FOCUSED FEASIBILITY STUDY REPORT
SARANAC LAKE GAS COMPANY, SITE # 516008
OPERABLE UNIT NO. 02

WORK ASSIGNMENT NO. D007619-23

Prepared for:

New York State Department of Environmental Conservation
Ray Brook, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3612132271

AUGUST 2015

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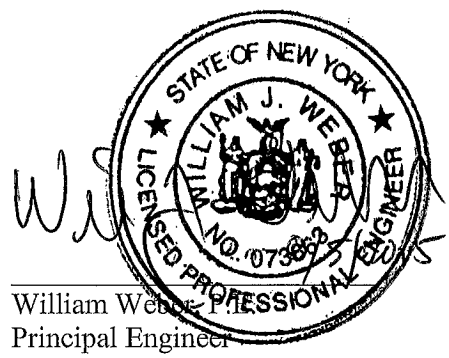

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Principal Engineer

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CAMP	Community Air Monitoring Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	contaminants of concern
cy	cubic yard
EC	engineering control
FFS	Focused Feasibility Study
ft	foot/feet
FS	Feasibility Study
IC	institutional control
ITRC	Interstate Technology Regulatory Council
MACTEC	MACTEC Engineering and Consulting, P.C.
MGP	manufactured gas plant
NYCRR	New York Codes, Rules, and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
OMB	Office of Management and Budget
OU	operable unit
PAHs	polycyclic aromatic hydrocarbons

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PID	photoionization detector
ppm	part(s) per million
PW	present worth
RAO	Remedial Action Objective
Report	Focused Feasibility Study Report
RI	Remedial Investigation
ROD	Record of Decision
SCGs	standards, criteria, and guidance values
SGV	Sediment Guidance Value
Site	Saranac Lake Gas Company site
SVOC	semivolatile organic compound
t(16) PAH	target compound list of 16 PAHs
t(34) PAH	complete list of 34 PAHs
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WA	work assignment

1.0 INTRODUCTION

This Focused Feasibility Study (FFS) Report (Report) has been prepared by MACTEC Engineering and Consulting, P.C. (MACTEC), in response to Work Assignment (WA) No. D007619-23 from the New York State Department of Environmental Conservation (NYSDEC) for Operable Unit (OU) 02 (Brandy Brook) of the former Saranac Lake Gas Company site (Site) in the Village of Saranac Lake of North Elba, Essex County, New York (Figure 1.1).

The FFS has been conducted in accordance with the WA, as well as with applicable portions of the following documents:

- NYSDEC DER-10 "Technical Guidance for Site Investigation and Remediation" (NYSDEC, 2010)
- 6 New York Codes, Rules and Regulations (NYCRR) Part 375 "Environmental Remediation Programs"
- United States Environmental Protection Agency (USEPA) "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (USEPA, 1988)

The site is a Class 2 site. The remedial investigation (RI) completed by MACTEC in 2015 (MACTEC, 2015) concluded that manufactured gas plant (MGP)-related contamination was detected in Brandy Brook sediments, and remedial action is necessary for unrestricted use.

1.1 PURPOSE

The purpose of this study is to develop and evaluate remedial action alternatives for MGP-related contaminants detected in Brandy Brook (OU02) sediments.

The approach to the FFS involves integration of data and conclusions presented in the RI Report (MACTEC, 2015), with development, screening, and evaluation of proposed remedial alternatives from engineering, environmental, public health, and economic perspectives. This Report is organized into the following sections.

- Section 1.0 – Introduction

- Section 2.0 – Summary and Conclusions of OU02 Remedial Investigation
- Section 3.0 – Development of Remedial Action Goals and Objectives
- Section 4.0 – Identification of General Response Actions and Extent of Contamination Requiring Remedial Action
- Section 5.0 – Identification and Screening of Technologies
- Section 6.0 – Development and Screening of Alternatives
- Section 7.0 – Detailed Analysis of Alternatives
- Section 8.0 – Comparative Analysis
- Section 9.0 – References

2.0 SUMMARY AND CONCLUSIONS OF THE REMEDIAL INVESTIGATION

The RI Report (MACTEC, 2015) documents the investigation activities completed from August 2013 through October 2014 at the Site for all OUs (as shown in Figure 1.1):

- OU01 - Site property (the former MGP property);
- OU02 - Brandy Brook (the section of brook from OU01 to Pontiac Bay in Lake Flower); and
- OU03 – Pontiac Bay of Lake Flower.

The former Saranac Lake Gas Company manufactured lighting gas through the coal gasification process for the Village of Saranac Lake. According to Sanborn insurance maps and photos obtained from the Saranac Lake Free Library, the gas company likely operated until the 1930s or 1940s and included two above-ground gas holders, a building housing the purifier and retort (heating) operations, as well as additional areas for coal storage and offices.

Based on the operational age of this MGP site, the most likely method of gas manufacturing was via the Carbureted Water Gas process. In general, this method involved:

- Coal was heated in closed retorts in which the coal was prevented from combusting by limiting oxygen.
- Steam was injected into the retort during the heating process and a chemical reaction occurred that produced a flammable gas mixture.
- Liquid petroleum hydrocarbons were sprayed into the hot gas mixture creating additional methane.
- The gas was collected, cooled, and purified before being used.
- Condensed tar (coal tar) was produced as a by-product.

Brandy Brook flows through OU01 and continues in a northerly direction for approximately 1,000 feet (ft) then turns to the west and flows for 700 ft, where it discharges to Pontiac Bay in Lake Flower. The section of the brook that turns to the west is culverted under a railroad crossing and culverted again under three driveway crossings and below Slater Avenue and Lake Flower Avenue. The driveway crossings range from 8 to 20 ft long and the culverted section below Slater Avenue and Lake Flower Avenue is approximately 250 ft long. The brook channel is approximately 3 to 5 ft wide. The bottom is scoured fine to medium sand, with pockets of mucky organic material in low

lying depositional areas. In places of high water flow and where flow through the brook is more channelized, the bottom of the brook is comprised of predominantly gravel and cobbles. The channel is well entrenched with undercut banks for nearly its entire length. Trees, branches, woody debris, and detritus were observed in the stream channel in multiple locations along the brook.

The brook provides habitat for aquatic invertebrates, amphibians, reptiles and minnows. Several green frogs and minnows were observed in the brook during an August 2013 site visit by MACTEC personnel. In addition, terrestrial wildlife observed on-site including birds, raccoons, and deer would also likely use the brook as a water source, as it appears to have perennial flow. Raccoon tracks were observed along the brook and raccoons are likely foraging for food in the brook (i.e., frogs and invertebrates).

Investigations conducted between 2007 and 2014 revealed the presence of MGP-related contamination within OU01 soil and groundwater; OU02 sediment in Brandy Brook east of the Adirondack Scenic Railroad, and to a much lesser extent, to the west of the Adirondack Scenic Railroad; and OU03 sediment within Pontiac Bay and extending further into Lake Flower.

Contaminants of Concern: The by-products resulting from manufacturing of coal gas contain a number of different chemical constituents that are a cause for concern when left untreated in the environment. The following contaminants of concern (COCs) are a result of the coal tar producing MGP process:

- Coal tar includes two predominant contaminant classifications, volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs).
- MGP-related VOCs are specifically characterized by four compounds: benzene, toluene, ethylbenzene and xylene (BTEX compounds). BTEX compounds often represent a small percentage of the mass of MGP-related waste, but are the most soluble and therefore are the most likely to migrate in groundwater. BTEX are also the most volatile and are thus the most likely to migrate through subsurface soils as vapors or soil gas.
- SVOCs found in coal tar are known as polycyclic aromatic hydrocarbons (PAHs). Although PAHs in the environment may originate from a variety of sources other than MGP waste, naphthalene is the most abundant singe constituent of coal tar (Merck Index, 1996). Therefore, naphthalene was used as an indicator compound for MGP-related waste during this RI.

OU02 Sediment Results: Section 4.2 of the RI Report (MACTEC, 2015) presents the findings of the OU02 RI. OU02 sediment throughout Brandy Brook showed evidence of impact from MGP-related contamination. PAH concentrations in OU02 exceed both the Class A and B Sediment Guidance Values (SGVs) and meet the definition of Class C sediments, which are "considered highly contaminated and likely to pose a risk to aquatic life" as set forth in NYSDEC Guidance Document titled "Screening and Assessment on Contaminated Sediment," issued June 24, 2014. As discussed in the RI report, samples were collected and analyzed prior to NYSDEC's adoption of the contaminated sediment guidance document and SVOC samples were not analyzed for the complete list of PAHs which includes 34 (t(34) PAH) on which the SGVs are based; rather, samples were analyzed for the Target Compound List of PAHs which includes 16 of these compounds (t(16)PAH). this correction factor will be applied to sample results if the selected remedy

Due to the nature of MGP-related waste, field observations (including visual, olfactory and photoionization detector [PID] field scan responses) are often used as a primary characterization tool to assess the extent of contamination in soil and sediment. For the RI, protocols were established to characterize subsurface samples using field observations and these were supplemented with analytical data collected to confirm the presence of waste and provide data to compare with regulatory guidance and criteria and to identify and or eliminate other potential sources.

Sediment sampling was conducted in areas of Brandy Brook (OU02) presumed to contain MGP-impacted wastes in two phases. Phase I sediment samples SD-101A through SD-105A and test borings TB-1 through TB-44 were collected using hand tools (e.g. hand geoprobe, hand auger) to depths ranging from three to 16 feet below ground surface (bgs). In addition, six equally spaced borings were completed with a direct push drill rig to depths of approximately 16 feet bgs during the Phase II field activities. Phase II sediment samples (SD-200 through SD-205) were collected using a four-foot long, two inch diameter core sampler lined with acrylic liners for discrete subsurface sediment. A predesign investigation will be implemented during the remedial design phase to refine the estimated extent of contaminated sediment/soil and post remediation confirmation sampling will be conducted during remedial action for the t(34) PAHs.

Dense non-aqueous phase liquid product and/or staining was present in 18 of the 44 test borings completed during the RI. The interpreted horizontal extent of impacted sediment in excess of Class A SGVs within OU02 is presented on Figures 4.5 (PAHs) and 4.6 (BTEX) from the RI, and are

included herein in Appendix A for reference. MGP-related contamination was generally observed from the surface to approximately three ft bgs in Brandy Brook and the associated wetland. Increased concentrations, volume and depth of MGP-related contamination were detected in depositional areas in Brandy Brook (i.e. areas where stream flow velocity is reduced). As shown on the RI Figures 4.5 and 4.6 in Appendix A, MGP-impacted sediment was not visually observed in one section of the stream. This is most likely due to the stream channel flow path changing (i.e. meandering) after deposition of the MGP-related materials. The volume of MGP-impacted sediment at concentrations exceeding Class A SGVs within OU02 is estimated to be approximately 4,800 cubic yards (cy) (Appendix B). In addition to MGP-related contaminants, lead was detected in one sample location and pesticides were detected in four sample locations at concentrations in excess of applicable standards. Neither lead nor pesticides are considered to be Site-related contaminants of concern.

OU02 Soil Results: Three soil borings were advanced in OU02 between four and six ft horizontally from the center of Brandy Brook. There was no visual evidence of MGP impacts in these borings and although PAHs were detected, naphthalene was not detected. Therefore, these PAHs may not be Site-related.

OU02 Surface Water Results: Three surface water samples were collected from Brandy Brook, downstream from OU01. These samples were collected within areas of known sediment contamination and at the bottom of the water column in order to target the likely highest concentrations of MGP-related compounds in surface water. No Site-related compounds were detected in OU02 surface water at concentrations above their applicable SCGs.

OU02 Groundwater Results: Four groundwater samples were collected from within OU02 as part of the RI. Naphthalene and one or more of the BTEX compounds were detected exceeding their SCG at sample location MW-201 (Appendix A, Figure 4.6). As discussed in the RI, groundwater from the northern portion of OU01 is likely flowing northwestward towards Pontiac Bay (OU03) in Lake Flower. Groundwater beneath OU01 flows mostly southward towards the McKenzie Brook watercourse and associated wetlands and small feeder ponds OU02; however, a portion of OU01 groundwater was determined to flow northward towards Brandy Brook, therefore, groundwater contamination observed in OU02 may be in part migrating from OU01 and will be addressed in the FFS for OU01.

3.0 DEVELOPMENT OF REMEDIAL ACTION GOALS AND OBJECTIVES

The RI concluded that under current and projected future use scenarios, complete exposure pathways for sediment include:

1. Direct contact with the MGP waste in Brandy Brook sediments for area residents and tourists who may visit or access the area for recreational use; and
2. Potential impacts to fish and wildlife resources from sediment-related exposures to MGP waste.

As previously described, there are currently no MGP impacts to surface water within Brandy Brook and therefore surface water does not require remediation. However, it is possible that under extreme weather conditions, high flows, or subsurface disturbance, impacted sediments could cause surface water impacts within the brook and possibly in downgradient Pontiac Bay and Lake Flower. This potential impact will be addressed during remedial design.

Remedial Action Objectives (RAOs) for sediment at OU02 are:

- Restore brook and wetland sediments to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent or eliminate direct exposure to MGP waste and contaminated sediments by human receptors.
- Prevent or eliminate, to the extent practicable, exposure of fish and wildlife to MGP tar and contaminated sediments.
- Prevent or eliminate, to the extent practicable, impacts to biota from ingestion/direct contact with MGP tar and contaminated sediments.
- Prevent surface water contamination during remedial action implementation from MGP tar and contaminated sediments that may result in a discharge to Lake Flower resulting in fish advisories or preventing use of the Lake as an alternate drinking water source.
- Prevent releases of contaminants from sediments during remedial action implementation that would result in surface water levels in excess of NYS Class A Surface Water Quality Standard (Class A SW Criteria).

Further, the remediation goals for OU02 include attaining to the extent practicable the following action-specific standards, chemical-specific standards, criteria, and guidance values (SCGs):

- Class A SGVs for freshwater sediment, specifically a maximum of 4 parts per million (ppm) of total PAHs (NYSDEC, 2014),
- Soil Cleanup Objectives (6 NYCRR Part 375)
- Maintain surface water concentrations of MGP-related contaminants below the Class A SW Criteria.
- Restore the stream and riparian habitat to pre-remediation conditions.

4.0 IDENTIFICATION OF GENERAL RESPONSE ACTIONS AND EXTENT OF CONTAMINATION REQUIRING REMEDIAL ACTION

Site-specific RAOs, presented in Section 3, were developed to address the contamination requiring remedial action for OU02 sediment. General response actions describe those actions that will satisfy the RAOs (USEPA, 1988). General response actions may include treatment, containment, excavation, disposal, institutional actions, or a combination of these. Like RAOs, general response actions are media-specific. The general response actions presented in the following subsections have been developed to address sediment contamination at OU02.

4.1 GENERAL RESPONSE ACTIONS

The following general response actions would address the RAOs identified for OU02 sediment:

- Access Restrictions
- Monitored Natural Recovery
- In-Situ Treatment
- Containment
- Removal

These general response actions are appropriate for sediment contamination requiring remediation. No Action will also be evaluated for the use of comparing baseline conditions to general response actions and remedial alternatives.

4.2 CONTAMINATION REQUIRING REMEDIAL ACTION

Figures 4.5 and 4.6 of the RI Report (see Appendix A) present the distribution of visually impacted MGP-related sediment contamination within OU02. As discussed in the RI Report, field observations (including visual, olfactory, and PID field scan responses) supplemented with analytical data were used to evaluate the presence of MGP tar or stained sediment, typically indicative of total PAH concentrations exceeding the Class A SGVs (4 ppm). Therefore, in order to meet the SCGs (Class A SGVs and the SCOs), it is estimated that remediation will be required within an approximate 29,000 square ft area along a stretch of Brandy Brook. Based upon RI sample results, MGP-related

contamination in sediment was generally observed from the surface to approximately three feet deep in Brandy Brook and the associated wetland. Depositional areas in Brandy Brook (i.e. areas where stream flow velocity is reduced) were observed to have increased concentrations, volume and depth of MGP-related contamination as compared to non-depositional areas. This results in a total volume of impacted sediments of approximately 4,800 cubic yards (cy) along the 1,700-ft stretch of brook, which is equivalent to an average depth of approximately 4.5 feet.

5.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section presents the identification and screening of potential remedial technologies. Technologies are identified for the purpose of attaining the RAOs established in Section 3.

Following identification, candidate technologies are screened based on their applicability to site- and contaminant-limiting characteristics. The purpose of the screening is to produce an inventory of suitable technologies that can be assembled into remedial alternatives capable of mitigating actual or potential risks at the Site. Potential technologies representing a range of general response actions are considered. The result of technology screening is a list of potential remedial technologies that may be developed into candidate remedial alternatives.

