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Feasibility Study Report for Special Area 13 Dredge Spoil Disposal Area
Moreau, New York

Site Number 5-46-041

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List of Abbreviations and Acronyms

APCS	Air Pollution Control System
APEG	alkaline polyethylene glycol
BCD	base-catalyzed decomposition
BEST	Basic Extractive Sludge Treatment
BGS	below ground surface
BUD	beneficial use determination
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm/sec	centimeters per second
COC	contaminant of concern
CY	cubic yards
EEEPC	Ecology and Environment Engineering, P.C.
EPA	United States Environmental Protection Agency
ERA	ecological risk assessment
ESMI	Environmental Soil Management, Inc.
FS	Feasibility Study
HTTD	high-temperature thermal desorption
IC	institutional control
IRM	interim remedial measure
ISTD	in situ thermal desorption
ISV	in situ vitrification
KPEG	potassium polyethylene glycol

List of Abbreviations and Acronyms (cont.)

LTM	long-term monitoring
LTTD	low-temperature thermal desorption
NCP	National Contingency Plan
NFESC	Naval Facilities Engineering Service Center
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PCE	perchloroethylene
PPE	personal protective equipment
ppm	parts per million
RAO	remedial action objective
RCC	Resource Conservation Company
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
SA 13	Special Area 13
SCG	standards, criteria, and guideline
SITE	Superfund Innovative Technology Evaluation
STU	secondary treatment unit
SVE	soil vapor extraction
SVOC	semivolatile organic compound

List of Abbreviations and Acronyms (cont.)

TAGM	Technical Administrative Guidance Memorandum
TBC	to be considered criteria
TCE	trichloroethylene
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substance Control Act
VOC	volatile organic compound

1 Introduction

1.1 Purpose and Organization

Ecology and Environment Engineering, P.C. (EEEPC) has completed this feasibility study (FS) at the Special Area 13 (SA 13) Dredge Spoil Disposal Area (NYSDEC Site 5-46-041) for the Division of Environmental Remediation (DER) in the New York State Department of Environmental Conservation (NYSDEC). This FS was conducted under the State Superfund Standby Contract Work Assignment No. D004435-05. The SA 13 project site is located south of the village of Fort Edward in the town of Moreau, Saratoga County, New York. SA 13 contains dredge spoils from the Hudson River. This FS was developed based on information in: the United States Environmental Protection Agency's (EPA's) Guidance for conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (EPA 540/G-89/004); NYSDEC's Final Commissioner Policy No. 51 (CP-51), NYSDEC's Technical and Administrative Guidance Memorandum (TAGM) 4030 – Selection of Remedial Actions at Inactive Hazardous Waste Sites; NYSDEC's DER-10 - Technical Guidance for Site Investigation and Remediation; and 6 New York State Codes of Rules and Regulations (NYCRR) Part 375 - Environmental Remediation Programs.

A remedial investigation (RI) was completed to characterize the nature and extent of contamination at the SA 13 site, as described in the *Remedial Investigation Report for the Special Area 13 Dredge Spoil Disposal Area, Moreau, New York* (EEEPC 2012).

EEEPC completed RI/FS programs for the NYSDEC at five other upland dredge spoil disposal sites located along the Upper Hudson River Valley. The results of these other investigations are presented in the RI/FS reports prepared for each project site. Refer to Appendix A for a location map of these other project sites.

This FS describes the technologies proposed and evaluated to address the contamination identified by the RI report completed at the SA 13 site. The FS report is divided into six sections.

- Section 1 describes the purpose of the study and discusses the site background information.

- Section 2 presents the process used to identify the appropriate standards, criteria and guidance (SCG) values applicable to the various contaminants found at the site and provides insight into the development of appropriate remedial action objectives (RAOs) for the protection of human health and the environment.

- Section 3 evaluates various remedial technologies that may be appropriate for the remediation of site contamination and the development of remedial alternatives to address that contamination.

- Section 4 discusses the combination of various remedial technologies to form appropriate remedial alternatives and provides a detailed description of each of the proposed alternatives.

- Section 5 presents a detailed and comparative analysis of proposed remedial alternatives along with some supporting rationale and a preliminary cost estimate for each proposed remedy.

- Section 6 contains a listing of the references cited in this report.

1.2 Background Information

1.2.1 Site Description and Surrounding Land Uses

The SA 13 Dredge Spoil Disposal Area is located along the western shore of the Hudson River south of the village of Fort Edward in the town of Moreau, Saratoga County, New York, about 1,200 feet down-river (south) of Champlain Canal Lock 7 and near the floating green Buoy 219 that marks the western margin of the navigation channel of the Champlain Canal within the Hudson River (see Figure 1-1). The 25.3-acre site consists of four distinct areas: the Capped Landfill Cell, the First Fill Area, the Second Fill Area, and the Third Fill Area.

The Capped Landfill Cell consists of a covered basin and earthen containment berm complex built by the Waterways Maintenance Division of the New York State Department of Transportation (NYSDOT) to dewater and hold sediment removed from the Champlain Canal/Hudson River navigation channel south of Canal Lock 7 and from around Rogers Island. In its present closed and covered state, this dredge spoil disposal structure ranges between 175 and 300 feet wide and extends about 1,750 feet along the shore of the Hudson River with a footprint covering nearly 14 acres. Polychlorinated biphenyl (PCB)-contaminated dredge spoils from the main area were moved out onto three adjoining areas prior to its closure.

The First Fill Area (referred to as First Fill Area) adjoins the main disposal area to the north and consists of a shallow depression fill area that ranges between 200 and 250 feet wide and about 550 feet long with a footprint covering nearly 3 acres. This area was covered with an engineered soil cover (consisting of filter fabric, a demarcation layer, one foot of clean soil, and a vegetated surface) to limit the potential for human exposure to the dredge spoil found here.

The Second Fill Area consists of a shallow depression fill area located north of the First Fill Area and is about 550 feet wide and 500 feet long with a footprint covering approximately 6.3 acres. Part of the Second Fill Area is covered with clean fill and pavement placed during the construction of a General Electric Work Support Marina Facility for the Hudson River PCBs Site remedial dredging project (referred to as Second Fill Area – Covered Spoils). The uncovered portion of the Second Fill Area (referred to as Second Fill Area - Uncovered Spoils) is relatively flat open/wooded land that adjoins a small family cemetery (Jones/Rogers estate) and the Moreau Dredge Disposal Site to the west, the Old Moreau Dredge Spoil Disposal Site to the north, and a drainage trench associated with the Moreau Dredge Disposal Site to the south. In addition, there is a small area of uncovered spoils located south of the Capped Landfill Cell that is included in the Second Fill Area – Uncovered Spoils for the purposes of this feasibility study.

The Third Fill Area (referred to as Third Fill Area – Morrison Property) adjoins the southwest corner of the Capped Landfill Cell and consists of a shallow depression fill area with a maximum width of about 220 feet and approximate length of 500 feet covering nearly 2 acres on a residential parcel. Within the Third Fill Area is a residential property (Morrison Property) that includes a single dwelling and a few out-buildings. There is also a private well on the property that draws water from the shallow overburden aquifer.

The Capped Landfill Cell is the location of a Toxic Substance Control Act- (TSCA-) approved dredge spoil containment structure and is currently zoned for manufacturing. The First Fill Area is zoned as a marina (commercial) and is being used as a State-owned recreational boat launch site. The Second Fill Area – Covered Spoils is zoned Hudson River Regulatory (industrial) and is now the location of an active Work Support Marina Facility for the Hudson River PCBs Site remedial dredging project. The Second Fill Area – Uncovered Spoils is zoned industrial; however, discussions with NYSDEC have indicated that future uses of this site may be for recreational purposes (commercial). The Third Fill Area is zoned residential.

1.2.2 Site History

A series of unlined, transient settling basin and baffle systems were constructed at the Capped Landfill Cell by the Waterways Maintenance Division of the NYSDOT and were used to dewater and hold dredge spoil material removed from the Champlain Canal/Hudson River navigation channel south of Champlain Canal Lock 7 in conjunction with routine and emergency maintenance dredging operations of the Canal System. These settling basin systems were initially constructed by excavating the soils across this area slightly and grading the displaced materials outward and upward to form the various containment berms. During subsequent maintenance operations, it is likely that some of the older dredge spoil materials were re-graded in order to deepen or modify the established settling basin to accommodate the disposal of additional dredge spoil materials.

During one or more of these re-grading activities in the 1970s, it is believed that spoils from the basin and containment berm complex were pushed outward and into the three identified shallow depression areas adjacent to the capped disposal area as fill material (the First, Second, and Third Fill areas described above).

Available NYSDOT records report that the SA 13 dredge spoil disposal area was used between 1952 and 1979 for the disposal of up to 802,000 cubic yards of dredge spoil material during canal maintenance operations. In 1979, it was covered with between 6 and 24 inches of sand and seeded. Monitoring wells were also installed and a monitoring program was established. These actions were done in compliance with TSCA requirements imposed by the EPA when they issued an approval for the temporary storage/disposal of PCB laden material at this site in September of 1979. In 1991, a TSCA-approved clay cover/cap was added over the existing "standard turf" cover. The new cover was constructed by the NYSDOT and the earlier monitoring wells were replaced. The new cover added a 6-inch to 5-foot thick layer of clay over the entire closed main structure. The combination of the two cover layers put the top surface of the potentially contaminated dredge spoil materials at depths ranging between about 1foot and nearly 5 feet below the ground surface. Following the installation of the TSCA-approved cap, subsequent monitoring demonstrated that PCB levels in the local groundwater diminished such that PCBs were no longer detected in the groundwater. Personnel from the NYSDOT inspect and sample the groundwater monitoring wells and maintain the site under the TSCA program. The latest TSCA program inspection reported to EEEPC occurred on May 20, 2010.

The First Fill Area adjoining the Capped Landfill Cell to the north was covered in 2008 and now serves as part of a State-owned recreational boat launch site. The Second Fill Area – Covered Spoils is covered with clean fill and pavement that was placed during the construction in 2009 of a Work Support Marina Facility for the Hudson River PCBs Site remedial dredging project. Neither the Second Fill Area – Uncovered Spoils nor the Third Fill Area – Morrison Property have been covered.

1.2.3 Site Geology and Hydrology

The geologic setting for the SA 13 site has a varied mixture of silts, sands, gravel, and clay and that were placed over bedrock by natural processes and a varied mixture of sand, silt, shale fragments, and debris that were placed over the earlier lacustrine and alluvial deposits by unnatural processes a relatively short time ago.

The overburden materials in the natural setting are located in most areas outside of the basin and berm system at the site. The overall thickness of these native soils at SA 13 is not known, but earlier work by others report similar undisturbed silts, sands, gravel, and clay to a depth about 30 feet lower than the bottom of the SA 13 dredge spoil disposal structure.

The overburden materials in the unnatural setting are best described as mechanically reworked native soil mixed with dredge spoil materials in the closed and covered dredge spoil disposal structure. The dredge spoils are typically dark gray to black, fine to medium sands with varying amounts of silt, black shale fragments, pebble gravel, brick fragments, coal fragments, fused slag, glass shards, and wood debris. Dredge spoils vary in thickness from a few inches to nearly 13.5 feet within the Capped Landfill Cell, from a few inches to 6.7 feet within the First Fill Area, from a few inches to 6.5 feet within the Second Fill Area, and from a few inches to about 7 feet within the Third Fill Area – Morrison Property.

Groundwater flow in this area typically moves away from the slight topographic rise on the west and toward the Hudson River in a general east-southeast direction.

1.2.4 Nature and Extent of Contamination

The results of analyses of samples of surface water, surface soil, drainage way soil, subsurface soil and groundwater collected during the RI (EEEPC 2012) identified the dredge spoils as the on-site source area for PCB contamination. Based upon investigations conducted to date, the primary contaminants of concern for the proposed SA 13 site are PCBs, cadmium, chromium, – and to a lesser extent – lead in soils. However, because metals were not detected at substantial concentrations above background levels or risk-based guidance values in any sample medium, PCBs are the primary contaminant of concern at the site. The predominant Aroclor detected in surficial soil samples was Aroclor 1248. Aroclors 1242, 1248, and 1254 were present in subsurface soil samples, with Aroclor 1248 being the most predominantly detected PCB.

None of the surface water samples collected during the RI contained PCBs; however, two commonly occurring metals (iron and manganese) exceeded groundwater standards. Since iron and manganese are naturally occurring, the presence of these metals is not considered to be site related. Therefore, surface water is not addressed in this FS.

Groundwater monitoring data demonstrates that groundwater is not being impacted by this site. Four rounds of groundwater samples were collected from fifteen groundwater monitoring wells installed across the site. PCBs were not detected in groundwater collected from the 15 on-site monitoring wells during the four sampling rounds. Therefore, groundwater remediation is not addressed in this FS.

This FS presents alternatives for the remediation of three distinct units of soil contamination at the SA 13 site: Capped Landfill Cell, Uncovered Spoils, and Covered Spoils. These three units are represented in the four main fill areas of the site. The following paragraphs summarize the extent of contamination in the four main areas of the site.

Capped Landfill Cell

PCBs were found in many of the subsurface soil samples collected below the established cover at concentrations up to 49 parts per million (ppm), which exceeds the soil cleanup objectives (SCOs) for unrestricted use (0.1 ppm), restricted residential use (1 ppm), commercial use (1 ppm), and industrial use (25 ppm).

Cadmium and chromium were found at concentrations up 78.4 ppm and 81.7 ppm in a few subsurface soil samples collected below the established cover over the main part of the site. The concentrations found for these two metals in a few areas exceed the SCOs for unrestricted use and restricted residential use.

First Fill Area

PCBs were found at concentrations up to 12 ppm in soil samples collected at locations that are now under the established cover. These PCB concentrations exceed the SCOs for unrestricted use (0.1 ppm), restricted residential use (1 ppm), and commercial use (1 ppm). Cadmium and chromium were found at concentrations up to 3.1 ppm and 31 ppm, respectively, in a few soil samples collected at locations below the established clean soil cover. The concentrations found for these two metals in a few areas exceed the SCOs for unrestricted use and restricted residential use.

Second Fill Area – Covered and Uncovered Spoils

PCBs were found in many of the soil samples collected at locations below the established cover at concentrations up to 25 ppm, which exceeds the SCOs for unrestricted use (0.1 ppm), restricted residential use (1 ppm), and commercial use (1 ppm). Cadmium and chromium were found at concentrations up 3.2 ppm and 62.5 ppm (estimated) in a few soil samples collected at locations below the cover in this Second Fill Area. The concentrations of these two metals in soil in a few areas exceed the SCOs for unrestricted use and restricted residential use.

Third Fill Area – Morrison Property (Uncovered)

PCBs were found in many of the soil samples collected from all parts of the Third Fill Area at concentrations up to 30 ppm, which exceeds the SCOs for unrestricted use (0.1 ppm), restricted residential use (1 ppm), commercial use (1 ppm), and restricted commercial use (25 ppm).

1.2.5 Contamination Fate and Transport

The RI evaluated contaminant transport and concluded PCBs in soil might be transported by surface water flow (EEEPC 2012). To a lesser extent, PCBs in soil can be transported by construction activity.

1.2.6 Qualitative Human Health Risk Evaluation

Current and potential future exposure pathways were evaluated in the RI (EEEPC 2012). The magnitude of exposure and likelihood of potential adverse health effects were assessed qualitatively through comparisons with risk-based concentrations. Current site users include adult and child residents and recreational users and adult site maintenance workers. Current site recreational users and residents were assumed to be exposed only to surface and drainage way soils outside of the fenced area. Residents were assumed to be exposed to soils on the Third Fill Area and soils and sediments located outside of the fenced area south of the Capped Landfill Cell. Recreational users were assumed to be exposed to soils and sediments outside of the fenced portion of the property, not including the Third Fill Area. Current maintenance workers were assumed to be exposed to surface soil and drainage way soil across the entire site (inside and outside the fence), excluding the Third Fill Area. If the site is redeveloped in the future, potential future site users would include permanent commercial/industrial workers and temporary construction, utility, and maintenance workers. Potential future industrial and construction workers were assumed to be exposed to soils inside and outside of the fenced area, including the Third Fill Area, up to 10 feet below ground surface (BGS). Exposure to groundwater or surface water was not considered for current or future receptors because these exposure pathways are incomplete.

Total excess cancer risk estimates for current and future site users are within or below the 10^{-4} to 10^{-6} range generally considered acceptable by the EPA, NYSDEC, and the New York State Department of Health (NYSDOH). Likewise, non-cancer hazard estimates for future site users and current adult maintenance workers, adult and child recreational users, and adult residents also are below a level of potential concern. The non-cancer hazard index calculated for these receptors were at or below the maximum generally acceptable value of 1, with the exception of the current child resident. For this receptor, a hazard index of 3 was calculated, indicating there may be the potential for adverse health effects due to exposure to PCB-contaminated soil and drainage way soil for the current child resident. However, by definition a reference dose has uncertainty that spans an order of magnitude (or one log-cycle); thus, hazard indices between 3 and 0.3 cannot be distinguished from 1 indicating that the child resident's hypothetical exposure is not necessarily to be of concern.

1.2.7 Screening-Level Ecological Risk Assessment

The ecological risk assessment (ERA) in the RI (EEEPC 2012) evaluated potential impacts of site-related contaminants on the ecological resources at the SA 13 Site. The assessment was limited to terrestrial and aquatic habitats that lie on the SA 13 site and does not include the Hudson River, which lies adjacent to the site. The following summarizes the conclusions made in the ERA:

- Risks to plant communities from chemicals in soil at SA 13 appear to be minimal (i.e., potential risks from cadmium, mercury, and zinc are highly localized and those from selenium and thallium appear to be an analytical artifact).

- The mercury screening benchmark was exceeded at three sampling locations. No other chemicals exceeded the available soil-fauna screening benchmarks.

Overall, these results suggest that risks to the soil invertebrate community at the site from chemicals in the soil are minimal.

- Based on food-chain modeling results, total PCBs in soil are likely to pose a risk to song birds, such as the American robin, and small mammals, such as the short-tailed shrew, that feed extensively on soil invertebrates. Risks to carnivorous birds and mammals and other wildlife species with large home ranges appear to be minimal.

- Because the chronic water-quality criterion for iron in water samples from the ditch was frequently exceeded, amphibians using the on-site ditch/stream may be at risk from iron.

- Benthic invertebrates using the on-site ditch/stream may be at risk from total PCBs and numerous metals (antimony, cadmium, chromium, copper, iron, lead, manganese, mercury, and zinc) based on exceedances of low-level effect benchmarks in one or more samples. Because such a large number of analytes exceeded benchmark concentrations, the possibility of cumulative impacts cannot be overlooked.

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West River Road Boat Launch
GE Work Support Marina
Parcel Boundary
Old Moreau Dredge Spoil Disposal Area
Moreau Dredge Spoil Disposal Site
Capped Landfill Cell
First Fill Area
Second Fill Area - Uncovered Spoils
Second Fill Area - Covered Spoils
Third Fill Area
Special Area 13

N W E S

0 200 400 800
Feet

Figure 1-1
Site Location Map
Special Area 13
Dredge Spoil Disposal Area

2 Identification of Standards, Criteria, and Guidelines and Remedial Action Objectives

This section identifies the site contaminants of concern (COCs) and media of interest, and establishes proposed cleanup goals and specific RAOs for contaminated on-site media. Also presented are estimates of areas and volumes of contaminated on-site media.

2.1 Introduction

PCBs, cadmium, chromium and lead were identified as the COCs in some of the environmental samples collected at the site during the RI (EEEPC 2012). Based on screening of the analytical results, the RI further identified potential risks posed by site contamination by evaluating contaminant concentrations and identifying potential exposure routes. This evaluation was conducted for both human and environmental receptors.

The evaluation identified the following potential risks at the site:

- Direct contact exposure to surface soils/sediments outside of the fenced area by current child residents;
- Direct contact and/or incidental ingestion exposure of site soils by birds, small mammals, and benthic invertebrates; and
- Direct contact and/or ingestion exposure of surface water by amphibians.

Surface water samples collected at this site during the RI were obtained from low depression areas and drainage ditches, which are not representative of streams and are not flooded for a sufficient duration of the year to support aquatic life. Although surface water rarely exists on site and human health risks were not identified in the RI, minor ecological risks due to metal contamination were identified. Site soils appear to be the source of contamination in surface water. Therefore, since active remediation of site soils is assumed to occur, remediation of site surface water is not addressed in this FS.

RAOs were developed (see Section 2.3) to reduce or eliminate these potential risks by eliminating these routes of exposure or reducing the contaminant concentrations in impacted media to meet applicable chemical-specific standards at the site. Chemical-specific cleanup goals were developed for each media at the site to evaluate the area or volume of each medium that must be addressed to meet the RAOs.

Standards, criteria, and guidelines (SCGs) are used at inactive hazardous waste sites to establish the locations where remedial actions are warranted and to establish cleanup goals. SCGs include state requirements. The following sections present potentially applicable SCGs and other standards and establish proposed cleanup goals and specific RAOs for contaminated on-site media.

2.2 Potentially Applicable Standards, Criteria, and Guidelines (SCGs) and Other Criteria

SCGs include applicable or relevant and appropriate requirements and other applicable requirements.

- *Applicable Requirements* are legally enforceable standards or regulations such as groundwater standards for drinking water that have been promulgated under state law.

- *Applicable or Relevant and Appropriate Requirements* include those requirements that have been promulgated under state law that may not be "applicable" to the specific contaminant released or the remedial actions contemplated but are sufficiently similar to site conditions to be considered relevant and appropriate. If a relevant or appropriate requirement is well suited to a site, it carries the same weight as an applicable requirement during the evaluation of remedial alternatives.

- *To Be Considered Criteria (TBCs)* are non-promulgated advisories or guidance issued by state agencies that may be used to evaluate whether a remedial alternative is protective of human health and the environment in cases where there are no standards or regulations for a particular contaminant or site condition. These criteria may be considered with SCGs in establishing cleanup goals for protection of human health and the environment.

The following sections present the three categories of SCGs: chemical-specific, location-specific, and action-specific.

2.2.1 Chemical-Specific SCGs

Chemical-specific SCGs are typically technology or health-risk-based numerical limitations on the contaminant concentrations in the environment. They are used to assess the extent of remedial action required and to establish cleanup goals for a site. Chemical-specific SCGs may be directly used as actual cleanup goals or as a basis for establishing appropriate cleanup goals for COCs at a site.

2.2.2 Location-Specific SCGs

Location-specific SCGs are site- or activity-specific. Examples of location-specific SCGs include building code requirements and zoning requirements.

Location-specific SCGs are commonly associated with features such as wetlands, floodplains, sensitive ecosystems, or historic buildings that are located on or close to the site. Location-specific SCGs for the SA 13 site are presented in Table 2-1.

2.2.3 Action-Specific SCGs

Action-specific SCGs are usually administrative or activity-based limitations that guide how components of remedial actions are conducted. These may include record-keeping and reporting requirements; permitting requirements; design and performance standards for remedial actions; and treatment, storage, and disposal requirements. Action-specific SCGs for this site are presented in Table 2-2.

2.3 Remedial Action Objectives

The RAOs for on-site remedial actions were developed based on information contained in the RI (EEEPC 2012); including identified contaminants present in the study area and existing or potential exposure pathways in which the contaminants may affect human health and the environment.

The on-site RAOs for this site are:

- Prevent migration of contaminants that would result in groundwater or surface water contamination; and,
- Reduce the potential for ecological contact with contaminated surface water by reducing contamination levels and/or migration of site soils.

2.4 Cleanup Objectives and Volume of Impacted Material

The following sections describe the process used to select numeric cleanup objectives and estimate the volume of impacted material.

2.4.1 Selection of Soil Cleanup Objectives

Standards

Numeric cleanup objectives identified for soils at the SA 13 Dredge Spoil Disposal Area are contained in 6 NYCRR Part 375-6.8 (NYSDEC 2006). This regulation presents soil cleanup goals for protection of ecological resources, groundwater, and public health. The soil cleanup goals for the protection of public health are based on land use criteria, which include:

- **Unrestricted use** is a use without imposed restrictions, such as environmental easements or other land use controls; or
- **Restricted use** is a use with imposed restrictions, such as environmental easements, which as part of the remedy selected for the site require a site management plan that relies on institutional controls or engineering controls to manage exposure to contamination remaining at a site. Restricted use is separated into four different categories:

1. **Residential use** is a land use category that allows a site to be used for any use other than raising livestock or producing animal products for human consumption. Restrictions on the use of groundwater are allowed, but no other institutional or engineering controls relative to the residential soil cleanup goals, such as a site management plan, would be allowed. This land use category will be considered for single-family housing;

2. **Restricted-Residential use** is a land use category that shall only be considered when there is common ownership or a single owner/managing entity of the site. Restricted-residential use shall, at a minimum, include restrictions which prohibit any vegetable gardens on a site, although community vegetable gardens may be considered with NYSDEC's approval and single-family housing. Active recreational uses, which are public uses with a reasonable potential for soil contact, such as parks, are also included under this category;

3. **Restricted-Commercial use** is a land use category for the primary purpose of buying, selling, or trading merchandise or services. Commercial use includes passive recreational uses, which are public uses with limited potential for soil contact; and,

4. **Restricted-Industrial use** is a land use category for the primary purpose of manufacturing, production, fabrication or assembly process and ancillary services. Industrial uses do not include any recreational component.

Based on Town of Moreau zoning maps (Town of Moreau 1989), the majority of the site is zoned as manufacturing (or industrial), with the exception of an existing residence with dredge spoils on the property, which is zoned as residential (unrestricted). Based on discussions with NYSDEC there is a potential that portion of the industrial-zone part of the site may be used for public recreation in the future. Therefore, for protection of public health at this site the 6 NYCRR Part 375-6.8 SCGs selected are those for unrestricted use.

SCGs presented in 6 NYCRR Subpart 375-6.8 for the protection of groundwater and ecological resources should generally be considered where applicable. So, because ecological receptors are impacted by site contamination according to the risk assessment performed for this site, cleanup goals for the protection of ecological resources will be considered. However, because PCBs were not detected in groundwater, cleanup goals for the protection of groundwater will not be considered.

The cleanup goals for the contaminants detected at this site are presented in Table 2-3.

Criteria and Guidance Values
Guidance values identified for soils are contained in NYSDEC CP-51 (December 2006). Criteria and guidance values for the contaminants detected at this site are presented in Table 2-3.

Background
Background soil sample data are used as cleanup objectives when standards and guidance values are not available. Site background samples were not collected. However, published soil background values from the New York State (NYS) Brownfield cleanup program (NYSDEC 2006) and eastern United States background levels (Shacklette et al. 1984) were used as background values.

Selection Process
The selected cleanup goals for soils are presented in Table 2-3. These values will be used later in this report to calculate remedial volumes and subsequently cost estimates. The following logical basis was used to select the preliminary cleanup values:

- The most stringent 6 NYCRR Part 375-6.8 unrestricted use soil cleanup standards (public health, ecological) were selected as the cleanup objective;
- Where cleanup standards were not available, NYSDEC CP-51 Soil Cleanup Guidance values were selected as the cleanup goal;
- If neither cleanup standards nor guidance were available, NYS background values were used as the cleanup goals;
- The maximum observed concentration for each compound was then compared to the selected cleanup goal in order to determine which compounds may require cleanup; and,
- Finally, the contaminants identified for cleanup were reviewed to determine whether they are site-related and whether cleanup is warranted.

2.4.2 Selection of Contaminants of Concern
Based on the cleanup objectives selected above and historical disposal of PCB-laden spoils, it was determined that PCBs are the primary soil contaminants of concern at the site, see Table 2-3. As stated above, some metals were detected above proposed cleanup goals. However, since soil removal/treatment remedy conducted at the site would remove other contaminants in the soil, total PCBs will be considered the primary COC at the site.

2.4.3 Determination of Contaminated Soil Volumes
The volume of contaminated soils at the site was estimated using the Autodesk Civil 3D. Two surfaces were created; the first surface was comprised of the ground elevations obtained from survey data (EEEPC 2012). The second surface

was the bottom of impacted material which was estimated using analytical data and boring log information collected during the RI (EEEPC 2012). Using these two surfaces, the software calculates a volume estimate. Figure 2-1 provides the extent of contamination to be further addressed in this FS.

For soils, a proposed cleanup goal of 1 ppm for PCBs was initially used in developing the draft FS. At this level, the contaminated soil volumes were estimated to be 119,800 cubic yards (CY) from the Capped Landfill Area; 14,400 CY from the First Fill Area; 30,500 CY from Second Fill Area; and 14,100 CY from the Third Fill Area. This volume considers drainage way soil and surface soil contamination in addition to contaminated subsurface soils. The volume was assumed to be split 50/50 for the covered and uncovered portions of The Second Fill Area.

In addition, cutback volumes were calculated for each of these areas based on the maximum excavation depth, the excavation perimeter, a 3-horizontal:1-vertical slope, and a triangular cross-section. Cut-back volumes were estimated to be 8,000 CY for the Capped Landfill Area; 1,500 CY for the First Fill Area; 2,500 CY for the Second Fill Area; and 2,000 CY for the Third Fill Area.

Depths of contamination within the fenced area were estimated to reach 17 feet BGS, while depths in the northern and southwestern portion of the site were estimated to reach 7 feet and 14 feet BGS, respectively. Based on drainage way soil sampling, a smaller detached area along a drainage ditch to the south is contaminated to approximately 2 inches deep.

The volume estimates described above were initially calculated for a proposed cleanup goal of 1 ppm. However, review of the existing surface and subsurface analytical data obtained during the RI (EEEPC 2012) indicated that an unrestricted use cleanup goal of 0.1 ppm for PCBs could be attained with a modest volume increase. PCB concentrations are constrained more by the physical location of the dredge spoils than by a chemical gradient. Therefore, the initial soil volume estimates were conservatively increased by 20% for the purposes of this FS.

