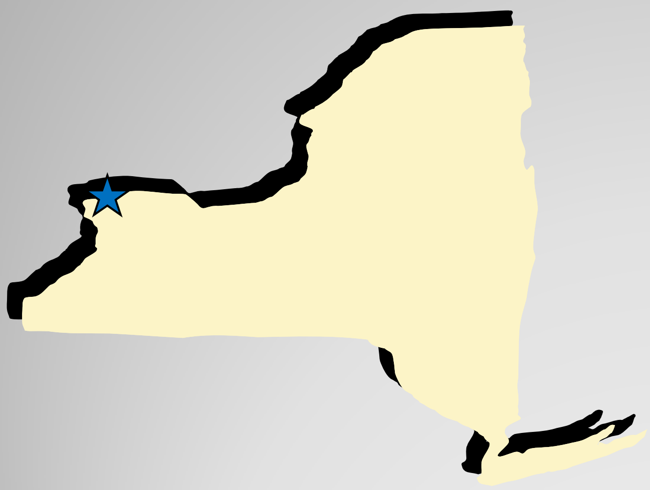
FINAL FEASIBILITY STUDY REPORT FOR OPERABLE UNIT 3

Old Upper Mountain Road Site (932112)
Lockport, Niagara County, New York



Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation

Prepared by:

EA ENGINEERING, P.C. and Its Affiliate
EA SCIENCE and TECHNOLOGY

February 2012

Feasibility Study Report for
Operable Unit 3
Old Upper Mountain Road (932112)
Lockport, New York

Prepared for

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1. INTRODUCTION AND PROJECT OVERVIEW

EA Engineering, P.C. and its affiliate EA Science and Technology (EA), under contract to the New York State Department of Environmental Conservation (NYSDEC) (Work Assignment No. D004438-41) was tasked to perform a Remedial Investigation (RI), Supplemental RI (SRI), and Feasibility Study (FS) at the Old Upper Mountain Road site (NYSDEC Site No. 932112) located in the town and city of Lockport, Niagara County, New York. Under the RI and SRI, the Old Upper Mountain Road site was evaluated as three separate operable units (OUs) defined as follows:

- OU 1 is defined as the approximately 6 acres of landfill wastes which make up the Old Upper Mountain Road site. Impacts associated with OU 1 and evaluated in the RI include on-site surface and subsurface soil/fill material, and on-site groundwater.

- OU 2 is defined as surface water and sediment within Gulf Creek, from the area located at the western origin of the ravine at the bulkhead outfall located to the north of the site to an area downstream where Gulf Creek meets Niagara Street.

- OU 3 is defined as the approximately 1 acre of landfill wastes that make up the portion of the Old Upper Mountain Road site located south and west of the Somerset rail line. Impacts associated with OU 3 and evaluated in the RI include on-site surface and subsurface soil/fill material, and on-site groundwater.

This FS has been prepared for OU 3.

1.1 PURPOSE AND SCOPE

This FS report has been prepared to develop and evaluate alternatives for remedial action and to determine which alternative is the most appropriate, cost effective, and protective of public health and the environment for the Old Upper Mountain Road site.

The FS has been conducted in accordance with the most recent versions of the *Guidance for Conducting Remedial Investigations and Feasibility Studies under Comprehensive Environmental Response, Compensation, and Liability Act* (U.S. Environmental Protection Agency [USEPA] 1988) and *DER-10, Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010) and focused on remedial alternatives proven effective at addressing the metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) detected in various environmental media on this site.

1.2 REPORT ORGANIZATION

The FS report has been organized as follows:

- ***Section 1***—Introduction and Project Overview
- ***Section 2***—Summary of Remedial Investigation and Exposure Assessment
- ***Section 3***—Development of Remedial Action Objectives
- ***Section 4***—General Response Actions
- ***Section 5***—Identification and Screening of Technologies
- ***Section 6***—Scoping and Development of Remedial Alternatives
- ***Section 7***—Costing and Evaluation Criteria
- ***Section 8***—Detailed Analysis of Alternatives and Recommendations
- ***Section 9***—References.

1.3 BACKGROUND

The following section provides a brief discussion of the site background for the Old Upper Mountain Road site. A full description of the site is provided in the Final RI Report (EA 2011a) and Supplemental RI Report (EA 2011b), which were submitted as a separate deliverables.

1.3.1 Site Location

The site is located along Old Upper Mountain Road, in both the town and city of Lockport, Niagara County, New York (Figures 1-1 and 1-2). The property is an irregular-shaped parcel that is approximately 7 acres in size. Main access to the site is located on Old Upper Mountain Road. The site sits northeast of the intersection between NYS Route 93 and NYS Route 31. An access road exists on Otto Park Place to the southeastern portion of the site. The site consists of seven Niagara County tax parcels and is located in a mixed use area including residential, industrial, and commercial properties. Somerset Railroad bounds the property to the south and east. The north of the property is bounded by private property and a ravine containing Gulf Creek, referred to as the Gulf.

1.3.2 Property Information

The Old Upper Mountain Road site was reportedly operated as a municipal dump by the city of Lockport from 1921 to the 1950s. Access to the landfill during that time was from the viaduct under the railroad track just north of Otto Park Place. Garbage and other wastes were apparently dumped at the landfill, burned, and then pushed into the ravine. The city of Lockport moved its dumping operations in the 1950s to the area known today as the Lockport City Landfill (NYSDEC Site No. 932010) located east of the Old Upper Mountain Road site along the railroad tracks.

The Old Upper Mountain Road site was reportedly used by the same clientele as the Lockport City Landfill. There was a shift in location between the two landfills in the 1950s. Clientele reportedly included Harrison Radiator, VanDeMark Chemical, Milward Alloys, Vanchlor, Upson, and Cotton Batting. Different areas of the dump were reportedly assigned to different companies.

The site was initially discovered in 1993 during a routine inspection of the Lockport City Landfill located north of the Old Upper Mountain Road site and downstream of the site along Gulf Creek. Evidence of ash and glass debris were noted throughout the top portion of the landfill, while recent dumping of trash/rubbish/tires was noted at the southern portion of the site. It was also noted during the inspection that a significant quantity of waste had been pushed over the embankment into the ravine through which Gulf Creek runs.

1.3.3 Site History

Based upon a review of historical information presented in the Environmental Data Resources, Inc. (EDR) reports, Upper Mountain Road first appears on the 1897 United States Geological Survey (USGS) topographic map along with the New York Central and Hudson River railroads which run along the southern boundary of the site. Access to the dumping area was historically through a viaduct located under this railroad track. An additional railroad appears in the area to the east of the site, running north to south along Gulf Creek on the 1948 USGS topographical map.

The topographic maps also illustrate changes in elevation at the site which reflect changes in the size and shape of the Gulf resulting from the historic landfill operations at the site, and development of other areas surrounding the Gulf. Based upon a review of the topographic maps, the following is known regarding impacts to the ravine from landfill activities and other site development:

- According to the 1897 topographic map, the ravine and Gulf extended almost completely to the railroad track that currently serves as the southern boundary of the site. Elevation at the top of the ravine was approximately 600 ft, while the base of the ravine was approximately 520 ft.

- The 1899 topographic map illustrates no discernable changes in the shape of the Gulf, indicating that landfill operations had not yet begun.

- The 1948 topographic map shows a large portion of the site formerly within the Gulf ravine filled to grade (approximately 587 ft). Filling appears to have been completed from the southwest corner of the site to the northeast, as a small portion of the ravine remains visible just beyond the eastern edge of the filled landfill area. Additionally, an industrial structure appears in the area of the current General Motors Components Holdings, LLC (GMCH), recently the former Delphi Thermal Systems, on the 1948 USGS topographic map to the west of the site across Upper Mountain Road.

- Landfill operations at the site appear to have continued through at least 1949. The 1949 topographic map illustrates further dumping within the ravine, as the small portion along the eastern portion of the site that was unfilled in 1948 is visible as being brought to grade in this map.

- The site appears unchanged in the 1965 topographic map. However, it appears that overburden soil was removed from the northern edge of the ravine, directly across Gulf Creek from the site during this time, as the ravine is shown to be slightly wider than observed in the 1949 map. A section of Upper Mountain Road was also abandoned between 1949 and 1965, and a new section was developed along NYS Route 93. The old section of the road was left behind and named Old Upper Mountain Road. Additionally, four structures are visible along Old Upper Mountain Road directly to the north of the site, while the GMCH property is shown to have expanded from previous maps.

- The 1980 topographic map shows an expansion in the western portion of the ravine, which appears to have coincided with the installation of a bulkhead outfall along Old Upper Mountain Road, which discharges directly into the ravine and Gulf Creek. This map also denotes the presence of the GMCH wastewater treatment plant to the north of the site, in addition to another expansion at the facility across Upper Mountain Road. A large section of water is also shown within the ravine approximately 500 ft downgradient from the site.

GMCH was started in 1910 as Harrison Radiator and has expanded over the last 100 years going through several changes of management. Harrison Radiator and later Delphi Thermal Systems have historically made radiators for cars. A wastewater treatment plant was constructed between 1965 and 1972 across the street from the industrial facility and to the north of the Old Upper Mountain Road site. The wastewater treatment plant reportedly treated and discharged hazardous waste and chemicals including hexavalent chromium, used in coating processes, into Eighteen Mile Creek. The wastewater treatment plant was closed in 2006 when the use of hexavalent chromium was eliminated and an alternative aluminum material system was selected that replaced the previous coating processes.

Currently, two off-site houses are located approximately between 175 ft and 300 ft north of the former dumping area. The two houses were unoccupied and vacant at the time the RI report was prepared (April 2011) and appear to be serviced by public water supply from the town of Lockport. The Somerset Railroad that bisects the site and currently serves as the eastern border of the site was installed between 1980 and 1985, replacing the line initially shown on the 1948 USGS topographic map. In 2006, site vehicle tracks were found on the site indicating a potential for recent surface dumping; therefore, a fence was installed at the site to deter trespassers from dumping at the site.

As mentioned earlier, the site currently consists of seven Niagara County tax parcels owned by various entities which include CSX Transportation, Inc. (CSX), Somerset Railroad Corporation, New York State Electric & Gas Corporation (NYSEG), the city of Lockport, Mr. Allen Penwright, Mr. Douglas Snow, and Mr. Robert H. Matheis. Most recently the site was used as a junkyard where abandoned vehicles, boats, concrete/asphalt debris, tires, and other surface dumping occurred. Most of the vehicles were removed from the site in November 2009 during the RI. In its current state a majority of the site is unoccupied and not being used for residential or commercial purposes. The CSX and Somerset Railroad lines are currently active and were observed with infrequent use during the field investigation efforts conducted during this RI. Figure 1-3 identifies the seven Niagara County tax parcels and their reputed owners as documented during an American Land Title Association (ALTA) survey completed by Popli Design Group (Popli).

1.3.4 Physiography

The subject site is located on the USGS Lockport, New York 7.5-minute topographic quadrangle map, dated 1980 (Figure 1-4).

Elevation at the site ranges from approximately 510 ft in the ravine to 595 ft above mean sea level (AMSL) near the railroad tracks. The Gulf ravine acts as the northern boundary of the site. The nearest surface water feature, as noted on the topographic map, is Gulf Creek, which is adjacent to the site along the base of the Gulf. Gulf Creek flows north towards Eighteen Mile Creek. Both creeks converge and flow north into Lake Ontario.

1.3.5 Site Geology

A review of the geologic map of New York, Niagara Sheet published by the University of the State of New York, the State Education Department and dated 1970, indicates that the subject site lies within the glacial deposits above the Guelph Dolostone, which is part of the Lockport Group. According to the EDR report, the subject site is located within the silty loams and bedrock associated with the Middle Silurian Period.

According to the Soil Service Geographic Database (SSURGO), the site is underlain by the Farmington silt loam. This soil, which has well drained, slow infiltration rates (Class C), is described as being soil with layers impeding downward movement of water, or soil with moderately fine or fine textures. Typically this soil is less than 46-in. thick, consisting of fine-grained soil, silt and clay, and lean clay.

Within 0.25 mi of the site lies the Rockland unit. This soil, which is somewhat excessively drained and has slow infiltration rates (Class C), is described as being soil with layers impeding downward movement of water, or soil with moderately fine or fine textures. Typically this soil is less than 13-in. thick.

Also within 0.25 mi of the site lies the Cayuga silty loam. This soil, which is moderately well drained and has slow infiltration rates (Class C), is described as being soil with layers impeding downward movement of water, or soil with moderately fine or fine textures. Typically this soil is less than 127-in. thick and consists of coarse-grained soil, sand, sand with fines, clayey sand, and silty sand.

1.3.6 Site Hydrogeology

Unconsolidated, fine-grained glacial deposits in the southwestern Lockport area are relatively thin, and horizontal laminations and sand lenses are uncommon. As a result of these thin deposits, shallow, unconfined aquifer groundwater flow in the area surrounding the site is expected to be highly localized and discontinuous, with flow expected to be generally to the north towards Gulf Creek. Groundwater elevations measured on August 2010 varied from 516.31 ft AMSL in MW-04 to 573.70 ft AMSL in MW-01.

Groundwater in the Lockport Group bedrock is primarily influenced by vertical and horizontal fractures, particularly in the upper unit, which is extensively fractured. Other contributors to bedrock groundwater in the area surrounding the site are likely to include weathered surface fractures, bedding joints, vertical joints, and small cavities within the upper bedrock formation. In addition, bedrock groundwater flow is anticipated to be influenced by several natural and manmade structures in the area, including the Niagara Escarpment and the Gulf located north of and adjacent to the site, the former Frontier Stone Products Quarry located south of the site, and the Erie Barge canal located southeast of the site.

2. SUMMARY OF REMEDIAL INVESTIGATION, SUPPLEMENTAL REMEDIAL INVESTIGATION, AND EXPOSURE ASSESSMENT

The following sections briefly summarize the environmental impacts at the Old Upper Mountain Road site as determined during the RI (April 2011) and SRI (August 2011). This section is organized by media of potential concern. The impacts associated with the environmental media are based on analytical results and their comparison with the appropriate standards, criteria, and guidance (SCGs). The media of concern discussed are soil/fill material, sediment, and groundwater.

2.1 OU 3 SURFACE AND SUBSURFACE SOIL

The focus of the soil screening and characterization efforts conducted during the RI was to determine the nature and extent of contamination and assess exposure pathways to develop a strategy to protect human health and the environment. Evaluation of soil/fill material was performed by collecting soil samples from the ground surface, test pit sampling to evaluate shallow soils, and deeper soils were accessed using a drill rig. An aerial view of the site identifying the OU boundaries and soil sampling locations on OU 3 is shown in Figures 2-1 and 2-2.

2.1.1 Surface Soil

Several target analyte list (TAL) metals were reported in on-site surface soil/fill above their applicable SCGs. Lead, a contaminant of concern (COC) reported in concentrations exceeding the SCGs in each of the surface soil/fill samples collected, was reported at concentrations of 900 mg/kg in SS-17 and 2,800 mg/kg in SS-16, within OU 3. The one surface soil/fill sample submitted for toxicity characteristic leaching procedure (TCLP) lead analysis exhibited hazardous waste characteristics for lead (D008). A number of SVOCs were also detected within surface soil/fill samples within OU 3 at concentrations above their applicable SCGs.

2.1.2 Subsurface Soil

Laboratory analytical results from the on-site subsurface soil/fill sampling program identified elevated concentrations of several TAL metals. Concentrations of lead in exceedence of its SCG were detected in 14 of 14 subsurface soil samples collected during the RI with the deepest impacts to subsurface soil/fill found within TP-05 at a depth of 6 ft below ground surface (bgs). It appears that the types and source(s) of waste dumped at the site, rather than migration of metals through the soil/fill material, is the primary influence on metals concentration within the subsurface at OU 3.

2.1.3 Volume of Impacted Soil

The estimated volume of fill material contained within the area of OU 3 is approximately 10,000

yd^3 for OU 3 or 15,000 tons using as an estimate that 1 yd^3 of fill material is approximately equal to 1.5 tons. This volume estimate does not account for fill material that lies beneath the railroad line and ballast which bisects OU 1 and OU 3. It is assumed that fill material beneath the railroad line will remain in place.

2.2 OU 1 and OU 3 GROUNDWATER

The RI groundwater program included the installation of six groundwater monitoring wells (five on OU 1 and one on OU 3) as shown in Figure 2-3 and the completion of one round of groundwater sampling. A supplemental groundwater sampling event was implemented during the SRI to validate on-site groundwater flow patterns determined during the RI and provide additional groundwater quality data with respect to NYSDEC Ambient Water Quality Standards (AWQS). Analytical results from the RI and SRI groundwater sampling events reported concentrations of metals VOCs that are in exceedance of the NYDEC AWQS.

Groundwater flow direction was determined to be towards the former ravine and eventually Gulf Creek. Groundwater moving within the bedrock system from the west continues in an easterly direction until it reaches the former ravine where it then moves north toward Gulf Creek. The bedrock groundwater system flowing from areas south of the site flows in a northerly direction into the former ravine and then toward Gulf Creek, while the flow from the eastern portion of the site moves west to the former ravine and then towards Gulf Creek. The former ravine identified during the subsurface investigation acts as a likely discharge point for bedrock groundwater within the vicinity of the site. Interpreted groundwater contour maps illustrating the direction of groundwater flow for the August 2010 gauging event is shown in Figure 2-4.

3. DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

Goals for the remedial program have been established through the remedy selection process stated in 6 New York Code of Rules and Regulations (NYCRR) Part 375. The remedial goal for all remedial actions is considered to be the restoration of the site to the pre-disposal/pre-release conditions to the extent practicable and legal. Remedial action objectives (RAOs) are defined as the medium-specific or OU-specific cleanup objectives to provide protection of public health and the environment. The RAOs are based on contaminant-specific SCGs. The RAOs for the Old Upper Mountain Road site are to meet the SCGs listed in the following table.

3.1 CLEANUP STANDARDS, CRITERIA, AND GUIDANCE

Cleanup standards for soil and groundwater are presented in the following table along with the range of contaminant detections.

SOIL – CLEANUP STANDARDS, CRITERIA, AND GUIDANCE				
	Chemical of Potential Concern	Concentration Range Detected (ppm)[1]	Unrestricted Use Soil Cleanup Objectives SCG (ppm)	Frequency of Exceeding Unrestricted Use SCG
Inorganics	Lead	900-2,800 (Surface) 220-23,000 (Subsurface)	63	2/2 (Surface) 14/14 (Subsurface)
	Zinc	1,000-1,900 (Surface) 540-8,800 (Subsurface)	109	2/2 (Surface) 14/14 (Subsurface)

1. Based on samples collected in May 2010.

NOTE: ppm = parts per million
NYSDEC 6 NYCRR Table 375-6.8(b): Unrestricted Use Soil Cleanup Objectives.

GROUNDWATER – CLEANUP STANDARDS, CRITERIA, AND GUIDANCE				
	Chemical of Potential Concern	Concentration Range Detected (ppb)[1]	SCG (ppb)	Frequency of Exceeding SCG
Inorganics	Lead	440	25	1/1
	Zinc	1,200	2,000	0/1

1. Based on samples collected in February and August 2010.

NOTE: ppb = parts per billion
NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards (Class GA), June 1998.

3.2 REMEDIAL ACTION OBJECTIVES

The medium-specific RAOs for the Old Upper Mountain Road site are displayed in the following table.

OU 3	
Soil/Fill	Prevent ingestion/direct contact with contaminated soil.
	Prevent migration of contaminants that would result in groundwater or surface water contamination.
	Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.
Groundwater	Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
	Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
	Prevent the discharge of contaminants to surface water.
	Remove the source of ground water contamination.