5.1 TECHNOLOGY IDENTIFICATION

Table 5.1 lists remedial technologies and associated process options identified for screening. These technologies were identified based on USEPA's guidance for Conducting RI/FS (USEPA, 1988), Interstate Technology Regulatory Council's (ITRC) guidance for Remedy Selection for Contaminated Sediments (ITRC, 2014) and on experience preparing feasibility study (FS) documents and performing site remediation.

5.2 TECHNOLOGY SCREENING

The technology screening process reduces the number of potentially applicable technologies and process options by evaluating factors that may influence process-option effectiveness and implementability. This overall screening is consistent with guidance for conducting an FS under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (USEPA, 1988). Effectiveness and implementability are incorporated into two screening criteria: waste- and site-limiting characteristics. Waste-limiting characteristics consider the suitability of a technology based on contaminant types, individual compound properties (e.g., volatility, solubility, specific gravity, adsorption potential, and biodegradability), and interactions that may occur between mixtures of compounds. Site-limiting characteristics consider the effect of site-specific physical features on the implementability of a technology, such as site topography and geology, the location

of buildings and underground utilities, available space, and proximity to sensitive operations. Technology screening serves a two-fold purpose of screening out technologies whose applicability is limited by site-specific waste or site considerations, while retaining as many potentially applicable technologies as possible.

Table 5.1 presents the technology-screening process. Technologies and process options judged ineffective or prohibitively difficult to implement were eliminated from further consideration. The technologies retained following screening represent an inventory of technologies considered most suitable for remediation of sediment at the Site and may be used alone or integrated with other technologies to develop remedial alternatives. Pilot-scale treatability studies may be required prior to final technology selection to evaluate the effectiveness of a given technology.

The technologies that have been retained for further evaluation for the remediation of sediment in Brandy Brook through the technology-screening process are:

- No Action – Required as a baseline condition to compare to other technologies
- Excavation – Retained to be carried through detailed analysis of alternatives.

6.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

The retained technologies are considered technically feasible and applicable to the waste types and physical conditions at OU02. These technologies were assembled into potential Site-specific remedial alternatives capable of achieving the RAOs for the contaminated media requiring remediation.

6.1 DEVELOPMENT OF REMEDIAL ALTERNATIVES FOR THE SITE

Table 6.1 presents a screening of the remedial alternatives described above. Consistent with DER-10, the developed medium-specific remedial alternatives were screened on the basis of whether they are technically implementable for OU02 (Implementability) and whether they have the ability to meet the RAOs (Effectiveness). Additionally, based upon available information, the relative cost of each remedial alternative is also evaluated. Those remedial alternatives which are not technically implementable, would not achieve RAOs for the Site, or would incur costs significantly higher than other remedial alternatives without providing greater effectiveness or implementability, will not be evaluated further.

6.1.1 No Action

This alternative will be used as a baseline for comparison to other remedial alternatives. No action would be taken to address contaminated sediment in Brandy Brook. No Action will be retained as Alternative 1.

6.1.2 Excavation

Excavation of impacted sediments in the brook would involve diverting surface water flow of the brook from the work area, clearing and grubbing, construction of an access road, dewatering as necessary and treatment of dewatered effluent, excavation, and ex-situ solidification of excavated material, transportation and disposal, and restoration of the brook and associated work areas.

Excavation alternatives retained for detailed analysis include:

- Alternative 2A – Excavation of Soil and Sediment to Meet SCGs.
- Alternative 2B – Excavation of Soil and Sediment to Meet Pre-Release Conditions.

7.0 DETAILED ANALYSIS OF ALTERNATIVES

The detailed analysis of each remedial action alternative for OU02 sediment was performed using the evaluation criteria identified in DER-10 (NYSDEC, 2010), Subpart 375-1.8(f) (NYS, 2006), and DER-31 (NYSDEC, 2011). The evaluation includes, where appropriate, a discussion of limitations, assumptions, and uncertainties for each evaluation criteria and provides a conceptual design of each alternative to support an alternatives-comparison and cost-estimation. Evaluation criteria include:

- Compliance with Standards, Criteria and Guidance
- Overall Protection of Public Health and the Environment
- Short-term Impacts and Effectiveness
- Long-term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, or Volume with Treatment
- Implementability
- Land Use
- Cost-Effectiveness
- Sustainability / Green Remediation (DER-31)

Compliance with Standards, Criteria, and Guidance. Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. SCGs for the Site will be listed along with a discussion of whether or not the remedy will achieve compliance. For those SCGs that will not be met, there will be a discussion and evaluation of the impacts of each, and whether waivers are necessary. Chemical-Specific SCGs were identified in Section 3. Table 7.1 summarizes the list of applicable SCGs used in the evaluation of alternatives. Location- and Action-Specific SCGs will be identified for each alternative in this Section.

Overall Protection of Public Health and the Environment. This criterion is an evaluation of the remedy's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, engineering controls (ECs) or institutional controls (ICs). The remedy's ability to achieve each of the RAOs will be evaluated.

Short-term Impacts and Effectiveness. The potential short-term adverse impacts and risks of the remedy upon the community, the workers, and the environment during the construction and/or implementation are evaluated. A discussion of how the identified adverse impacts and health risks to the community or workers at the Site will be controlled, and the effectiveness of the controls, will be presented, along with a discussion of ECs that will be used to mitigate short term impacts (e.g., contaminant migration/odor control measures). The length of time needed to achieve the remedial objectives will be estimated.

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

1. magnitude of remaining risks
2. adequacy of the ECs/ICs intended to limit the risk
3. reliability of these controls
4. ability of the remedy to continue to meet RAOs in the future

Effectiveness of alternatives in protecting human health and the environment after RAOs are met will be evaluated. This will include an evaluation of the permanence of the alternative, the magnitude of residual risk, and the adequacy and reliability of controls required to manage wastes or residuals remaining at the Site.

Reduction of Toxicity, Mobility, or Volume with Treatment. The remedy's ability to reduce the toxicity, mobility or volume of site contamination will be evaluated. Preference will be given to remedies that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the Site.

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

Land Use. The current, intended, and reasonably anticipated future land uses of the Site and its surroundings will be considered in the evaluation of remedial alternatives.

Cost-Effectiveness. Capital and Site Management costs, including Operation, Maintenance and Monitoring costs, will be estimated for the remedy and presented on a present worth (PW) basis.

Sustainability / Green Remediation (DER-31). DER-31 (NYSDEC, 2011) includes applying green remediation concepts, such as minimizing energy consumption, reducing greenhouse gas (GHG) emissions, maximizing the reuse of land and the recycling of materials, and conserving natural resources such as soil, water and habitat to the extent possible while still implementing remedies that are protective of public health and the environment.

7.1 COST ANALYSIS PROCEDURES

Estimated costs presented in this Report are intended to be within the target accuracy range of minus 30 to plus 50 percent of actual cost (USEPA, 1988). Costs are presented as a PW and as a total cost for up to a 30-year period.

A summary of the costs for each alternative identifying capital and PW costs are included in each alternative's cost description. Each cost estimate includes a PW analysis to evaluate expenditures that occur over different time periods. The analysis discounts future costs to a PW and allows the cost of remedial alternatives to be compared on an equal basis. PW represents the amount of money that, if invested now and disbursed as needed, would be sufficient to cover costs associated with the remedial action over its planned life. A discount rate of 3.4 percent, as published by the Office of Management and Budget (OMB), was used to prepare the cost estimates (OMB, 2014).

Consistent with USEPA FS cost estimating guidance (USEPA, 2000), the remedial alternative cost estimates include costs for project management, remedial design, construction management, technical support, and scope contingency.

Project management includes planning and reporting, community relations support during construction or Operation and Maintenance (O&M), bid or contract administration, permitting (not

already provided by the construction or O&M contractor), and legal services outside of ICs. Project management cost are generally between 5 and 10 percent of total direct costs.

Remedial design cost includes cost for pre-design collection and analysis of field data, engineering survey for design, treatability study/pilot-scale testing, and the various design components such as design analysis, plans, specifications, cost estimate, and schedule. Remedial design cost is generally between 6 and 20 percent of total direct costs. For the purpose of this FFS, sediment transportation & disposal costs were subtracted from the total direct costs of each alternative prior to assigning the appropriate percentages to remedial design because the overall quantity of sediment to be disposed should not impact the design.

Construction management cost includes costs associated with services to manage construction or installation of the remedial action, except similar services provided as part of regular construction activities. Activities include review of submittals, design modifications, construction observation or oversight, engineering survey for construction, preparation of O&M manual, documentation of quality control/quality assurance, and record drawings. Construction management cost is generally between 6 and 15 percent of total direct costs.

Technical support during O&M includes services to monitor, evaluate, and report progress of remedial action. This includes oversight of O&M activities, update of O&M manual, and progress reporting and is generally between 10 percent and 20 percent of total annual O&M costs depending on complexity of the remedial action (USEPA, 2000).

Scope contingency represents project risks associated with the feasibility-level of design presented in this Report. This type of contingency represents costs, unforeseeable at the time of estimate preparation, which are likely to become known as the remedial design proceeds. Scope contingency ranges from 10 to 25 percent, with higher values appropriate for alternatives with greater levels of cost growth potential (USEPA, 2000). A contingency of 20% was added to each of the alternatives described herein.

Project management, remedial design, and construction management costs, related to implementation of the chosen remedial alternative, presented in this Report are based upon the following matrix presented in the USEPA FS cost estimating guidance (USEPA, 2000).

Professional and Technical Costs as Percentage of Direct Costs					
Indirect Cost	< $100K (%)	$100K-$500K (%)	$500K-$2M (%)	$2M-$10M (%)	>$10M (%)
Project Management	10	8	6	5	5
Remedial Design	20	15	12	8	6
Construction Management	15	10	8	6	6

7.2 GENERAL ASSUMPTIONS

Alternative-specific details and assumptions pertaining to the cost estimates are included in each alternative's cost description. In addition to the alternative-specific assumptions, the following is a list of assumptions that are carried through from the screening of technologies phase to the comparison of remedial alternatives:

- RI results for OU02 surface water meet applicable SCGs; therefore, remedial action for surface water is not necessary. However, it is possible that the selected remedy to address the sediments may cause migration of contaminants into the surface water. Therefore, flow from the brook will be diverted from the work area. In addition, dewatering and water treatment will be used as necessary to prevent accumulated water from flowing downstream to Lake Flower during remediation. Monitoring will be included in the remedial design in order to adhere to water quality standards during implementation.
- If remedial actions for OU03 are conducted prior to or concurrent with OU02 care will need to be taken during implementation of OU02 to prevent migration of contaminants to OU03.
- Sediment cleanup levels will need to meet the definition of Class A SGVs within the upper two ft of sediment to prevent exposure to humans, fish, and biota. Regardless of the chosen remedy, the top two ft of the brook's bathymetry will be restored with clean in-kind habitat substrate per DER-10.
- A contingency of 20 percent has been added to the total quantity of impacted sediment to address potential for MGP-impacted sediment and soil being present deeper than observed during RI investigation and/or within adjacent banks of the Brook.
- Confirmation sampling will be conducted. The sample frequency will be determined during remedial design. A rate of one sample per 50 linear ft at the bottom of the stream for excavation scenarios, and 2 samples every 100 linear ft on each stream bank was used for costing purposes. Additional remediation will be conducted as required based on results of laboratory data.

- Waste characterization sampling will be conducted at a rate of one sample per 1,000 cy, or more frequently if required by the disposal facility.
- The remedial activities will be conducted during the fall and winter seasons when flow from the brook is low and odors will be less pronounced. The timing of the activities will be coordinated with the Division of Fish, Wildlife and Marine Resources as well as with the Adirondack Scenic Railroad that operates during a portion of the year. These coordination activities will occur during the design phase of the project.
- A sanitary sewer line is located adjacent to and within a portion of the brook, which may be replaced concurrent with remedial activities in OU02. Remedial design will take this into consideration and will coordinate efforts with the design engineer for the new sanitary sewer line.
- Air monitoring and odor control will be conducted as part of the chosen remedial alternative, which will be described in detail in a Community Air Monitoring Program (CAMP).
- NYSDEC will coordinate with the public and landowners to secure access along the length of the brook requiring remediation.
- Remediation of OU02 will be conducted prior to OU01, and the OU01 property will be used for storage of construction equipment, temporary treatment systems, and stockpiling areas.
- For the purpose of cost estimating, transportation, treatment and disposal of sediments will be treated at a thermal desorption facility. However, depending on timing of remediation for OU3, OU2 and OU1, there is potential for cost savings by using a mobile thermal desorption facility on-site. These closed systems can provide significant cost savings depending on the overall quantity of sediment that requires remediation. This would also be considered more sustainable since some of the treated sediment would be able to be reused as backfill instead of imported fill.
- Pre-design investigations will include an evaluation of soil impacts around the culvert between Slater Avenue and Lake Flower. However, for costing purposes it has been assumed remediation will not include soils around this culvert, but will include removal of sediment inside the culvert.

The following subsections present a conceptual design and cost estimate for each of these remedial alternatives and a discussion of each alternative relative to the evaluation criteria as set forth in DER-10 (NYSDEC, 2002a). Figure 7.1 depicts the extent of sediment/soil contamination to be addressed under Alternatives 2A and 2B.

7.3 ALTERNATIVE 1: NO ACTION

This alternative does not include actions to address sediment/soil contamination at OU02 at concentrations above SCGs.

Compliance with Standards, Criteria, and Guidance. This alternative will not meet Chemical-Specific SCGs because it would not address sediment/soil contamination in excess of the Class A SGV for total PAHs of 4 ppm or the SCOs. This alternative will not trigger Location- or Action-Specific SCGs.

Overall Protection of Public Health and the Environment. This remedial alternative will not protect public health and the environment through eliminating, reducing, or controlling existing or potential exposure pathways through removal, treatment, ECs, or ICs. This remedial alternative will not achieve the RAOs for sediment/soil.

Short-term Effectiveness. Because no actions will be taken, this alternative will not result in short-term adverse impacts and risks to the community, site workers, and the environment, but will also not provide shot-term effectiveness.

Long-term Effectiveness and Permanence. This alternative will not include actions to address contaminated sediments/soil at and in the vicinity of the brook. This remedy does not currently meet RAOs for sediment/soil and, due to the properties of the Site-specific COCs (i.e., longevity of non-aqueous phase liquid), will not be expected to meet RAOs in the future.

Reduction of Toxicity, Mobility, or Volume with Treatment. This alternative will not result in the reduction of toxicity, mobility, or volume of sediment/soil contamination through treatment.

Implementability. No actions would be conducted, therefore there are no technical difficulties associated with this alternative. However, obtaining regulatory and/or public approval of this alternative would be difficult.

Land Use. The current and reasonably anticipated future land use of OU02 is for commercial and residential use. Because no actions will be conducted for this alternative and there will be no restrictions to future use, this alternative will not be protective of the public or the environment.

Cost. There are no costs associated with this alternative.

Sustainability / Green Remediation (DER-31). No action does not require energy or create GHG emissions and does not deplete natural resources. However, this alternative is not protective of public health and the environment.

7.4 ALTERNATIVE 2: EXCAVATION

Excavation alternative includes two scenarios that result in variable costs as well as overall effectiveness:

- Alternative 2A – Excavation of Soil and Sediment to Meet SCGs.
- Alternative 2B – Excavation of Soil and Sediment to Meet Pre-Disposal Conditions

The primary difference between the two excavation scenarios is the size of the excavation area and overall quantity of excavated sediment/soil. The primary components of each excavation scenario in Alternative 2 include:

- pre-design investigations and studies
- mobilization of temporary facilities and controls
- brook diversion
- placement of dams and dewatering systems as applicable
- excavation of sediment/soil
- ex-situ solidification of excavated sediment/soil and further dewatering
- treatment of dewatering effluent from excavations and sediment/soil stockpiles prior to downgradient discharge
- transportation and disposal of excavated sediment/soil
- restoration
- long-term monitoring

7.4.1 Detailed Description of Alternatives 2A and 2B

Pre-Design Investigations and Studies. Pre-design investigations and/or studies would be conducted to support the remedial design, and would include, but not be limited to:

- additional investigation of sediment and soil to complete the horizontal and vertical delineation of MGP impacts;

- investigation of sediment inside and/or beneath culverts and in the vicinity of the adjacent sewer line (see Figure 7.1);
- investigation of potential contamination in the soils surrounding the culvert between Brandy Brook and Lake Flower;
- full bathymetric survey of the remedial area;
- characterization of the habitat substrate material in order to replace in-kind;
- geotechnical investigations for bank stability design.