Table 2-1 Location-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Local Location-Specific SCGs					
Town Code	Noise	Chapter 100	Restricts unnecessary noise and construction equipment noise within the town during certain time frames	Potentially Applicable	
	Disposal or Processing of waste	Chapter 92	Prohibits the disposal of or processing of prohibited waste in the town	Potentially Applicable	
	Vehicles and Traffic	Chapter 136	Weight limitations on certain town roads during portions of the year	Potentially Applicable	
State Location-Specific SCGs					
Environmental Conservation Law	Endangered and Threatened Species	6 NYCRR 182	Lists endangered and threatened species and species of special interest	Potentially Applicable	
	Freshwater Wetlands	6 NYCRR 663-665	Establishes permit requirement regulations, wetland maps and classifications	Potentially Applicable	
	Wild, Scenic, and Recreational Rivers	6 NYCRR 666	Regulations for administration and management	Potentially Applicable	
	Floodplains	6 NYCRR 502	Contains floodplain management criterion for state projects	Potentially Applicable	

Table 2-1 Location-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Federal Location-Specific SCGs					
National Historical Preservation Act 16 USC Section 469	Preservation of archaeological and historical data	36 CFR Part 65	Action to recover and preserve artifacts	Potentially Applicable	
National Historic Preservation Act Section 106 (16 USC 470)	Historic project owned or controlled by Federal agency	36 CFR Part 880	Preserve historic property, minimize harm to National Historic Landmarks	Potentially Applicable	
Endangered Species Act of 1973 16 USC 1531, 661	Endangered and Threatened species	50 CFR Part 200, 402 33 CFR Parts 320-330	Determine presence and conservation of endangered species	Potentially Applicable	
Clean Water Act Section 404	Protect wetlands	40 CFR Parts 230 33 CFR Parts 320-330	Action to prohibit discharge into wetlands	Potentially Applicable	
Clean Water Act Part 6 Appendix A	Wetland Protection	40 CFR Part 6 Appendix A, section 4	Avoid adverse effects, minimize potential harm, preserve and enhance wetlands	Potentially Applicable	
Floodplain Management	Executive Order No. 11988	40 CFR 6.302 (b) (2005)	Regulates activities in a floodplain	Potentially Applicable	

Table 2-2 Action-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
State Action-Specific SCGs					
New York State Vehicle and Traffic Law, Article 386; Environmental Conservation Law Articles 3 and 19.	Noise from Heavy Motor Vehicles	6 NYCRR 450	Defines maximum acceptable noise levels	Potentially Applicable	Marginally applicable; appears to apply to over-the-road vehicles, not construction equipment
Environmental Conservation Law, Articles 3 and 19.	Prevention and Control of Air Contaminants and Air Pollution	6 NYCRR 200 - 202	Establishes general provisions and requires construction and operation permits for emission of air pollutants	Potentially Applicable	
Environmental Conservation Law, Article 15; also Public Health Law Articles 1271 and 1276 (Part 288 only)	Air Quality Classifications and Standards	6 NYCRR 256, 257	Part 256: NY Ambient Air Quality Classification System Part 257: Air quality standards for various pollutants including particulates and non-methane hydrocarbons	Potentially Applicable	Applicable to remediation activities at the site that include a controlled air emission source
Environmental Conservation Law, Articles 1, 3, 8, 19, 23, 27, 52, 54, and 70.	Solid Waste Management Facilities	6 NYCRR 360	360-1: General provisions; includes identification of "beneficial use" potentially applicable to non-hazardous oily waste/soil (360-1.15). 360-2: Regulates construction and operation of landfills, including construction and demolition (C&D) debris landfills	Potentially Applicable	May be applicable for establishing off-site treatment and disposal options for excavated contaminated non-hazardous soil and debris

Table 2-2 Action-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
New York Waste Transport Permit Regulations	Permitting Regulations, Requirements and Standards for Transport	6 NYCRR 364	The collection, transport and delivery of regulated waste, originating or terminating at a location with New York, will be governed in accordance with Part 364	Potentially Applicable	Applicable if site's wastes fall into regulated categories
Environmental Conservation Law, Articles 3, 19, 23, 27, and 70	Hazardous Waste Management System - General	6 NYCRR 370	Provides definition of terms and general standards applicable to 6 NYCRR 370 - 374, 376	Potentially Applicable	
	Identification and Listing of Hazardous Waste	6 NYCRR 371	Identifies characteristic hazardous waste (PCBs) and lists specific wastes	Potentially Applicable	Applies to transportation and all other hazardous waste management practices in NYS Applicable if hazardous waste (PCBs > 50 ppm) is generated during remediation
	Hazardous Waste Manifest System and Related Standards	6 NYCRR 372	Establishes manifest system and record keeping standards for generators and transporters of hazardous waste and for treatment, storage, and disposal facilities	Potentially Applicable	Relevant to transportation of hazardous material by bulk rail and water shipments for off-site treatment
	Hazardous Waste Treatment, Storage, and Disposal Facility Permitting Requirements	6 NYCRR 373	Regulates treatment, storage, and disposal of hazardous waste	Potentially Applicable	Relevant to off-site treatment/disposal of hazardous waste

Table 2-2 Action-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	6 NYCRR 374	Subpart 374-1 establishes standards for the management of specific hazardous wastes (Subpart 374-2 establishes standards for the management of used oil)	Potentially Applicable	
Environmental Conservation Law, Articles 1, 3, 27, and 52; Administrative Procedures Act Articles 301 and 305.	Inactive Hazardous Waste Disposal Site	6 NYCRR 375	Identifies process for investigation and remedial action at state funded Registry site; provides exception from NYSDEC permits. Part 375-6.8: Provides soil cleanup goals used for this report	Applicable	
Environmental Conservation Law, Articles 3 and 27.	Land Disposal Restrictions	6 NYCRR 376	Identifies hazardous wastes that are restricted from land disposal. Defines treatment standards for hazardous waste.	Potentially Applicable	To be considered if on-site disposal is chosen as the remedial alternative
New York Environmental Quality Review Regulations		6 NYCRR Part 617	Implements provisions of State Environmental Quality Review Act (SEQR)	Potentially Applicable	
Implementation of SPDES Program in New York	General permit for Stormwater	6 NYCRR 750 – 758	Regulates permitted releases into waters of the state	Potentially Applicable	

Table 2-2 Action-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Primary and Principal Aquifer Determinations (5/87)		NYSDEC TOGS 2.1.3	Provides guidance on determining water supply aquifers in upstate New York	Not Applicable	Drinking Water supplied by the local drinking water supply system in the Town of Moreau, NY
Environmental Justice and Permitting	Environmental Justice	Commissioner Policy (CP) 29	Policy incorporates environmental justice concerns into DEC's public participation provisions	Potentially Applicable	Relevant to actions that involve discharges to surface water, sol-id/hazardous waste disposal or siting an industrial hazardous waste facility
Federal Action-Specific SCGs					
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and Superfund Amendments and Reauthorization Act of 1986 (SARA)	National Contingency Plan	40 CFR 300, Subpart E	Outlines procedures for remedial actions and for planning and implementing off-site removal actions	Potentially Applicable	

Table 2-2 Action-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Occupational Safety and Health Act	Worker Protection	29 CFR 1904, 1910, and 1926	Specifies minimum requirements to maintain worker health and safety during hazardous waste operations. Includes training requirements and construction safety requirements	Potentially Applicable	Under 40 CFR 300.38, require-ments of OSHA apply to all activities that fall under jurisdiction of the National Contingen-cy Plan
Executive Order	Delegation of Authority	Executive Order 12316 and Coordination with Other Agencies	Delegates authority over remedial actions to federal agencies	Potentially Applicable	
Clean Air Act	National Primary and Secondary Ambient Air Quality Standards	40 CFR 50	Establishes emission limits for six pollutants (SO_2, PM_{10}, CO, O_3, NO_2, and Pb)	Potentially Applicable	
	National Emission Standards for Hazardous Air Pollutants	40 CFR 61	Provides emission standards for 8 contami-nants. Identifies 25 additional contaminants, including PCE and TCE, as having serious health effects but does not provide emission standards for these contaminants	Potentially Applicable	
Toxic Substances Control Act	Rules for Controlling PCBs	40 CFR 761	Provides guidance on storage and disposal of PCB-contaminated materials	Potentially Applicable	

Table 2-2 Action-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Resource Conservation and Recovery Act	Criteria for Municipal Solid Waste Landfills	40 CFR 258	Establishes minimum national criteria for management of non-hazardous waste	Potentially Applicable	Applicable to remedial alternatives that involve generation of non-hazardous waste. Non-hazardous waste must be hauled and disposed of in accordance with RCRA.
	Hazardous Waste Manage-ment System - General	40 CFR 260	Provides definition of terms and general standards applicable to 40 CFR 260 - 265, 268	Potentially Applicable	Applicable to remedial alternatives that involve generation of a hazardous waste (e.g., contaminated soil). Hazardous waste must be handled and disposed of in accordance with RCRA
	Identification and Listing of Hazardous Waste	40 CFR 261	Identifies solid wastes that are subject to regulation as hazardous wastes	Potentially Applicable	
	Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Establishes requirements (e.g., EPA ID numbers and manifests) for generators of hazardous waste	Potentially Applicable	

Table 2-2 Action-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
	Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Establishes standards that apply to persons transporting manifested hazardous waste within the United States	Potentially Applicable	
	Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities	40 CFR 264	Establishes the minimum national standards that define acceptable management of hazardous waste	Potentially Applicable	
	Standards for owners of hazardous waste facilities	40 CFR 265	Establishes interim status standards for owners and operators of hazardous waste treatment, storage, and disposal facilities	Potentially Applicable	
	Land Disposal Restrictions	40 CFR 268	Identifies hazardous wastes that are restricted from land disposal	Potentially Applicable	
	Hazardous Waste Permit Program	40 CFR 270, 124	EPA administers hazardous waste permit program for CERCLA/Superfund Sites. Covers basic permitting, application, monitoring, and reporting requirements for off-site hazardous waste management facilities	Potentially Applicable	

Table 2-2 Action-Specific SCGs, Special Area 13 Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
	EPA Pretreatment Standards	40 CFR 403	Establishes responsibilities of federal, state, and local government to implement National pretreatment standards to control pollutants that pass through to a POTW	Not Applicable	

Table 2-3 Selected Cleanup Goals for Soils - Special Area 13 Dredge Spoil Disposal Area

Analyte	NYSDEC Part 375 Cleanup Goals[a]		NYSDEC CP-51[b]			
	Protection of Public Health: Unrestricted	Protection of Ecological Resources	Protection of Ecological Resources	New York State Background	Maximum Concen-tration	Selected Cleanup Goal
Total PCBs	0.1	1	-	-	49	**0.1**
Cadmium	2.5	4	-	2.4	78.4	**2.5**
Chromium	1 / 30[e]	41	-	20	81.7	**1 / 30[e]**
Lead	63	63	-	72	77.9	**63**
Mercury	0.18	0.18	-	0.2	0.776	**0.18**
Aluminum	-	-	10,000	15,800	10,400	**-**
Antimony	-	-	12	2.17	ND	**-**
Arsenic	13	13	-	12	4.3	**-**
Barium	350	433	-	165	143	**-**
Beryllium	7.2	10	-	1	0.18	**-**
Calcium	-	-	10,000	9,190	10,900	**10,000**
Cobalt	-	-	20	13.3	10.2	**-**
Copper	50	50	-	32	25.1	**-**
Iron	-	-	-	25,600	25,500	**-**
Magnesium	-	-	-	5,130	2,040	**-**
Manganese	1600	1,600	-	1610	2,560	**1,610**
Nickel	30	30	-	25	12.5	**-**
Potassium	-	-	-	1,890	1,010	**-**
Selenium	3.9	3.9	-	3.7	ND	**-**
Silver	2	2	-	0.6	ND	**-**
Sodium	-	-	-	211	281	**211**
Thallium	-	-	5	16.3	ND	**-**
Vanadium	-	-	39	31	22.1	**-**
Zinc	109	109	-	140	123	**109**

Notes:
All values are in parts per million (ppm).
[a] Cleanup goals obtained from 6 NYCRR Part 375-6.8(a) Soil Cleanup Objective Tables (NYSDEC December 14, 2006)
[b] NYSDEC Final Commissioner Policy #51 (CP-51) (Oct 2010) Soil Cleanup Guidance.
[c] Background values obtained from NYS background (95th percentile), Source-Distant Data Set from NYS Brownfield Cleanup Program, Technical Support Document, Appendix D, (NYSDEC September 2006) for metals presented except thallium and antimony for which background values were obtained from Eastern United States background (95th percentile) (Shacklette and Boerngen 1984).
[d] Concentration listed is the maximum detected value from surface soil, subsurface soil, or drainageway soil samples collected during the Special Area 13 RI (EEEPC 2012).
[e] Hexavalent chromium soil cleanup goal is 1 ppm, while trivalent chromium soil cleanup goal is 30 ppm.

Key:
EPA = (United States) Environmental Protection Agency.
J = Estimated value ("-" is biased low and "+" is biased high).
ND = non-detect.
NYSDEC = New York State Department of Environmental Conservation
PCB = Polychlorinated biphenyl.

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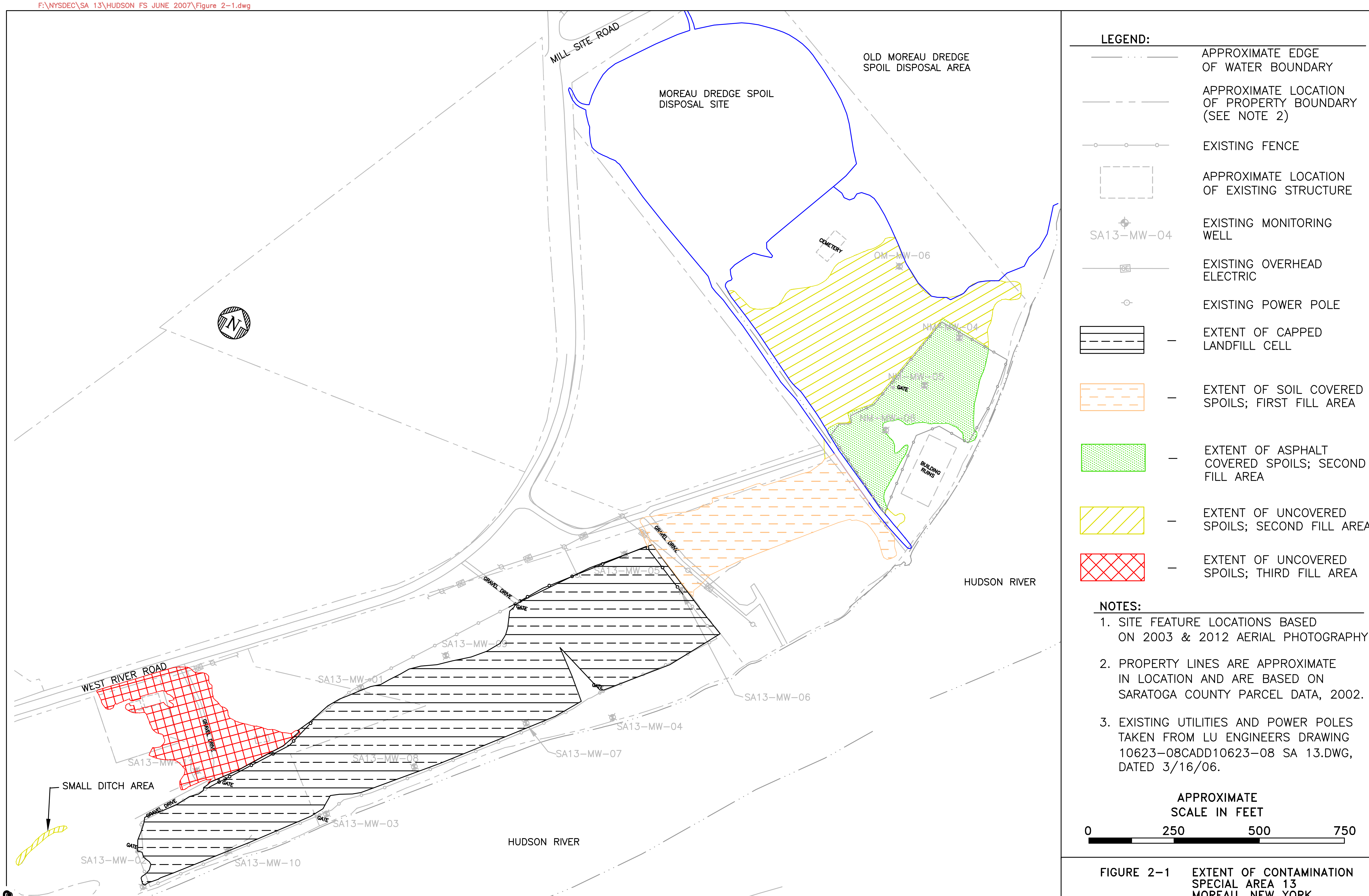

FIGURE 2-1 EXTENT OF CONTAMINATION
SPECIAL AREA 13
MOREAU, NEW YORK

3 Identification and Screening of Remedial Technologies

3.1 Introduction

This section presents the results of the preliminary screening of remedial actions that may be used to achieve the RAOs. Potential remedial actions, including general response actions and remedial technologies, are evaluated during the preliminary screening on the basis of effectiveness, implementability, and relative cost. Past performance (e.g., demonstrated technology) and operating reliability were also considered in identifying and screening applicable technologies. Technologies which were not initially considered effective and/or technically or administratively feasible were eliminated from further consideration.

The purpose of the preliminary screening is to eliminate remedial actions that may not be effective based on anticipated on-site conditions, or cannot be implemented at the site. The general response actions considered herein are intended to include those actions that are most appropriate for the site and, therefore, are not exhaustive.

3.2 General Response Actions

Based on the information presented in the RI (EEEPC 2012) and the RAOs established in Section 2, this section identifies general response actions, or classes of responses for contaminated soils. General response actions describe classes of technologies that can be used to meet the remediation objectives for contaminated site soils. As previously discussed, PCB contamination in soil will be the focus of remedial actions addressed by this FS.

General response actions identified for the contaminated soils are as follows:

- No action;
- Institutional controls;
- Containment;
- In situ treatment;
- Ex-situ treatment; and

- On- and off-site disposal.

3.2.1 Criteria for Preliminary Screening

In accordance with guidance documents issued by NYSDEC (CP-51) and the EPA (Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA [October 1988]), the criteria used for preliminary screening of general response actions and remedial technologies include the following.

- **Effectiveness**. The effectiveness evaluation focuses on the degree to which a remedial action is protective of human health and the environment. An assessment is made of the extent to which an action: (1) reduces the mobility, toxicity, and volume of contamination at the site; (2) meets the remediation goals identified in the RAOs; (3) effectively handles the estimated areas and volumes of contaminated media; (4) reduces impacts to human health and the environment in the short-term during the construction and implementation phase; and (5) has been proven or shown to be reliable in the long-term with respect to the contaminants and conditions at the site. Alternatives that do not provide adequate protection of human health and the environment are eliminated from further consideration.

- **Implementability.** The implementability evaluation focuses on the technical and administrative feasibility of a remedial action. Technical feasibility refers to the ability to construct and operate a remedial action for the specific conditions at the site and the availability of necessary equipment and technical specialists. Technical feasibility also includes the future maintenance, replacement, and monitoring that may be required for a remedial action. Administrative feasibility refers to compliance with applicable rules, regulations, statutes, and the ability to obtain permits or approvals from other government agencies or offices and the availability of adequate capacity at permitted treatment, storage, and disposal facilities and related services. Remedial actions that do not appear to be technically or administratively feasible or that would require equipment, specialists, or facilities that are not available within a reasonable period of time are eliminated from further consideration.

- **Relative Cost.** In the preliminary screening of remedial actions, relative costs are considered rather than detailed cost estimates. The capital costs and operation and maintenance (O&M) costs of the remedial actions are compared on the basis of engineering judgment, where each action is evaluated as to whether the costs are high, moderate, or low relative to other remedial actions based on knowledge of site conditions. A remedial action is eliminated during preliminary screening on the basis of cost if other remedial actions are comparably effective and implementable at a much lower cost.

The results of the preliminary screening are summarized below.

3.3 Identification of Remedial Technologies

This section identifies the potential remedial action technologies that may be applicable to remediation of soils at SA 13. Table 3-1 shows a summary of results from the screening of remedial technologies.

3.3.1 No Action

The no-action alternative involves taking no further action to remedy the condition of contaminated soils. NYSDEC and EPA guidance set forth in the CERCLA National Contingency Plan (NCP), requires that the no-action alternative automatically pass through the preliminary screening and be compared to other alternatives in the detailed analysis of alternatives.

3.3.2 Institutional Controls (ICs) and Long-Term Monitoring (LTM)

ICs are meant to be non-physical means of enforcing a restriction on the use of real property that limits human and environmental exposure, restricts the use of groundwater, provides notice to potential owners, operators, or members of the public, or prevents actions that would interfere with the effectiveness of the remedial program or with the effectiveness and/or integrity of operation, maintenance and/or monitoring activities at or pertaining to a remedial site. They typically include easements, deed restrictions, covenants, well drilling prohibitions, zoning restrictions, building or excavation permits.

ICs are meant to supplement engineering controls (ECs) during all phases of cleanup and may be a necessary component of the completed remedy. Engineering Controls (ECs) are defined as any physical barriers or methods employed to actively or passively contain, stabilize, or monitor contamination, restrict the movement of contamination to ensure the long-term effectiveness of a remedial program, or eliminate potential exposure pathways to contamination. Engineering controls include, but are not limited to: pavement, caps, covers, subsurface barriers, vapor barriers, slurry walls, building ventilation systems, fences, groundwater monitoring wells, provision of alternative water supplies via connection to an existing public water supply, adding treatment technologies to such water supplies, and installing filtration devices on private water supplies.

ICs are not generally expected to be the sole remedial action unless active response measures are determined to be impracticable. For this site, ICs will be considered in conjunction with other engineering alternatives to achieve RAOs.

Long-term monitoring (LTM) is not an IC or an EC, but a part of site operation, monitoring, and maintenance (OM&M). LTM can be performed in multiple environmental media, but is most applicable in groundwater at this site. LTM in groundwater generally uses an array of monitoring wells that are regularly sampled and tested by an analytical laboratory for COC. These wells are placed such that they would detect migration toward potential receptors. Similarly, sampling of surface water (or drainage ditch at this site) would detect migration of contamination toward potential receptors or other waterbodies. LTM will not actively reduce contamination levels; it can be useful in demonstrating that exposures do not occur. LTM of groundwater and surface water will be further considered.

3.3.3 Containment

3.3.3.1 Capping

Containment of impacted soils can be achieved by capping contaminated materials in place, consolidating and capping, excavating selective areas, and capping or surface sealing. Capping is a means to limit direct contact with impacted material and reduce the potential for rainfall infiltration into groundwater, thus limiting contaminant mobility and exposure. Capping systems use materials, such as soil, synthetic membranes, asphalt, concrete, and chemical sealants.

Capping of the entire effected area is generally performed when subsurface contamination at a site precludes excavation and removal of contaminated materials because of potential hazards and/or prohibitive costs. Capping also may be performed as an interim remedial measure to reduce infiltration of precipitation and to control air releases. The main disadvantages of capping are uncertain design life and the need for long-term maintenance and monitoring.

Capping systems (single and multi-layered) considered applicable and represent the range of available options include asphalt cover (single-layered cap), a soil cover, 6 NYCRR Part 360, and 6 NYCRR Part 373 (Resource Conservation and Recovery Act [RCRA] cap). These cover systems would be effective in limiting infiltration of surface water.

- **Bituminous Concrete Cover (Asphalt):** A standard asphalt cover system typically includes a layer of stone (6 to 8 inches), followed by an asphalt binder course (typically 4 inches), and a final wearing course (typically 2 inches). Site grading is typically required to achieve an adequate slope for drainage. Although asphalt covers serve to limit infiltration into groundwater, they are more permeable than 6 NYCRR Part 360 composite cap and 6 NYCRR Part 373 RCRA cap. Furthermore, asphalt is susceptible to cracking and settlement, and thus would require more O&M in the long term.

- **Soil Cover.** A soil cover consists of a layer of low permeability clay or soil over the contaminated material. Typically, the thickness of this layer is between 1 and 5 feet. This type of cover may be designed to prevent the infiltration of water, in which case, it needs to be graded for proper drainage.

  Soil covers are not as protective as an asphalt, 6 NYCRR Part 360, or 6 NYCRR Part 373 cover/cap as they are more susceptible to cracking thus would require more O&M in the long term. Based on current knowledge of the site, a clay cap exists over the contaminated material in the Capped Landfill Cell enclosed by the existing fence.

- **6 NYCRR Part 360 Cap:** A 6 NYCRR Part 360 cap is commonly used in New York State to close municipal solid waste landfills. The cap system consists of the following components:

  1. A 12-inch gas venting layer with a hydraulic conductivity equal or greater than $1x10^{-3}$ centimeters per second (cm/sec) directly overlying the waste material. A filter fabric is typically directly below and above the venting layer to limit the migration of fines into the venting layer. This layer is intended to transmit methane for high organic waste material. This layer might not be required for SA 13, because the PCB-containing waste material does not readily decompose.

  2. An 18-inch layer of compacted low permeability barrier soil overlying the gas venting layer with a hydraulic conductivity equal to or less than $1x10^{-6}$ cm/sec.

  3. A synthetic 40-mil or thicker geomembrane overlying the low permeability soil barrier.

  4. A 24-inch compacted soil layer to protect the low permeability layer and geomembrane from root penetration, desiccation, and freezing.

  5. A final 6-inches of topsoil placed on top of the protective layer to promote vegetative growth for erosion control.

- **6 NYCRR Part 373 (RCRA) Cap:** RCRA caps are typically required at hazardous waste sites. A RCRA cap is most applicable when a significant potential for leaching of contaminants from the unsaturated zone to the saturated zone exists. Basic requirements for cover systems are described in 6 NYCRR Part 373. These requirements are also consistent Subparts G, K, and N of RCRA of Subtitle C regulations (for hazardous waste). The recommended design for a RCRA Subtitle C cap system consists of the following (from bottom to top):

  1. A low hydraulic conductivity geomembrane/soil layer consisting of a 24-inch layer of compacted natural or amended soil with a hydraulic conductivity of $1x10^{-7}$ cm/sec, and a minimum 20-mil (0.5 mm) geomembrane liner.

  2. A minimum 12-inch soil layer having a minimum hydraulic conductivity of $1x10^{-2}$ cm/sec, or a layer of geosynthetic material having the same characteristics.

  3. Minimum 24-inch top vegetative soil layer.

The following presents the preliminary screening of containment technology:

- **Effectiveness.** Placement of a cover/cap over the contaminated soils would be effective in helping to achieve the RAOs for soil, since it would reduce the potential for direct contact with the contaminated soils and limit erosion and transport of contaminated materials.

- **Implementability.** The materials, equipment, and labor for construction of a cover/cap are available and can be readily implemented.

- **Cost.** Capital costs for installing a NYCRR Part 360 cap are around $165,000 per acre, while it is $225,000 per acre for a RCRA Subtitle C cap (FRTR 2002). Soil cover costs determined from RS Means cost data were calculated to be around $32,900 per acre. Capital costs may include materials, labor, and equipment to construct the cap. O&M costs would be minimal.

Containment is an effective method to protect human health and the environment; it is readily implementable and cost-effective as a containment technology. Soil covers were demonstrated to be the most cost-effective form of containment; therefore, on-site soil covering of contaminated material will be retained for further consideration.

Addition of contaminated material to the existing landfill is understood to contradict conditions set forth by the landfill's approval letter from EPA (EPA 1979); therefore, no additional contaminated material will be consolidated and capped or covered with the existing landfill cell; however, continued operation and maintenance of the landfill cell will be retained for further consideration.

3.3.4 In Situ Treatment

In situ treatment technologies for soil remediation typically fall in the following three categories:

- Thermal treatment;

- Physical/chemical treatment; and

- Biological treatment.

The following sections present a discussion of applicable soil remediation technologies under each general response category described above.

3.3.4.1 Thermal Treatment

Thermal treatment processes generally involve applying heat to contaminated material to vaporize the contaminants into a gas stream (i.e., physically separate from the host medium), and then treating the gas stream prior to discharge into the atmosphere. Various gas treatment technologies can be used to collect, condense, or destroy the volatilized gases. The three common types of in situ thermal treatment technologies are: in situ thermal desorption using thermal blankets and thermal wells, vitrification using electrodes, and enhanced soil vapor extraction (SVE).

Thermally enhanced SVE is a full-scale technology that uses electrical resistance/electromagnetic/radio frequency heating, or hot-air steam injection to facilitate volatilization and extraction of the contaminant vapors. The process is otherwise similar to SVE. However, since SVE does not remove PCBs and heavy hydrocarbons (only applicable to volatile organic compounds [VOCs] and semivolatile organic compounds [SVOCs] with Henry's constant greater than 0.01), it will not be retained for further consideration.

In Situ Thermal Desorption (ISTD) - Thermal Blankets and Thermal Wells

This type of technology was developed in Shell Research labs over the last 25 years as part of its enhanced oil recovery efforts, and has been one of the few in situ forms of thermal desorption technologies that has been demonstrated to work effectively on a commercial scale. At the present time, thermal blankets and thermal wells are proprietary technologies of TerraTherm, Inc. (TerraTherm), an affiliate of Shell Oil Company. The thermal blanket system consists of electric heating "blankets" approximately 8 by 20 feet that are placed on top of the contaminated ground surface. The blankets can be heated to 1,800° Fahrenheit (F), and by thermal conduction are able to vaporize most contaminants down to about 3 feet. Vapors are drawn out of the soil and through the blanket system by means of a vacuum system. The contaminated vapors are then oxidized at high temperature in a thermal oxidizer near the treatment area, and finally cooled and passed through activated carbon beds to collect any trace levels of organics not oxidized prior to discharge to the atmosphere.

Thermal wells use the same process as thermal blankets, except that heating elements are placed in well boreholes drilled at an average spacing of 7 to 10 feet. Similar to the blanket modules, the vacuum is drawn on the manifold so that extracted vapors are collected and destroyed. Estimated in situ thermal desorption (ISTD) treatment costs obtained from TerraTherm range from $100/CY for a 100,000-CY site to $600/CY for a 1,000-CY site (TerraTherm, Inc. 2007).

ISTD using thermal wells and blankets has been successfully demonstrated by TerraTherm for a number of PCB-contaminated sites. PCB reduction of 99.9% was achieved from initial concentrations of as high as 20,000 ppm at a contaminated site in Missouri. Contamination depth varied between 6 to 18 inches for blankets, and up to 12 feet with thermal wells for these demonstrations. ISTD is a more appropriate technology for volumes of contamination up to 10,000 CY (Naval Facilities Engineering Service Center 1998). A treatability study is generally recommended to determine the effectiveness of thermal treatment as a remediation technology at a site.

- **Effectiveness.** Thermal treatment has not been demonstrated in treating PCB-contaminated soil at depths of more than 12 feet, whereas SA 13 has contamination at depths greater than 12 feet.

- **Implementability.** Contractors and treatment facilities are available to implement this technology. This option alone would have limited application at the site due to the depth (below the groundwater table in some locations) of soil contamination. Treatability studies may be necessary to evaluate the effectiveness of the type of thermal treatment needed to treat the soil at these site acceptable levels.

- **Cost.** The cost of an in situ treatment is high but may be comparable to other in situ treatment technologies considering the lifetime for treatment and O&M costs of other technologies.

In summary, since the contaminated soil volumes are greater than 10,000 CY, in situ thermal desorption is not considered feasible based on implementability and cost. Therefore, this technology will not be retained for further analysis.

In Situ Vitrification

In situ vitrification (ISV) is a process that uses electrical power to heat and melt soil contaminated with organics, inorganics, and metal-bearing wastes. The molten material cools to form a hard, monolithic, chemically inert, stable glass and crystalline product that incorporates the inorganic compounds and heavy metals in the hazardous waste. The organic contaminants within the waste are vaporized or pyrolyzed and migrate to the surface of the vitrified zone where they are oxidized under a collection hood. Residual emissions are captured in an off-gas treatment system.

ISV uses electrodes that are inserted into the ground to the desired treatment depth. Electrical power is charged to the electrodes, which heat the surrounding soil to 2,000 ºC, which is above the initial melting temperature of typical soils. With favorable site conditions, it is estimated that a processing depth of up to 30 feet can be achieved.

Although ISV has been tested for a range of organic and inorganic contaminants, including PCBs, and has been operated for demonstration purposes at the pilot scale, few full-scale applications of this technology exist. Treatability studies are generally required to determine the effectiveness of ISV as a remediation technology at a site. Once vitrified, the original volume of soil would decrease by approximately 20 to 50%, requiring backfilling with clean material, grading, and restoring.

- **Effectiveness.** ISV processing requires that sufficient glass-forming materials (e.g., silicon and aluminum oxides) be present within the contaminated soil to form and support a high-temperature melt. If the natural soil does not contain enough of these materials, then a fluxing agent, such as sodium carbonate, can be added. If metals of high concentrations and/or large dimensions are present in the soil to be treated, the electrodes may short circuit.

ISV can treat soils saturated with water; however, additional power is required to dry the soil prior to melting. The presence of large inclusions in the area to be treated can limit the effectiveness of the ISV process. Inclusions are highly concentrated contaminant layers, void volumes, containers, metal scrap, general refuse, demolition debris, rock, or other heterogeneous materials within the treatment volume.

- **Implementability**. ISV is considered an emerging technology. The only vendor currently supplying commercial systems for in situ vitrification of hazardous wastes is Geosafe Corporation. Four units are in operation ranging from bench-scale to commercial-scale. A large-scale test was conducted at Hanford, Washington, on mixed radioactive and chemical wastes that contained chromium. A fire involving the protective hooding occurred. Materials of construction (e.g., for the collection hood) and electrode-feeding mechanisms are still being tested and developed.

- **Cost**. Two studies conducted on the West Coast and midwest estimated ISV costs between $1,320 and $2,900 per CY of contaminated soil (EPA 2007). Factors that influence the cost of remediation by ISV are the moisture content of the soil, the amount of additives required to create the required “recipe,” the amount of site preparation required, the specific properties of the waste soil, the depth of processing, and the unit price of electricity.

In summary, since few full-scale applications of this technology exist and this technology has relatively high implementation costs, in situ vitrification will not be considered any further.

3.3.4.2 Physical/Chemical Treatment

A number of in situ physical/chemical treatment processes for soil have been developed to chemically convert, separate, or contain waste constituents. These include solidification/stabilization and soil flushing.

In Situ Solidification/Stabilization

Solidification/stabilization treatment systems, sometimes referred to as fixation systems, seek to trap or immobilize contaminants within their “host” medium instead of removing them through chemical or physical treatment. Solidification is a process whereby contaminants are physically bound or enclosed within a stabilized mass. Stabilization is a process where chemical reactions are induced between the stabilizing agent and contaminants to either neutralize or detoxify the wastes, thus reducing their mobility.

Solidification/stabilization methods used for chemical soil consolidation can immobilize contaminants. Most techniques involve a thorough mixing of the solidifying agent and the waste. Solidification of wastes produces a monolithic block. The contaminants do not necessarily interact chemically with the solidification reagents but are mechanically locked within the solidified matrix. Solidification/stabilization systems have generally targeted inorganics (i.e., Heavy metals) and radionuclides, not PCBs. Stabilization methods usually involve the addition of materials, such as molten bitumen, asphalt emulsion, and portland cement, that limit the solubility or mobility of waste constituents even though the physical handling characteristics of the waste may not be improved. Remedial actions involving combinations of solidification and stabilization techniques are often used to yield a product or material for land disposal, or in other cases, that can be applied to beneficial use. Auger/caisson systems and injector head systems are techniques used in soil solidification/stabilization systems.

- **Effectiveness.** In situ solidification/stabilization systems have generally targeted inorganics (i.e., heavy metals) and radionuclides. The auger/caisson and reagent/injector head systems have limited effectiveness in treating organics, although systems are currently being developed and tested for treatment of PCBs.

- **Implementability.** Treatability studies are generally required to assess compatibility of waste material and reagent used.

- **Cost.** In situ solidification/stabilization costs around $150 to $250 per CY for deeper applications (FRTR 2002). However, based on the extent of the contamination and depth of the contaminated soil, we believe the cost of this treatment alternative would be moderate at best. Treatability studies would be required to better determine the cost of this alternative in a full-scale operation.

In summary, since this technology has not been successfully demonstrated on a full-scale basis for treating organics and because the solidified material may hinder future site use, this technology will not be retained for further consideration.

In Situ Soil Flushing

Soil flushing is an extraction process by which organic and inorganic contaminants are washed from contaminated soils. An aqueous solution is injected into the area of contamination, and the contaminant elutriate is pumped to the surface for removal, re-circulation, or on-site treatment, and re-injection. During elutriation, sorbed contaminants are mobilized into solution because of solubility, and form an emulsion, or chemical reaction with the flushing solution. An in situ soil-flushing system includes extraction wells installed in the area of contamination, injection wells installed upgradient of the contaminated soil areas, and a wastewater treatment system for treatment of recovered fluids. Similar to solidification/stabilization systems, in situ soil flushing generally targets inorganics (i.e., heavy metals) and radionuclides, not PCBs.

Co-solvent flushing is another type of soil flushing that involves injecting a solvent mixture (e.g., water plus a miscible organic solvent such as alcohol) into the vadose zone, saturated zone, or both to extract organic contaminants. Co-solvent flushing can be applied to soils to dissolve either the source of contamination or the contaminant plume emanating from it.

- **Effectiveness.** The effectiveness of this technology decreases in heterogeneous soils similar to those found at SA 13.
- **Implementability.** In situ soil flushing has had very limited commercial success. This technology can be used only in areas where flushed contaminants and soil flushing fluid can be contained or recaptured. Typically treatability studies must be performed under site-specific conditions before this technology can be selected.
- **Cost.** In situ soil flushing is a low cost technology with costs ranging from $25 to $250 per CY (FRTR 2002). Treatability studies would need to be performed to estimate the cost for installing a full-scale system. Also, the aboveground separation and treatment of recovered fluids can drive the cost of the whole process.

In summary, it is believed that in situ soil flushing is not effective in heterogeneous soils found at this site. Due to its limited success and difficulty in ensuring effectiveness in situ, this technology will, therefore, not be considered.

3.3.4.3 Biological Treatment

Biological treatment processes use indigenous or selectively cultured microorganisms to reduce hazardous organic compounds into water, carbon dioxide, and chlorinated hydrogen chloride. Available in situ biological treatment technologies include bioventing, enhanced biodegradation (aerobic and anaerobic), natural attenuation, and phytoremediation. Factors that affect the rate of biodegradation include the type of contaminants present and their concentrations, oxygen, nutrients, moisture, pH, and temperature. Treatability studies are typically conducted to determine the effectiveness of bioremediation in a given situation. A review of completed remediation projects and demonstration projects where biological treatment technologies were used for soil remediation indicates that these technologies have primarily been used for soils contaminated with petroleum hydrocarbons, VOCs (e.g., trichloroethylene [TCE] and perchloroethylene [PCE]), pesticides, and wood preservatives. Because PCBs have relatively higher chlorine content, they are more persistent in the environment and are less susceptible to biodegradation.

- **Effectiveness.** Bioremediation of PCB-contaminated soil is not very effective.
- **Implementability.** Vendors and organisms to biologically treat contaminated soil are readily available.

- **Cost.** Costs vary based on the type of technology used and can range from $20 to $80 per CY (FRTR 2002).

Since biological treatment technologies are not well demonstrated for PCBs, and due to the relatively longer remediation periods, these technologies were not retained for further consideration.

