Final
Feasibility Study for the
Newland Island (Lock 4)
Dredge Spoil Disposal Area
Schaghticoke, New York

Site Number 442033

August 2009

Prepared for:

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List of Abbreviations and Acronyms

APEG	alkaline polyethylene /glycol
ARAR	applicable or relevant and appropriate requirement
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 of 1980
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COC	contaminant of concern
COPC	contaminant of potential concern
CY	cubic yards
EEEPC	Ecology and Environment Engineering, P.C.
EPA	(United States) Environmental Protection Agency
ESMI	Environmental Soil Management, Inc.
°F	degrees Fahrenheit
FS	feasibility study
GCL	geosynthetic clay liner
HTTD	high-temperature thermal desorption
IC	institutional control
ISTD	in situ thermal desorption

List of Abbreviations and Acronyms (cont.)

ISV	in situ vitrification
KPEG	potassium polyethylene glycol
LTM	long-term monitoring
LTTD	low-temperature thermal desorption
MCL	maximum contaminant level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
NCP	National Contingency Plan
NYCRR	New York Codes, Rules, and Regulations
NYS	New York State
NYSCC	New York State Canal Corporation
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
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	perchloroethylene
PLCS	Primary Leachate Collection System
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

List of Abbreviations and Acronyms (cont.)

ROD	Record of Decision
SCG	standards, criteria, and guidelines
SCO	soil cleanup objective
SITE	Superfund Innovative Technology Evaluation
SLCS	secondary leachate collection system
SPDES	State Pollutant Discharge Elimination System
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TBC	to be considered
TCE	trichloroethylene
TCLP	toxicity characteristic leaching procedure
TOGS	Technical Operational Guidance Series
TSCA	Toxic Substance Control Act
VOC	volatile organic compound

1 Introduction

1.1 Purpose and Organization

Ecology and Environment Engineering, P.C. (EEEPC) completed a feasibility study (FS) on behalf of the New York State Department of Environmental Conservation (NYSDEC), for the Newland Island Dredge Spoil Disposal Area (Site No. 4-42-033), located in the town of Schaghticoke, Rensselaer County, New York. The Newland Island site contains dredge spoils from the Hudson and Hoosic rivers as well as the Champlain Canal. The FS was conducted under State Superfund Standby Contract Work Assignment No. D004435-03. The 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 Technical and Administrative Guidance Memorandum (TAGM) 4030, Selection of Remedial Actions at Inactive Hazardous Waste Sites, NYSDEC's Draft DER-10, Technical Guidance for Site Investigation and Remediation and 6 New York State Codes of Rules and Regulations Part 375, Environmental Remediation Programs.

A remedial investigation (RI) was completed to characterize the nature and extent of contamination at the site, as described in the *Draft Remedial Investigation Report for the Newland Island Dredge Spoil Disposal Area*, Schaghticoke, Rensselaer County, New York (EEEPC 2007).

Five other similar dredge spoil sites were investigated under separate RI/FS work assignments, the results of which are submitted under separate cover (see Appendix A for a location map of these sites).

This FS describes technologies that address the on-site contamination identified by the RI report at the Site. The report is divided into six sections.

- Section 1 provides the study purpose and the site background information;
- Section 2 presents the identification of standards, criteria, and guidelines for various contaminants and the development of remedial action objectives (RAOs);

- Section 3 evaluates appropriate technologies for the remediation of site contamination and the development of remedial alternatives;

- Section 4 discusses the combination of remedial technologies to form remedial alternatives and the detailed analysis of the alternatives;

- Section 5 presents a detailed and comparative analysis of alternatives. Included in these analyses are rationale and a preliminary cost estimate for the selected remedies; and

- Section 6 contains references used in this report.

1.2 Background Information

1.2.1 Site Description and Surrounding Land Uses

The Newland Island (Lock 4) Dredge Spoil Disposal Area is located along the southern and eastern margins of Newland Island, in the town of Schaghticoke (Rensselaer County, New York), just south of Champlain Canal Lock 4 and near the confluence of the Hoosic River with the Hudson River and the navigation channel of the Champlain Canal (See Figure 1-1).