Further investigations will be required to refine the horizontal and vertical delineation of MGP impacts. Pre-design investigations will be collected for both field observations and analytical testing of t(34)PAHs.

Investigation of sediment within and surrounding culverts in OU02 will be required to evaluate the presence of MGP-impacted sediment inside or around the culverts prior to removal (residential driveways) or cleanout (culvert from Slater Avenue to Lake Flower and under railroad tracks). Investigation of soil around the culvert from Slater Avenue to Lake Flower via will also be evaluated, which will require drilling operations. Similarly, geotechnical investigation and structural stability of the sanitary sewer line that runs adjacent to portions of the brook will be assessed and taken into consideration during design to evaluate whether structural support of the sewer line is required during implementation of the remedy. Coordination with the design engineers for the new proposed sanitary sewer line will be required prior to investigations and design near these structures.

The bathymetric survey and existing condition characterization of the impacted portions of Brandy Brook will be conducted to support restoration to existing conditions. These activities will include: surveying the slope of the stream channel and surrounding area, characterization of plant life along the banks and characterization of habitat substrate of the stream bed, wetland delineation, and photo documentation. The survey will also help evaluate the need for an access road and where it will be placed, and help identify laydown areas for required equipment and supplies along the brook. If necessary, wetlands on site will be delineated following the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (Technical Report Y-87-1), to identify areas that may require protection during remedial action.

Characterization of the habitat within the stream, collection and analysis of biota samples and habitat substrate will be conducted to facilitate design of appropriate habitat substrate types and thicknesses for the remediated portion of the stream.

Geotechnical investigation will be required to assist with restoration design, specifically along banks of the brook adjacent to the railroad and residential properties along Brandy Brook Road.

Mobilization and Temporary Facilities and Controls. Site preparation, mobilization, and temporary facilities and controls would include activities required to prepare the Site for construction, including, but not limited to:

- delivery and setup of site trailers
- installation of temporary utilities
- construction of Site access road
- installation of decontamination pad
- construction of material stockpile/solidification areas
- installation of temporary security fencing
- implementation of erosion and sediment control measures
- installation of odor control and monitoring equipment

It is anticipated that the majority of the supplies and equipment for OU02 remediation will be staged on the OU01 property.

Temporary construction fencing and erosion controls will be placed along the perimeter of the work areas.

An access road will likely be required, in particular for portion of Brandy Brook that runs south to north. The area for the access road will be cleared and grubbed, and then geogrid material along with wood chips or crushed stone will be placed along the road to provide stability for construction vehicles. The road will run parallel to Brandy Brook but will allow a safe distance for excavation work.

Dewatering / Brook Diversion. Water in the stream will need to be diverted from the work area to enable excavation activities to take place. This will require a temporary dam upstream from the MGP-impacted sediment area or plugging the flow to the stream at a culvert near Payville Lane and using pumps and conveyance lines to divert stream flow either to a nearby wetland or downgradient of the active work area. Or the area of work will be broken into sections with water flow diverted around the active section. The means and methods for brook diversion will be considered during remedial design.

Additional dewatering of the excavation area via a sump pump will also be required prior to and during excavation. Dewatering effluent will be treated in a temporary water treatment system staged at the OU01 site prior to discharge.

Excavation and Pipe Cleanout. Once stream diversion and dewatering of the area of work have occurred, MGP-impacted sediment/soil along Brandy Brook will be excavated. Excavation activities will begin in the portion of the brook closest to OU01 and will continue towards OU03. Both excavation alternatives require the use of an excavator to remove MGP-impacted sediment/soil from Brandy Brook. The excavated material will then be transported via lined dump trucks to the OU01 property where it will be stockpiled, solidified, and dewatered. Excavated sediment/soil will be combined with approximately 15% by weight Portland cement and/or kiln dust to achieve solidification. Decanted water resulting from stockpiling and solidification will be collected and treated through the temporary water treatment system. MGP-impacted sediment/soil will then be sampled for disposal characterization at a rate of one composite sample per 1,000 cy of material, or as required by the receiving facility. Following review of laboratory analysis, sediment/soil will be loaded and transported off-site to a treatment facility in accordance with the NYSDEC DER-4, Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants (NYSDEC, 2002b).

For Alternative 2A, the depth of excavation will be until there are no visual observations of MGP-impacted sediment/soil, approximately 4.5 ft on average. The average depth of excavation for Alternative 2B is assumed to be approximately 5.5 ft or one foot beyond visual observations of MGP-impacted sediment/soil. For both Alternatives 2A and 2B, confirmatory sampling will be conducted every 50 ft along the excavation bottom and every 100 ft along the sides of the excavated area prior

to backfilling. Excavation will continue until RAOs have been met (i.e., results are below 4 ppm for t(34)PAHs for Alternative 2A and results are non-detect for total t(34)PAHs for Alternative 2B).

The estimated extent of excavation for Alternatives 2A and 2B are as follows (see Appendix B for quantity calculations):

Alternative 2A:

- Approximately 5,800 cy, excavated to an average depth of 4.5 ft (includes a 20% contingency).
- Total estimated tonnage of excavation after solidification is approximately 11,400 tons.
- Based on this estimation, over a 2 month construction period, an average of 285 tons will be transported per day (assuming 5-day work weeks). See Appendix B for sediment/soil quantity calculations.

Alternative 2B:

- Approximately 9,200 cy (an estimated additional 1 ft in depth and 2 ft wider compared to Alternative 2A), excavated to an average depth of 5.5 ft. This area will need to be confirmed during pre-design investigations.
- Total estimated tonnage of excavation after solidification is approximately 18,000 tons.
- Based on this estimation, over a 2 month construction period, an average of 450 tons will be transported per day (assuming 5-day work weeks).

Throughout OU02, in particular in the east-west portion along Brandy Brook road, there are several culverts and concrete headwalls that cross through the delineated MGP-impacted portions of the brook (as shown in the survey drawings included in Appendix C and shown on Figure 7.1). During sediment/soil excavation, each of the culverts located beneath residential driveways will be removed to access sediments/soil beneath the culvert and the culverts will be replaced in-kind during backfilling activities. The gravel driveways will also be replaced in-kind. Brandy Brook also passes through a 4-foot by 5.5-foot culvert beneath the railroad tracks, and through a 24-inch diameter culvert from Slater Avenue to Pontiac Bay. Impacted sediment from these two culverts will be flushed out with high pressure water and both the sediments and water will be captured at the effluent end of the culverts and will be transported to OU01 to be dewatered and solidified.

Backfilling following excavation and restoration. Once the MGP-impacted sediment/soil is removed from Brandy Brook, certified clean sand will be used as backfill to within two feet below

final grade, followed by habitat substrate for the upper two feet. Backfilling for Alternatives 2A and 2B will be conducted so that the excavated areas of Brandy Brook will be restored to pre-excavation elevations.

Following remediation, the stream bed and banks will be restored with in-kind habitat material to pre-remediation grade and sinuosity and will follow an approved restoration design. Riprap or other bank armoring will be replaced with bank protection of the same dimensions. Specific restoration requirements will be determined during the remedial design.

Water diversion materials will be removed allowing flow through the brook after excavation and channel restoration activities are complete. The temporary access road will be removed and the area will be restored with topsoil, hydroseed, trees and/or plants as necessary. Lay down areas at the OU01 property will removed, as necessary pending on remediation schedule for OU01.

Long Term Monitoring. It is assumed that after implementation of the excavation alternative, monitoring will be carried out for a total of up to 30 years. For costing purposes, it is assumed that on an annual basis up to three sediment samples and two surface water samples will be collected along the brook. Results of annual monitoring will be presented in an annual report.

7.4.2 Detailed Evaluation of Alternatives 2A and 2B

Compliance with Standards, Criteria, and Guidance.

Alternative 2A: Alternative 2A will meet Chemical-Specific SCGs by removing approximately 4.5 ft of sediment/soil over an approximate 29,000 square foot area (visible MGP-impacted sediment/soil) to effectively remove sediment contamination in excess of the Class A SGV within Brandy Brook and SCOs adjacent to and beneath Brandy Brook.

Alternative 2A will trigger Location-Specific SCGs associated with construction within a flood plain, and Action-Specific SCGs associated with dust control, odor control, erosion and sediment control, transportation and disposal of remediation wastes, and stream restoration.

Alternative 2B: Alternative 2B will meet Chemical-Specific SCGs by removing approximately 5.5 ft of sediment/soil over an approximate 38,000 square foot area (sediment/soil with detectable

concentrations of PAHs) to effectively remove sediment to restore Brandy Brook to pre-disposal conditions.

Alternative 2B will trigger Location-Specific SCGs associated with construction within a flood plain, and Action-Specific SCGs associated with dust control, odor control, erosion and sediment control, transportation and disposal of remediation wastes, and stream restoration.

Overall Protection of Public Health and the Environment.

Alternative 2A: This remedial alternative will protect public health and the environment through eliminating, reducing, or controlling existing or potential exposure pathways through excavation. This remedial alternative will achieve the majority of RAOs for sediment/soil at OU02 with the exception of restoring the brook sediments/soil to pre-disposal/pre-lease conditions. Alternative 2A would remove visible MGP-impacted sediment/soil and remaining sediment will meet the Class A SGV for total PAHs of 4 ppm (i.e., remaining sediment will present little or no potential for risk to aquatic life and wildlife) and SCOs adjacent to and beneath Brandy Brook.

Alternative 2B: This remedial alternative will protect public health and the environment through eliminating, reducing, or controlling existing or potential exposure pathways through removal. This remedial alternative will achieve RAOs for sediment/soil. Alternative 2B will meet the SCGs for total PAHs since the remaining concentrations will be non-detect throughout Brandy Brook, which will result in no potential for risk to aquatic life and wildlife.

Short-term Effectiveness and Impacts.

Alternative 2A: This alternative will result in short-term adverse impacts and risks to the community, site workers, and the environment as a result of implementation. Implementation of this alternative will include preparation of and adherence to a construction work plan and health and safety plan. Once the excavation is complete, attainable RAOs for sediment/soil will be achieved. Alternative 2A involves less disturbance of sediment/soil compared to Alternative 2B, but will still require extensive use of odor control foam throughout the excavation.

Alternative 2B: This alternative will result in short-term adverse impacts and risks to the community, site workers, and the environment as a result of implementation. Implementation of this alternative will include preparation of and adherence to a construction work plan and health and safety plan.

Once the excavation is complete, RAOs for sediment/soil will be achieved. Alternative 2B involves the most disturbance of sediment/soil compared to the other retained alternatives and will require extensive use of odor control foam throughout the excavation.

Long-term Effectiveness and Permanence.

Alternative 2A: This alternative will permanently remove and dispose of MGP-impacted sediment/soil exceeding the SCGs for PAHs. Site restoration will return the stream to pre-construction conditions, as determined by the pre-design investigations.

Alternative 2B: This alternative will permanently remove and dispose of MGP-impacted sediment/soil with detectable concentrations of total PAHs. Site restoration will return the stream to pre-construction conditions, as determined by the pre-design investigations.

Reduction of Toxicity, Mobility, or Volume with Treatment.

Alternative 2A: This alternative will eliminate the toxicity, mobility and volume of sediment/soil contamination in Brandy Brook by removing MGP-impacted sediment/soil measuring above 4 ppm for total PAHs and transporting the sediment/soil off-site for disposal.

Alternative 2B: This alternative will eliminate the toxicity, mobility and volume of sediment/soil contamination in Brandy Brook by removing MGP-impacted sediment/soil with detectable concentrations of total PAHs and transporting the sediment/soil off-site for disposal.

Implementability.

There will be limited technical issues with implementing Alternatives 2A and 2B, associated primarily with accessing portions of the brook, diverting/dewatering, excavating and restoring Brandy Brook. State or Federal regulations for construction within a flood plain may complicate implementation of this alternative. Implementability of this alternative will be contingent upon cooperation of the community and land owners, in particular, property owners with culverts that will be removed and replaced as part of the excavation activities.

In addition, in the event that OU03 is remediated before OU01 and OU02, ECs may need to be considered during the OU02 remedial design to prevent recontamination of Pontiac Bay.

Land Use. The current and reasonably anticipated future land use of OU02 is mixed residential and commercial. OU02 flows directly into OU03, which is used for recreational use. Alternatives 2A and 2B would be compatible with current land use and reasonably anticipated future land use for OU02 and OU03.

Cost. The capital cost estimate and present worth of the Alternative 2 scenarios are as follows:

Excavation Scenario	Capital Cost	Present Worth
Alternative 2A (meets Class A)	$3,500,000	$3,683,000
Alternative 2B (meets pre-disposal)	$4,490,000	$4,373,000

A summary of the costs associated with these alternatives is presented in Table 7.2. Detailed cost analysis backup is provided in Appendix D.

Sustainability / Green Remediation (DER-31). Excavation is not considered a green remedy, as it would require energy and create GHG emissions through on-site treatment of water, emissions from on-site construction vehicles and from off-site transportation of sediment/soil, and from off-site disposal. Alternative 2A rates higher than 2B with regards to green remediation since it will disturb less sediments/soil and natural habitat while still being protective of public health and the environment. As previously described, the use of a mobile thermal desorption facility could enable the reuse of soil and decrease GHG emissions of truck traffic. This will be considered during the remedial design.

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The comparative analysis evaluates the relative performance of each alternative using the same criteria by which the detailed analysis of each alternative was conducted. The purpose of the comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another to aid in selecting an overall remedy for the Site.

The comparative analysis includes a narrative discussion of the strengths and weaknesses of the alternatives relative to one another with respect to each criterion, and how reasonable variations of key uncertainties could change the expectations of their relative performance, as applicable. The comparative analysis presented in this document uses a qualitative approach to comparison, with the exceptions of comparing alternative costs and the required time to implement each alternative.

A comparison of the capital and long-term costs associated with the remedial alternatives is presented in Table 8.1. Detailed cost analysis backup is provided in Appendix D.

Compliance with Standards, Criteria, and Guidance. Alternative 1 would not meet Chemical-Specific SCGs because it would not address contamination at and in the vicinity of the Site which exceeds applicable SCG values.

Alternatives 2A and 2B would meet Chemical-Specific SCGs by solidifying and/or removing sediment/soil contamination in excess of the SCGs for PAHs.

Location-Specific SCGs would be triggered for Alternatives 2A and 2B associated with construction within a flood plain and fresh water body. Action-Specific SCGs for these alternatives would be associated with dust and odor control, erosion and sediment control, transportation and disposal of remediation wastes, and stream restoration. Both alternatives would maintain current flood plain storage capacity. Therefore, Alternatives 2A and 2B rate equally for Compliance with Standards, Criteria and Guidance.

Overall Protection of Public Health and the Environment. Alternative 1 would not protect public health and the environment through eliminating, reducing, or controlling existing or potential

exposure pathways through removal, treatment, or ECs. This remedial alternative would not achieve the RAOs for OU02 sediment/soil.

Alternatives 2A would protect public health and the environment through eliminating, reducing, and controlling existing or potential exposure pathways through excavation. The remedial alternative would achieve the majority of RAOs for sediment/soil at OU02 with the exception of restoring the brook sediment/soil to pre-disposal/pre-release conditions. Alternative 2A would meet the SCGs for PAHs by removing visible MGP-impacted sediment/soil.

Alternative 2B would protect public health and the environment through eliminating, reducing, and controlling existing and potential exposure pathways through excavation. Alternative 2B would achieve RAOs for sediment/soil by removing visible MGP-impacted sediment/soil and sediment/soil with detectable concentrations of PAHs. Meeting Class A criteria would mean remaining sediment would present no potential for risk to aquatic life or wildlife.

Therefore, Alternative 2B rates highest for Overall Protection of Public Health, followed closely by Alternative 2A.

Short-term Effectiveness and Impacts. Because no action will be taken, Alternative 1 will not result in short-term adverse impacts and risks to the community, site workers, and the environment, but will also not be effective in the short term.

Alternatives 2A and 2B have potential short-term impacts due to the large amount of construction equipment and traffic required for off-site transportation of sediment/soil, as well as the need for odor control measures.

Both alternatives will meet their respective remedial objection upon completion of construction activities. Alternative 2B will require more extensive excavation and will require a longer construction period than Alternative 2A.Therefore, Alternative 2A rates slightly higher for Short-Term Effectiveness and Impacts than Alternative 2B.

Long-term Effectiveness and Permanence. Alternative 1 will not include actions to address contaminated sediments/soil at and in the vicinity of the Site. This remedy does not currently meet RAOs for sediment/soil and will not be expected to meet RAOs in the future.

Alternatives 2A and 2B have high long-term effectiveness because excavated sediment/soil will be transported off-site for disposal following excavation and would not limit future use of the Site.