3.3.5 Ex-Situ Treatment

Ex-situ treatment requires soil to be excavated before treatment. Ex-situ treatment allows for greater flexibility in establishing the physical, chemical, or biological conditions; or any combination of these conditions that are required to remove or destroy the contaminant. Available ex-situ treatment technologies that would be applicable at the site include thermal desorption, incineration vitrification (thermal treatment processes), dehalogenation, solvent extraction (chemical processes), and soil washing (physical process).

3.3.5.1 Thermal Treatment

Thermal treatment processes generally involve the application of heat to physically separate, destroy, or immobilize the contaminant. A number of ex-situ thermal treatment technologies exist to treat a range of contaminants including high-temperature and low-temperature thermal desorption, hot gas decontamination, open burning/open detonation, pyrolysis, and incineration. This section will focus on high-temperature thermal desorption, incineration, and vitrification, because the other technologies are either not applicable to PCB contamination (hot gas decontamination, open burning/open detonation, low-temperature thermal desorption), or have not been successfully demonstrated on a full-scale basis for sites contaminated with PCBs (pyrolysis). High-temperature thermal desorption, incineration, and vitrification are described below.

High-Temperature Thermal Desorption

Thermal desorption is a physical separation process that uses heat to volatilize organic wastes, which are subsequently collected and treated in a gas treatment system. Thermal desorption differs from incineration because the decomposition or destruction of organic material is not the desired result, although some decomposition may occur. Varieties of gas treatment technologies are used to collect, condense, or destroy the volatilized gases. A vacuum system is typically used to transport volatilized water and organics to the treatment system. As described above, thermal desorption technologies can be grouped into high-temperature thermal desorption (HTTD) and low-temperature thermal desorption (LTTD) systems. LTTD is primarily used for non-halogenated VOCs and SVOCs with low boiling points (i.e., below 600° F), and is not considered as an applicable technology for PCB contamination.

HTTD systems are able to heat materials to temperatures in the range of 600°F to 1,200°F, and can target SVOCs, polyaromatic hydrocarbon, and PCBs. In general, thermal systems can be differentiated by the method used to transfer heat to the contaminated material and by the gas treatment system. Direct-contact or direct-fired systems (i.e., rotary dryer) apply heat directly by radiation from a combustion flame. Indirect-contact or indirect-fired systems (i.e., thermal screw conveyor) apply heat indirectly by transferring it from the source (combustion or hot oil) through a physical barrier that separates the heat source from the contaminated material.

Of the several vendors working in the thermal treatment industry, Environmental Soil Management, Inc. (ESMI) currently owns and operates three fixed location thermal treatment facilities in the northeast region, one each in New York, New Jersey, and New Hampshire. In addition, ESMI owns a portable thermal treatment unit that can be transported as needed based on site-specific conditions. Depending on the material volume to be treated and chemical concentrations, material may be more appropriately sent to one facility versus another.

HTTD is a full-scale technology that has been successfully demonstrated in the field for treatment of PCB-contaminated soils. Typically, systems that have been used for PCB contamination consist of a rotary dryer (primary chamber) to volatilize the contaminated material, and an afterburner (secondary chamber) where the off-gas is oxidized at temperatures in the range of 1,400°F to 1,800°F. The off-gas is then cooled, or quenched, and passed through a baghouse to remove any trace organics not oxidized prior to discharge into the atmosphere. HTTD units are considered to be incinerators, and must meet RCRA incinerator emission requirements (40 CFR Parts 264 and 265, Subpart O).

- **Effectiveness.** HTTD technology is effective in treating PCB contamination and the treated soils can be returned to the site as backfill.

- **Implementability.** This technology can be implemented fairly quickly. The equipment can be set up on site or it may be mobilized, so that it could potentially be moved from site to site.

- **Cost.** HTTD is a moderate cost technology with costs typically ranging from $300 to $500 per CY depending on the volume of contaminated soils (FRTR 2002).

In summary, HTTD is a demonstrated technology which could be implemented effectively at this site and, therefore, will be retained for further consideration.

Incineration

Incineration uses high temperatures (1,600° to 2,200°F) to volatilize and destroy organic contaminants and wastes. A typical incineration system consists of the primary combustion chamber into which contaminated material is fed and initial destruction takes place, and a secondary combustion chamber where combustion byproducts (products of incomplete combustion) are oxidized and destroyed. From the secondary chamber, the off-gases are drawn under negative pressure into an air pollution control system which may include a variety of units depending on the contaminants and site-specific requirements.

The two primary types of incinerators are rotary kiln and liquid injection incinerators. The rotary kiln is a refractory-lined, slightly inclined, rotating cylinder that serves as the primary combustion chamber operating at temperatures up to 1,800°F. The kilns can range in size from 6 to 14 feet in diameter. The liquid injection incinerators are used to treat combustible liquid, sludge, and slurries. Liquid injectors would not be applicable for the contamination at SA 13, since liquid waste is not present at the site.

Ex-situ on-site incineration is a demonstrated treatment technology for PCB-contaminated soils. Incineration is considered an effective technology, achieving a greater than 99% reduction requirement of PCBs and dioxins concentrations in soil, thus providing long-term protection. Incinerators burning hazardous wastes must meet the RCRA incinerator regulations (40 CFR Parts 264 and 265, Subpart O) as well as state and local regulations. Furthermore, on-site incinerators used to treat PCB-contaminated material with concentrations greater than 50 ppm may also be subject to the requirements under TSCA set forth in 40 CFR Part 761.

- **Effectiveness.** Incineration is an effective, demonstrated technology that can treat PCB-contaminated soils.

- **Implementability.** Incineration can be implemented at this site since the equipment may be used for multiple sites. However, permitting of an incinerator may prove to be a significant effort as the public may mount an effort to keep it out of their community.

- **Cost.** Ex-situ incineration is a high cost technology with costs ranging from $600 to $1,100 per CY (FRTR 2002).

In summary, because the effectiveness of incineration to remediate site contaminated soil would be similar to HTTD, but at a much higher cost, incineration will not be retained for further consideration.

Vitrification

Thermal vitrification of contaminated material uses a natural gas and oxygen-enhanced power source or an electrical power source to treat PCB-impacted soil and produce a glass-like material. Natural gas-fired vitrification is less costly than the electric-powered system. For thermal vitrification, soils must be excavated, segregated, and stockpiled prior to treatment using an on-site glass furnace. This alternative may require the soils to be “dried” so that the soils entering the system contain less than 15% moisture.

The glass furnace is a “melter” constructed of refractory brick. A series of oxy-fuel burners combine natural gas and oxygen, which raise the temperature of the melter to 2,900°F. PCBs are destroyed and the soil melts and flows out of the system as molten glass. Molten glass then flows into a water-filled quench tank that hardens the molten glass into glass aggregate that makes it inert to the environment. Water is continuously added to the quench tank as the molten glass causes the water to evaporate. The glass aggregate can be beneficially reused as backfill in the original excavation, or can be sold for use as a loose-grain abrasive, as highway aggregate, or in a number of other applications.

A pilot-scale ex-situ vitrification process using glass furnace technology was demonstrated to treat PCB-contaminated river sediment at Minergy Glass Pack Test Center, Wisconsin and is documented in the EPA's Superfund Innovative Technology Evaluation (SITE) Program in *Minergy Corporation Glass Furnace Technology Evaluation* (EPA 2004). The process attained greater than 99% total PCBs removal or destruction, and the glass aggregate met the state of Wisconsin's requirements for beneficial reuse. Other vitrification technologies that historically converted waste materials to glass aggregate have been applied in NYS, and the resulting materials met the NYSDEC Beneficial Use Determination (BUD) requirements.

In October 2005, soil samples from a nearby dredge spoil disposal area, the Old Moreau Site (see Appendix A for location), were submitted to Minergy for initial screening tests to determine the feasibility of this technology (Minergy Corporation 2006). The results concluded that the mineral content of site soils is similar to those seen in other full-scale vitrification projects that were able to produce a glass aggregate end product and vitrification is an applicable technology for this site. Additional bench scale testing would be required to establish design parameters for full-scale implementation.

- **Effectiveness.** Ex-situ vitrification of soils is an effective method of treating PCB-contaminated soils. In addition, this action reduces/eliminates the potential for future contamination of groundwater from soil contamination.

- **Implementability.** Contractors are available to implement this technology. The system would be set up at a location central to the site and the soil would be transported to it. A benchscale study would be necessary prior to implementation of this technology.

- **Cost.** Estimated costs for vitrification obtained from Minergy range from $50 to $475 per CY (Minergy Corporation 2007 and 2003). Compared with other ex-situ treatment technologies, vitrification has a much greater up-front capital cost. There are some financial risks associated with this technology as a major cost-factor is the price of natural gas, which can fluctuate significantly over the life of the operation.

In summary, ex-situ vitrification is a moderate cost technology with proven effectiveness to remediate PCB contamination. However, since full-scale demonstration of this technology for remediation purposes has not been performed, vitrification will not be retained for further consideration.

3.3.5.2 Physical/Chemical Treatment

A number of ex-situ physical/chemical treatment processes for soils have been developed to chemically convert, separate, or contain waste constituents. These include dehalogenation (or dechlorination), soil washing, and solvent extraction as discussed below.

Dehalogenation

Dehalogenation is a chemical process that is achieved either by replacement of the halogen molecule of the organic compound or decomposition and partial volatilization of the contaminant through adding and mixing specific reagents. This technology typically consists of excavating, screening, and crushing the contaminated soils; mixing the soils with the reagent in a heated reactor; and then treating the wastewater or the volatilized contaminants. Two types of dehalogenation technologies exist: base-catalyzed decomposition (BCD) and glycolate/alkaline polyethylene glycol (APEG).

Glycolate technology involves the replacement of halogen molecules in the organic contaminant by mixing the contaminant with an APEG-type reagent (commonly potassium polyethylene glycol [KPEG]) in a heated reactor. The byproducts of the reaction include glycol ether and/or hydroxylated compound and an alkali metal, which are all water soluble. Typically, treatment and disposal of wastewater generated by the process is required. The APEG process has been successfully used and demonstrated for cleanup of contaminated soils containing PCBs ranging between 2 and 45,000 ppm.

- **Effectiveness.** This technology has been approved by EPA's Office of Toxic Substances under TSCA for PCB treatment, and has been selected for cleanup at three Superfund sites.

- **Implementability.** EPA has been developing the BCD technology since 1990, in cooperation with the Naval Facilities Engineering Service Center (NFESC), as a remedial technology specifically for soils contaminated with chlorinated organic compounds such as PCBs. Although this technology has been approved by EPA's Office of Toxic Substances under the TSCA for PCB treatment, and one successful test run in 1994 was completed, BCD has had no commercial application to date.

- **Cost.** Ex-situ dehalogenation is a high-cost technology with costs ranging from $440 to $1,100 per CY (FRTR 2002). Excavation and material handling cost would be higher with this alternative compared with more established technologies.

In summary, since dehalogenation was not commercially implemented on a large scale and is moderately expensive, this technology will not be considered.

Solvent Extraction

Solvent extraction is a chemical process whereby the target contaminant is physically separated from its medium (soil) using an appropriate organic solvent. This technology does not destroy the waste, but reduces the volume of material that must be treated. Solvent extraction is typically accomplished by homogeneously mixing the soil, flooding it with the solvent, then mixing thoroughly again to allow the waste to come in contact with the solution. Once mixing is complete, the solvent is drawn off by gravity, vacuum filtration, or some other conventional dewatering process. The solids are then rinsed with a neutralizing agent (if needed), dried, and placed back on site or otherwise treated/disposed of. Solvents and rinse water are processed through an on-site treatment system and recycled for further use. Solvent extraction has been shown to be effective in treating sediments, sludges, and soils containing primarily organic contaminants, such as PCBs, VOCs, halogenated solvents, and petroleum wastes.

- **Effectiveness.** An on-site demonstration of the solvent extraction technology was completed in 2000 at a similar site contaminated with PCBs. Although analytical results from the demonstration showed on average a greater than 99% total PCB removal, operational problems were encountered during start-up, and multiple extractions were needed to achieve the required cleanup criteria.

- **Implementability.** This technology was demonstrated successfully at a number of Superfund sites for PCB-contaminated soils and sediments. The performance data currently available are mostly from the Resource Conservation Company's (RCC's) full-scale Basic Extractive Sludge Treatment (BEST) process. However, full-scale application of the technology has been limited, especially with large volumes of soil as is the case at the SA 13 site. Additional concerns with this technology include the potential for presence of solvent in the treated soil, and regeneration and reuse of the spent solvent.

- **Cost.** The costs involved in the implementation of this technology would typically range between $275 to $1,300 per CY depending on site-specific conditions and volume of treated material (FRTR 2002).

In summary, solvent extraction has not been commercially implemented and is costly compared to other ex-situ treatment technologies. For these reasons, solvent extraction will not be retained for further consideration.

Soil Washing

Soil washing segregates the fine solid fractions from the coarser soils through an aqueous washing process and uses a wash water treatment system. Typically, soil washing has been used to remediate SVOCs, fuels, and heavy metals in soils, with limited success in remediating PCB-contaminated soils. This technology is based on the observation that the majority of contaminants are found adsorbed into the fine soils (typically silt and clay-size particles) due to their greater specific surface area. The finer, contaminated fraction of soils would require further treatment/disposal. The coarser soils (expected to be relatively free of contamination) would be backfilled on site once site cleanup goals have been achieved, which might require the soil to pass through the soil washing process multiple times. This alternative, on average, returns 80 to 90% of the treated soil or sediment back to its source. Commercially available surfactants are commonly used in the aqueous washing solution to transfer contaminants from the soil matrix to the liquid phase. Bench-scale studies are generally required prior to implementation of a full-scale soil washing operation to determine site-specific parameters and selection of surfactant(s).

- **Effectiveness.** Soil washing offers the ability to clean a wide range of contaminants from coarse-grained soils. However, the effectiveness of the technology decreases with complex waste mixtures, which make choosing the washing fluid difficult. However, because contaminated site soils are primarily glacial deposits that consist of unsorted glacial till and lacustrine deposits of gravel, sand, silt, and clay as opposed to exclusively finer soils, soil washing is expected to be effective in reducing the volume of contaminated on-site soils.

- **Implementability.** Bench-scale studies are generally required prior to implementation of a full-scale soil washing operation to determine site-specific parameters and selection of surfactant(s). The equipment for this process would be fairly inexpensive, readily available, and mobile.

- **Cost.** Ex-situ soil washing is a moderate cost technology with costs ranging between $333 to $444 per CY depending on the site conditions, target waste quantity, and concentration (FRTR 2002).

In summary, there is not a high level of confidence in the effectiveness of soil washing of PCB-contaminated soil. Furthermore, since the cost to construct an on-site processing facility and the cost to operate the facility for the contaminated volume are high, ex-situ soil washing is not feasible at this site. Therefore, ex-situ soil washing will not be retained for further consideration.

3.3.6 On- and Off-Site Disposal

Land disposal of contaminated wastes has historically been the most common remedial action for hazardous waste sites. The two disposal options: on-site disposal in a constructed landfill, or off-site disposal in a commercial facility.

3.3.6.1 On-Site Disposal

On-site disposal of material classified as hazardous waste by NYS Hazardous Waste Regulations and TSCA, requires construction of a secure landfill that meets RCRA and state requirements. These requirements include the following:

1. The landfill must be designed so that the local groundwater table will not be in contact with the landfill;

2. The landfill must be lined with, natural and synthetic material of low permeability to inhibit leachate migration;

3. A low permeability cover must be employed to limit infiltration and leachate production; and

4. Periodic monitoring of surface water, groundwater, and soils adjacent to the facility must be conducted to confirm the integrity of the liner and leachate collection system.

- **Effectiveness.** Construction of an on-site landfill would be an effective technology because it would limit the direct contact with and mobility of the contaminated material.

- **Implementability.** The implementability of this option is limited by the shallow groundwater table, the high volume of contaminated soil at the site, and the anticipated difficulty in meeting permit requirements.

- **Cost.** The costs involved in a construction of an on-site landfill are high.

In summary, migration of soil contamination into groundwater is not a significant transport mechanism and containment of the waste material could be achieved by capping. Therefore, construction of an on-site landfill is not warranted. On-site disposal of contaminated materials will not be retained as an applicable technology.

3.3.6.2 Off-Site Disposal

Off-site disposal of contaminated soils and sediments involves hauling excavated materials to an appropriate commercially licensed disposal facility. The type of disposal facility depends on whether the waste is considered hazardous or non-hazardous. Waste material classified as hazardous waste may only be disposed of in an RCRA-permitted facility. In accordance with New York State Hazardous Waste Regulations and TSCA, materials containing PCBs at or above 50 ppm (if excavated and removed from the site), are subject to regulation as both hazardous waste and TSCA waste. Contaminated waste materials containing less than 50 ppm of PCBs are considered non-hazardous waste, and can be disposed of in a non-hazardous/solid waste facility.

- **Effectiveness.** Excavation and disposal of contaminated soil at a permitted landfill is an effective method of reducing potential for direct contact with contaminated soils. In addition, this action reduces the potential for future contamination of groundwater.

- **Implementability.** Contractors and disposal facilities are available to implement both disposal options.

- **Cost.** The cost for disposal of contaminated soils ranges between $100 and $150 per CY for non-hazardous soils and $200 to $300 per CY for hazardous soils (Waste Management 2007).

In summary, off-site disposal of contaminated materials in an off-site permitted disposal facility is a demonstrated alternative which effectively reduces exposure risks and provides long-term protection of human health and the environment. For these reasons, off-site disposal will be retained as an applicable alternative.

Table 3-1 Summary of Soil Remedial Technologies, Special Area 13 Dredge Spoil Disposal Area

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Screening
No Action			
	No further action to remedy soil conditions at the site.	Ineffective for the protection of human health and the environment.	Yes
Institutional Controls and Long Term Monitoring			
	Include public notification, deed restrictions, fencing, and signs.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	Yes
Containment			
Capping			
Bituminous Concrete Cover (Asphalt)	Selective excavation and/or standard asphalt cover system including layer of stone, asphalt binder course and final wearing course.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	No
Soil Cover	Selective excavation and/or clap cap system	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	Yes
6 NYCRR Part 360 Cap	Selective excavation and/or non-RCRA cap typically used to close Municipal Solid Waste Landfills.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	No
6 NYCRR Part 373 (RCRA) Cap	Selective excavation and/or RCRA cap typically required at Hazardous Waste Sites.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	No
In Situ Treatment			
Thermal			
Thermally Enhanced Soil Vapor Extraction (SVE)	Uses electrical resistance/electromagnetic/radio frequency heating, or hot-air steam injection to facilitate volatilization and extraction of the contaminant vapors.	SVE is not effective in removing non-volatile organics such as PCBs.	No
Thermal Desorption (thermal blankets and wells)	Thermal blankets and thermal wells are placed on contaminated ground surface. A majority of contaminants are vaporized out by thermal conduction. Vapors are drawn out by vacuum system, oxidized, cooled, and passed through activated carbon beds.	More expensive than other established remedial technologies.	No

Table 3-1 Summary of Soil Remedial Technologies, Special Area 13 Dredge Spoil Disposal Area

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Screening
Vitrification (ISV)	Contaminated soils are melted at extremely high temperatures using probes inserted into the ground delivering an electric current. The soil is heated to extremely high temperatures, and are cooled to form a stable, glassy crystalline mass.	Only a few commercial applications of this technology exist. Treatability studies are generally required to determine the effectiveness of ISV as a remediation technology at a given site. End product of the technology may hinder future site use, and there is relatively high implementa-tion cost.	No
Physical/Chemical			
Solidification/stabilization	Solidification/stabilization treatment systems, sometimes referred to as fixation systems, seek to trap or immobilize contaminants within their "host" medium using chemical reactions instead of removing them through chemical or physical treatment.	Stabilization technologies have not been successfully demonstrated on a full-scale basis for treating organics. Solidified material may hinder future site use. Treatability studies would be required prior to implementing this technology.	No
Soil Flushing	An extraction process by which organic and inorganic contaminants are washed from contaminated soils through the injection of an aqueous solution into the area of contamination, and the contaminant elutriate is pumped to the surface and removed from the site.	Capture of the impacted solution is critical to the effectiveness of this technology. Contamination depths and PCBs strong tendency to adhere to soil particles may limit this technology’s effective-ness.	No
Biological Treatment	Uses indigenous or selectively cultured microorganisms to reduce hazardous organic compounds into water, carbon dioxide, and chlorinated hydrogen chloride.	Biological treatment technologies are not well demonstrated for PCBs. This technology also involves a relatively longer remediation period compared to other treatment technologies.	No
Ex-Situ Treatment			
Thermal			
High Temperature Thermal Desorption (HTTD)	A physical separation process that uses heat to volatilize organic wastes, which are collected and treated in a gas treatment system.	Moderate cost, full-scale technology that has been successfully demonstrated in the field for treatment of PCB contaminated soils. HTTD units are permitted as incinerators.	Yes
Incineration	Uses high temperatures to volatilize and destroy organic contaminants and wastes.	A moderate cost technology that has a demonstrated success; however, the public is generally adverse to this technology.	No

Table 3-1 Summary of Soil Remedial Technologies, Special Area 13 Dredge Spoil Disposal Area

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Screening
Vitrification	Thermally vitrifies and destroys PCBs at high temperatures using a gas/oxygen power source. Soils are excavated and stockpiled, and a fluxing agent is introduced to aide in the melting process.	Medium-to-high cost technology that is successful in destroying PCBs. The inert glass aggregate byproduct can be returned to the site for backfill or can be sold as a construction aggregate. However, full-scale demonstration of this technology for remediation purposes has not been performed.	No
Physical/Chemical			
Dehalogenation	A chemical process that is achieved either by replacement of the halogen molecule of the organic compound or decomposition and partial volatilization of the contaminant through adding and mixing specific reagents.	Although EPA has been developing this technology since 1990, it has not yet been successfully demonstrated in a commercial application.	No
Solvent Extraction	A chemical extraction process whereby the target contaminant is physically separated from the soil using an appropriate organic solvent to dissolve PCBs.	This technology has not been commercially implemented, and may require multiple extractions so that solvent-contaminated soils are not returned to the site.	No
Soil Washing	A volume reduction technology that segregates the fine solid fractions from the coarser soils through an aqueous washing process and washing water treatment system.	There is not a high level of confidence in the effectiveness of soil washing of PCB contaminated soil and the costs to construct and operate an on-site processing facility are high.	No
On- and Off-Site Disposal			
On-Site Disposal	Requires construction of a secure landfill that meets RCRA and state requirements.	Migration of soil contamination into groundwater is not a significant transport mechanism and containment of the waste material in an on site landfill is not necessary.	No
Off-Site Disposal	Involves the excavation and hauling of contaminated material to appropriate commercially licensed disposal facilities. The non-hazardous spoils would go to a non-haz/solid waste facility, while the hazardous spoils would go to a RCRA-permitted facility.	Excavation and disposal of contaminated soil at a permitted landfill is an effective method of reducing potential for direct contact with contaminated soils and future contamination of the groundwater. Backfill materials would need to be imported to fill the site.	Yes

4 Identification of Alternatives

This section combines the technologies selected in Section 3 into alternatives. As directed by NYSDEC, alternatives have been identified for the three distinct units of soil contamination at the SA 13 site: the Capped Landfill cell, covered spoils (First and Second Fill areas), and uncovered spoils (Second and Third Fill areas). The alternatives for each unit are briefly described below. A detailed description and evaluation of the alternatives is presented in Section 5.

4.1 Capped Landfill Cell

4.1.1 Alternative No. 1: No Action

The no-action alternative was carried through the FS for comparison purposes as required by the NCP. This alternative would be acceptable only if it is demonstrated that the contamination at the site is below the RAOs, or that natural processes will reduce the contamination to acceptable levels. This alternative does not include institutional controls.

4.1.2 Alternative No. 2: No Further Action with Site Management

This alternative consists of using ECs such as the existing landfill cap, fencing, and signage to further restrict human contact with site soils. ICs and monitoring would also be implemented to maintain the integrity of the cover system.

4.1.3 Alternative No. 3: Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and On-Site Treatment by High Temperature Thermal Desorption

This alternative consists of excavation and thermal treatment of contaminated soils from the Capped Landfill Cell that exceed the site cleanup goals. An on-site HTTD system was selected to thermally treat the contaminated soils. This process applies heat to the contaminated material and volatilizes the contaminants (i.e., physical separation process). The resulting gas stream is then collected and treated separately. An Air Pollution Control System (APCS) would also be included as part of the treatment system to ensure that the air emissions meet regulatory criteria prior to discharge into the atmosphere.

4.1.4 Alternative No. 4: Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and Off-Site Disposal of the Dredge Spoils and Impacted Soils

This alternative consists of excavation and off-site disposal of contaminated soils that exceed the site cleanup goals. The excavated material would be stockpiled, sampled, and disposed of accordingly. As maximum PCB concentrations in soil at the site were detected below 50 ppm, contaminated soils are considered non-hazardous waste and are anticipated to be disposed of in a non-hazardous/solid waste facility.

4.2 Uncovered Spoils (Second and Third Fill areas)

4.2.1 Alternative No. 1: No Action

The no-action alternative was carried through the FS for comparison purposes as required by the NCP. This alternative would be acceptable only if it is demonstrated that the contamination at the site is below the RAOs, or that natural processes will reduce the contamination to acceptable levels. This alternative does not include institutional controls.

4.2.2 Alternative 2: Cover Uncovered Spoils in Place

This alternative consists of placement of a soil cover on the Second Fill Area – Uncovered Spoils and Third Fill Area – Morrison Property. The soil cover would consist of a demarcation layer, at least12 inches of soil over the contaminated material (including topsoil), and a vegetated surface. Typically, the thickness of the layer is between 1 and 5 feet. OM&M would be required to maintain the soil cover. Additional ECs such as fencing and signage would be used as a physical barrier to control site access, and ICs consisting of access/use and deed restrictions will be implemented at the site to limit the potential for human exposure to contaminated site soils.

4.2.3 Alternative 3: Excavation and Off-Site Disposal to meet Unrestricted SCGs in Third Fill Area (Residential Parcel), Soil Cover with Site Management for Second Fill Area – Uncovered Spoils

This alternative consists of excavation and off-site disposal of contaminated soils from the Third Fill area – Morrison Property that exceed the site cleanup goals. The excavated material would be stockpiled, sampled, and disposed of accordingly. As maximum PCB concentrations in soil at the site were detected below 50 ppm, contaminated soils are considered non-hazardous waste and are anticipated to be disposed of in a non-hazardous/solid waste facility.

In addition, a soil cover would be placed on the areas referred to as the Second Fill Area – Uncovered Spoils that are outside the covered materials placed in association with the construction of the General Electric Work Support Marina facility for the Hudson River PCBs site remedial dredging project. The ICs alternative would consist of access/use and deed restrictions at the site to limit the potential for human exposure to contaminated site soils. ECs such as fencing and signage would be used as a physical barrier and as a warning to further restrict human contact with site soils. Lastly, OM&M would include maintaining the soil cover and monitoring of existing groundwater wells located along the Hudson River to demonstrate that PCBs do not migrate into the river.

4.2.4 Alternative 4: Excavation and On-Site Treatment to meet Unrestricted SCGs in Third Fill Area (Residential Parcel), Soil Cover with Site Management for Second Fill Area – Uncovered Spoils

This alternative consists of excavation and thermal treatment of contaminated soils from the Third Fill Area that exceed the site cleanup goals. An on-site HTTD system was selected to thermally treat the contaminated soils. This process applies heat to the contaminated material and volatilizes the contaminants (i.e., physical separation process). The resulting gas stream is then collected and treated separately. An APCS would also be included as part of the treatment system to ensure that the air emissions meet regulatory criteria prior to discharge into the atmosphere.

In addition, a soil cover would be placed on the areas referred to as the Second Fill Area – Uncovered Spoils that are outside the covered materials placed in association with the construction of the General Electric Work Support Marina facility for the Hudson River PCBs site remedial dredging project. The ICs alternative would consist of access/use and deed restrictions at the site to limit the potential for human exposure to contaminated site soils. ECs such as fencing and signage would be used as a physical barrier and as a warning to further restrict human contact with site soils. Lastly, OM&M would include maintaining the soil cover and monitoring of existing groundwater wells located along the Hudson River to demonstrate that PCBs do not migrate into the river.

4.2.5 Alternative 5: Excavation and Off-Site Disposal of Uncovered Spoils

This alternative consists of excavation and off-site disposal of contaminated soils that exceed the site cleanup goals. The excavated material would be stockpiled, sampled, and disposed of accordingly. As maximum PCB concentrations in soil at the site were detected below 50 ppm, contaminated soils are considered non-hazardous waste and are anticipated to be disposed of in a non-hazardous/solid waste facility.

4.3 Covered Spoils

4.3.1 Alternative No. 1: No Action

The no-action alternative was carried through the FS for comparison purposes as required by the NCP. This alternative would be acceptable only if it is demonstrated that the contamination at the site is below the RAOs, or that natural processes will reduce the contamination to acceptable levels. This alternative does not include institutional controls.

4.3.2 Alternative 2: No Further Action with Site Management

This alternative consists of OM&M to maintain the existing soil cover in the First Fill Area and the asphalt cover in the Second Fill Area - Covered Spoils, additional ECs such as fencing and signage to be used as a physical barrier to control site access, and ICs consisting of access/use and deed restrictions will be implemented at the site to limit the potential for human exposure to contaminated site soils.

4.3.3 Alternative 3: Excavation and Off-Site Disposal of Covered Spoils

This alternative consists of excavation and off-site disposal of contaminated soils from the First Fill Area and the Second Fill Area – Covered spoils that exceed the site cleanup goals. The excavated material would be stockpiled, sampled, and disposed of accordingly. As maximum PCB concentrations in soil at the site were detected below 50 ppm, contaminated soils are considered non-hazardous waste and are anticipated to be disposed of in a non-hazardous/solid waste facility.

5 Detailed Analysis of Alternatives

5.1 Introduction

The purpose of the detailed analysis of remedial action alternatives is to present the relevant information for selecting a remedy for the site. In the detailed analysis, the alternatives established in Sections 4 are described in detail and evaluated on the basis of environmental benefits and costs using criteria established by NYSDEC in CP-51, DER-10, and 6 NYCRR Part 375. This approach is intended to provide needed information to compare the merits of each alternative and select an appropriate remedy that satisfies the remedial action objectives for the site.

5.1.1 Detailed Evaluation of Criteria

This section first presents a summary of 10 evaluation criteria that were used to evaluate the alternatives.

Overall Protection of Human Health and the Environment

This criterion provides an overall assessment of protection of human health and the environment and is based on a composite of factors assessed under the evaluation criteria, especially short-term effectiveness, long-term effectiveness and performance, and compliance with cleanup goals.

Compliance with SCGs

This criterion is used to evaluate the extent to which each alternative may achieve the proposed cleanup goals. The proposed cleanup goals were developed based on SCGs presented in Section 2.

Short-Term Impacts and Effectiveness

This criterion addresses the impacts of the alternative during the construction and implementation phase until the RAOs are met. Factors to be evaluated include protection of the community during the remedial actions; protection of workers during the remedial actions; and the time required to achieve the RAOs. Several alternatives described within the following sections may not be effective in meeting RAOs in less than 30 years. Therefore, references to short-term impacts and effectiveness may include discussions of impacts/effectiveness over a period of 30 years.

Long-Term Effectiveness and Permanence

This criterion addresses the long-term protection of human health and the environment after completion of the remedial action. An assessment is made of the effectiveness of the remedial action in managing the risk posed by untreated wastes and/or the residual contamination remaining after treatment and the long-term reliability of the remedial action.

Reduction of Toxicity, Mobility, and Volume through Treatment

This criterion addresses NYSDEC's preference for selecting "remedial technologies that permanently and significantly reduce the toxicity, mobility, and volume" of the contaminants of concern at the site. This evaluation consists of assessing the extent to which the treatment technology destroys toxic contaminants, reduces mobility of the contaminants using irreversible treatment processes, and/or reduces the total volume of contaminated media.

Implementability

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of services and materials required during implementation. Technical feasibility refers to the ability to construct and operate a remedial action for the specific conditions at the site and the availability of necessary equipment and technical specialists. Technical feasibility also considers construction and O&M difficulties, reliability, ease of undertaking additional remedial action (if required), and the ability to monitor effectiveness. Administrative feasibility refers to compliance with applicable rules, regulations, and statutes and the ability to obtain permits or approvals from government agencies or offices.

Cost

The estimated capital costs, long-term O&M costs, and environmental monitoring costs are evaluated. The estimates included herein (unless otherwise noted) assume engineering and administrative costs would equal 10% of the capital costs and contingency costs would equal 15% of the capital costs. A present-worth analysis is made to compare the remedial alternatives on the basis of a single dollar amount for the base year. For the present-worth analysis, assumptions are made regarding the interest rate applicable to borrowed funds and the average inflation rate. According to the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, the Superfund program recommends that a discount rate of 5% before taxes and after inflation be assumed. Also, the CERLA guidance states that in general, the period of performance for costing purposes should not exceed 30 years for the purpose of the detailed analysis. Therefore, the following detailed analysis of remedial alternatives will follow this guidance. The comparative cost estimates are intended to reflect actual costs with an accuracy of +50% to –30%.

State Acceptance

This assessment evaluates the technical and administrative issues and concerns the state may have regarding each alternative. This criterion will be addressed in the record of decision (ROD) once comments are received on the proposed plan. Therefore, state acceptance will not be discussed further in this report.

Community Acceptance
This assessment evaluates the issues and concerns the public may have regarding each alternative. This criterion will be addressed in the ROD once comments on the proposed plan have been received. Therefore, community acceptance will not be discussed further in this report.

Land Use
The land use criterion evaluates the issues and concerns regarding the current, intended, and reasonably anticipated future land uses of the site. Other considerations include the sites' surroundings, compatibility with applicable zoning laws, compatibility with comprehensive community master plans and Local Waterfront Revitalization plans, proximity to incompatible property in proximity to the site, accessibility to existing infrastructure, and a number of other concerns as identified in 6 NYCRR Part 375-1.

A detailed description of the alternatives listed in Section 4 and evaluation criteria are described below. Cost estimates for each alternative are presented in Tables 5-1 through 5-9. Table 5-10 presents a summary of costs for all alternatives.

5.2 Remedial Alternatives for the Capped Landfill Cell

5.2.1 Cell Alternative No. 1: No Further Action

5.2.1.1 Detailed Description

The no-action alternative involves taking no further action to remedy site conditions. The NCP at 40 CFR §300.430(e) (6) provides that the no-action alternative be considered at every site as a baseline for comparison with other alternatives. This alternative does not include remedial action, institutional or engineering controls, or long-term monitoring.