The site consists of a series of three basins and earthen containment berms, built by the Waterways Maintenance Division of the New York State Department of Transportation (NYSDOT) (now operated by the New York State Canal Corporation (NYSCC), a subsidiary of the NYS Thruway Authority). These basins were designed to hold sediment removed from the Champlain Canal/Hudson River navigation channel in the Hudson River near Canal Lock 4 and the mouth of the Hoosic River in conjunction with routine maintenance dredging operations of the Canal System. Historic dredging activity appears to be the source of the polychlorinated biphenyl (PCB)-contaminated material found at the site.

The Southern basin is actively used by the NYSCC to process sediments on a four to six year cycle and was divided into two sub-basins during modification in 2002 to accomplish this. Both sub-basins were covered with a geo-textile fabric to segregate the future dredge spoil materials from the existing potentially contaminated dredge spoil materials. The Southern basin is approximately 10 to 15 feet deep compared to the surrounding berm. Northern and Central basins are older disposal areas and are overgrown with brush and trees; however, the containment berm is still present in most areas. Dirt roads and equine trails surround and/or bisect the disposal basins. The Northern basin is sometimes used by the adjoining residents for horseback riding.

The unlined basins at this site were excavated down to shale bedrock during the initial construction and the displaced soils and shale debris were graded 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 regraded in order to deepen a basin and accommodate the disposal of additional dredge spoil materials.

The basin and berm system at this site is between 100 and 500 feet wide and extends about 1,800 feet along the southeastern side of the island with a footprint covering nearly 12.1 acres on the 28.6-acre parcel owned by New York State (NYS). The remainder of the State-owned parcel is undeveloped and unoccupied. The adjoining property on the lower island is privately owned and is occupied by two single-family dwellings, equine stables, equine riding facilities, and several small service structures. There is a pair of private wells on this part of the island that draws water from the bedrock aquifer. The wells are approximately 875 feet away from the northernmost portion of the site and approximately 1,680 feet away from the southern portion of the site.

The site is not located in a floodplain (FEMA 1995). During the December 2005 site visit for the RI, two small flooded areas were observed within the site boundary. It is not clear if the flooded areas are temporary pools caused by recent precipitation or actual small wetlands based on the United States Army Corps of Engineers wetland classification methodology. A field survey by a certified wetland scientist would be needed to make this determination. For purposes of this FS, these flooded areas are assumed to be wetlands; however, their classification would need to be clarified prior to remedial actions at the site.

Based on the Town of Schaghticoke Zoning map (Town of Schaghticoke 2005), the site is zoned Marine. The purpose of the Marine zoning is to support the historic role played by the town’s waterfront in the development of the town, to encourage river-oriented activities consistent with sound environmental practices, and to enhance public access to the river (Town of Schaghticoke 2007). Based on discussions with NYSDEC regarding future activities at the site, it is anticipated that the site will not be used for residential or agricultural purposes and will remain an active dredge spoil disposal/dewatering site.

1.2.2 Operational/Disposal History

As described in Section 1.2.1, three unlined settling basins were constructed at the site and were used to hold dredge soil material removed from the Champlain Canal/Hudson River navigation channel between Canal Lock 4 and Canal Lock 3 as a part of routine maintenance dredging operations of the Canal System. Available NYSDOT records report that the Newland Island dredge spoil disposal area, known in the past as the Lock 4 site, was used between 1952 and 1984. The records covering the 1970s and onward also report the disposal of dredge spoil material at this site totaling 135,450 cubic yards (CY), 23,960 CY, 21,470 CY, and 44,509 CY for the years 1971, 1977, 1981, and 1984, respectively (Malcolm Pirnie, Inc. 1992). At the time of these disposals, the Newland Island site was owned and operated by NYSDOT. PCBs were found in shallow surface soil samples collected within the basin complex in 1989 by the NYSDOT while they prepared the site for the disposal of additional dredge spoil material that year. As a result, NYSDOT abandoned plans to use the site in 1989.

State legislation enacted in 1992 transferred the responsibility for all Canal System operations and properties from the Department of Transportation to the NYSCC, a subsidiary of the New York State Thruway Authority. A subsequent navigational dredging operation completed by the NYSCC in 1996, resulted in the disposal of another 35,974 CY of dredge spoil material at this site in the Southern basin. In 2002, the NYSCC modified and improved the Southern basin to stage approximately 25,000 CY of dredge spoil material (characterized as sand and gravel) that was removed from the navigation channel near the mouth of the Hoosic River. Prior to removal, environmental sampling verified that the sediments targeted for removal in 2002 did not contain any PCBs. As a result, the 2002 dredge spoil materials were segregated from the previous dredge spoil materials by a layer of geotextile fabric as a marker making it possible to remove the later materials for reuse under an established Beneficial Use Determination (BUD). In 2006-2007, the NYSCC removed nearly 115,000 CY of additional sand and gravel sediment during more navigational dredging near the mouth of the Hoosic and mingled them with the 2002 dredging materials. Despite environmental sampling done prior to removal that verified that the targeted sediments did not contain any PCBs, the mixing of the 2006-2007 and 2002 dredge spoil materials nullified the earlier BUD.