Reduction of Toxicity, Mobility, or Volume with Treatment. Alternative 1 will not result in the reduction of toxicity, mobility, or volume of sediment contamination through treatment.

Alternative 2A will reduce the toxicity, mobility, and volume of on-site MGP-impacted sediment/soil by removing and disposing of MGP-impacted sediment/soil with PAH concentrations exceeding SCGs. Remaining sediment within Brandy Brook would present little or no potential for risk to aquatic life.

Alternative 2B will most effectively reduce the toxicity, mobility, and volume of site contamination. This would be achieved through excavation of sediment/soil with detectable concentrations of total PAHs and as a result, would return the site to pre-disposal conditions.

Implementability. Alternative 1 requires no action, therefore there are no technical difficulties associated with this alternative. However, obtaining stake holder approval of this alternative would be difficult.

There would be some technical issues with implementing Alternatives 2A and 2B; associated primarily with access, stream diversion/dewatering, as well as the excavation, and restoration within Brandy Brook. State or Federal regulations for construction within a flood plain may complicate implementation of this alternative. Access to Brandy Brook is currently limited, and in order to use construction equipment and to transport sediment and backfill to and from OU02, an access road will likely be required. Implementability of these alternatives would be contingent upon cooperation of the community and land owners, in particular, property owners with culverts and gravel driveways that will be removed/altered and replaced as part of the excavation activities.

In addition, in the event that OU03 is remediated before OU01 and OU02, ECs may need to be considered during the remedial design to prevent recontamination of Pontiac Bay.

Overall, Alternative 2A rates highest for implementability since it will generate less sediment for dewatering, stabilization and off-site disposal.

Land Use. The current and reasonably anticipated future land use of OU02 is mixed residential and commercial. Surface water from Brandy Brook flows directly into Pontiac Bay of Lake Flower (OU03), which is used for recreational use. Because no actions will be conducted with Alternative 1 and there will be no restrictions to future use, Alternative 1 will not be protective of the public or the environment.

Alternatives 2A and 2B will be compatible with current land use and reasonably anticipated future land use for OU02 and OU03. Therefore Alternatives 2A and 2B rate equally for land use.

Cost. A comparison of the capital and long-term costs associated with the remedial alternatives is presented in Table 8.1. There are no costs associated with Alternative 1. The difference in costs between Alternatives 2A and 2B is primarily due to the quantity of sediment/soil to be excavated, dewatered and stabilized, and transported off site for disposal.

Green Remediation (DER-31). Alternative 1, no action, rates highest for green remediation since it does not require natural resources to implement. Alternatives 2A and 2B both rate low for green remediation given that they all incorporate a significant amount of sediment removal that will require transportation to a facility for disposal. Both alternatives would also include excavation dewatering and/or sediment stockpile dewatering, which would require on-site treatment. Based on comparison of alternatives against other criteria, it is apparent that Alternative 2B is more protective to human health and the environment in comparison to Alternative 2A because it restores the site to pre-disposal conditions. However, other than meeting pre-disposal, pre-release conditions, there is no indication that Alternative 2B is more protective of aquatic life or the public than 2A. Therefore, the additional resources required to transport and dispose an additional 20 percent or more of sediment for Alternative 2B compared to 2A are not justifiable.

Additionally, as previously discussed, depending on timing of remediation for OU3, OU2 and OU1, there is potential to significantly decrease overall resource consumption and associated costs for both Alternative 2A and 2B by using a mobile thermal desorption facility on-site. This will be considered further during the remedial design phase of the various OUs.

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FIGURES

Half Mile Radius

OU02 Brandy Brook

OU03 Pontiac Bay

OU01 Saranac Lake Gas Co. Parcel

Lake Flower

Legend

- OU01 - Saranac Lake Gas Co. Parcel
- Half Mile Radius
- OU - Operable Unit
- Stream
- Lake/Pond/River

N

0 300 600 Feet

Essex and Franklin County color digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 07/21/15
Checked/Date: JMF 07/21/15

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Site Location Map

Project 3612132271 Figure 1.1

Brandy Brook Rd
Lake Flower Ave
Slater Ave
Pontiac St
Winona Ave
Pine St

2'x2' Culvert to be removed and replaced
4' x 5.5' Culvert to be flushed
30" Diam Corrugated Metal Pipe to be removed and replaced
24" Diam Precast Concrete Pipe to be removed and replaced
Approximate Location of 24" Diam Precast Concrete Pipe to be flushed (see survey drawing from Appendix C)
Known Extent of Sanitary Sewer Line; Additional Survey Necessary During Pre-Design.
Location of Sanitary Sewer
OU01 to be used for staging and stockpiling

SW-105A
SD-205
SD-105A
SD-07
DP1
DP2
DP3
SD-08
TB-44
SD-104C
SD-202
SD-06
SW-103A
SD-103A
SD-103D
SD-103C
SD-200
MW-203
MW-201
SW-102A
SD-05
SD-102A
SD-04
SD-03
SD-02
MW-202

Legend

Total PAH Concentrations Detected in Sediment (SD/TB):
- Not Sampled
- Not Detected
- Detected
- Class B/SGV
- Class C/SGV

Square Position in Stack Indicates Sediment Depth:
- 0-4 ft bgs
- 4-8 ft bgs
- 8-12 ft bgs
- 12-16 ft bgs
- 16-20 ft bgs
- > 20 ft bgs

PAH Concentrations Detected in Soil (DP):
- NS - for legend
- Not Detected
- Detected < Restricted Residential SCO
- Exceeds Restricted Residential SCO
- Exceeds Commercial SCO
- Exceeds Industrial SCO

Square Position in Stack Indicates Soil Depth:
- 0-4 ft bgs
- 4-8 ft bgs
- 8-12 ft bgs
- 12-16 ft bgs
- > 16 ft bgs

SD-06 2007 SC Data
Sample Location; No Analytical Data
Surface Water Location = PAH Compounds not detected at concentrations above criteria or background

Criteria:

SCO = Soil Cleanup Objectives
Criteria from Subpart 375-6.8(b)

SGV = Standardized Guidance Values
Sediment Criteria from NYS Screening and Assessment of Contaminated Sediment Table 5

- Monitoring Well
- Groundwater Grab
- Estimated Extent of Alternative 2A Excavation
- Estimated Extent of Alternative 2B Excavation
- Fence
- Brandy Brook and Lake Flower
- Concrete Pipe
- Sanitary Sewer
- Sanitary Sewer Manhole
- Former Structure
- Adirondack Scenic Railroad
- Saranac Lake Gas Co. Parcel

CY - cubic yards
ft - feet/foot
PAHs - Polycyclic Aromatic Hydrocarbons
SF - square feet

Alternative	Area (SF)	Depth (ft)	Volume (CY)
Alternative 2A - Excavation of Soil and Sediment to Meet SCGs	29,000	4.5	5,760
Alternative 2B - Excavation of Soil and Sediment to meet Pre-Disposal Conditions	38,000	5.5	9,290

N
0 25 50 Feet

Essex County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Summary of Remedial Alternatives
Project 3612132271 Figure 7.1

Prepared/Date: BRP 08/13/15
Checked/Date: JMF 08/13/15

TABLES

Table 5.1: Identification and Screening of Potential Remedial Technologies - OU02

Environmental Media	General Response Action	Remedial Technology	Process Option	Applicability to		Screening Status	Comments
				Site-Limiting Characteristics	Waste-Limiting Characteristics		
Sediment	No Action	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Retained	Does not meet RGs, will be carried through as a baseline comparison to other alternatives.
	Monitored Natural Recovery	Monitored Natural Recovery	Conventional Or Enhanced Monitored Natural Recovery	Access to Brandy Brook for monitoring or to employ enhancements is currently limited; this alternative will require building an access road.	Sediments are contaminated with NAPL which will impede natural recovery.	Eliminated	
	In-Situ Treatment	Biological Treatment	Bioaugmentation	Access to portions of Brandy Brook is limited; this alternative will require building an access road. The presence of driveways, culverts, adjacent railroad tracks and storm sewer would impact implementability. Amendments used have the potential to migrate to Lake Flower which is used as a alternative public drinking water supply.	Sediments are contaminated with NAPL and limited data is available regarding the effectiveness of Biological and Chemical in-situ treatment of NAPL.	Eliminated	
		Chemical Treatment	Chemical Transformation			Eliminated	
		Physical Treatment	In-situ Solidification	Access to portions of Brandy Brook is limited; this alternative will require building an access road. The presence of driveways, culverts, adjacent railroad tracks and storm sewer would impact implementability. In-situ Solidification of sediments would impact the natural features of the brook. In-situ solidification above the frost line does not comply with 6 NYCRR Part 608; the soldified material would permanently alter the chemical and physical properties of the stream habitat.	Solidification of DNAPL from MGP waste has proven to be effective in subsurface soil to prevent migration, but limited data is available regarding the effectiveness of this technology in sediments.	Eliminated	
	Containment	Capping	Conventional sediment capping	Access to portions of Brandy Brook is limited; this alternative will require building an access road. The presence of driveways, culverts, adjacent railroad tracks and storm sewer would impact implementability. The stream water will need to be diverted during installation of the cap. Capping alone would result in a decrease in depth of Brandy Brook which may impact natural flow paths and decrease overall flood storage.	Low viscosity DNAPL may be mobilized during implementation of traditional capping (sand & gravel cap). Sand and gravel cover systems may not prevent potential upwelling of contaminants, and stream flow could eventually displace capping materials. Capping would not reduce the volume or toxicity of contaminants.	Eliminated	
			Amended Sediment capping		Capping with amendments (e.g. AquateGate™ or AquaBlok®) will not reduce the volume or toxicity of contaminants. This type of capping system may be difficult to implement over low viscosity DNAPL.	Eliminated	
	Removal	Excavation	Dewater and/or Divert and Excavate	Access to portions of Brandy Brook is limited; this alternative will require building an access road. The presence of driveways, culverts, adjacent railroad tracks and storm sewer would impact implementability. The stream water will need to be diverted during excavation. Additional space is required for lay down areas of excavated soil and backfill material. Odor control will also be necessary.	None	Retained	Retained to be carried through detailed analysis of alternatives.

Notes:
DNAPL - Dense Non-Aqueous Phase Liquid
RGs - Remedial Goals
GRA - General Response Action

Table 6.1: Screening of Remedial Alternatives - OU02

Remedial Alternative	Effectiveness	Implement ability	Relative Cost	Screening Result
No Action	This alternative would not be effective at reducing contamination concentrations or addressing the identified exposure pathways.	There are no technical issues with implementing this alternative.	No cost associated with this alternative.	Retained as: **Alternative 1 -** No Action. Use as a base-line for comparison to other alternatives.
Excavation	Excavation is an effective way to remove contamination from OU02. Excavation could be conducted throughout Brandy Brook to meet the applicable SCGs or to restore the brook to pre-disposal conditions. Each of these scenarios would be effective provided that there are no ongoing sources of contamination being introduced to Brandy Brook.	There are some technical difficulties with implementing this alternative. Equipment access to the brook will require tree clearing and building an access road. Upstream flow will need to be diverted during excavation. Excavation of sediment/soil beneath or in close proximity to structures such as culverts and railroad tracks could be challenging. Excavated sediment would likely need to be solidified prior to transportation and disposal and water removed during excavation would need to be treated prior to disposal/discharge. There is also potential for significant odors during the excavation and from the stockpiled sediment/soil that will need to be managed. Space for staging equipment, lay down areas for contaminated sediment/soil and backfill materials is limited near the brook.	Costs for this alternative would be high. Excavation to pre-disposal conditions (i.e., removal of all detected contaminants of concern) will be higher than excavating to meet SCGs. The primary items contributing to cost include tree clearing and construction of the access road, diverting the stream during construction, dewatering and water treatment, excavation, solidification of excavated sediment/soil, and transportation and disposal of contaminated sediment/soil.	Retained as the following: **Alternative 2A -** Excavation of Soil and Sediment to Meet SCGs **Alternative 2B-** Excavation of Soil and Sediment to meet Pre-Disposal Conditions

Notes:

MGP - manufactured gas plant

NAPL - non-aqueous phase liquid

SCGs -Standards, Criteria, and Guidance Values. Specifically Class A Sediment Guidance Value and Residential Soil Cleanup Objectives.

Table 7.1: Applicable Location- and Action-Specific Standards, Criteria, and Guidance

Requirement	Consideration in the Remedial Response Process
NYSDEC Division of Fish, Wildlife and Marine Resources - Freshwater Sediment Guidance Values (June 2014)	Applicable to the determination of toxicity of sediment contamination in Brandy Brook.
29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response	Applicable to implementation of Health and Safety implementation, enforcement, and emergency response.
6 NYCRR Part 175 - Special Licenses and Permits-Definitions and Uniform Procedures	Applicable to implementation of biota sampling as part of pre-design investigation
6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)	Applicable to the characterization, handling, transportation, and treatment/disposal of soils, sediments, and debris to be removed from the Site.
6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (November 1998)	Applicable to the handling, transportation, and treatment/disposal of soils, sediments, and C&D debris to be removed from the Site.
6 NYCRR Part 375 - Environmental Remediation Programs (as amended December 2006)	Applicable to the development and implementation of remedial programs.
6 NYCRR Part 376 - Land Disposal Restrictions	Applicable to disposal of hazardous wastes. Identifies those wastes that are restricted from land disposal.
19 NYCRR Part 600 - Waterfront Revitalization and Coastal Resources	Not Applicable.
6 NYCRR Part 608 - Use and Protection of Waters	Applicable as part of construction and restoration activities.
19 NYCRR Part 622 - Freshwater Wetlands - Interim Requirements	Applicable as part of construction and restoration activities.
19 NYCRR Part 622 - Freshwater Wetlands - Permit Requirements	Applicable as part of construction and restoration activities.
6 NYCRR Parts 700-706 - Water Quality Standards (June 1998)	Applicable to construction in and adjacent to Brandy Brook and for temporary diversion of the Brook and discharge of treated wastewater if needed.
6 NYCRR Part 750 through 758 - Implementation of NPDES Program in NYS (“SPDES Regulations”)	Applicable to construction in and adjacent to water bodies, temporary diversion of Brandy Brook, and discharge of treated wastewater, if needed.
DER-10 Technical Guidance for Site Investigation and Remediation	Applicable to the development and implementation of remedial programs.
Citizen Participation in New York’s Hazardous Waste Site Remediation Program: A Guidebook (June 1998)	Applicable to the development and implementation of remedial programs.
TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations	Applicable to construction in and adjacent to Brandy Brook and for temporary diversion of the Brook and discharge of treated wastewater if needed.
Solidification/Stabilization and its Application to Waste Materials	Applicable to disposal of wastes generated during implementation of remedial program.
DER-31 - Green Remediation (August 2010)	Applicable to the development and implementation of remedial programs.

Table 7.2: Cost Summary for Alternatives 2A & 2B -Excavation

ITEM	COST 2A	COST 2B
DIRECT CAPITAL COSTS		
Pre-Design Investigation	$ 171,000	$ 171,000
Full-Scale Excavation: Alternative 3A - Excavation with Capping	$ 2,473,000	$ 3,266,000
Contingency (@ 20 Percent)	$ 529,000	$ 688,000
Direct Cost Subtotal	$ 3,173,000	$ 4,125,000
INDIRECT CAPITAL COSTS		
Project Management (@ 5 Percent)	$ 86,000	$ 96,000
Remedial Design (@ 8 Percent)	$ 138,000	$ 154,000
Construction Management (@ 6 Percent)	$ 103,000	$ 115,000
Indirect Cost Subtotal	$ 327,000	$ 365,000
TOTAL CAPITAL COSTS	**$ 3,500,000**	**$ 4,490,000**
ANNUAL OPERATION AND MAINTENANCE COSTS		
Annual Site Inspection and Reporting (years 1-30)	$ 10,000	$ 10,000
PRESENT WORTH OF ANNUAL COSTS (30 yrs)	**$ 183,000**	**$ 183,000**
TOTAL PRESENT WORTH OF ALTERNATIVE 3 (30 yrs)	**$ 3,683,000**	**$ 4,673,000**
TOTAL NON-DISCOUNTED COST OF ALTERNATIVE 3 (30 yrs)	**$ 3,795,000**	**$ 4,785,000**

NOTES:

*Costs include additional 10 percent for bid contingency and 15 percent for scope contingency unforeseen project complexities, including insurance, taxes, and licensing costs (USEPA 2000).
Costs have been rounded to the nearest thousand.

