIL BORINGS, MONITORING WELLS, TEST PITS, AND TARGOST LOCATIONS ON BAUSCH & LOMB PROPERTY WERE SURVEYED BY HOFFMAN LAND SURVEYING & GEOMATICS ON 25 NOVEMBER 2013 AND 7 AUGUST 2014.

0 100 200
SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

OFF-SITE REMEDIAL INVESTIGATION EXPLORATION LOCATIONS

SCALE: AS SHOWN
MAY 2021

FIGURE 6

MARCH, HEATHER Printed:6/17/2015 2:08 PM Layout: FIG7
G:\36492_EAST_STATION\GLOBAL\CADD\RAWINGS\RI - MARCH 2015\36492-042-007-LOCATIONS-OFFSITE_R1.DWG

NOTES

1. SEDIMENT INVESTIGATION LOCATIONS WERE COMPLETED IN SEPTEMBER 2013 BY HALEY & ALDRICH OF NEW YORK
2. AERIAL PHOTO DATED APRIL 2009 OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE.
3. AREAS 1 THROUGH 4 DEPICTED ON THE MAP SHOW AREAS OF POTENTIAL MGP-RELATED IMPACTS BASED ON 2008 AND 2009 INVESTIGATIONS BY OTHERS.
4. SEDIMENT PROBE AND CORE LOCATION NAMES HAVE BEEN ABBREVIATED. FINAL LOCATION NAMES INCLUDE "SE-" AT THE BEGINNING OF EACH NAME.

0 150 300
SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

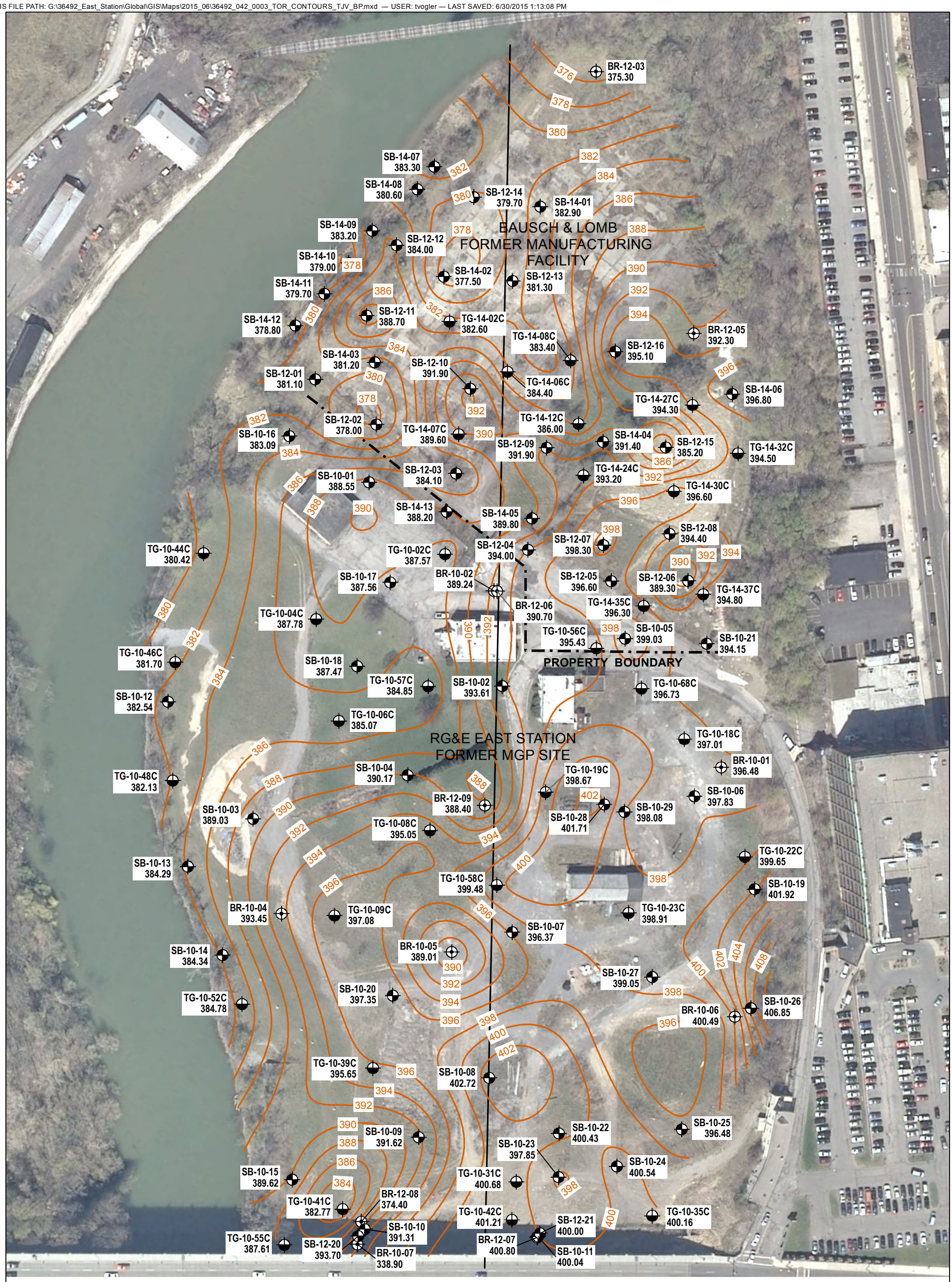
SEDIMENT PROBE AND VIBRACORE LOCATIONS - 2013

MAY 2021

FIGURE 7

GIS FILE PATH: G:\36492_East_Station\Global\GIS\2015-0324-HANY-Sediment Completed Locations-F.mxd — USER: dca — LAST SAVED: 3/24/2015 4:04:58 PM

GIS FILE PATH: G:\36492_East_Station\Global\GIS\Maps\2015_06\36492_042_0003_TOR_CONTOURS_TJV_BP.mxd — USER: tvogler — LAST SAVED: 6/30/2015 1:13:08 PM



LEGEND

- SOIL BORING LOCATION
- TARGOST LOCATION
- BEDROCK CORING LOCATION
- TOP OF BEDROCK ELEVATION CONTOUR LINE
- BEDROCK CROSS-SECTION A - A'
- PROPERTY BOUNDARY

NOTES

1. AERIAL PHOTO DATED APRIL 2012 OBTAINED FROM THE NEW YORK STATE GIS CLEARING-HOUSE OPERATED BY THE STATE OF NEW YORK.

2. CONTOURS CREATED WITH ARCGIS SPATIAL ANALYST SPLINE METHOD. ACTUAL ELEVATIONS BETWEEN LOCATIONS MAY VARY.

0 120 240
SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

TOP OF BEDROCK CONTOURS

MAY 2021

FIGURE 8

NOTES

1. CONFIRMATORY BORING, TEST PIT, AND SOIL BORING RANKING BASED ON VISUAL FIELD OBSERVATIONS ONLY.

2. AERIAL PHOTO DATED APRIL 2009 OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE OPERATED BY THE STATE OF NEW YORK.

SOIL BORING OBSERVATIONS

- MINOR MGP IMPACTS OBSERVED
- SHEEN OBSERVED
- MINOR TLM/OLM OBSERVED
- TLM/OLM OBSERVED

TEST PIT OBSERVATIONS

- MINOR MGP IMPACTS OBSERVED
- SHEEN OBSERVED
- MINOR TLM/OLM OBSERVED
- TLM/OLM OBSERVED

MAXIMUM TarGOST RESPONSE

- BACKGROUND (LESS THAN 20%)
- 20% TO 50%
- 50% TO 100%
- GREATER THAN 100%

TarGOST CONFIRMATORY BORING OBSERVATIONS

- MINOR MGP IMPACTS OBSERVED
- SHEEN OBSERVED
- MINOR TLM/OLM OBSERVED
- TLM/OLM OBSERVED

N

0 150 300

SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

TARGOST, SOIL BORING, AND TEST PIT OBSERVATIONS

MAY 2021

FIGURE 9

GIS FILE PATH: G:\36492_East_Station\GlobalGIS\2015-0327-HANY-NAPL Distribution L FULL.mxd — USER: dca — LAST SAVED: 3/27/2015 11:11:10 AM

NOTE:
1. SEDIMENT OBSERVATIONS WERE COMPLETED IN 2013 BY HALEY & ALDRICH OF NEW YORK.
2. AERIAL PHOTO DATED APRIL 2009 OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE.

0 150 300
SCALE IN FEET

HALEY ALDRICH

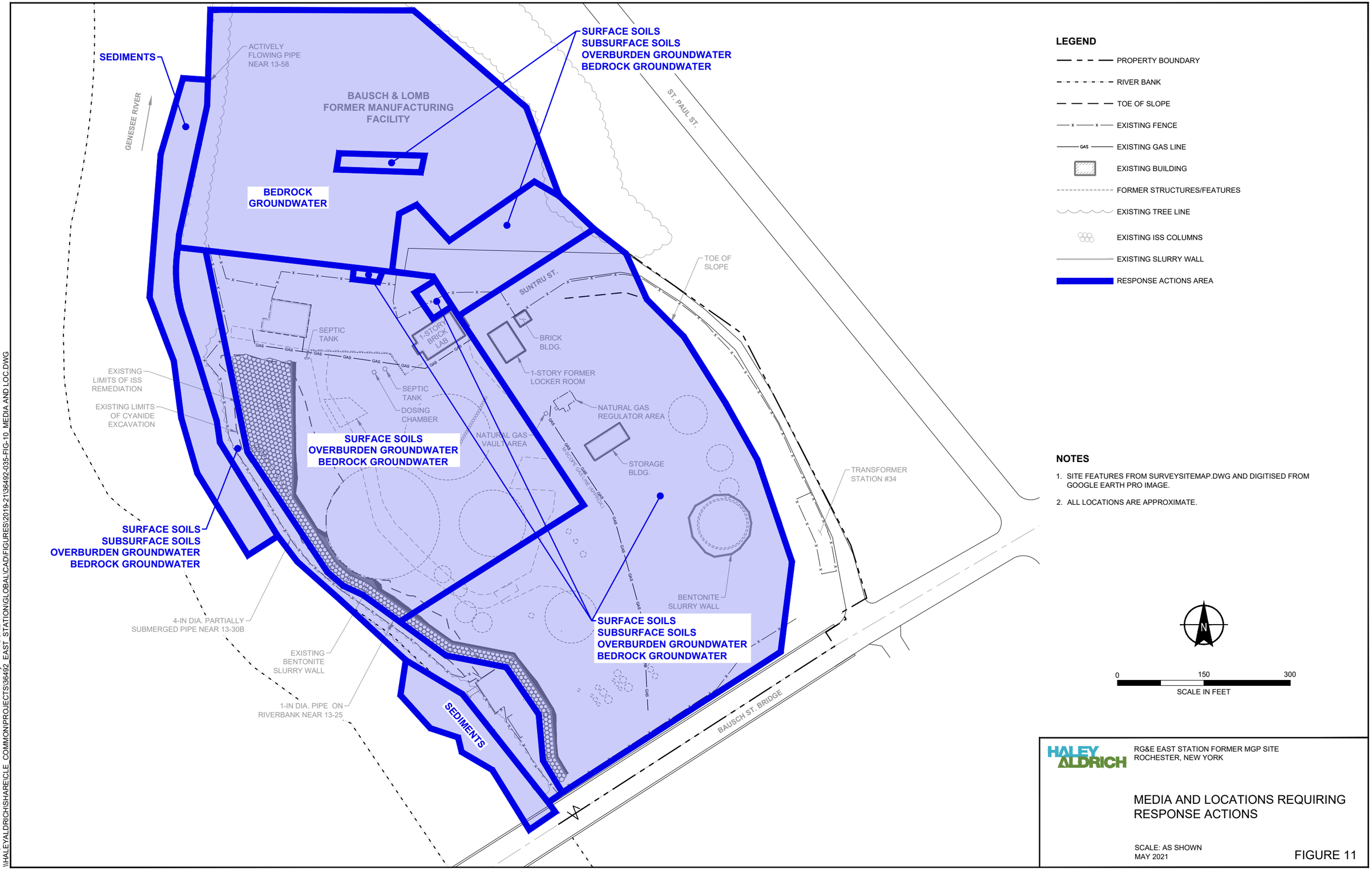
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