The continued use of Newland Island to stage additional sediment removed from the navigation channel near the mouth of the Hoosic River is expected as sediments from the Hoosic River further impact the canal system. Based on recent conditions, the need for channel maintenance dredging operations near the mouth of the Hoosic River occurs every four to six years.

1.2.3 Remedial History/Previous Investigations

During an assessment of areas with possible PCB contamination in the Upper Hudson River Valley completed by Weston Environmental for the NYSDEC in 1978, it was found that the dredge spoil materials disposed of at this site were contaminated with PCBs at levels up to 4,190 parts per million (ppm). A follow-up assessment completed by Malcolm Pirnie in 1992 for the NYSDEC confirmed the presence of PCB contamination at the Newland Island site at levels greater than 50 ppm, the definition of hazardous waste, in three of the 26 samples that had reportable PCB detections. PCB concentrations for all of the samples ranged between non-detect (< 2 ppm) and 290 ppm while the overall average PCB concentration was calculated to be 21 ppm. Based on the results of the Malcolm Pirnie study, it was estimated that the Newland Island site contained 79,700 CY of contaminated soil with a PCB concentration greater than 2 ppm. The mass of PCBs at this site was also estimated to be 4,100 pounds (lbs) in the Malcolm Pirnie report.

A series of eleven surface soil samples were collected from the basin and berm system and from the adjoining residential property in August of 1998 by the NYSDEC. PCBs were detected at a concentration of 1 ppm in one of the eleven surface soil samples - this single sample was on the residential property. Three sediment samples were also collected by the NYSDEC - one sample from a swim area possibly used by the residents - two samples from a wetland area between Newland Island and the island peninsula to the north. PCBs were only detected in the two wetland samples with concentrations at less than 1 ppm. These findings were included in the NYSDEC's *July 2001 Dredge Spoils Investigation Report* (NYSDEC 2001).

In November of 1998, the NYSDEC listed the Newland Island site as a Class 2 site in the *Registry of Inactive Hazardous Waste Disposal Sites in New York State*. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

Additional surface soil samples were collected at the residential property on Newland Island following the release of the *July 2001 Dredge Spoils Investigation Report* (NYSDEC 2001). Three of the samples were collected to verify the results obtained earlier using field screening test methods. Twenty-three other samples were collected from areas of the property that were of concern to the resident family. All samples were analyzed for PCBs using a certified laboratory test method and all results were reported as non-detect.

In 2005, the NYSDEC contracted Ecology & Environment Engineering, P.C. to perform the Newland Island RI/FS to characterize the nature and extent of contamination at the site and to develop remedial alternatives to address the contamination.

1.2.4 Site Geology and Hydrology

The geologic setting for the Newland Island site has a varied mixture of shale fragments, sands, and clays that were placed over bedrock by natural processes a long time ago - and a varied mixture of cobbles, pebbles, shale fragments, brick fragments, coal fragments, fused slag, glass shards, sands, silts, and clays that were placed over bedrock 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. In a few locations, these native soils were found buried under dredge spoil materials in the basin and berm complex. The overall thickness of these native soils on Newland Island is not known, but where encountered in undisturbed locations around the site, the thicknesses varied from a few inches to about five feet. The thickness of these native soils where observed in the basins varied up to two feet.