3.3 OTHER POTENTIALLY APPLICABLE REQUIREMENTS

The NYSDEC Environmental Remediation Programs guidance (6 NYCRR Part 375) requires that site remedies "conform to standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable, or that are not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with (6 NYCRR Part 75, 375-1.8[f][2])." The primary requirements are presented in the following table.

SCGS FOR THE OLD UPPER MOUNTAIN ROAD SITE REMEDY	
Requirement	Rationale
FEDERAL	
CLEAN WATER ACT **National Pollution Discharge Elimination System 40 Code of Federal Regulations (CFR) Part 122** The National Pollution Discharge Elimination System establishes permitting requirements, technology-based limitations and standards, control of toxic pollutants, and monitoring of effluents to assure discharge permit conditions and limits are not exceeded.	Applicable if groundwater will be extracted from ground and discharged to a surface water body.
SAFE DRINKING WATER ACT **National Primary and Secondary Drinking Water Regulations) (42 U.S.C. 300f, 40 CFR Part 141, 40 CFR Part 143)** The Safe Drinking Water Act provides a national framework to ensure the quality and safety of drinking water. The primary standards establish maximum contaminant levels and maximum contaminant level goals for chemical constituents in drinking water. Secondary standards pertain primarily to the aesthetic qualities of drinking water.	The removal action is being conducted to reduce chemical concentrations in soil and groundwater, with a goal of meeting unrestricted use levels.
CLEAN AIR ACT, as Amended (42 U.S.C. 7401) The Clean Air Act is a comprehensive law which is designed to regulate any activities that affect air quality, and provides the national framework for controlling air pollution. The National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50) set standards for ambient pollutants which are regulated within a region. The National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61) establishes numerical standards for hazardous air pollutants.	The Clean Air Act will be required if any remediation alternatives produce air emissions.

SCGS FOR THE OLD UPPER MOUNTAIN ROAD SITE REMEDY	
Requirement	Rationale
RESOURCE CONSERVATION AND RECOVERY ACT Provides the governing regulations for owners and operators of hazardous waste treatment, storage, and disposal facilities; and for the generators and transporters of hazardous waste.	All waste generated during the removal alternative will be characterized and handled per Resource Conservation and Recovery Act regulations, as implemented by WAC 173-303.
OCCUPATIONAL SAFETY AND HEALTH ACT (29 CFR 1910) Establishes the worker health and safety requirements for operations at hazardous waste sites.	Site activities will be conducted under appropriate Occupational Safety and Health Act standards.
Rules for Transport of Hazardous Waste (49 CFR 107, 171) The U.S. Department of Transportation establishes requirements for packaging, handling, and manifesting hazardous waste.	Any hazardous waste generated during site activities will be characterized as needed to determine packaging, handling, and transport requirements.
STATE	
NYSDEC Environmental Remediation Programs (6 NYCRR Part 375) This program applies to the development and implementation of remedial programs for environmental restoration sites.	Site cleanup will be conducted in accordance with 6 NYCRR Part 375.
Solid Waste Management Facilities (6 NYCRR Part 360) Provides standards and regulations for permitting and operating solid waste management facilities.	These regulations will be followed for offsite generation, treatment, and disposal of hazardous waste (if generated during the removal action).
Waste Transporter Permits (NYCRR Part 364) Provides standards and regulations for waste transporters.	
Land Disposal Restrictions (6 NYCRR Part 376)	
Hazardous Waste Management System (6 NYCRR Parts 370, 371, 372, 373, 375) Provides standards and regulations for the state hazardous waste management system, identification and listing of hazardous wastes, and provides standards, regulations, and guidelines for the manifest system, as well as additional standards for generators, transporters, and facilities.	
New York State Department of Transportation Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1-500) Addresses requirements for marking, manifesting, handling, and transport of hazardous materials; applicable if offsite treatment or disposal of wastes is required.	
Water Quality Regulations for Surface Waters and Groundwater (6 NYCRR Part 700-706) Provides standards, regulations, and guidelines for the protection of waters within the state.	Water discharged from the site will comply with this guidance.
Air Quality Standards (6 NYCRR Part 257) Air quality standards are designed to provide protection from the adverse health effects of air contamination; and they are intended further to protect and conserve the natural resources and environment.	All substantive requirements of the State air pollution control regulations will be followed if air emissions are created.
LOCAL	
Land development standards, stormwater and surface water regulations, and clearing and grading requirements.	Local permits may be required depending on the selected remedial action.
Building permits and building codes.	Local permits may be required depending on the selected remedial action.

4. GENERAL RESPONSE ACTIONS

In general, remedial technologies fit into one or more category of general response actions (GRAs). GRAs are generic, medium-specific, remedial actions that will satisfy the RAOs discussed earlier. GRAs may include no action, institutional controls, containment, removal, treatment, disposal, monitoring, or a combination thereof (USEPA 1988). The development of remedial alternatives for this FS begins with the identification of GRAs that can meet RAOs. These GRAs are then screened based on their effectiveness, implementability, and cost and developed into remedial alternatives to address contaminated media at the site (e.g., soil and on-site groundwater).

4.1 SOIL

Technologies for the remediation of soil will fall into the following GRAs: no action, removal, treatment, and disposal.

No Action

The no action alternative is included to be used as the baseline alternative against which other remedial alternatives are compared.

Site Management

Site management (also known as institutional controls) involves the placement of a restriction on the use of property that limits human or environmental exposure, provides notice to any individual who might come in contact with the site, or prevents actions that would interfere with the effectiveness of a remedial program or with the effectiveness and/or integrity of site management activities at or pertaining to a site.

Containment

Soil and fill containment would be accomplished by installing either a multi-media cap or impermeable liner over the waste mass to eliminate exposure and prevent transport through groundwater. Existing physical setting would require re-grading of waste surface and partial removal of waste to achieve required slopes.

Removal

Physical removal of contaminated soil would be conducted by excavation, using standard construction equipment, i.e., excavators, to remove material from the ground and load it into transport mechanisms, i.e., trucks, for off-site treatment or disposal.

Treatment

Treatment subjects contaminants to processes that alter their state, transform them to innocuous forms, or immobilize them. Potentially applicable treatment technologies for soil at this site include *in situ* biological treatment, *in situ* soil flushing, *in situ* or *ex situ* solidification, *in situ* or *ex situ* chemical stabilization, *ex situ* acid leaching, and *ex situ* vitrification.

Biological treatment involves the use of plants to treat the impacted media. This can be achieved through phytoextraction, which involves the physical removal of contaminants from the soil through plant uptake or phytoremediation, which involves contaminant break down by the plant or microbes near the root system.

Soil flushing is the use of water or other suitable aqueous solution to flush contaminants from soil. The fluid is then extracted *in situ*.

Stabilization is achieved through the use of amendments that are mixed into the soil matrix and reduce the toxicity and mobility of the contaminants. This results in the production of a monolith of waste with high structural integrity and can be done *in situ* or *ex situ*.

Acid leaching is the use of potentially hazardous acid to remove inorganic contaminants from soil.

Vitrification is the use of electric current to convert contaminants to an inert, solid form. Following vitrification, the contaminants are trapped within the treated area, eliminating mobility.

Disposal

Disposal involves transporting the soil to a landfill that will either put the soil in a lined landfill or use it for daily cover, based on characterization results. The Old Upper Mountain Road site is adjacent to the city of Lockport closed landfill, which is one location that can be considered. Another location would be an off-site commercial landfill. Alternatively, soil could be disposed of on-site, which would be followed by containment.

5. IDENTIFICATION AND SCREENING OF TECHNOLOGIES

The potentially applicable technologies identified earlier are screened using the process defined in DER-10, Technical Guidance for Site Investigation and Remediation. The screening process and summary of results are described below and the detailed technology screening is presented in Table 1.

5.1 SCREENING CRITERIA

Three preliminary screening criteria (i.e., effectiveness, implementability, and cost) were used to screen the remedial technologies identified earlier for each media of concern. Definitions for these criteria are presented below.

5.1.1 Effectiveness

Effectiveness is a measure of the ability of an option to: (1) reduce toxicity, mobility, or volume of contamination; (2) minimize residual risks; (3) afford long-term protection; (4) comply with applicable or relevant and appropriate requirements; (5) minimize short-term impacts; and (6) achieve protectiveness in a limited duration. Technologies that offer significantly less effectiveness than other proposed technologies may be eliminated from the alternative development process. Options that do not provide adequate protection of human health and the environment likewise may be eliminated from further consideration.

5.1.2 Implementability

Implementability is a measure of the technical feasibility and availability of the option and the administrative feasibility of implementing it (e.g., obtaining permits for off-site activities, right-of-ways, or construction). Options that are technically or administratively infeasible or that would require equipment, specialists, or facilities that are not available within a reasonable period may be eliminated from further consideration.

5.1.3 Cost

Qualitative relative costs for implementing the remedy are considered. Technologies that cost more to implement, but that offer no benefit in effectiveness or implementability over other technologies, may be excluded from the alternative development process.

5.2 SCREENING SUMMARY

The results of the technology screening are summarized in the following two sections. The first section discusses technologies that were not retained for further analysis, and the reasons for exclusion. The second section lists technologies that were retained for further analysis as individual components in remedial alternatives. The screening is presented in greater detail in Table 1.

5.2.1 Technologies Not Retained for Further Analysis

From the list of technologies potentially applicable for remediation of the chemicals and media of concern at this site, a few technologies were excluded from further consideration because they were considered ineffective, not implementable at this site, or too costly relative to the other technologies under consideration. The reasons for exclusion are explained below.

Technologies Not Retained for Soil Remediation

Phytoremediation was not retained because it was not considered effective for the existing depths of contamination. Phytoremediation is only effective to the depth of the root system of the plants. In addition, phytoremediation is generally used for lower levels of contamination than what exists at the site.

Soil flushing was not retained due to the high cost and unknown level of effectiveness. Soil flushing is an emerging technology which has not been widely implemented.

Disposal at the adjacent city of Lockport closed landfill was not retained due to the volume of contaminated soil requiring disposal and the limited capacity of the landfill.

Technologies Not Retained for Groundwater Remediation

All potential groundwater remediation technologies were retained for consideration.

5.2.2 Technologies Retained for Further Analysis

Technologies that will be retained for further evaluation for the site are listed below for soil at OU 3.

The following remedial alternatives are considered for this FS for OU 3:

- **Alternative 1A—**No Action
- **Alternative 1B—**Site Management
- **Alternative 2—**Complete Removal (Excavation) and Disposal Off-site
- **Alternative 3—**Landfill Capping with a Part 360 Cap
- **Alternative 4—***In situ* Stabilization
- **Alternative 5—***Ex situ* Stabilization and Disposal Off-site
- **Alternative 6—**Landfill Capping with a Clean Soil Cover

6. SCOPING AND DEVELOPMENT OF REMEDIAL ALTERNATIVES

The scoping for the FS was completed based on correspondence between EA and NYSDEC. EA completed the alternative comparison in accordance with DER-10 and the 1988 USEPA publication *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA l540lG-891004). The results of the technology screening process were summarized in a letter dated 17 June 2011from EA to NYSDEC. Comments regarding this letter were included in a letter dated 13 July 2011 from NYSDEC to EA. Copies of each letter are provided in Appendix A. The screening of alternatives was designed to provide a basis for an overall assessment of applicable technologies based on impacted media identified at the site during the RI and SRI.

The scoping and development of the technologies/alternatives selected during the previous step of the FS process are described below.

6.1 OU 3 ALTERNATIVES

The OU 3 treatment areas were determined based on data presented in the RI and SRI. The area and depths selected address the area of concern within the operable unit (Figure 6-1). Detailed soil and groundwater alternatives screening is presented in Table 2.

6.1.1 OU 3 Alternative 1A: No Action

The no action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition.

6.1.2 OU 3 Alternative 1B: Site Management

Alternative 1B is to implement a deed restriction on the property to control the use of the site. This alternative would leave the site in its present physical condition, but would address the RAO “Prevent ingestion/direct contact with contaminated soil.”

6.1.3 OU 3 Alternative 2: Complete Removal (Excavation) and Disposal Off-site

Complete excavation and off-site disposal of OU 3 fill would consist of removing the soil exceeding the unrestricted SCGs from the site and disposing of it at a commercial landfill.

Excavation is a common remedy used to remove contaminated soil from a source area. This approach can be effective at eliminating exposure and preventing transport of contaminants.

Off-site treatment and/or disposal can be expensive depending on the location of the site relative to treatment or disposal facilities, the volume of soil involved, the nature of contamination, and the availability of different treatment or disposal options in the area. See Figure 6-2 for proposed final conditions under this alternative.

This alternative would be implemented as follows:

- A utility locator would be brought on-site to locate any underground utilities or other obstructions that may prove problematic during excavation.

- A pre-design characterization study would take place at the site prior to the remedial design process of this alternative. Such a study would involve the installation of soil borings and collection of soil samples spaced 15 ft horizontally and 3 ft vertically. Samples would be submitted to an analytical laboratory for full TCLP analysis. The objective of this study would be to evaluate the potential for the segregation of hazardous vs. non-hazardous fill for disposal.

- One monitoring well would be abandoned prior to excavation activities.

- Approximately 11,500 loose yd^3 of soil would be excavated, to a maximum depth of 6 ft bgs.

- Approximately 43 percent of the excavated soil is assumed to be hazardous and would be disposed of at a permitted hazardous waste landfill. The remainder of the soil would be disposed of at a general waste landfill, following acceptance.

- Confirmation soil sampling would be conducted during excavation to document any remaining contamination at the bottom and sides of the excavation.

- Once excavation and disposal activities are complete, the site would be restored to original grades using an approved backfill source. All disturbed areas would be restored with topsoil and seed.

6.1.4 OU 3 Alternative 3: Landfill Capping with a Part 360 Cap

Landfill capping consists of the construction of a multi-layer cap system comprised of a vegetated topsoil upper layer, a geotextile drainage layer, a 60 mil HDPE geomembrane liner, and a geotextile gas venting layer. Installation of a cap would eliminate exposure and prevent infiltration of storm water through fill. See Figure 6-3 for approximate final conditions under this alternative.

This alternative would be implemented as follows:

- A utility locator would be brought onsite to locate any underground utilities or other obstructions that may prove problematic during grading.

- One monitoring well would be abandoned prior to grading activities.
- Once final subgrade surfaces are graded, a four part cap system would be installed by qualified personnel, complete with an anchor trench, proper surface drainage, topsoil, and seed.
- One monitoring well would be installed following restoration.
- The site would be secured using a 10-ft Galvanized fence with barbed wire and a 7-ft high swing gate.

6.1.5 OU 3 Alternative 4: *In Situ* Stabilization

For this alternative, fill would be treated *in situ* with a stabilizing amendment, such as Eco-Bond®, to reduce the mobility of the contaminants. See Figure 6-4 for approximate final conditions under this alternative.

This alternative would be implemented as follows:

- A utility locator would be brought onsite to locate known underground utilities or other obstructions that may prove problematic during excavation.
- A pilot study would be completed to evaluate the effectiveness of the proposed stabilization amendment.
- One monitoring well would be abandoned prior to excavation activities.
- 10,000 yd^3 of fill would be treated with a stabilization amendment, such as Eco-Bond®, using deep mixing equipment.
- All disturbed areas would be restored with topsoil and seed.
- One monitoring well would be installed following restoration.

6.1.6 OU 3 Alternative 5: *Ex situ* Stabilization and Disposal Off-site

Ex situ stabilization consists of excavating contaminated soil, stabilizing excavated soil, and disposing off-site as non-hazardous waste. Soil would be mixed with amendments such as Eco-Bond® prior to off-site disposal. Stabilization is expected to reduce the toxicity of the soil; thereby, reducing the cost of disposal.

This alternative would be implemented as follows:

- A utility locator would be brought on-site to locate any underground utilities or other obstructions that may prove problematic during excavation.

- A pilot study would be completed to evaluate the effectiveness of the proposed stabilization amendment.

- One monitoring well would be abandoned prior to excavation activities.

- Approximately 11,500 loose yd^3 of soil would be excavated, to a maximum depth of 6 ft.

- Soil would be treated on-site prior to disposal at an approved facility.

- Confirmation soil sampling would be conducted during excavation to document any remaining contamination at the bottom and sides of the excavation.

- Once excavation, treatment, and disposal activities are complete, the site would be restored to original grades using an approved backfill source. All disturbed areas would be restored with topsoil and seed.

6.1.7 OU 3 Alternative 6: Landfill Capping with a Clean Soil Cover

Landfill capping consists of the construction of a multi-layer cap system comprised of a vegetated topsoil upper layer and a low permeability barrier soil cover layer. Installation of a cap would eliminate exposure and prevent infiltration of storm water through fill.

This alternative would be implemented as follows:

- A utility locator would be brought onsite to locate any underground utilities or other obstructions that may prove problematic during grading.

- One monitoring well would be abandoned prior to grading activities.

- Subgrade surface would be graded to achieve 4% slopes, to promote positive drainage off of the landfill surface.

- Once final subgrade surfaces are graded, a geotextile demarcation layer would be placed prior to the placement of an 18 in barrier layer. This layer would be installed and compacted to prevent erosion. The barrier layer would be graded to promote proper surface drainage and covered with a 6 in layer of topsoil and seed.

- One monitoring well would be installed following restoration.

- The site would be secured using a 10-ft Galvanized fence with barbed wire and a 7-ft high swing gate.

7. COSTING AND EVALUATION CRITERIA

This section describes the process for the detailed analysis of remedial alternatives for the Old Upper Mountain Road site and also presents the cost estimates used as part of the analysis.

The detailed analysis of the remedial alternatives is presented in Table 3.

7.1 CRITERIA USED FOR ANALYSIS OF ALTERNATIVES

The criteria to which potential remedial alternatives are compared (and used during this detailed analysis) are defined in 6 NYCRR Part 375 and are listed below:

- Overall protectiveness of public health and the environment
- Conformance to SCGs
- Long-term effectiveness and permanence
- Reduction in toxicity, mobility, or volume of contamination through treatment
- Short-term impacts and effectiveness
- Implementability
- Cost-effectiveness
- Land use
- Community acceptance.

A description of the criteria and how alternatives are evaluated against them follows.

***Overall Protectiveness of Public Health and the Environment*—**This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

***Conformance to Standards, Criteria, and Guidance*—**Compliance with SCGs addresses whether a remedy would meet environmental laws, regulations, and other standards and criteria. The SCGs were presented in Section 3.

***Long-Term Effectiveness and Permanence*—**This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain onsite after the selected remedy has been implemented, the following items are evaluated: (1) magnitude of the remaining risks, (2) adequacy of the engineering and/or institutional controls intended to limit the risk, and (3) reliability of these controls.

***Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment*—**The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances including the adequacy of the alternative in destroying the hazardous substances, reduction or elimination of hazardous substance releases and sources of releases, degree of irreversibility of waste treatment process, and characteristics and quantity of treatment residuals generated. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the site.

***Short-Term Impacts and Effectiveness*—**Evaluation of the short-term effectiveness for an alternative includes consideration of the risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks. Impacts from remedial action implementation include vehicle traffic; temporary relocation of residences/buildings; temporary closure of public facilities; odor; open excavations; and noise, dust, and safety concerns associated with extensive heavy equipment activity. The greatest short-term risk to human health is related to safety and general construction activity.