SEDIMENT NAPL/SHEEN OBSERVATIONS - 2013

MAY 2021

FIGURE 10

GIS FILE PATH: G:\36492_East_Station\Global\GIS\2015-0324-HANY-Sediment Observations 2013-F.mxd — USER: dca — LAST SAVED: 3/24/2015 2:52:59 PM



LEGEND

- PROPERTY BOUNDARY
- RIVER BANK
- TOE OF SLOPE
- EXISTING FENCE
- EXISTING GAS LINE
- EXISTING BUILDING
- FORMER STRUCTURES/FEATURES
- EXISTING TREE LINE
- EXISTING ISS COLUMNS
- EXISTING SLURRY WALL
- RESPONSE ACTIONS AREA

NOTES

1. SITE FEATURES FROM SURVEYSITEMAP.DWG AND DIGITISED FROM GOOGLE EARTH PRO IMAGE.
2. ALL LOCATIONS ARE APPROXIMATE.

N

0 150 300

SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

MEDIA AND LOCATIONS REQUIRING RESPONSE ACTIONS

SCALE: AS SHOWN
MAY 2021

FIGURE 11

VARI, KATALIN Printed: 4/26/2021 12:38 PM Layout: FIGURE 11
\\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBAL\CAD\FIGURES\2019-21\36492-035-FIG-10_MEDIA AND LOC.DWG

NOTES

1. SITE FEATURES FROM SURVEYSITEMAP.DWG AND DIGITISED FROM GOOGLE EARTH PRO IMAGE.
2. ALL LOCATIONS ARE APPROXIMATE.
3. REMEDY TO EXTEND TO TOE OF SLOPE AT WESTERN PROPERTY BOUNDARY.

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

ON-SITE REMEDY
SLURRY WALL AND ASPHALT CAP
(ALTERNATIVE 2)

SCALE: AS SHOWN
MAY 2021

FIGURE 12

BAUSCH & LOMB
FORMER MANUFACTURING
FACILITY

RG&E EAST STATION
FORMER MGP SITE

ST. PAUL ST.

SUNTRU ST.

GENESEE RIVER

BR-12-03
DW-12-03G/M
SB-14-01
SW-14-01
TG-14-04
TG-14-10
SB-14-07
SB-12-14
BR-12-05
TG-14-22
TP-14-01
SB-14-08
SB-14-06
SW-14-06
TG-14-01
SB-12-13
SW-12-13
TG-14-05
SB-12-16
TG-14-11
TG-14-27C
TG-14-32C
SB-14-09
SB-12-12
SB-14-02
SW-14-02
TG-14-08
TG-14-08C
TG-14-23
TG-14-29
SB-12-15
TG-14-41
TG-14-02C
TG-14-06
TG-14-06C
SB-12-17A
SB-12-17
SB-14-10
4,248 SF
TP-14-02
DW-12-01M/R
SB-14-04
SW-14-04
TG-14-28
TG-14-33
TG-14-12C
TG-14-30C
SB-14-11
SB-12-11
SW-12-10
DW-12-01G/Q
BR-12-01
SB-12-10
SB-12-09
SB-12-08
TG-14-36
TG-14-09
TG-14-31
TG-14-24C
SW-14-03
SB-14-03
DW-12-02I
DW-12-02M
SB-14-12
TG-14-03
TG-14-07C
TG-14-25
TG-14-34
TG-14-37
TG-14-37C
TG-14-13C
SB-14-05
SW-14-05
SB-12-07
SB-12-06
SW-12-06
BR-12-02
39,172 SF
SB-12-01
SW-12-01
SB-12-02
SB-12-03
TP-14-03
TG-14-26
TG-14-35C
TG-14-35
TG-14-15
SB-12-04
SB-12-05
SW-12-05
TG-14-17C
TG-14-17
TG-14-39
TG-14-40
TG-14-14
SW-12-04
TG-14-19
TG-14-38
TG-14-16
SB-14-13
TP-14-04
TG-14-18
TG-14-18C
TG-14-42
TG-14-20
TG-14-21

LEGEND

- PROPERTY BOUNDARY
- SOIL BORING LOCATION
  SB = SOIL BORING
- SOIL BORING/OVERBURDEN MONITORING WELL LOCATION
  SW = SHALLOW (OVERBURDEN) WELL
- BEDROCK MONITORING WELL LOCATION
  BR = BEDROCK CORING, DW = DEEP (BEDROCK) WELL
- TARGOST LOCATION
  TG = TARGOST
- TARGOST WITH CONFIRMATION SOIL BORING
  TG-14-XXC
- TEST PIT
- OFF-SITE CAP

NOTES

1. AERIAL PHOTO DATED APRIL 2009 OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE OPERATED BY THE STATE OF NEW YORK.
2. SOIL BORINGS, MONITORING WELLS, TEST PITS, AND TARGOST LOCATIONS ON BAUSCH & LOMB PROPERTY WERE SURVEYED BY HOFFMAN LAND SURVEYING & GEOMATICS ON 25 NOVEMBER 2013 AND 7 AUGUST 2014.

N

0 100 200
SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

OFF-SITE REMEDY
ASPHALT CAP
(ALTERNATIVE 2)

SCALE: AS SHOWN
MAY 2021

FIGURE 13

VARI, KATALIN Printed: 4/26/2021 12:38 PM Layout: FIGURE 13
\\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBAL\CAD\FIGURES\2019-21\36492-035-FIGS-13-16-18_OFF SITE_REMED.DWG

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

SEDIMENT REMEDY
FULL EXCAVATION
(ALL ALTERNATIVES)

SCALE: AS SHOWN
MAY 2021

FIGURE 14

VARI, KATALIN Printed: 4/26/2021 12:38 PM Layout: FIGURE 14
\\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBAL\CAD\FIGURES\2019-21\36492-035-FIGS-14_EXCAV.DWG

HALEY ALDRICH

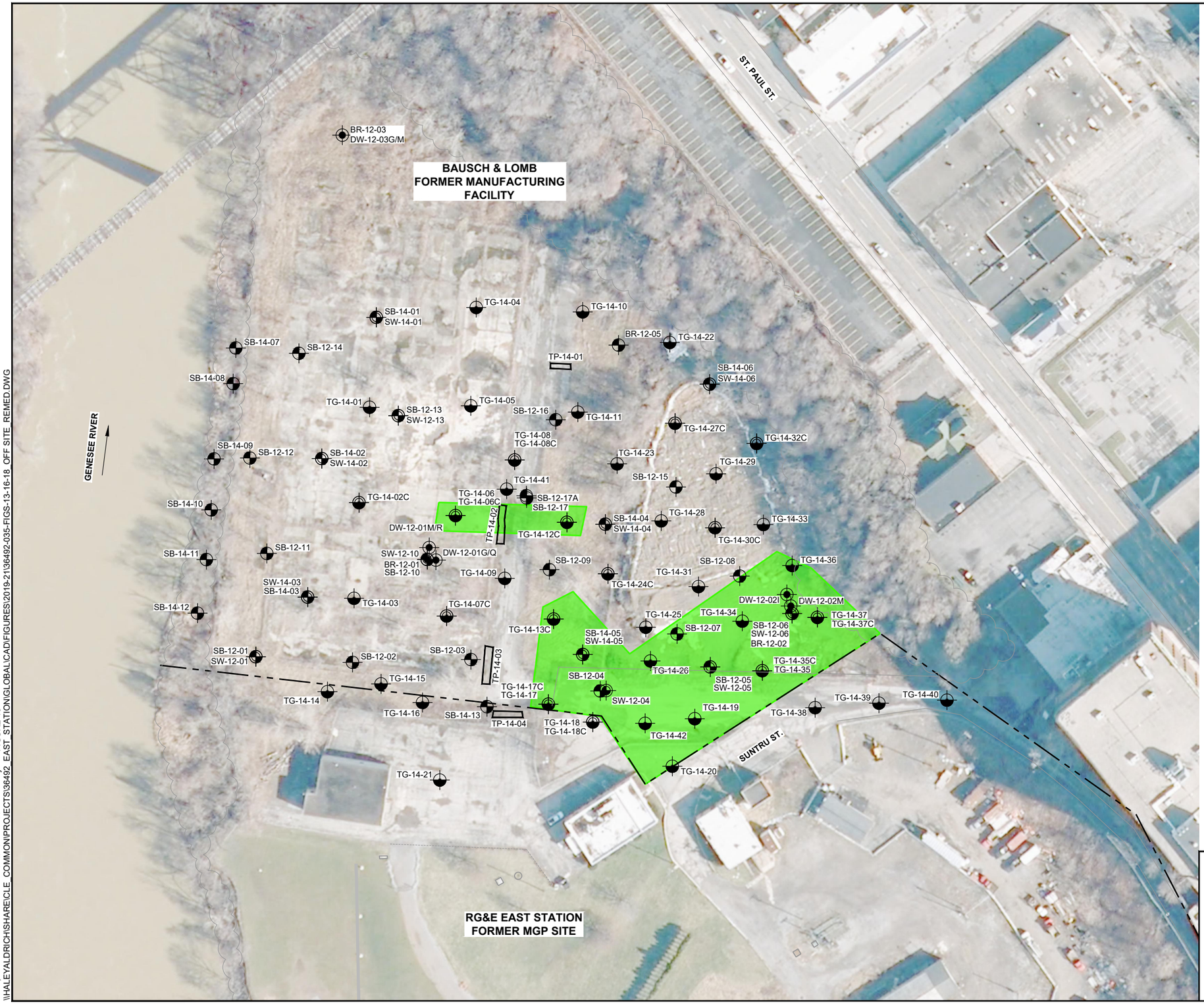
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

ON-SITE REMEDY
FULL EXCAVATION
(ALTERNATIVE 3)

SCALE: AS SHOWN
MAY 2021

FIGURE 15

VARI, KATALIN Printed:4/26/2021 12:38 PM Layout: FIGURE 15
\\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBAL\CAD\FIGURES\2019-21\36492-035-FIGS-12-15-17-19_ON SITE_REMED.DWG



LEGEND

- PROPERTY BOUNDARY
- SOIL BORING LOCATION
  SB = SOIL BORING
- SOIL BORING/OVERBURDEN MONITORING WELL LOCATION
  SW = SHALLOW (OVERBURDEN) WELL
- BEDROCK MONITORING WELL LOCATION
  BR = BEDROCK CORING, DW = DEEP (BEDROCK) WELL
- TARGOST LOCATION
  TG = TARGOST
- TARGOST WITH CONFIRMATION SOIL BORING
  TG-14-XXC
- TEST PIT
- OFF-SITE EXCAVATION

NOTES

1. AERIAL PHOTO DATED APRIL 2009 OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE OPERATED BY THE STATE OF NEW YORK.
2. SOIL BORINGS, MONITORING WELLS, TEST PITS, AND TARGOST LOCATIONS ON BAUSCH & LOMB PROPERTY WERE SURVEYED BY HOFFMAN LAND SURVEYING & GEOMATICS ON 25 NOVEMBER 2013 AND 7 AUGUST 2014.