The overburden materials in the unnatural setting are best described as mechanically reworked native soil and bedrock mixed with dredge spoil materials in the basin and berm complex. The older, pre-2002 dredge spoils are typically dark gray to black, fine to medium sands with varying amounts of silt and black shale fragments. These pre-2002 dredge spoils varied in thickness from a few inches to nearly 10 feet across the floor of the Southern basin and were up 27-feet-thick in parts of the surrounding berm; for the Central basin, they varied in thickness from a few inches to nearly 4 feet across the floor and were up to 14-feet-thick in part of that berm; for the Northern basin, they varied in thickness from a few inches to nearly 8½ feet across the floor and were up to 7-feet-thick in part of that berm structure. The more recent dredge spoil materials are characterized as light gray to medium brownish-gray, coarse to fine sand with varying amounts of gravel. The latest observations made in May 2008 show that there were between 10 and 14 feet of these recent dredge spoils over the older dredge spoil across the floor of the Southern basin. There was approximately one foot of these recent spoils over the older spoils at the core of the northern-most berm wall for the Southern basin.

Bedrock at this site is a dark gray to grayish-black, variably calcareous shale that is sometimes finely laminated with very fine sand. This shale is rather friable and weathers to slightly lighter colors.

Groundwater flow throughout the year mimics the topography of the site and moves radially away from the topographic ridge in the central part of the island. This results in groundwater flowing southeast, southwest, and northwest, depending on the point of reference on the island. Overall groundwater flow is either toward the Hudson River or the Champlain Canal.

1.2.5 Nature and Extent of Contamination

The results of analyses of samples of sediment, surface water, surface soil, subsurface soil, and groundwater collected during the RI (EEEPC 2007) identified the contaminated dredge spoils as the on-site source area.

Sediment, surface and near surface soil, and subsurface soil samples collected within the disposal basins indicate elevated concentrations of PCBs and some metals. The predominant Aroclors discovered in the sediment, surface and near surface soils were Aroclor 1248 and 1254. Aroclors 1242, 1248, 1254, and 1016 were detected in the subsurface soil samples with Aroclor 1248 being the most predominantly detected Aroclor. Even though some of the surface soil, subsurface soil, and groundwater samples collected at the site contain metals that can be attributed to site activities at concentrations above the recommended soil cleanup objectives (SCOs) in general, the number of metal exceedances was far less frequent than the number of PCB exceedances. Therefore, PCBs are the primary contaminants of concern at this site and are the only contaminants considered further in this discussion.

None of the surface water samples collected during the RI contained PCBs; therefore, surface water will not be addressed in this FS.

The following paragraphs summarize test results for sediment, surface and near surface soil, and subsurface soil sampling as described in the RI (EEEPC 2007). Samples for each media were analyzed for PCBs and metals.

- Sediment. Three sediment samples were collected from on-site seeps along the southern border of the Southern basin and from under the pipes in the northern section of the site. The pipes formerly drained water from the Northern basin during disposal/dewatering operations. PCBs were detected in two of the three sediment samples at concentrations of 0.51 ppm and 10.1 ppm. The highest detected sample was located in the northeastern portion of the site southwest of Champlain Canal Lock 4. Floodplain sediments of the Hudson River were not addressed as part of the RI.

- Surface and Near-Surface Soil. A total of 111 surface (less than 2 inches BGS) and near-surface (between 10 and 12 inches BGS) soil samples were collected from 73 locations at the site, including points distributed within each dredge soil disposal basin/cell, upon each containment berm, and around each basin perimeter. In general, PCB concentrations for these surface and near-surface soil samples ranged from non-detect to less than 20 ppm. PCBs were found above the NYSDEC Part 375-6.8, restricted use - commercial - SCO of 1 ppm in 24 of the 69 surface soil samples and in 19 of the 42 near-surface soil samples. Surface soil sample NI-SS-04A, collected from the Northern basin, had the highest concentration of PCBs at 10.7 ppm among all surface samples, while near-surface soil sample NI-SS-19B, collected from the Central basin, had the highest concentration of PCBs at 20 ppm among near-surface samples.

- Subsurface Soil. A total of 35 boreholes and nine groundwater monitoring wells were installed in and around the basin and berm complex as part of the exploration borehole and well drilling programs at the Newland Island site. Supplemental investigation work to refine the extent of contamination in May 2008 led to 13 new boreholes drilled in and around the basin and berm complex and three more boreholes drilled at existing locations. A total of 173 surface and subsurface soil samples were collected from the 51 soil exploration borings advanced during this investigation project and another 34 surface and subsurface soil samples were collected during the installation of the nine monitoring wells at the site. Thirty-eight of these soil samples contained PCBs at concentrations that exceed the SCO of 1 ppm, while six samples contained PCBs at concentrations of at least 10 ppm or more. The greatest PCB concentrations were detected in soil samples of material that could be characterized as dredge spoil from borings NI-BH-17 and NI-BH-18 in the Southern basin, at 38 ppm at a depth of eight feet and 43 ppm at a depth of six feet respectively, and from boring NI-BH-30 in the Northern basin, at 29 ppm at a depth of six feet.