Prepared By/Date: SB 6/24/2015
Revised By/Date: JW 7/29/2015

Table 8.1: Summary of Remedial Alternative Costs

Item	Description	Alternative 1	Alternative 2 A	Alternative 2 B
1	Capital Costs	$ -	$ 3,500,000	$ 4,490,000
2	Present Worth of Annual Costs	$ -	$ 183,000	$ 183,000
3	**Total Present Worth (Item 1 plus 2)**	**$ -**	**$ 3,683,000**	**$ 4,673,000**
4	Annual Costs (1-30 years)	$ -	$ 10,000	$ 10,000
6	Remedial Timeframe (years)	>30	2	2

Alternative Descriptions:

1 = No Further Action
2 = Excavation
  2A = Excavate to meet Class A SGVs
  2B = Excavate to remove detected concentrations of PAHs

Notes:

1. Present Worth costs shown above are based upon the assumed Remedial Timeframe.
2. Annual and Periodic Costs (Item 4 - 6) presented are non-discounted (future) costs.
3. Estimated costs presented in this table are intended to be within the target accuracy range of minus 30 to plus 50 percent of actual cost.
4. The remedial timeframe is for the construction portion of the remedy, monitoring would continue for 30 years.

Prepared By/Date: SB 6/24/2015
Revised By/Date: JW 7/29/2015

APPENDIX A

APPLICABLE FIGURES FROM RI REPORT

Legend

Total PAH Concentrations Detected in Sediment (SD/TB):
- Not Sampled
- Not Detected
- Detected
- Class B/SGV
- Class C/SGV
- SD-202 Exceeds Class A SGV Based on a correction factor of 9.3

Square Position in Stack Indicates Sediment Depth:
- 0-4 ft bgs
- 4-8 ft bgs
- 8-12 ft bgs
- 12-16 ft bgs
- 16-20 ft bgs
- > 20 ft bgs

PAH Concentrations Detected in Soil (DP):
- NS - for legend
- Not Detected
- Detected < Restricted Residential Criteria
- Exceeds Restricted Residential Criteria
- Exceeds Commercial Criteria
- Exceeds Industrial Criteria

Square Position in Stack Indicates Soil Depth:
- 0-4 ft bgs
- 4-8 ft bgs
- 8-12 ft bgs
- 12-16 ft bgs
- > 16 ft bgs

PAH Concentrations Detected in Groundwater:
- Not Detected
- Detected < Class GA Standard
- Exceeds Class GA Standard

SD-06 2007 SC Data

MW-203 2013/2014 RI Data

(12) Sample Depth (ft bgs)

Sample Location; No Analytical Data

Surface Water Location = PAH Compounds not detected at concentrations above criteria or background

Estimated Extent of Visual MGP-Impacted Soils and Exceeding Class A SGV

Fence

Brandy Brook

Existing Structure

Former Structure

Adirondack Scenic Railroad

Saranac Lake Gas Co. Parcel

Criteria:
Soil Cleanup Objectives Criteria from Subpart 375-6.8(b)

Groundwater Criteria from Technical and Operational Guidance Series 1.1.1

SGV = Standardized Guidance Values
Sediment Criteria from NYS Screening and Assessment of Contaminated Sediment Table 5

PAHs - Polycyclic Aromatic Hydrocarbons

Essex County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

N

0 25 50 Feet

Prepared/Date: BRP 12/10/14
Checked/Date: JMF 12/10/14

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

OU02 - PAHs Detected in Media Compared to Criteria
Project 3612132271 Figure 4.5

Legend

BTEX Concentrations Detected in Sediment (SD/TB):
- Not Sampled
- Not Detected
- Detected
- Class B/SGV
- Class C/SGV

Square Position in Stack Indicates Sediment Depth:
- 0-4 ft bgs
- 4-8 ft bgs
- 8-12 ft bgs
- 12-16 ft bgs
- 16-20 ft bgs
- > 20 ft bgs

BTEX Concentrations Detected in Soil (DP):
- NS - for legend
- Not Detected
- Detected < Restricted Residential Criteria
- Exceeds Restricted Residential Criteria
- Exceeds Commercial Criteria
- Exceeds Industrial Criteria

Square Position in Stack Indicates Soil Depth:
- 0-4 ft bgs
- 4-8 ft bgs
- 8-12 ft bgs
- 12-16 ft bgs
- > 16 ft bgs

BTEX Concentrations Detected in Groundwater:
- Not Detected
- Detected < Class GA Standard
- Exceeds Class GA Standard

SD-06 2007 SC Data

MW-203 2013/2014 RI Data

(12) Sample Depth (ft bgs)

Sample Location; No Analytical Data

Surface Water Location = BTEX Compounds not detected at concentrations above criteria or background

Estimated Extent of Visual MGP-Impacted Soils and Exceeding Class A SGV

Fence

Brandy Brook

Existing Structure

Former Structure

Adirondack Scenic Railroad

Saranac Lake Gas Co. Parcel

Criteria:
Soil Cleanup Objectives Criteria from Subpart 375-6.8(b)

Groundwater Criteria from Technical and Operational Guidance Series 1.1.1

SGV = Standardized Guidance Values
Sediment Criteria from NYS Screening and Assessment of Contaminated Sediment Table 5

BTEX = Benzene, Toluene, Ethylbenzene and Xylene Compounds

Essex County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

N

0 25 50 Feet

Prepared/Date: BRP 12/10/14
Checked/Date: JMF 12/10/14

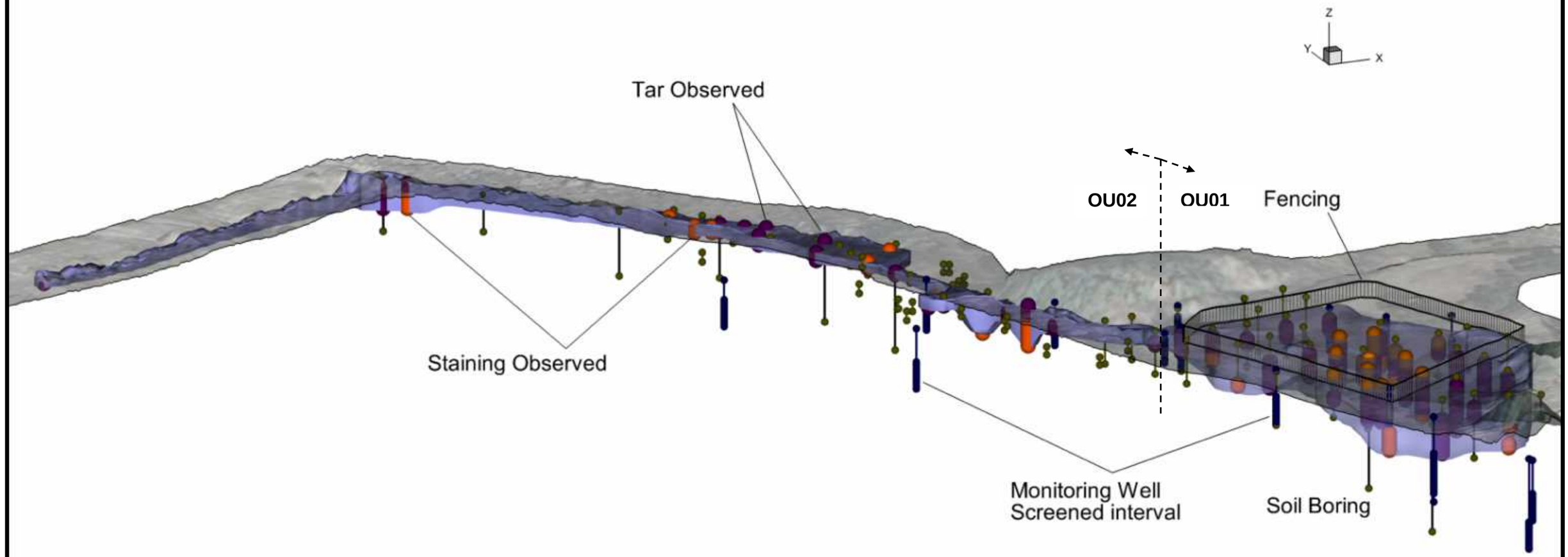
NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

OU02 - BTEX Compounds Detected in Media Compared to Criteria
Project 3612132271 Figure 4.6

APPENDIX B

QUANTITY CALCULATIONS



Interpreted extent of MGP-impacted soil,OU02 volume estimated at 4,800 cubic yds

NYSDEC – Site # 516008 **Saranac Lake Gas Company** **Saranac Lake, New York**	MACTEC	**Interpretation of the Volume of MGP-Impacted Sediment from OU02** **Project 3612132271 Appendix B.1**

Job No.	3612132271	Sheet	1	of	1
Phase	03	Task	****		
Job Name	Saranac Lake - OU02 FS				
By	SLB	Date	06/08/15		
Checked By	JDW	Date	06/15/15		
Revised By	SLB	Date	07/28/15		
Checked By	JDW	Date	07/29/15		

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Purpose: To calculate the quantity of sediment/soil that would be removed from Brandy Brook, stockpiled on-site, transported and disposed of, and used for backfilling for each remedial alternative.

Method: An interpreted area of varying depths containing MGP-impacted sediment/soil was estimated using a combination of visual observations and analytical results from the Remedial Investigation (RI) using Tecplot (see Appendix B.1). Based on these results, an additional 20 percent of sediment/soil removal has been assumed to achieve non-detectable levels of total PAHs in Brandy Brook. These estimated volumes were used to establish the extent of sediment removal and for cost estimating purposes for Alternatives 2A and 2B.

Assumptions: The volume of MGP-impacted sediment/soil exceeding 4 ppm total PAH was an estimated 4,800 cubic yards (cy), an average depth of 4.5 feet (ft), and applies to Alternative 2A.
The volume of sediment/soil with detectable concentrations of total PAH was an estimated 7,740 cy, an average depth of 5.5 ft, and applies to Alternative 2B.
Due to the uncertainty of the extent of MGP-impacted sediment/soil in Brandy Brook, a contingency of 20% additional sediment volume has been added for costing purposes.

Constants and Inputs:

Area of MGP-impacted sediment (Alt 2A):	29,000	square feet
Area of MGP-impacted sediment (Alt 2B):	38,000	square feet
Sediment volume for Alternative 2A:	4,800	cubic yards
Sediment volume for Alternative 2B:	7,700	cubic yards
Average depth of Excavation for Alternative 2A:	4.5	feet
Average depth of Excavation for Alternative 2B:	5.5	feet
Sediment volume contingency factor:	1.2	Additional 20% for uncertainty
Bulking factor:	1.15	Additional 15% added for solidification
Conversion factor from cubic yards to tons:	1.7	For Portland Cement

References: MACTEC Engineering and Consulting, P.C., 2014. *Remedial Investigation Report – Saranac Lake Gas Company Site.* Prepared for New York State Department of Environmental Conservation, Albany, New York. 30 January 2015.

Calculations:

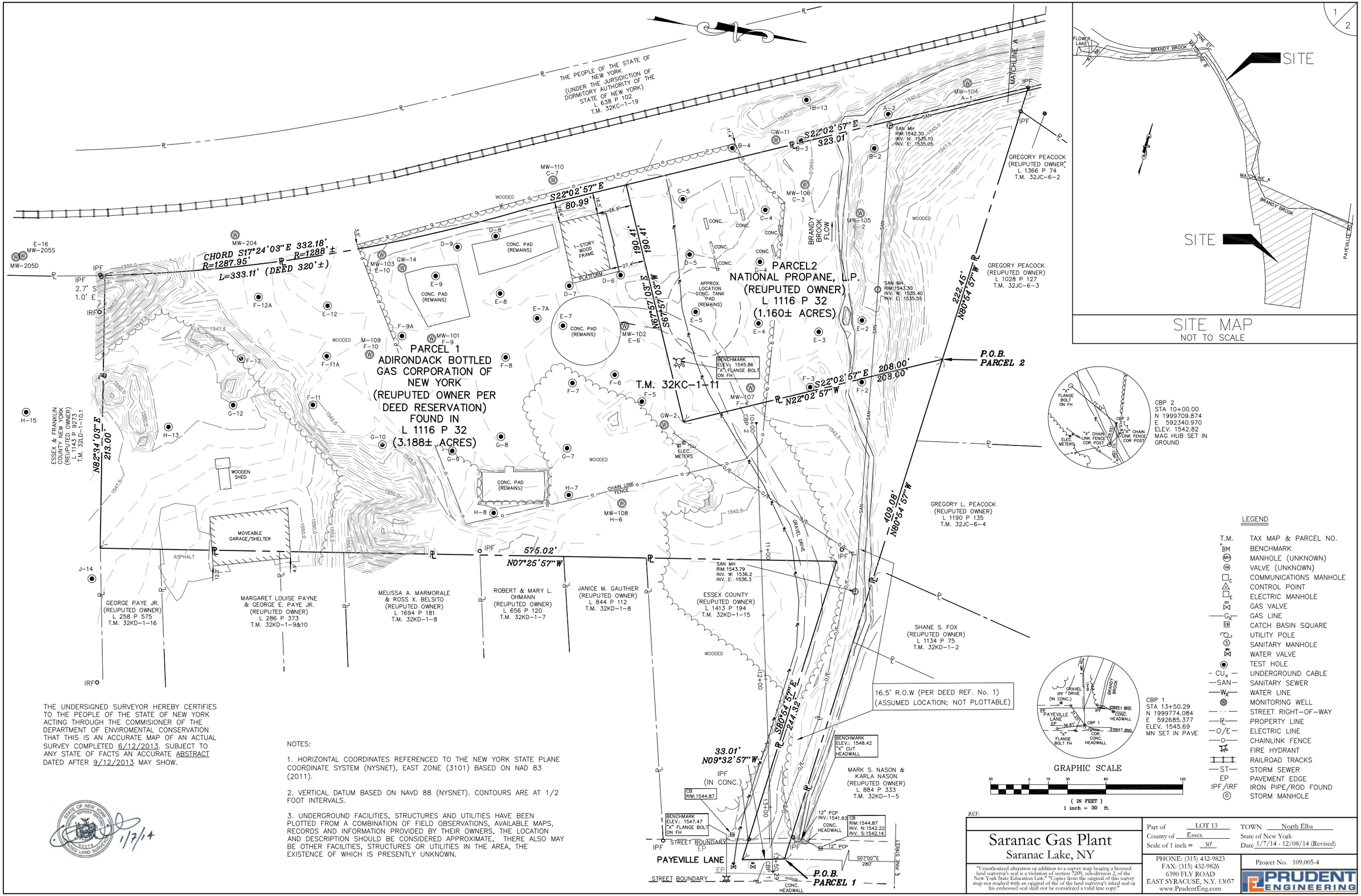
Quantity of excavated sediment for Alternative 2A	5,800	cubic yards		
Quantity of excavated sediment for Alternative 2B	9,200	cubic yards		
Quantity of sediment to be transported and disposed of after bulking for Alternative 2A	6,700	cubic yards	11,400	tons
Quantity of sediment to be transported and disposed of after bulking for Alternative 2B	10,600	cubic yards	18,000	tons

	Total	Sand Backfill	Habitat Substrate (top 2 ft)	
Quantity of backfill for Alternative 2A (sand and habitat substrate)	5,800	3,200	2,600	cubic yards
Quantity of backfill for Alternative 2B (sand and habitat substrate)	9,200	6,600	2,600	cubic yards

Conclusion: The above sediment volume and weight calculations can be used to verify the basis costing for sediment excavation, transportation and disposal, as well as backfilling provided in both the text and in Appendix A.

APPENDIX C

SURVEY DRAWINGS



THE UNDERSIGNED SURVEYOR HEREBY CERTIFIES TO THE PEOPLE OF THE STATE OF NEW YORK ACTING THROUGH THE COMMISIONER OF THE DEPARTMENT OF ENVIROMENTAL CONSERVATION THAT THIS IS AN ACCURATE MAP OF AN ACTUAL SURVEY COMPLETED 6/12/2013. SUBJECT TO ANY STATE OF FACTS AN ACCURATE ABSTRACT DATED AFTER 9/12/2013 MAY SHOW.

STATE OF NEW YORK — MICHAEL A. VOSS — 50213 — LICENSED LAND SURVEYOR — 1/7/14

NOTES:

1. HORIZONTAL COORDINATES REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM (NYSNET), EAST ZONE (3101) BASED ON NAD 83 (2011).

2. VERTICAL DATUM BASED ON NAVD 88 (NYSNET). CONTOURS ARE AT 1/2 FOOT INTERVALS.

3. UNDERGROUND FACILITIES, STRUCTURES AND UTILITIES HAVE BEEN PLOTTED FROM A COMBINATION OF FIELD OBSERVATIONS, AVAILABLE MAPS, RECORDS AND INFORMATION PROVIDED BY THEIR OWNERS, THE LOCATION AND DESCRIPTION SHOULD BE CONSIDERED APPROXIMATE, THERE ALSO MAY BE OTHER FACILITIES, STRUCTURES OR UTILITIES IN THE AREA, THE EXISTENCE OF WHICH IS PRESENTLY UNKNOWN.