***Implementability*—**The technical and administrative feasibility of implementing each alternative is evaluated. Technical feasibility includes the difficulties associated with construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

***Cost-Effectiveness*—**Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

***Land Use*—**The current and anticipated future use of the site will be considered. Land use must comply with applicable zoning laws and maps.

***Community Acceptance*—**Public comments will be considered after the close of the public comment period.

7.2 COST ASSUMPTIONS

Cost assumptions were prepared for each alternative using USEPA's *Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (USEPA 1996). Net present value of the project costs was estimated using an interest rate of 5 percent. The cost assumptions were calculated using the most common products and application methods available for a remedial alternative. The USEPA guidance was used in conjunction with *DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010).

7.3 COSTS

Based on the results of the remedial technology screening in Table 1, the following cost estimates were prepared for each alternative. Appendix B shows the detailed cost estimates developed.

7.3.1 OU 3 - Soil

OU 3 Alternative 1A: No Action

Present Worth *$0*
Capital Cost *$0*
Annual Costs (Years 0) *$0*

OU3 Alternative 1B: Site Management

Present Worth *$44,000*
Capital Cost *$38,000*
Annual Costs (Years 1-30) *$400*

OU 3 Alternative 2: Complete Removal (Excavation) and Disposal Off-site

Present Worth *$2,912,000*
Capital Cost *$2,912,000*
Annual Costs (Years 0) *$0*
** Present worth for full hazardous disposal is $4,352,000.*

OU 3 Alternative 3: Landfill Capping with a Part 360 Cap

Present Worth *$663,000*
Capital Cost *$562,000*
Annual Costs (Years 1-5) *$8,000*
Annual Costs (Years 6-30) *$6,000*

OU 3 Alternative 4: *In situ* Stabilization

Present Worth *$2,037,000*
Capital Cost *$1,993,000*
Annual Costs (Years 1-5) *$5,000*
Annual Costs (Years 6-30) *$2,000*

OU 3 Alternative 5: *Ex situ* Stabilization and Disposal Off-site

Present Worth *$2,261,000*
Capital Cost *$2,261,000*
Annual Costs (Years 0) *$0*

OU 3 Alternative 6: Landfill Capping with a Clean Soil Cover

Present Worth $462,000
Capital Cost $361,000
Annual Costs (Years 1-5) $8,000
Annual Costs (Years 6-30) $6,000

8. DETAILED ANALYSIS OF ALTERNATIVES AND RECOMMENDATIONS

The purpose of this FS was to develop, screen, and evaluate potential remedial alternatives for the Old Upper Mountain Road site. Remedies were identified and screened in accordance with USEPA and NYSDEC guidance. The comparison of alternatives and recommendations are described below for each media type. An additional alternative to achieve pre-disposal conditions on-site was developed based on the recommendations for soil and groundwater.

Remedial alternatives were developed in this FS, as identified below.

The following remedial alternatives are considered for this FS for OU 3:

- **Alternative 1A**—No Action
- **Alternative 1B—**Site Management
- **Alternative 2—**Complete Removal (Excavation) and Disposal Offsite
- **Alternative 3—**Landfill Capping with a Part 360 Cap
- **Alternative 4—***In Situ* Stabilization
- **Alternative 5—***Ex Situ* Stabilization and Disposal Offsite
- **Alternative6—**Landfill Capping with a Clean Soil Cover

8.1 COMPARISON OF OU 3 ALTERNATIVES

8.1.1 Overall Protection of Public Health and the Environment

This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

Alternative 1A does not fulfill this criterion. Alternative 1B will moderately protect public health by the implementation of a deed restriction. Alternatives 2 and 5 fulfill this criterion by completely removing the contaminants from the site. Through containment, Alternatives 3 and 6 close off the soil exposure pathway; thereby, preventing human contact with remaining contamination. Alternative 4 moderately fulfills this criterion by reducing contaminant mobility.

8.1.2 Standards, Criteria, and Guidance

Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria.

Alternatives 1A, 1B, and 4 do not meet this criterion. Alternatives 2 and 5 fulfill this criterion by removing all soil exceeding SCGs. Alternatives 3 and 6 will fulfill this criterion by containing soil exceeding SCGs.

8.1.3 Long-Term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain onsite after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Alternative 1A will not provide long-term effectiveness or permanence. Alternative 1B would not provide long-term effectiveness as a stand-alone alternative; however, this alternative would complement another alternative, such as Alternatives 3, 4 or 6. Alternatives 2 and 5 would fulfill this criterion because all contaminants would be completely removed from the site. Alternatives 3, 4 and 6 would moderately fulfill this criterion. Alternatives 3 and 6 would permanently and effectively prevent exposure by soil containment, but would require periodic monitoring and maintenance. Alternative 4 would permanently reduce toxicity and mobility of contaminants, but would require periodic monitoring to ensure effectiveness.

8.1.4 Reduction of Toxicity, Mobility, or Volume of Contamination

Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternatives 1A and 1B will not reduce the toxicity, mobility, or volume of contamination. Alternatives 2 and 5 will fulfill this criterion by removal of contamination. Alternatives 3 and 6 will fulfill this criterion by reducing the volume and mobility of contamination by soil containment. Alternative 4 will fulfill this criterion by reducing the mobility of contamination by soil treatment.

8.1.5 Short-Term Impacts and Effectiveness

This criterion evaluates the potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternatives 1A and 1B do not pose additional risk to the community, workers, or environment, as there are no construction activities involved. Alternatives 2, 3, 4, 5 and 6 pose increased short-term risks to the public during excavation, grading, treatment, and other site activities through the production of dust; these effects can be reduced through the implementation of standard dust mitigation construction practices. Workers can potentially be exposed to contaminated media during excavation and/or treatment activities involved in Alternatives 2, 3, 4, 5 and 6. Risks can be minimized by implementing health and safety controls. Alternatives 2 through 6 will pose increased short-term risks to the environment in the form of air emissions.

8.1.6 Implementability

This criterion evaluates the technical and administrative feasibility of implementing each alternative.

All alternatives 1A through 6 are implementable and have been used nationally.

8.1.7 Cost-Effectiveness

This criterion evaluates estimated capital costs and annual operation, maintenance, and monitoring costs on a present worth basis.

Alternatives 1A and 1B are the least expensive, but are also the least effective. Alternatives 2 and 5 are the most effective and the most expensive. Alternatives 3, 4 and 6 fulfill most of the screening criteria, and Alternative 6 is the least expensive.

8.1.8 Land Use

Alternatives 1A and 1B would not affect the future use of the site since contamination would remain in place. Alternatives 2 and 5 involve the removal of fill with concentrations of lead and zinc exceeding unrestricted SCGs. Contaminated fill would remain onsite for Alternatives 3, 4 and 6; however, under Alternatives 3 and 6, this fill would be capped and the land use would be restricted to landfill use only. Under Alternative 4, the fill would be stabilized and less mobile, but land use would be restricted.

8.1.9 Community Acceptance

This criterion evaluates concerns of the community regarding the investigation and the evaluation of alternatives. The Old Upper Mountain Road site has not been presented to the community for comment at this point.

8.2 RESTORATION TO PRE-DISPOSAL CONDITIONS

Based on the objective to return soil and groundwater to pre-disposal conditions on-site, OU 3 Alternative 6 is recommended.

This alternative would be implemented as follows:

- A utility locator would be brought onsite to locate any underground utilities or other obstructions that may prove problematic during grading.

- One monitoring well would be abandoned prior to grading activities.

- Subgrade surface would be graded to achieve 4% slopes, to promote positive drainage off of the landfill surface.

- Once final subgrade surfaces are graded, a geotextile demarcation layer would be placed prior to the placement of an 18 in barrier layer. This layer would be installed and compacted to prevent erosion. The barrier layer would be graded to promote proper surface drainage and covered with a 6 in layer of topsoil and seed.

- One monitoring well would be installed following restoration.

- The site would be secured using a 10-ft Galvanized fence with barbed wire and a 7-ft high swing gate.

Detailed cost estimates can be found in Appendix B. The estimated cost to implement this alternative is as follows:

Present Worth *$462,000*
Capital Cost *$361,000*
Annual Costs (Years 1-5) *$8,000*
Annual Costs (Years 6-30) *$6,000*

9. REFERENCES

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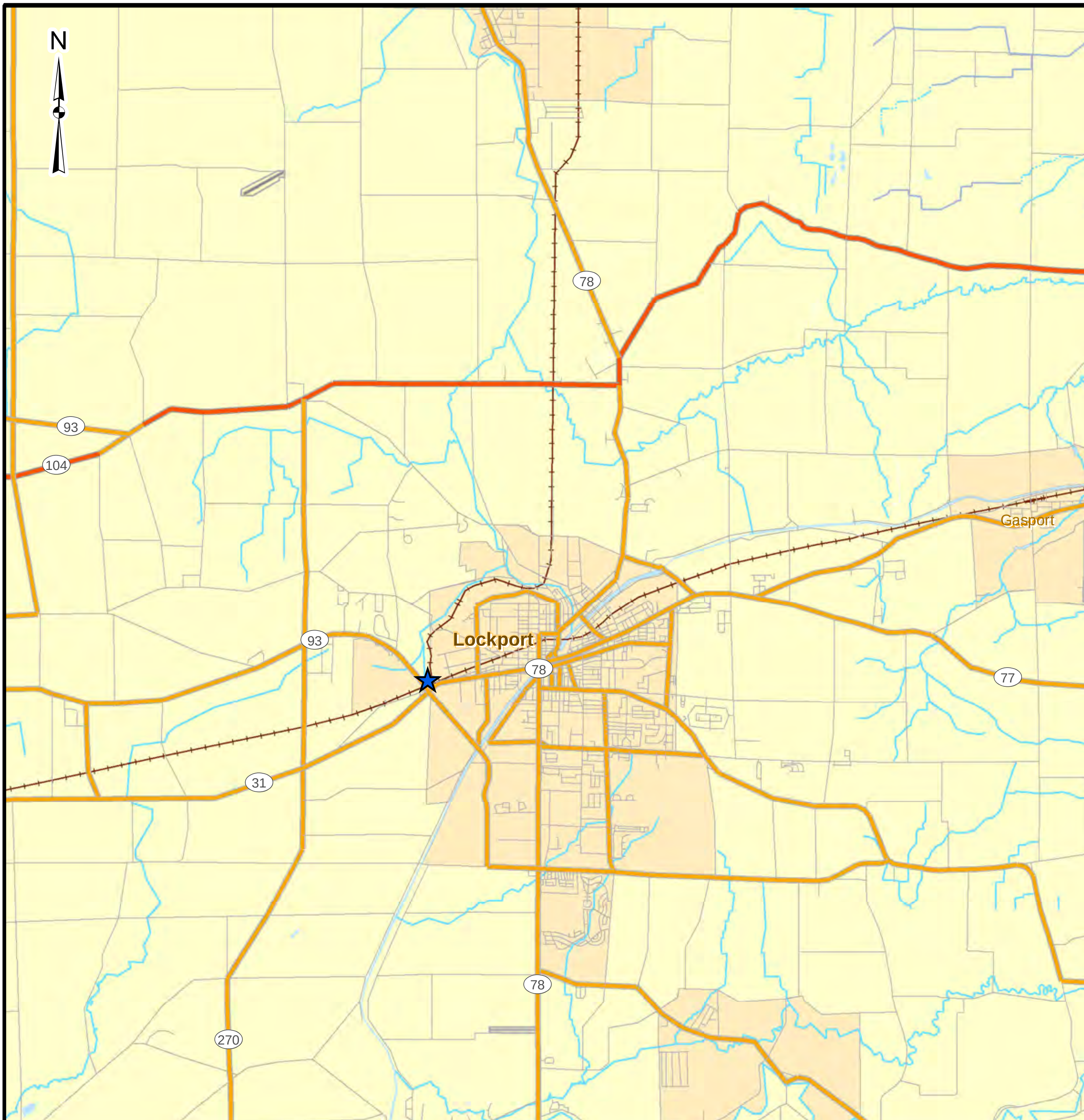


Legend

★ Old Upper Mountain Road Site Location

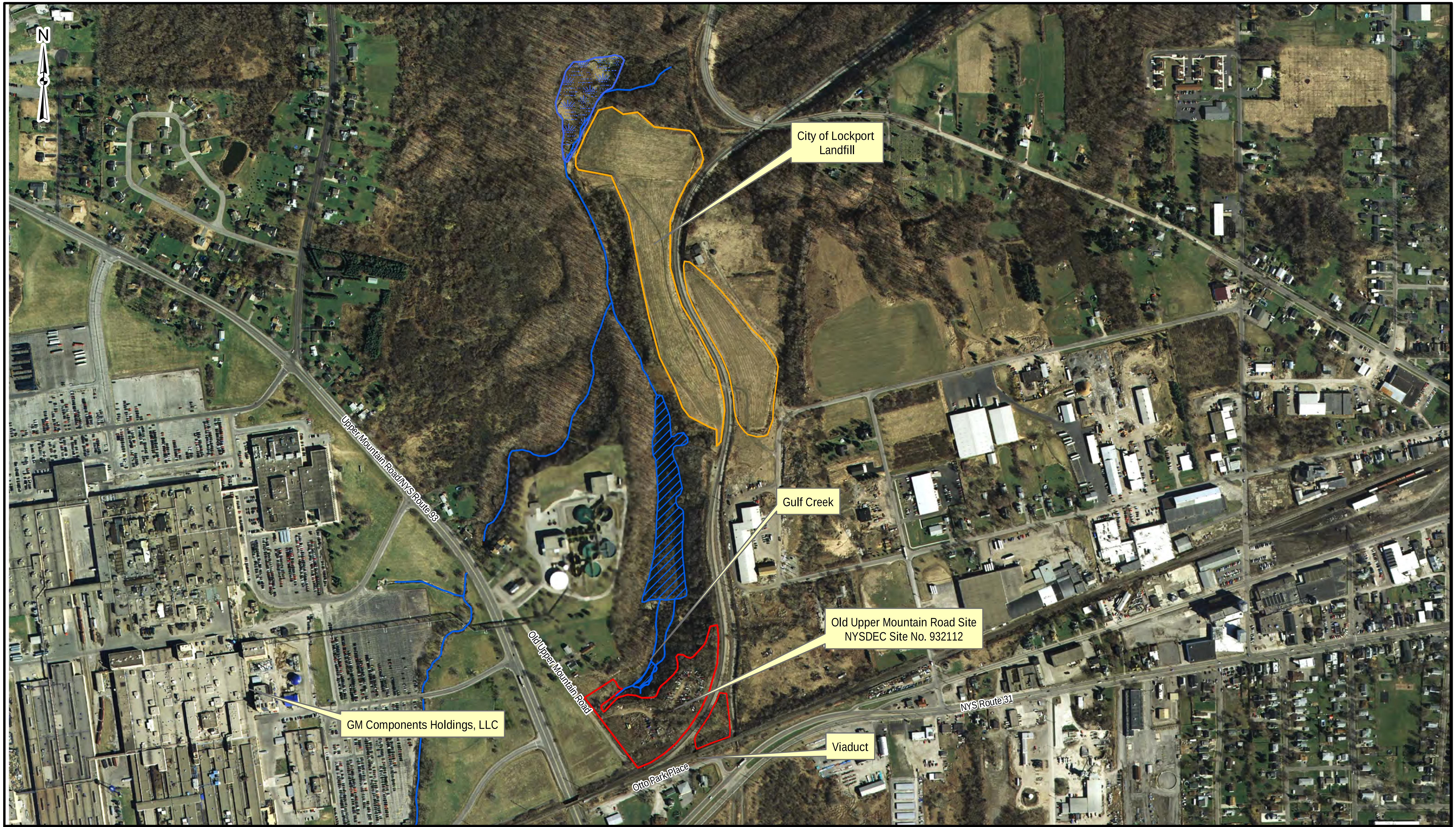
0 1 2 4 Miles

1 in = 2 miles

ESRI Street Maps USA

	OLD UPPER MOUNTAIN ROAD (932112) OU 3 FEASIBILITY STUDY REPORT LOCKPORT, NEW YORK	FIGURE 1-1 Site Location

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
RSC	DCC	DCC	RSC	AS SHOWN	FEBRUARY 2012	14368.41	GIS/PROJECTS/ FIGURE1-1.MXD



OLD UPPER MOUNTAIN ROAD (932112)
OU 3 FEASIBILITY STUDY REPORT
LOCKPORT, NEW YORK

FIGURE 1-2
Site and Surrounding Area

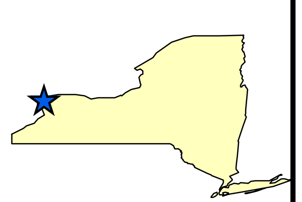
Feet
0 250 500 1,000
1 inch = 500 feet

Legend

Source: NYS GIS Clearing House

- Approximate Site Boundary
- Approximate City of Lockport Landfill Site Boundary
- Streams/Surface Water
- Water

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	PROJECT NO:	DATE:	SCALE:	FILE NO:
RSC	DCC	DCC	RSC	14368.41	FEBRUARY 2012	AS SHOWN	GIS/PROJECTS/ FIGURE1-2.MXD



OLD UPPER MOUNTAIN ROAD (932112)
OU 3 FEASIBILITY STUDY REPORT
LOCKPORT, NEW YORK

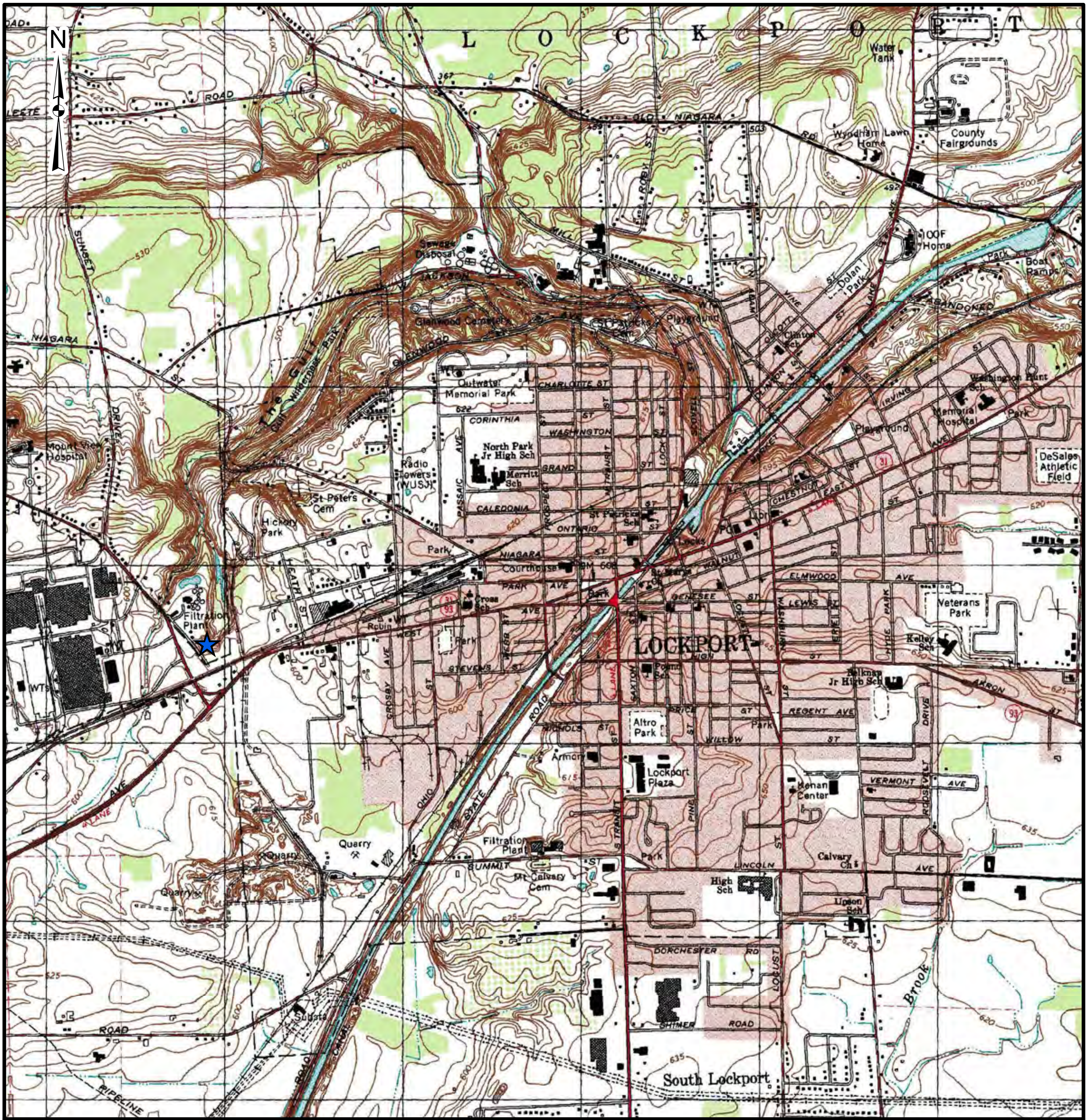
FIGURE 1-3
Niagara County Tax
Parcel Identification