  Four rounds of groundwater samples were collected from nine new on-site monitoring wells and two existing residential wells. PCBs were detected in groundwater samples collected from one monitoring well, NI-MW-07, at concentrations exceeding the groundwater screening criteria of 0.09 micrograms per liter (µg/L). This monitoring well was installed through sandy soils (where maximum PCBs concentrations were detected in surface soil at 1.8 milligrams per kilogram [mg/kg]) and is located outside of the Northern basin, between the cell and the Champlain Canal. No PCBs were detected in the residential well water samples.

1.2.6 Contamination Fate and Transport

The RI evaluated contaminant transport and concluded that PCBs in the soil may be transported by surface water flow and man-made mechanisms (e.g., excavation, grading, and vehicular traffic) (EEEPC 2007). To a lesser extent, PCBs in soil can be transported by groundwater flow and infiltration.

1.2.7 Qualitative Human Health Risk Evaluation

Contaminants of potential concern (COPCs) identified in soil, sediment, surface water, and groundwater were evaluated for potential current and future exposure pathways to assess potential risks with human exposure to COPCs. The magnitude of exposure and likelihood of potential adverse health effects were assessed qualitatively through comparisons with appropriate risk-based concentrations that were available. The major COPC identified in the sampled media was PCB; however, cadmium and chromium were also considered in the assessment due to their presence in soil samples at concentrations exceeding NYSDEC soil cleanup objectives (SCOs).

Current human site users include adult and child residents and recreational users, and adult NYSCC workers. Current site recreational users and residents were assumed to be exposed only to soil/dredge spoil material at the surface within Central and Northern basins and their respective berm walls. Current NYSCC workers were assumed to be exposed to soil/dredge spoil material at the surface and soil brought to the surface during earth moving activities, in all areas of the basin and berm complex, but primarily in the Southern basin where sediment processing operations occur every four to six years. If the site is redeveloped, potential future human site users could include recreational workers, site residents and workers, permanent commercial/industrial workers, and temporary construction, utility, and maintenance workers. Potential future site residents, workers, recreational users, and industrial/construction workers were assumed to be exposed to soils/dredge spoils to a depth of 10 feet. 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 and NYSDEC/New York State Department of Health (NYSDOH). The non-cancer hazard estimates for these receptors were at or below the maximum generally acceptable value of 1, with the exception of the future child resident. For this receptor, a hazard index of 4 was calculated indicating that there may be the potential for adverse health effects associated with exposure to PCB-contaminated soil and dredge spoil materials. However, due to the uncertainty associated with reference doses and the conservative nature of this assessment, resident child exposure to PCB-contaminated soil/dredge spoil is not likely to result in adverse health effects. This potential hazard is attributable to presumed PCB exposure in the southwestern portion of the Southern basin where sediment processing operations occur every four to six years and will likely continue into the future.

1.2.8 Screening-Level Ecological Risk Assessment

The screening-level ecological risk assessment suggests that current levels of environmental contamination at the Newland Island site may pose a risk to terrestrial plants, soil invertebrates, and invertivorous wildlife, such as the American robin and short-tailed shrew. PCBs in soil are the risk drivers for song birds and small mammals feeding extensively on soil invertebrates. Metals (cobalt, copper, lead, mercury, and zinc) in soil are the risk drivers for plants and soil invertebrates while PCBs in soil are the risk drivers for wildlife. Although current levels of PCBs and metals in soil may pose a risk to some groups of ecological receptors, the primary stressor to ecological receptors at the site is most likely the physical disturbance caused by placement, dewatering, and mechanical redistribution of spoil materials.