REF.

Saranac Gas Plant
Saranac Lake, NY

Part of LOT 13 — TOWN North Elba
County of Essex — State of New York
Scale of 1 inch = 30' — Date 1/7/14 - 12/08/14 (Revised)

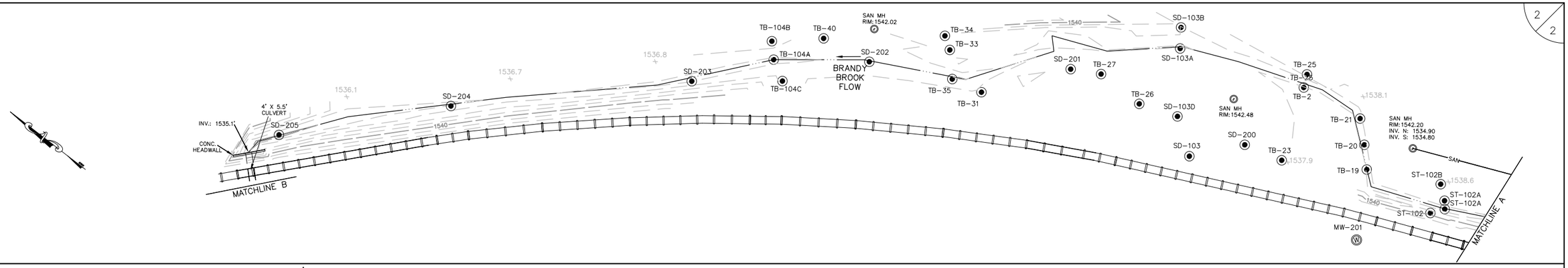
PHONE: (315) 432-9823
FAX: (315) 432-9826
6390 FLY ROAD
EAST SYRACUSE, N.Y. 13057
www.PrudentEng.com

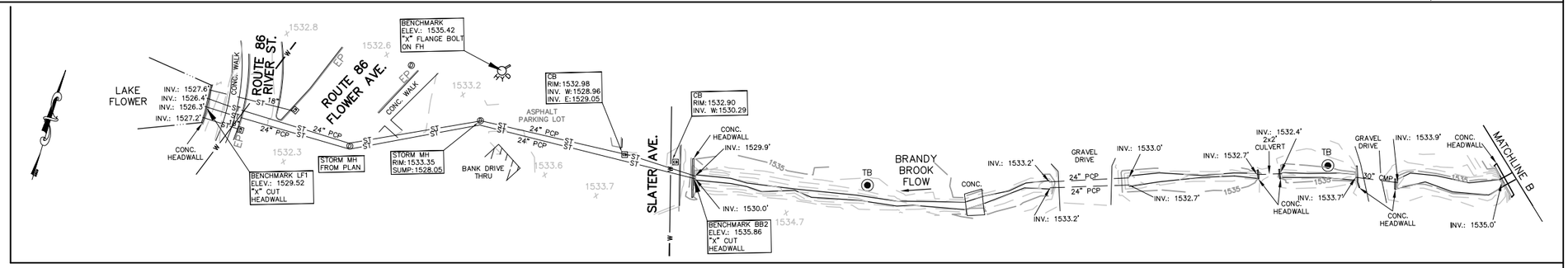
Project No. 109.005-4

PRUDENT ENGINEERING

CADD File Name: M:\Drawings\109\005\Phase 04 – SARANAC GAS PLANT.DWG

IN CHARGE OF M.A.V. DESIGNED BY CHECKED BY DRAFTED BY M.A.V. CHECKED BY ESTIMATED BY B.G.P.





NEW DESCRIPTION OF THE SURVEYED PROPERTY

A NEW DESCRIPTION WAS PREPARED WITH BEARINGS REFERENCE TO TRUE NORTH AT THE 74°30' MERIDIAN OF WEST LONGITUDE.

ALL THAT TRACT OR PARCEL OF LAND , SITUATE IN THE TOWN OF NORTH ELBA, COUNTY OF ESSEX AND STATE OF NEW YORK, BEING PART OF LOT NUMBER 13, TOWNSHIP 11, OLD MILITARY TRACT, BEING A PORTION OF TAX PARCEL NUMBER 32KC-1-11, AND ALSO BEING MORE PARTICULARLY BOUNDED AND DESCRIBED AS FOLLOWS:

PARCEL 1 - ADIRONDACK BOTTLED GAS CORPORATION OF NEW YORK

BEGINNING AT A POINT IN THE CENTER OF PAYEVILLE LANE, SAID POINT BEING DISTANT S 7°00' E, AS MEASURE ALONG THE CENTERLINE OF PAYEVILLE LANE, 280 FEET FROM THE CENTERLINE INTERSECTION OF PINE ST, SAID POINT ALSO BEING THE SOUTHEASTERLY CORNER OF A PARCEL OF LAND CONVEYED TO MARK S. NASON & KARLA NASON BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 884 AT PAGE 333;

THENCE NORTHWESTERLY ALONG SAID SOUTHERLY BOUNDARY OF SAID MARK S. NASON & KARLA NASON, SHANE S. FOX BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1134 AT PAGE 75, GREGORY L. PEACOCK BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1190 AT PAGE 135, AND PARTIALLY ALONG GREGORY L. PEACOCK BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1028 AT PAGE 127 N80°54'57" W A DISTANCE OF 409.08 FEET TO NORTHEASTERLY CORNER OF A PARCEL OF LAND CONVEYED TO NATIONAL PROPANE, L.P. (PARCEL 2) BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1116 AT PAGE 32;

THENCE ALONG SAID EASTERLY AND SOUTHERLY LINE OF SAID PARCEL 2 THE FOLLOWING (2) COURSES AND DISTANCES: 1) SOUTHEASTERLY S 22°02'57" E, A DISTANCE OF 208.00 FEET; 2) SOUTHWESTERLY S 67°57'03" W, A DISTANCE OF 190.41FEET TO A POINT ON THE EASTERLY BOUNDS OF THE PEOPLE OF THE STATE OF NEW YORK (UNDER THE JURISDICTION OF THE DORMITORY AUTHORITY OF THE STATE OF NEW YORK) BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 638 AT PAGE 102;

THENCE SOUTHEASTERLY ALONG THE EASTERLY LINE OF THE PEOPLE OF THE STATE OF NEW YORK (UNDER THE JURISDICTION OF THE DORMITORY AUTHORITY OF THE STATE OF NEW YORK) THE FOLLOWING (2) COURSES AND DISTANCES: 1) S 22°02'57" E A DISTANCE OF 80.99 FEET TO A POINT; 2) ALONG A NON TANGENT CURVE TO THE RIGHT WITH A RADIUS OF 1287.95 FEET A LENGTH OF 333.11 FEET (CHORD S 17°24'03" E, 332.18 FEET) TO A POINT BEING THE NORTHWEST CORNER OF A PARCEL OF LAND CONVEYED TO ESSEX & FRANKLIN COUNTY NEW YORK BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1143 AT PAGE 9273;

THENCE NORTHEASTERLY ALONG SAID NORTHERLY LINE OF ESSEX & FRANKLIN COUNTY NEW YORK N 82°34'03" E A DISTANCE OF 213.00 FEET TO A POINT, BEING THE SOUTHWEST CORNER OF A PARCEL OF LAND CONVEYED TO GEORGE PAYE JR. DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 258 AT PAGE 575;

THENCE NORTHERLY ALONG THE WESTERLY LINE OF SAID GEORGE PAYE JR., MARGARET LOUISE PAYE & GEORGE E. PAYE JR. BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 286 AT PAGE 373, MELISSA A. MARMORALE & ROSS X. BELSITO BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1694 AT PAGE 181, ROBERT & MARY L. OHMANN BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 656 AT PAGE 120, JANICE M. GAUTHIER BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 844 AT PAGE 112, AND ESSEX COUNTY BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1413 AT PAGE 194 N 07°25'57" E A DISTANCE OF 575.02 FEET TO A POINT BEING THE NORTHWEST CORNER OF A PARCEL OF LAND CONVEYED TO SAID ESSEX COUNTY;

THENCE EASTERLY ALONG SAID NORTHERLY LINE OF ESSEX COUNTY NEW YORK N 80°54'57" E A DISTANCE OF 244.32 FEET TO A POINT IN THE CENTER OF SAID PAYEVILLE LANE;

THENCE NORTHERLY ALONG THE SAID CENTERLINE OF PAYEVILLE LANE N 09°32'57" E A DISTANCE OF 33.01 FEET TO THE POINT AND PLACE OF BEGINNING.

CONTAINING 3.188 ACRES OF LAND, MORE OR LESS.

SUBJECT TO ANY EASEMENTS, RIGHT-OF-WAYS, AND/OR RESTRICTIONS OF RECORD, WHICH MAY AFFECT THIS PROPERTY.

PARCEL 2 - NATIONAL PROPANE, L.P.

COMMENCING AT A POINT IN THE CENTERLINE OF PAYEVILLE ROAD, SAID POINT BEING THE NORTHEASTERLY CORNER OF A PARCEL OF LAND CONVEYED TO ADIRONDACK BOTTLED GAS CORPORATION OF NEW YORK BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1116 AT PAGE 32 (PARCEL 1) AND THE SOUTHEASTERLY CORNER OF LANDS CONVEYED TO MARK S. NASON & KARLA NASON BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 884 AT PAGE 333;

THENCE NORTHWESTERLY ALONG SAID NORTHERLY LINE OF PARCEL 1 N 80°54'57" W, A DISTANCE OF 409.08 FEET TO THE **POINT OF BEGINNING**, SAID POINT BEING THE NORTHWESTERLY CORNER OF PARCEL 1;

THENCE FROM SAID POINT OF BEGINNING N 80°54'57" W PARTIALLY ALONG THE SOUTHERLY LINE OF A PARCEL OF LAND CONVEYED TO GREGORY PEACOCK. BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1028 AT PAGE 127 AND ALONG OTHER LANDS OF GREGORY PEACOCK BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 1366 AT PAGE 74 A DISTANCE OF 222.45 FEET TO AN IRON PIPE IN THE EASTERLY BOUNDS OF THE PEOPLE OF THE STATE OF NEW YORK (UNDER THE JURISDICTION OF THE DORMITORY AUTHORITY OF THE STATE OF NEW YORK) BY DEED AS RECORDED IN THE ESSEX'S COUNTY CLERK'S OFFICE IN BOOK OF DEEDS 638 AT PAGE 102;

THENCE SOUTHEASTERLY ALONG THE EASTERLY LINE OF SAID THE PEOPLE OF THE STATE OF NEW YORK (UNDER THE JURISDICTION OF THE DORMITORY AUTHORITY OF THE STATE OF NEW YORK) S 22°02'57" E A DISTANCE OF 323.01 FEET TO A POINT BEING THE NORTHWEST CORNER OF SAID PARCEL 1;

THENCE SOUTHERLY AND EASTERLY LINE OF PARCEL 1 THE FOLLOWING (2) COURSES AND DISTANCES: 1) NORTHEASTERLY N 67°57'03" E, A DISTANCE OF 190.41 FEET; 2) NORTHWESTERLY N 22°02'57" W, A DISTANCE OF 208.00 FEET TO THE POINT AND PLACE OF BEGINNING.

CONTAINING 1.160 ACRES OF LAND, MORE OR LESS.

SUBJECT TO ANY EASEMENTS, RIGHT-OF-WAYS, AND/OR RESTRICTIONS OF RECORD, WHICH MAY AFFECT THIS PROPERTY.

SAMPLE LOCATIONS

Pnt.	Northing	Easting	Ground Elev.	PVC Riser Pipe Elev.	Desc.
1197	1999701.4	592314.4	1542.21	-	MW-107/F-4
1198	1999700.1	592263.7	1541.62	-	E-4
1199	1999694.1	592216.1	1541.37	-	D-4
1200	1999692.3	592175.3	1541.58	-	C-4
1201	1999659.8	592131.4	1542.32	-	B-4
1205	1999627.4	592176.5	1542.43	-	C-5
1206	1999639.0	592218.4	1542.27	-	D-5
1207	1999650.2	592262.1	1542.67	-	E-5
1209	1999639.0	592352.9	1543.65	-	GW-2
1210	1999619.0	592337.5	1544.14	-	F-5
1211	1999597.0	592281.0	1543.51	1543.22	MW-102/E-6
1212	1999588.1	592242.3	1543.28	-	D-6
1263	1999595.0	592319.9	1543.25	-	F-6
1264	1999563.3	592331.1	1543.85	-	F-7
1266	1999566.6	592382.1	1543.62	-	G-7
1279	1999497.1	592270.3	1543.57	-	E-8
1280	1999549.6	592256.4	1543.51	-	D-7
1282	1999487.1	592226.6	1543.19	-	D-8
1283	1999508.7	592319.0	1543.27	-	F-8
1284	1999514.2	592380.7	1543.39	-	G-8
1285	1999573.2	592418.0	1543.65	-	H-7
1286	1999517.3	592440.5	1544.79	-	H-8
1287	1999478.2	592397.3	1543.65	-	G-9
1323	1999401.4	592254.1	1542.45	1542.07	MW-103/E-10
1324	1999445.3	592264.2	1543.14	-	E-9
1325	1999418.5	592261.8	1543.17	1542.97	GW-14
1326	1999449.4	592312.9	1543.18	1542.93	MW-101/F-9
1382	1999529.3	592469.7	1542.28	-	I-7
1484	1999365.4	592377.8	1542.27	-	F-11
1489	1999423.6	592400.6	1543.56	-	G-10
1499	1999403.3	592332.4	1546.10	1545.85	MW-109/F-10
1501	1999365.3	592299.6	1542.85	-	E-11
1519	1999304.6	592350.3	1548.51	-	F-12
1531	1999256.3	592411.4	1547.19	-	H-13
1550	1999214.6	592537.4	1548.29	-	J-14
1699	1999615.2	592418.3	1546.75	1546.69	MW-108/H-6

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

SAMPLE LOCATIONS

Pnt.	Northing	Easting	Ground Elev.	PVC Riser Pipe Elev.	Desc.
1749	1999786.6	592297.3	1541.46	-	F-2
1767	1999747.5	592263.3	1541.36	-	E-3
1831	1999779.6	592249.6	1540.61	-	E-2
1882	1999766.0	592166.9	1545.98	-	MW-105/C-2
1892	1999720.0	592151.2	1543.23	-	MW-106/C-3
1931	1999833.9	592054.2	1545.27	1545.12	MW-104/A-1
1944	1999776.3	592087.3	1539.82	1539.76	A-2
1947	1999769.4	592115.3	1540.89	1540.47	B-2
2019	1999711.5	592085.6	1538.75	-	TB-13
2023	1999692.5	592120.1	1542.15	-	GW-11
2024	1999711.9	592117.5	1541.27	-	B-3
2034	1999525.0	592176.7	1543.33	-	MW-110 /C-7
2205	2000429.5	591223.3	1533.56	-	TEST BORING
2332	2000510.4	591451.8	1535.11	1534.86	TEST BORING
3842	1999912.6	592004.8	1537.04	-	ST-102A
3843	1999916.0	592009.0	1538.85	-	ST-102A
3844	1999924.5	592016.0	1538.59	-	ST-102B
3845	1999918.4	591997.1	1539.73	-	ST-102
3854	1999968.2	591994.3	1537.84	-	TB-19
3856	1999979.3	592006.1	1537.51	-	TB-20
3857	1999991.8	592017.9	1537.50	-	TB-21
3868	2000032.9	592011.6	1538.09	-	TB-2
3869	2000036.4	592019.6	1537.26	-	TB-25
3870	2000015.6	591965.5	1537.87	-	TB-23
3882	2000119.7	591994.0	1537.55	-	SD-103B
3883	2000111.8	591982.9	1537.11	-	SD-103A
3884	2000086.4	591946.9	1537.53	-	SD-103D
3885	2000111.0	591938.3	1537.56	-	TB-26
3886	2000142.3	591938.6	1537.36	-	TB-27
3908	2000196.6	591882.1	1537.17	-	TB-31
3909	2000216.8	591877.3	1536.05	-	TB-35
3910	2000229.5	591891.3	1537.05	-	TB-33
3911	2000237.6	591896.6	1537.24	-	TB-34
3912	2000064.6	591931.2	1541.23	-	SD-103
3921	2000298.9	591847.4	1536.40	-	TB-40
3922	2000324.4	591825.6	1537.36	-	SD-104B
3924	2000316.2	591816.8	1535.73	-	SD-104C
3926	2000303.2	591809.3	1536.76	-	SD-104C
	1999549.4	592288.0	-	-	E-7
	1999747.3	592307.1	-	-	F-3
	1999458.9	592239.3	-	-	D-9

**Horizontal Coordinates reference to the New York State Plane Coordinate System, East Zone (3101) based on NAD 83 (2011). Vertical Datum is NAVD88. Horizontal and Vertical control was established by NYSNET RTK.*

SAMPLE LOCATIONS 9-26-14

Pnt.	Northing	Easting	Ground Elev.	Top of Well Elev.	PVC Riser Pipe Elev.	Desc.
10032	1999370.5	592338.7	1543.08	-	-	F-11A
10034	1999285.8	592255.5	1543.44	1546.53	1546.29	MW-204
11003	1999528.6	592285.2	1543.02	-	-	E-7A
11004	1999426.2	592314.4	1543.02	-	-	F-9A
11005	1999945.7	591954.2	1540.77	1543.81	1543.58	MW-201
11007	2000040.7	591958.9	1537.72	-	-	SD-200
11008	2000159.9	591929.1	1537.35	-	-	SD-201
11009	2000266.2	591853.5	1536.29	-	-	SD-202
11010	2000349.7	591773.5	1536.14	-	-	SD-203
11011	2000463.7	591665.8	1535.66	-	-	SD-204
11012	2000540.6	591583.1	1535.11	-	-	SD-205
11014	1999993.6	591741.0	1547.99	1548.05	1547.83	MW-203*
11017	1999711.9	591841.6	1554.26	1554.19	1553.97	MW-202*
11020	1999119.0	592297.7	1542.44	1545.52	1545.37	MW-205D*
11021	1999124.3	592295.9	1542.65	1545.44	1545.24	MW-205S*
11026	1999303.8	592387.3	1547.16	-	-	G-12
11027	1999144.7	592416.4	1542.10	-	-	H-15*
11028	1999792.2	592658.4	1548.42	-	-	BB1
11029	2000366.8	590878.9	1529.52	-	-	LF1
11030	2000406.2	591134.9	1535.86	-	-	BB2

Note: Horizontal Coordinates reference to the New York State Plane Coordinate System, East Zone (3101) based on NAD 83 (2011). Vertical Datum is NAVD88. Horizontal and Vertical control was established by NYSNET RTK.