5.2.1.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment
This alternative is not protective of human health and the environment, because the site would remain in its present condition. Soils contamination exceeding target risk levels and regulatory levels will continue to exist at the site and will be available for potential future exposure. Uncontrolled excavations could lead to PCB exposure and, therefore, risk to human health. In addition, direct contact and ingestion exposure of contaminated soil by certain wildlife may be a risk.

Compliance with SCGs
The contaminants (PCBs) are resistant compounds by nature and are not expected to decrease appreciably over time. Therefore, this alternative would not comply with the chemical-specific SCGs for the site.

Short-Term Impacts and Effectiveness

No short-term impacts (other than those existing) are anticipated during the implementation of this alternative since there are no remedial activities involved.

This alternative does not include source removal or treatment of the Capped Landfill Cell and would not meet the RAOs (as defined in Section 2.3) in a reasonable or predictable timeframe.

Long-Term Effectiveness and Permanence

Because this alternative does not involve removal or treatment of the contaminated soil, the volume of contamination, risks associated with direct contact and ingestion with the soil, and migration of contaminants to groundwater will essentially remain the same. This alternative is, therefore, not effective in the long-term.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative does not involve removal or treatment of contaminated soil, and, therefore, the toxicity, mobility, and volume of contamination will not be reduced.

Implementability

There are no actions to implement under this alternative.

Cost

There are no costs associated with this alternative for the Capped Landfill Cell.

Land Use

The SA 13 site occupies portions of three property parcels: the majority of the site, including the fenced area and the northern property used as a boat-launch, is owned by New York State. The third parcel, located in the southwest portion of the site is on private property. Based on the Town of Moreau zoning maps (Town of Moreau 1989), the non-residential portions of the site are zoned as manufacturing (or industrial) with future use as commercial. NYSDEC indicated that the future use at the site may be for public recreation. Based on current zoning, implementation of this alternative would limit future uses at this site.

5.2.2 Cell Alternative No. 2: No Further Action with Site Management

5.2.2.1 Detailed Description

OM&M for this alternative would primarily include maintaining the soil cover and LTM of existing groundwater wells. The groundwater wells that would be included in the LTM program are those located along the Hudson River between the river and the dredge spoil areas. The groundwater gradient in this area conveys water toward the Hudson River, so LTM of these wells could aid the evaluation of PCB migration into the river from groundwater recharge.
ECs such as the existing capped landfill cell, fencing, and signage would be used as a physical barrier and as a warning to further restrict human contact with site soils. Lastly, ICs would consist of access/use and deed restrictions at the site to limit the potential for human exposure to contaminated site soils.

Under CERCLA 121 (c) five-year reviews should be conducted for sites that implement remedial actions that, upon completion, would leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative would result in PCB concentrations above the 6 NYCRR Part 375 unrestricted use cleanup objective of 0.1 ppm, five-year reviews would be required at the site.

5.2.2.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

Although contamination will remain on site, this alternative will be protective of human health, since the existing landfill cover system will significantly reduce the potential for direct human and wildlife exposure. However, this alternative is not designed to reduce the potential for migration of the contaminants in the saturated zone.

Compliance with SCGs

The contaminant levels in soil are not expected to decrease appreciably over time. Therefore, this alternative would not comply with the chemical-specific SCGs for the site. Action-specific and location-specific SCGs (e.g., safety regulations) would be included in the institutional controls and complied with for site activities.

Short-Term Impacts and Effectiveness

No short-term impacts (other than those existing) are anticipated during the implementation of this alternative since there are no remedial activities involved.

Provided that the OM&M, ECs and ICs are enforced, this alternative would meet the RAO to “Prevent migration of contaminants that would result in groundwater or surface water contamination.”

Long-Term Effectiveness and Permanence

This alternative would not be effective in the long term (in terms of protecting human health and the environment) because this alternative does not involve removal or treatment of contaminated soil. In addition, the potential for contaminant migration via erosion, while reduced, would still remain. Deed or other restrictions would be effective in the long term as long as they are interpreted correctly, unchanged by future site users, and enforced.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative does not involve removal or treatment of contaminated soil, and, therefore, the toxicity, mobility, and volume of contamination would not be reduced.

Implementability

This alternative can be readily implemented using standard construction means and methods.

Cost

The 2012 total present value cost of this alternative for the Capped Landfill Cell, based on a 30 year period is $302,000. Table 5-1 presents the quantities, unit costs, and subtotal cost for the various work items in this alternative.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning, implementation of this alternative would limit future uses at this site.

5.2.3 Cell Alternative No. 3: Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and On-Site Treatment by High Temperature Thermal Desorption

5.2.3.1 Detailed Description

This alternative involves excavation and on-site thermal treatment of contaminated soils to unrestricted SCGs (0.1 ppm PCBs). Figure 5-2 presents the anticipated layout of the processing facility and associated features at the site while Figure 5-3 presents a conceptual process for this alternative. As indicated in Section 2.4.3, a total of approximately 119,800 CY of soil (less a portion of the existing cap) would be excavated from the site and hauled to an HTTD unit for on-site treatment. The existing cap soils are clean and would be stockpiled without treatment for use as backfill. It is assumed that the existing monitoring wells would be decommissioned, without replacement, in the excavated areas as groundwater monitoring is not included in this alternative.

Excavation of the contaminated soil would be performed using conventional construction equipment primarily limited to a hydraulic excavator and bulldozers. As shown in Figure 5-2, the excavation area extent is the existing fenced area. The maximum depth of excavation in the excavation area would be approximately 17 feet BGS. The top 1 foot of soil, currently used as cover material over the existing landfill, is considered uncontaminated material and would be excavated and set aside for later use as backfill. To ensure safe working conditions in the excavation, cutback of the excavation or shoring would be required meeting Occupational Safety and Health Administration (OSHA) requirements. Based on a cutback slope of 3:1, EEEPC estimated that approximately 8,000 CY of clean soil would need to be excavated from the site. In addition, excavation at this site may require a permit as portions of excavation are located in existing wetlands (area to the south).

During the excavation process, PCB field screening tests would be used in accordance with 40 CFR 761.61, analytical sampling for metals, and the approval of NYSDEC's construction oversight inspector to verify contamination levels. The goal would be to determine if the remaining soil has PCB or metals levels above cleanup criteria, thus requiring additional excavation, or providing documentation that additional excavation is not necessary if the results indicate that PCB and metals levels are less than the respective clean-up goals. A sampling grid would be developed over the soil area for the NYSDEC construction oversight inspector's approval.

Excavated soil would be placed in storage piles near the treatment unit. While awaiting treatment, the storage piles would be mechanically mixed (typically a front-end loader). For costing purposes, it is assumed that the material would contain 85% solids or greater and dewatering (or drying) of this material would not be required. Based on discussions with a HTTD vendor, the feed rate was estimated at 35 tons per hour. The HTTD unit is assumed to work continuously (24 hours per day, 365 days per year) to limit the thermal stress on the unit. Periodically, the HTTD unit would be shut down for regular maintenance. Assuming standard operating conditions, the system is anticipated to operate approximately 75% of the time.

Initially, the soil would be sent through a vibratory screen to remove particles 2.5 inches in diameter or greater. After screening, the soil would be fed by conveyor belt to the primary treatment unit, which would be an inclined rotary dryer. The material would be fed into the same end of the dryer as the fuel burner, which is typically called a "co-current feed system". Soils would be thermally treated using direct fired technology, that is, fire is directly applied to the surface of the contaminated soil. The incline of the unit is such that the "hot" gases would travel towards the elevated end for further treatment. Typically, soils would reach temperatures of 800° to 900°F within the rotary dryer. Combustion gas from the rotary dryer would then flow to dual cyclones where they would proceed to the secondary treatment unit (STU) and residual dust settles for ultimate disposal to the pugmill mixer. In the STU, combustion gases undergo high temperature thermal oxidation, which raises the temperature of the gases to 2,000°F. The gases are then cooled by an evaporative cooling chamber. After cooling, the air is moved to the baghouse where it is filtered and then released into the atmosphere. Figure 5-3 illustrates the conceptual process of the HTTD system.

For operation of the HTTD unit, several on-site utilities would be required. The connection to existing electrical lines is located along West River Road. Water would be needed to cool the air stream after the oxidizer and dust suppression. Discussions with the Town of Moreau concluded that the closest water and sanitary sewer lines are approximately 3 to 4 miles away from the site making connection difficult. Therefore, for costing purposes, it is assumed water would be extracted from the Hudson River. Lastly, natural gas connection is nearly a mile and a half away.

After treatment, the treated soil would be loaded into a pugmill mixer for a relatively homogeneous end product for ultimate placement as backfill in excavated areas. Prior to backfilling, water would be sprayed over the treated soil to allow for cooling and reduce wind dispersion. Based on contractor specifications, negligible soil loss is anticipated through the treatment process, and it was assumed no additional backfill would be imported to the site. Six inches of topsoil would be placed and graded to the final surface elevation. Once backfill operations are completed, the site would be restored to preconstruction conditions to include seeding and tree planting.

5.2.3.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is considered protective of human health and the environment since the contaminated material is excavated and thermally treated on site to meet site cleanup levels. Because the contaminants would be treated and destroyed, exposure risks associated with soil contamination would be eliminated.

Compliance with SCGs

This alternative would meet SCGs since the PCB contamination in site soils would be effectively treated to meet cleanup goals at the site. However, approval from the town must be obtained in order to process contaminated soils on site prior to implementation of this alternative. Applicable action- and location-specific SCGs including air discharge permits and requirements, noise limitations, wetland permits (as required), and OSHA regulations would be met during implementation of the alternative, or with inclusion and enforcement of site institutional controls.

Short-Term Impacts and Effectiveness

Several short-term impacts to the community and workers may arise during excavation of contaminated soil from the site. With this alternative, an increased risk to workers is imposed due to the equipment required to excavate the soil. Community impacts include dust and noise from equipment operation. Continuous operation of the HTTD system (24-hour) and construction equipment may increase noise impacts on the surrounding community. These noise impacts can be reduced through engineering controls such as noise barriers and mufflers attached to the HTTD unit. To minimize other short-term impacts, site access would be restricted during excavation and remediation activities. Health and safety measures, including air monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, would be in place to protect the workers and surrounding community. Action levels for the site would be set prior to any intrusive activities, and an appropriate correction action would be implemented if these action levels are exceeded.

This alternative involves treatment of contaminated soil at the site, so the RAOs would be achieved at the completion of this work. Excavation and thermal treatment of the contaminated soil is estimated to be complete in approximately 2 to 3 years. Additional time would be needed for engineering, design, mobilization/demobilization, etc.

Long-Term Effectiveness and Permanence

This alternative is considered to be an effective remedy in the long term, since contaminants in site soils would be destroyed using thermal treatment. Treated soil would meet site cleanup criteria, therefore, human health and environmental risks would be reduced to unrestricted site-use levels.

Reduction of Toxicity, Mobility, and Volume through Treatment

The volume of contamination would be reduced at the site because this alternative actively treats PCB contamination in site soils. Consequently, the toxicity and mobility of the contaminants would also be reduced.

Implementability

This alternative can be readily implemented using standard construction means and methods. A contractor specializing in thermal treatment systems would likely be employed for the operation of the thermal treatment system. Although start-up problems may be encountered and periodic downtime due to mechanical complexity, thermal treatment could reliably meet cleanup goals. Due to variability of the PCB and other parameter concentrations (e.g., presence of metals, debris) adjustment in operational parameters may be required to treat this material. This however should not affect the performance or implementability of the alternative. Monitoring and sampling of the HTTD system would be conducted during the treatment phase to ensure that site cleanup criteria are met and air discharge standards are not exceeded.

Cost

The 2012 total present-value cost of this alternative for the Capped Landfill Cell, based on a 30-year period is $32,821,000. Table 5-2 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Technology-specific costs were obtained from ESMI of New York in 2007 and escalated to 2012 present values using RS Means historical cost indices, while other cost estimating information was obtained from RS Means Cost Data series and engineering judgment. No long-term O & M costs are anticipated with this alternative.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning, implementation of this alternative would not limit future uses of the site.

5.2.4 Cell Alternative No. 4: Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and Off-Site Disposal of the Dredge Spoils and Impacted Soils

5.2.4.1 Detailed Description

This alternative involves excavation and off-site disposal of contaminated soils at the Capped Landfill Cell at SA 13 site (see Figure 5-4). The top 1 foot of contaminated soil from the existing landfill would be removed and stockpiled for use in restoring the site as this soil is considered uncontaminated. The contaminated soil below would be excavated, stockpiled, characterized, and properly disposed of at an offsite NYSDEC permitted facility. It is assumed that the existing monitoring wells would be decommissioned, without replacement, in the excavated areas as groundwater monitoring is not included in this alternative.

Due to the fact that contamination within this site does not exceed 50 ppm, according to NYS regulations the contaminated soil is considered to be a non-hazardous waste. As such non-hazardous soils would be disposed of at an acceptable solid waste landfill. Temporary facilities would be required for on-site storage of contaminated material after excavation. Clean fill including the previously removed clean soil would be used to backfill the excavated areas to bring final grades above the groundwater table.

Excavation of the contaminated soil, analytical testing, and dewatering would be performed as described in Alternative 3. Excavated soils that are contaminated would be stockpiled on plastic liners on site for characterization in accordance with disposal facility requirements. The contractor would be responsible for the characterization sampling, which would be conducted at a NYSDOH certified laboratory.

After the results of the characterization sampling are received, the soil would be cleared for disposal by the NYSDEC construction oversight inspector. For this alternative, lined and covered dump trucks were assumed at $45 per ton for transportation of the non-hazardous soil. Trucks would be weighed with an empty load. The soil would be loaded onto the trucks then weighed again to determine the loaded weight of the vehicle. The trucks would then transport the soil to the appropriate disposal facility.

Excavated soils with PCB concentrations less than 50 ppm are considered non-hazardous. These soils can be disposed of in a permitted NYSDEC approved non-hazardous/solid waste landfill. A number of disposal locations are available for non-hazardous soils. For example, Waste Management accepts soil with PCBs less than 50 ppm at a landfill in Fairport, New York. Due to the large volume of the excavation, disposal may be split among multiple facilities. For costing purposes, unit costs from this Waste Management facility with the understanding that landfill(s) closer to the site may be located at the design stage. The contractor would be responsible for characterization sampling in accordance with disposal facility requirements. At a minimum, EEEPC assumed that toxicity characteristic leaching procedure (TCLP), pesticides/PCB, polyaromatic hydrocarbon, RCRA ignitability, RCRA corrosivity, and RCRA reactivity analyses would be performed on samples collected every 1,000 CY. It is estimated that approximately 119,800 CY of contaminated soil (less a portion of the existing cap) would be excavated and disposed of as non-hazardous material. The existing cap soils are clean and would be stockpiled for use as backfill.

Following excavation and removal of designated soil from the site, an average 5-foot layer of imported and stockpiled clean fill would be placed and compacted in the excavation area to bring the final site grades above the groundwater table. Six inches of topsoil would be placed and graded to the final surface elevation. Once backfill operations are completed, the site would be restored to preconstruction conditions to include seeding and tree planting.

5.2.4.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment, since contaminated soils would be removed from the site and properly disposed of in an NYSDEC permitted facility. The contaminated soil would no longer present an exposure risk.

Compliance with SCGs

This alternative complies with SCGs since contaminated soils would be removed from the site and properly disposed of in an environmentally acceptable facility. Off-site disposal would comply with all applicable land disposal restrictions and analytical requirements. Action- and location-specific SCGs including noise limitations, wetlands permits (as required), and OSHA regulations would be in compliance with during implementation of this alternative or included and enforced with institutional controls.

Short-Term Impacts and Effectiveness

Several short-term impacts to the community and workers may arise during excavation of contaminated soil at the site, including dust, noise, and potential spills during handling and transportation of contaminants. To minimize short-term impacts, site access would be restricted during construction and remediation activities. Health and safety measures, including air monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, would be in place to protect the workers and surrounding residence and community. Action levels would be set prior to any intrusive activities, and an appropriate correction action would be implemented if these action levels are exceeded.

Off-site transportation of contaminated soil to the disposal facility would be performed by a licensed hauler. While there is a risk of spills due to accidents, this risk would be limited by using closed and lined containers for transport.

Because this alternative involves removal of the contaminated soil from the site and replacement with clean fill, site RAOs would be achieved at the completion of this work. The time to complete this alternative is estimated to be approximately 1 to 2 years.

Long-Term Effectiveness and Permanence

Removal and off-site disposal is considered to be an adequate and effective remedy in the long-term since the contaminated soil would no longer represent a human health or ecological risk.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative does not reduce the toxicity, mobility, or volume of contaminated soil through treatment. However, excavation and off-site disposal of contaminated soils would eliminate concerns associated with toxicity and mobility of the contaminants at the site. Since the non-hazardous soil would be disposed of in an engineered permitted facility, the mobility of the contaminants would be within acceptable limits and would be practically reduced.

Implementability

This alternative is readily implemented using standard construction means and methods. Contaminated soil would be excavated, tested, and disposed of at a non-hazardous waste facility. Several facilities have been identified which can accept the contaminated soil from the site. No capacity or availability problems have been identified, although disposal at multiple facilities may be required to handle the large volume of the excavation. Finally, no delay is anticipated in obtaining the necessary approvals from the state and local agencies for implementation of this alternative.

Cost

The 2012 total present-value cost of this alternative for the landfill cell based on a 30-year period is $28,344,000. Table 5-3 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Disposal costs were obtained from Waste Management, Inc. of New York in 2007 and escalated based on RS Means historical cost indices. Other cost estimating information was obtained from RS Means Cost Data series and engineering judgment. No long-term OM&M costs are anticipated with this alternative.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning, implementation of this alternative would not limit future uses at this site.

5.3 Remedial Alternatives for Uncovered Spoils

5.3.1 Uncovered Spoils Alternative No. 1: No Action

5.3.1.1 Detailed Description

The no-action alternative involves taking no further action to remedy site conditions. The NCP at 40 CFR §300.430(e) (6) provides that the no-action alternative be considered at every site as a baseline for comparison with other alternatives. This alternative does not include remedial action, institutional or engineering controls, or long-term monitoring.

5.3.1.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is not protective of human health and the environment, because the site would remain in its present condition. Soils contamination exceeding target risk levels and regulatory levels would continue to exist at the site and would be available for potential future exposure. Uncontrolled soil disturbance could lead to PCB exposure and, therefore, risk to human health. In addition, direct contact and ingestion exposure of contaminated soil by certain wildlife may be a risk.

Compliance with SCGs
The contaminants (PCBs) are resistant compounds by nature and are not expected to decrease appreciably over time. Therefore, this alternative would not comply with the chemical-specific SCGs for the site.

Short-Term Impacts and Effectiveness
No short-term impacts (other than those existing) are anticipated during the implementation of this alternative since there are no remedial activities involved.

This alternative does not include source removal or treatment of uncovered spoils and would not meet the RAOs (as defined in Section 2.3) in a reasonable or predictable timeframe.

Long-Term Effectiveness and Permanence
Because this alternative does not involve removal or treatment of the contaminated soil, the volume of contamination, risks associated with direct contact and ingestion with the soil, and migration of contaminants to groundwater would essentially remain the same. This alternative is, therefore, not effective in the long-term.

Reduction of Toxicity, Mobility, and Volume through Treatment
This alternative does not involve removal or treatment of contaminated soil, and, therefore, the toxicity, mobility, and volume of contamination would not be reduced.

Implementability
There are no actions to implement under this alternative.

Cost
There are no costs associated with this alternative for the uncovered spoils.

Land Use
Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning, implementation of this alternative would limit future uses at this site.

5.3.2 Uncovered Spoils Alternative No. 2: Cover Uncovered Spoils in Place

5.3.2.1 Detailed Description
This alternative consists of covering the uncovered spoils with a compacted soil cover. Specifically, the soil cover shall be placed on the Second Fill Area - Uncovered Spoils and the Third Fill Area (see Figure 5-5). The soil cover shall

be placed over the extent of contamination to a depth of at least 12 inches to limit the potential for human and wildlife exposure to the contaminated soils. The soil cover shall consist of a demarcation layer, at least 12 inches of clean soil, including 6 inches of topsoil, and a vegetated surface.

OM&M on the soil cover would be required to ensure continued reduction of potential exposures. Additional ECs such as fencing and signage would be used as a physical barrier and as a warning to further restrict human contact with site soils. ICs consisting of access/use and deed restrictions would also be implemented at the site to limit the potential for human exposure to contaminated site soils.

Under CERCLA 121 (c) five-year reviews should be conducted for sites that implement remedial actions that, upon completion, would leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative would result in PCB concentrations above the 6 NYCRR Part 375 unrestricted use cleanup objective of 0.1 ppm, five-year reviews would be required at the site.

5.3.2.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

Although contamination would remain on site, this alternative would be protective of human health, since the cover system would significantly reduce the potential for direct human and wildlife exposure. However, this alternative is not designed to reduce the potential for migration of the contaminants in the saturated zone.

In order to maintain protection of human health and the environment, institutional controls, such as restrictions on subsurface excavation of the covered area, would be implemented so that future uses of the site are consistent with the intent of the cover.

Compliance with SCGs

The contaminant levels in soil are not expected to decrease appreciably over time. Therefore, this alternative would not comply with the chemical-specific SCGs for the site. Action- and location-specific SCGs including noise limitations, wetlands permits (as required), and OSHA regulations would be incompliance with during implementation of this alternative.

Short-Term Impacts and Effectiveness

Short-term impacts on the community and workers (e.g., dust and noise) may arise during installation of the soil cover. To minimize short-term impacts, site access would be restricted during construction and remediation activities. Health and safety measures, including the use of appropriate personal protective equipment (PPE) and decontamination of equipment leaving the site, would be in place to protect site workers and the surrounding community. Action levels would be set prior to any intrusive activities, and an appropriate correction action would be implemented if these action levels are exceeded.

Because this alternative does not involve removal or treatment of contaminated soil from the site, site RAOs would be not be achieved at the completion of this work. Installation of the soil cover is estimated to be complete within one year. Additional time would be needed for engineering, design, mobilization/demobilization, etc.

This alternative meets the RAOs for public health and environmental protection. It reduces (to the extent practicable) the potential for direct human or wildlife contact or ingestion of contaminated soil. It also prevents the migration of contaminants that would result in groundwater or surface water contamination.

Long-Term Effectiveness and Permanence

This alternative would not be effective in the long term (in terms of protecting human health and the environment) because this alternative does not involve removal or treatment of contaminated soil. In addition, the potential for contaminant migration via erosion, while reduced, would still remain. However, the risks involved with direct contact with on-site contaminants would be limited to some extent. Deed or other restrictions would be effective in the long term as long as they are interpreted correctly, unchanged by future site users, and enforced.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative does not involve the removal or treatment of contaminated soil. Therefore, neither the toxicity, nor volume of contamination is expected to be reduced. However, the potential for migration of contaminants via erosion would be reduced.

Implementability

This alternative is readily implemented using standard construction means and methods. However, coordination with the EPA may be required if the alternative is implemented while the site is occupied (the EPA anticipated to use the site through 2014). No capacity or availability problems have been identified. Finally, no delay is anticipated in obtaining the necessary approvals from the state and local agencies for implementation of this alternative.

Cost

The 2012 total present-value cost of this alternative for uncovered spoils, based on a 30-year period is $589,000. Table 5-4 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Cost estimating information was obtained from RS Means Cost Data series and engineering judgment.

Land Use
Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning and anticipated future land use, implementation of this alternative would limit future uses at this property.

5.3.3 Uncovered Spoils Alternative No. 3: Excavation and Off-Site Disposal to meet Unrestricted SCOs in Third Fill Area (Residential Parcel), Soil Cover with Site Management for Second Fill Area – Uncovered Spoils

5.3.3.1 Detailed Description
This alternative consists of excavation and off-site disposal of contaminated soils from the Third Fill area – The Morrison Property that exceed the site cleanup goals above the unrestricted SCGs (see Figure 5-6). The excavated material would be stockpiled, sampled, and disposed of accordingly. As maximum PCB concentrations in soil at the site were detected below 50 ppm, contaminated soils are considered non-hazardous waste and are anticipated to be disposed of in a non-hazardous/solid waste facility.

Excavation on the residential property would occur in the same manner described in Section 5.2.3.1. EEEPC estimated that approximately 14,100 CY of contaminated soil would need to be excavated from the site. In addition, excavation at this site may require a permit as portions of excavation are located in existing wetlands (area to the south).

Based on the groundwater elevations collected during the RI (EEEPC 2012), dewatering may be necessary in portions of the site once depths of 7 feet or more (approximately 126 feet above mean sea level or less) are encountered. Means and methods of dewatering would be determined by the contractor's approach to the site work. EEEPC assumed the establishment of an on-site temporary water treatment system. Treated water would be appropriately discharged off site.

As part of this alternative, a soil cover shall be placed over contaminated soil in the Second Fill area – Uncovered Spoils (see Figure 5-6). The soil cover would be placed as described in Section 5.3.2.1. The ICs used in this alternative would consist of access/use and deed restrictions at the site to limit the potential for human exposure to contaminated site soils. ECs such as fencing and signage would be used as a physical barrier and as a warning to further restrict human contact with site soils. Lastly, OM&M on the soil cover would be required to ensure continued reduction of potential exposures.

Under CERCLA 121 (c) five-year reviews should be conducted for sites that implement remedial actions that, upon completion, would leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative would result in PCB concentrations above the 6 NYCRR Part 375 unrestricted use cleanup objective of 0.1 ppm, five-year reviews would be required at the site.

5.3.3.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment
At the Third Fill Area – Morrison Property, soil would be excavated to unrestricted SCGs and disposed of in an NYSDEC permitted facility. Therefore this alternative is protective of human health and the environment. The contaminated soil would no longer present an exposure risk.

In the Second Fill Area, where a soil cover would be placed, this alternative would be protective of human health and the environment, since the cover system would significantly reduce the potential for direct human and wildlife exposure. However, this alternative is not designed to reduce the potential for migration of the contaminants in the saturated zone.

In order to maintain protection of human health and the environment, institutional controls, such as restrictions on subsurface excavation of the covered area, would be implemented so that future uses of the site are consistent with the intent of the cover.

Compliance with SCGs
At the Third Fill Area, where excavation and offsite disposal would be implemented, this alternative complies with SCGs since contaminated soils would be removed from the site and properly disposed of in an environmentally acceptable facility. Off-site disposal would comply with all applicable land disposal restrictions and analytical requirements. Action- and location-specific SCGs including noise limitations, wetlands permits (as required), and OSHA regulations would be required during implementation of this alternative.

In the Second Fill Area, where a soil cover would be placed, this alternative would not comply with the chemical-specific SCGs for the site since contaminant levels in soil are not expected to decrease appreciably over time. Action-specific and location-specific SCGs (e.g., safety regulations) would be included in the institutional controls and complied with for site activities.

Short-Term Impacts and Effectiveness
Several short-term impacts to the community and workers may arise during excavation of contaminated soil and installation of the soil cover at the site. Furthermore, excavation on private property (near resident) may disturb/preclude activities from occurring at these areas during construction. Other impacts include dust, noise, and potential spills during handling and transportation of contaminants. To minimize short-term impacts, site access would be restricted during construction and remediation activities. Health and safety measures, including air monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, would be in place to protect the workers and surrounding community. Action levels would be set prior to any intrusive activities, and an appropriate correction action would be implemented if these action levels are exceeded.

Off-site transportation of contaminated soil to the disposal facility would be performed by a licensed hauler. While there is a risk of spills due to accidents, this risk would be limited by using closed and lined containers for transport.

This alternative meets the RAOs for public health and environmental protection in the soil cover area. It reduces (to the extent practicable) the potential for direct human or wildlife contact or ingestion of contaminated soil. It also prevents the migration of contaminants that would result in groundwater or surface water contamination.

Long-Term Effectiveness and Permanence

In the Third Fill Area, where excavation and offsite disposal would be implemented, removal and off-site disposal is considered to be an adequate and effective remedy in the long-term since the contaminated soil would no longer represent a human health or ecological risk. However, contaminated soil that remains on site under soil cover would not be effective in the long term (in terms of protecting human health and the environment) because this alternative does not involve removal or treatment of contaminated soil. In addition, the potential for erosion to occur would remain. On the other hand, the risks involved with direct contact with on-site contaminants would be limited to some extent. Deed or other restrictions would be effective in the long term as long as they are interpreted correctly, unchanged by future site users, and enforced.

Reduction of Toxicity, Mobility, and Volume through Treatment

In the Third Fill area, where excavation and offsite disposal would be implemented, this alternative does not reduce the toxicity, mobility, or volume of contaminated soil through treatment. However, excavation and off-site disposal of contaminated soils would eliminate concerns associated with toxicity and mobility of the contaminants at the site. Since the non-hazardous soil would be disposed of in an engineered permitted facility, the mobility of the contaminants would be within acceptable limits and would be practically reduced.

In the Second Fill Area, where a soil cover would be placed, this alternative does not involve the removal or treatment of contaminated soil. Therefore, neither the toxicity, nor volume of contamination is expected to be reduced. However, the mobility or the potential for migration of contaminants via erosion would be reduced.

Implementability

This alternative is readily implemented using standard construction means and methods. Contaminated soil would be excavated, tested, and disposed of at a non-hazardous waste facility. Several facilities have been identified which can accept the contaminated soil from the site. No capacity or availability problems have been identified. Finally, no delay is anticipated in obtaining the necessary approvals from the state and local agencies for implementation of this alternative.

Cost

The 2012 total present-value cost of this alternative for uncovered spoils based on a 30-year period is $4,851,000. Table 5-5 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Disposal costs were obtained from Waste Management, Inc. of New York in 2007 and escalated based on RS Means historical cost indices, while other cost estimating information was obtained from RS Means Cost Data series and engineering judgment. No long-term O & M costs are anticipated with this alternative.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning and anticipated future land use, implementation of this alternative would limit future uses at the site.

5.3.4 Uncovered Spoils Alternative No. 4: Excavation and On-Site Treatment to meet Unrestricted SCOs in Third Fill Area (Residential Parcel), Soil Cover with Site Management for Second Fill Area – Uncovered Spoils

5.3.4.1 Detailed Description

This alternative consists of excavation and thermal treatment of contaminated soils from the Third Fill Area – Morrison Property (see Figure 5-7) that exceed the site cleanup goals. An on-site HTTD system was selected to thermally treat the contaminated soils to achieve unrestricted SCGs. This process applies heat to the contaminated material and volatilizes the contaminants (i.e., physical separation process). The resulting gas stream is then collected and treated separately. An APCS would also be included as part of the treatment system to ensure that the air emissions meet regulatory criteria prior to discharge into the atmosphere.

As part of this alternative a soil cover shall be placed over contaminated soil in the Second Fill area – Uncovered Spoils (see Figure 5-7). The soil cover and the placement of the cover shall be as described in Section 5.3.2.1.

The ICs alternative would consist of access/use and deed restrictions at the site to limit the potential for human exposure to contaminated site soils. ECs such as fencing and signage would be used as a physical barrier and as a warning to further restrict human contact with site soils. Lastly, OM&M on the soil cover would be required to ensure continued reduction of potential exposures. OM&M would include monitoring of existing groundwater wells located along the Hudson River to demonstrate that PCBs do not migrate into the river.

EEEPC estimated that approximately 14,100 CY of contaminated soil would need to be excavated from the site.

Under CERCLA 121 (c) five-year reviews should be conducted for sites that implement remedial actions that, upon completion, would leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative would result in PCB concentrations above the 6 NYCRR Part 375 unrestricted use cleanup objective of 0.1 ppm, five-year reviews would be required at the site.

5.3.4.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

In the Third Fill area, where excavation and onsite treatment would be implemented, this alternative is considered protective of human health and the environment since the contaminated material is excavated and thermally treated on site to meet unrestricted site cleanup levels. Because the contaminants would be treated and destroyed, exposure risks associated with soil contamination would be eliminated.

In the Second Fill area-Uncovered Spoils, where a soil cover would be placed, this alternative would be protective of human health, since the cover system would significantly reduce the potential for direct human and wildlife exposure. However, this alternative is not designed to reduce the potential for migration of the contaminants in the saturated zone.

In order to maintain protection of human health and the environment, institutional controls, such as restrictions on subsurface excavation of the covered area, would need to be implemented so that future uses of the site are consistent with the intent of the cover.

Compliance with SCGs

In the Third Fill area, where excavation and onsite treatment would be implemented, this alternative would meet SCGs since the PCB contamination in site soils would be effectively treated to meet cleanup goals at the site. However, approval from the town must be obtained in order to process contaminated soils on site prior to implementation of this alternative. Applicable action- and location-specific SCGs including air discharge permits and requirements, noise limitations, wetland permits (as required), and OSHA regulations would be met during implementation of the alternative.

In the Second Fill area-Uncovered Spoils, where a soil cover would be placed, this alternative would not comply with the chemical-specific SCGs for the site since contaminant levels in soil are not expected to decrease appreciably over time. Action-specific and location-specific SCGs (e.g., safety regulations) would be included in the institutional controls and complied with for site activities.

Short-Term Impacts and Effectiveness

Several short-term impacts to the community and workers may arise during excavation of contaminated soil from the site. With this alternative, an increased risk to workers is imposed due to the equipment required to excavate the soil. Furthermore, excavation on private property (near resident) and recreational boat launch area may disturb/preclude activities from occurring at these areas during construction. Community impacts include dust and noise from equipment operation. Continuous operation of the HTTD system (24-hour) and construction equipment may increase noise impacts on the surrounding community. These noise impacts can be reduced through engineering controls such as noise barriers and mufflers attached to the HTTD unit. To minimize other short-term impacts, site access would be restricted during excavation and remediation activities. Health and safety measures, including air monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, would be in place to protect the workers and surrounding community. Action levels for the site would be set prior to any intrusive activities, and an appropriate correction action would be implemented if these action levels are exceeded.

This alternative involves treatment of contaminated soil at the site, so the preliminary remediation goals would be achieved at the completion of this work. Excavation and thermal treatment of the contaminated soil is estimated to be complete in approximately 1 to 2 years. Additional time would be needed for engineering, design, mobilization/demobilization, etc.

Long-Term Effectiveness and Permanence

In the Third Fill Area, where excavation and onsite treatment would be implemented, this alternative is considered to be an effective remedy in the long term, since contaminants in site soils would be destroyed using thermal treatment. Treated soil would meet site cleanup criteria, therefore, human health and environmental risks would be eliminated.

However, contaminated soil that remains on site under soil cover would not be effective in the long term (in terms of protecting human health and the environment) because this alternative does not involve removal or treatment of contaminated soil. In addition, the potential for contaminant migration via erosion, while reduced, would still remain. However, the risks involved with direct contact with on-site contaminants would be limited to some extent. Deed or other restrictions would be effective in the long term as long as they are interpreted correctly, unchanged by future site users, and enforced.