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\\BUFSDL4\GIS\Buffalo\NYSDEC_RIFS\Maps\MXD\Newland\DRAFT_Newland_Island_Remedial_Investigation\July2007\Figure 1-1 Site Location Map rev01.mxd

Site Boundary

Parcel Boundary

Approximate Dredge Spoil Disposal Area Boundary

N W E S

0 125 250 500

Feet

Figure 1-1
Site Location Map
Newland Island 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

The RI for this site identified PCB and/or metals contamination in soils (sediment, surface soil, and subsurface soil) and groundwater at the Newland Island site. 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 human health risk evaluation (EEEPC 2007) assumed future residential uses at the Newland Island site for both soil and groundwater. Discussions with NYSDEC indicate the future use of the site would continue to be for active dredge disposal activities. Thus the current town zoning of Marine (Town of Schaghticoke 2005) is not applicable. Furthermore, NYSDEC indicated the potential future resident exposure pathway is not plausible assuming deed restrictions could be placed on the impacted property. Considering this scenario and the human health risk evaluation performed in the RI, current and future human health risks were within acceptable risk levels or below levels of potential concern. Thus, human health risks (current and future) are not of concern at this site.

Considering the above, the environmental receptor evaluation identified the following potential risks at the site:

- Direct contact and/or ingestion exposure of site soils by terrestrial plants and soil invertebrates;
- Incidental ingestion and direct ingestion exposure to site soils by birds and small mammals; and
- Due to the physical disturbance of soils at the site from placing, dewatering, and resurfacing soils there are potential risks to the health and composition of plants and soil invertebrates and for the use of the site by wildlife.

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 (ARARs)** 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 (TBC)** 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 the 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 Newland Island 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 2007); 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 RAOs for on-site soils and groundwater are to:

- Reduce the potential for direct ecological contact and ingestion of contaminated soils;
- Reduce the risk of further contamination of the groundwater by reducing contamination levels and/or migration of site soils; and
- Achieve proposed cleanup goals for COCs based on an evaluation of ARARs.

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 Goals

Standards

Numeric cleanup goals identified for soils at the Newland Island site are contained in New York Codes, Rules, and Regulations (NYCRR) Part 375-6.8 (NYSDEC 2006). This regulation presents SCOs for protection of ecological resources, groundwater, and public health. The public health criteria 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 objectives, 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 of 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 the town of Schaghticoke Zoning Map (Town of Schaghticoke 2005), the site is zoned Marine. The purpose of the Marine zoning is to support the historic role played by the town's waterfront in the development of the town to encourage river-oriented activities consistent with sound environmental practices and to enhance public access to the river (Town of Schaghticoke 2007). Based on discussions with NYSDEC regarding future activities at the site, it is anticipated that the site will not be used for residential or agricultural purposes as it will remain an active dredge spoil site. Considering this, the 6 NYCRR Part 375 - 6.8 SCO selected for the site is Restricted-Commercial and closely represents the manner in which NYSDEC anticipates the site to be used in the future. In addition, soil cleanup objectives presented in 6 NYCRR Subpart 375-6.8 for the protection of groundwater and ecological resources should be considered where applicable. Because PCBs were detected in groundwater at one location (see Section 2.5.2), cleanup goals for the protection of groundwater were considered. Similarly, ecological receptors are impacted by site contamination according to the risk assessment performed for this site, therefore, cleanup goals for the protection of ecological resources will also 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 TAGM 4046 (January 1994) and 6 NYCRR Subpart 375-6.8. Criteria and guidance values for the contaminants detected at this site are presented in Table 2-3.

Background and Soil Concentration Values

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 NYS Brownfield cleanup program (NYSDEC 2006) and eastern United States background levels (Shacklette and Boerngen 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 subsequent cost estimates. The following logical basis was used to select the preliminary cleanup values:

- The most stringent 6 NYCRR Part 375-6.8 restricted use soil cleanup standards (public health, groundwater, or ecological) were selected as the cleanup goals;

- Where cleanup standards were not available, NYSDEC TAGM 4046 values were selected as the cleanup goal;

- If neither cleanup standards or guidance were not 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. 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, PCBs will be considered the primary COCs at the site.

2.4.3 Determination of Contaminated Soil Volumes

Due to the nature of how the dredge spoils were placed at this site (heterogeneous material with PCB levels greater and less than 1 ppm), the depth of impacted material was assumed to be the bottom of the spoils layer. The depth to the bottom of the spoils layer was estimated using the borehole logs collected as part of the RI (EEEPC 2007). Similarly, the horizontal extent of the spoils was assumed to extend to the historical boundaries of the Northern, Central, and Southern basins. Borehole logs further indicate that there is a berm constructed out of spoils between each cell. This material was included in the volume calculation. See Table 2-4 for a summary of the area and volume of impacted material for each cell.