**Test areas located off site.*

NOTES:

1. HORIZONTAL COORDINATES REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM (NYSNET), EAST ZONE (3101) BASED ON NAD 83 (2011).

2. VERTICAL DATUM BASED ON NAVD 88 (NYSNET). CONTOURS ARE AT 1 FOOT INTERVALS.

3. UNDERGROUND FACILITIES, STRUCTURES AND UTILITIES HAVE BEEN PLOTTED FROM A COMBINATION OF FIELD OBSERVATIONS, AVAILABLE MAPS, RECORDS AND INFORMATION PROVIDED BY THEIR OWNERS, THE LOCATION AND DESCRIPTION SHOULD BE CONSIDERED APPROXIMATE, THERE ALSO MAY BE OTHER FACILITIES, STRUCTURES OR UTILITIES IN THE AREA, THE EXISTENCE OF WHICH IS PRESENTLY UNKNOWN.

REF.

Saranac Gas Plant
Saranac Lake, NY

Part of LOT 13
County of Essex
Scale of 1 inch = 30'
TOWN North Elba
State of New York
Date 1/7/14 - 12/08/14 (Revised)

PHONE: (315) 432-9823
FAX: (315) 432-9826
6390 FLY ROAD
EAST SYRACUSE, N.Y. 13057
www.PrudentEng.com

Project No. 109.005-4

PRUDENT ENGINEERING

CADD File Name: M:\Drawings\109\005\Phase 04 – SARANAC GAS PLANT.DWG

IN CHARGE OF M.A.V. DESIGNED BY CHECKED BY ESTIMATED BY CHECKED BY DRAFTED BY M.A.V. B.G.P. CHECKED BY

APPENDIX D

DETAILED COST ESTIMATE BACKUP

Alternative 2 - Excavation

Task	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Extended Cost	Comments/ Assumptions
CAPITAL COSTS								
Pre-Design								
Pre-Design Investigation								
	Geoprobe Drill Rig & Crew	5	WK	$ -	$ 7,500.00	$ -	$ 37,500.00	Cost to mobilize and keep onsite for 5 weeks
	Hollow-Stem Auger Rig & Crew	1	WK	$ -	$ 15,000.00	$ -	$ 15,000.00	
	Field Technician 1	250	HR	$ -	$ 80.00	$ -	$ 20,000.00	Assume 1 technicians for 5 weeks and
	Field Technician 2	300	HR	$ -	$ 80.00	$ -	$ 24,000.00	one Technician for 6 weeks
	Sediment/Soil/GW Seepage Samples	45	EA	$ 200.00	$ -	$ -	$ 9,000.00	Sediment and soil samples
	Surface Water/GW Seepage Samples	10	EA	$ 200.00	$ -	$ -	$ 2,000.00	
	GeoTech Sample Analysis	10	EA	$ 500.00	$ -	$ -	$ 5,000.00	
Site Investigations								
	Site/Bathymetric Survey	1	LS	$ 10,000.00	$ -	$ -	$ 10,000.00	
	Habitat Characterization (1 technician)	40	HR	$ -	$ 80.00	$ -	$ 3,200.00	1 person, 5 days (includes per diem)
	Biota Lab Analysis	20	EA	$ 500.00	$ -	$ -	$ 10,000.00	20 samples for biota analysis
	Hydrogeo Modeling for GW Seepage	1	LS	$15,000	$ -	$ -	$ 15,000.00	
	Ecological Risk Assessment	1	LS	$ 20,000.00	$ -	$ -	$ 20,000.00	
Task Subtotal							**$ 170,700.00**	
Full-Scale Excavation								
Alternative 2A - Excavation to Meet Class A SVGs								
	Excavation Implementation	1	LS	$ 2,456,360.65	$ -	$ -	$ 2,456,360.65	See detailed cost estimate
	Excavation w/out T&D/Backfill	1	LS	$ 1,427,202.85	$ -	$ -	$ 1,427,202.85	For Indirect capital cost calculation
	Confirmatory Sampling	70	EA	$ 150.00	$ -	$ -	$ 10,500.00	Sample from bottom every 50 ft, sidewalls every 100 ft
	Disposal Characterization	8	EA	$ 750.00	$ -	$ -	$ 6,000.00	1 sample for every 1,000 CY of sediment
Task Subtotal							**$ 2,472,860.65**	
Alternative 2B - Excavation to Pre-Disposal Conditions								
	Excavation Implementation	1	LS	$ 3,248,267.43	$ -	$ -	$ 3,248,267.43	See detailed cost estimate
	Excavation w/out T&D/Backfill	1	LS	$ 1,595,678.07	$ -	$ -	$ 1,595,678.07	For indirect capital cost calculations
	Confirmatory Sampling	70	EA	$ 150.00	$ -	$ -	$ 10,500.00	Sample from bottom every 50 ft, sidewalls every 100 ft
	Disposal Characterization	9	EA	$ 750.00	$ -	$ -	$ 6,750.00	1 sample every 1,000 CY of sediment
Task Subtotal							**$ 3,265,517.43**	
ANNUAL AND PERIODIC COSTS								
2A/2B Long-Term Monitoring (per annual inspection)								
	Field Technician 1	24	HR	$ -	$ 80.00	$ -	$ 1,920.00	
	Field Technician 2	24	HR	$ -	$ 80.00	$ -	$ 1,920.00	
	Sediment & SW samples	5	EA	$ 200.00	$ -	$ -	$ 1,000.00	3 sediment, 2 surface water
Task Subtotal							**$ 4,840.00**	
Annual Reporting								
Eng. Est.	Annual Report	1	LS	$ -	$ 5,000.00	$ -	$ 5,000.00	
Task Subtotal							**$ 5,000.00**	

Prepared By/Date: SB 6/24/2015
Revised By/Date: JW 7/29/2015

Estimate Summary

Description: Brandy Brook - Excavate 4,800 CY to Meet Class A SGVs

Resource Code	Description	Hours	Quantity	Unit		Unit Cost	Total Cost
1.1	Work Plans, Schedules and Permits						**$69,795.42**
1.11	Detailed Construction Plan						$15,302.88
	Project Engineer	24		hr	$	79.83	$1,915.92
	Project Manager	72		hr	$	32.20	$2,318.40
	QC Officer	12		hr	$	43.19	$518.28
	Safety Officer	12		hr	$	59.33	$711.96
	Project Control/Scheduler	48		hr	$	47.31	$2,270.88
	Administrative Assistant	48		hr	$	37.91	$1,819.68
	Site Superintendent	72		hr	$	79.83	$5,747.76
1.1.2	H&S Plan Project						$11,679.52
	Administrative Assistant	96		hr	$	37.91	$3,639.36
	Safety Officer	16		hr	$	59.33	$949.28
	Project Engineer	32		hr	$	27.50	$880.00
	Project Manager	16		hr	$	32.20	$515.20
	Safety Tech	96		hr	$	59.33	$5,695.68
1.1.3	Contingency Plan						$11,464.40
	Project Engineer	80		hr	$	79.83	$6,386.40
	Project Manager	20		hr	$	32.20	$644.00
	QC Officer	10		hr	$	43.19	$431.90
	Safety Officer	10		hr	$	59.33	$593.30
	Project Control/Scheduler	40		hr	$	47.31	$1,892.40
	Administrative Assistant	40		hr	$	37.91	$1,516.40
1.1.4	QA/QC Plan						$4,229.96
	Administrative Assistant	40		hr	$	37.91	$1,516.40
	Project Engineer	4		hr	$	79.83	$319.32
	Project Manager	4		hr	$	32.20	$128.80
	QC Officer	16		hr	$	43.19	$691.04
	QC Tech	40		hr	$	39.36	$1,574.40
1.1.5	Traffic Control Plan						$6,689.48
	Administrative Assistant	24		hr	$	37.91	$909.84
	Project Engineer	48		hr	$	79.83	$3,831.84
	Project Manager	16		hr	$	32.20	$515.20
	Safety Officer	8		hr	$	59.33	$474.64
	Site Superintendent	12		hr	$	79.83	$957.96
1.1.6	Storm Water Management Plan						$8,429.18
	Administrative Assistant	10		hr	$	37.91	$379.10
	Project Engineer	48		hr	$	79.83	$3,831.84
	Project Manager	12		hr	$	32.20	$386.40
	Site Superintendent	48		hr	$	79.83	$3,831.84
1.1.7	Fees and Permits	0	1	LS	$	12,000.00	$12,000.00
1.2	Mobilization & Site Prep						**$149,386.07**
	Mobilize crew and equipment						$15,084.16
	Site Foreman	8		hr	$	30.37	$242.96
	Heavy Const Skilled Laborer	48		hr	$	48.54	$2,329.92
	Equipment Operator	16		hr	$	59.02	$944.32
	Wheeled Loader	8		hr	$	105.52	$844.16
	Track Excavator	8		hr	$	95.07	$760.56
	Truck	16		hr	$	97.64	$1,562.24
	Office Trailer		3	Month	$	800.00	$2,400.00
	Job Boxes (2)		6	Month	$	400.00	$2,400.00
	Utilities		1	LS			$3,600.00
	Sedimentation & Erosion Control (~1,500 ft)						$5,046.21
	Skilled Laborer	24		hr	$	48.54	$1,164.96
	Silt Fence 3ft High		15	Roll	$	26.75	$401.25
	Hay Bales		500	each	$	6.96	$3,480.00
	Stabilized Construction Access Road						$23,149.76
	Heavy Const Skilled Laborer	32	2	each	$	48.54	$1,553.28
	Equipment Operator	32	2	each	$	59.02	$1,888.64
	Wheeled Loader	16	1	each	$	105.52	$1,688.32

Estimate Summary

Description: Brandy Brook - Excavate 4,800 CY to Meet Class A SGVs

Resource Code	Description	Hours	Quantity	Unit		Unit Cost	Total Cost
	Dump Truck Driver	16	1	each	$	49.31	$788.96
	Dump Truck	16	1	each	$	34.41	$550.56
	Class A Geofabric		9000	SF	$	1.02	$9,180.00
	Wood Chips or crushed stone		500	tons	$	15.00	$7,500.00
	Stockpile Areas						$5,105.94
	1-1/2" Stone/Aggregate		210	tons	$	17.65	$3,706.50
	Non-Woven Geo-Fabric		3600	SF	$	0.10	$360.00
	Wheeled Loader	6		each	$	65.68	$394.08
	Heavy Const Skilled Laborer	6		each	$	48.54	$291.24
	Equipment Operator	6		each	$	59.02	$354.12
	Survey						$15,000.00
	Pre-Construction Survey		1	LS	$	8,000.00	$8,000.00
	As-built Survey		1	LS	$	7,000.00	$7,000.00
	Construction Fencing		3000	LF	$	12.00	$36,000.00
	General Conditions		1	LS	$	50,000.00	$50,000.00
1.4	Water Diversion, dewatering, water treatment						**$286,489.46**
	Divert Brook Flow						$9,864.24
	Heavy Const Skilled Laborer	32		hr	$	48.54	$1,553.28
	Equipment Operator	16		hr	$	59.02	$944.32
	Track Excavator	16		hr	$	95.07	$1,521.12
	Pump	8		hr	$	49.44	$395.52
	Piping - 4" 20ft lengths		10	each	$	20.00	$200.00
	Aquadams - 4 ft high		50	each	$	105.00	$5,250.00
	Dewatering Excavation Areas						$9,912.06
	Heavy Const Skilled Laborer	120		hr	$	48.54	$5,824.80
	Suction Hose 10' Length		100	each	$	27.29	$2,729.00
	6-inch X 50' discharge hose		6	each	$	59.71	$358.26
	Pump		2	each	$	500.00	$1,000.00
	Set up Water Treatment System						$125,365.96
	Pumps/piping/fittings/connections		1	LS	$	10,000.00	$10,000.00
	Filter Bag Unit Mob/Demob		1	LS	$	10,000.00	$10,000.00
	Filter Bag Unit Rental		3	Month	$	6,045.00	$18,135.00
	GAC Units		2	Each	$	26,750.00	$53,500.00
	Oil Water Separator		1	Each	$	24,075.00	$24,075.00
	Frac Tank		6	Month	$	802.50	$4,815.00
	Frac Tank Delivery & Pick-up		2	Each	$	200.00	$400.00
	Heavy Const Skilled Laborer	64		hr	$	48.54	$3,106.56
	Equipment Operator	16		hr	$	59.02	$944.32
	Backhoe	16		hr	$	24.38	$390.08
	Operate Water Treatment System						$141,347.20
	WWTP Licensed Operator	320		hr	$	66.71	$21,347.20
	Lodging per day		40	day	$	125.00	$5,000.00
	Per Diem		40	day	$	35.00	$1,400.00
	Truck	320		hr	$	11.25	$3,600.00
	GAC		30	tons	$	3,500.00	$105,000.00
	Miscellaneous Materials		1	LS	$	5,000.00	$5,000.00
1.5	Excavation, transportation and disposal of sediments to (Average Depth of 4.5 feet)						**$1,424,191.30**
	General Excavation (including culverts at driveways)						$237,444.00
	Heavy Const Skilled Laborer	1200		hr	$	48.54	$58,248.00
	Equipment Operator	400		hr	$	59.02	$23,608.00
	Track Excavator	400		hr	$	95.07	$38,028.00
	Articulating Truck	800		hr	$	97.64	$78,112.00
	Dump Truck Driver	800		hr	$	49.31	$39,448.00
	Odor Control						$17,912.40
	Disperse odor control foam (assume twice at each area)		60000	SF	$	0.25	$15,000.00
	Heavy Const Skilled Laborer	60		hr	$	48.54	$2,912.40
	Vacuum Excavation / Flushing 24" culvert under Route 86						$12,500.00
	Flush & Capture Sediment		250	LF	$	50.00	$12,500.00