Reduction of Toxicity, Mobility, and Volume through Treatment

In the Third Fill area, where excavation and onsite treatment would be implemented, the volume of contamination would be reduced at the site because this alternative actively treats PCB contamination in site soils. Consequently, the toxicity and mobility of the contaminants would also be reduced.

In the Second Fill area-Uncovered Spoils, where a soil cover would be placed, this alternative does not involve the removal or treatment of contaminated soil. Therefore, neither the toxicity, nor volume of contamination is expected to be reduced. However, the potential for migration of contaminants via erosion would be reduced.

Implementability

This alternative can be readily implemented using standard construction means and methods. A contractor specializing in thermal treatment systems would likely be employed for the operation of the thermal treatment system. Although start-up problems may be encountered and periodic downtime due to mechanical complexity, thermal treatment could reliably meet cleanup goals. Due to variability of the PCB and other parameter concentrations (e.g., presence of metals, debris) adjustment in operational parameters may be required to treat this material. This however should not affect the performance or implementability of the alternative. Monitoring and sampling of the HTTD system would be conducted during the treatment phase to ensure that site cleanup criteria are met and air discharge standards are not exceeded.

Cost

The 2012 total present-worth cost of this alternative for uncovered spoils based on a 30-year period is $6,751,000. Table 5-6 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Technology-specific costs were obtained from ESMI of New York in 2007 and escalated based on RS Means historical cost indices, while other cost estimating information was obtained from RS Means Cost Data series and engineering judgment. No long-term O & M costs are anticipated with this alternative.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning and anticipated future land use, implementation of this alternative would limit future uses at this property.

5.3.5 Uncovered Spoils Alternative No. 5: Excavation and Off-Site Disposal of Uncovered Spoils

5.3.5.1 Detailed Description

This alternative involves excavation and off-site disposal of uncovered contaminated soils from the Second Fill Area – Uncovered Spoils and the Third Fill Area (see Figure 5-8) that exceed the unrestricted site cleanup goals (0.1 ppm PCBs). As maximum PCB concentrations in soil at the site were detected below 50 ppm, contaminated soils are considered non-hazardous waste and are anticipated to be disposed of in a non-hazardous/solid waste facility. The contaminated soil would be excavated, stockpiled, characterized, and properly disposed of off-site in the same method as described in Section 5.2.4.1.

5.3.5.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment since contaminated soils would be removed from the site and properly disposed of in an environmentally acceptable facility. The contaminated soil would no longer present an exposure risk.

Compliance with SCGs

This alternative complies with SCGs since contaminated soils would be removed from the site and properly disposed of in an environmentally acceptable facility. Off-site disposal would comply with all applicable land disposal restrictions and analytical requirements. Action- and location-specific SCGs including noise limitations, wetlands permits (as required), and OSHA regulations would be in compliance with during implementation of this alternative.

Short-Term Impacts and Effectiveness

Several short-term impacts to the community and workers may arise during excavation of contaminated soil at the site. Furthermore, excavation on private property (near resident) and recreational boat launch area may disturb/preclude activities from occurring at these areas during construction. Other impacts include dust, noise, and potential spills during handling and transportation of contaminants. To minimize short-term impacts, site access would be restricted during construction and remediation activities. Health and safety measures, including air monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, would be in place to protect the workers and surrounding community. Action levels would be set prior to any intrusive activities, and an appropriate correction action would be implemented if these action levels are exceeded.

Off-site transportation of contaminated soil to the disposal facility would be performed by a licensed hauler. While there is a risk of spills due to accidents, this risk would be limited by using closed and lined containers for transport.

Because this alternative involves removal of the contaminated soil from the site and replacement with clean fill, site RAOs would be achieved at the completion of this work. The time to complete this alternative is estimated to be approximately 1 to 2 years.

Long-Term Effectiveness and Permanence

Removal and off-site disposal is considered to be an adequate and effective remedy in the long-term since the contaminated soil would no longer represent a human health or ecological risk.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative does not reduce the toxicity, mobility, or volume of contaminated soil through treatment. However, excavation and off-site disposal of contaminated soils would eliminate concerns associated with toxicity and mobility of the contaminants at the site. Since the non-hazardous soil would be disposed of in an engineered permitted facility, the mobility of the contaminants would be within acceptable limits and would be practically reduced.

Implementability

This alternative is readily implemented using standard construction means and methods. Contaminated soil would be excavated, tested, and disposed of at a non-hazardous waste facility. Several facilities have been identified that can accept the contaminated soil from the site. No capacity or availability problems have been identified; however, due to the large volume, disposal at multiple facilities may be required. Finally, no delay is anticipated in obtaining the necessary approvals from the state and local agencies for implementation of this alternative.

Cost

The 2012 total present-worth cost of this alternative is based on a 30-year period is $9,479,000. Table 5-7 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Disposal costs were obtained from Waste Management, Inc. of New York in 2007 and escalated based on RS Means historical cost indices, while other cost estimating information was obtained from RS Means Cost Data series and engineering judgment. No long-term O & M costs are anticipated with this alternative.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning and intended future uses of the site, implementation of this alternative would not limit future uses at this site.

5.4 Remedial Alternatives for Covered Spoils

5.4.1 Covered Spoils Alternative No. 1: No Further Action

5.4.1.1 Detailed Description

The no-action alternative involves taking no further action to remedy site conditions. The NCP at 40 CFR §300.430(e) (6) provides that the no-action alternative be considered at every site as a baseline for comparison with other alternatives. This alternative does not include remedial action, institutional or engineering controls, or long-term monitoring.

5.4.1.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is not protective of human health and the environment, because the site would remain in its present condition. Soils contamination exceeding target risk levels and regulatory levels would continue to exist at the site and would be available for potential future exposure. Uncontrolled excavations could lead to PCB exposure and, therefore, risk to human health. In addition, direct contact and ingestion exposure of contaminated soil by certain wildlife may be a risk.

Compliance with SCGs

The contaminants (PCBs) are resistant compounds by nature and are not expected to decrease appreciably over time. Therefore, this alternative would not comply with the chemical-specific SCGs for the site.

Short-Term Impacts and Effectiveness

No short-term impacts (other than those existing) are anticipated during the implementation of this alternative since there are no remedial activities involved.

This alternative does not include source removal or treatment and would not meet the RAOs (as defined in Section 2.3) in a reasonable or predictable timeframe.

Long-Term Effectiveness and Permanence

Because this alternative does not involve removal or treatment of the contaminated soil, the volume of contamination, risks associated with direct contact and ingestion with the soil, and migration of contaminants to groundwater would essentially remain the same. This alternative is, therefore, not effective in the long-term.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative does not involve removal or treatment of contaminated soil, and, therefore, the toxicity, mobility, and volume of contamination would not be reduced.

Implementability

There are no actions to implement under this alternative.

Cost

There are no costs associated with this alternative.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning, implementation of this alternative would limit future uses at this site.

5.4.2 Covered Spoils Alternative No. 2: No Further Action with Site Management

5.4.2.1 Detailed Description

This alternative would consist of OM&M to maintain the cover placed over the First Fill Area and the Second Fill Area - Covered Spoils (see Figure 5-9). Additional ECs such as fencing and signage would be used as a physical barrier to control site access, and ICs consisting of access/use and deed restrictions and long-term monitoring would be implemented at the site to limit the potential for human exposure to contaminated site soils.

Under CERCLA 121 (c) five-year reviews should be conducted for sites that implement remedial actions that, upon completion, would leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative would result in PCB concentrations above the 6 NYCRR Part 375 unrestricted use cleanup objective of 0.1 ppm, five-year reviews would be required at the site.

5.4.2.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment
Although contamination would remain on site, this alternative would be protective of human health, since the cover system would significantly reduce the potential for direct human and wildlife exposure. However, this alternative is not designed to reduce the potential for migration of the contaminants in the saturated zone.

Compliance with SCGs
The contaminant levels in soil are not expected to decrease appreciably over time. Therefore, this alternative would not comply with the chemical-specific SCGs for the site. Action-specific and location-specific SCGs (e.g., safety regulations) would be included in the institutional controls and complied with for site activities.

Short-Term Impacts and Effectiveness
No short-term impacts (other than those existing) are anticipated during the implementation of this alternative since there are no remedial activities involved.

This alternative does not include source removal or treatment and would not meet the RAOs (as defined in Section 2.3) in a reasonable or predictable timeframe.

Long-Term Effectiveness and Permanence
This alternative would not be effective in the long term (in terms of protecting human health and the environment) because this alternative does not involve removal or treatment of contaminated soil. In addition, the potential for contamination migration via erosion, while reduced, would still remain. However, the risks involved with direct contact with on-site contaminants would be limited to some extent. Deed or other restrictions would be effective in the long term as long as they are interpreted correctly, unchanged by future site users, and enforced.

Reduction of Toxicity, Mobility, and Volume through Treatment
This alternative does not involve removal or treatment of contaminated soil, and, therefore, the toxicity, mobility, and volume of contamination would not be reduced.

Implementability
This alternative is readily implemented using standard construction means and methods. However, coordination with the EPA may be required if the alternative is implemented while the site is occupied (the EPA anticipated to use the site through 2014). No capacity or availability problems have been identified.

Finally, no delay is anticipated in obtaining the necessary approvals from the state and local agencies for implementation of this alternative.

Cost

The 2012 total present-value cost of this alternative, based on a 30-year period is $238,000. Table 5-8 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Cost estimating information was obtained from RS Means Cost Data series and engineering judgment.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning, implementation of this alternative would limit future uses at this site.

5.4.3 Covered Spoils Alternative No. 3: Excavation and Offsite Disposal of Covered Spoils

5.4.3.1 Detailed Description

This alternative involves excavation and off-site disposal of covered contaminated soils from the First Fill Area and the Second Fill Area - Covered Spoils (See Figure 5-10) that exceed the unrestricted site cleanup goals (0.1 ppm PCBs). As maximum PCB concentrations in soil at the site were detected below 50 ppm, contaminated soils are considered non-hazardous waste and are anticipated to be disposed of in a non-hazardous/solid waste facility. The contaminated soil would be excavated, stockpiled, characterized, and properly disposed of offsite in the same method as described in Section 5.2.2.1.

5.4.3.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment since contaminated soils would be removed from the site and properly disposed of in an environmentally acceptable facility. The contaminated soil would no longer present an exposure risk.

Compliance with SCGs

This alternative complies with SCGs since contaminated soils would be removed from the site and properly disposed of in an environmentally acceptable facility. Off-site disposal would comply with all applicable land disposal restrictions and analytical requirements. Action- and location-specific SCGs including noise limitations, wetlands permits (as required), and OSHA regulations would be in compliance with during implementation of this alternative.

Short-Term Impacts and Effectiveness

Several short-term impacts to the community and workers may arise during excavation of contaminated soil at the site. Furthermore, excavation on private property (near resident) and recreational boat launch area may disturb/preclude activities from occurring at these areas during construction. Other impacts include dust, noise, and potential spills during handling and transportation of contaminants. To minimize short-term impacts, site access would be restricted during construction and remediation activities. Health and safety measures, including air monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, would be in place to protect the workers and surrounding community. Action levels would be set prior to any intrusive activities, and an appropriate correction action would be implemented if these action levels are exceeded.

Off-site transportation of contaminated soil to the disposal facility would be performed by a licensed hauler. While there is a risk of spills due to accidents, this risk would be limited by using closed and lined containers for transport.

Because this alternative involves removal of the contaminated soil from the site and replacement with clean fill, site RAOs would be achieved at the completion of this work. The time to complete this alternative is estimated to be approximately 1 to 2 years.

Long-Term Effectiveness and Permanence

Removal and off-site disposal is considered to be an adequate and effective remedy in the long-term since the contaminated soil would no longer represent a human health or ecological risk.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative does not reduce the toxicity, mobility, or volume of contaminated soil through treatment. However, excavation and off-site disposal of contaminated soils would eliminate concerns associated with toxicity and mobility of the contaminants at the site. Since the non-hazardous soil would be disposed of in an engineered permitted facility, the mobility of the contaminants would be within acceptable limits and would be practically reduced.

Implementability

This alternative is readily implemented using standard construction means and methods. Contaminated soil would be excavated, tested, and disposed of at a non-hazardous waste facility. Several facilities have been identified which can accept the contaminated soil from the site. No capacity or availability problems have been identified, although, disposal at multiple facilities may be required due to the large excavation volume. Finally, no delay is anticipated in obtaining the necessary approvals from the state and local agencies for implementation of this alternative.

Cost

The 2012 total present-value cost of this alternative for covered spoils, based on a 30-year period is $9,476,000. Table 5-9 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Disposal costs were obtained from Waste Management, Inc. of New York in 2007 and escalated based on RS Means historical cost indices, while other cost estimating information was obtained from RS Means Cost Data series and engineering judgment. No long-term O & M costs are anticipated with this alternative.

Land Use

Land use at the SA 13 Dredge Spoil Disposal Area is described in Section 5.2.1.2. Based on current zoning, implementation of this alternative would not limit future uses at this site.

5.3 Comparative Evaluation of Alternatives

5.3.1 Capped Landfill Cell Alternatives

Overall Protection of Human Health and the Environment

Since Alternative 1 employs no action, contaminated soils within the landfill cells would remain on site providing no protection for potential future exposure. Alternatives 2, 3, and 4 are more protective of human health and the environment; each at a different level. Alternative 2 would be protective of human health since the maintenance of the existing cover system along with ICs and ECs would reduce the potential for direct human and wildlife exposure; however, inadequate enforcement could lead to potential health risks. Alternatives 3 and 4 would provide a higher level of protection than Alternative 2 because the landfill cell contaminated soils would be excavated and either treated onsite or properly disposed of off-site.

Compliance with SCGs

PCBs are recalcitrant compounds by nature and, therefore, their levels in the soil are not expected to decrease over time. Alternatives 1 and 2 do not comply with SCGs because the contaminated soils would remain on site. Alternatives 3 and 4 comply with SCGs since soil contamination would be either treated or properly disposed of off-site. However, approval from the town must be obtained in order to process contaminated soils on-site prior to implementation of Alternatives 3.

Short-Term Impacts and Effectiveness

Short-term impacts are not anticipated for Alternatives 1 and 2 since no remediation activities would take place. Several similar short-term impacts may affect the community during remedial activities for Alternatives 3 and 4 such as dust and noise due to the excavation of the contaminated soil. A continuous influx of dump trucks would be needed on a daily basis was well as the potential for spills of contaminated soils during the off-site transport of soils by trucks with Alternative 4. Noise impacts are inherent of excavation activities, therefore, affecting Alternatives 3 and 4. Alternative 3 may potentially have an increased noise impact due to the combination of excavation activities and operation of the HTTD system.

Long-Term Effectiveness and Permanence

Since Alternative 1 employs no action, contaminated soil would remain on site providing no protection for potential future exposure. Alternative 2 is effective in the long term provided proper OM&M is performed and ICs are implemented and enforced. Alternatives 3 and 4 have a higher level of long-term effectiveness and permanence compared to Alternatives 1 and 2, because landfill cell contaminated soils would be either treated onsite or properly disposed of offsite.

Reduction in Toxicity, Mobility, or Volume through Treatment

Reduction in toxicity, mobility, or volume through treatment would be achieved through Alternative 3. Alternatives 1 and 2 would not treat contaminated soils, therefore reduction in, toxicity, mobility, or volume would not take place. Alternative 4 would essentially eliminate concerns of toxicity, mobility, and volume of contaminated soil at the site through off-site disposal of contaminated soils at a permitted disposal facility.

Implementability

There are no actions to implement for Alternative 1. Alternatives 2 through 4 can be readily implemented using standard construction means and methods. Although initial problems may be encountered during the start-up phase of the on-site HTTD systems in Alternative 3, technical difficulties are not anticipated once the systems are fully operational.

Cost

Table 5-10 presents a summary of costs for all alternatives. Alternative 1 calls for no action, and thus incurs no costs. Alternative 2 has a significantly lower total present value than Alternatives 3 and 4, since the main action is site management. Alternative 3 is the most expensive alternative primarily due to the initial capital cost needed for the on-site HTTD unit.

Land Use

As contaminated soil would be left in place for Alternatives 1 and 2, future uses at the site would be limited based on current zoning. For Alternatives 3 and 4, contaminated soil would be either removed or treated thus future uses of the site would not be limited.

5.3.2 Uncovered Spoils Alternatives

Overall Protection of Human Health and the Environment

Since Alternative 1 employs no action, contaminated uncovered spoils would remain on site providing no protection for potential future exposure. Alternatives 2, 3, 4, and 5 are more protective of human health and the environment; each at a different level. Alternative 2 would be protective of human health and the environment as it would reduce direct human and wildlife exposure. Similarly, soil cover placed over contaminated soils on non-residential land as part of Alternatives 3 and 4 would also reduce direct human and wildlife exposure. Greater protection would occur for the residential property in Alternatives 3 and 4, as contaminated soils would be excavated and either treated or properly disposed of off-site. Out of all of the Uncovered Soil Alternatives, Alternative 5 has the greatest level of protection since all uncovered spoils would be excavated and properly disposed of off-site.

Compliance with SCGs

Alternatives 1 and 2 do not comply with SCGs because the contaminated spoils would remain on site. Alternatives 3 and 4 would partially comply with the SCGs, since uncovered soil contamination on the Third Fill Area would be either treated or properly disposed of off-site. Alternative 5 would fully comply with the SCGs since all uncovered soil contamination would be excavated and properly disposed of off-site.

Short-Term Impacts and Effectiveness

Short-term impacts are not anticipated for Alternative 1 since no remediation activities would take place. Several similar short-term impacts may affect the community during remedial activities for Alternatives 2, 3, 4 and 5 such as dust and noise due to applying the soil cover and excavation of the contaminated soil. A more significant impact would include disturbance to the Morrison residence adjacent to the site. A continuous influx of dump trucks would be needed on a daily basis, as well as the potential for spills of contaminated soils during the off-site transport of soils by trucks with Alternatives 3 and 5. Noise impacts are inherent of excavation activities, therefore, affecting Alternatives 3, 4, and 5. Alternatives 4 may potentially have an increased noise impact due to the combination of excavation activities and operation of the HTTD system.

Long-Term Effectiveness and Permanence

Since Alternative 1 employs no action, contaminated soil would remain on site providing no protection for potential future exposure. Alternative 2 is effective in the long term provided proper OM&M is performed and ICs are implemented and enforced. Alternatives 3, 4, and 5 have higher levels of long-term effectiveness and permanence than Alternatives 1 and 2 due to a portion or all of the uncovered contaminated soils being treated onsite or properly disposed of offsite.

Reduction in Toxicity, Mobility, or Volume through Treatment

Reduction in toxicity, mobility, or volume through treatment would be achieved through treatment in Alternative 4. Alternative 1 and 2 would not treat contaminated soils, therefore reduction in, toxicity, mobility, or volume would not take place. However, Alternatives 3 and 5 would essentially eliminate concerns of toxicity, mobility, and volume of contaminated soil at the site through off-site disposal at a permitted disposal facility.

Implementability

There are no actions to implement for Alternative 1. Alternatives 2 through 5 are readily implemented using standard construction means and methods. Although initial problems may be encountered during the start-up phase of the on-site HTTD systems in Alternatives 4, technical difficulties are not anticipated once the system is fully operational.

Cost

Alternative 1 calls for no action, and thus incurs no costs. Alternative 2 has a lower total present value than Alternatives 3, 4 and 5 due to costs only consisting of a soil cover and site management. Alternative 5 is the most expensive alternative, because it requires the excavation of the largest volume (all uncovered spoils).

Land Use

As contaminated soil would be left in place for Alternatives 1 through 4, future uses at the site may be limited based on current zoning. For Alternative 5, contaminated soil would be removed thus future uses of the site would not be limited.

5.3.3 Covered Spoils Alternatives

Overall Protection of Human Health and the Environment

Since Alternative 1 employs no action, contaminated covered soils would remain on site providing no further protection for potential future exposure. Alternative 2, no further action with site management would be protective of human health and the environment, since the maintenance of the existing cover would reduce the potential for direct human and wildlife exposure; however, inadequate OM&M or enforcement of ICs could lead to potential health risks. Out of all of the Covered Spoils Alternatives, Alternative 3 has the greatest level of protection since all covered spoils would be excavated and properly disposed of off-site

Compliance with SCGs

Alternatives 1 and 2 do not comply with SCGs because the contaminated soils would remain on-site. Alternative 3 complies with the SCGs since soil contamination would be properly disposed of off-site.

Short-Term Impacts and Effectiveness

Short-term impacts are not anticipated for Alternatives 1 and 2 since no remediation activities would take place. Short-term impacts may affect the community during remedial activities for Alternative 3 such as dust and noise due to the excavation of the contaminated soil. A more significant impact would include the recreational boat launch area to the north. A continuous influx of dump trucks would be needed on a daily basis was well as the potential for spills of contaminated soils during the off-site transport of soils by trucks would be associated with Alternative 3. Noise impacts are inherent of excavation activities, therefore also affecting Alternative 3.

Long-Term Effectiveness and Permanence

Since Alternative 1 employs no action, contaminated soil would remain on site providing no protection for potential future exposure. Alternative 2 is effective in the long term provided proper OM&M, ECs and ICs are implemented and enforced. Alternative 3 has a higher level of long-term effectiveness and permanence than Alternatives 1 and 2 because site-wide contaminated soils would be properly disposed of offsite.

Reduction in Toxicity, Mobility, or Volume through Treatment

No reduction in toxicity, mobility, or volume through treatment would be achieved by any of the Alternatives. Alternatives 1 and 2 would not treat contaminated soils, therefore reduction in toxicity, mobility, or volume would not take place. Alternative 3 would essentially eliminate concerns of toxicity, mobility, and volume of contaminated soil at the site through off-site disposal at a permitted disposal facility.

Implementability

There are no actions to implement for Alternative 1. Alternatives 2 through 3 are readily implemented using standard construction means and methods.

Cost

Table 5-10 presents a summary of costs for all alternatives. Alternative 1 calls for no action, and thus incurs no costs. Alternative 2 has a lower total present value compared to Alternative 3 due to costs only consisting of site management. Alternative 3 is the most expensive alternative primarily due excavation and transport costs.

Land Use

As covered contaminated soil would be left in place for Alternatives 1 and 2, future uses at the site may be limited based on current zoning. For Alternative 3, soil would be removed thus future uses of the site would not be limited.

Table 5-1 Cost Estimate for Capped Landfill Cell Alternative 2 - No Further Action with Site Management Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Institutional Controls		Each	1	$5,700	$5,700
Subtotal					$5,700
Physical Barriers/Warnings					
Signs	Reflectorized 24"x24" sign mounted to fence	Each	4	$190.50	$762
Subtotal					$762
				Capital Cost Subtotal:	$6,462
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$5,977
				10% Legal, administrative, engineering fees, construction management:	$598
				15% Contingencies:	$986
				Total Capital Cost:	**$8,000**
Annual Costs					
Groundwater Sampling (Labor)	2-people @ $100/hr; 8 hr/day; total of 10 wells; assume 3 wells/day	Day	4	$1,600.00	$6,400
Parameter Analysis	Includes TCL PCBs	Each	10	$100.00	$1,000
Data Evaluation and Reporting		HR	32	$100.00	$3,200
Subtotal					$10,600
				Annual Cost Subtotal:	$10,600
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$9,805
				10% Legal, administrative, engineering fees:	$981
				15% Contingencies:	$1,618
				Annual Cost Total:	**$12,403**
				30-Year Present Worth of Annual Costs:	**$191,000**
5-Year Costs (Periodic Costs)					
10% of Existing Fence Replaced	Chain link industrial, 6' high, 6 gauge wire with 3 strands barb wire	LF	620	$28.50	$17,670
Institutional Controls	Maintain/update documentation	Each	1	$5,000.00	$5,000
5-year CERCLA reviews		Hr	80	$109.00	$8,800
Subtotal					$31,470
				5-Year Cost Subtotal:	$31,470
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$29,110
				10% Legal, administrative, engineering fees:	$2,911
				15% Contingencies:	$4,803
				5-Year Total:	**$36,824**
				30-Year Present Worth of 5-Year Costs:	**$103,000**
				2012 Total Present Worth Cost:	**$302,000**

Assumptions:

1. Length of existing fence estimated from Figure 5-1.
2. Present worth of costs assumes 5% annual interest rate.
3. Unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.

Key:

HR = hour
LF = linear foot
LS = lump sum

Table 5-2 Cost Estimate for Capped Landfill Cell, Alternative 3 - Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and On-site Treatment by High Temperature Thermal Desorption
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings	LS	1	$797,192.47	$797,192
Subtotal					$797,192
Site Preparation					
Surveying Crew	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	Day	183	$1,821.02	$332,335
Install Construction Fence	Chain link fence rental, 6' high, encompass treatment facility	LF	1,000	$8.75	$8,750
Construct Concrete Pad Foundation	200' x 100' area, assuming 6" reinforced pad	SF	20,000	$13.80	$276,000
	Acid etching	SF	20,000	$0.83	$16,600
	6" high forms in place, assume 200' x 100' area	LF	600	$3.20	$1,920
	4" concrete topping over treatment unit area	SF	20,000	$2.57	$51,400
	Epoxy coating as finish coat	LS	1	$11,381.35	$11,381
Decommission Wells	10 wells installed within the disposal cell need to be decommissioned before the excavation.	EA	10	$6,000.00	$60,000
Subtotal					$758,387
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,414.40	$6,829
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,536.01	$34,144
Site Safety Officer	10 hrs/day, 5days/wk, $100/hr; 100% of project duration	manweeks	69	$5,690.67	$394,553
Subtotal					$435,526
Excavation					
Excavation	Backhoe, hydraulic, 2 CY bucket = 130 CY/hr	BCY	152,380	$1.80	$274,284
Transport contaminated soil to Stockpile	Front End Loader, 5 CY bucket	BCY	128,280	$1.85	$237,318
Stockpiling (prior to treatment)	300 Horsepower Bulldozer w/ 50' haul	BCY	128,280	$1.61	$206,531
Transport clean soil (cap + cutback) to Stockpile	Front End Loader, 5 CY bucket	BCY	24,100	$1.85	$44,585
Stockpiling clean soil (cap + cutback)	300 Horsepower Bulldozer w/ 50' haul	BCY	24,100	$1.61	$38,801
Dewatering	Methodology to be determined by contractor; unit cost assumed as 2-4" pumps operating 24 hr/day; assume 5' of75% of excavation will be below the groundwater table	Day	129	$1,037.00	$133,682
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	4,179	$85.36	$356,681
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	418	$113.81	$47,557
Confirmation Sampling (Metals)	TAL metals	Each	4,179	$142.27	$594,468
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	21	$227.63	$4,780
Subtotal					$1,938,687
High Temperature Thermal Desorption					
HTTD (Installation)	Includes mob/demob, equipment, labor, permitting (if necessary)	LS	1	$853,600.94	$853,601
HTTD (Treatment)	Includes equipment, labor, maintenance, utilities	Ton	192,420	$113.81	$21,899,986
Soil Mixing	Front End Loader, 5 CY bucket	BCY	128,280	$1.85	$237,318
Transport Soil to Stockpile (for backfill)	Front End Loader, 5 CY bucket	BCY	128,280	$1.85	$237,318
Soil Testing (influent)	Includes TCL PCBs	Each	611	$113.81	$69,524
Soil Testing (effluent)	Includes TCL PCBs	Each	153	$113.81	$17,381
Subtotal					$23,315,127
Utilities					
Electrical					
Electric Utilility Pole	Wooden pole, 40' high	Each	1	$1,550.00	$1,550
Wiring to Electric Service	3 - 1/0 Wires	CLF	3	$460.00	$1,380
Wiring Connections to treatment facility	200 amp w/ 18 branch breakers, includes main breaker, meter, socket, panel board, ground rod (20' avg runs, #14/2 wiring)	EA	4	$3,025.00	$12,100
Switchboard	1200 amp	EA	1	$7,525.00	$7,525
Transformer	Dry type transformer, 3 Phase, 500 kVA	EA	1	$16,300.00	$16,300
Electrical Connection Fee		LS	1	$2,845.34	$2,845
Install Electrical Connections/Testing	0.25 Electrician Foreman, 1 electrician, 2 laborers	Day	5	$1,640.50	$8,203
Electric Meter	AC recording ammeter	Each	1	$7,625.00	$7,625
Natural Gas					
Trenching	1' - 4' deep, 1/2 CY excavator	BCY	1,760	$5.65	$9,944
Pipe Bedding	Sand	LCY	657	$16.45	$10,809
Compaction		BCY	2,347	$4.34	$10,185
Backfill	1' - 4' deep, 1/2 CY excavator	BCY	1,760	$5.65	$9,944

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Section 5 Tables SA 13 FS Cost Estimate_Rev4_JJ_RM.xlsx-5-2Capped Alt 3 Onsite Treatmt-3/6/2012

Table 5-2 Cost Estimate for Capped Landfill Cell, Alternative 3 - Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and On-site Treatment by High Temperature Thermal Desorption
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Gas Pipe	2" polyethylene; 60 psi	LF	7,920	$6.05	$47,916
Meter		Each	1	$5,690.67	$5,691
Water					
Pump Station	10' x 10' x 10' Fiberglass (insulated)	Each	1	$22,762.69	$20,000
Foundation	12' x 12' x 12" thick	Each	1	$1,275.00	$1,275
Treatment	6' Diameter Electric Automatic Pressure Filter Unit, 140 GPM	Each	1	$27,683.76	$27,684
Pump	125 GPM, 150' Head, 10 HP, Centrifugal Pump	Each	1	$3,024.40	$3,024
Pump Station Heater	1500 watt wall type, with blower	Each	1	$275.00	$275
Trenching	4'-6' Deep, 1/2 CY excavator	BCY	667	$5.65	$3,767
Pipe	4" PVC	LF	1,200	$7.70	$9,240
Pipe Bedding	Sand	LCY	149	$16.45	$2,457
Compaction		BCY	800	$4.34	$3,472
Backfill	4'-6' Deep, 1/2 CY excavator	BCY	667	$5.65	$3,767
Water meter		Each	1	$2,845.34	$2,845
Administrative Costs	Permitting	LS	1	$5,690.67	$5,691
Subtotal					$235,512
Backfilling					
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	152,380	$1.61	$245,332
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	152,380	$0.99	$150,856
Subtotal					$396,188
Site Restoration					
Topsoil (Material only)	0.5 ft thick layer	LCY	8,085	$14.23	$115,028
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	7,219	$1.61	$11,623
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	430	$47.50	$20,425
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	162	$82.50	$13,365
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	162	$72.00	$11,664
Subtotal					$172,105
				Capital Cost Subtotal:	$28,048,724
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$25,945,070
				10% Legal, administrative, engineering fees:	$2,594,507
				15% Contingencies:	$4,280,936
				Total Capital Cost:	**$32,821,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				Present Worth of Annual Costs	**$0**
5-Year Costs (Periodic Costs)					
Not Applicable				$0.00	$0
Subtotal					$0
				5-Year Cost Subtotal:	$0
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				5-Year Total:	**$0**
				30-Year Present Worth of 5-Year Costs:	**$0**
				2012 Total Present Worth Cost:	**$32,821,000**

Assumptions:

1. Total cap area at the site (assumed to be within	389,830	SF, as obtained from EEEPC CAD department Sept 2007
the existing fenceline) =	8.9	acres
2. Thickness of the existing clay cap layer to be used as backfill =	1	ft
3. Volume of cap soil to be reused on site =	14,500	BCY
4. Contaminated soil volume, including cap material above =	119,800	BCY, as obtained from EEEPC CAD department Sept 2007
5. Volume of contaminated soil to be excavated =	105,300	
Perimeter of excavation area =	6,200	ft, as estimated from Figure 5-2
Additional volume to be excavated due to cutback =	9,600	BCY, estimated from maximum excavation depth and excavation perimeter
Additional assumed 20% volume to be excavated to achieve unrestricted SCGs=	22,980	BCY
Total excavation volume =	152,380	BCY

Table 5-2 Cost Estimate for Capped Landfill Cell, Alternative 3 - Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and On-site Treatment by High Temperature Thermal Desorption
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost

6. Area to be restored with trees = 1.5 acres
7. Assume confirmation sampling spacing = 10 foot grid spacing (per 40 CFR 761.265)
8. Maximum excavation depth = 17 ft BGS
9. Basic production rate of HTTD system = 35 Tons/hr
840 Tons/day
75% assumed effective operating rate for maintenance and downtime
630 Tons/day, effective production rate
229,950 Tons/year, effective production rate
10. Assuming effective production rate, time to treat excavated soil = 11.93 months, or 1 years
11. Mob/demob assumed to be = 4 months, or 0.33 years
Volume of soil to be treated by HTTD unit = 128,280 BCY
12. Assume % of treated soil to be used as backfill = 100%
13. Assume % reduction by volume of soil from Thermal Treatment process = 0%
14. Backfill volume for site restoration = 152,380 BCY, or
170,666 LCY
15. Topsoil volume for site restoration (0.5ft thick) = 7,219 BCY, or
8,085 LCY
16. Assume tree planting grid spacing every 20 ft
17. No storage facilities are assumed for treated or untreated soil. However, these facilities may be added at a later time.
18. Soil testing for HTTD unit assumes:
Influent - 1 sample for every 315 Tons (or 2 samples every day)
Effluent - 1 sample for every 1,260 Tons (or once every other day)
19. The distance from the treatment facility to river is = 1,200 ft
The distance from the treatment facility to electrical connection is = 100 ft
The distance from the treatment facility to natural gas connection = 7,920 ft
20. Depth of water pipe trench = 5 ft
Width of water pipe trench = 3 ft
21. Depth of pipe bedding (water line) = 1.0 ft
22. Depth of backfill (water line) = 4.0 ft
23. Width of natural gas trench = 2.0 ft
Depth of natural gas trench = 3.0 ft
24. Depth of pipe bedding (gas) = 1.0 ft
Depth of backfill (gas) = 2.0 ft
25. Electrical wiring assumes #10 (wiring inside facility)= 3000 ft
Assuming 3 - 1/0 wires from processing facility to electrical connection = 300 ft
26. Demobilization of processing unit is not included.
27. Based on geotechnical data from the RI (EEEPC 2007) , in-situ bulk density of site soils =
1.5 Tons/BCY
28. For loose soil assume sandy, dry soil with swell factor = 12%
(Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).
29. Topsoil density assumed to be 1.2 Tons/LCY
30. The excavated cap volume will be used as backfill.
31. Fire protection for processing facility not included in this estimate.
32. Present worth of costs assumes 5% annual interest rate.
33. HTTD costs supplied by vendor, Environmental Soil Management, Inc. (ESMI), June 2007. Other unit costs listed were obtained from 2012 RS Means Cost Data and engineering
34. Unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.