Feet
0 50 100 200
1 inch = 100 feet

Legend
Property Line

Source: NYS GIS Clearing House

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	PROJECT NO:	DATE:	SCALE:	FILE NO:
RSC	RSC	JCP	RSC	14368.41	FEBRUARY 2012	AS SHOWN	GIS/PROJECTS/ FIGURE1-3.MXD



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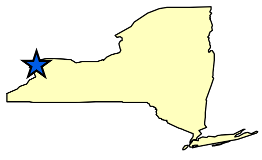
★ Old Upper Mountain Road Site Location



0 150 300 600 Feet

1 inch = 300 feet

Source: USGS

OLD UPPER MOUNTAIN ROAD (932112)
OU 3 FEASIBILITY STUDY REPORT
LOCKPORT, NEW YORK

FIGURE 1-4
USGS Topographic Map

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
RSC	DCC	DCC	RSC	AS SHOWN	FEBRUARY 2012	14368.41	GIS/PROJECTS/ FIGURE1-4.MXD

OLD UPPER MOUNTAIN ROAD (932112) OU 3 FEASIBILITY STUDY REPORT LOCKPORT, NEW YORK			FIGURE 2-1 Operable Units Approximate Boundaries	0 250 500 1,000 Feet 1 inch = 500 feet
PROJECT MGR: RSC	DESIGNED BY: DCC	CREATED BY: DCC	CHECKED BY: RSC	PROJECT NO: 14368.41

DATE: FEBRUARY 2012	SCALE: AS SHOWN	FILE NO: GIS/PROJECTS/ FIGURE2-1.MXD

Legend

- Operable Unit 1 - Approximate Boundary
- Operable Unit 1A - Approximate Boundary
- Operable Unit 2 - Approximate Boundary

Source: NYS GIS Clearing House

OLD UPPER MOUNTAIN ROAD (932112)
OU 3 FEASIBILITY STUDY REPORT
LOCKPORT, NEW YORK

FIGURE 2-2
Surface and Subsurface Soil
Sample Locations

Feet
0 30 60 120
1 inch = 60 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	PROJECT NO:	DATE:	SCALE:	FILE NO:
RSC	RSC	JCP	RSC	14368.41	FEBRUARY 2012	AS SHOWN	GIS/PROJECTS/ FIGURE2-2.MXD

Legend

Source: NYS GIS Clearing House

- Vertical Profile Soil Boring Location - May 2010 (Augered)
- Soil Boring Locations - May 2010 (Direct-Push and Auger)
- Surface Soil Locations
- Limits of Test Pit Excavations - May 2010

OLD UPPER MOUNTAIN ROAD (932112)
OU 3 FEASIBILITY STUDY REPORT
LOCKPORT, NEW YORK

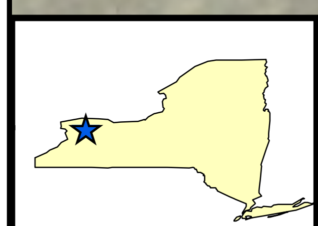
FIGURE 2-3
Groundwater Monitoring
Well Locations

Feet
0 30 60 120
1 inch = 60 feet

Legend
Monitoring Well Location

Source: NYS GIS Clearing House

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	PROJECT NO:	DATE:	SCALE:	FILE NO:
RSC	RSC	JCP	RSC	14368.41	FEBRUARY 2012	AS SHOWN	GIS/PROJECTS/ FIGURE2-3.MXD



OLD UPPER MOUNTAIN ROAD (932112)
OU 3 FEASIBILITY STUDY REPORT
LOCKPORT, NEW YORK

FIGURE 2-4
Interpreted
Groundwater Contour Map
August 2010

Feet
0 30 60 120
1 inch = 60 feet

Legend

Interpreted Groundwater Contour

Inferred Groundwater Contour

Groundwater Flow Direction

Source: NYS GIS Clearing House

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	PROJECT NO:	DATE:	SCALE:	FILE NO:
RSC	RSC	SAB	RSC	14368.41	FEBRUARY 2012	AS SHOWN	GIS/PROJECTS/ FIGURE2-4.MXD

OLD UPPER MOUNTAIN ROAD (932112) OU 3 FEASIBILITY STUDY REPORT LOCKPORT, NEW YORK			FIGURE 6-1 OU3 Treatment Areas and Depths		
PROJECT MGR: RSC	DESIGNED BY: RSC	CREATED BY: JCP	CHECKED BY: RSC	PROJECT NO: 14368.41	DATE: FEBRUARY 2012

SCALE: AS SHOWN	FILE NO: GIS\Projects\ FIGURE6-1.MXD

Source: NYS GIS Clearing House

OLD UPPER MOUNTAIN ROAD (932112)
OU 3 FEASIBILITY STUDY REPORT
LOCKPORT, NEW YORK

FIGURE 6-2
OU3 Alternative 2:
Complete Removal
Final Conditions

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	PROJECT NO:	DATE:	SCALE:	FILE NO:
RSC	MEM	SAB	RSC	14368.41	FEBRUARY 2012	AS SHOWN	GIS\Projects\ FIGURE6-2.MXD

Fill Removed

Sheet Piling

Feet

0 25 50 100

1 inch = 50 feet

OLD UPPER MOUNTAIN ROAD (932112) OU 3 FEASIBILITY STUDY REPORT LOCKPORT, NEW YORK			FIGURE 6-3 OU3 Alternative 3: Landfill Capping				
PROJECT MGR: RSC	DESIGNED BY: MEM	CREATED BY: SAB	CHECKED BY: RSC	PROJECT NO: 14368.41	DATE: FEBRUARY 2012	SCALE: AS SHOWN	FILE NO: GIS\Projects\ FIGURE6-3.MXD

Source: NYS GIS Clearing House

Cover with Part 360 Cap

Perimeter Drain/ Anchor Trench

0 25 50 100 Feet

1 inch = 50 feet

Source: NYS GIS Clearing House

OLD UPPER MOUNTAIN ROAD (932112)
OU 3 FEASIBILITY STUDY REPORT
LOCKPORT, NEW YORK

FIGURE 6-4
OU3 Alternative 4:
In-Situ Stabilization

In-Situ Stabilization

0 25 50 100 Feet

1 inch = 50 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	PROJECT NO:	DATE:	SCALE:	FILE NO:
RSC	MEM	SAB	RSC	14368.41	FEBRUARY 2012	AS SHOWN	GIS\Projects\ FIGURE6-4.MXD

TABLE 1 TECHNOLOGY SCREENING MATRIX

SOIL/FILL (OPERABLE UNIT 3)						
Technology	**Process Options**	**Effectiveness in Addressing RAOs**	**Implementability**	**Key Factors**	**Cost**	**Status**
No Action						
No Action	NA	Ineffective	Easily implemented	NA	None	Retained per NCP
Site Management						
Engineering and Institutional controls	Land use restrictions	Effective for human health risk RAOs associated with contact of fill	Easily implemented	Requires regulatory and public acceptance of restricted/diminished resource use.	Low	Retained for potential combination with other technologies
***In-situ* Biological Treatment**						
Phytoremediation	Reliance on natural processes and chemical change	Ineffective due to thickness of fill impacts	Easily implemented; requires demonstration of natural processes causing attenuation and subsequent monitoring	Appropriate only for sites where chemical contamination is relatively shallow. Requires regulatory and public acceptance of short term restrictions on resource use.	Low	Not retained due to depths of soil/fill contamination.
Containment						
Landfill Capping	Multi-media cap	Effectively addresses RAOs associated with contact of fill.	Moderately difficult to implement; requires import of sand, stone, clay placement; monitoring of cap thickness; periodic maintenance and monitoring.	Effective in long term source control; would require long-term groundwater monitoring.	Moderate	Retain for consideration
	Impermeable Liner (i.e. clay, plastic, etc.)	Effectively addresses RAOs associated with contact of fill.	Moderately difficult to implement; requires periodic maintenance and monitoring.	Effective in long term source control; would require long-term groundwater monitoring.	Moderate	Retain for consideration
***In Situ* Physical/Chemical Treatment**						
In-situ Stabilization	Addition of amendments/reagents to soil/fill to convert contaminants to stable compounds with reduced or eliminated leaching potential; requires in-situ mixing	Effective for risk-based RAOs and partially effective for source control; would require leachability testings to measure the immobility of contaminants	Depth of contaminants significantly limit the effectiveness of in-situ process; requires import and availability of suitable materials/reagents (i.e.activated carbon, gypsum, apatite, etc.); stabilization below groundwater table is difficult; periodic monitoring.	Causes significant disturbance to site that may hinder future use; volume increase with bulk can be significant.	Moderate for Shallow Soils (~\$60/yd^3) High at Depth (~\$250/yd^3)	Retained for potential combination with other technology.
Soil Flushing	Extraction of contaminants from soil with water or other suitable aqueous solutions; soil flushing process includes injection or infiltration process of extraction fluid through soil in-situ.	Thickness and permeability of fill may hinder effectiveness	Considered an emerging technology, has not been widely implemented; Moderately difficult to implement; addition of environmentally compatible solvents may be used to increase effective solubility of some COCs; however, flushing solution may alter the physical/chemical properties of the soil system; technology offers the potential for recovery of metals and can mobilize a wide range of organic and inorganic contaminants from coarse-grained soils;	Capture of groundwater and flushing fluids with desorbed contaminants may need treatment to meet appropriate discharge standards prior to release to local, publicly owned wastewater treatment works or receiving streams; separation of solvents from recovered flushing fluid, for reuse in the process, is a major factor in the cost of soil flushing. Treatment of the recovered fluids results in process sludges and residual solids, such as spent carbon and spent ion exchange resin, which must be appropriately treated before disposal. Residual flushing additives in soil may be a concern.	High	Not Retained
Removal						
Excavation	Mechanical excavation used to remove soil/fill material	Will address relevant RAOs, assuming use of handling treatment/disposal options discussed below	Implementable; moderately difficult to implement; requires ravine access by excavation equipment; potential for dewatering needs once GW is encountered; staging/access/mobility at base of ravine will be limiting; base of ravine will need to be stabilized for excavation equipment	Could require establishment of dewatering facilities which could slow process.	High	Retain for consideration
***Ex-situ* Physical/Chemcial Treatment**						
Solidification or Stabilization	Amendments added to modify physical and chemical properties of material to facilitate handling and disposal	Effective at immobilizing inorganics within fill.	Relatively easy to implement; can be performed on small batches as material is staged for transport; requires import and addition of amendments; result is decreased water content and toxicity and mobility of contaminants; volume increase	Requires use of amendments to achieve stabilization	Moderate	Retain for consideration
Ex-situ chemical treatment	Acid leaching used to remove inorganics from soil/fill	Permeability of fill may hinder effectiveness.	Difficult to implement; requires establishment of a designated treatment facility using potentially hazardous chemicals to remove inorganics from fill.	Requires long term use of facilities for soil/fill treatment and disposal or recycling of leached fluids; rate of treatment may limit rate of excavation and disposal; requires use and maintenance of specialized equipment and chemicals	High	Not retained.
	Vitrification used to convert inorganic contaminants to inert forms	Permeability of fill may hinder effectiveness.	Difficult to implement; requires establishment of a designated treatment facility using high temperature processes to vitrify soil/fill	Requires long term use of facilities for soil/fill treatment and disposal; rate of treatment may limit rate of excavation and disposal; requires use and maintenance of specialized equipment	High	Not retained.
Disposal						
Off-site Disposal	Off-site commercial landfill	May be required for excavation options to meet RAOs	Low degree of difficulty to implement; requires identification of landfills capable of accepting material.	Material may require stabilization or treatment to meet criteria for acceptance. Long range transport may be required dependent on landfill capacity/location.	High	Retain for consideration
	Adjacent City of Lockport closed landfill	May be required for excavation options to meet RAOs	Moderately difficult to implement; requires design of a landfill capable of accepting material.	Requires permission and approval from City of Lockport for redesign of landfill; access roads would need to be constructed connecting excavation area to landfill.	Moderate	Not retained.
On-site Disposal	On-site landfill	May be required for excavation options to meet RAOs	Difficult to implement; requires designation and design of a landfill area capable of placing material.	Identification of landfill area at the site and subsequent design and construction; limited to available size of site.	High	Not retained.

NOTE: RAO = Remedial Action Objective
NA = Not Applicable
COC = Contaminant of Concern

TABLE 2 SOIL ALTERNATIVES SCREENING

OPERABLE UNIT 3							
	Alternative 1A **No Action**	**Alternative 1B** **Site Management**	**Alternative 2** **Complete Removal (Excavation) and Disposal Off-Site (Commercial)**	**Alternative 3** **Landfill Capping with a Part 360 Cap**	**Alternative 4** ***In Situ* Stabilization**	**Alternative 5** ***Ex Situ* Stabilization and Disposal Off-Site**	**Alternative 6** **Landfill Capping with a Clean Soil Cover**
Size and Configuration of Process Options	NA	A deed restriction would be implemented at the site to limit the use of the property and groundwater.	Approximately 10,000 yd^3 of soil would be excavated from the site, to a 15 ft maximum depth. 6,450 tons of the excavated soil (assumed to be hazardous) would be disposed of at a permitted hazardous waste landfill. Remaining soils would be transported to a general waste landfill. An approved source of fill would be used to backfill the area and create positive drainage on the site.	Fill would be covered with a full Part 360 cap. Depending on the remedy selected at OU 1, additional fill may be added to the OU 3 footprint, creating a mound with 3:1 slopes. An anchor trench as well as a drain will be placed along the perimeter of the cap to prevent ponding.	Approximately 10,000 yd^3 would be mixed with stabilizing amendment *in situ* to prevent leaching.	Approximately 10,000 yd^3 of soil would be excavated and treated on-site with a stabilizing amendment to be disposed of at a non-hazardous permitted disposal facility. An approved source of fill would be used to backfill the area and create positive drainage on the site.	Fill would be covered with a 24" clean soil cover (18" common fill, 6" topsoil). Depending on the remedy selected at OU 1, additional fill may be added to the OU 3 footprint, creating a mound with 3:1 slopes. The surface will be graded to promote positive drainage.
Time for Remediation	NA	NA	Approximately 3 months	Approximately 2 months	Approximately 2 months	Approximately 3 months	Approximately 2 months
Spatial Requirements	None	None	Area of excavation will be inaccessible during remedial activities. Area for equipment storage and loading and unloading for contaminated/clean soil (~100 X 100 ft).	Area for equipment storage (~100 X 100 ft).	Area for equipment storage (~100 X 100 ft).	Area of excavation will be inaccessible during remedial activities. Area for treatment and utilities equipment (~400 X 400 ft) would need to be obtained on OU 1 or elsewhere.	Area for equipment storage (~100 X 100 ft).
Options for Disposal	NA	NA	Off-site disposal through approved hazardous waste and general waste facilities. Consideration for treatment and reuse of soils would be handled by the facility.	None	None	Off-site disposal for treated soil through approved facilities.	None
Substantive Technical Permit Requirements	None	None	None	None	None	None	None
Limitations or Other Factors Necessary to Evaluate Alternatives	None	None	Disposal facilities will require TCLP analysis for waste characterization prior to acceptance.	Placement of additional fill would nominally increase the surface area of the cap, thereby increasing the cost.	Pilot study will be required for full evaluation.	Pilot study will be required for full evaluation.	Placement of additional fill would nominally increase the surface area of the cap, thereby increasing the cost.
Public Impacts	Will not reduce exposure to contaminants.	Will not physically reduce exposure to contaminants.	Noise, dust, and traffic may disturb local residents.	Noise, dust, and traffic may disturb local residents.	Noise, dust, and traffic may disturb local residents.	Noise, dust, and traffic may disturb local residents.	Noise, dust, and traffic may disturb local residents.
Beneficial and/or Adverse Impacts on Fish and Wildlife Resources	Because soil would be left untreated, the soil could contribute to further groundwater contamination.	Because the soil would be left untreated, the soil could contribute to further groundwater contamination.	No known impacts on fish and wildlife resources. The potential source of groundwater contamination will be removed.	No known impacts on fish and wildlif resources. The potential source of groundwater contamination will be removed.	No known impacts on fish and wildlife resources. The potential sources of groundwater contamination will be treated.	No known impacts on fish and wildlife resources. The potential source of groundwater contamination will be removed.	No known impacts on fish and wildlife resources. The potential source of groundwater contamination will be removed.
Net Present Worth	$0.00	$44,000.00	$2,912,000	$663,000	$2,037,000	$2,261,000	$462,000