This volume might be a conservative estimate as it includes unimpacted spoil material above what was identified as the PCB contaminated material. See Section 1.2.2 for a description of how spoils were historically placed at the site. In some locations, this impacted material is defined by an overlying geotextile (Southern basin). Some of this material is considered uncontaminated (PCBs < 1 ppm) and randomly located within each cell. At the FS stage, quantification of the extent of the uncontaminated material above the spoils is irrelevant as the material would need to be moved/removed in order to access the spoils beneath regardless of the active remedy selected. It is noted that during the design/implementation phase of the remedial actions for this site, it may be beneficial to segregate uncontaminated from contaminated soil to limit the treatment volume.

Figure 2-1 provides the extent of contamination to be further addressed in this FS.

2.5 Groundwater

The following sections describe the selection of cleanup goals and contaminants of concern for groundwater.

2.5.1 Selection of Groundwater Cleanup Goals

Standards

Standards identified for groundwater at the Newland Island site are NYSDEC Class GA groundwater standards (June 1998 and 2004 addendum) taken from the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) Memorandum 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, indicating the potential use of this groundwater as a drinking water source. All NYS groundwater is considered Class GA by NYSDEC.

Guidance
The NYSDEC Class GA groundwater guidance values were also taken from TOGS 1.1.1. The guidance values were used for compounds for which NYSDEC Class GA standards have not been established. The proposed cleanup goal screening criteria for groundwater are presented in Table 2-5.

Selection Process
The following method was used to select the cleanup goals presented in Table 2-4:

- The NYSDEC Class GA standard, if it existed, was selected as the cleanup goal;
- If a groundwater standard did not exist for a compound, the NYSDEC Class GA guidance value, if it existed, was used;
- The cleanup goals were then compared to the maximum observed concentrations of each compound 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 actually is warranted.

2.5.2 Selection of Contaminants of Concern
PCBs were detected in one of the monitoring wells installed within the dredge spoil disposal area (NI-MW-07) during the four rounds of sampling. In two of the four sampling rounds, PCBs exceeded the Class GA Groundwater Standard of0.09 µg/L, with a maximum concentration of 1.45 µg/L. NI-MW-07 is located in the northeastern portion of the site outside of the Northern basin, between the cell and the Champlain Canal samples were not filtered.

Eight metals (barium, chromium, copper, iron, lead, magnesium, manganese, and sodium) were detected in groundwater at levels above standards/guidance values. Iron, magnesium, manganese, and sodium are naturally occurring in groundwater and are not considered COCs at this site. The remaining metals were detected above standards/guidance values in one well for each metal during one of the four sampling events conducted for the RI (metals exceedances varied by well and sampling event). Additionally, the remaining metals were not identified as a potential risk to human health or the environment during the RI.

PCBs were detected in only one of the nine monitoring wells on site during two of the four sampling rounds performed during the RI. Because PCB-contaminated soil is considered to be the source of groundwater contamination and groundwater does not appear to be a significant transport mechanism for PCB contamination, groundwater remediation does not appear to be warranted.

Although groundwater remediation will not be addressed in this FS, groundwater monitoring of existing monitoring wells will be included in the remedial alternatives that do not address contaminated soil removal and/or treatment to monitor PCB concentrations for a period of time. This will be included in the alternatives to confirm that the PCBs do not migrate towards the Hudson River and Champlain Canal.

Table 2-1 Location-Specific SCGs, Newland Island Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Local Location–Specific SCGs					
Town Zoning Law, General Performance Standards	Noise	Section V, Part A.1	Restricts unnecessary noise. No specific decibel requirements.	Potentially Applicable	
Town Zoning Law, General Performance Standards	Atmospheric Effluences	Section V, Part A.2	Restricts dust, smoke, and odor effluences from the property on which they are generated.	Potentially Applicable	
Town Zoning Law General Performance Standards	Fire and Explosion Hazards	Section V, Part A.6	Requires appropriate safety devices for the use and storage of any inflammable or explosive materials.	Potentially Applicable	
Town Zoning Law	Loading and unloading of ships and barges, boat launches and signs.	Section III.A	Requires special use permits for barge and boat launch related activities. Planning board must approve all such permits.	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	Threatened/endangered birds/plants identified in the vicinity of the site.
	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.	Not Applicable	The Newland Island site is not located within a floodplain.
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	

Table 2-1 Location-Specific SCGs, Newland Island Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
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	Threatened/endangered birds/plants identified in the vicinity of the site.
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.	Not Applicable	The Newland Island site is not located in a floodplain.