N

0 100 200
SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

OFF-SITE REMEDY EXCAVATION (ALTERNATIVES 3, 4 & 6)

SCALE: AS SHOWN
MAY 2021

FIGURE 16

LEGEND

- PROPERTY BOUNDARY
- RIVER BANK
- TOE OF SLOPE
- EXISTING FENCE
- EXISTING GAS LINE
- EXISTING BUILDING
- FORMER STRUCTURES/FEATURES
- EXISTING TREE LINE
- EXISTING ISS COLUMNS
- EXISTING SLURRY WALL
- EXCAVATION
- BOUNDARY OF SOIL COVER

NOTES

1. SITE FEATURES FROM SURVEYSITEMAP.DWG AND DIGITISED FROM GOOGLE EARTH PRO IMAGE.
2. ALL LOCATIONS ARE APPROXIMATE.
3. REMEDY TO EXTEND TO TOE OF SLOPE AT WESTERN PROPERTY BOUNDARY.

N

0 150 300

SCALE IN FEET

HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

ON-SITE REMEDY
PARTIAL EXCAVATION
(ALTERNATIVE 4)

SCALE: AS SHOWN
MAY 2021

FIGURE 17

VARI, KATALIN Printed: 4/29/2021 10:28 AM Layout: FIGURE 17
\\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBAL\CAD\FIGURES\2019-21\36492-035-FIGS-12-15-17-19_ON SITE_REMED.DWG

BAUSCH & LOMB
FORMER MANUFACTURING
FACILITY

RG&E EAST STATION
FORMER MGP SITE

ST. PAUL ST.

SUNTRU ST.

GENESEE RIVER

BR-12-03
DW-12-03G/M
SB-14-01
SW-14-01
TG-14-04
TG-14-10
SB-14-07
SB-12-14
BR-12-05
TG-14-22
TP-14-01
SB-14-08
SB-14-06
SW-14-06
TG-14-01
SB-12-13
SW-12-13
TG-14-05
SB-12-16
TG-14-11
TG-14-27C
TG-14-32C
SB-14-09
SB-12-12
SB-14-02
SW-14-02
TG-14-08
TG-14-08C
TG-14-23
TG-14-29
SB-12-15
TG-14-41
TG-14-02C
TG-14-06
TG-14-06C
SB-12-17A
SB-12-17
SB-14-10
DW-12-01M/R
TF-14-02
SB-14-04
SW-14-04
TG-14-28
TG-14-33
TG-14-12C
TG-14-30C
SB-14-11
SB-12-11
SW-12-10
DW-12-01G/Q
BR-12-01
SB-12-10
SB-12-09
SB-12-08
TG-14-36
TG-14-09
TG-14-31
TG-14-24C
SW-14-03
SB-14-03
DW-12-02I
DW-12-02M
SB-14-12
TG-14-03
TG-14-07C
TG-14-25
TG-14-34
TG-14-37
TG-14-37C
TG-14-13C
SB-14-05
SW-14-05
SB-12-07
SB-12-06
SW-12-06
BR-12-02
SB-12-01
SW-12-01
SB-12-02
SB-12-03
TP-14-03
TG-14-26
TG-14-35C
TG-14-35
TG-14-15
SB-14-04
SB-12-05
SW-12-05
TG-14-17C
TG-14-17
TG-14-14
SW-12-04
TG-14-39
TG-14-40
TG-14-16
SB-14-13
TP-14-04
TG-14-19
TG-14-38
TG-14-18
TG-14-18C
TG-14-42
TG-14-21
TG-14-20

LEGEND

- PROPERTY BOUNDARY
- SOIL BORING LOCATION
  SB = SOIL BORING
- SOIL BORING/OVERBURDEN MONITORING WELL LOCATION
  SW = SHALLOW (OVERBURDEN) WELL
- BEDROCK MONITORING WELL LOCATION
  BR = BEDROCK CORING, DW = DEEP (BEDROCK) WELL
- TARGOST LOCATION
  TG = TARGOST
- TARGOST WITH CONFIRMATION SOIL BORING
  TG-14-XXC
- TEST PIT
- OFF-SITE IN SITU SOLIDIFICATION WITH SOIL/PAVEMENT COVER

NOTES

1. AERIAL PHOTO DATED APRIL 2009 OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE OPERATED BY THE STATE OF NEW YORK.
2. SOIL BORINGS, MONITORING WELLS, TEST PITS, AND TARGOST LOCATIONS ON BAUSCH & LOMB PROPERTY WERE SURVEYED BY HOFFMAN LAND SURVEYING & GEOMATICS ON 25 NOVEMBER 2013 AND 7 AUGUST 2014.

N

0 100 200
SCALE IN FEET

HALEY ALDRICH

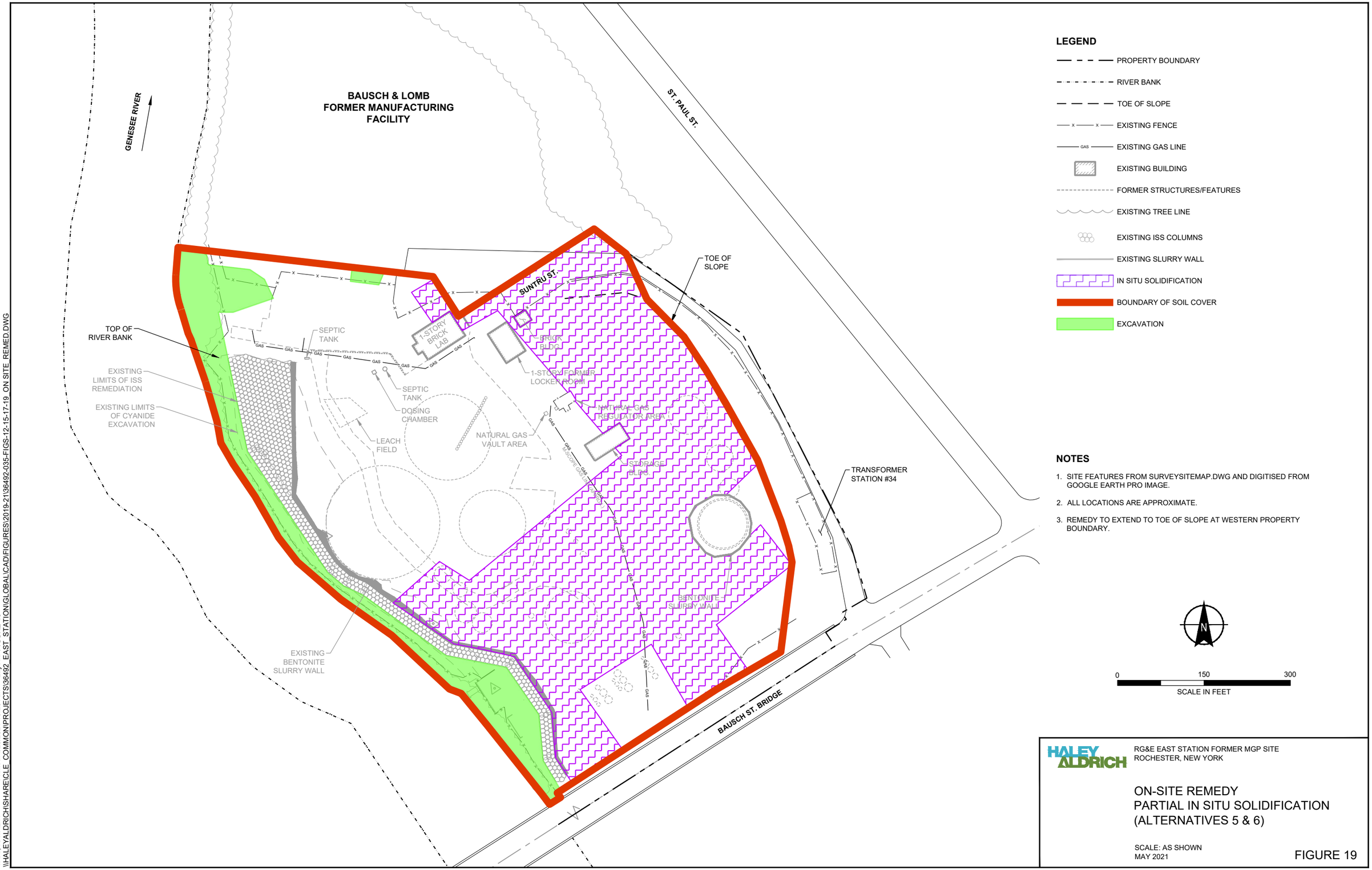
RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

OFF-SITE REMEDY
IN SITU SOLIDIFICATION
(ALTERNATIVE 5)

SCALE: AS SHOWN
MAY 2021

FIGURE 18

VARI, KATALIN Printed:4/26/2021 12:39 PM Layout: FIGURE 18
\\HALEYALDRICH\SHAREICLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBALICAD\FIGURES\2019-21\36492-035-FIGS-13-16-18_OFF SITE_REMED.DWG



HALEY ALDRICH

RG&E EAST STATION FORMER MGP SITE
ROCHESTER, NEW YORK

ON-SITE REMEDY
PARTIAL IN SITU SOLIDIFICATION
(ALTERNATIVES 5 & 6)

SCALE: AS SHOWN
MAY 2021

FIGURE 19

VARI, KATALIN Printed: 4/29/2021 10:29 AM Layout: FIGURE 19
\\HALEYALDRICH\SHARE\CLE_COMMON\PROJECTS\36492_EAST_STATION\GLOBAL\CAD\FIGURES\2019-21\36492-035-FIGS-12-15-17-19_ON SITE_REMED.DWG

APPENDIX A

Cost Estimation Spreadsheet

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Full Remedy
Overall Scope Excavation & Off-Site Treatment/Disposal
Media Soil

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)		1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying		2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Excavation/Blending, shallow (< 2')		43,921	cy	$ 13.42	$ 589,413.11	31 23 16.13 0062, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Waste Characterization		28	sample	$ 750.00	$ 21,082.31	Engineering judgement, prior project experience
Off-Site Soil T&D at Landfill		70,274	tons	$ 50.00	$ 3,513,718.52	Typical NY T&D for off-site landfill (e.g, Seneca Meadows)
Air Monitoring		4	month	$ 10,000.00	$ 43,921.48	Engineering judgement, prior project experience
Odor Control		88	Drum	$ 125.00	$ 11,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 4,209,483.12	
Health & Safety - Level D	9%				$ 378,853.48	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%				$ 210,474.16	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	8%				$ 336,758.65	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%				$ 252,568.99	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	25%				$ 1,052,370.78	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total					$ 6,440,509.17	
Operational & Maintenance Costs						
Periodic Review Report		0	LS	$ 1,500.00	$ -	Engineering judgement, prior project experience
Subtotal O&M Costs					$ -	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ -	
Rounded Total					**$ 6,441,000**	