TABLE 3 SOIL ALTERNATIVE EVALUATION SUMMARY

OPERABLE UNIT 3

	Alternative 1A	Alternative 1B	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
	No Action	**Site Management**	**Complete Removal (Excavation) and Disposal Off-Site (Commercial)**	**Landfill Capping with a Part 360 Cap**	**In Situ Stabilization**	**Ex Situ Stabilization and Disposal Off-Site**	**Landfill Capping with a Clean Soil Cover**
(1) Overall Protection of the Public Health and the Environment							
	There is no reduction of risk with this alternative. The soil pathways would continue to pose unacceptable risk to all receptors.	Implementation of this alternative would serve to prevent ingestion or direct contact with contaminated soil and groundwater.	Removal of source reduces potential migration of contaminants to groundwater.	Capping of impacted area reduces potential migration of contaminants to groundwater.	Treatment of impacted area reduces potential migration of contaminants to groundwater.	Removal of source reduces potential migration of contaminants to groundwater.	Capping of impacted area reduces potential contact with fill.
(2) Standards, Criteria and Guidance (SCGs)							
	Does not meet SCG criterion.	Does not meet SCG criterion	Will meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.
(3) Long-Term Effectiveness and Permanence							
	This alternative will not provide long-term effectiveness or permanence. This alternative offers no controls.	This alternative would effectively address RAOs if implemented in conjunction with another alternative. As a stand-alone alternative, it is only moderately effective, as contamination will remain in place and no physical barriers would prevent contact or ingestion of soil or groundwater.	When designed and implemented properly, effectively eliminates exposure and prevents transport, permanently removes some habitat , eliminates need for groundwater remedy, RAOs are achieved in short time frame.	Effectively addresses RAOs associated with contact of fill in short time frame; Institutional (Deed Restrictions) and Engineering Controls would need to be in-place.	Effectively addresses RAOs associated with contact of fill in short time frame; Institutional (Deed Restrictions) and Engineering Controls would need to be in-place; assumes that soi/fill would be removed from areas in contact with groundwater and shallow fill would be treat via in-situ stabilization.	When designed and implemented properly, effectively eliminates exposure and prevents transport, permanently removes some habitat , RAOs are achieved in short time frame.	Effectively addresses RAOs associated with contact of fill in short time frame; Institutional (Deed Restrictions) and Engineering Controls would need to be in-place.
(4) Reduction of Toxicity, Mobility, or Volume of Contamination Through Treatment							
Amount of Hazardous Materials Destroyed, Treated, or Removed	None	None	Excavation will remove soil exceeding allowable risks at the impacted area.	Capping fill materials will not remove or destroy hazardous materials.	Partial excavation will remove most of the soil exceeding allowable risks. Treatment will reduce toxicity of the remaining soil.	Excavation will remove soil exceeding allowable risks at the impacted area.	Capping fill materials will not remove or destroy hazardous materials.
Degree of Expected Reductions in Toxicity, Mobility, or Volume	None	None	Contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Contaminant mobility will be reduced.	Contaminant toxicity and volume will be reduced.	Contaminant toxicity and volume will be reduced.	Contaminant mobility will be reduced.
Irreversible Treatment?	No	No	Yes	Partially reversible. Fill could be un-capped.	Yes	Yes	Reversible. Fill could be un-capped.
Residuals Remaining After Treatment	Yes	Yes	Trace residuals may remain after excavation is complete.	Residuals will remain under cap.	Residuals will remain in treatment area, but will be less mobile.	Trace residuals may remain after excavation is complete.	Residuals will remain under cap.
(5) Short-Term Impact and Effectiveness							
Community Protection	There is no action and therefore, no additional risk to the community.	There is no physical action and therefore, no additional risk to the community.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust will be produced during excavation activities. These can be mitigated through standard construction practices and permitting. Some habitats will be temporarily disturbed.	Dust will be produced during clearing and grubbing and grading activities. These can be mitigated through standard construction practices and permitting.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust will be produced during excavation and mixing activities. These can be mitigated through standard construction practices and permitting.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices and permitting.	Dust will be produced during clearing and grubbing and grading activities. These can be mitigated through standard construction practices and permitting.
Worker Protection	There is no action and therefore no workers will be present on site.	There is no physical action and therefore, no workers will be present at the site	Workers can potentially be exposed to contaminated media during excavation activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during clearing, grubbing and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during treatment activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during treatment activities. Work around heavy equipment and electrical power carries potential risk to workers. Risks can be minimized by implementing controls.	Workers can potentially be exposed to contaminated media during clearing, grubbing and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.
Environmental Impacts	There are no short-term impacts associated with this alternative.	There are no short-term impacts associated with this alternative.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs. Limited short term environmental impacts associated with implementation and air emissions.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs. Limited short term environmental impacts associated with implementation and air emissions.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs. Limited short term environmental impacts associated with implementation and air emissions.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs. Limited short term environmental impacts associated with implementation and air emissions.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs. Limited short term environmental impacts associated with implementation and air emissions.
Time Until Action Complete (Field Construction Time)	No action taken	Approximately 2 months for the deed restriction to be in effect.	Approximately 3 months	Approximately 2 months	Approximately 2 months	Approximately 3 months	Approximately 2 months
(6) Implementability							
Ability to Construct and Operate	Not Applicable.	Institutional controls can be implemented, and have been used nationally.	Excavation alternatives can be implemented, and have been used nationally.	Landfill capping alternatives can be implemented, and have been used nationally.	Excavation and treatment alternatives can be implemented, and have been used nationally.	Excavation and treatment alternatives can be implemented, and have been used nationally.	Landfill capping alternatives can be implemented, and have been used nationally.
Monitoring Requirements	Not Applicable.	Not Applicable.	Soil shall be sampled and analyzed to confirm removal of impacted area.	Groundwater shall be sampled and analyzed to monitor potential groundwater impacts.	Soil shall be sampled and analyzed to confirm removal of impacted area. Groundwater shall be sampled and analyzed to monitor potential groundwater impacts.	Soil shall be sampled and analyzed to confirm removal of impacted area.	Groundwater shall be sampled and analyzed to monitor potential groundwater impacts.
Availability of Equipment and Specialists	Not Applicable.	Specialists are available for the implementation of institutional controls.	Equipment and specialists are available for the implementation of all of these technologies.				
Ability to Obtain Approvals and Coordinate with Other Agencies	Not Applicable.	Ability to obtain approvals and coordinate with other agencies assumed to be possible.	Ability to obtain approvals and coordinate with other agencies assumed to be possible.				
(7) Cost Effectiveness							
Cost	**$0**	**$44,000**	**$2,912,000**	**$663,000**	**$2,037,000**	**$2,261,000**	**$462,000**
(8) Land Use							
	NA	Restricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted
(9) Community Acceptance							
	TBD	TBD	TBD	TBD	TBD	TBD	TBD

NOTE: PPE = Personal protective equipment
ARAR = Applicable or Relevant and Appropriate Requirement
TBD = To be determined

Appendix A
Technology Screening Letter and Comments

EA Engineering, P.C.
EA Science and Technology

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17 June 2011

DRAFT

Mr. Glenn May
NYSDEC - Region 9
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, NY 14203-2999

RE: Contract/Work Assignment No: D004438-41
Site/Spill No/Pin: Old Upper Mountain Road Site (932112)
Remedial Action Objectives and Feasibility Study Technology Screening

Dear Mr. May:

EA Engineering, P.C., and its affiliate EA Science and Technology (EA) is providing the Department with this letter as part of the Feasibility Study (FS) being conducted for the Old Upper Mountain Road site (932112), located in Lockport, New York. The FS is being conducted in accordance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) *DER-10 Technical Guidance for Site Investigation and Remediation* (DER-10). The following bullets summarize the criteria and initial screening to be used for the development of the Feasibility Study Report.

- Pursuant to DER-10 remedial goals for the site are defined by the applicable regulations for New York State Inactive Hazardous Waste Disposal Site Remedial Program (State Superfund Program or SSF), as defined by Environmental Conservation Law (ECL), Article 27, Title 13.

- Remedial Action Objectives (RAOs) are medium or operable unit-specific objectives for the protection of public health and the environment and are developed based on contaminant-specific Standards, Criteria, and Guidance (SCGs) to address contamination identified at a site. NYSDEC has developed generic RAOs for various media that will be used during the development of the Feasibility Study and remedy selection process. The RAOs for impacted media identified at the site are listed in Table 1.

- EA completed a technology screening review to begin preparation of the FS. The screening was completed based on discussions between EA and the Department and an on-site evaluation of existing site conditions.

EA completed the technology screening in accordance with DER-10 and the 1988 U.S. Environmental Protection Agency (USEPA) publication *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA l540lG-891004). The basis of the screening was designed to provide an overall assessment of applicable technologies based on impacted media identified at the site during the RI and SRI. Under the RI and SRI, the Old Upper Mountain Road site was evaluated as three separate operable units defined as follows:

- Operable Unit 1 (OU 1) defined as the approximately 6 acres of landfill wastes which make up the Old Upper Mountain Road site. Impacts associated with OU 1 and evaluated in the RI include on-site surface and subsurface soil/fill material, and on-site groundwater.

- Operable Unit 1A (OU 1A) defined as the approximately 1 acre of land fill wastes that make up the portion of the Old Upper Mountain Road site located south and west of the Somerset rail line. Impacts associated with OU 1A and evaluated in the RI include on-site surface and subsurface soil/fill material, and on-site groundwater.

- Operable Unit 2 (OU 2) defined as surface water and sediment within Gulf Creek, from the area located at the western origin of the ravine at the bulkhead outfall located to the north of the site to an area downstream where Gulf Creek meets Niagara Street.

The remedial goal for all remedial actions is considered to be the restoration of the site to the pre-disposal/pre-release conditions to the extent practicable and legal. Remedial action objectives (RAOs) are defined as the medium specific or operable-unit specific cleanup objectives to provide protection of public health and the environment. The RAOs are based on contaminant specific standards, criteria, and guidance defined in the RI and SRI. The areas of concern and impacts associated with the environmental media were based on laboratory analytical results and their comparison to the SCGs. The following is a summary of the conclusions presented in the RI and SRI and aimed at defining the nature and extent of environmental impacts associated within each operable unit.

Operable Unit 1 and 1A (OU 1):

Surface Soil

- Several TAL metals were reported in on-site surface soil/fill above their applicable SCGs. Lead, a COC reported in concentrations exceeding the SCGs in each of the surface soil/fill samples collected, was reported at concentrations ranging from 900 mg/kg to 19,000 mg/kg in surface soil/fill material within OU 1/OU 1A.

- Surface soil/fill material within OU 1/OU 1A exhibited hazardous waste characteristics for lead (D008). Three out of eight (approximately 38 percent) surface soil/fill samples submitted for TCLP lead analysis were identified as hazardous waste.

- A number of SVOCs, pesticides, and PCBs were also detected within surface soil/fill samples within OU 1/OU 1A at concentrations above their applicable SCGs.

Subsurface Soil

- Laboratory analytical results from the on-site subsurface soil/fill sampling program identified elevated concentrations of several TAL Metals. Concentrations of lead in exceedence of its SCG were detected in 107 of 116 (approximately 92 percent) subsurface soil samples collected under this evaluation. The deepest impacts to subsurface soil/fill were found within SB-24 at a depth of 70-73 ft bgs.

- Subsurface soil/fill material within OU 1/OU 1A exhibited hazardous waste characteristics for lead (D008). Thirty-three out of 77 (approximately 43 percent) subsurface soil/fill samples submitted for TCLP lead analysis were identified as hazardous waste.

- The estimated volume of fill material contained within OU 1/OU 1A is approximately 145,000 yds^3 or 217,500 ton using as an estimate that one cubic yard of fill material is approximately equal to 1.5 ton. This volume estimate does not account for fill material that lies along the slope of the ravine to the base of Gulf Creek or fill material that lies beneath the railroad line and ballast which bisects OU 1 and OU 1A.

- Vertical profile borings indicated that there is no direct correlation between metals impacts and depth of fill material on-site. There does not appear to be a general pattern indicating a trend for increasing or decreasing lead concentrations with depth based on the analytical data collected during the RI. It appears that the types and source(s) of waste dumped at the site, rather than migration of metals through the soil/fill material, is the primary influence on metals concentration within the subsurface at OU 1/OU 1A.

Groundwater

- The hydrogeologic data evaluated during the RI and SRI indicates that bedrock groundwater is in communication with the saturated zones observed within the overburden fill material.

- Groundwater flow direction, based on groundwater elevations, is towards the former ravine and eventually Gulf Creek. Groundwater moving within the bedrock system from the west continues in a westerly direction until it reaches the former ravine where it then moves north toward Gulf Creek. The bedrock groundwater system flowing from areas south of the site flows in a northerly direction into the former ravine and then toward Gulf Creek, while the flow from the eastern portion of the site moves west to the former ravine and then towards Gulf Creek. The former ravine identified during the subsurface investigation acts as a discharge point for bedrock groundwater within the vicinity of the site.

- Groundwater analytical results reported concentrations of TAL metals above SCGs at each monitoring well location. The highest overall concentrations of TAL metals were reported at monitoring wells MW-04 and MW-03, which are screened within the deepest portion of the on-site fill material (MW-04) and shallow bedrock just below the fill material (MW-03), and are located along the northern portion of the site. On-site subsurface fill material appears to be acting as a direct source of elevated metal concentrations to groundwater quality within OU 1/OU 1A.

- SVOCs that exceeded site SCGs were detected at monitoring wells MW-04 and MW-03 as well. Because SVOC concentrations were not reported at monitoring well locations upgradient of monitoring wells MW-03 and MW-04, it appears that SVOC contamination observed within the fill material are also impacting groundwater quality.

- Groundwater samples collected at monitoring wells MW-01, MW-02, MW-04, and MW-05 reported CVOC concentrations above the SCGs. Groundwater samples collected at monitoring well MW-03 reported concentrations of toluene exceeding the SCG. VOC detections in groundwater at the site is likely due to off-site sources.

Operable Unit 2 (OU 2):

Surface Water

- Low level CVOCs have been identified in surface water within Gulf Creek nearest OU 1, the storm sewer system discharge water that flows into Gulf Creek, the sanitary sewer system that intersects the western portion of the site, and on-site groundwater. PCE was detected above its respective SCG for Class D waters within surface water samples collected from Gulf Creek.

- Iron was detected in surface water within Gulf Creek, the storm sewer system discharge water that flows into Gulf Creek, the sanitary sewer system that intersects the western portion of the site, and in on-site groundwater. Iron was detected at concentrations above the SCG within the surface water samples collected from Gulf Creek during both RI and SRI.

- As noted above, multiple sources of iron appear to be contributing to surface water quality conditions observed in Gulf Creek. Remedial measures specifically designed to address surface water impacts are considered not needed at this time under the assumption that remediation efforts at OU 1/OU 1A metals contamination source area and OU 2 would address the limited impacts to surface water. In addition, SCGs developed for iron are for aesthetics.

Sediment

- Concentrations of nine TAL metals were identified above the SELs in the sediment of Gulf Creek with the most prevalent metals being lead and zinc. Sediment with metal concentrations above the SELs is considered contaminated and significant harm to benthic aquatic life is possible. None of the sediment samples submitted for TCLP lead analysis were identified as hazardous waste.

- It is estimated that approximately 17,500 yd^3 of impacted sediment exists within the reaches of Gulf Creek evaluated during the RI and SRI.

- The specific TAL metals reported in sediment samples correlate with the TAL metals observed within the on-site fill material (OU 1 and OU 1A) and are likely migrating to the sediments of Gulf Creek via erosion runoff and groundwater transport pathways.

In addition to media impacts identified during the RI and SRI there are a number of physical and environmental constraints that have a significant influence on the implementability of a potential remedial alternative as identified below:

- Depth of subsurface soil/fill contamination ranges from ground surface to 75 ft bgs across OU-1. The soil/fill material is located within a former ravine.

- Permeability of soil/fill is unknown and would need to be tested prior to implementing in-situ technologies. Based on observations of ash within the fill, permeability characterization would be required to accommodate some technologies.

- Much of the soil/fill material is located along the edge of a ravine, which impedes access.

- An active combined sewer line intersects OU 1 and runs beneath Gulf Creek (OU 2). EA has gathered additional details on the construction, location, and pitch of this sewer line from the City of Lockport.

- An active Somerset railroad line bisects OU 1 and OU 1A and was likely constructed over contaminated soil/fill material. EA is currently working with Somerset personnel to identify as-built drawing and other pertinent information to estimate the volume of potentially impacted soil/fill material, which likely would need to be left in-place.

- Access to Gulf Creek is limited as only one access point currently exists. This access road would require an engineering evaluation to determine its capacity for construction related activities.

- Several beaver dams are currently located throughout Gulf Creek within OU 2. These damns retain a large volume of surface water.

- Sensitive habitats (i.e., wetlands, pond) exist downstream from OU 1 and within OU-2.

The technology screening assessed applicable technologies based on operable unit-specific media and contaminants, as well as with the following five categories:

- Compliance with RAO
- Effectiveness
- Implementability
- Reduction of toxicity, mobility, and volume
- Cost.

The technology screening tables attached (Table 2) to this letter provide a review of each screened technology for potentially addressing surface and subsurface soil/fill material and groundwater impacts associated with OU 1 and OU 1A, and sediment impacts associated with OU 2 based upon the above listed criteria. EA has evaluated multiple technologies known to be effective in the remediation of inorganic compounds in soil/fill, sediment, and groundwater. Based on the screening matrix and in accordance with the conclusions of the RI and SRI reports, EA proposes to develop the FS evaluating the remedial alternatives as presented in Table 3.

Upon your receipt and review of this document, please provide concurrence and/or comments with the proposed remedial alternatives so that EA may move forward with preparation of the FS for the Old Upper Mountain Road site.

If you have any questions, please do not hesitate to contact me at (315) 431-4610, extension 104.

Sincerely yours,

EA SCIENCE AND TECHNOLOGY

Robert S. Casey
Project Manager

EA ENGINEERING, P.C.

Chris Canonica, P.E.
Vice President

Enclosures (E.doc)

RSC/drs

TABLE 1 OLD UPPER MOUNTAIN ROAD - REMEDIAL ACTION OBJECTIVES

Media	Remedial Action Objective
Operable Unit OU 1 & OU 1A	
Soil/Fill	◦ Prevent ingestion/direct contact with contaminated soil. ◦ Prevent migration of contaminants that would result in groundwater or surface water contamination. ◦ Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.
Groundwater	◦ Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards. ◦ Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable. ◦ Prevent the discharge of contaminants to surface water. ◦ Remove the source of ground or surface water contamination.
Operable Unit OU 2	
Sediment	◦ Prevent direct contact with contaminated sediments. ◦ Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain. ◦ Restore sediments to pre-release/background conditions to the extent feasible.