Key:
BCY = bank cubic yards
BGS = below ground surface
CLF = current limiting fuse
ft = feet
LCY = loose cubic yards
LF = linear foot
LS = lump sum
MSF = thousand square feet
SF = square feet

Table 5-3 Cost Estimate for Capped Landfill Cell, Alternative 4 - Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and Off-Site Disposal of the Dredge Spoils and Impacted Soils
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings	LS	1	$688,451.79	$688,452
Subtotal					$688,452
Site Preparation					
Surveying Crew	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	Day	73	$1,821.02	$132,934
Install Construction Fence	Chain link fence rental, 6' high, encompass stockpile area	LF	800	$8.75	$7,000
Decommission Wells	10 wells installed within the disposal cell need to be decommissioned before the	EA	10	$6,000.00	$60,000
Subtotal					$139,934
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,414.40	$6,829
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,536.01	$34,144
Site Safety Officer	10 hrs/day, 5days/wk, $100/hr; 100% of project duration	manweeks	34	$5,690.67	$192,345
Subtotal					$233,318
Excavation					
Excavation	Backhoe, hydraulic, 2 CY bucket = 130 CY/hr	BCY	152,380	$1.80	$274,284
Transport contaminated soil to Stockpile	Front End Loader, 5 CY bucket	BCY	128,280	$1.85	$237,318
Stockpiling	300 Horsepower Bulldozer w/ 50' haul	BCY	128,280	$1.61	$206,531
Transport clean soil (cap + cutback) to Stockpile	Front End Loader, 5 CY bucket	BCY	24,100	$1.85	$44,585
Stockpiling clean soil (cap + cutback)	300 Horsepower Bulldozer w/ 50' haul	BCY	24,100	$1.61	$38,801
Stockpile Liner		LS	1	$5,690.67	$5,691
Dewatering	Methodology to be determined by contractor; unit cost assumed as 2-4" pumps operating 24 hr/day; assume 5' of 75% of the excavation will be below the groundwater table, includes time for excavation and backfill	Day	208	$1,037.00	$215,947
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	4,148	$85.36	$354,078
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	415	$113.81	$47,210
Confirmation Sampling (Metals)	TAL metals	Each	4,148	$142.27	$590,131
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	21	$227.63	$4,780
Subtotal					$2,019,357
Off Site Disposal					
Off-Site Disposal of Non-Hazardous Soil (PCB concentration < 50 ppm)					
Characterization Sampling	Includes TCLP, Pesticides/PCB, PAH, RCRA ignitability, RCRA corrosivity, RCRA reactivity analyses; Assume 24-hr turnaround; one sample for first 500 LCY, and one sample for each additional 1000 LCY	Each	145	$1,669.00	$242,005
Loading Trucks	Front End Loader, 5 CY bucket	BCY	128,280	$1.85	$237,318
Transportation	Dump truck transport from Special Area 13 to Fairport, NY; incl taxes and fees	Ton	192,420	$51.00	$9,813,420
Off-Site Disposal (Soil)	Disposal at High Acres Landfill (Fairport, NY); incl taxes and fees	Ton	192,420	$52.00	$10,005,840
Subtotal					$20,298,583
Backfilling					
Backfill (Material)	Includes material and transportation to site; average of 5' layer of backfill over 75% of contaminated soil excavation area within fence	LCY	44,396	$11.38	$505,281
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	63,739	$1.61	$102,620
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	63,739	$0.99	$63,102
Subtotal					$671,002
Site Restoration					
Topsoil (Material only)	0.5 ft thick layer	LCY	8,085	$14.23	$115,028
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	7,219	$1.61	$11,623
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	430	$47.50	$20,425
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	162	$82.50	$13,365
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	162	$72.00	$11,664

Table 5-3 Cost Estimate for Capped Landfill Cell, Alternative 4 - Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and Off-Site Disposal of the Dredge Spoils and Impacted Soils
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Subtotal					$172,105
				Capital Cost Subtotal:	$24,222,751
	Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):				$22,406,045
			10% Legal, administrative, engineering fees:		$2,240,604
				15% Contingencies:	$3,696,997
				Total Capital Cost:	**$28,344,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
	Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):				$0
			10% Legal, administrative, engineering fees:		$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
			Present Worth of Annual Costs:		**$0**
5-Year Costs (Periodic Costs)					
Not Applicable				$0.00	$0
Subtotal					$0
				5-Year Cost Subtotal:	$0
	Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925)				$0
			10% Legal, administrative, engineering fees:		$0
				15% Contingencies:	$0
				5-Year Total:	**$0**
			30-Year Present Worth of 5-Year Costs:		**$0**
			2012 Total Present Worth Cost:		**$28,344,000**

Assumptions:

1. Total cap area at the site (assumed to be within the existing fenceline) = 389,830 SF, as obtained from EEEPC CAD department Sept 2007; 8.9 acres
2. Thickness of the existing clay cap layer to be used as backfill = 1 ft
3. Volume of cap soil to be reused on site = 14,500 BCY
4. Contaminated soil volume, including cap material above = 119,800 BCY, as obtained from EEEPC CAD department Sept 2007
5. Volume of contaminated soil to be excavated = 105,300 BCY
   - Perimeter of excavation area = 6,200 ft, as estimated from Figure 5-2
   - Additional volume to be excavated due to cutback = 9,600 BCY, estimated from maximum excavation depth and excavation perimeter
   - Additional assumed 20% volume to be excavated to achieve unrestricted SCGs= 22,980 BCY
   - Total excavated volume = 152,380 BCY
6. Area to be restored with trees = 1.5 acres
7. Assume confirmation sampling spacing = 10 foot grid spacing (per 40 CFR 761.265)
8. Maximum excavation depth = 17 ft BGS
9. Assumed production rate of excavation = 130 BCY/hr
   - 75% assumed effective production rate
   - 98 BCY/hr, effective production rate
   - 780 BCY/day, effective production rate
   - 284,700 BCY/year, effective production rate
10. Assuming effective production rate, time to excavate soil = 6 months, or 0.4 years
11. Mob/demob assumed to be = 3 months, or 0.25 years
12. Volume of soil estimated as < 50ppb PCBs = 128,280 BCY
13. Taxes and fees for non-haz landfill transportation 26%
14. Taxes and fees for non-haz landfill disposal 12%
15. Total volume of backfill needed = 63,739 BCY, Assume 5' of 75% of excavation needs to be backfilled to raise grade above groundwater elevation and cutback volume w/ 20% incr
    - Volume of backfill needed for purchase (excluding cap material to be reused) = 39,639 BCY
16. Topsoil volume for site restoration (0.5ft thick) = 7,219 BCY, or 8,085 LCY
17. Assume tree planting grid spacing every 20 ft
18. Based on geotechnical data from the RI (EEEPC 2007), in-situ bulk density of site soils = 1.5 Tons/BCY
19. For loose soil assume sandy, dry soil with swell factor = 12%
    (Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).
20. Topsoil density assumed to be 1.2 Tons/LCY
21. The excavated cap volume will be used as backfill.
22. Present worth of costs assumes 5% annual interest rate.
23. Disposal costs supplied by vendor, Waste Management, Inc., February 2007. Other unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.

Key:
BGS = below ground surface
ft = feet
LCY = loose cubic yards
LF = linear foot
LS = lump sum
MSF = thousand square feet
SF = square feet

Table 5-4 Cost Estimate for Uncovered Spoils, Alternative 2 - Cover all Uncovered Spoils in Place
Special Area 13 Dredge Spoil Disposal Area, Moreau, New York

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings	LS	1	$12,118.25	$12,118
Institutional Controls		Each	1	$5,700.00	$5,700
Subtotal					$17,818
Site Preparation					
Surveying Crew	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	Day	15	$1,821.02	$27,989
Decommission Wells	2 wells installed within the disposal cell need to be decommissioned before the excavation.	EA	2	$6,000.00	$12,000
Subtotal					$27,989
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,414.40	$6,829
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$7,200.00	$28,800
Site Safety Officer	10 hrs/day, 5days/wk, $100/hr; 100% of project duration	manweeks	13	$5,690.67	$74,241
Subtotal					$109,870
Soil Cover					
Demarcation layer	High visibility construction fence	MSF	210	$75.00	$15,736
6"soil fill	Includes 6" soil and transportation to site	LCY	4,352	$11.38	$49,521
Placement of soil fill	300 Horsepower Bulldozer w/ 50' haul	BCY	3,885	$1.61	$6,255
Topsoil (Material only)	0.5' depth of topsoil over soil cover area	LCY	4,352	$14.23	$61,909
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	3,885	$1.61	$6,255
Compaction of Topsoil	Vibrating roller, 6" compacted lifts, 4 passes	ECY	3,885	$1.98	$7,693
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	231	$47.50	$10,963
Subtotal					$158,333
Physical Barriers/Warnings					
Fence	Chain link industrial, 6' high, 6 gauge wire with 3 strands barb wire	LF	4,000	$28.50	$114,000
Gate	Double swing gates, incl posts with 12' opening	Each	4	$730.00	$2,920
Signs	Reflectorized 24"x 24" sign mounted to fence	Each	6	$190.50	$1,143
Subtotal					$118,063
			Capital Cost Subtotal:		$432,073
	Adjusted Capital Cost Subtotal for Glen Falls,New York Location Factor (0.925):				$399,668
	10% Legal, administrative, engineering fees, construction management:				$39,967
				15% Contingencies:	$65,945
				Total Capital Cost:	**$506,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost S	$0
	Adjusted Capital Cost Subtotal for Glen Falls, New York Location Factor (0.925):				$0
			10% Legal, administrative, engineering fees:		$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
			30-Year Present Worth of Annual Costs:		**$0**
5-Year Costs (Periodic Costs)					
10% of Fence Replaced	Chain link industrial, 6' high, 6 gauge wire with 3 strands barb wire	LF	400	$28.50	$11,400
Institutional Controls	Maintain/update documentation	Each	1	$5,000.00	$5,000
5-year CERCLA reviews		Hr	80	$109.00	$8,800
Subtotal					$25,200
				5-Year Cost Subtotal:	$25,200
	Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925):				$23,310
			10% Legal, administrative, engineering fees:		$2,331
				15% Contingencies:	$3,846
				5-Year Total:	**$29,487**
			30-Year Present Worth of 5-Year Costs:		**$83,000**
			2012 Total Present Worth Cost:		**$589,000**

Assumptions:

1. Length of fencing obtained from EEEPC CAD department June 2007.
2. Present worth of costs assumes 5% annual interest rate.
3. Unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.
4. Total soil cover area = 209,810 SF, as obtained from EEEPC CAD department Sept 2007 for Morrison property + Moreau Site
   4.8 acres
6. Wooded area assumed to be = 1.5 acres
7. Soil fill layer thickness (excluding topsoil) = 0.5 ft

Table 5-4 Cost Estimate for Uncovered Spoils, Alternative 2 - Cover all Uncovered Spoils in Place
Special Area 13 Dredge Spoil Disposal Area, Moreau, New York

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
8. Volume of soil fill for base of cover =	3885	BCY, or			
	4352	LCY			
9. Topsoil volume for site restoration (6") =	4352	LCY			
10. Assumed time to install soil cover =	160	LCY/hr, placement of soil layer			
	0.75	assumed effective production rate			
	120	LCY/hr, effective production rate			
	960	LCY/day, effective production rate			
	5	Days for soil placement			
	10	Days for demarcation layer			
	17	days assumed for topsoil/site restoration			
	31	days, in total to install cap, or			
	1	months, or		0.1 years	
11. Mob/demob assumed to be =	2	months, or		0.2 years	
12. For loose soil assume sandy, dry soil with swell factor =	12%				
(Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).					
12. Topsoil density assumed to be	1.2	Tons/LCY			

Key:

BCY = Bank cubic yards.
BGS = Below ground surface.
CF = Cubic feet.
ft = Feet.
LCY = Loose cubic yards.
LF = Linear foot.
LS = Lump sum.
MSF = Thousand square feet.
psf = Pounds per square foot.
psi = Pounds per square inch.
SF = Square feet.
SF = Square yards.

Table 5-5 Cost Estimate for Uncovered Spoils Alternative 3 - Excavation and Off-Site Disposal to meet Unrestricted SCOs in Fill Area 3 (Residential Parcel), Soil Cover with Site Management for Uncovered Impacted Areas near the Main Dredge Spoil Disposal Area and within Fill Area 2
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings	LS	1	$115,937.65	$115,938
Institutional Controls		Each	1	$5,700	$5,700
Subtotal					$121,638
Site Preparation					
Surveying Crew	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	Day	13	$1,821.02	$22,777
Cut and Chip Trees	Trees to 12" dia.	Acre	1.5	$6,250.00	$9,298
Grub Stumps and Remove		Acre	1.5	$3,775.00	$5,616
Install Construction Fence	Chain link fence rental, 6' high, encompass treatment facility	LF	1,200	$8.75	$10,500
Decommission Wells	2 wells installed within the disposal cell need to be decommissioned before the excavation.	EA	2	$6,000.00	$12,000
Subtotal					$48,190
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,414.40	$6,829
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,536.01	$34,144
Site Safety Officer	10 hrs/day, 5days/wk, $100/hr; 100% of project duration	manweeks	11	$5,690.67	$64,506
Subtotal					$105,479
Excavation					
Excavation	Backhoe, hydraulic, 2 CY bucket = 130 CY/hr	BCY	19,783	$1.80	$35,610
Transport contaminated soil to Stockpile	Front End Loader, 5 CY bucket	BCY	17,383	$1.85	$32,159
Stockpiling	300 Horsepower Bulldozer w/ 50' haul	BCY	17,383	$1.61	$27,987
Transport clean soil (cutback) to Stockpile	Front End Loader, 5 CY bucket	BCY	2,400	$1.85	$4,440
Stockpiling clean soil (cutback)	300 Horsepower Bulldozer w/ 50' haul	BCY	2,400	$1.61	$3,864
Stockpile Liner		LS	1	$5,690.67	$5,691
Dewatering	Methodology to be determined by contractor; unit cost assumed as 2-4" pumps operating 24 hr/day; assume dewatering only for Morrison Property (14,100 BCY of excavation and backfilling)	Day	54	$1,037.00	$56,237
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	1,484	$85.36	$126,703
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	148	$113.81	$16,894
Confirmation Sampling (Metals)	TAL metals	Each	1,484	$142.27	$211,172
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	21	$227.63	$4,780
Subtotal					$525,537
Off Site Disposal					
Off-Site Disposal of Non-Hazardous Soil (PCB concentration < 50 ppm)					
Characterization Sampling	Includes TCLP, Pesticides/PCB, PAH, RCRA ignitability, RCRA corrosivity, RCRA reactivity analyses; Assume 24-hr turnaround; one sample for first 500 LCY, and one sample for each additional 1000 LCY	Each	20	$1,669.00	$33,380
Loading Trucks	Front End Loader, 5 CY bucket	BCY	17,383	$1.85	$32,159
Transportation	Dump truck transport from Special Area 13 to Fairport, NY; incl taxes and fees	Ton	26,075	$51.00	$1,329,815
Off-Site Disposal (Soil)	Disposal at High Acres Landfill (Fairport, NY); incl taxes and fees	Ton	26,075	$52.00	$1,355,890
Subtotal					$2,751,243
Backfilling					
Backfill (Material)	Includes material and transportation to site;	LCY	18,932	$11.38	$215,467
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	19,783	$1.61	$31,851
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	19,783	$0.99	$19,585
Subtotal					$266,903
Soil Cover					
Demarcation layer	High visibility construction fence	MSF	145	$75.00	$10,875
6" soil fill	Includes 6" soil and transportation to site	CY	3,007	$11.38	$34,224
Placement of soil fill	300 Horsepower Bulldozer w/ 50' haul	BCY	2,685	$1.61	$4,323
Topsoil (Material only)	0.5' depth of topsoil over soil cover area	CY	3,007	$14.23	$42,785
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	2,685	$1.61	$4,323
Compaction of Topsoil	Vibrating roller, 6" compacted lifts, 4 passes	ECY	2,685	$1.98	$5,317
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	160	$47.50	$7,576
Subtotal					$109,424
Site Restoration of Excavated Area					
Topsoil (Material only)	0.5 ft thick layer	LCY	2,614	$14.23	$37,182

Table 5-5 Cost Estimate for Uncovered Spoils Alternative 3 - Excavation and Off-Site Disposal to meet Unrestricted SCOs in Fill Area 3 (Residential Parcel), Soil Cover with Site Management for Uncovered Impacted Areas near the Main Dredge Spoil Disposal Area and within Fill Area 2
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	2,334	$1.61	$3,757
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	140	$47.50	$6,650
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	162	$82.50	$13,365
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	162	$72.00	$11,664
Subtotal					$72,618
Physical Barriers/Warnings					
Fence	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	2,800	$28.50	$79,800
Gate	Double swing gates, incl posts with 12' opening	Each	4	$730.00	$2,920
Signs	Reflectorized 24"x24" sign mounted to fence	Each	6	$190.50	$1,143
Subtotal					$83,863
				Capital Cost Subtotal:	$4,084,895
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$3,778,528
				10% Legal, administrative, engineering fees:	$377,853
				15% Contingencies:	$623,457
				Total Capital Cost:	**$4,780,000**
Annual Costs					
Not applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				30-Year Present Worth of Annual Costs:	**$0**
5-Year Costs (Periodic Costs)					
10% of Fence Replaced	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	280	$28.50	$7,980
Institutional Controls	Maintain/update documentation	Each	1	$5,000.00	$5,000
5-year CERCLA reviews		Hr	80	$109.00	$8,800
Subtotal					$21,780
				5-Year Cost Subtotal:	$21,780
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$20,147
				10% Legal, administrative, engineering fees:	$2,015
				15% Contingencies:	$3,324
				5-Year Total:	**$25,485**
				30-Year Present Worth of 5-Year Costs:	**$71,000**
				2012 Total Present Worth Cost:	**$4,851,000**

Assumptions:

1. Total area at the site	209,810	SF, as obtained from EEEPC CAD department Sept 2007
	4.8	acres
2. Contaminated soil volume =	14,086	BCY, as obtained from EEEPC CAD department Sept 2007 for the Morrison Property
Perimeter of excavation area =	1,200	ft, as estimated from Figure 5-6
Additional volume to be excavated due to cutback =	2,400	BCY, estimated from maximum excavation depth and excavation perimeter
Additional assumed 20% volume to be excavated to achieve unrestricted SCGs=	3,297	BCY
Total excavated volume =	19,783	BCY
3. Contaminated soil excavation area =	64,810	SF, as obtained from EEEPC CAD department Sept 2007
Additional area due to cutback =	61,200	SF, assumes 3:1 slope around excavation perimeter based on max excavation depth
Total excavation area =	126,010	SF, or
	2.9	acres
4. Wooded area assumed to be =	1.5	acres
5. Assume confirmation sampling spacing =	10	foot grid spacing (per 40 CFR 761.265)
6. Maximum excavation depth =	17	ft BGS
7. Assumed production rate of excavation =	130	BCY/hr
	75%	assumed effective production rate
	98	BCY/hr, effective production rate
	780	BCY/day, effective production rate
	284,700	BCY/year, effective production rate
8. Assuming effective production rate, time to excavate soil =	1	months, or 0.10 years
9. Mob/demob assumed to be =	2	months, or 0.17 years
10. Volume of soil estimated as < 50ppb PCBs =	17,383	BCY
11. Taxes and fees for non-haz landfill transportation	26%	
12. Taxes and fees for non-haz landfill disposal	12%	
13. Total volume of backfill needed =	19,783	BCY

Table 5-5 Cost Estimate for Uncovered Spoils Alternative 3 - Excavation and Off-Site Disposal to meet Unrestricted SCOs in Fill Area 3 (Residential Parcel), Soil Cover with Site Management for Uncovered Impacted Areas near the Main Dredge Spoil Disposal Area and within Fill Area 2

Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
14. Topsoil volume for site restoration (0.5ft thick) =	2,334	BCY, or			
	2,614	LCY			
15. Assume tree planting grid spacing every	20	ft			
16. Based on geotechnical data from the RI (EEEPC 2007), in-situ bulk density of site soils =					
	1.5	Tons/BCY			
17. For loose soil assume sandy, dry soil with swell factor =	12%				
(Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).					
18. Topsoil density assumed to be	1.2	Tons/LCY			
19. The excavated cap volume will be used as backfill.					
20. Present worth of costs assumes 5% annual interest rate.					
21. Disposal costs supplied by vendor, Waste Management, Inc., February 2007. Other unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.					
22. Total soil cover area =	145,000	SF, as obtained from EEEPC CAD department Sept 2007 for the Moreau Site (Fill Area 2)			
	3.3	acres			
23. Soil Cover perimeter =	2800	ft, as estimated from Figure 5-8			
25. Soil thickness for cover base =	0.5	ft			
26. Volume of soil for base of cover =	2685	BCY			
	3007	LCY			
27. Topsoil volume for site restoration (6") =	3007	LCY			
28. Assumed time to install soil cover =	160	LCY/hr, placement of soil layer			
	0.75	assumed effective production rate			
	120	LCY/hr, effective production rate			
	960	LCY/day, effective production rate			
	4	Days for soil placement			
	17	Days for demarcation layer			
	13	days assumed for topsoil/site restoration			
	34	days, in total to install cap, or			
	1	months, or	0.1 years		
29. Mob/demob assumed to be =	2	months, or	0.2 years		
30. Assume tree planting grid spacing every	20	ft			
31. For loose soil assume sandy, dry soil with swell factor =	12%				

Key:

BCY = bank cubic yards
BGS = below ground surface
ft = feet
LCY = loose cubic yards
LF = linear foot
LS = lump sum
MSF = thousand square feet
SF = square feet

Table 5-6 Cost Estimate for Uncovered Spoils Alternative 3 - Excavation and On-Site Treatment to meet Unrestricted SCOs in Fill Area 3 (Residential Parcel), Soil Cover with Site Management for Uncovered Impacted Areas near the Main Dredge Spoil Disposal Area and within Fill Area 2
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings	LS	1	$162,241.13	$162,241
Institutional Controls		Each	1	$5,700.00	$5,700
Subtotal					$167,941
Site Preparation					
Surveying Crew	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	Day	18	$1,821.02	$33,234
Cut and Chip Trees	Trees to 12" dia.	Acre	1.5	$6,250.00	$9,298
Grub Stumps and Remove		Acre	1.5	$3,775.00	$5,616
Install Construction Fence	Chain link fence rental, 6' high, encompass treatment facility	LF	2,200	$8.75	$19,250
Construct Concrete Pad Foundation	200' x 100' area, assuming 6" reinforced pad	SF	20,000	$13.80	$276,000
	Acid etching	SF	20,000	$0.83	$16,600
	6" high forms in place, assume 200' x 100' area	LF	600	$3.20	$1,920
	4" concrete topping over treatment unit area	SF	20,000	$2.57	$51,400
	Epoxy coating as finish coat	LS	1	$11,381.35	$11,381
Decommission Wells	2 wells installed within the disposal cell need to be decommissioned before the excavation.	EA	2	$6,000.00	$12,000
Subtotal					$424,698
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,414.40	$6,829
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,536.01	$34,144
Site Safety Officer	10 hrs/day, 5days/wk, $100/hr; 100% of project duration	manweeks	14	$5,690.67	$78,911
Subtotal					$119,884
Excavation					
Excavation	Backhoe, hydraulic, 2 CY bucket = 130 CY/hr	BCY	19,783	$1.80	$35,610
Transport contaminated soil to Stockpile	Front End Loader, 5 CY bucket	BCY	17,383	$1.85	$32,159
Transport clean soil (cutback) to Stockpile	Front End Loader, 5 CY bucket	BCY	2,400	$1.85	$4,440
Stockpiling clean soil (cutback)	300 Horsepower Bulldozer w/ 50' haul	BCY	2,400	$1.61	$3,864
Stockpiling (prior to treatment)	300 Horsepower Bulldozer w/ 50' haul	BCY	17,383	$1.61	$27,987
Dewatering	Methodology to be determined by contractor; unit cost assumed as 2-4" pumps operating 24 hr/day; assume dewatering only for Morrison Property (14,100 BCY of excavation and backfilling)	Day	50	$1,037.00	$52,220
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	1,637	$85.36	$139,716
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	164	$113.81	$18,629
Confirmation Sampling (Metals)	TAL metals	Each	1,637	$142.27	$232,859
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	9	$227.63	$2,049
Subtotal					$549,532
High Temperature Thermal Desorption					
HTTD (Installation)	Includes mob/demob, equipment, labor, permitting (if necessary)	LS	1	$853,600.94	$853,601
HTTD (Treatment)	Includes equipment, labor, maintenance, utilities	Ton	26,075	$113.81	$2,967,663
Soil Mixing	Front End Loader, 5 CY bucket	BCY	17,383	$1.85	$32,159
Transport Soil to Stockpile (for backfill)	Front End Loader, 5 CY bucket	BCY	17,383	$1.85	$32,159
Soil Testing (influent)	Includes TCL PCBs	Each	83	$113.81	$9,421
Soil Testing (effluent)	Includes TCL PCBs	Each	21	$113.81	$2,355
Subtotal					$3,897,358
Utilities					
Electrical					
Electric Utilility Pole	Wooden pole, 40' high	Each	1	$1,550.00	$1,550
Wiring to Electric Service	3 - 1/0 Wires	CLF	3	$460.00	$1,380
Wiring Connections to treatment facility	200 amp w/ 18 branch breakers, includes main breaker, meter, socket, panel board, ground rod (20' avg runs, #14/2 wiring)	EA	4	$3,025.00	$12,100
Switchboard	1200 amp	EA	1	$7,525.00	$7,525
Transformer	Dry type transformer, 3 Phase, 500 kVA	EA	1	$16,300.00	$16,300
Electrical Connection Fee		LS	1	$2,845.34	$2,845
Install Electrical Connections/Testing	0.25 Electrician Foreman, 1 electrician, 2 laborers	Day	5	$1,640.50	$8,203
Electric Meter	AC recording ammeter	Each	1	$7,625.00	$7,625
Natural Gas					
Trenching	1' - 4' deep, 1/2 CY excavator	BCY	1,758	$5.65	$9,934
Pipe Bedding	Sand	LCY	656	$16.45	$10,798
Compaction		BCY	2,344	$4.34	$10,174
Backfill	1' - 4' deep, 1/2 CY excavator	BCY	1,758	$5.65	$9,934
Gas Pipe	2" polyethylene; 60 psi	LF	7,920	$6.05	$47,916
Meter		Each	1	$5,690.67	$5,691

Table 5-6 Cost Estimate for Uncovered Spoils Alternative 3 - Excavation and On-Site Treatment to meet Unrestricted SCOs in Fill Area 3 (Residential Parcel), Soil Cover with Site Management for Uncovered Impacted Areas near the Main Dredge Spoil Disposal Area and within Fill Area 2
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Water					
Pump Station	10' x 10' x 10' Fiberglass (insulated)	Each	1	$22,762.69	$22,763
Foundation	12' x 12' x 12" thick	Each	1	$1,275.00	$1,275
Treatment	6' Diameter Electric Automatic Pressure Filter Unit, 140 GPM	Each	1	$27,683.76	$27,684
Pump	125 GPM, 150' Head, 10 HP, Centrifugal Pump	Each	1	$3,024.40	$3,024
Pump Station Heater	1500 watt wall type, with blower	Each	1	$275.00	$275
Trenching	4'-6' Deep, 1/2 CY excavator	BCY	666	$5.65	$3,763
Pipe	4" PVC	LF	1,200	$7.70	$9,240
Pipe Bedding	Sand	LCY	149	$16.45	$2,454
Compaction		BCY	799	$4.34	$3,469
Backfill	4'-6' Deep, 1/2 CY excavator	BCY	666	$5.65	$3,763
Water meter		Each	1	$2,845.34	$2,845
Administrative Costs	Permitting	LS	1	$5,690.67	$5,691
Subtotal					$238,220
Backfilling					
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	19,783	$1.61	$31,851
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	19,783	$0.99	$19,585
Subtotal					$51,436
Soil Cover					
Demarcation layer	High visibility construction fence	MSF	145	$75.00	$10,875
6"soil fill	Includes 6" soil and transportation to site	CY	3,007	$11.38	$34,224
Placement of soil fill	300 Horsepower Bulldozer w/ 50' haul	BCY	2,685	$1.61	$4,323
Topsoil (Material only)	0.5' depth of topsoil over soil cover area	CY	3,007	$14.23	$42,785
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	2,685	$1.61	$4,323
Compaction of Topsoil	Vibrating roller, 6" compacted lifts, 4 passes	ECY	2,685	$1.98	$5,317
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	160	$47.50	$7,576
Subtotal					$109,424
Site Restoration for Excavated Area					
Topsoil (Material only)	0.5 ft thick layer	LCY	2,614	$14.23	$37,182
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	2,334	$1.61	$3,757
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	140	$47.50	$6,650
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	162	$82.50	$13,365
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	162	$72.00	$11,664
Subtotal					$72,618
Physical Barriers/Warnings					
Fence	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	2,800	$28.50	$79,800
Gate	Double swing gates, incl posts with 12' opening	Each	3	$730.00	$2,190
Signs	Reflectorized 24"x24" sign mounted to fence	Each	5	$190.50	$953
Subtotal					$82,943
				Capital Cost Subtotal:	$5,714,054
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$5,285,500
				10% Legal, administrative, engineering fees:	$528,550
				15% Contingencies:	$872,107
				Total Capital Cost:	**$6,687,000**
Annual Costs					
Not applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				30-Year Present Worth of Annual Costs:	**$0**
5-Year Costs					
10% of Fence Replaced	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	280	$28.50	$7,980
Institutional Controls	Maintain/update documentation	Each	1	$5,000.00	$5,000
5-year CERCLA reviews		Hr	80	$109.00	$8,800
Subtotal					$21,780
				5-Year Cost Subtotal:	$21,780
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$20,147
				10% Legal, administrative, engineering fees:	$2,015
				15% Contingencies:	$3,324
				5-Year Total:	**$25,485**
				30-Year Present Worth of 5-Year Costs:	**$64,000**
				2012 Total Present Worth Cost:	**$6,751,000**

Assumptions:

1. Total area at the site	209,810	SF, as obtained from EEEPC CAD department Sept 2007
	4.8	acres
2. Contaminated soil volume =	14,086	BCY, as obtained from EEEPC CAD department Sept 2007
Perimeter of excavation area =	1,200	ft, as estimated from Figure 5-7
Additional volume to be excavated due to cutback =	2,400	BCY, estimated from maximum excavation depth and excavation perimeter
Additional assumed 20% volume to be excavated to achieve unrestricted SCGs=	3,297	BCY
Total excavation volume =	19,783	BCY

Table 5-6 Cost Estimate for Uncovered Spoils Alternative 3 - Excavation and On-Site Treatment to meet Unrestricted SCOs in Fill Area 3 (Residential Parcel), Soil Cover with Site Management for Uncovered Impacted Areas near the Main Dredge Spoil Disposal Area and within Fill Area 2
Special Area 13 Dredge Spoil Disposal Are

Item Description	Comment	Unit	Quantity	Unit Cost	Cost

3. Contaminated soil excavation area = 64,810 SF, as obtained from EEEPC CAD department Sept 2007 for the Morrison Property
   Additional area due to cutback = 61,200 SF, assumes 3:1 slope around excavation perimeter based on max excavation depth
   Total excavation area = 126,010 SF
   2.9 acres
4. Wooded area assumed to be = 1.5 acres
5. Assume confirmation sampling spacing = 10 foot grid spacing (per 40 CFR 761.265)
6. Maximum excavation depth = 17 ft BGS
7. Basic production rate of HTTD system = 35 Tons/hr
   840 Tons/day
   75% assumed effective operating rate for maintenance and downtime
   630 Tons/day, effective production rate
   229,950 Tons/year, effective production rate
8. Assuming effective production rate, time to treat excavated soil = 1.5 months, or 0.10 years
9. Mob/demob assumed to be = 2 months, or 0.17 years
   Volume of soil to be treated by HTTD unit = 17,383 BCY
10. Assume % of treated soil to be used as backfill = 100%
11. Assume % reduction by volume of soil from Thermal Treatment process = 0%
12. Backfill volume for site restoration = 19,783 BCY, or
    22,157 LCY
13. Topsoil volume for site restoration (0.5ft thick) = 2,334 BCY, or
    2,614 LCY
14. Assume tree planting grid spacing every 20 ft
15. No storage facilities are assumed for treated or untreated soil. However, these facilities may be added at a later time.
16. Soil testing for HTTD unit assumes:
    Influent - 1 sample for every 315 Tons (or 2 samples every day)
    Effluent - 1 sample for every 1,260 Tons (or once every other day)
17. The distance from the treatment facility to river is = 1,200 ft
    The distance from the treatment facility to electrical connection is = 100 ft
    The distance from the treatment facility to natural gas connection = 7,920 ft
18. Depth of water pipe trench = 5 ft
    Width of water pipe trench = 3 ft
    Conversion from feet cubed to cubic yards = 0.037
19. Depth of pipe bedding (water line) = 1.0 ft
20. Depth of backfill (water line) = 4.0 ft
21. Width of natural gas trench = 2.0 ft
    Depth of natural gas trench = 3.0 ft
22. Depth of pipe bedding (gas) = 1.0 ft
    Depth of backfill (gas) = 2.0 ft
23. Electrical wiring assumes #10 (wiring inside facility)= 3000 ft
    Assuming 3 - 1/0 wires from processing facility to electrical connection = 300 ft
24. Demobilization of processing unit is not included.
25. Based on geotechnical data from the RI (EEEPC 2007) , in-situ bulk density of site soils = 1.5 Tons/BCY
26. For loose soil assume sandy, dry soil with swell factor = 12%
    (Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).
27. Topsoil density assumed to be 1.2 Tons/LCY
28. The excavated cap volume will be used as backfill.
29. Fire protection for processing facility not included in this estimate.
30. Present worth of costs assumes 5% annual interest rate.
31. HTTD costs supplied by vendor, Environmental Soil Management, Inc. (ESMI), June 2007. Other unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.
32. Total soil cover area = 145,000 SF, as obtained from EEEPC CAD department Sept 2007 for the Moreau Site (Fill Area 2)
    3.3 acres
33. Soil Cover perimeter = 2800 ft, as estimated from Figure 5-8
34. Wooded area assumed to be = 10% of soil cover area
    0.3 acres
    14,500 SF
35. Soil thickness for cover base = 0.5 ft
36. Volume of soil for base of cover = 2685 BCY
    3007 LCY
37. Topsoil volume for site restoration (6") = 3007 LCY
38. Assumed time to install soil cover = 160 LCY/hr, placement of soil layer
    0.75 assumed effective production rate
    120 LCY/hr, effective production rate
    960 LCY/day, effective production rate
    4 Days for soil placement
    17 Days for demarcation layer
    5 days assumed for topsoil/site restoration
    26 days, in total to install cap, or
    1 months, or 0.1 years
39. Mob/demob assumed to be = 2 months, or 0.2 years
40. Assume tree planting grid spacing every 20 ft
41. For loose soil assume sandy, dry soil with swell factor = 12%