Assumptions

Excav Dimensions (sq ft)=	592,940	
Excav Depth (ft) =	2	
Restored Topsoil Depth (ft) =	0.5	
Material Process Rate (Ex)	500	CY/day
Disposal Volume/ Sample	2500	CY
Wooded Area (Full)	250000	ft2
Restoration =	Not Included	
Odor Control	500	CY/Drum

1. Excavation ONLY, must be combined with Asp/Cap for restoration.
2. Debris is not present in the surficial excavation.
3. Brush removal cost captured in capping alternative
4. Air Monitoring Cost captured in deeper remedy alternative
5. Verification of Institutional Controls and Notifications to NYSDEC captured in capping alternative
6. WIRM included in excavation dimensions.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Full Remedy
Overall Scope Excavation & Reuse
Media Soil

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)		1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying		2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Excavation, stockpile/reuse, shallow (< 2')		43,921	cy	$ 19.73	$ 866,392.95	31 23 16.13 0062, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use Characterization		18	sample	$ 1,000.00	$ 17,568.59	Engineering judgement, prior project experience
Air Monitoring		4	month	$ 10,000.00	$ 43,921.48	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 958,230.72	
Health & Safety - Level D	9%				$ 86,240.76	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	6%				$ 57,493.84	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	12%				$ 114,987.69	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	8%				$ 76,658.46	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	25%				$ 239,557.68	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total					$ 1,533,169.15	
Operational & Maintenance Costs						
Periodic Review Report		0	LS	$ 1,500.00	$ -	Engineering judgement, prior project experience
Subtotal O&M Costs					$ -	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ -	
Rounded Total					**$ 1,533,000**	

Assumptions

Excav Dimensions (sq ft)=	592,940	
Excav Depth (ft) =	2	
Restored Topsoil Depth (ft) =	0.5	
Material Process Rate (Ex)	500	CY/day
Re-Use Volume/ Sample	2500	CY
Wooded Area (Full)	250000	ft2
Restoration =	Not Included	
Odor Control	500	CY/Drum

1. Excavation ONLY, must be combined with Asp/Cap for restoration.
2. Debris is not present in the surficial excavation.
3. Brush removal cost captured in capping alternative
4. Air Monitoring Cost captured in deeper remedy alternative
5. Verification of Institutional Controls and Notifications to NYSDEC captured in capping alternative
6. Restoration of 0' - 2' bg will be with imported cap material captured under Asp/Cap.
7. Stockpiled material from 0' - 2' bg shall be restored at 8' - 10' bg to reduce the volume of material imported for deep restoration.

43348.14815

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Full Remedy
Overall Scope Soil Cover
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)	1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Cut & chip light trees to 6" diameter	5.7	acre	$ 4,994.55	$ 28,664.77	31 11 10.10 0020, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Grub stumps and remove	5.7	acre	$ 1,992.78	$ 11,436.95	31 11 10.10 0150, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Grading	66,849	sy	$ 0.21	$ 14,164.61	31 22 16.10 3300; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Geotextile Marker Barrier	66,849	sy	$ 2.37	$ 158,508.74	31 32 19.16 1510, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Sand/gravel backfill, rolling compactor, 12" layers	33,424	cy	$ 42.13	$ 1,408,029.79	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Restoration - soil; furnish/place, truck dumped, screened, 6" deep	66,849	sy	$ 6.51	$ 435,055.91	32 91 19.13 0800; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Restoration - seeding; utility mix, 7#/msf, hydroseed, with mulch/fertilizer	602	msf	$ 68.61	$ 41,279.72	32 92 19.14 5400; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Subtotal Capital Costs				$ 2,127,488.21	
Health & Safety - Level D 9%				$ 191,473.94	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management 5%				$ 106,374.41	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting 8%				$ 170,199.06	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management 6%				$ 127,649.29	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency 10%				$ 212,748.82	Low end of synthetic cap contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 2,935,933.73	

Operational & Maintenance Costs					
Periodic Review Report	0	LS	$ 1,500.00	$ -	Engineering judgement, prior project experience
Cap repairs & limited grading/reseeding	6016	sf	$ 6.58	$ 39,579.97	(32 91 19.13 0800) + (32 92 19.14 5400); 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Subtotal O&M Costs				$ 39,579.97	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ 491,149.48	

Rounded Total	**$ 3,427,000**

Assumptions

Full Remedy Area	601640	ft2	*includes structure 6
Cap materials	2	ft	
Restored Topsoil Depth	0.5	ft	
Wooded Area (Full)	250000	ft2	
Cap Life	30	years	
Cap Repair Frequency	5	years	
Cap Repair Area	5%		

1. Costs shown involve premium for construction through MGP-impacted wastes.
2. Cap repairs assumes repairs to 5% of total cap area, once per 5 years over 30 years (5 times total)
3. Debris is not present in the surficial excavation.
4. 250,000 ft2 will require tree and brush removal.
5. WIRM included in full remedy area.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Full Remedy
Overall Scope Asphalt Capping
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)	1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Cut & chip light trees to 6" diameter	5.7	acre	$ 4,994.55	$ 28,664.77	31 11 10.10 0020, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Grub stumps and remove	5.7	acre	$ 1,992.78	$ 11,436.95	31 11 10.10 0150, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Grading	66,849	sy	$ 0.21	$ 14,164.61	31 22 16.10 3300; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Geotextile Marker Barrier	66,849	sy	$ 2.37	$ 158,508.74	31 32 19.16 1510, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Sand/gravel backfill, rolling compactor, 12" layers	27,854	cy	$ 42.13	$ 1,173,358.16	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Paving cap: Prep & Roll Subbase, Large Areas over 2500 sy	66,849	sy	$ 0.93	$ 62,054.49	32 11 23.23 8000; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Paving cap: 6" stone base, 2" binder course, 1" topping	601,640	sf	$ 2.67	$ 1,608,695.11	32 12 16.14 0020; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Paving cap: 6" stone base, 2" binder course, 1" topping (hauling)	16,712	cy	$ 39.65	$ 662,701.45	32 12 16.14 0018; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Subtotal Capital Costs				$ 3,749,931.99	
Health & Safety - Level D	9%			$ 337,493.88	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%			$ 187,496.60	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	8%			$ 299,994.56	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%			$ 224,995.92	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	10%			$ 374,993.20	Low end of synthetic cap contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 5,174,906.14	

Operational & Maintenance Costs					
Periodic Review Report	0	LS	$ 1,500.00	$ -	Engineering judgement, prior project experience
Restoration - asphalt	1805	sf	$ 5.35	$ 9,656.32	32 01 17.20 1420; 2018 RS Means Heavy Construction Cost Data
Subtotal O&M Costs				$ 9,656.32	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ 119,825.70	

Rounded Total			**$ 5,295,000**

Assumptions

Full Remedy Area	601640	ft2	*includes structure 6
Cap materials	2	ft	
Pavement/base Thickness	0.75	ft	
Wooded Area (Full)	250000	ft2	
Cap Life	30	years	
Cap Repair Frequency	10	years	
Cap Repair Area	3%		

1. Costs shown involve premium for construction through MGP-impacted wastes.
2. Cap repairs assumes repairs to 10% of total cap area, once per 10 years over 30 years (2 times total)
3. Debris is not present in the surficial excavation.
4. 250,000 ft2 will require tree and brush removal.
5. WIRM included in full remedy area.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Full Remedy
Overall Scope Suntru St - Repairs/Upgrade
Media Soil

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)		1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying		1	day	$ 2,673.85	$ 2,673.85	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Pavement removal, bituminous roads, 3" thick		3,111	sy	$ 5.80	$ 18,049.89	02 41 13.17 5010; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Paving cap: Binder course, 2" thick		3,111	sy	$ 9.23	$ 28,722.87	32 12 16.13 0120; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Paving cap: Wearing course, 1" thick		3,111	sy	$ 4.81	$ 14,973.56	32 12 16.13 0300; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Subtotal Capital Costs					$ 89,420.17	
Health & Safety - Level D	9%				$ 8,047.81	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ 8,942.02	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ 17,884.03	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ 13,413.02	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	10%				$ 8,942.02	Low end of synthetic cap contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost					$ 146,649.07	

Operational & Maintenance Costs						
Restoration - asphalt		0	sf	$ 5.35	$ -	32 01 17.20 1420; 2018 RS Means Heavy Construction Cost Data
Subtotal O&M Costs					$ -	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ -	

Rounded Total	**$ 147,000**

Assumptions

Repave Area 28000 ft2

1. Costs shown involve mill and repave to 3" depth only

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Full Remedy
Overall Scope Engineering Controls (Fencing)
Media Soil

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Prep)		1	LS	$ 5,000.00	$ 5,000.00	Engineering judgement, prior project experience
Construction Layout Surveying		1	day	$ 2,673.85	$ 2,673.85	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Chain link fence		3,500	LF	$ 18.11	$ 63,390.43	32 31 13.40 1250, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Off-Site Disposal post hole spoils		35	tons	$ 45.00	$ 1,575.00	Typical NY T&D for off-site fixed facility thermal desorption
Restoration (fence)		1	LS	$ 5,000.00	$ 5,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 77,639.28	
Health & Safety - Level D	9%				$ 6,987.53	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ 7,763.93	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ 15,527.86	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ 11,645.89	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	5%				$ 3,881.96	Low end of surface grading contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total					$ 123,446.45	
Operational & Maintenance Costs						
Periodic Review Report		0	LS	$ 1,500.00	$ -	Engineering judgement, prior project experience
Chain link fence		105	LF	$ 18.11	$ 1,901.71	32 31 13.40 1250, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Subtotal O&M Costs					$ 1,901.71	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ 23,598.43	
Rounded Total					**$ 147,000.00**	

Assumptions

Work Area Perimeter (ft) = 3500 *check value- 3400 ft
Fence repair per year 3%

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Full Remedy
Overall Scope Institutional Controls/Land Use Restrictions
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Environmental Easement	1	LS	$ 10,000.00	$ 10,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs				$ 10,000.00	
Health & Safety - Level D	9%			$ -	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%			$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%			$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%			$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	15%			$ 1,500.00	Low end of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 11,500.00	

Operational & Maintenance Costs					
Periodic Review Report	1	LS	$ 1,500.00	$ 1,500.00	Engineering judgement, prior project experience
Subtotal O&M Costs				$ 1,500.00	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ 18,613.56	

Rounded Total	**$ 30,000.00**

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Partial Remedy
Overall Scope Institutional Controls/Land Use Restrictions
Media Soil

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Environmental Easement		1	LS	$ 10,000.00	$ 10,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 10,000.00	
Health & Safety - Level D	9%				$ -	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	15%				$ 1,500.00	Low end of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost					$ 11,500.00	

Operational & Maintenance Costs						
Periodic Review Report		1	LS	$ 1,500.00	$ 1,500.00	Engineering judgement, prior project experience
Subtotal O&M Costs					$ 1,500.00	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ 18,613.56	

Rounded Total	**$ 30,000.00**

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Off-site
Overall Scope Excavation & Off-Site Treatment/Disposal
Media Soil