TABLE 2 - TECHNOLOGY SCREENING MATRIX - SOIL/FILL (OU 1 & OU 1A)

Technology	Process Options	Effectiveness in Addressing RAOs	Implementability	Key Factors	Cost	Status
No Action						
No Action	NA	Ineffective	Easily implemented	NA	None	Retained per NCP
Institutional Controls						
Engineering and Institutional controls	Land use restrictions	Effective for human health risk RAOs associated with contact of fill	Easily implemented	Requires regulatory and public acceptance of restricted/diminished resource use.	Low	Retained for potential combination with other technologies
Monitored Natural Attenuation						
Monitored Natural Attenuation	Reliance on natural processes and chemical change	Ineffective in short term but potentially effective in the long term, dependent on addressing the source	Easily implemented; requires demonstration of natural processes causing attenuation and subsequent monitoring	Appropriate only for sites where natural processes serve to permanently bury or sequester chemical contamination. Requires regulatory and public acceptance of short term restrictions on resource use.	Low	Retained for potential combination with other technologies
In-situ Biological Treatment						
Phytoremediation	Reliance on natural processes and chemical change	Ineffective due to thickness of fill impacts	Easily implemented; requires demonstration of natural processes causing attenuation and subsequent monitoring	Appropriate only for sites where chemical contamination is relatively shallow. Requires regulatory and public acceptance of short term restrictions on resource use.	Low	Not retained due to depths of soil/fill contamination.
Containment						
Landfill Capping	Multi-media cap	Effectively addresses RAOs associated with contact of fill.	Moderately difficult to implement; requires import of sand, stone, clay placement; monitoring of cap thickness; periodic maintenance and monitoring; steepness of ravine would require substainial earthwork design.	Would require site grading changes and/or consolidation of waste; effective in long term source control; would require long-term groundwater treatment technology;	Moderate	Retain for consideration
	Impermeable Liner (i.e. clay, plastic, etc.)	Effectively addresses RAOs	Implementable but impractical due to need to remove all fill.	Covers over habitat and limits types of vegetative growth but effectively blocks transport	Moderate	Not Retained
In Situ Physical/Chemical Treatment						
In-situ Stabilization/Solidification	Addition of amendments/reagents to soil/fill to produce monolith of waste with high structural integrity; requires in-situ mixing	Effective for risk-based RAOs and partially effective for source control; would require leachability testings to measure the immobility of contaminants	Depth of contaminants significantly limit the effectiveness of in-situ process; requires import and availability of suitable materials/reagents (i.e.activated carbon, gypsum, apatite, etc.); stabilization below groundwater table is difficult; periodic monitoring.	Causes significant disturbance to site that may hinder future use; volume increase with bulk can be significant;	Moderate for Shallow Soils (~$60/cy) High at Depth (~$250/cy)	Retained for potential combination with other technology.
Soil Flushing	Extraction of contaminants from soil with water or other suitable aqueous solutions; soil flushing process includes injection or infiltration process of extraction fluid through soil in-situ.	Thickness and permeability of fill may hinder effectiveness	Considered an emerging technology, has not been widely implemented; Moderately difficult to implement; addition of environmentally compatible solvents may be used to increase effective solubility of some COCs; however, flushing solution may alter the physical/chemical properties of the soil system; technology offers the potential for recovery of metals and can mobilize a wide range of organic and inorganic contaminants from coarse-grained soils;	Capture of groundwater and flushing fluids with desorbed contaminants may need treatment to meet appropriate discharge standards prior to release to local, publicly owned wastewater treatment works or receiving streams; separation of solvents from recovered flushing fluid, for reuse in the process, is a major factor in the cost of soil flushing. Treatment of the recovered fluids results in process sludges and residual solids, such as spent carbon and spent ion exchange resin, which must be appropriately treated before disposal. Residual flushing additives in soil may be a concern.	High	Not Retained
Removal						
Excavation	Mechanical excavation used to remove soil/fill material	Will address relevant RAOs, assuming use of handling treatment/disposal options discussed below	Implementable; moderately difficult to implement; requires ravine access by excavation equipment; potential for dewatering needs once GW is encountered; staging/access/mobility at base of ravine will be limiting; base of ravine will need to be stabilized for excavation equipment	Could require establishment of dewatering facilities which could slow process.	High	Retain for consideration
Ex-situ Physical/Chemcial Treatment						
Solidification or Stabilization	Amendments added to modify physical and chemical properties of material to facilitate handling and disposal	Effective at immobilizing inorganics within fill.	Relatively easy to implement; can be performed on small batches as material is staged for transport; requires import and addition of amendments; result is decreased water content and toxicity and mobility of contaminants; volume increase	Requires use of amendments to achieve stabilization	Moderate	Retain for consideration
Ex-situ chemical treatment	Acid leaching used to remove inorganics from soil/fill	Permeability of fill may hinder effectiveness.	Difficult to implement; requires establishment of a designated treatment facility using potentially hazardous chemicals to remove inorganics from fill.	Requires long term use of facilities for soil/fill treatment and disposal or recycling of leached fluids; rate of treatment may limit rate of excavation and disposal; requires use and maintenance of specialized equipment and chemicals	High	Not retained.
	Vitrification used to convert inorganic contaminants to inert forms	Permeability of fill may hinder effectiveness.	Difficult to implement; requires establishment of a designated treatment facility using high temperature processes to vitrify soil/fill	Requires long term use of facilities for soil/fill treatment and disposal; rate of treatment may limit rate of excavation and disposal; requires use and maintenance of specialized equipment	High	Not retained.
Disposal						
Off-site Disposal	Off-site commercial landfill	May be required for excavation options to meet RAOs	Low degree of difficulty to implement; requires identification of landfills capable of accepting material; landfill capacity and permitting may limit excavation and disposal rates.	Material may require dewatering, stabilization, or treatment to meet criteria for acceptance. Long range transport may be required dependent on landfill capacity/location; extensive site work and earthwork to accommodate	High	Retain for consideration
	Adjacent City of Lockport closed landfill	May be required for excavation options to meet RAOs	Moderately difficult to implement; requires design of a landfill capable of accepting material.	Requires permission and approval from City of Lockport for redesign of landfill; access roads would need to be constructed connecting excavation area to landfill; extensive site work and earthwork to accommodate excavation of material.	Moderate	Retain for consideration
On-site Disposal	On-site landfill	May be required for excavation options to meet RAOs	Difficult to implement; requires designation and design of a landfill area capable of placing material.	Identification of landfill area at the site and subsequent design and construction; limited to avaiable size of site;	High	Retain for consideration

TABLE 2 TECHNOLOGY SCREENING MATRIX - GROUNDWATER (OU 1 & OU 1A)

Technology	Process Options	Effectiveness in Addressing RAOs	Implementability	Key Factors	Cost	Status
No Action						
No Action	NA	Ineffective	Easily implemented	NA	None	Retained per NCP
Institutional Controls						
Engineering and Institutional controls	Groundwater use restrictions; and long-term monitoring program	Effective for human health risk RAOs	Easily implemented	Requires regulatory and public acceptance of restricted/diminished resource use.	Low	Retained for use with other technologies
Containment						
Physical Barriers	A slurry wall is installed from the ground surface to a confining layer; contains contaminated groundwater; may also divert contaminated groundwater from drinking water intakes or toward a treatment system.	May be required for landfill capping options to meet RAOs	Easily implementable; requires the design/construction of engineered slurry wall or othe type of physical barrier	Most effective when barrier is able to be keyed into a low permeability layer; cost increases greatly when installed deeper than 100 ft	Low	Retained for use with other technologies
Ex Situ Physical/Chemical Treatment						
Filtration (Adsorption/Absorption)	Isolates solid particles by running a fluid stream through a porous medium; Utilizes gravity or a pressure differential across the filtration medium; chemicals are not destroyed; they are merely concentrated, making reclamation possible.	May be required for landfill capping options to meet RAOs	Moderate difficulty for implementation; would require design/construction of treatment process and facility; treatment building would be permanant and treatment times are extensive; requires long-term OM&M; hydrogeological data would be needed to determine flows rates and treatment process parameters	High concentrations of contaminants would require frequent replacement of adsorbent unit; chemicals are not destroyed, thereby requiring proper treatment, disposal, or reclamation	Moderate to High	Retained for use with other technologies
Precipitation/flocculation	Pumping or capture of ground water through extraction wells or collection trench and then treatment to precipitate lead and other heavy metals. Metals removal employs precipitation with hydroxides, carbonates, or sulfides; Precipitating agent is added to water in a mixing tank along with flocculating agents; mixture then flows to a flocculation chamber that agglomerates particles, which are then separated from the liquid phase in a sedimentation chamber. Other physical processes, such as filtration, may follow.	May be required for landfill capping options to meet RAOs	Well designed treatment process for metals; Moderate difficulty for implementation; would require design/construction of treatment process and facility; treatment building would be permanant and treatment times are extensive; requires long-term OM&M; hydrogeological data would be needed to determine flows rates and treatment process parameters	Presence of a variety of metals may make removal of all constituents difficult, thereby requiring further treatment; resulting sludge requires TCLP testing prior to disposal; treated water may require pH adjustment	Moderate to High	Retained for use with other technologies
Ion Exchange	Groundwater is pumped through ion exchange resins. Resin is made of synthetic or natural materials the size of a grain of sand with the opposite charge of the contaminated ion. Resin can be regenerated for re-use after resin capacity has been exhausted.	May be required for landfill capping options to meet RAOs	Well designed treatment process for metals; moderate difficulty for implementation; would require design/construction of treatment process and facility; treatment building would be permanant and treatment times are extensive; requires long term OM&M; hydrogeological data would be needed to determine flows rates and treatment process parameters	High concentrations of suspended solid may cause resin blinding; groundwater pH needs to be considered when selecting the ion exchange resin; oxidants in groundwater may damage the ion exchange resin; may require additional treatment	Moderate to High	Retained for use with other technologies

TABLE 2 - TECHNOLOGY SCREENING MATRIX - SEDIMENT (OU 2)

Technology	Process Options[a]	Effectiveness in Addressing RAOs	Implementability	Key Factors	Cost	Status
No Action						
No Action	NA	Ineffective	Easily implemented	NA	None	Retained per NCP
Institutional Controls						
Engineering and Institutional controls	Land use restrictions; Waterbody use restrictions; fishing advisories; waterbody management practicies	Effective for human health risk RAOs only	Easily implemented	Requires regulatory and public acceptance of restricted/diminished resource use.	Low	Retained for potential combination with other technologies
Monitored Natural Attenuation						
Monitored Natural Attenuation	Reliance on natural processes and chemical change	Ineffective in short term but potentially effective in the long term, dependent on addressing the source	Easily implemented; requires demonstration of natural processes causing attenuation and subsequent monitoring	Appropriate only for sites where natural processes serve to permanently bury or sequester chemical contamination. Requires regulatory and public acceptance of short term restrictions on resource use.	Low	Retained for potential combination with other technologies
Containment						
In-situ subaqueous capping - physical barrier	Thin layer capping with armor material (gravel or stone, less than 1 ft. thickness)	Effective for risk-based RAOs; effectiveness for source control uncertain	Moderately difficult to implement; requires import of stone; placement in water; monitoring of cap thickness; periodic maintenance & monitoring.	May require filling shallow areas & may alter habitat; long term source control effective only if contaminant is of limited solubility; requires access easement for sewer.	Moderate	Not retained.
	Multi-media cap	Effectively addresses RAOs	Moderately difficult to implement; requires import of sand, stone, clay placement in water; monitoring of cap thickness; periodic maintenance and monitoring.	May require changes in bottom topography/habitat; effective in long term source control unless inorganic are soluble and upwelling is substantial; requires acceess easement for sewer.	Moderate	Retain for use
	Impermeable Liner (i.e. clay, plastic, etc.)	Effectively addresses RAOs	Implementable only for small areas because liners would destroy habitat; moderately difficult to implement; requires import of liners; placement in water; periodic maintenance and monitoring.	Covers over habitat but effectively blocks transport; requires access easement for sewer.	Moderate	Not retained.
In-situ subaqueous capping - reactive cap	Capping using activated carbon/organo-carbon in a thin layer (less than 3 in.)or mixed with sand	Effective for risk-based RAOs and partially effective for source control	Moderately difficult to implement; requires import of special materials (i.e. Sedi-mite, activated carbon, organic carbon, or similar products); placement in water; monitoring of cap thickness; periodic maintenance and monitoring.	May require filling some areas and substantial changes in bottom topography/habitat; effective in long term source control unless inorganics are soluble and upwelling is substantial; requires access easement for sewer.	Moderate	Not retained.
	Capping using sulfide complexed minerals (Mackinawite, gypsum, phosphogypsum), biopolymers (chitin/chitosan), or other compounds (zeolite, organoclay, apatite) in a thin layer (less than 3 in.) or mixed with sand	Effective for risk-based RAOs and partially effective for source control	Moderately difficult to implement; requires import of special materials (i.e. amendments); placement in water; monitoring of cap thickness; periodic maintenance and monitoring.	Causes minimal changes in bottom topography/habitat; long term effectiveness is still subject to evaluation; binding likely to decrease toxicity and dissolved phase mobility but does not inhibit physical transport; requires access easement for sewer.	Moderate	Not retained.
In Situ Treatment						
In-situ chemical treatment	Addition of amendments to sediment; may require in situ mixing	Effective for risk-based RAOs and partially effective for source control	Difficult to implement; requires import of special materials (i.e. Sedi-mite, activated carbon, gypsum, apatite, etc.); placement in water; mixing of upper layers of sediment; periodic monitoring.	Causes significant disturbance to habitat; effective long term source control for dissolved phase, but does not prevent physical transport	Moderate to high	Not retained.
In-situ chemical treatment	Solidification/stabilization	Effective for risk-based RAOs and source control	Difficult to implement; requires import of stabilization amendments; placement in water; mixing of upper layers of sediment; periodic monitoring.	Causes significant disturbance to habitat and long term change in sediment properties; effective long term source control	Moderate to high	Not retained.
In-situ biological treatment	Phytoextraction	Effective for risk-based RAOs and source control	Difficult to implement; limited to areas that will support wetland plant growth; requires planting of appropriate species and subsequent harvest for disposal. May require long time frames, and effectiveness may be limited.	Would require alteration of site wetland habitats; would not provide short-term risk reduction and overall effectiveness may be limited	Moderate	Retain for consideration.
Removal						
Dredging	Hydraulic dredging	Will address relevant RAOs, assuming use of handling treatment/disposal options discussed below	Modertaley difficult to implement; requires waterway access by hydraulic dredging equipment; requires subsequent dewatering to remove water added by hydraulic conveyance	Requires establishment of dewatering facilities; rate may be limited by distance to and capacity of dewatering facility; rate may also be affected by sediment type; dredging typically requires water quality monitoring and resuspension/residuals controls	High	Not retained.
Dredging	Mechanical dredging	Will address relevant RAOs, assuming use of handling treatment/disposal options discussed below	Difficult to implement; requires waterway access by dredging equipment; less dewatering required than for hydraulic dredging; buried debris, rocks, or bedrock may limit dredging implementation	Requires establishment of dewatering facilities; rate may be limited by dewatering practices; rate may also be affected by presence of debris or obstacles to dredging; dredging typically requires water quality monitoring and resuspension/residuals controls	High	Retain for consideration.
Dredged Material Handling and Treatment						
Dewatering	Passive dewatering conducted over long periods of time with the the aid of flocculants, lined holding cells, or fabric containment structures	May be required for dredging options to meet RAOs	Moderately difficult to implement; requires establishment of a long term dewatering facility with adequate capacity, water treatment facilities, and discharge monitoring; result is decreased water content and volume	Requires long term use of land for dewatering and use of flocculants; rate of dewatering may limit rate of dredging and disposal	Moderate	Retain for consideration.
	Mechanical dewatering conducted using specialized mechanical equipment	May be required for dredging options to meet RAOs	Moderately difficult to implement; requires establishment of a long term dewatering facility with appropriate equipment, water treatment facilities, and discharge monitoring; result is decreased water content and volume	Requires long term use of facilities for dewatering; rate of dewatering may limit rate of dredging and disposal; requires use and maintenance of specialized equipment	High	Retain for consideration.
Solidification or Stabilization	Amendments added to modify physical and chemical properties of material to facilitate handling and disposal	May be required for dredging options to meet RAOs	Relatively easy to implement; can be performed on small batches as material is staged for transport; requires import and addition of amendments; result is decreased water content and volume as well as decreased toxicity and mobility of inorganics	Requires use of amendments to achieve stabilization	Moderate	Retain for consideration.
Ex-situ chemical treatment	Amendments (e.g. gypsum, apatite) added to modify chemical properties of sediment	May be required for dredging options to meet RAOs	Relatively easy to implement; can be performed on small batches as material is dewatered or staged for transport; requires import and addition of amendments; result is decreased toxicity and mobility of contaminants	Requires use of amendments to achieve decreased toxicity and mobility	Moderate	Not retained.
Disposal						
Off-site Disposal	Off-site commercial landfill	May be required for dredging options to meet RAOs	Modrately difficult to implement; requires identification of landfills capable of accepting material; landfill capacity may limit dredging and disposal rates.	Material may require dewatering, stabilization, or treatment to meet criteria for acceptance. Long range transport may be required dependent on landfill capacity.	High	Retain for consideration.
	Adjacent City of Lockport closed landfill	May be required for dredging options to meet RAOs	Moderately difficult to implement; requires design of a landfill capable of accepting material.	Material may require dewatering, stabilization, or treatment prior to placement; requires permission and approval from City of Lockport for redesign of landfill; access roads would need to be constructed connecting excavation area to landfill; extensive site work and earthwork to accommodate excavation of material.	Moderate	Retain for consideration.
On-site Disposal	On-site landfill	May be required for dredging options to meet RAOs	Difficult to implement; requires designation and design of a landfill area capable of accepting material.	Facility would require designation of landfill area and subsequent design and construction.	High	Retain for consideration.

TABLE 3 PROPOSED REMEDIAL ALTERNATIVES

Remedial Alternative Development
Old Upper Mountain Road - OU1 & OU1A
Lockport, New York

Contaminated Soil/Fill Material and Groundwater

Contaminant of Concern (COC):
Inorganics (primarily Lead & Zinc)

Remedial Action Objectives - Soil/Fill:	Remedial Action Objectives - Groundwater:
◦ Prevent ingestion/direct contact with contaminated soil. ◦ Prevent migration of contaminants that would result in groundwater or surface water contamination. ◦ Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the	◦ Prevent the discharge of contaminants to surface water ◦ Restore groundwater to pre-disposal conditions, to the extent practicable. ◦ Remove the source of ground or surface water contamination. ◦ Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

Technology Screening:

Pursuant to DER-10 Technical Guidance for Site Investigation and Remediation, Section 4.0 (Remedy Selection) specifically subsection 4.2 (Development and Evaluation of Alternatives) recommends where presumptive remedies are available to address the contamination identified, that the presumptive remedy be strongly considered but not exclusionary to other innovative technologies. If the presumptive remedies are applicable, pursuant to current USEPA and DER guidance, the remedy selection process can continue to the assembly of technologies into operable units and/or site-wide alternatives.

	Remedial Technology	Compliance with RAO	Effectiveness	Implementability	Reduction of toxicity, mobility, and volume	Cost
1	No Action					
2	Complete Removal (Excavation) and Disposal Off-site (Commercial)	Yes	when designed and implemented properly, effectively eliminates exposure and prevents transport, temporarily disturbs habitat, permanently removes some habitat , eliminates need for groundwater remedy, RAOs are achieved in short time frame	moderately difficult to implement due to physical setting and grades, requires ravine access by excavation equipment; additional engineering evaluations would be needed to determine capacity of existing access roads; potential for dewatering needs once GW is encountered; staging/access/mobility at base of ravine will be limiting; base of ravine will need to be stabilized for excavation equipment	does not reduce toxicity, mobility or volume; transfer of COCs to off-site permitted TSDF	large initial capital investment, low long-term monitoring costs, no groundwater treatment needed under this alternative
3	Landfill Capping and Groundwater Containment (Slurry Wall) or *Ex-Situ* Treatment Option	Yes	Effectively addresses RAOs associated with contact of fill in short time frame, long-term monitoring of effectiveness of slurry wall, effectiveness of medium used in slurry wall will decrease with time and require replacement; Institutional (Deed Restrictions) and Engineering Controls would need to be in-place	Moderately difficult to implement; requires import of sand, stone, clay placement; monitoring of cap thickness; periodic maintenance and monitoring; steepness of ravine would require substainial earthwork design, limited area within the base of the ravine and additional hydrogeological study would be required for design of slurry wall	does not reduce toxicity, mobility or volume of soil/fill; leaves in-place under long-term monitoring; groundwater treatment would reduce the mobility of COCs	high capital investment, moderate long-term monitoring costs
4	Partial Removal (deeper fill) and Off-site disposal and *In Situ* Stabilization (shallow fill 0 - 14ft)	Yes	Effectively addresses RAOs associated with contact of fill in short time frame; Institutional (Deed Restrictions) and Engineering Controls would need to be in-place; assumes that soi/fill would be removed from areas in contact with groundwater and shallow fill would be treat	Moderately difficult to implement for removal; depth of contaminants limit the effectiveness of *in-situ* process; requires import and availability of suitable materials/reagents (i.e.activated carbon, gypsum, apatite, etc.); periodic monitoring, may require groundwater treatment option if	may include treatment during dewatering and handling of excavated fill material; would result in decreased mobility and toxicity, volume of soil/fill material would increase due to bulking processes	high capital investment, requires long-term monitoring and O&M costs
5	*Ex-Situ* Stabilization/Solidification and Disposal Off-Site (Commercial)	Yes	Effective at immobilizing inorganics within soil/fill,	Relatively easy to implement; can be performed on small batches as material is staged for transport; requires import and addition of amendments; result is decreased water content and toxicity and mobility of contaminants; volume increase, temporary on-site infrastructure would be required	reduces the overall mobility of COCs, increase overall volume of material required for disposal but reduce toxicity for acceptance	very high capital investment, no long-term monitoring and O&M costs, may require some capping or containment systems if all fill material can not be captured

TABLE 3 PROPOSED REMEDIAL ALTERNATIVES

Remedial Alternative Development
Old Upper Mountain Road - OU2
Lockport, New York

Contaminated Sediment

Contaminant of Concern (COC):
Inorganics (primarily Lead & Zinc)

Remedial Action Objective - Sediment:
◦ Prevent direct contact with contaminated sediments.
◦ Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain.
◦ Restore sediments to pre-release/background conditions to the extent feasible.