Key:
BCY = bank cubic yards
BGS = below ground surface
CLF = current limiting fuse
ft = feet
LCY = loose cubic yards
LF = linear foot
LS = lump sum
MSF = thousand square feet
SF = square feet

Table 5-7 Cost Estimate for Uncovered Spoils Alternative 5 - Excavation and Off-Site Disposal of all Uncovered Spoils Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings	LS	1	$230,237.07	$230,237
Subtotal					$230,237
Site Preparation					
Surveying Crew	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	Day	25	$1,821.02	$45,504
Cut and Chip Trees	Trees to 12" dia.	Acre	1.5	$6,250.00	$9,298
Grub Stumps and Remove		Acre	1.5	$3,775.00	$5,616
Install Construction Fence	Chain link fence rental, 6' high, encompass treatment facility	LF	5,000	$8.75	$43,750
Subtotal					$104,167
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,414.40	$6,829
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,536.01	$34,144
Site Safety Officer	10 hrs/day, 5days/wk, $100/hr; 100% of project duration	manweeks	15	$5,690.67	$83,445
Subtotal					$124,418
Excavation					
Excavation	Backhoe, hydraulic, 2 CY bucket = 130 CY/hr	BCY	39,523	$1.80	$71,142
Transport contaminated soil to Stockpile	Front End Loader, 5 CY bucket	BCY	35,923	$1.85	$66,458
Stockpiling	300 Horsepower Bulldozer w/ 50' haul	BCY	35,923	$1.61	$57,836
Transport clean soil (cutback) to Stockpile	Front End Loader, 5 CY bucket	BCY	3,600	$1.85	$6,660
Stockpiling clean soil (cutback)	300 Horsepower Bulldozer w/ 50' haul	BCY	3,600	$1.61	$5,796
Stockpile Liner		LS	1	$5,690.67	$5,691
Dewatering	Methodology to be determined by contractor; unit cost assumed as 2-4" pumps operating 24 hr/day; assume dewatering only for Morrison Property (14,100 BCY of excavation and backfilling)	Day	54	$1,037.00	$56,237
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	4,082	$85.36	$348,412
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	408	$113.81	$46,455
Confirmation Sampling (Metals)	TAL metals	Each	4,082	$142.27	$580,686
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	21	$227.63	$4,780
Subtotal					$1,250,153
Off Site Disposal					
Off-Site Disposal of Non-Hazardous Soil (PCB concentration < 50 ppm)					
Characterization Sampling	Includes TCLP, Pesticides/PCB, PAH, RCRA ignitability, RCRA corrosivity, RCRA reactivity analyses; Assume 24-hr turnaround; one sample for first 500 LCY, and one sample for each additional 1000 LCY	Each	41	$1,669.00	$68,429
Loading Trucks	Front End Loader, 5 CY bucket	BCY	35,923	$1.85	$66,458
Transportation	Dump truck transport from Special Area 13 to Fairport, NY; incl taxes and fees	Ton	53,885	$51.00	$2,748,125
Off-Site Disposal (Soil)	Disposal at High Acres Landfill (Fairport, NY); incl taxes and fees	Ton	53,885	$52.00	$2,802,010
Subtotal					$5,685,021
Backfilling					
Backfill (Material)	Includes material and transportation to site;	LCY	40,234	$11.38	$457,917
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	39,523	$1.61	$63,632
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	39,523	$0.99	$39,128
Subtotal					$560,677
Site Restoration					
Topsoil (Material only)	0.5 ft thick layer	LCY	6,666	$14.23	$94,839
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	5,952	$1.61	$9,583
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	350	$47.50	$16,625
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	162	$82.50	$13,365
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	162	$72.00	$11,664
Subtotal					$146,076
				Capital Cost Subtotal:	$8,100,749
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$7,493,193
				10% Legal, administrative, engineering fees:	$749,319
				15% Contingencies:	$1,236,377
				Total Capital Cost:	**$9,479,000**

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Section 5 Tables SA 13 FS Cost Estimate_Rev4_JJ_RM.xlsx-5-7Uncov Alt 5, Ex, offsitedisp-3/6/2012

Table 5-7 Cost Estimate for Uncovered Spoils Alternative 5 - Excavation and Off-Site Disposal of all Uncovered Spoils Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				Present Worth of Annual Costs:	**$0**
5-Year Costs (Periodic Costs)					
Not Applicable				$0.00	$0
Subtotal					$0
				5-Year Cost Subtotal:	$0
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				5-Year Total:	**$0**
				30-Year Present Worth of 5-Year Costs:	**$0**
				2012 Total Present Worth Cost:	**$9,479,000**

Assumptions:

1. Total area at the site	209,810	SF, as obtained from EEEPC CAD department Sept 2007 for Morrison property + Moreau Site
	4.8	acres
2. Contaminated soil volume =	29,336	BCY, as obtained from EEEPC CAD department Sept 2007
Perimeter of excavation area =	4,000	ft, as estimated from Figure 5-8
Additional volume to be excavated due to cutback =	3,600	BCY, estimated from maximum excavation depth and excavation perimeter
Additional assumed 20% volume to be excavated to achieve unrestricted SCGs=	6,587	BCY
Total excavated volume =	39,523	BCY
3. Contaminated soil excavation area =	209,810	SF
Additional area due to cutback =	111,600	SF, assumes 3:1 slope around excavation perimeter based on max excavation depth
Total excavation area =	321,410	SF
	7.4	acres
4. Wooded area assumed to be =	1.5	acres
5. Assume confirmation sampling spacing =	10	foot grid spacing (per 40 CFR 761.265)
6. Maximum excavation depth =	17	ft BGS, at the Morrison property, and
	6	ft BGS, elsewhere
7. Assumed production rate of excavation =	130	BCY/hr
	75%	assumed effective production rate
	98	BCY/hr, effective production rate
	780	BCY/day, effective production rate
	284,700	BCY/year, effective production rate
8. Assuming effective production rate, time to excavate soil =	2	months, or 0.2 years
9. Mob/demob assumed to be =	2	months, or 0.17 years
10. Volume of soil estimated as < 50ppb PCBs =	35,923	BCY
11. Taxes and fees for non-haz landfill transportation	26%	
12. Taxes and fees for non-haz landfill disposal	12%	
13. Total volume of backfill needed =	39,523	BCY
Backfill needed for purchase =	35,923	BCY
14. Topsoil volume for site restoration (0.5ft thick) =	5,952	BCY, or
	6,666	LCY
15. Assume tree planting grid spacing every	20	ft
16. Based on geotechnical data from the RI (EEEPC 2007), in-situ bulk density of site soils =	1.5	Tons/BCY
17. For loose soil assume sandy, dry soil with swell factor =	12%	

(Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).

18. Topsoil density assumed to be 1.2 Tons/LCY
19. The excavated cap volume will be used as backfill.
20. Present worth of costs assumes 5% annual interest rate.
21. Disposal costs supplied by vendor, Waste Management, Inc., February 2012. Other unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.

Key:
BCY = bank cubic yards
BGS = below ground surface
ft = feet
LCY = loose cubic yards
LF = linear foot
LS = lump sum
MSF = thousand square feet
SF = square feet

Table 5-8 Cost Estimate for Alternative 2, Covered Spoils - No Further Action with Site Management
Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Institutional Controls		Each	1	$5,700	$5,700
Subtotal					$5,700
Physical Barriers/Warnings					
Fence	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	2,000	$28.50	$57,000
Gate	Double swing gates, incl posts with 12' opening	Each	3	$730.00	$2,190
Signs	Reflectorized 24"x24" sign mounted to fence	Each	5	$190.50	$953
Subtotal					$60,143
				Capital Cost Subtotal:	$65,843
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$60,904
				10% Legal, administrative, engineering fees, construction management:	$6,090
				15% Contingencies:	$10,049
				Total Capital Cost:	**$78,000**
Annual Costs					
Groundwater Sampling (Labor)	2-people @ $100/hr; 8 hr/day; total of 3 wells; assume 3 wells/day	Day	1	$1,600.00	$1,600
Parameter Analysis	Includes TCL PCBs	Each	3	$100.00	$300
Data Evaluation and Reporting		HR	32	$100.00	$3,200
Subtotal					$5,100
				Annual Cost Subtotal:	$5,100
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$4,718
				10% Legal, administrative, engineering fees:	$472
				15% Contingencies:	$1,038
				Annual Cost Total:	**$6,227**
				30-Year Present Worth of Annual Costs:	**$96,000**
5-Year Costs (Periodic Costs)					
10% of Fence Replaced	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	200	$28.50	$5,700
Institutional Controls	Maintain/update documentation	Each	1	$5,000.00	$5,000
5-year CERCLA reviews		Hr	80	$109.00	$8,800
Subtotal					$19,500
				5-Year Cost Subtotal:	$19,500
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$18,038
				10% Legal, administrative, engineering fees:	$1,804
				15% Contingencies:	$2,976
				5-Year Total:	**$22,817**
				30-Year Present Worth of 5-Year Costs:	**$64,000**
				2012 Total Present Worth Cost:	**$238,000**

Assumptions:

1. Length of fencing estimated from Figure 5-9
2. Excavation perimeter = 2,000 LF, as estimated from Figure 5-9
3. Present worth of costs assumes 5% annual interest rate.
4. Unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.

Key:

HR = hour
LF = linear foot
LS = lump sum

Table 5-9 Cost Estimate for Alternative 3, Covered Spoils - Excavation and Off-Site Disposal of all Covered Spoils Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings	LS	1	$230,148.96	$230,149
Subtotal					$230,149
Site Preparation					
Surveying Crew	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	Day	37	$1,821.02	$66,467
Cut and Chip Trees	Trees to 12" dia.	Acre	1.5	$6,250.00	$9,298
Grub Stumps and Remove		Acre	1.5	$3,775.00	$5,616
Install Construction Fence	Chain link fence rental, 6' high, encompass treatment facility	LF	2,000	$8.75	$17,500
Subtotal					$98,880
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,414.40	$6,829
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,536.01	$34,144
Site Safety Officer	10 hrs/day, 5days/wk, $100/hr; 100% of project duration	manweeks	15	$5,690.67	$83,843
Subtotal					$124,815
Excavation					
Excavation	Backhoe, hydraulic, 2 CY bucket = 130 CY/hr	BCY	39,900	$1.80	$71,820
Transport contaminated soil to Stockpile	Front End Loader, 5 CY bucket	BCY	36,300	$1.85	$67,155
Stockpiling	300 Horsepower Bulldozer w/ 50' haul	BCY	36,300	$1.61	$58,443
Transport clean soil (cutback) to Stockpile	Front End Loader, 5 CY bucket	BCY	3,600	$1.85	$6,660
Stockpiling clean soil (cutback)	300 Horsepower Bulldozer w/ 50' haul	BCY	3,600	$1.61	$5,796
Stockpile Liner		LS	1	$5,690.67	$5,691
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	4,083	$85.36	$348,509
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	408	$113.81	$46,468
Confirmation Sampling (Metals)	TAL metals	Each	4,083	$142.27	$580,848
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	21	$227.63	$4,780
Subtotal					$1,196,169
Off Site Disposal					
Off-Site Disposal of Non-Hazardous Soil (PCB concentration < 50 ppm)					
Characterization Sampling	Includes TCLP, Pesticides/PCB, PAH, RCRA ignitability, RCRA corrosivity, RCRA reactivity analyses; Assume 24-hr turnaround; one sample for first 500 LCY, and one sample for each additional 1000 LCY	Each	42	$1,669.00	$70,098
Loading Trucks	Front End Loader, 5 CY bucket	BCY	36,300	$1.85	$67,155
Transportation	Dump truck transport from Special Area 13 to Fairport, NY; incl taxes and fees	Ton	54,450	$51.00	$2,776,950
Off-Site Disposal (Soil)	Disposal at High Acres Landfill (Fairport, NY); incl taxes and fees	Ton	54,450	$52.00	$2,831,400
Subtotal					$5,745,603
Backfilling					
Backfill (Material)	Includes material and transportation to site	LCY	40,656	$11.38	$462,720
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	39,900	$1.61	$64,239
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	39,900	$0.99	$39,501
Subtotal					$566,460
Site Restoration					
Topsoil (Material only)	0.5 ft thick layer	LCY	5,844	$14.23	$83,143
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	5,218	$1.61	$8,401
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 10% for disturbed areas outside of excavation area	MSF	400	$47.50	$19,000
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	162	$82.50	$13,365
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	162	$72.00	$11,664
Subtotal					$135,573
				Capital Cost Subtotal:	$8,097,649
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$7,490,325
				10% Legal, administrative, engineering fees:	$749,033
				15% Contingencies:	$1,235,904
				Total Capital Cost:	**$9,476,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.925):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				Present Worth of Annual Costs:	**$0**

Table 5-9 Cost Estimate for Alternative 3, Covered Spoils - Excavation and Off-Site Disposal of all Covered Spoils Special Area 13 Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
5-Year Costs (Periodic Costs)					
Not Applicable				$0.00	$0
Subtotal					$0
				5-Year Cost Subtotal:	$0
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.925)	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				5-Year Total:	**$0**
				30-Year Present Worth of 5-Year Costs:	**$0**
				2012 Total Present Worth Cost:	**$9,476,000**

Assumptions:

1. Total cap area at the site (assumed to be within the existing fenceline) =	281,773	SF, as obtained from EEEPC CAD department Sept 2007
	6.5	acres
2. Contaminated soil volume =	29,650	BCY, as obtained from EEEPC CAD department Sept 2007
Additional volume to be excavated due to cutback =	3,600	BCY, estimated from maximum excavation depth and excavation perimeter
Additional assumed 20% volume to be excavated to achieve unrestricted SCGs=	6,650	BCY
Total excavated volume =	39,900	BCY
3. Contaminated soil excavation area =	281,800	SF
Additional area due to cutback =	84,000	SF, assumes 3:1 slope around excavation perimeter based on max excavation depth
Total excavation area =	365,800	SF, as obtained from EEEPC CAD department August 2007, or
	8.4	acres
4. Wooded area assumed to be =	1.5	acres
5. Assume confirmation sampling spacing =	10	foot grid spacing (per 40 CFR 761.265)
6. Maximum excavation depth =	7	ft BGS
7. Assumed production rate of excavation =	130	BCY/hr
	75%	assumed effective production rate
	98	BCY/hr, effective production rate
	683	BCY/day, effective production rate
	249,113	BCY/year, effective production rate
8. Assuming effective production rate, time to excavate soil =	2	months, or 0.2 years
9. Mob/demob assumed to be =	1	months, or 0.08 years
10. Volume of soil estimated as < 50ppb PCBs =	36,300	BCY
11. Taxes and fees for non-haz landfill transportation	26%	
12. Taxes and fees for non-haz landfill disposal	12%	
13. Total volume of backfill needed =	39,900	BCY
Volume of backfill needed for purchase (excludes cutback material to be reused) =	36,300	BCY
14. Topsoil volume for site restoration (0.5ft thick) =	5,218	BCY, or
	5,844	LCY
15. Assume tree planting grid spacing every	20	ft
16. Based on geotechnical data from the RI (EEEPC 2007), in-situ bulk density of site soils =	1.5	Tons/BCY
17. For loose soil assume sandy, dry soil with swell factor = (Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).	12%	
18. Topsoil density assumed to be	1.2	Tons/LCY

19. The excavated cap volume will be used as backfill.
20. Present worth of costs assumes 5% annual interest rate.
21. Disposal costs supplied by vendor, Waste Management, Inc., February 2007. Other unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.

22. Length of new fence =	2,000	LF, as estimated from Figure 5-9
23. Excavation perimeter =	4,000	LF, as estimated from Figure 5-9

Key:
BCY = bank cubic yards
BGS = below ground surface
ft = feet
LCY = loose cubic yards
LF = linear foot
LS = lump sum
MSF = thousand square feet
SF = square feet

Table 5-10 Summary of Total Present Values of Alternatives at the Special Area 13 Dredge Spoil Disposal Area
Special Area 13 Dredge Spoil Disposal Area

	Landfill Cell Altneratives				Uncovered Spoils					Covered Spoils		
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 1	Alternative 2	Alternative 3
Description	No Action	No Further Action with Site Management	Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and On-site Treatment by HTTD	Restoration to Pre-Disposal or Unrestricted Conditions by Excavation and Off-Site disposal of the Dredge Spoils and Imacted Soils	No Action	Cover all Uncovered Spoils in Place	Excavation and Off-site Disposal to meet Unrestricted SCOs in Fill Area 3 (Residential Parcel), Soil Cover with Site Management for Uncovered Impacted Areas near the Main Dredge Spoil Disposal Area and within Fill Area 2	Excavation and On-site Treatment to meet Unrestricted SCOs in Fill Area 3 (Residential Parcel), Soil Cover with Site Management for Uncovered Impacted Areas near the Main Dredge Spoil Disposal Area and within Fill Area 2	Excavation and Off Site Disposal of all Uncovered Spoils	No Action	No Further Action with Site Management	Excavation and Off-Site Disposal of all Covered Spoils
Estimated Total Project Duration	0	30	2 to 4	1 to 2	0	1 (30)[4]	1 (30)[4]	1 (30)[4]	1 to 2	0	30	1 to 3
Capital Cost	$0	$8,000	$32,821,000	$28,344,000	$0	$506,000	$4,780,000	$6,687,000	$9,479,000	$0	$78,000	$9,476,000
Annual O&M[1]	$0	$191,000	$0	$0	$0	$0	$0	$0	$0	$0	$96,000	$0
Periodic O&M[2]	$0	$103,000	$0	$0	$0	$83,000	$71,000	$64,000	$0	$0	$64,000	$0
2012 Total Present Value of Alternative[3]	**$0**	**$302,000**	**$32,821,000**	**$28,344,000**	**$0**	**$589,000**	**$4,851,000**	**$6,751,000**	**$9,479,000**	**$0**	**$238,000**	**$9,476,000**

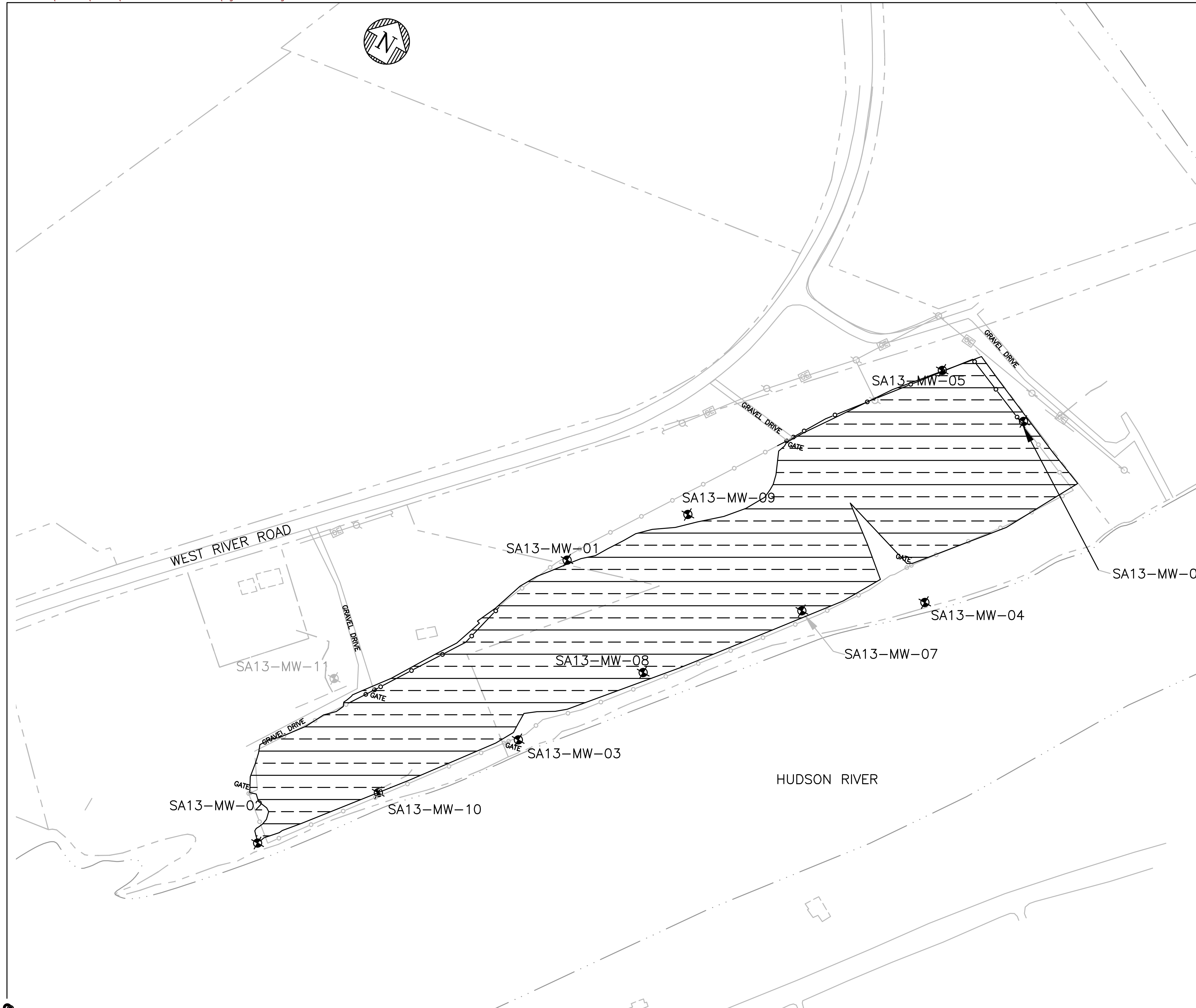
Notes:

1 - Annual costs would typically include groundwater monitoring and reporting.

2 - Periodic costs would typically include maintaining/updating institutional controls and partial fence replacement.

3 - The Total Present value of Alternative represents the estimated present value of the capital costs and 30-years of annual and periodic costs.

4 - Project duration after installation of engineering control includes 30 years of OM&M and periodic costs



LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 2)
- EXISTING FENCE
- APPROXIMATE LOCATION OF EXISTING STRUCTURE
- SA13-MW-04 — EXISTING MONITORING WELL IN LTM PROGRAM
- EXISTING OVERHEAD ELECTRIC
- EXISTING POWER POLE
- EXTENT OF EXISTING CAPPED LANDFILL CELL

NOTES:

1. SITE FEATURE LOCATIONS BASED ON 2003 AERIAL PHOTOGRAPHY.
2. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA COUNTY PARCEL DATA, 2002.
3. EXISTING UTILITIES AND POWER POLES TAKEN FROM LU ENGINEERS DRAWING 10623-08CADD10623-08 SA 13.DWG, DATED 3/16/06.

APPROXIMATE SCALE IN FEET

0 250 500 750

FIGURE 5-1 LANDFILL CELL ALTERNATIVE 2 – NO FURTHER ACTION WITH SITE MANAGEMENT
SPECIAL AREA 13
MOREAU, NEW YORK

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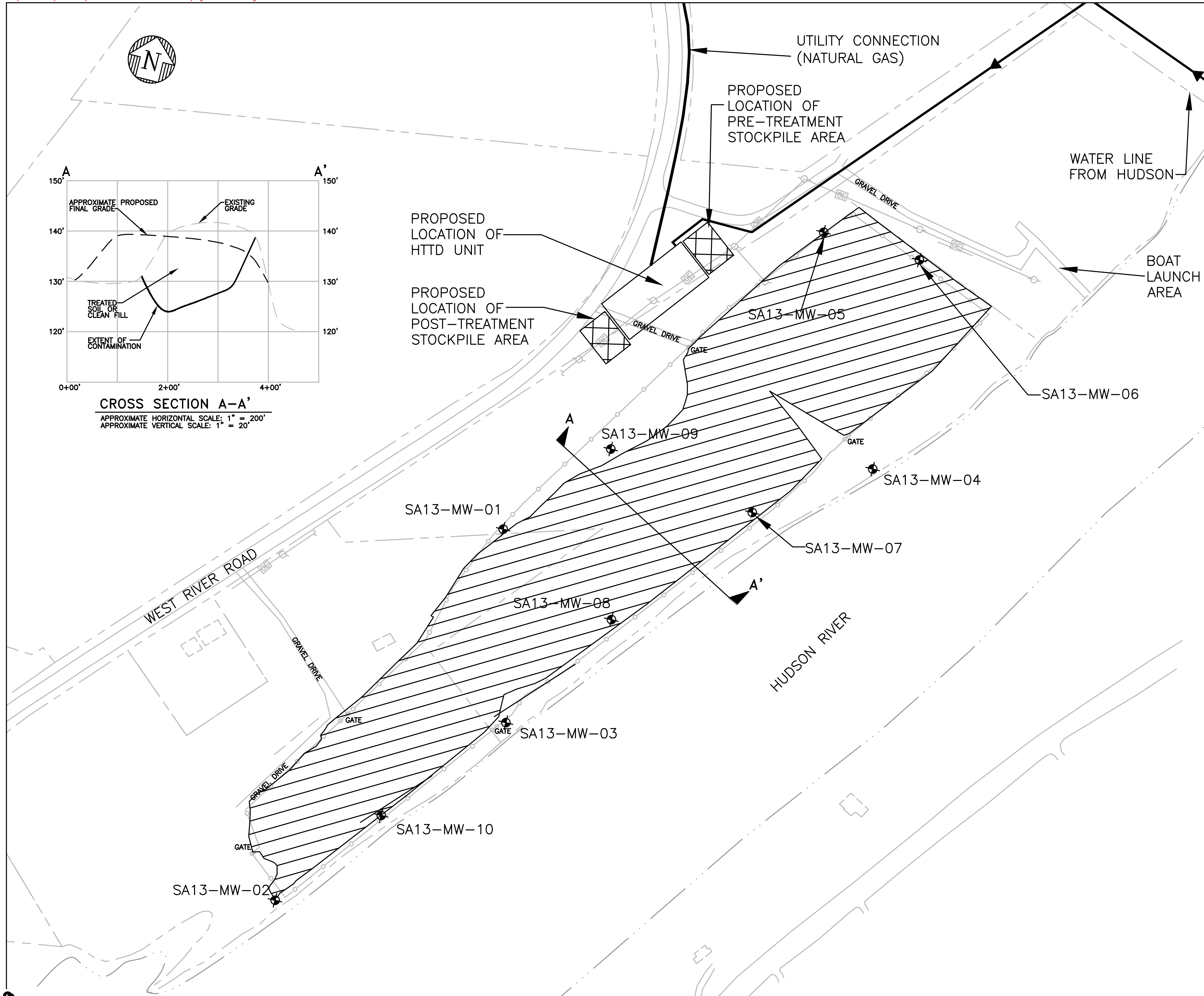
F:\NYSDEC\SA 13\HUDSON FS JUNE 2007\Figure 5-3.dwg



LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 2)
- EXISTING FENCE
- APPROXIMATE LOCATION OF EXISTING STRUCTURE
- SA13-MW-06 EXISTING MONITORING WELL TO BE DECOMMISSIONED
- EXISTING OVERHEAD ELECTRIC
- EXISTING POWER POLE
- PROPOSED SOIL AREAS TO BE EXCAVATED AND TREATED ON-SITE
- PROPOSED STOCKPILE AREA

NOTES:

1. SITE FEATURE LOCATIONS BASED ON 2003 AERIAL PHOTOGRAPHY.
2. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA COUNTY PARCEL DATA, 2002.
3. EXISTING UTILITIES AND POWER POLES TAKEN FROM LU ENGINEERS DRAWING 10623-08CADD10623-08 SA 13.DWG, DATED 3/16/06.

APPROXIMATE SCALE IN FEET

0 200 400 600

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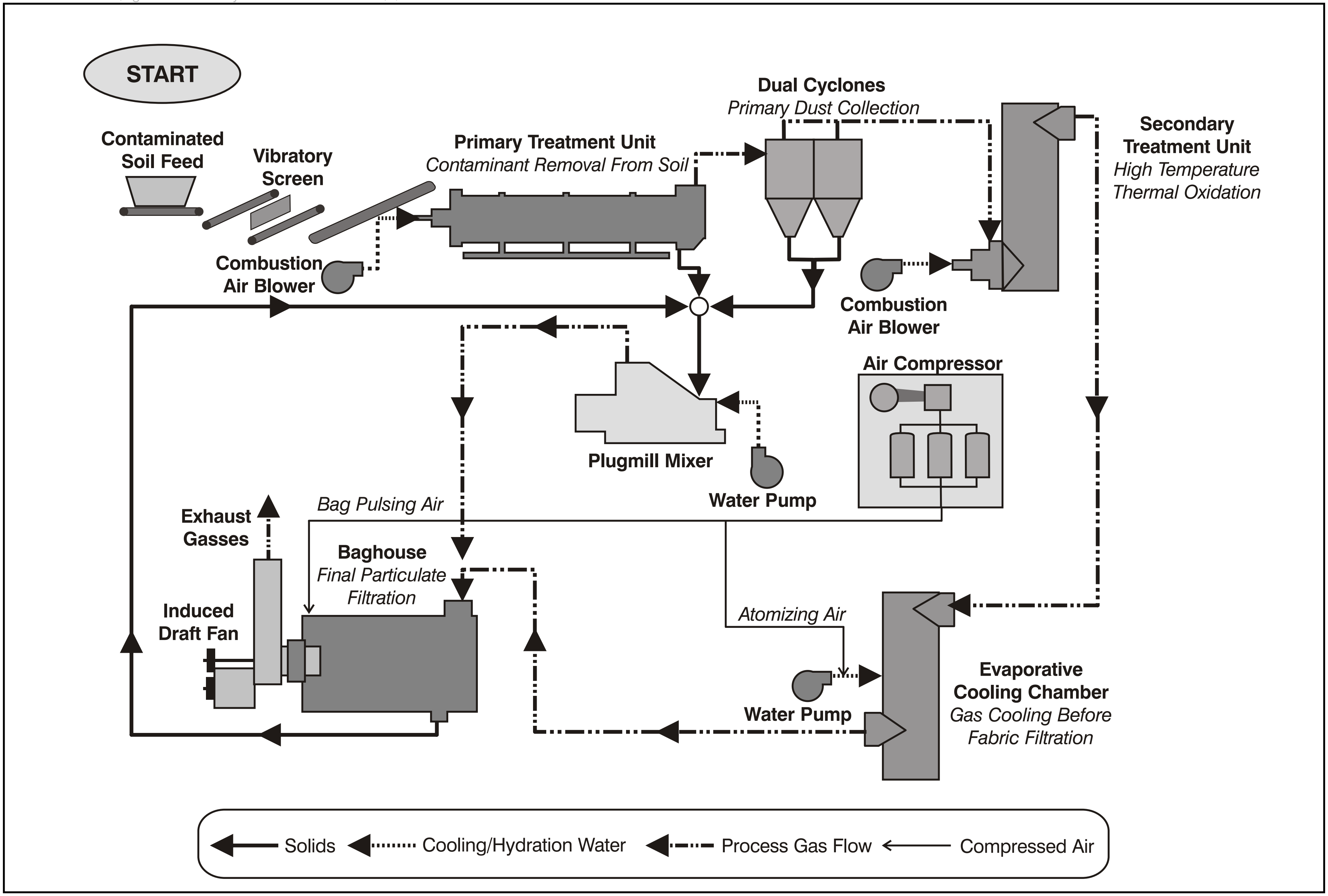
FIGURE 5-2 LANDFILL CELL ALTERNATIVE 3: EXCAVATION ON-SITE TREATMENT
SPECIAL AREA 13
MOREAU, NEW YORK



SOURCE: Environmental Soil Management Inc., 2007

Figure 5-3 High Temperature Thermal Desorption System Process Flow Diagram

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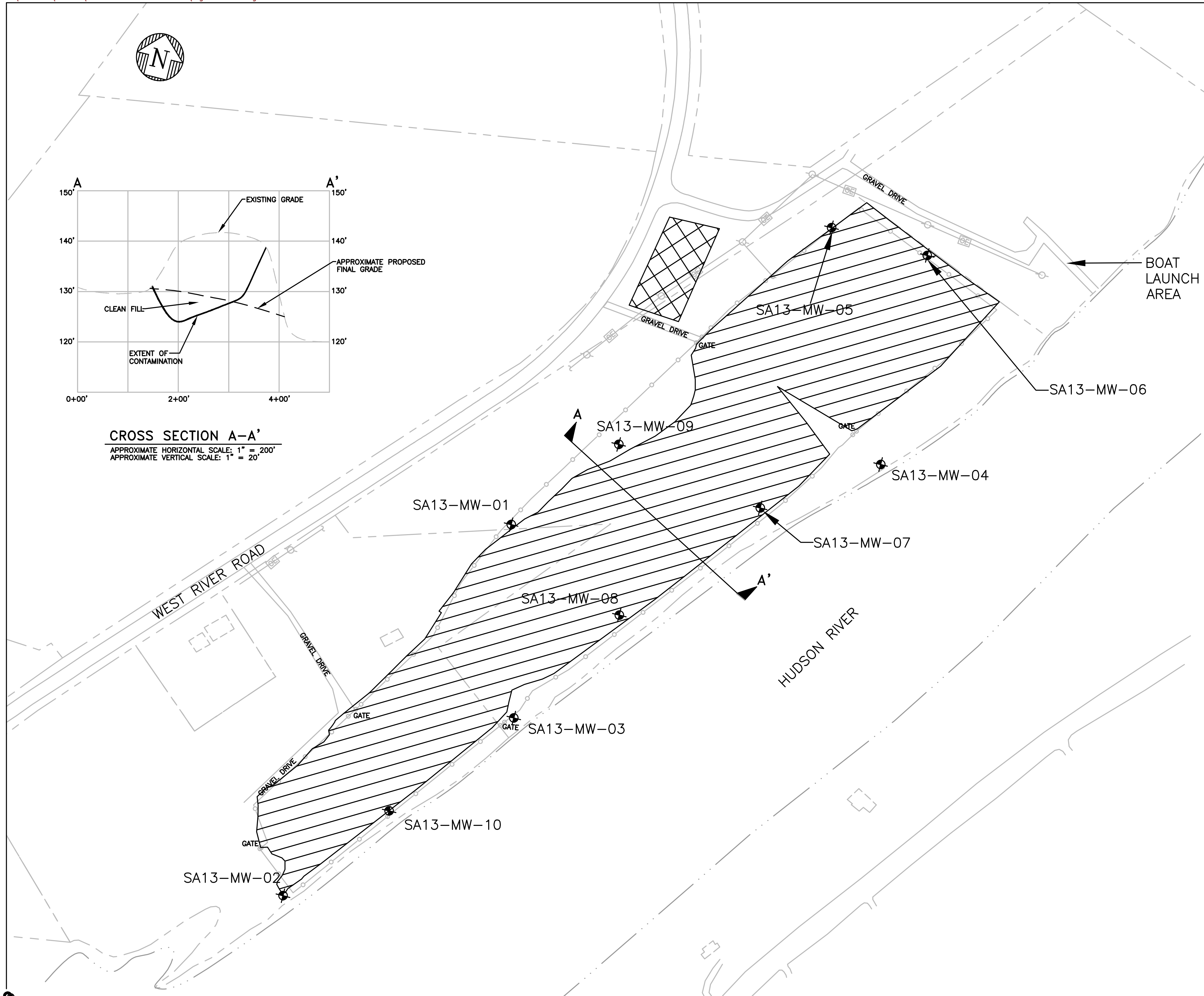

LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 2)
- EXISTING FENCE
- APPROXIMATE LOCATION OF EXISTING STRUCTURE
- SA13-MW-06 — EXISTING MONITORING WELL TO BE DECOMMISSIONED
- EXISTING OVERHEAD ELECTRIC
- EXISTING POWER POLE
- PROPOSED SOIL AREAS TO BE EXCAVATED AND DISPOSED OFF-SITE
- PROPOSED STOCKPILE AREA FOR CONTAMINATED SOIL

NOTES:

1. SITE FEATURE LOCATIONS BASED ON 2003 AERIAL PHOTOGRAPHY.
2. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA COUNTY PARCEL DATA, 2002.
3. EXISTING UTILITIES AND POWER POLES TAKEN FROM LU ENGINEERS DRAWING 10623-08CADD10623-08 SA 13.DWG, DATED 3/16/06.