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)		1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying		2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Excavation/Blending, shallow (< 2')		3,217	cy	$ 13.42	$ 43,171.67	31 23 16.13 0062, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Waste Characterization		2	sample	$ 750.00	$ 1,544.18	Engineering judgement, prior project experience
Off-Site Soil T&D at Landfill		5,147	tons	$ 50.00	$ 257,362.96	Typical NY T&D for off-site landfill (e.g, Seneca Meadows)
Air Monitoring		0.3	month	$ 10,000.00	$ 3,217.04	Engineering judgement, prior project experience
Odor Control		7	Drum	$ 125.00	$ 875.00	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 336,518.55	
Health & Safety - Level D	9%				$ 30,286.67	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	8%				$ 26,921.48	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	15%				$ 50,477.78	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	10%				$ 33,651.85	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	25%				$ 84,129.64	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total					$ 561,985.98	
Operational & Maintenance Costs						
Periodic Review Report		0	LS	$ 1,500.00	$ -	Engineering judgement, prior project experience
Subtotal O&M Costs					$ -	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ -	
Rounded Total					**$ 562,000**	

Assumptions

Excav Dimensions (sq ft)=	43,430	
Excav Depth (ft) =	2	
Restored Topsoil Depth (ft) =	0.5	
Restoration =	Vegetated	
Material Process Rate (Ex)	500	CY/day
Disposal Volume/ Sample	2500	CY
Odor Control	500	CY/Drum

1. Excavation ONLY, must be combined with Restoration/Cap
2. Debris is not present in the surficial excavation.
3. Brush removal cost captured in capping alternative
4. Air Monitoring Cost captured in deeper remedy alternative
5. Verification of Institutional Controls and Notifications to NYSDEC captured in capping alternative

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Off-site
Overall Scope Soil Cover
Media Soil

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)		1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying		2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Sand/gravel backfill, rolling compactor, 12" layers		2,413	cy	$ 42.13	$ 101,640.07	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Geotextile Marker Barrier		4,826	sy	$ 2.37	$ 11,442.12	31 32 19.16 1510, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Restoration - soil; furnish/place, truck dumped, scr		4,826	sy	$ 6.51	$ 31,404.96	32 91 19.13 0800; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Restoration - seeding; utility mix, 7#/msf, hydrosee		43	msf	$ 68.61	$ 2,979.82	32 92 19.14 5400; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Subtotal Capital Costs					$ 177,814.67	
Health & Safety - Level D	9%				$ 16,003.32	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	8%				$ 14,225.17	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	15%				$ 26,672.20	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	10%				$ 17,781.47	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	15%				$ 26,672.20	Low end of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total					$ 279,169.02	
Operational & Maintenance Costs						
Periodic Review Report		0	LS	$ 1,500.00	$ -	Engineering judgement, prior project experience
Cap repairs & limited grading/reseeding		261	sf	$ 6.58	$ 1,714.27	(32 91 19.13 0800) + (32 92 19.14 5400); 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Subtotal O&M Costs					$ 1,714.27	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ 21,272.48	
Rounded Total					**$ 300,000**	

Assumptions

Excav Dimensions (sq ft)=	43,430	
Excav Depth (ft) =	2	
Restored Topsoil Depth (ft) =	0.5	
Restoration =	Vegetated	
Wooded Area (Offsite)	25000	ft2
Cap Life	30	years
Cap Repair Frequency	5	years
Cap Repair Area	3%	

1. Costs shown involve premium for construction through MGP-impacted wastes.
2. Cap repairs assumes repairs to 5% of total cap area, once per 5 years over 30 years (5 times total)
3. Debris is not present in the surficial excavation.
4. 25,000 ft2 will require tree and brush removal.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Onsite - Full Remedy
Overall Scope Asphalt Capping
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)	1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Cut & chip light trees to 6" diameter	0.6	acre	$ 4,994.55	$ 2,866.48	31 11 10.10 0020, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Grub stumps and remove	0.6	acre	$ 1,992.78	$ 1,143.70	31 11 10.10 0150, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Grading	4,826	sy	$ 0.21	$ 1,022.49	31 22 16.10 3300; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Geotextile Marker Barrier	4,826	sy	$ 2.37	$ 11,442.12	31 32 19.16 1510, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Sand/gravel backfill, rolling compactor, 12" layers	2,011	cy	$ 42.13	$ 84,700.06	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Paving cap: Prep & Roll Subbase, Large Areas over 2500 sy	4,826	sy	$ 0.93	$ 4,479.47	32 11 23.23 8000; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Paving cap: 6" stone base, 2" binder course, 1" topping	43,430	sf	$ 2.67	$ 116,125.31	32 12 16.14 0020; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Paving cap: 6" stone base, 2" binder course, 1" topping (hauling)	1,206	cy	$ 39.65	$ 47,837.78	32 12 16.14 0018; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Subtotal Capital Costs				$ 299,965.09	
Health & Safety - Level D 9%				$ 26,996.86	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management 8%				$ 23,997.21	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting 15%				$ 44,994.76	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management 10%				$ 29,996.51	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency 10%				$ 29,996.51	Low end of synthetic cap contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 455,946.94	

Operational & Maintenance Costs					
Periodic Review Report	0	LS	$ 1,500.00	$ -	Engineering judgement, prior project experience
Restoration - asphalt	434	sf	$ 5.35	$ 2,323.51	32 01 17.20 1420; 2018 RS Means Heavy Construction Cost Data
Subtotal O&M Costs				$ 2,323.51	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ 28,832.47	

Rounded Total		**$ 485,000**

Assumptions

Full Remedy Area	43430	ft2
Cap materials	2	ft
Pavement/base Thickness	0.75	ft
Wooded Area (Offsite)	25000	ft2
Cap Life	30	years
Cap Repair Frequency	5	years
Cap Repair Area	5%	

1. Costs shown involve premium for construction through MGP-impacted wastes.
2. Cap repairs assumes repairs to 10% of total cap area, once per 10 years over 30 years (2 times total)
3. Debris is not present in the surficial excavation.
4. 250,000 ft2 will require tree and brush removal.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Surficial Soils (Upper 2 ft) - Off-site
Overall Scope Excavation & Off-Site Treatment/Disposal
Media Soil

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Prep)		1	LS	$ 5,000.00	$ 5,000.00	Engineering judgement, prior project experience
Construction Layout Surveying		2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Chain link fence		1,980	LF	$ 18.11	$ 35,860.87	32 31 13.40 1250, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Off-Site Disposal post hole spoils		19.8	tons	$ 45.00	$ 891.00	Typical NY T&D for off-site fixed facility thermal desorption
Site Restoration		1	LS	$ 5,000.00	$ 5,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 52,099.57	
Health & Safety - Level D	9%				$ 4,688.96	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ 5,209.96	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ 10,419.91	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ 7,814.94	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	5%				$ 2,604.98	Low end of surface grading contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total					$ 82,838.31	
Operational & Maintenance Costs						
Periodic Review Report		1	LS	$ 1,500.00	$ 1,500.00	Engineering judgement, prior project experience
Subtotal O&M Costs					$ 1,500.00	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ 18,613.56	
Rounded Total					**$ 101,000**	

Assumptions

Work Area Perimeter (ft) = 1980 *check 1980

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Subsurface Soils (Greater than 2 ft bgs) - Full Remedy
Overall Scope Excavation, Shallow Reuse & Off-Site Treatment/Disposal
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Pre-Design Investigation (side slope & southern limit)	1	LS	$100,000.00	$100,000.00	Engineering judgement, prior project experience
Mobilization/Demobilization (Earthwork)	1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use (2' - 9' bg)					
Excavation, stockpile/reuse, deep (> 2')	153,725	cy	$ 21.09	$ 3,241,772.08	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use Characterization	61	sample	$ 1,000.00	$ 61,490.07	Engineering judgement, prior project experience
Debris Disposal	24,596	ton	$ 50.00	$ 1,229,801.48	Typical NY T&D for off-site debris
Disposal (9' - 20.2' bg)					
Excavation/Blending, deep (> 2')	246,053	cy	$ 14.78	$ 3,637,123.41	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Waste Characterization	98	sample	$ 750.00	$ 73,816.00	Engineering judgement, prior project experience
Off-Site Soil Transportation & Disposal	354,317	tons	$ 62.50	$ 22,144,799.66	Cost averaging between off-site landfill (75% at $50/ton) and off-site thermal (25% at $100/ton)
Debris Disposal	39,369	ton	$ 50.00	$ 1,968,426.64	Typical NY T&D for off-site debris
Sand/gravel backfill, rolling compactor, 12" layers	202,132	cy	$ 42.13	$ 8,514,955.70	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Sheet piling systems: 25' deep excavation; drive, extract &	87,500	sf	$ 28.25	$ 2,472,050.00	31 41 16.10 1800, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Air Monitoring	40	month	$ 10,000.00	$ 399,778.51	Engineering judgement, prior project experience
Odor Control	493	Drum	$ 125.00	$ 61,625.00	Engineering judgement, prior project experience
Dewatering and Treatment System Mobilization/Demobili	1	LS	$ 100,000	$ 100,000.00	Engineering judgement, prior project experience
Dewatering and Treatment System O&M	37	Month	$ 40,000.00	$ 1,480,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs				$45,515,986.25	
Health & Safety - Level D 9%				$ 4,096,438.76	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management 5%				$ 2,275,799.31	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting 6%				$ 2,730,959.17	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management 6%				$ 2,730,959.17	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency 25%				$ 11,378,996.56	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 68,729,139.24	
Operational & Maintenance Costs					
Pavement O&M	0	LS	$ 4,000.00	$ -	*Included in SS costs - not included here*
Subtotal O&M Costs				$ -	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ -	
Rounded Total				**$ 68,729,000.00**	

Assumptions

Excav Dimensions	592940	sq ft
Re-use Depth	7.0	ft
Disposal Depth	11.20	ft
Excavation Volume	246053	CY
Stockpiled Surficial material	2	ft
Material Process Rate (Ex)	500	CY/day
Disposal Volume/ Sample	2500	CY
Length of SOE Wall (FR)	3500	ft
Odor Control	500	CY/Drum
Debris	10%	
Total Excavation Volume	399779	CY
Production Rate	500	CY/day
Duration	800	work days
Duration	37	months

1. Costs shown involve premium for construction through MGP-impacted wastes.
2. 10% debris encountered in excavation.
3. Temporary earth support required on east side of the excavation
4. 0-2' bg accounted for in SS-FR-Reuse
5. Stockpiled material from 0' - 2' bg shall be restored at 8' - 10' bg to reduce the volume of material imported for deep restoration.
6. This Alternative is Inclusive of Presumptive WIRM, addition of stand-alone WIRM cost not required
7. Production rate based on one excavator
8. WIRM included in excavation dimensions.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Subsurface Soils (Greater than 2 ft bgs) - Full Remedy
Overall Scope Containment
Media Soil

Captial Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Bench-Scale Treatability Test (Slurry Wall)		1	LS	$ 10,000.00	$ 10,000.00	Engineering judgement, prior project experience
Mobilization/Demobilization (Slurry Wall)		1	LS	$ 75,000.00	$ 75,000.00	Engineering judgement, prior project experience
Pre-Slurry Wall Excavation		467	cy	$ 100.00	$ 46,666.67	Typical NY T&D for off-site fixed facility thermal desorption
Slurry Wall		132,300	cf	$ 27.75	$ 3,670,994.25	31 56 23.20 0100; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Treatment Agent (Slurry Wall)		184	ton	$ 173.55	$ 31,889.45	03 05 13.30 0300; 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Funnel & Gate System		1	LS	$ 35,000.00	$ 35,000.00	Engineering judgement, prior project experience
Post-ISS Swell Removal		537	cy	$ 14.78	$ 7,932.93	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Off-Site Soil T&D at Landfill		821	tons	$ 50.00	$ 41,066.67	Typical NY T&D for off-site landfill (e.g, Seneca Meadows)
Debris Disposal		784	ton	$ 50.00	$ 39,200.00	Typical NY T&D for off-site debris
Waste Characterization		0.16	sample	$ 750.00	$ 120.00	Engineering judgement, prior project experience
Air Monitoring		0.49	month	$ 10,000.00	$ 4,900.00	Engineering judgement, prior project experience
Odor Control		10	Drum	$ 125.00	$ 1,250.00	Engineering judgement, prior project experience
Subtotal					$ 3,964,019.95	
Health & Safety - Level D	9%				$ 356,761.80	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%				$ 198,201.00	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	8%				$ 317,121.60	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%				$ 237,841.20	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Contruction Management
Contingency	10%				$ 396,402.00	Low end of vertical barrier contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost					$ 5,470,347.54	