Technology Screening:

Pursuant to DER-10 Technical Guidance for Site Investigation and Remediation, Section 4.0 (Remedy Selection) specifically subsection 4.2 (Development and Evaluation of Alternatives) recommends where presumptive remedies are available to address the contamination identified, that the presumptive remedy be strongly considered but not exclusionary to other innovative technologies. If the presumptive remedies are applicable, pursuant to current USEPA and DER guidance, the remedy selection process can continue to the assembly of technologies into operable units and/or site-wide alternatives.

	Remedial Technology	Compliance with RAO	Effectiveness	Implementability	Reduction of toxicity, mobility, and volume	Cost
1	No Action					
2	*In-Situ* Multi-media Sub-aqueous Capping	Yes	effectively decreases exposure and prevents transport, temporarily disturbs habitat, RAOs are achieved in short time frame	Moderately difficult to implement; requires import of sand, stone, clay placement in water; monitoring of cap thickness; periodic maintenance and monitoring, may require changes in Gulf Creek topography/habitat; effective in long term source control unless inorganics are soluble and upwelling is substantial; requires acceess easement for sewer	does not reduce toxicity or volume, mobility would be reduced	moderate capital investment, long-term monitoring costs and potential for maintenance
3	*In-Situ* Biological Treatment (phytoextraction)	Yes	Effective for risk-based RAOs and source control, may require long time frames	Difficult to implement; limited to areas that will support wetland plant growth; requires planting of appropriate species and subsequent harvest for disposal, Would require alteration of site wetland habitats; would not provide short-term risk reduction and overall effectiveness may be limited	No decrease in volume, reduction in toxicity and mobility over long term	moderate capital investment, long-term monitoring and harvest/disposal costs
4	Complete Removal Dredging (Mechanical) with Dewatering and Off-site Disposal (Commercial)	Yes	effectively treats COCs by removal, RAOs are achieved in short time frame	difficult to implement, technology has been demonstrated and documented, a designated dewatering facility or staging area for stabilization is required and transport routes may be required, requires waterway access by dredging equipment, buried debris, rocks, or bedrock may limit dredging implementation	may include treatment during dewatering/ handling for disposal which could decrease mobility	high capital investment, reduced long-term monitoring costs and duration
5	Mass Removal Dredging of areas with the largest volumes and highest concentrations with off-site disposal. To be followed my multi-media layer capping of residuals	Yes	effectively treats COCs by removal, minimizes disposal volume through select use of dredging, RAOs are achieved in short time frame	difficult to implement, technology has been demonstrated and documented, areas difficult to dredge can be capped instead or MNA	may include treatment during dewatering/ handling for disposal which could decrease mobility	high capital investment, requires long-term monitoring
6	Dredging to LELs and off-site disposal in landfill	Yes	effectively treats COCs by removal, RAOs are achieved in short time frame	very difficult to implement because complete recovery of residuals requires overdredging, technology has been demonstrated and documented, designated dewatering facility and transport routes required	may include treatment during dewatering/ handling for disposal which could decrease mobility	very high capital investment, no long-term monitoring and O&M costs, may require capping if residuals can not be captured

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, New York 14203-2915
Phone: (716) 851-7220 • **Fax:** (716) 851-7226
Website: www.dec.ny.gov

Joe Martens
Commissioner

July 13, 2011

Mr. Robert Casey
6712 Brooklawn Parkway - Suite 104
Syracuse, New York 13211-2158

Dear Mr. Casey:

Remedial Action Objectives and Feasibility Study
Technology Screening
Old Upper Mountain Road Site, Site No. 932112
Lockport (C), Niagara County

The New York State Departments of Environmental Conservation (NYSDEC) and Health (NYSDOH) have completed a detailed review of the draft Remedial Action Objectives and Feasibility Study Technology Screening letter submitted to the NYSDEC via e-mail on June 21, 2011. This letter summarizes the results of the Remedial Investigation (RI) and Supplemental RI for the three operable units of the site, discusses the remedial action objectives for each contaminated media identified, and presents the initial screening of remedial alternatives. The initial screening of alternatives, and the alternatives retained for evaluation in the Feasibility Study (FS), appears reasonably given the physical constraints of the site. The Departments, however, have a number of comments concerning the Technology Screening Matrix tables. These comments are summarized as follows:

1. **Table 2, Soil/Fill, Monitored Natural Attenuation, Page 1:** This technology is generally associated with volatile organic compounds. For soil/fill at the Old Upper Mountain Road Site, is this technology being evaluated for metals?

2. **Table 2, Groundwater, Page 2:** If MNA was evaluated and retained for soil/fill and sediment, should it be evaluated and retained for groundwater?

3. **Table 2, Sediment, Page 3:**

   A. **Monitored Natural Attenuation:** For sediment at the Old Upper Mountain Road Site, is this technology being evaluated for metals?

B. **Containment:** It is not clear from the information given why some of the containment options were not retained for evaluation. For example, a multi-media cap was retained while a thin layer cap was not. From the description given, it appears to us that a thin layer cap would be easier and less disruptive to construct than a multi-media cap.

C. **Removal:** For the Eighteenmile Creek Corridor Site, the selected ROD remedy for creek sediment included excavation following creek diversion. This alternative was selected, in part, due to the difficulties in dredging a shallow, rocky creek. A similar alternative should be evaluated for Gulf Creek sediment.

D. **Dredged Material Handling and Treatment:** It is not clear from the information given why ex-situ chemical treatment was not retained for evaluation.

4. **Table 3:** The text for Alternative 4 on page 1 and Alternative 2 on page 2 is cut-off.

Should you have any questions regarding any of the above, please feel free to contact me at (716) 851-7220.

Sincerely yours,

Glenn M May

Glenn M. May, CPG
Environmental Geologist II

GMM:sz

ec: Mr. Gregory Sutton, NYSDEC, Region 9
Mr. Matthew Forcucci, NYSDOH, Buffalo

Appendix B

Cost Estimates

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$44,000	
Soil Alternative 1B **Site Management**	**Old Upper Mountain Road** **Lockport, NY**	**Soil - OU3**	**Construction Time:**	**2**	**months**
			Operation Time:	**-**	**months**
			Post Remediation Monitoring	**0**	**years**

Description	Data Source (Means[1] or Other)	Quantities: Quantity Amount	Quantity Unit	Cost Breakdown (if available): Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$38,000**
Site Management Activities		**1**			**$0**		**$0**		**$0**	**$30,000**	**$15,000**
Surveyor- monument installation		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Lawyer		1	ls				$ -		$ -	$ 10,000	$10,000
Fence, chain link, 9 ga. Wire, in concrete, 6' H		1,000	lf	$ 15.92	$ 15,921	$ 3.53	$ 3,528	$ 1.11	$ 1,108	$ -	$20,558
Professional/Technical Services											**$2,550**
5% Project Management										$15,000	$750.00
6% Remedial Design											$900
6% Construction Management											$900
LONG TERM ANNUAL MONITORING AND MAINTENANCE								**ANNUAL LTM COST (YRS 1-30)**			**$400**
								LIFETIME LTM (NPV)			**$6,149**
Monitoring and Maintenance											
Assume 20% of combined monitoring and maintenance event											
Site Monitoring											**$387**
Mobilization/Demobilization of Inspector		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 85.00	$85
Reporting		6	hr	$ -	$ -	$ 17	$ 102.00	$ -	$ -	$ -	$102
Maintenance- Fence Maintenance											
Repair fence	*32 01 90.19 1670*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 200.00	$200
Lifetime Long Term Monitoring (Net Present Value)											
30 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											
TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring)											**$44,000**

Assumptions:

Labor		
Cost per hr	**$85**	
Weighted Average of city cost index (Buffalo, NY)		**101.4%**
Inflation		**3%**
workers per event	**1**	
hours travel per event	**5**	
for materials (gloves, notebooks, etc.)	**$50**	

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$2,912,000	
Soil Alternative 2 **Complete Removal and Disposal Offsite**	**Old Upper Mountain Road** **Lockport, NY**	**Soil - OU3**	Construction Time:	3	months
			Operation Time:	-	months
			Post Remediation Monitoring	0	years

Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$2,912,000**
Construction Activities		**1**			**$312,114**		**$85,746**		**$65,612**	**$80,121**	**$2,196,902**
Pre-Design Characterization Study											
Driller											
Mob/Demob	*quote- SJB*	1	ls							$ 874	$874
Geoprobe/Crew for Soil Borings	*quote- SJB*	1	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,273	$1,273
Sample Collection		10	hr	$ -	$ -	$0	$ -	$ -	$ -		$0
Sample Analysis for TCLP Lead and Zinc	*Life Science Laboratories*	29	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$2,175
Reporting	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	0.5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,475.00	$1,238
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	3,000	lf	$ 0.55	$ 1,650	$ 0.45	$ 1,350	$ -	$ -	$ -	$3,000
Monitoring Well Abandonment	*recent quote- EnviroTrac*	36	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22.00	$792
Cut and chip medium, trees to 12" dia.	*31 11 10.10 0200*	1	acre							$ 5,982.60	$2,991
Sheetpiling (15' deep, drive, extract and salvage)	*31 41 16.10 1300*	7,305	sf	$ 6.19	$ 45,186	$ 5.22	$ 38,113	$ 7.58	$ 55,402	$ -	$138,700
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	3	mo			$ 85	$ 45,977	$ 3,420	$ 9,250		$55,227
Dust Control, Heavy	*31 23 23.20 2510*	34	day				$ -		$ -	$ 1,901.25	$64,815
Grading of embankment, by dozer	*31 23 23.20 2300*	11,500	lcy							$ 2.06	$23,672
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	10,000	bcy	$ -	$ -		$ -		$ -	$ 1.29	$12,878
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	11,500	lcy							$ 3.65	$41,980
Haul Road Maintenance	*31 23 23.20 2600*	10	day							$ 1,216.80	$12,168
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	10,000	bcy							$ 1.93	$19,266
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	11,500	lcy							$ 1.24	$14,226
Spotter at Loadout	*31 23 23.20 2310*	54	hrs							$ 51.71	$2,797
Confirmation Soil Sampling											
Grab Samples- 12 per acre plus 20% QA/QC		14	sample	$ -	$ 50	$ 21	$ 306	$ 67	$ 961	$ -	$1,317
Lab Analyses - TAL Metals	*Life Science Laboratories*	14	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 82.50	$1,188
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	20	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593.48	$11,870
Hazardous Soil Disposal	*CWM*	6,450	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$903,000
Transportation using dumps	*CWM*	6,450	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 19.50	$125,775
Demurrage (assume 5 hours per week of loading)	*CWM*	15	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85.00	$1,246
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 45,279.00	$45,279
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	8,550	ton	$ -	$ -	$ -	$ -	$ -	$ -	$37.68	$322,121
Backfill and Compaction											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	9,645	lcy	$ 28	$ 265,228	$ -	$ -	$ -	$ -	$ -	$265,228
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	9,645	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.37	$13,177
Finishing grading slopes, gentle	*31 22 16.10 3300*	4,840	sy	$ -	$ -		$ -			$ 0.25	$1,198
Compacting backfill, 12" lift, 2 passes w/ vibrating roller	*31 23 23.23 5060*	1,613	ecy	$ -	$ -		$ -		$ -	$ 0.34	$555
Site Restoration											
Topsoil	*Recent quote- ESG from Seven Springs*	1,855	lcy	$ 45	$ 82,562						$82,562
Finishing grading slopes, gentle	*31 22 16.10 3300*	4,840	sy	$ -	$ -	$ 0.10	$ 475	$ 0.08	$ 389	$ -	$864
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	44	msf	$ 54.00	$ 2,352	$ 15.27	$ 665	$ 9.94	$ 433	$ -	$3,450
Mobilization and Demobilization											**$10,579**
5% of Total Costs of Site Work, Treatment										$211,582	$10,579
Contingency											**$331,122**
15% of Total Construction Activities										$2,207,482	$331,122
Professional/Technical Services											**$373,473**
5% Project Management										$2,196,902	$109,845
6% Remedial Design											$131,814
6% Construction Management											$131,814

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring) — $2,912,000

Assumptions:

Working condition is Safety Level: **D/C** **(Labor productivity: 82% ; Equipment productivity: 100%)**

Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**

Costs are loaded with a profit factor **10%**

Inflation **3%** per year

Estimated number of soil samples **12** samples; **1** times sampled; **20%** added for QA/QC samples; **0.25** hrs/sample; **1** worker sampling; Labor **$85** Cost per hr

Characterization Cost — Table A (per CWM) — **$593.48** per sample

Analytical cost — TAL Metals — **$75.00** per sample

For each sampling event, assumed: **$50** for materials (gloves, notebooks, etc.)

Disposal

Lead contaminated soil as a "listed" waste- incineration **$275** per ton; **6,450** tons soil hazardous (assume 43% hazardous)

22 tons per load; **293** loads for haz disposal

Lead contaminated soil as non-haz **$39.87** per ton; **8,550** tons soil for non-haz disposal; **389** loads for non-haz disposal

Concrete **3,300** lbs per cy; **-** tons concrete for disposal

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID **$96.08** per day

Truck/SUV (1/2 ton or smaller) **$70.74** per day

Work day consists of: **10** hrs

20 loads per day
20 working days per month
10 hours per working day
0.05 months for pre-design characterization
0.5 months for site prep/restoration
2 months to completion
150 ft/day drilling

Excavation With Concrete and Asphalt:

Concrete and Asphalt: **0.0%** % of excavation volume

Excavation Area: **43,560** sf

Excavation Volume: **10,000** cy; **11,500** lcy

Excavated Weight: **15,000** tons

Roll-off dumpster can hold approximately: **12** tons

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$663,000
Soil Alternative 3 **Landfill Capping with a Part 360 Cap**	**Old Upper Mountain Road** **Lockport, NY**	**Soil - OU3**	**Construction Time:**	2 months
			Operation Time:	- months
			Post Remediation Monitoring	30 years

Description	Data Source (Means[1] or Other)	Quantities: Quantity Amount	Quantity Unit	Cost Breakdown (if available): Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$562,000**
Construction Activities		**1**			**$62,617**		**$83,504**		**$15,115**	**$38,700**	**$412,653**
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	0.5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,475.00	$1,238
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 30,000	$30,000
Silt Fence	*31 25 13.10 1000*	3,000	lf	$ 0.55	$ 1,650	$ 0.45	$ 1,350	$ -	$ -	$ -	$3,000
Cut and chip medium, trees to 12" dia.	*31 11 10.10 0200*	1	acre							$ 5,982.60	$5,983
Monitoring Well Abandonment	*recent quote- EnviroTrac*	36	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22.00	$792
Monitoring Well Installation	*recent quote- EnviroTrac*	36	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94.00	$3,384
6' to 10' deep, 3/4 CY excavator w/ trench box	*31 23 16.13 1362*	1,333.33	bcy							$ 8.67	$11,560
13' length, SDR 35, B&S 24" dia.	*33 31 13.25 2500*	1,200	lf							$ 26.87	$32,245
Capping											
Finishing grading slopes, gentle	*31 22 16.10 3300*	4,840	sy	$ -	$ -		$ -			$ 0.19	$937
Polymeric Liner Anchor Trench 3'x1.5'	*ECHOS 2006 33 08 0503*	1,000	lf	$ 0.07	$ 73	$ 0.68	$ 678	$ 0.27	$ 266	$ -	$1,017
Deploy 10oz/sy mil Nonwoven Geotextile	*ECHOS 2006 33 08 0533*	4,840	sy	$ 1.20	$ 5,802	$ 0.68	$ 3,282	$ 0.04	$ 176	$ -	$9,259
60 mil HDPE Liner	*ECHOS 2006 33 08 0572*	43,560	sf	$ 0.59	$ 25,843	$ 1.72	$ 74,892	$ 0.31	$ 13,713	$ -	$114,448
Drainage Netting, Geotextile Fabric Heat Bonded (2 sides)	*ECHOS 2006 33 08 0513*	43,560	sf	$ 0.62	$ 26,898	$ 0.06	$ 2,637	$ 0.01	$ 527	$ -	$30,062
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	2,420	cy	$ 28						$ 27.50	$66,550
Spreading and Compaction of General Fill	*ECHOS 2006 17 03 0422*	2,420	cy							$ 9.12	$22,075
Topsoil	*Recent quote- ESG*	807	cy	$ 45						$ 44.50	$35,897
Spreading Topsoil 6" Lifts	*ECHOS 2006 18 05 0301*	807	cy							$ 9.43	$7,605
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	44	msf	$ 54.00	$ 2,352	$ 15.27	$ 665	$ 9.94	$ 433	$ -	$3,450
Site Restoration											
Security Fence, 10' Galvanized w/ Barbed Wire	*ECHOS 2006 18 04 0101*	700	lf		$ -					$ 45.25	$31,673
7' High Swing Gate, 12' Wide Double	*ECHOS 2006 18 04 0118*	2	ea	$ -	$ -		$ -		$ -	$ 739.27	$1,479
Mobilization and Demobilization											**$14,864**
5% of Total Costs of Site Work, Treatment										$297,283	$14,864
Contingency											**$64,128**
15% of Total Construction Activities										$427,517	64127.51126
Professional/Technical Services											**$70,151**
5% Project Management										$412,653	$20,632.63
6% Remedial Design											$24,759
6% Construction Management											$24,759
LONG TERM MONITORING								**ANNUAL LTM COST (YRS 1-5)**			**$8,000**
								ANNUAL LTM COST (YRS 6-30)			**$6,000**
								LIFETIME LTM (NPV)			**$100,900**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for OU1 and OU3											$1,473
Site Monitoring											
Sampling for 1 event - Includes collection of field parameters		1	well	$ -	$ -	$ -	$ -	91.63	$ 91.63	$ -	$92
Materials		1	event	$ 10							$10
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 68.00	$68
Reporting		10	hr	$85	$ 850.00	$ -	$ -	$ -	$ -	$ -	$850
Landfill Cap Inspection, 2 hrs each event, mob/demob with monitoring event		1	ea	$ -	$ -	$170	$ 170.00	$75.00	$ 75.00	$ -	$245
Laboratory analysis											
Metals and VOCs	*Life Science Laboratories*	1	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 174.00	$209
Maintenance- Cap Maintenance											
Mowing brush, tractor with rotary mower, Medium density 2x per year	*32 01 90.19 1670*	44	msf	$ -	$ -	$ 28.51	$ 1,242	$ 24.74	$ 1,078	$ -	$2,320
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring) **$663,000**

Assumptions:

- Working condition is Safety Level: **D** (**Labor productivity:** **82%**; **Equipment productivity:** **100%**)
- Weighted Average of city cost index (Buffalo, NY): **101.4%** (**not applicable for costs derived from vendor quotes).**
- Costs are loaded with a profit factor: **10%**
- Inflation: **3%** per year

Estimated number of soil samples: **12** samples; **-** times sampled; **20%** added for QA/QC samples; **0.25** hrs/sample; **1** worker sampling; Labor **$85** Cost per hr

- Characterization Cost — Table A (per CWM) — **$593.48** per sample
- Analytical cost — TAL Metals — **$75.00** per sample
- For each sampling event, assumed: **$50** for materials (gloves, notebooks, etc.)