Estimate Summary

Description: Brandy Brook - Excavate 4,800 CY to Meet Class A SGVs

Resource Code	Description	Hours	Quantity	Unit		Unit Cost	Total Cost
	Handling/Dewatering of sediments						$112,732.00
	Heavy Const Skilled Laborer	400		hr	$	48.54	$19,416.00
	Equipment Operator	400		hr	$	59.02	$23,608.00
	Wheeled Loader	400		hr	$	105.52	$42,208.00
	Kiln Dust		1100	tons	$	25.00	$27,500.00
	Loading, Transportation and Disposal						$1,029,157.80
	Heavy Const Skilled Laborer	60		hr	$	48.54	$2,912.40
	Equipment Operator	60		hr	$	59.02	$3,541.20
	Track Excavator	60		hr	$	95.07	$5,704.20
	T&D (Thermal Desorption)		11300	tons	$	90.00	$1,017,000.00
	Handling Decant (Treat through dewatering plant)						$14,445.10
	Frac Tank		3	Month	$	802.50	$2,407.50
	Frac Tank Delivery & Pick-up		1	Each	$	200.00	$200.00
	Heavy Const Skilled Laborer	120		hr	$	48.54	$5,824.80
	Diesel Transfer Pump	120		hr	$	49.44	$5,932.80
	Transfer Piping (20 foot ea)		4	each	$	20.00	$80.00
1.6	Reinstate Brook Bottom (2.5 feet backfill, 2 feet habitat substrate)						**$133,947.60**
	Site Foreman	40	1	each	$	30.37	$1,214.80
	Heavy Const Skilled Laborer	120	6	each	$	48.54	$5,824.80
	Equipment Operator	120	2	each	$	59.02	$7,082.40
	Track Excavator	120	1	each	$	95.07	$11,408.40
	Track Dozer	120	1	each	$	63.26	$7,591.20
	Washed Sand		3200	CY	$	12.84	$41,088.00
	Habitat Substrate		2600	CY	$	21.08	$54,808.00
	Erosion Control Straw Mats		29000	SF	$	0.07	$2,030.00
	Seeding		29000	SF	$	0.10	$2,900.00
1.7	Site Restoration (disturbed areas including access road & OU01 Site)						**$62,295.24**
	Heavy Const Skilled Laborer	96		hr	$	48.54	$4,659.84
	Equipment Operator	80		hr	$	59.02	$4,721.60
	Dump Truck Driver	40		hr	$	49.31	$1,972.40
	Articulating Truck	40		hr	$	97.64	$3,905.60
	Wheeled Loader	20		hr	$	105.52	$2,110.40
	Backhoe	80		hr	$	24.38	$1,950.40
	Replace Culverts (3 driveways)		3	each	$	2,000.00	$6,000.00
	Bedding around Culverts		10	CY	$	40.00	$400.00
	Restore Driveways (3)		900	SF	$	20.00	$18,000.00
	Topsoil		500	CY	$	26.75	$13,375.00
	Planting (trees, shrubs, etc.)		100	each	$	35.00	$3,500.00
	Erosion Control Straw Mats		10000	SF	$	0.07	$700.00
	Seeding		10000	SF	$	0.10	$1,000.00
1.8	Demobilization						**$15,000.00**
1.9	Engineering Oversight						**$79,734.00**
	Construction Manager	600		hr	$	105.89	$63,534.00
	Lodging/Per Diem		60	day	$	160.00	$9,600.00
	Office Support (1 hr per day)	60		hr	$	110.00	$6,600.00
1.10	Payment and Performance Bonds						**$21,411.05**
1.11	Subcontract Profit						**$214,110.51**
TOTAL							**$2,456,360.65**

Prepared By/Date: SB 6/24/2015
Revised By/Date: JW 7/29/2015

Estimate Summary

Description: Brandy Brook - Excavate 5,760 CY to meet pre-disposal conditions

Resource Code	Description	Hours	Quantity	Unit		Unit Cost	Total Cost
1.1	Work Plans, Schedules and Permits						**$69,795.42**
1.11	Detailed Construction Plan						$15,302.88
	Project Engineer	24		hr	$	79.83	$1,915.92
	Project Manager	72		hr	$	32.20	$2,318.40
	QC Officer	12		hr	$	43.19	$518.28
	Safety Officer	12		hr	$	59.33	$711.96
	Project Control/Scheduler	48		hr	$	47.31	$2,270.88
	Administrative Assistant	48		hr	$	37.91	$1,819.68
	Site Superintendent	72		hr	$	79.83	$5,747.76
1.1.2	H&S Plan Project						$11,679.52
	Administrative Assistant	96		hr	$	37.91	$3,639.36
	Safety Officer	16		hr	$	59.33	$949.28
	Project Engineer	32		hr	$	27.50	$880.00
	Project Manager	16		hr	$	32.20	$515.20
	Safety Tech	96		hr	$	59.33	$5,695.68
1.1.3	Contingency Plan						$11,464.40
	Project Engineer	80		hr	$	79.83	$6,386.40
	Project Manager	20		hr	$	32.20	$644.00
	QC Officer	10		hr	$	43.19	$431.90
	Safety Officer	10		hr	$	59.33	$593.30
	Project Control/Scheduler	40		hr	$	47.31	$1,892.40
	Administrative Assistant	40		hr	$	37.91	$1,516.40
1.1.4	QA/QC Plan						$4,229.96
	Administrative Assistant	40		hr	$	37.91	$1,516.40
	Project Engineer	4		hr	$	79.83	$319.32
	Project Manager	4		hr	$	32.20	$128.80
	QC Officer	16		hr	$	43.19	$691.04
	QC Tech	40		hr	$	39.36	$1,574.40
1.1.5	Traffic Control Plan						$6,689.48
	Administrative Assistant	24		hr	$	37.91	$909.84
	Project Engineer	48		hr	$	79.83	$3,831.84
	Project Manager	16		hr	$	32.20	$515.20
	Safety Officer	8		hr	$	59.33	$474.64
	Site Superintendent	12		hr	$	79.83	$957.96
1.1.6	Storm Water Management Plan						$8,429.18
	Administrative Assistant	10		hr	$	37.91	$379.10
	Project Engineer	48		hr	$	79.83	$3,831.84
	Project Manager	12		hr	$	32.20	$386.40
	Site Superintendent	48		hr	$	79.83	$3,831.84
1.1.7	Fees and Permits		1	LS	$	12,000.00	$12,000.00
1.2	Mobilization & Site Prep						**$149,582.57**
	Mobilize crew and equipment						$15,084.16
	Site Foreman	8		hr	$	30.37	$242.96
	Heavy Const Skilled Laborer	48		hr	$	48.54	$2,329.92
	Equipment Operator	16		hr	$	59.02	$944.32
	Wheeled Loader	8		hr	$	105.52	$844.16
	Track Excavator	8		hr	$	95.07	$760.56
	Truck	16		hr	$	97.64	$1,562.24
	Office Trailer		3	Month	$	800.00	$2,400.00
	Job Boxes (2)		6	Month	$	400.00	$2,400.00
	Utilities		1	LS			$3,600.00
	Sedimentation & Erosion Control (~1,500 ft)						$5,046.21
	Skilled Laborer	24			$	48.54	$1,164.96
	Silt Fence 3ft High		15	Roll	$	26.75	$401.25
	Hay Bales		500	each	$	6.96	$3,480.00
	Stabilized Construction Access Road						$23,149.76
	Heavy Const Skilled Laborer	32		hr	$	48.54	$1,553.28
	Equipment Operator	32		hr	$	59.02	$1,888.64
	Wheeled Loader	16		hr	$	105.52	$1,688.32

Estimate Summary

Description: Brandy Brook - Excavate 5,760 CY to meet pre-disposal conditions

Resource Code	Description	Hours	Quantity	Unit		Unit Cost	Total Cost
	Dump Truck Driver	16		hr	$	49.31	$788.96
	Dump Truck	16		hr	$	34.41	$550.56
	Class A Geofabric		9000	SF	$	1.02	$9,180.00
	Wood Chips or crushed stone		500	tons	$	15.00	$7,500.00
	Stockpile Areas						$5,302.44
	1-1/2" Stone/Aggregate		220	tons	$	17.65	$3,883.00
	Non-Woven Geo-Fabric		3800	SF	$	0.10	$380.00
	Wheeled Loader	6		each	$	65.68	$394.08
	Heavy Const Skilled Laborer	6		each	$	48.54	$291.24
	Equipment Operator	6		each	$	59.02	$354.12
	Survey						$15,000.00
	Pre-Construction Survey		1	LS	$	8,000.00	$8,000.00
	As-built Survey		1	LS	$	7,000.00	$7,000.00
	Construction Fencing		3000	LF	$	12.00	$36,000.00
	General Conditions		1	LS	$	50,000.00	$50,000.00
1.4	Water Diversion, dewatering, water treatment						**$286,489.46**
	Divert Brook Flow						$9,864.24
	Heavy Const Skilled Laborer	32		hr	$	48.54	$1,553.28
	Equipment Operator	16		hr	$	59.02	$944.32
	Track Excavator	16		hr	$	95.07	$1,521.12
	Pump	8		hr	$	49.44	$395.52
	Piping - 4" 20ft lengths		10	each	$	20.00	$200.00
	Aquadams - 4 ft high		50	each	$	105.00	$5,250.00
	Dewatering Excavation Areas						$9,912.06
	Heavy Const Skilled Laborer	120		hr	$	48.54	$5,824.80
	Suction Hose 10' Length		100	each	$	27.29	$2,729.00
	6-inch X 50' discharge hose		6	each	$	59.71	$358.26
	Pump		2	each	$	500.00	$1,000.00
	Set up Water Treatment System						$125,365.96
	Pumps/piping/fittings/connections		1	LS	$	10,000.00	$10,000.00
	Filter Bag Unit Mob/Demob		1	LS	$	10,000.00	$10,000.00
	Filter Bag Unit Rental		3	Month	$	6,045.00	$18,135.00
	GAC Units		2	Each	$	26,750.00	$53,500.00
	Oil Water Separator		1	Each	$	24,075.00	$24,075.00
	Frac Tank		6	Month	$	802.50	$4,815.00
	Frac Tank Delivery & Pick-up		2	Each	$	200.00	$400.00
	Heavy Const Skilled Laborer	64		hr	$	48.54	$3,106.56
	Equipment Operator	16		hr	$	59.02	$944.32
	Backhoe	16		hr	$	24.38	$390.08
	Operate Water Treatment System						$141,347.20
	WWTP Licensed Operator	320		hr	$	66.71	$21,347.20
	Lodging per day		40	Day	$	125.00	$5,000.00
	Per Diem		40	Day	$	35.00	$1,400.00
	Truck	320		hr	$	11.25	$3,600.00
	GAC		30	Tons	$	3,500.00	$105,000.00
	Miscellaneous Materials		1	LS	$	5,000.00	$5,000.00
1.5	Excavation, transportation and disposal of sediments to (Average Depth of 4.5 feet)						**$2,084,515.86**
	General Excavation (including culverts at driveways)						$253,368.80
	Heavy Const Skilled Laborer	1280		hr	$	48.54	$62,131.20
	Equipment Operator	440		hr	$	59.02	$25,968.80
	Track Excavator	440		hr	$	95.07	$41,830.80
	Articulating Truck	840		hr	$	97.64	$82,017.60
	Dump Truck Driver	840		hr	$	49.31	$41,420.40
	Odor Control						$23,397.80
	Disperse odor control foam (assume twice at each area)		80000	SF	$	0.25	$20,000.00
	Heavy Const Skilled Laborer	70		hr	$	48.54	$3,397.80
	Vacuum Excavation / Flushing 24" culvert under Route 86						$12,500.00
	Flush & Capture Sediment		250	LF	$	50.00	$12,500.00

Estimate Summary

Description: Brandy Brook - Excavate 5,760 CY to meet pre-disposal conditions

Resource Code	Description	Hours	Quantity	Unit		Unit Cost	Total Cost
	Handling/Dewatering of sediments						$126,255.20
	Heavy Const Skilled Laborer	440		hr	$	48.54	$21,357.60
	Equipment Operator	440		hr	$	59.02	$25,968.80
	Wheeled Loader	440	1	each	$	105.52	$46,428.80
	Kiln Dust		1300	tons	$	25.00	$32,500.00
	Loading, Transportation and Disposal						$1,652,589.36
	Heavy Const Skilled Laborer	72		hr	$	48.54	$3,494.88
	Equipment Operator	72		hr	$	59.02	$4,249.44
	Track Excavator	72		hr	$	95.07	$6,845.04
	T&D (Thermal Desorption)		18200	tons	$	90.00	$1,638,000.00
	Handling Decant (Treat through dewatering plant)						$16,404.70
	Frac Tank		3	Month	$	802.50	$2,407.50
	Frac Tank Delivery & Pick-up		1	Each	$	200.00	$200.00
	Heavy Const Skilled Laborer	140		hr	$	48.54	$6,795.60
	Diesel Transfer Pump	140		hr	$	49.44	$6,921.60
	Transfer Piping (20 foot ea)		4	each	$	20.00	$80.00
1.6	Reinstate Brook Bottom (2.5 feet backfill, 2 feet habitat substrate)						**$182,544.72**
	Site Foreman	40			$	30.37	$1,214.80
	Heavy Const Skilled Laborer	128			$	48.54	$6,213.12
	Equipment Operator	128			$	59.02	$7,554.56
	Track Excavator	128			$	95.07	$12,168.96
	Track Dozer	128			$	63.26	$8,097.28
	Washed Sand		6700	CY	$	12.84	$86,028.00
	Habitat Substrate		2600	CY	$	21.08	$54,808.00
	Erosion Control Straw Mats		38000	SF	$	0.07	$2,660.00
	Seeding		38000	SF	$	0.10	$3,800.00
1.7	Site Restoration (disturbed areas including access road & OU01 Site)						**$62,295.24**
	Heavy Const Skilled Laborer	96			$	48.54	$4,659.84
	Equipment Operator	80			$	59.02	$4,721.60
	Dump Truck Driver	40			$	49.31	$1,972.40
	Articulating Truck	40			$	97.64	$3,905.60
	Wheeled Loader	20			$	105.52	$2,110.40
	Backhoe	80			$	24.38	$1,950.40
	Replace Culverts (3 driveways)		3	each	$	2,000.00	$6,000.00
	Bedding around Culverts		10	CY	$	40.00	$400.00
	Restore Driveways (3)		900	SF	$	20.00	$18,000.00
	Topsoil		500	CY	$	26.75	$13,375.00
	Planting (trees, shrubs, etc.)		100	each	$	35.00	$3,500.00
	Erosion Control Straw Mats		10000	SF	$	0.07	$700.00
	Seeding		10000	SF	$	0.10	$1,000.00
1.8	Demobilization						**$15,000.00**
1.9	Engineering Oversight						**$84,519.60**
	Construction Manager	640		hr	$	105.89	$67,769.60
	Lodging/Per Diem		60	day	$	160.00	$9,600.00
	Office Support (1 hr per day)	65		hr	$	110.00	$7,150.00
1.10	Payment and Performance Bonds						**$28,502.23**
1.11	Subcontract Profit						**$285,022.33**
TOTAL							**$3,248,267.43**

Prepared By/Date: SB 6/24/2015
Revised By/Date: JW 7/29/2015

PRESENT VALUE OF ANNUAL AND PERIODIC COSTS FOR ALTERNATIVES 2 - EXCAVATION

Alternative 2A - Excavation to Class A SGVs **Year**	**Cost***	**Number of Annual Periods**	**Annual Discount Rate**	**Number of 2-Year Periods**	**2-Year Discount Rate**	**Number of 4-Year Periods**	**4-Year Discount Rate**	**Total Non-Discounted Cost**	**Present Value Cost**
Capital (Year 0)	$ 3,500,000	1	0	NA	NA	NA	NA	$ 3,500,000.00	$ 3,500,000.00
Annual Long Term Monitoring Reporting (Years 1-30)	$ 9,840	30	0.034	NA	NA	NA	NA	$ 295,200.00	$ 183,266.65
Totals								**$ 3,795,200.00**	**$ 3,683,266.65**

*Annual and periodic costs include 10% for technical support and 15% contingency for unforeseen project complexities, including insurance, taxes, and licensing costs.
Capital costs include 25% contingency, as well as project management, remedial design, and construction management costs per DER-10 guidance.
Discount rate of 3.4% (for 30-years) percent based on NYSDEC PRAP Outline / Instructions.

Prepared By/Date: DF 11/05/2014

Alternative 2B - Excavation to Meet Pre-Disposal Conditions **Year**	**Cost***	**Number of Annual Periods**	**Annual Discount Rate**	**Number of 2-Year Periods**	**2-Year Discount Rate**	**Number of 4-Year Periods**	**4-Year Discount Rate**	**Total Non-Discounted Cost**	**Present Value Cost**
Capital (Year 0)	$ 4,490,000	1	0	NA	NA	NA	NA	$ 4,490,000.00	$ 4,490,000.00
Annual Long Term Monitoring Reporting (Years 1-30)	$ 9,840	30	0.034	NA	NA	NA	NA	$ 295,200.00	$ 183,266.65
Totals								**$ 4,785,200.00**	**$ 4,673,266.65**

Prepared By/Date: SB 6/24/2015
Revised By/Date: JW 7/29/2015