Operational & Maintenance Costs

Subtotal O&M Costs	$ -
Percent Worth Factor (30 yrs @ 7%)	12.41
Total Present Worth O&M Cost	$ -

Rounded Total	**$ 5,470,000**

Assumptions

Slurry Wall	6,300	SF
Slurry Wall length	2100	LF
Slurry Wall width	3	ft
Slurry Wall Depth	21	ft
Slurry Wall Volume	4,900	CY
Pre-excavation depth	2	ft
Material Process Rate (SW)	500	CY/day
Debris	10%	
Swell	20%	
Odor Control	500	CY/Drum
Treatment Agent Mix (Slurry Wall)	6%	

1. Assumed pre-exc depth (not calculated)
2. 10% debis encountered in excavation.
3. Assumes no dewatering
4. Assumes slurry wall is uncapped and solidified to grade
5. Assumes 20% swell resulting in a 4' (0 -4 ft bg) pre-excavation
6. 0-2' bg acconted for in SS-FR-Asp

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Subsurface Soils (Greater than 2 ft bgs) - Area W. of IRM
Overall Scope Excavation, Shallow Reuse & Off-Site Treatment/Disposal
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)	0	LS	$ 25,000.00	$ -	Engineering judgement, prior project experience
Construction Layout Surveying	0	day	$ 2,673.85	$ -	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use (2' - 9' bg)					
Excavation, stockpile/reuse, deep (> 2')	5,594	cy	$ 21.09	$ 117,975.97	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use Characterization	2	sample	$ 1,000.00	$ 2,237.77	Engineering judgement, prior project experience
Debris Disposal	895	ton	$ 50.00	$ 44,755.47	Typical NY T&D for off-site debris
West of IRM Excavation (9' - 20.' bg)					
West of IRM Excavation	22,762	cy	$ 14.78	$ 336,462.44	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Debris Disposal	3,642	ton	$ 50.00	$ 182,094.90	Typical NY T&D for off-site debris
Off-Site Soil Transportation & Disposal	36,419	tons	$ 62.50	$ 2,276,186.26	Cost averaging between off-site landfill (75% at $50/ton) and off-site thermal (25% at $100/ton)
Waste Characterization	15	sample	$ 750.00	$ 10,925.69	Engineering judgement, prior project experience
Air Monitoring	3	month	$ 10,000.00	$ 28,356.30	Engineering judgement, prior project experience
Odor Control	10	Drum	$ 125.00	$ 1,250.00	Engineering judgement, prior project experience
Dewatering and Treatment System Mobilization/Demobili	1	LS	$ 100,000	$ 100,000.00	Engineering judgement, prior project experience
Dewatering and Treatment System O&M	4	Month	$ 40,000.00	$ 160,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs				$ 3,260,244.80	
Health & Safety - Level D	9%			$ 293,422.03	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%			$ 163,012.24	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	8%			$ 260,819.58	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%			$ 195,614.69	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	25%			$ 815,061.20	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 4,988,174.55	

Operational & Maintenance Costs	
Subtotal O&M Costs	$ -
Percent Worth Factor (30 yrs @ 7%)	12.41
Total Present Worth O&M Cost	$ -

Rounded Total	**$ 4,988,000.00**

Assumptions

West of IRM Area	52,000	SF
West of IRM Volume	21,579	CY
TG-10-01 Volume	1,183	CY
Re-use Depth	7.0	ft
Treatment Depth	11.20	ft
Stockpiled Surficial material	2	ft
Material Process Rate (ISS)	500	CY/day
Disposal Volume/ Sample	2500	CY
Odor Control	500	CY/Drum
Debris	10%	
Odor Control	500	CY/Drum
Total Excavation Volume	21579	CY
Production Rate	300	CY/day
Duration	72	work days
Duration	4	months

1. Mobilization accounted for in associated Large Scale Soil Remedy
2. Survey accounted for in associated Large Scale Soil Treatment
3. 0-2' bg accounted for in SS-FR-Reuse
4. Production rate based on one excavator
5. WIRM included in calculations/ this overall scope

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Subsurface Soils (Greater than 2 ft bgs) - Partial Remedy
Overall Scope Excavation, Shallow Reuse & Off-Site Treatment/Disposal
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Pre-Design Investigation (side slope & southern limit)	1	LS	$100,000.00	$100,000.00	Engineering judgement, prior project experience
Mobilization/Demobilization (Earthwork)	1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use (2' - 20' bg)					
Excavation, stockpile/reuse, deep (> 2')	207,667	cy	$ 21.09	$ 4,379,295.43	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use Characterization	83	sample	$ 1,000.00	$ 83,066.67	Engineering judgement, prior project experience
Debris Disposal	33,227	ton	$ 50.00	$ 1,661,333.33	Typical NY T&D for off-site debris
Disposal (20' - 24' bg)					
Excavation/Blending, deep (> 2')	47,893	cy	$ 14.78	$ 707,941.12	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Waste Characterization	19	sample	$ 750.00	$ 14,367.78	Engineering judgement, prior project experience
Off-Site Soil Transportation & Disposal	68,965	tons	$ 62.50	$ 4,310,333.33	Cost averaging between off-site landfill (75% at $50/ton) and off-site thermal (25% at $100/ton)
Debris Disposal	7,663	ton	$ 50.00	$ 383,140.74	Typical NY T&D for off-site debris
Sand/gravel backfill, rolling compactor, 12" layers	23,074	cy	$ 42.13	$ 972,012.68	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Sheet piling systems: 25' deep excavation; drive, extract & s	125,000	sf	$ 28.25	$ 3,531,500.00	31 41 16.10 1800, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Air Monitoring	26	month	$ 10,000.00	$ 255,559.26	Engineering judgement, prior project experience
Odor Control	96	Drum	$ 125.00	$ 12,000.00	Engineering judgement, prior project experience
Dewatering and Treatment System Mobilization/Demobiliz	1	LS	$ 100,000	$ 100,000.00	Engineering judgement, prior project experience
Dewatering and Treatment System O&M	24	Month	$ 40,000.00	$ 960,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs				$17,500,898.04	
Health & Safety - Level D	9%			$ 1,575,080.82	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%			$ 875,044.90	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	6%			$ 1,050,053.88	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%			$ 1,050,053.88	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	25%			$ 4,375,224.51	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 26,426,356.04	
Operational & Maintenance Costs					
Pavement O&M	0	LS	$ 4,000.00	$ -	*Included in SS costs - not included here*
Subtotal O&M Costs				$ -	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ -	
Rounded Total				**$ 26,426,000.00**	

Assumptions

Excav Dimensions	259,500	sq ft
West of IRM Area	52,000	sq ft
SB-14-13 Volume	561	CY
TG-10-01 Volume	1,183	CY
Total Excav Dimensions	311500	sq ft
Re-use Depth	18.0	ft
Disposal Depth	4.00	ft
Excavation Volume	46148	CY
Stockpiled Surficial material	2	ft
Material Process Rate (Ex)	500	CY/day
Disposal Volume/ Sample	2500	CY
Length of SOE Wall (PR)	5000	ft
Odor Control	500	CY/Drum
Debris	10%	
Total Excavation Volume	255559	CY
Production Rate	500	CY/day
Duration	511	work days
Duration	24	months

1. Costs shown involve premium for construction through MGP-impacted wastes.
2. 10% debris encountered in excavation.
3. Temporary earth support required on east side of the excavation
4. 0-2' bg accounted for in SS-FR-Reuse
5. Stockpiled material from 0' - 2' bg shall be restored at 8' - 10' bg to reduce the volume of material imported for deep restoration.
6. This Alternative is Inclusive of Presumptive WIRM, addition of stand-alone WIRM cost not required
7. Production rate based on one excavator
8. WIRM included in excavation dimensions.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Subsurface Soils (Greater than 2 ft bgs) - Partial Remedy
Overall Scope In-Situ Solidification with Shallow Excavation and Reuse
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Pre-Design Investigation (side slope & southern limit)	1	LS	$100,000.00	$100,000.00	Engineering judgement, prior project experience
Mobilization/Demobilization (Earthwork)	1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use (2' - 9' bg)					
Excavation, stockpile/reuse, deep (> 2')	67,278	cy	$ 21.09	$ 1,418,760.51	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use Characterization	27	sample	$ 1,000.00	$ 26,911.11	Engineering judgement, prior project experience
Debris Disposal	10,764	ton	$ 50.00	$ 538,222.22	Typical NY T&D for off-site debris
ISS (9' - 24' bg)					
Bench-Scale Treatability test (ISS)	1	LS	$ 10,000.00	$ 10,000.00	Engineering judgement, prior project experience
Mobilization/Demobilization (ISS)	1	LS	$ 75,000.00	$ 75,000.00	Engineering judgement, prior project experience
ISS - Excavators	144,167	cy	$ 80.00	$ 11,533,333.33	Engineering judgement, prior project experience
Post-ISS Swell Removal	28,833	cy	$ 14.78	$ 426,210.01	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Debris Disposal	23,067	ton	$ 50.00	$ 1,153,333.33	Typical NY T&D for off-site debris
All					
Off-Site Soil Transportation & Disposal	23,067	tons	$ 62.50	$ 1,441,666.67	Cost averaging between off-site landfill (75% at $50/ton) and off-site thermal (25% at $100/ton)
Waste Characterization	9	sample	$ 750.00	$ 6,920.00	Engineering judgement, prior project experience
Air Monitoring	24	month	$ 10,000.00	$ 240,277.78	Engineering judgement, prior project experience
Odor Control	12	Drum	$ 125.00	$ 1,500.00	Engineering judgement, prior project experience
Dewatering and Treatment System Mobilization/Demobili	1	LS	$ 100,000	$ 100,000.00	Engineering judgement, prior project experience
Dewatering and Treatment System O&M	22	Month	$ 40,000.00	$ 880,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs				$17,982,482.66	
Health & Safety - Level D	9%			$ 1,618,423.44	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%			$ 899,124.13	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	6%			$ 1,078,948.96	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%			$ 1,078,948.96	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	25%			$ 4,495,620.66	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 27,153,548.81	
Operational & Maintenance Costs					
Pavement O&M	0	LS	$ 4,000.00	$ -	*Included in SS costs - not included here*
Subtotal O&M Costs				$ -	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ -	
Rounded Total				**$ 27,154,000.00**	

Assumptions

West of IRM Area	52,000	SF
ISS Dimensions	259500	SF
Re-use Depth	7.0	ft
Treatment Depth	15.00	ft
Treatment Volume	144167	CY
Stockpiled Surficial material	2	ft
Material Process Rate (ISS)	500	CY/day
Disposal Volume/ Sample	2500	CY
Odor Control	500	CY/Drum
Debris	10%	
Swell	20%	
Odor Control	500	CY/Drum
Treatment Agent Mix (ISS)	10%	
Production Rate	300	CY/day
Duration	481	work days
Duration	22	months