APPROXIMATE SCALE IN FEET

0 200 400 600

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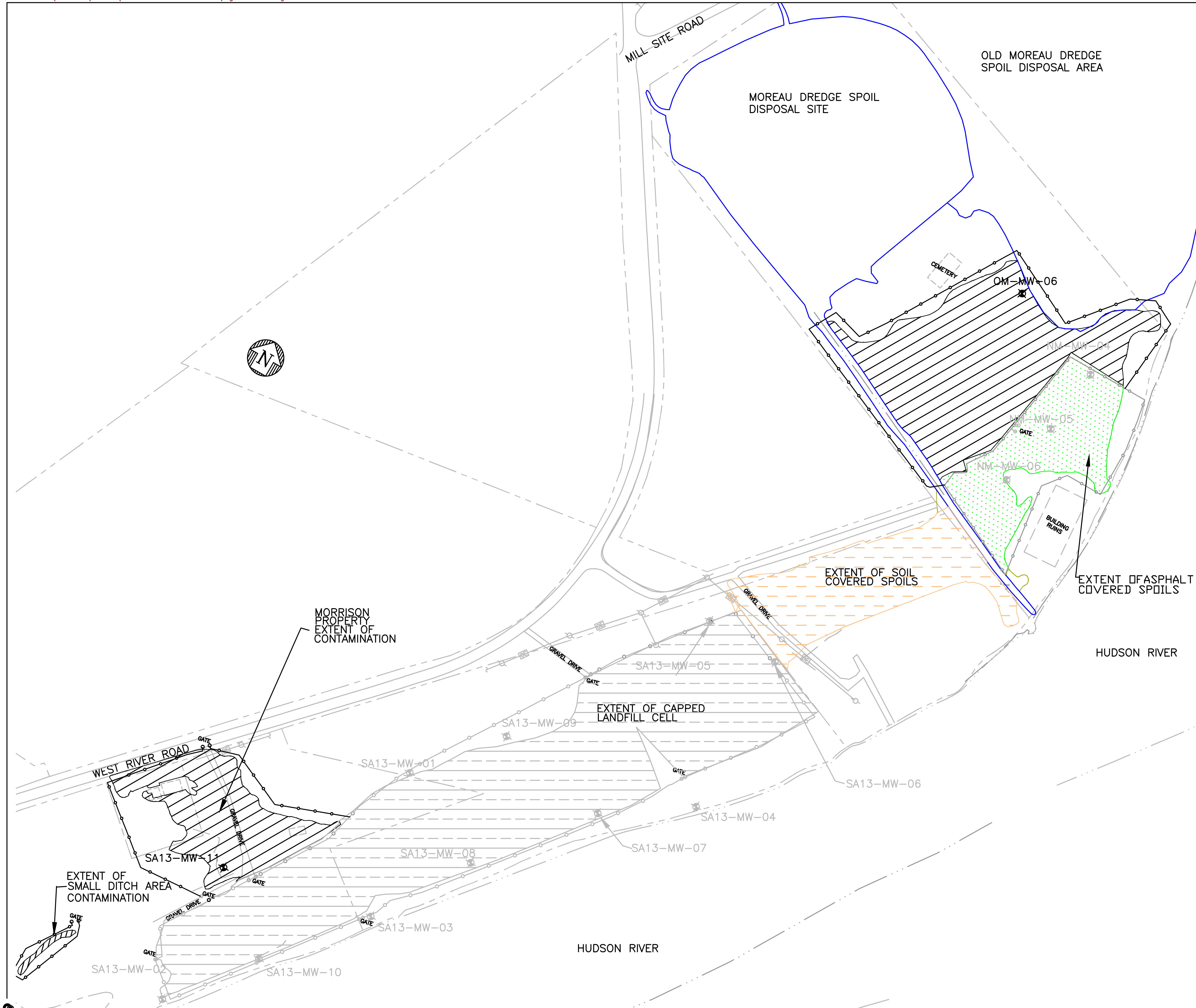
FIGURE 5-4 LANDFILL CELL ALTERNATIVE 4: EXCAVATION AND OFF-SITE DISPOSAL
SPECIAL AREA 13
MOREAU, NEW YORK



LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 1)
- PROPOSED FENCE
- EXISTING FENCE
- APPROXIMATE LOCATION OF EXISTING STRUCTURE
- SA13-MW-04 EXISTING MONITORING WELL
- SA13-MW-04 EXISTING MONITORING WELL TO BE DECOMMISSIONED
- OE EXISTING OVERHEAD ELECTRIC
- EXISTING POWER POLE
- – EXTENT OF UNCOVERED SPOILS; PROPOSED EXTENT OF SOIL COVER

NOTES:

1. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA COUNTY PARCEL DATA, 2002.
2. EXISTING UTILITIES AND POWER POLES TAKEN FROM LU ENGINEERS DRAWING 10623-08CADD10623-08 SA 13.DWG, DATED 3/16/06.

APPROXIMATE SCALE IN FEET

0 250 500 750

FIGURE 5-5 UNCOVERED SPOILS ALTERNATIVE 2– COVER ALL UNCOVERED SPOILS IN PLACE
SPECIAL AREA 13
MOREAU, NEW YORK

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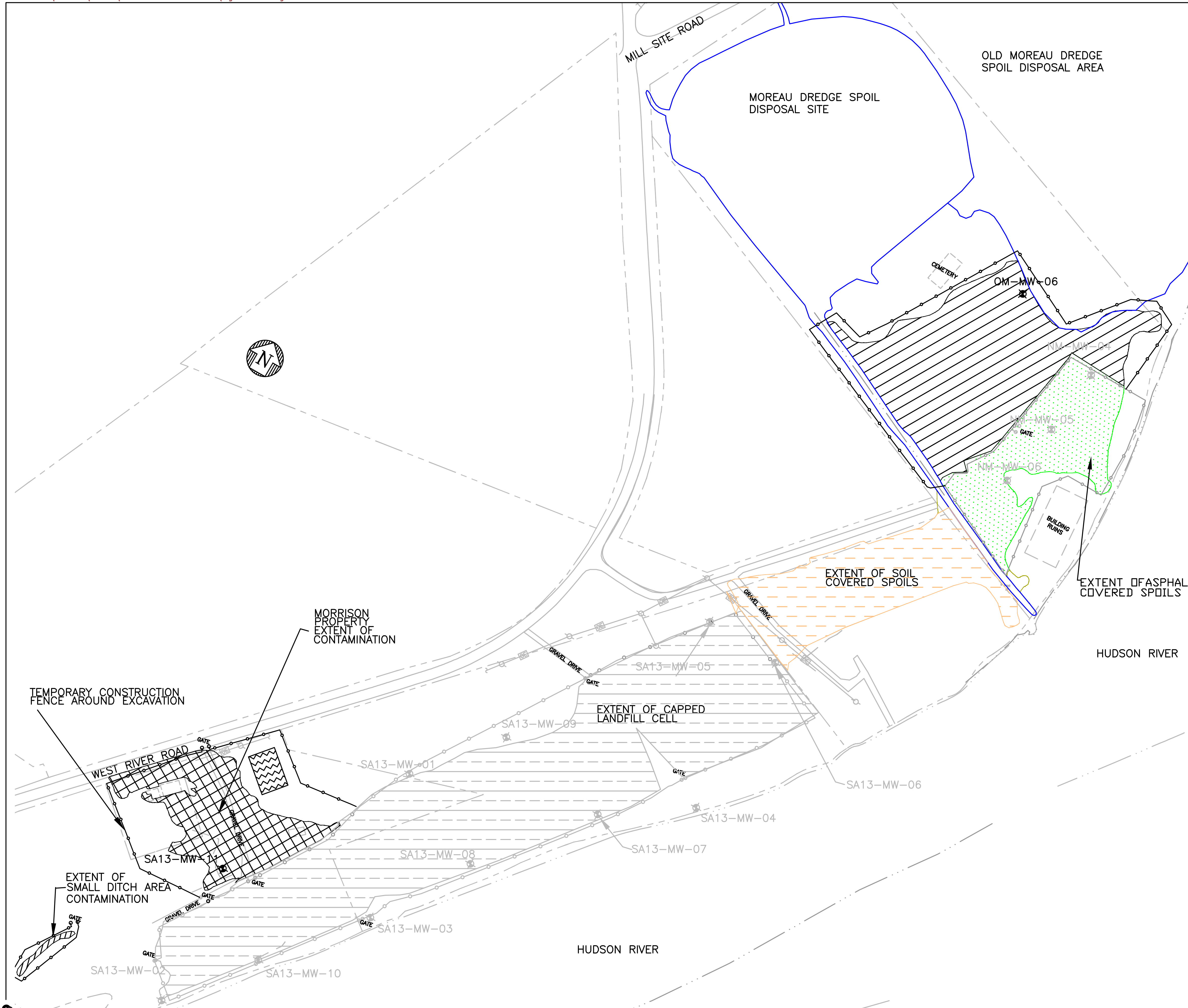
F:\NYSDEC\SA 13\HUDSON FS JUNE 2007\Figure 2-1.dwg



LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 1)
- PROPOSED FENCE
- EXISTING FENCE
- APPROXIMATE LOCATION OF EXISTING STRUCTURE
- SA13-MW-04 EXISTING MONITORING WELL
- SA13-MW-04 EXISTING MONITORING WELL TO BE DECOMMISSIONED
- EXISTING OVERHEAD ELECTRIC
- EXISTING POWER POLE
- – EXTENT OF UNCOVERED SPOILS; PROPOSED EXTENT OF SOIL COVER
- – EXTENT OF UNCOVERED SPOILS; PROPOSED EXTENT OF EXCAVATION
- – PROPOSED STOCKPILE AREA FOR CONTAMINATED SOIL

NOTES:

1. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA COUNTY PARCEL DATA, 2002.
2. EXISTING UTILITIES AND POWER POLES TAKEN FROM LU ENGINEERS DRAWING 10623-08CADD10623-08 SA 13.DWG, DATED 3/16/06.

APPROXIMATE SCALE IN FEET

0 250 500 750

FIGURE 5-6 UNCOVERED SPOILS ALTERNATIVE 3– EXCAVATION AND OFF-SITE DISPOSAL AT RESIDENTIAL PROPERTY AND SOIL COVER ELSEWHERE
SPECIAL AREA 13
MOREAU, NEW YORK

F:\NYSDEC\SA 13\HUDSON FS JUNE 2007\Figure 2-1.dwg

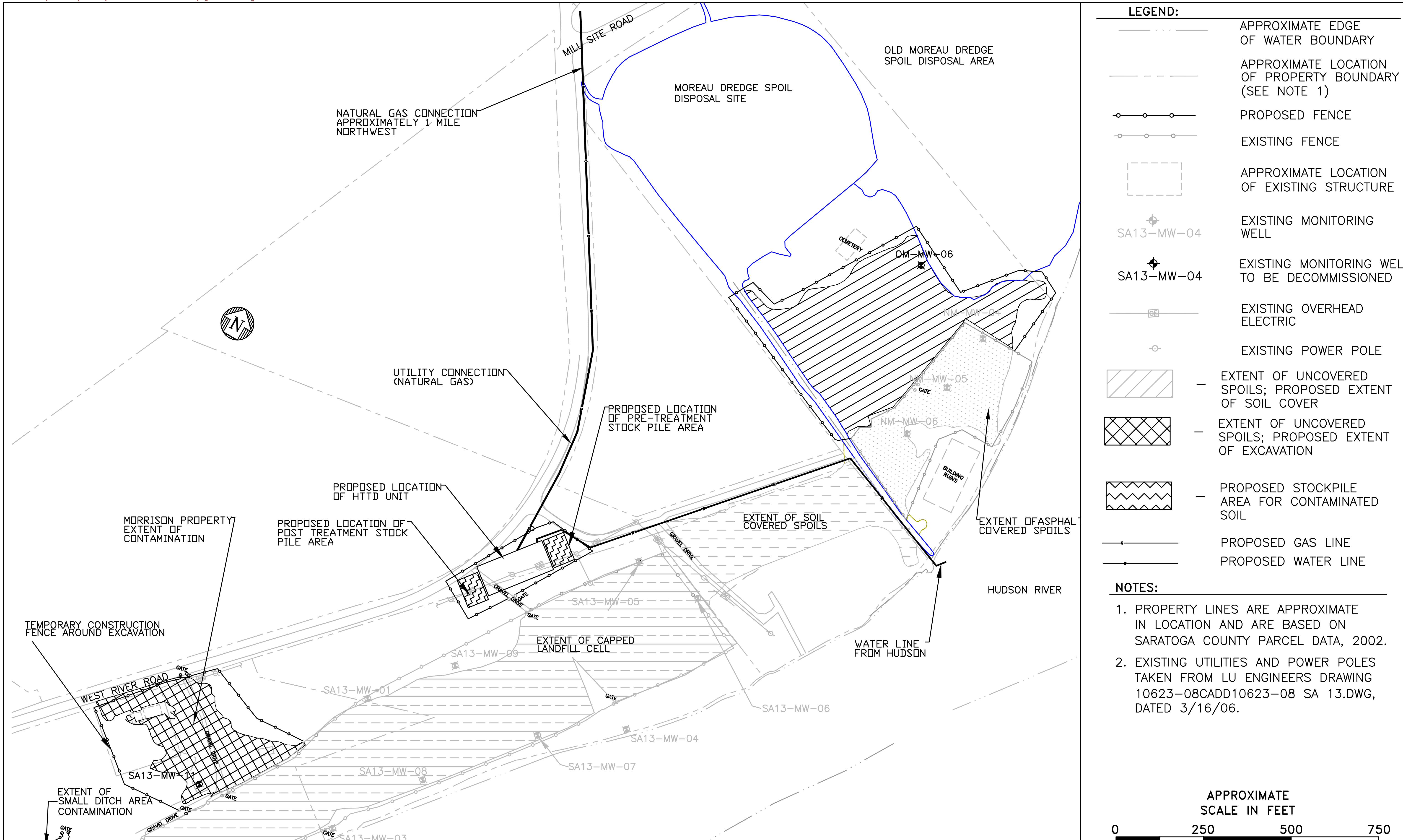


FIGURE 5-7 UNCOVERED SPOILS ALTERNATIVE 4– EXCAVATION AND ON-SITE TREATMENT AT RESIDENTIAL PROPERTY AND SOIL COVER ELSEWHERE
SPECIAL AREA 13
MOREAU, NEW YORK

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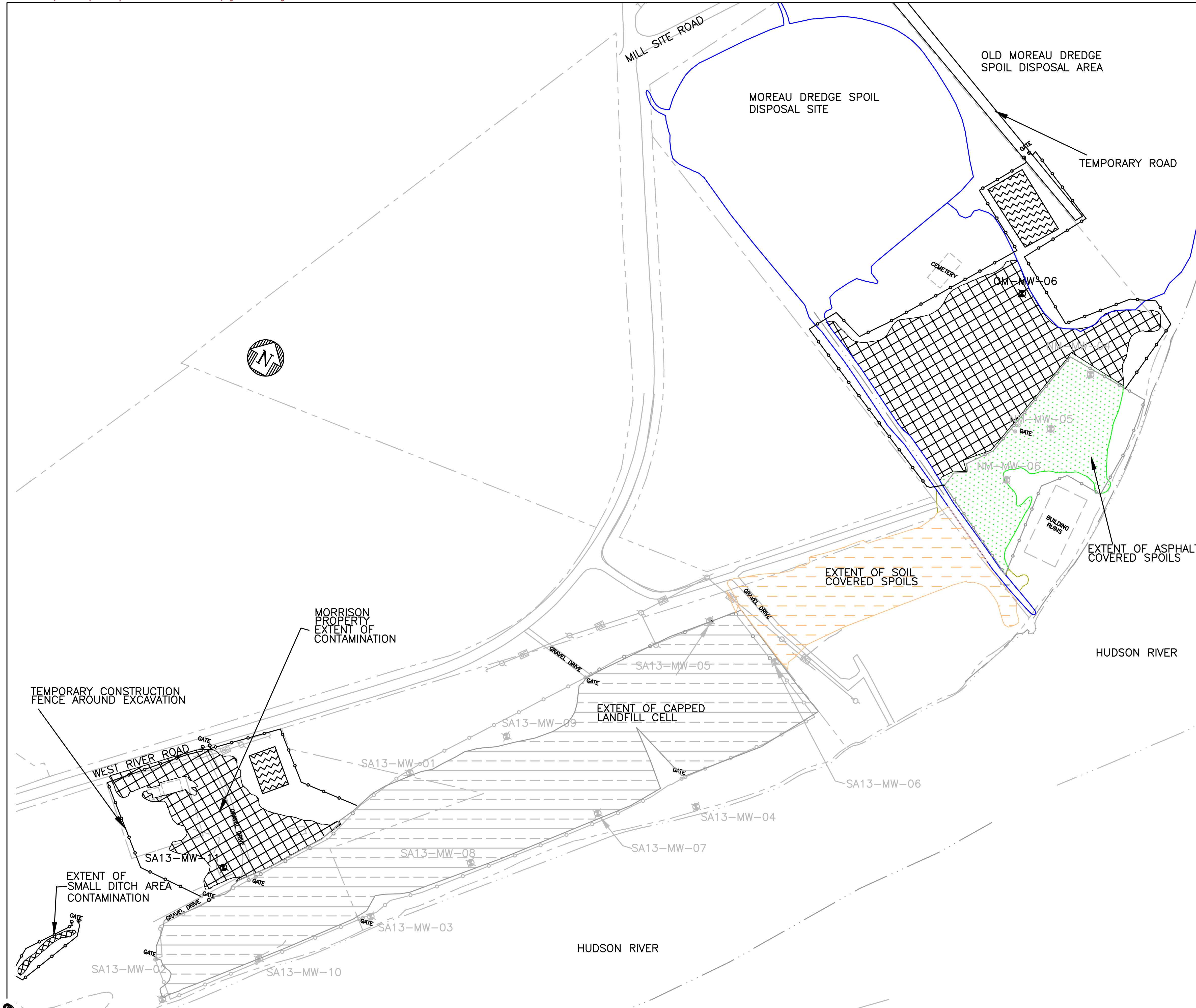
F:\NYSDEC\SA 13\HUDSON FS JUNE 2007\Figure 2-1.dwg



LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 1)
- PROPOSED FENCE
- EXISTING FENCE
- APPROXIMATE LOCATION OF EXISTING STRUCTURE
- SA13-MW-04 — EXISTING MONITORING WELL
- SA13-MW-04 — EXISTING MONITORING WELL TO BE DECOMMISSIONED
- EXISTING OVERHEAD ELECTRIC
- EXISTING POWER POLE
- – EXTENT OF UNCOVERED SPOILS; PROPOSED EXTENT OF EXCAVATION
- – PROPOSED STOCKPILE AREA FOR CONTAMINATED SOIL

NOTES:

1. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA COUNTY PARCEL DATA, 2002.
2. EXISTING UTILITIES AND POWER POLES TAKEN FROM LU ENGINEERS DRAWING 10623-08CADD10623-08 SA 13.DWG, DATED 3/16/06.

APPROXIMATE SCALE IN FEET

0 250 500 750

FIGURE 5-8 UNCOVERED SPOILS ALTERNATIVE 5– EXCAVATION AND OFF-SITE DISPOSAL OF ALL UNCOVERED SPOILS
SPECIAL AREA 13
MOREAU, NEW YORK

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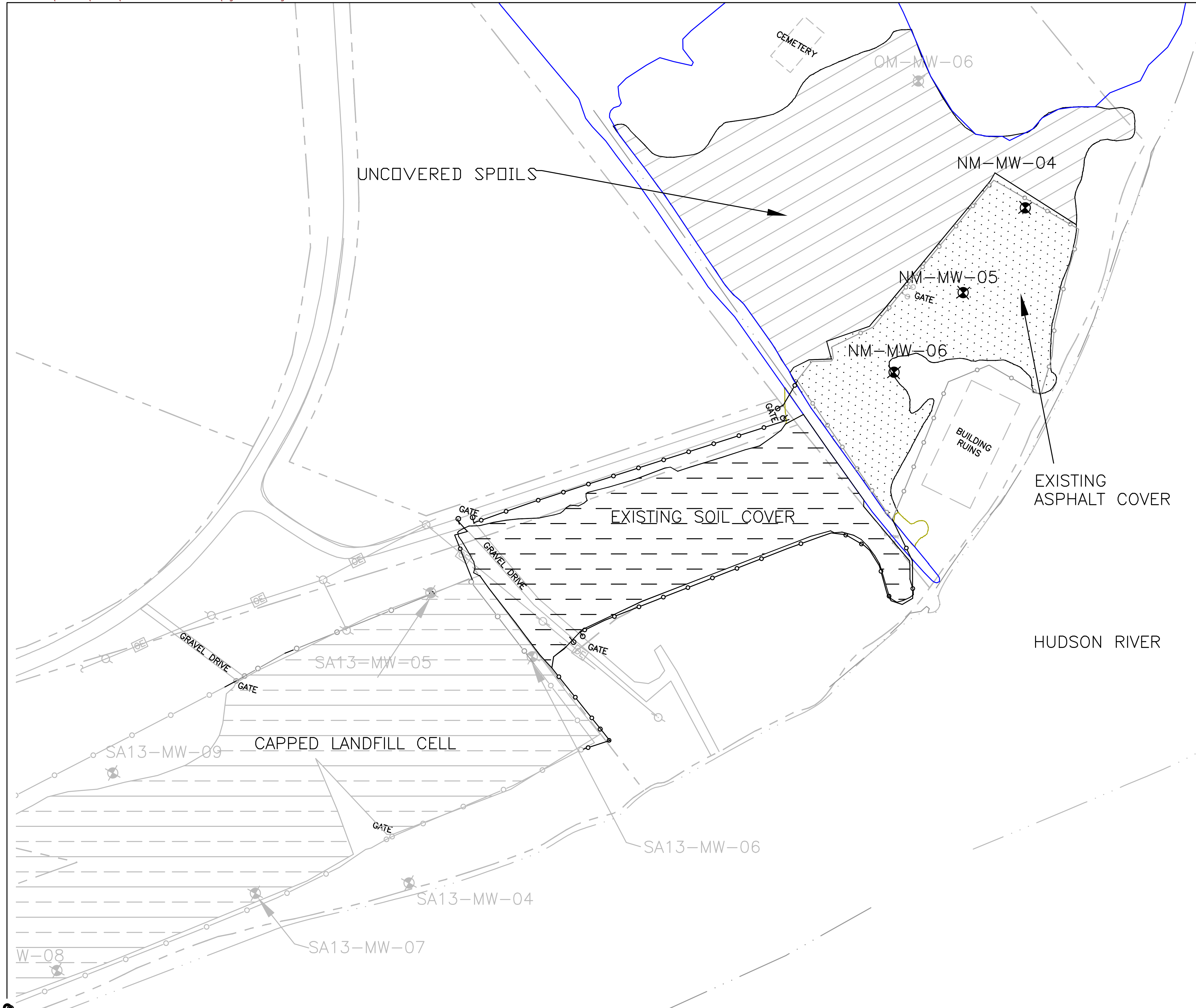


LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 1)
- PROPOSED FENCE
- EXISTING FENCE
- APPROXIMATE LOCATION OF EXISTING STRUCTURE
- SA13-MW-04 — EXISTING MONITORING WELL
- SA13-MW-04 — EXISTING MONITORING WELL IN LTM PROGRAM
- EXISTING OVERHEAD ELECTRIC
- EXISTING POWER POLE
- – EXTENT OF ASPHALT COVERED SPOILS; SECOND FILL AREA
- – EXTENT OF SOIL COVERED SPOILS; FIRST FILL AREA
- – PROPOSED STOCKPILE AREA FOR CONTAMINATED SOIL

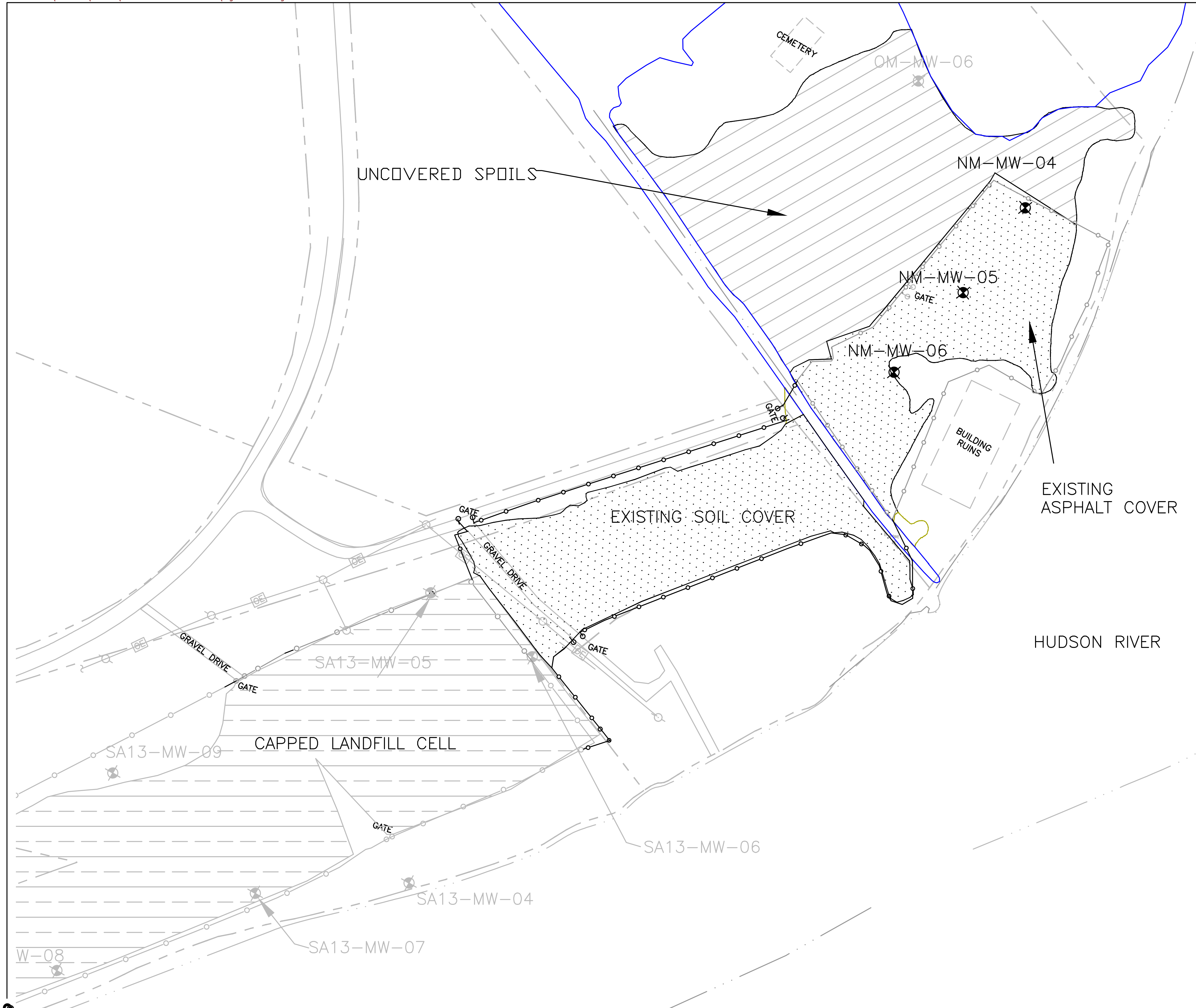
NOTES:

1. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA COUNTY PARCEL DATA, 2002.
2. EXISTING UTILITIES AND POWER POLES TAKEN FROM LU ENGINEERS DRAWING 10623-08CADD10623-08 SA 13.DWG, DATED 3/16/06.

APPROXIMATE SCALE IN FEET

0 200 400 600

FIGURE 5-9 COVERED SPOILS ALTERNATIVE 2– NO FURTHER ACTION WITH SITE MANAGEMENT SPECIAL AREA 13 MOREAU, NEW YORK



LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 1)
- PROPOSED FENCE
- EXISTING FENCE
- APPROXIMATE LOCATION OF EXISTING STRUCTURE
- SA13-MW-04 — EXISTING MONITORING WELL
- SA13-MW-04 — EXISTING MONITORING WELL IN LTM PROGRAM
- EXISTING OVERHEAD ELECTRIC
- EXISTING POWER POLE
- – EXTENT OF COVERED SPOILS; PROPOSED EXTENT OF EXCAVATION
- – PROPOSED STOCKPILE AREA FOR CONTAMINATED SOIL

NOTES:

1. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA COUNTY PARCEL DATA, 2002.
2. EXISTING UTILITIES AND POWER POLES TAKEN FROM LU ENGINEERS DRAWING 10623-08CADD10623-08 SA 13.DWG, DATED 3/16/06.

APPROXIMATE SCALE IN FEET

0 200 400 600

FIGURE 5-10 COVERED SPOILS ALTERNATIVE 3-EXCAVATION AND OFF-SITE DISPOSAL
SPECIAL AREA 13
MOREAU, NEW YORK

6 References

Ecology and Environment Engineering, P.C., 2012, *Remedial Investigation for the Special Area 13 Dredge Spoil Disposal Area, Moreau, New York*, June 2007.

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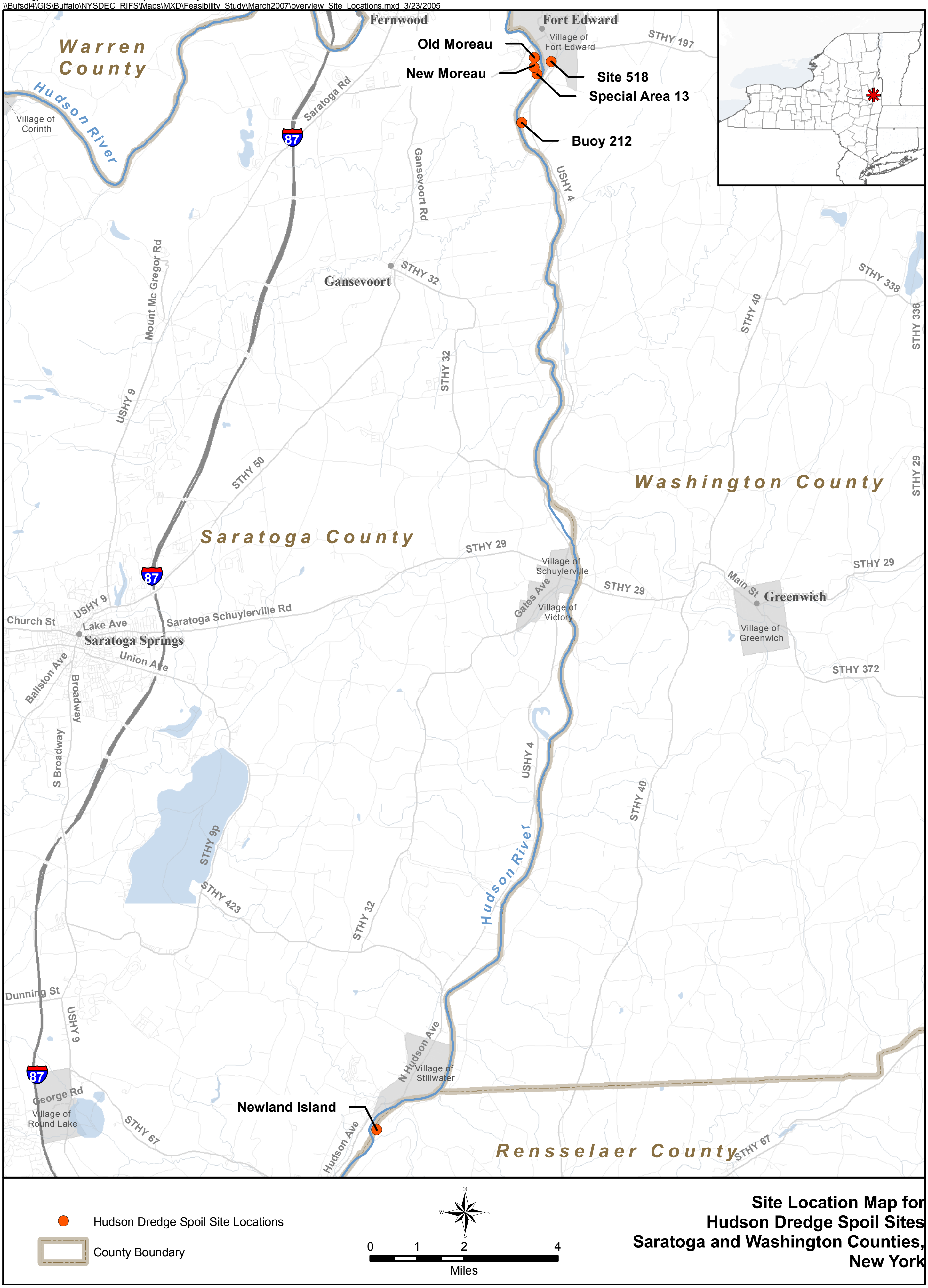
A Overview Map of Dredge Spoil Disposal Sites



Site Location Map for Hudson Dredge Spoil Sites Saratoga and Washington Counties, New York