Disposal

- Lead contaminated soil as a "listed" waste- incineration: **$275** per ton; **-** tons soil hazardous (assume 43% hazardous); **22** tons per load; **0** loads for haz disposal
- Lead contaminated soil as non-haz: **$39.87** per ton; **-** tons soil for non-haz disposal; **0** loads for non-haz disposal
- Concrete: **3,300** lbs per cy; **-** tons concrete for disposal

Typical Rental Rates - Includes G&A and 10% Profit

- Mini-Rae Survey Mode PID: **$96.08** per day
- Truck/SUV (1/2 ton or smaller): **$70.74** per day

20 loads per day
20 working days per month
10 hours per working day
1 months for site prep/restoration
1 months to completion

Work day consists of: **10** hrs

Excavation With Concrete and Asphalt:

- Concrete and Asphalt: **0.0%** % of excavation volume
- Excavation Area: **43,560** sf
- Excavation Volume: **10,000** cy; **11,500** lcy
- Excavated Weight: **15,000** tons
- Roll-off dumpster can hold approximately: **12** tons

Groundwater Monitoring

Typical Rental Rates - Includes G&A and 10% Profit

- Truck/SUV (1/2 ton or smaller): **$70.74** per day
- Water Quality Analyzer: **$159.00** per day
- Water Level Meter: **$31.80** per day
- Submersible Pump: **$113.91** per day
- Generators: 220 Volt: **$82.68** per day
- Multi-gas meter: **$75.00**

Analytical Costs

- Metals: **$75.00** per sample
- VOCs: **$90.00** per sample
- **2** hrs/sample; **$85** Labor cost per hr
- **2** workers per event
- **5** hours travel per event
- **$50** for materials (gloves, notebooks, etc.)

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$2,037,000	
OU3 Soil Alternative 4 **In Situ Stabilization**	**Old Upper Mountain Road** **Lockport, NY**	**Soil - OU3**	**Construction Time:**	**15**	**months**
			Operation Time:	**-**	**months**
			Post Remediation Monitoring	**30**	**years**

Description	Data Source (Means[1] or Other)	Quantities: Quantity Amount	Quantity Unit	Cost Breakdown (if available): Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$1,993,000**
Construction Activities		**1**			**$1,650**		**$251,327**		**$50,153**	**$46,094**	**$1,507,195**
Pre-Design Pilot Study (Ecobond)											
Pilot Study Treatment	*MT2 Estimate*	5	ton							$ 33.24	$166
Sample collection (2 ppl, 4 hrs)		4	hrs			$ 170.00	$ 680				$680
Sample analysis	*MT2 Estimate*	1	sample							$ 550.00	$550
Reporting	*Engineer's Estimate*	1	ls							$5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	0.5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,475.00	$1,238
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 30,000	$30,000
Silt Fence	*31 25 13.10 1000*	3,000	lf	$ 0.55	$ 1,650	$ 0.45	$ 1,350	$ -	$ -	$ -	$3,000
Monitoring Well Abandonment	*recent quote- EnviroTrac*	36	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22.00	$792
Monitoring Well Installation	*recent quote- EnviroTrac*	36	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94.00	$3,384
Cut and chip medium, trees to 12" dia.	*31 11 10.10 0200*	1	acre							$ 5,982.60	$5,983
Stabilization with Ecobond											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	15	mo			$ 85	$ 249,297	$ 3,420	$ 50,153		$299,450
Dust Control, Heavy	*31 23 23.20 2510*	293	day				$ -		$ -	$ 1,901.25	$557,619
Treat w/ EcoBond, 5% volume added	*MT2 est*	15,750	ton							$ 35.50	$559,122
Site Restoration											
Topsoil	*Recent quote- ESG from Seven Springs*	807	cy	$ 45	$ 35,897						$35,897
Finishing grading slopes, gentle	*31 22 16.10 3300*	4,840	sy	$ -	$ -	$ 0.10	$ 475	$ 0.08	$ 389	$ -	$864
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	44	msf	$ 54.00	$ 2,352	$ 15.27	$ 665	$ 9.94	$ 433	$ -	$3,450
Mobilization and Demobilization											**$2,730**
5% of Total Costs of Site Work, Treatment										$54,607	$2,730
Contingency											**$226,489**
15% of Total Construction Activities										$1,509,925	$226,489
Professional/Technical Services											**$256,223**
5% Project Management										$1,507,195	$75,360
6% Remedial Design											$90,432
6% Construction Management											$90,432
LONG TERM ANNUAL MONITORING AND MAINTENANCE								**ANNUAL LTM COST (YRS 1-5)**			**$5,000**
								ANNUAL LTM COST (YRS 6-30)			**$2,000**
								LIFETIME LTM (NPV)			**$43,700**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for OU1 and OU3											$2,350
Site Monitoring											
Groundwater sampling for 1 event - Includes collection of field parameters		1	well	$ -	$ -	$ 340	$ 340.00	$ 92	$ 91.63	$ -	$432
Materials		1	event	$ 40							$40
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 680.00	$680
Reporting		10	hr	$85	$ 850.00	$ -	$ -	$ -	$ -	$ -	$850
Laboratory analysis											
Metals and VOCs, plus 20% QA/QC	*Life Science Laboratories*	2	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 174.00	$348
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											
TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring)											**$2,037,000**

Assumptions:

Working condition is Safety Level: **D** **(Labor productivity: 82% ; Equipment productivity: 100%)**

Weighted Average of city cost index (Buffalo, NY): **101.4%** **(not applicable for costs derived from vendor quotes).**

Costs are loaded with a profit factor: **10%**

Inflation: **3%** per year

Estimated number of soil samples: **12** samples; **1** times sampled; **20%** added for QA/QC samples; **0.25** hrs/sample; **1** worker sampling; Labor **$85** Cost per hr

Characterization Cost	Table A (per CWM)	**$593.48**	per sample
Analytical cost	TAL Metals	**$75.00**	per sample
For each sampling event, assumed:		**$50**	for materials (gloves, notebooks, etc.)

Disposal

Lead contaminated soil as a "listed" waste- incineration	**$275**	per ton	**48,727**	tons soil hazardous (assume 43% hazardous)		
			22	tons per load	**2,215**	loads for haz disposal
Lead contaminated soil as non-haz	**$39.87**	per ton	**64,591**	tons soil for non-haz disposal	**2,936**	loads for non-haz disposal
					15,750	tons for treatment
Concrete	**3,300**	lbs per cy	**-**	tons concrete for disposal		

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	**$96.08**	per day
Truck/SUV (1/2 ton or smaller)	**$70.74**	per day

Work day consists of: **10** hrs

1000 tons per day treatment
20 loads per day
20 working days per month
10 hours per working day
1 months for site prep/restoration
14 months to completion

Excavation With Concrete and Asphalt:

Concrete and Asphalt:	**0.0%**	% of excavation volume		
Excavation Area:	**43,560**	sf		
Excavation Volume:	**10,000**	cy	**11,500**	lcy
Excavated Weight:	**15,000**	tons		
Roll-off dumpster can hold approximately:	**12**	tons		

Backfill 2:1 Slopes
0 cy
0 lcy

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

2 hrs/sample
2 workers per event
5 hours travel per event

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$2,261,000	
Soil Alternative 5 **Ex Situ Stabilization**	**Old Upper Mountain Road** **Lockport, NY**	**Soil - OU3**	**Construction Time:**	**3**	**months**
			Operation Time:	**-**	**months**
			Post Remediation Monitoring	**0**	**years**

Description	Data Source (Means[1] or Other)	Quantities: Quantity Amount	Quantity Unit	Cost Breakdown (if available): Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$2,261,000**
Construction Activities		**1**			**$46,886**		**$87,195**		**$65,903**	**$26,820**	**$1,699,332**
Pre-Design Pilot Study											
Pilot Study Treatment	*MT2 Estimate*	5	ton							$ 33.24	$166
Sample collection (2 ppl, 4 hrs)		4	hours			$ 170.00	$ 680				$680
Sample analysis	*MT2 Estimate*	1	sample							$ 550.00	$550
Reporting	*Engineer's Estimate*	1	ls							$5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	0.5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,475.00	$1,238
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	3,000	lf	$ 0.55	$ 1,650	$ 0.45	$ 1,350	$ -	$ -	$ -	$3,000
Monitoring Well Abandonment	*recent quote-EnviroTrac*	-	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22.00	$0
Cut and chip medium, trees to 12" dia.	*31 11 10.10 0200*	1	acre							$ 5,982.60	$2,991
Sheetpiling (15' deep, drive, extract and salvage)	*31 41 16.10 1300*	7,305	sf	$ 6.19	$ 45,186	$ 5.22	$ 38,113	$ 7.58	$ 55,402	$ -	$138,700
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	3	mo			$ 85	$ 47,426	$ 3,420	$ 9,541		$56,967
Dust Control, Heavy	*31 23 23.20 2510*	36	day				$ -		$ -	$ 1,901.25	$68,056
Grading of embankment, by dozer	*31 23 23.20 2300*	11,500	lcy							$ 2.06	$23,672
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	10,000	bcy	$ -	$ -		$ -		$ -	$ 1.29	$12,878
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	11,500	lcy							$ 3.65	$41,980
Haul Road Maintenance	*31 23 23.20 2600*	10	day							$ 1,216.80	$12,168
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	10,000	bcy							$ 1.93	$19,266
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	11,500	lcy							$ 1.24	$14,226
Spotter at Loadout	*31 23 23.20 2310*	56	hrs							$ 51.71	$2,885
Confirmation Soil Sampling											
Grab Samples- 12 per acre plus 20% QA/QC		14	sample	$ -	$ 50	$ 21	$ 306	$ 67	$ 961	$ -	$1,317
Lab Analyses - TAL Metals	*Life Science Laboratories*	14	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 82.50	$1,188
EcoBond Treat											
Treat w/ EcoBond, load and dispose off-site	*MT2 est*	15,750	ton							$ 76.05	$1,197,788
Backfill and Compaction											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	-	lcy	$ 28	$ -	$ -	$ -	$ -	$ -	$ -	$0
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	-	lcy							$ 1.37	
Finishing grading slopes, steep	*31 22 16.10 3310*	-	sy	$ -	$ -		$ -			$ 0.23	$0
Compacting backfill, 12" lift, 2 passes w/ vibrating roller	*31 23 23.23 5060*	-	ecy	$ -	$ -		$ -		$ -	$ 0.32	$0
Site Restoration											
Topsoil	*Recent quote- ESG from Seven Springs*	1,855	lcy	$ 45	$ 82,562						$82,562
Finishing grading slopes, gentle	*31 22 16.10 3300*	-	sy	$ -	$ -	$ 0.10	$ -	$ 0.08	$ -	$ -	$0
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	44	msf	$ 54.00	$ 2,352	$ 15.27	$ 665	$ 9.94	$ 433	$ -	$3,450
Mobilization and Demobilization											**$9,912**
5% of Total Costs of Site Work, Treatment										$198,237	$9,912
Contingency											**$256,387**
15% of Total Construction Activities										$1,709,244	$256,387
Professional/Technical Services											**$288,886**
5% Project Management										$1,699,332	$84,967
6% Remedial Design											$101,960
6% Construction Management											$101,960
TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring)											**$2,261,000**

Assumptions:

Working condition is Safety Level: **D** **(Labor productivity: 82% ; Equipment productivity: 100%)**
Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**
Costs are loaded with a profit factor **10%**
Inflation **3%** per year

Estimated number of soil samples **12** samples | **1** times sampled | **0.25** hrs/sample | Labor **$85** Cost per hr
20% added for QA/QC samples | **1** worker sampling

Characterization Cost — Table A (per CWM) — **$593.48** per sample
Analytical cost — TCLP Metals — **$75.00** per sample
For each sampling event, assumed: **$50** for materials (gloves, notebooks, etc.)

Disposal
Lead contaminated soil as a "listed" waste- incineration **$275** per ton | **15,750** tons soil for treatment
22 tons per load | **716** loads for non-haz disposal
Lead contaminated soil as non-haz **$39.87** per ton
Concrete **3,300** lbs per cy

Typical Rental Rates - Includes G&A and 10% Profit
Mini-Rae Survey Mode PID **$96.08** per day
Truck/SUV (1/2 ton or smaller) **$70.74** per day

20 loads per day
20 working days per month
10 hours per working day
1 months for site prep/restoration
2 months to completion

Work day consists of: **10** hrs

Excavation With Concrete and Asphalt:
Concrete and Asphalt: **0.0%** % of excavation volume
Excavation Area: **43,560** sf
Excavation Volume: **10,000** cy | **11,500** lcy
Excavated Weight: **15,000** tons
Roll-off dumpster can hold approximately: **12** tons

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$462,000	
OU3 Soil Alternative 6 **Landfill Capping with a Clean Soil Cover**	**Old Upper Mountain Road** **Lockport, NY**	**Soil - OU3**	**Construction Time:**	**2**	**months**
			Operation Time:	**-**	**months**
			Post Remediation Monitoring	**30**	**years**

Description	Data Source (Means[1] or Other)	Quantities: Quantity Amount	Quantity Unit	Cost Breakdown (if available): Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$361,000**
Construction Activities		**1**			**$9,804**		**$5,297**		**$609**	**$38,700**	**$267,125**
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	0.5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,475.00	$1,238
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 30,000	$30,000
Silt Fence	*31 25 13.10 1000*	3,000	lf	$ 0.55	$ 1,650	$ 0.45	$ 1,350	$ -	$ -	$ -	$3,000
Cut and chip medium, trees to 12" dia.	*31 11 10.10 0200*	1	acre							$ 5,982.60	$5,983
Monitoring Well Abandonment	*recent quote- EnviroTrac*	36	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22.00	$792
Monitoring Well Installation	*recent quote- EnviroTrac*	36	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94.00	$3,384
6' to 10' deep, 3/4 CY excavator w/ trench box	*31 23 16.13 1362*	1,333.33	bcy							$ 8.67	$11,560
13' length, SDR 35, B&S 24" dia.	*33 31 13.25 2500*	1,200	lf							$ 26.87	$32,245
Capping											
Finishing grading slopes, gentle	*31 22 16.10 3300*	4,840	sy	$ -	$ -		$ -			$ 0.19	$937
Deploy 10oz/sy mil Nonwoven Geotextile	*ECHOS 2006 33 08 0533*	4,840	sy	$ 1.20	$ 5,802	$ 0.68	$ 3,282	$ 0.04	$ 176	$ -	$9,259
Supply and Transportation of NYS Certified Clean Back Fill Material for 18" Barrier Layer	*Recent quote- ESG from Seven Springs*	2,420	cy	$ -	$ -	$ -	$ -	$ -	$ -	$ 27.50	$66,550
Spreading and Compaction of General Fill for 18" Barrier Protection Layer	*ECHOS 2006 17 03 0422*	2,420	cy							$ 9.12	$22,075
Topsoil	*Recent quote- ESG*	807	cy	$ -	$ -	$ -	$ -	$ -	$ -	$ 44.50	$35,897
Spreading Topsoil 6" Lifts	*ECHOS 2006 18 05 0301*	807	cy	$ -	$ -	$ -	$ -	$ -	$ -	$ 9.43	$7,605
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	44	msf	$ 54.00	$ 2,352	$ 15.27	$ 665	$ 9.94	$ 433	$ -	$3,450
Site Restoration											
Security Fence, 10' Galvanized w/ Barbed Wire	*ECHOS 2006 18 04 0101*	700	lf		$ -					$ 45.25	$31,673
7' High Swing Gate, 12' Wide Double	*ECHOS 2006 18 04 0118*	2	ea	$ -	$ -		$ -		$ -	$ 739.27	$1,479
Mobilization and Demobilization											**$7,588**
5% of Total Costs of Site Work, Treatment										$151,756	$7,588
Contingency											**$41,207**
15% of Total Construction Activities										$274,713	$ 41,206.91
Professional/Technical Services											**$45,411**
5% Project Management										$267,125	$13,356.25
6% Remedial Design											$16,027.50
6% Construction Management											$16,027.50
LONG TERM MONITORING								**ANNUAL LTM COST (YRS 1-5)**			**$8,000**
								ANNUAL LTM COST (YRS 6-30)			**$6,000**
								LIFETIME LTM (NPV)			**$100,900**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for OU1 and OU3											$1,473
Site Monitoring											
Sampling for 1 event - Includes collection of field parameters		1	well	$ -	$ -	$ -	$ -	91.63	$ 91.63	$ -	$92
Materials		1	event	$ 10							$10
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 68.00	$68
Reporting		10	hr	$85	$ 850.00	$ -	$ -	$ -	$ -	$ -	$850
Landfill Cap Inspection, 2 hrs each event, mob/demob with monitoring event		1	ea	$ -	$ -	$170	$ 170.00	$75.00	$ 75.00	$ -	$245
Laboratory analysis											
Metals and VOCs	*Life Science Laboratories*	1	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 174.00	$209
Maintenance- Cap Maintenance											
Mowing brush, tractor with rotary mower, Medium density 2x per year	*32 01 90.19 1670*	44	msf	$ -	$ -	$ 28.51	$ 1,242	$ 24.74	$ 1,078	$ -	$2,320
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											
TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring)											**$462,000**

Assumptions:

Working condition is Safety Level: **D** **(Labor productivity: 82% ; Equipment productivity: 100%)**

Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**

Costs are loaded with a profit factor **10%**

Inflation **3%** per year

Estimated number of soil samples **12** samples; **-** times sampled; **20%** added for QA/QC samples; **0.25** hrs/sample; **1** worker sampling; **$85** Labor Cost per hr

Characterization Cost — Table A (per CWM) — **$593.48** per sample

Analytical cost — TAL Metals — **$75.00** per sample

For each sampling event, assumed: **$50** for materials (gloves, notebooks, etc.)

Disposal

Lead contaminated soil as a "listed" waste- incineration **$275** per ton; **-** tons soil hazardous (assume 43% hazardous)

22 tons per load; **0** loads for haz disposal

Lead contaminated soil as non-haz **$39.87** per ton; **-** tons soil for non-haz disposal; **0** loads for non-haz disposal

Concrete **3,300** lbs per cy; **-** tons concrete for disposal

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID **$96.08** per day

Truck/SUV (1/2 ton or smaller) **$70.74** per day

20 loads per day

20 working days per month

10 hours per working day

Work day consists of: **10** hrs

1 months for site prep/restoration

1 months to completion

Excavation With Concrete and Asphalt:

Concrete and Asphalt: **0.0%** % of excavation volume

Excavation Area: **43,560** sf

Excavation Volume: **10,000** cy **11,500** lcy

Excavated Weight: **15,000** tons

Roll-off dumpster can hold approximately: **12** tons

Groundwater Monitoring

Typical Rental Rates - Includes G&A and 10% Profit

Truck/SUV (1/2 ton or smaller)	**$70.74**	per day
Water Quality Analyzer	**$159.00**	per day
Water Level Meter	**$31.80**	per day
Submersible Pump	**$113.91**	per day
Generators: 220 Volt	**$82.68**	per day
Multi-gas meter	**$75.00**	

Analytical Costs

Metals	**$75.00**	per sample
VOCs	**$90.00**	per sample

2 hrs/sample; **$85** Labor cost per hr

2 workers per event

5 hours travel per event

$50 for materials (gloves, notebooks, etc.)

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		