1. A pre-ISS Excavation is completed to minimize treatment volume and allow reuse of unimpacted soils.
2. 10% debris encountered in excavation.
3. Upon completion of ISS a post-swell removal is executed to restore the work surface in preparation for reuse of stockpiled upper soils.
4. ISS via excavator mixing. Treatment depth limited by reach of excavator.
5. Assumes 20% swell
6. 0-2' bg accounted for in SS-FR-Reuse
7. S-FR-WIRM must be included in final Alternative cost to account for soils West of IRM
8. Production rate assumes one ISS bucket mixing system
9. Mid-range of excavation contingency (25%) used instead of high range of sludge stabilization contigency (20%) due to the remedy's reliance on excavation/reuse.
10. WIRM is not included in ISS.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Subsurface Soils (Greater than 2 ft bgs) - Area W. of IRM
Overall Scope Excavation, Reuse & Off-Site Treatment/Disposal
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)	0	LS	$ 25,000.00	$ -	Engineering judgement, prior project experience
Construction Layout Surveying	0	day	$ 2,673.85	$ -	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use (2' - 9' bg)					
Excavation, stockpile/reuse, deep (> 2')	5,594	cy	$ 21.09	$ 117,975.97	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Re-Use Characterization	2	sample	$ 1,000.00	$ 2,237.77	Engineering judgement, prior project experience
Debris Disposal	895	ton	$ 50.00	$ 44,755.47	Typical NY T&D for off-site debris
West of IRM Excavation (9' - 20.' bg)					
West of IRM Excavation	23,323	cy	$ 14.78	$ 344,756.70	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Debris Disposal	3,732	ton	$ 50.00	$ 186,583.79	Typical NY T&D for off-site debris
Off-Site Soil Transportation & Disposal	37,317	tons	$ 62.50	$ 2,332,297.37	Cost averaging between off-site landfill (75% at $50/ton) and off-site thermal (25% at $100/ton)
Waste Characterization	15	sample	$ 750.00	$ 11,195.03	Engineering judgement, prior project experience
Air Monitoring	3	month	$ 10,000.00	$ 28,917.41	Engineering judgement, prior project experience
Odor Control	10	Drum	$ 125.00	$ 1,250.00	Engineering judgement, prior project experience
Dewatering and Treatment System Mobilization/Demobili	1	LS	$ 100,000	$ 100,000.00	Engineering judgement, prior project experience
Dewatering and Treatment System O&M	3	Month	$ 40,000.00	$ 120,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs				$ 3,289,969.51	
Health & Safety - Level D	9%			$ 296,097.26	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%			$ 164,498.48	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	8%			$ 263,197.56	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%			$ 197,398.17	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	25%			$ 822,492.38	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 5,033,653.35	
Operational & Maintenance Costs					
Subtotal O&M Costs				$ -	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ -	
Rounded Total				**$ 5,034,000.00**	

Assumptions

West of IRM Area	52,000	SF
West of IRM Volume	21,579	CY
SB-14-13 Volume	561	CY
TG-10-01 Volume	1,183	CY
Re-use Depth	7.0	ft
Treatment Depth	11.20	ft
Stockpiled Surficial material	2	ft
Material Process Rate (ISS)	500	CY/day
Disposal Volume/ Sample	2500	CY
Odor Control	500	CY/Drum
Debris	10%	
Odor Control	500	CY/Drum
Total Excavation Volume	28917	CY
Production Rate	500	CY/day
Duration	58	work days
Duration	3	months

1. Mobilization accounted for in associated Large Scale Soil Remedy
2. Survey accounted for in associated Large Scale Soil Treatment
3. 0-2' bg accounted for in SS-FR-Reuse
4. WIRM included in excavation dimensions.

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Subsurface Soils (Greater than 2 ft) - Off-Site
Overall Scope Excavation & Off-Site Treatment/Disposal
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Earthwork)	1	LS	$ 25,000.00	$ 25,000.00	Engineering judgement, prior project experience
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Excavation/Blending, deep (> 2')	30,160	cy	$ 14.78	$ 445,816.49	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Waste Characterization	17	sample	$ 750.00	$ 13,029.00	Engineering judgement, prior project experience
Off-Site Soil Transportation & Disposal	43,430	tons	$ 62.50	$ 2,714,375.00	Cost averaging between off-site landfill (75% at $50/ton) and off-site thermal (25% at $100/ton)
Debris Disposal	4,826	ton	$ 50.00	$ 241,277.78	Typical NY T&D for off-site debris
Sand/gravel backfill, rolling compactor, 12" layers	30,160	cy	$ 42.13	$ 1,270,500.92	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Sheet piling systems: 25' deep excavation; drive, ex	30,000	sf	$ 28.25	$ 847,560.00	31 41 16.10 1800, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Air Monitoring	3	month	$ 10,000.00	$ 30,159.72	Engineering judgement, prior project experience
Odor Control	61	Drum	$ 125.00	$ 7,625.00	Engineering judgement, prior project experience
Dewatering and Treatment System (OS)	1	LS	$ 75,000.00	$ 75,000.00	Engineering judgement, prior project experience
Dewatering and Treatment System O&M	3	Month	$ 40,000.00	$ 120,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs				$ 5,795,691.61	
Health & Safety - Level D	9%			$ 521,612.24	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%			$ 289,784.58	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	12%			$ 695,482.99	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	10%			$ 579,569.16	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	25%			$ 1,448,922.90	Mid-range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 9,331,063.49	

Operational & Maintenance Costs

Subtotal O&M Costs	$	-
Percent Worth Factor (30 yrs @ 7%)		12.41
Total Present Worth O&M Cost	$	-

Rounded Total	**$**	**9,331,000**

Assumptions

Excav Dimensions (sq ft)=	43430	
Excav Depth (ft) =	18.75	
Excavation Volume (cy) =	30160	
Material Process Rate (Ex)	500	CY/day
Length of SOE Wall (OS)	1200	ft
Odor Control	500	CY/Drum
Disposal Volume/ Sample	2500	CY
Debris	10%	
Production Rate	500	CY/day
Duration	60.31944444	work days
Duration	3	months

1. Costs shown involve premium for construction through MGP-impacted wastes.
2. 10% debris encountered in excavation.
3.No temporary earth support required .

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Subsurface Soils (Greater than 2 ft) - Off-Site
Overall Scope In-Situ Solidification
Media Soil

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Bench-Scale Treatability test (ISS)	1	LS	$ 10,000.00	$ 10,000.00	Engineering judgement, prior project experience
Mobilization/Demobilization (ISS)	1	LS	$ 75,000.00	$ 75,000.00	Engineering judgement, prior project experience
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Pre-ISS Excavation	6,032	cy	$ 14.78	$ 89,163.30	31 23 16.13 0500, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
ISS - Excavators	24,128	cy	$ 80.00	$ 1,930,222.22	Engineering judgement, prior project experience
Post-ISS Restoration	1,206	cy	$ 42.13	$ 50,820.04	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Debris Disposal	3,860	ton	$ 50.00	$ 193,022.22	Typical NY T&D for off-site debris
Off-Site Soil Transportation & Disposal	5,791	tons	$ 62.50	$ 361,916.67	Cost averaging between off-site landfill (75% at $50/ton) and off-site thermal (25% at $100/ton)
Waste Characterization	2	sample	$ 750.00	$ 1,737.20	Engineering judgement, prior project experience
Air Monitoring	3	month	$ 10,000.00	$ 30,159.72	Engineering judgement, prior project experience
Odor Control	49	Drum	$ 125.00	$ 6,125.00	Engineering judgement, prior project experience
Dewatering and Treatment System (OS)	1	LS	$ 75,000.00	$ 75,000.00	Engineering judgement, prior project experience
Dewatering and Treatment System O&M	4	Month	$ 40,000.00	$ 160,000.00	Engineering judgement, prior project experience
Subtotal				$ 2,988,514.07	
Health & Safety - Level D	9%			$ 268,966.27	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%			$ 149,425.70	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	8%			$ 239,081.13	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%			$ 179,310.84	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	20%			$ 597,702.81	High end of sludge stabilization contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 4,423,000.82	

Operational & Maintenance Costs	
Subtotal O&M Costs	$ -
Percent Worth Factor (30 yrs @ 7%)	12.41
Total Present Worth O&M Cost	$ -

Rounded Total	**$ 4,423,000**

Assumptions

Excav Dimensions	43430	SF
Max Treatment Depth (ISS)	15	ft
Treatment Volume	24,128	CY
Pre-excavation depth	3.8	ft
Post-ISS restoration Height	0.8	ft
Post-ISS restoration Volume	1,206	CY
Material Process Rate (ISS)	500	CY/day
Disposal Volume/ Sample	2,500	CY
Debris	10%	
Swell	20%	
Odor Control	500	CY/Drum
Treatment Agent Mix (ISS)	10%	
Production Rate	300	CY/day
Duration	80.42592593	work days
Duration	4	months

1. A pre-ISS Excavation is completed to minimize swell removal and limit the maximum necessary reach of the ISS excavator.
2. 10% debris encountered in excavation.
3. Upon completion of ISS a post-ISS restoration is executed to restore the work surface to -2 ft bg in preparation for capping.
4. ISS via excavator mixing. Treatment depth limited by reach of excavator.
5. Assumes 20% swell
6. 0-2' bg accounted for in SS-OS-Exc

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Groundwater
Overall Scope Institutional Controls/Groundwater Use Restrictions
Media Groundwater

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Site Management Plan		1	LS	$ 10,000.00	$ 10,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 10,000.00	
Health & Safety - Level D	9%				$ -	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	15%				$ 1,500.00	Low end of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost					$ 11,500.00	
Operational & Maintenance Costs						
Periodic Review Report		1	LS	$ 1,500.00	$ 1,500.00	Engineering judgement, prior project experience
Subtotal O&M Costs					$ 1,500.00	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ 18,613.56	
Rounded Total					**$ 30,000**	

Client	Rochester Gas & Electric (RG&E)
Site	RG&E East Station Former MGP
Area	Groundwater - Overburden
Overall Scope	Monitored Natural Attenuation
Media	Groundwater

Capital Cost Items		**Quantity**	**Unit**	**Unit Cost**	**Total Cost**	**Source**
Well Replacement (2" PVC)		0	LF	$ 50.44	$ -	Engineering judgement, prior project experience
Subtotal Capital Costs					$ -	
Health & Safety - Level D	9%				$ -	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	20%				$ -	Mid-Range of extraction well contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost					$ -	

Operational & Maintenance Costs					
Engineer/Scientist	12	Hr	$ 114.00	$ 1,368.00	Typical Labor Rate
Misc. GW Sampling Equipment	1	Event	$ 200.00	$ 200.00	Engineering judgement, prior project experience
Analytical costs (GW MNA)	4	Sample	$ 234.00	$ 936.00	Laboratory Quote
Annual MNA report	1	EA	$ 7,500.00	$ 7,500.00	Engineering judgement, prior project experience
Well Replacement (2" PVC)	20	LF	$ 50.44	$ 1,008.80	Engineering judgement, prior project experience
Subtotal O&M Costs				$ 11,012.80	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ 136,658.29	

Rounded Total	**$ 137,000**

Assumptions

No. Sample Events/Yr =	1	
No. Samples/Event =	4	
No. Samples/Day =	4	
No. Days/Event =	1	
MW (OB)	4	wells
MW Depth (OB)	25	ft
MW Diameter (OB)	2	in
Soil Volume	0.73	CY
Well Replacement/Yr =	20	LF

Analytical Costs Include =		**$ 234.00**	
	VOCs - GW - Rush	$ 80.00	8260
	SVOCs - GW - Rush	$ 154.00	8270

1. Existing wells suitable and sufficient for groundwater monitoring
2. Analytical is for VOCs and PAHs for 4 wells per event
3. Well replacement at 1 Well/5 years

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Groundwater - Overburden
Overall Scope Passive NAPL Recovery
Media Groundwater

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Drilling)	1	LS	$ 500.00	$ 500.00	Drilling Quote
Engineer/Scientist	60	Hr	$ 114.00	$ 6,840.00	Typical Labor Rate
One-Call	1	LS	$ 135.00	$ 135.00	Drilling Quote
Well permit	10	each	$ 345.00	$ 3,450.00	Drilling Quote
4" Product Recovery Well	500	LF	$ 48.86	$ 24,429.20	Engineering judgement, prior project experience
12" Flush Mount Well Completions	10	ea	$ 450.00	$ 4,500.00	Engineer's estimate based on October 2013 Summit quote
Off-Site Soil T&D at Thermal Desorption Facility	9	tons	$ 100.00	$ 930.37	Typical NY T&D for off-site fixed facility thermal desorption
Storage drum, 55-gallon	10	ea	$ 70.00	$ 700.00	Drilling Quote
Subtotal Capital Costs				$ 41,484.57	
Health & Safety - Level D 9%				$ 3,733.61	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management 10%				$ 4,148.46	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting 20%				$ 8,296.91	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management 15%				$ 6,222.69	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency 20%				$ 8,296.91	Mid-Range of extraction well contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 72,183.15	
Operational & Maintenance Costs					
Engineer/Scientist	144	Hr	$ 114.00	$ 16,416.00	Typical Labor Rate
Storage drum, 55-gallon	10	ea	$ 70.00	$ 700.00	Drilling Quote
Product disposal	1	drum	$ 400.00	$ 484.85	Typical contaminated material drum disposal cost allowance
Contingency	30%			$ 5,280.25	High-Range of extraction well contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Subtotal O&M Costs				$ 22,881.10	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost			$283,932.55	$ 283,932.55	
Rounded Total				**$ 356,000**	

Assumptions

	1	gallon/month
NAPL Recovery Rate/well (OB)		
RW (OB)	10	wells
Annual NAPL Recovery	60	gallons
Drum Volume	55	gallons
RW Depth (OB)	50	ft
RW Diameter (OB)	4	in
Soil Volume	5.81	CY

System Checks/Yr = 12
Hours/Event = 12
Hours/Yr = 144

1. Only onsite overburden area treated.
2. Assumes well installation at a rate of 2 wells/day, 12 hrs/day.
3. An O&M contingency is included due to the scale of O&M cost
4. The mobilization includes: System power drop/hook up, system enclosure, and Header piping.
5. Drums considered full at 90% capacity
6. Recover volumes will be combined to minimize drum disposal

Client	Rochester Gas & Electric (RG&E)
Site	RG&E East Station Former MGP
Area	Groundwater - Bedrock
Overall Scope	Monitored Natural Attenuation
Media	Groundwater

Capital Cost Items		**Quantity**	**Unit**	**Unit Cost**	**Total Cost**	**Source**
Well Replacement (2" PVC)		0	LF	$ 50.44	$ -	Engineering judgement, prior project experience
Subtotal Capital Costs					$ -	
Health & Safety - Level D	9%				$ -	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	20%				$ -	Mid-Range of extraction well contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost					$ -	

Operational & Maintenance Costs					
Engineer/Scientist	12	Hr	$ 114.00	$ 1,368.00	Typical Labor Rate
Misc. GW Sampling Equipment	1	Event	$ 200.00	$ 200.00	Engineering judgement, prior project experience
Analytical costs (GW MNA)	4	Sample	$ 234.00	$ 936.00	Laboratory Quote
Annual MNA report	1	EA	$ 7,500.00	$ 7,500.00	Engineering judgement, prior project experience
Well Replacement (2" PVC)	10	LF	$ 50.44	$ 504.40	Engineering judgement, prior project experience
Subtotal O&M Costs				$ 10,508.40	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ 130,399.17	

Rounded Total	**$ 130,000**

Assumptions

No. Sample Events/Yr =	1	
No. Samples/Event =	4	
No. Samples/Day =	4	
No. Days/Event =	1	
MW (BR)	4	wells
MW Depth (BR)	50	ft
MW Diameter (BR)	2	in
Soil Volume	1.45	CY
Well Replacement/Yr =	10	LF

Analytical Costs Include =		**$ 234.00**	
	VOCs - GW - Rush	$ 80.00	8260
	SVOCs - GW - Rush	$ 154.00	8270

1. Existing wells suitable and sufficient for groundwater monitoring
2. Analytical is for VOCs and PAHs for 4 wells per event
3. Well replacement at 1 Well/5 years

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Sediment
Overall Scope Institutional Controls/River Use Restrictions
Media Sediment

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Environmental Easement		1	LS	$ 10,000.00	$ 10,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 10,000.00	
Health & Safety - Level D	9%				$ -	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ -	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	15%				$ 1,500.00	Low end of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost					$ 11,500.00	
Operational & Maintenance Costs						
Periodic Review Report		1	LS	$ 1,500.00	$ 1,500.00	Engineering judgement, prior project experience
Subtotal O&M Costs					$ 1,500.00	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ 18,613.56	
Rounded Total					**$ 30,000**	

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Sediment
Overall Scope Install Signs
Media Sediment

Capital Cost Items		Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Signage)		1	LS	$ 5,000.00	$ 5,000.00	Engineering judgement, prior project experience
Construction Layout Surveying		1	day	$ 2,673.85	$ 2,673.85	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Sign		6	ea	$ 50.00	$ 275.00	Engineering judgement, prior project experience
Sign Installation (barge)		1	LS	$ 5,000.00	$ 5,000.00	Engineering judgement, prior project experience
Subtotal Capital Costs					$ 12,948.85	
Health & Safety - Level D	9%				$ 1,165.40	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	10%				$ 1,294.89	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	20%				$ 2,589.77	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	15%				$ 1,942.33	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	5%				$ 647.44	Low end of surface grading contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost					$ 20,588.67	

Operational & Maintenance Costs						
Sign Replacement		1	LS	$ 2,000.00	$ 2,000.00	Engineering judgement, prior project experience
Subtotal O&M Costs					$ 2,000.00	
Percent Worth Factor (30 yrs @ 7%)					12.41	
Total Present Worth O&M Cost					$ 24,818.08	

Rounded Total	**$ 45,000**

Assumptions

Coast Length 1,375 ft

1. Assume no sediment removal. Install signs from barge.
2. Approximately 1 sign replaced on annual basis to account for vandalism.
3. One sign per 250 ft of coast

Client Rochester Gas & Electric (RG&E)
Site RG&E East Station Former MGP
Area Sediment
Overall Scope Excavate Sediment for Off-Site Disposal
Media Sediment

Capital Cost Items	Quantity	Unit	Unit Cost	Total Cost	Source
Mobilization/Demobilization (Dredge)	1	LS	$ 77,188.50	$ 77,188.50	35 24 23.13 0100; 2018 RS Means Heavy Construction Cost Data; City Cost Index, Rochester, NY
Construction Layout Surveying	2	day	$ 2,673.85	$ 5,347.70	01 71 23.13 1200, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Coffer Dam	59,400	SF	$ 34.81	$ 2,067,743.70	31 52 16.10 0020; 2018 RS Means Heavy Construction Cost Data; City Cost Index, Rochester, NY
Double Silt Curtain	1,375	LF	$ 252.25	$ 346,843.75	35 49 13.30 0740; 2018 RS Means Heavy Construction Cost Data; City Cost Index, Rochester, NY
Debris Disposal	371	ton	$ 50.00	$ 18,527.78	Typical NY T&D for off-site debris
Dredge Impacted Sediments & Transport to Shore	2,470	cy	$ 25.73	$ 63,561.39	35 24 23.13 0400; 2018 RS Means Heavy Construction Cost Data; City Cost Index, Rochester, NY
Waste Characterization	1	sample	$ 750.00	$ 741.11	Engineering judgement, prior project experience
Dewatering Pad	1	LS	$ 100,000.00	$ 100,000.00	Engineering judgement, prior project experience
Manage, Condition & Load Impacted Sediments	2,470	cy	$ 11.75	$ 29,038.83	35 24 13.13 1000; 2018 RS Means Heavy Construction Cost Data; City Cost Index, Rochester, NY
Off-Site Soil Transportation & Disposal	3,706	tons	$ 62.50	$ 231,597.22	Cost averaging between off-site landfill (75% at $50/ton) and off-site thermal (25% at $100/ton)
Surface Water Boom	1,375	LF	$ 40.00	$ 55,000.00	Engineering judgement, prior project experience
Sand/gravel backfill, rolling compactor, 12" layers	0	cy	$ 42.13	$ -	31 23 23.13 0900, 2018 RS Means Heavy Construction Cost Data; Rochester, NY City Cost Index
Backfill - Rip Rap (Material & Placement)	2,470	CY	$ 68.11	$ 168,250.75	31 37 13.10 0100; 2018 RS Means Heavy Construction Cost Data; City Cost Index, Rochester, NY
Air Monitoring	2	month	$ 10,000.00	$ 20,000.00	Engineering judgement, prior project experience
Odor Control	5	Drum	$ 125.00	$ 625.00	Engineering judgement, prior project experience
Subtotal Capital Costs				$ 3,184,465.74	
Health & Safety - Level D	9%			$ 286,601.92	2005 RS Means Environmental Remediation Cost Data; 82% labor efficiency, 100% equipment efficiency
Project Management	5%			$ 159,223.29	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Project Management
Design and Permitting	8%			$ 254,757.26	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Remedial Design
Construction Management	6%			$ 191,067.94	EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-0002, Exhibit 5-8, Construction Management
Contingency	35%			$ 1,114,563.01	Mid-Range of excavation contingency. EPA/ACOE FS Cost Guide July 2000, EPA 540-R-00-002, Exhibit 5-6
Total Capital Cost				$ 5,190,679.15	
Operational & Maintenance Costs					
Subtotal O&M Costs				$ -	
Percent Worth Factor (30 yrs @ 7%)				12.41	
Total Present Worth O&M Cost				$ -	
Rounded Total				**$ 5,191,000**	

Assumptions

Dredge Area Dimensions (sq ft)	66700	
Coast Length (ft) =	1375	
Excav Depth (ft) =	1	
Dredge Volume (cy) =	2470	
Coffer Dam Perimeter	2970	ft
Coffer Dam Depth	20	ft
Coffer Dam Area	59400	SF
Restoration =	1 ft 4-8 inch rip rap over common borrow	
Odor Control	500	CY/Drum
Disposal Volume/ Sample	2500	CY
Production Rate	200	CY/day

1. Surface water boom and silt curtain costs include installation, maintenance, monitoring, removal and disposal
2. 10% debris encountered in excavation.
3. Both Sand/Gravel backfill and Rip Rap backfill must = 0 when combined with subaqueous cap
   Sand/Gravel backfill and Rip Rap backfill must cumulatively = dredge volume when not combined with subaqueous cap