Table 2-2 Action-Specific SCGs, Newland Island 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 on/off-site treatment and disposal options for excavated contaminated non-hazardous soil and debris
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

Table 2-2 Action-Specific SCGs, Newland Island Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
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
	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 objectives used for this report	Applicable	

Table 2-2 Action-Specific SCGs, Newland Island Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
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	
Primary and Principal Aquifer Determinations (5/87)		NYSDEC TOGS 2.1.3	Provides guidance on determining water supply aquifers in upstate New York	Potentially Applicable	Newland Island appears to overlie a principal aquifer
Environmental Justice and Permitting	Environmental Justice	Commissioner Policy (CP) 29	Policy incorporates environmental justice concerns into NYSDEC's public participation provisions	Potentially Applicable	Relevant to actions that involve discharges to surface water, solid/ 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	
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, requirements of OSHA apply to all activities that fall under jurisdiction of the National Contingency Plan

Table 2-2 Action-Specific SCGs, Newland Island Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
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 eight contaminants. 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	Applicable	
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 Management 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	

Table 2-2 Action-Specific SCGs, Newland Island Dredge Spoil Disposal Area

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
	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	
	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	
Clean Water Act	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	Potentially Applicable	Applies if discharge is made to a POTW

Table 2-3 Selected Cleanup Goals for Soils, Newland Island Dredge Spoil Disposal Area

Analyte	6 NYCRR 375-6.8 Restricted Use			NYSDEC TAGM 4046[b]	New York State Background[c]	Maximum Concentration[d]	Selected Cleanup Goal
	Protection of Public Health Commercial[a]	Protection of Ecological Resources[a]	Protection of Groundwater[a]				
Total PCB by Method 8082 (mg/kg)							
Total PCBs	1	1	3.2	1 / 10	-	43	**1**
Metals by Method 6010/7471 (mg/kg)							
Cadmium	9.3	4	7.5	1	2.4	15.2	**4**
Chromium	1,500	41	-	10	20	406	**41**
Lead	1,000	63	450	SB	72	265	**63**
Mercury	2.8	0.18	0.73	0.1	0.2	2 J	**0.18**
Aluminum	-	-	-	SB	15,800	21,000	**15,800**
Antimony	-	-	-	SB	2.17	NA[e]	-
Arsenic	16	13	16	7.5	12	8.6	-
Barium	400	433	820	300	165	158 J	-
Beryllium	590	10	47	0.16	1	0.73	-
Calcium	-	-	-	SB	9,190	55,100	**9,190**
Cobalt	-	-	-	30	13.3	18.6	-
Copper	270	50	1,720	25	32	85.1	**50**
Iron	-	-	-	2,000	25,600	43,200 J	**2,000**
Magnesium	-	-	-	SB	5,130	11,600 J	**5,130**
Manganese	10,000	1,600	2,000	SB	1610	937	-
Nickel	310	30	130	13	25	50.1 J	**30**
Potassium	-	-	-	SB	1,890	2,490	**1,890**
Selenium	1,500	3.9	4	2	3.7	ND	-
Silver	1,500	2	8.3	SB	0.6	1.9	-
Sodium	-	-	-	SB	211	ND	-
Thallium	-	-	-	SB	16.3	ND	-
Vanadium	-	-	-	150	31	38.5	-
Zinc	10,000	109	2,480	20	140	621	**109**

Notes:

[a] Cleanup goals obtained from 6 NYCRR Part 375-6.8 Soil Cleanup Objective Tables (NYSDEC December 14, 2006).

[b] NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 (Jan 1994) Soil Cleanup Objectives.
PCB value in surface soil is 1 ppm and 10 ppm in subsurface soils.

[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] Concentrations are the maximum detected value from surface soil, subsurface soil or sediment sediment samples collected during the Newland Island RI (EEEPC 2007).

[e] All sample results for this analyte were qualified as rejected and therefore could not be utilized to establish a cleanup goal for this site.

Key:

J = Estimated value.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ND = Not detected.
SB = Site background.

Table 2-4 Impacted Soil Volume Summary

Basin	Area (square feet)	Volume (cubic yards)
Southern	267,740	100,482
Central	21,137	391
Northern	78,462	24,119
Other Areas[1]	7,500	3,170
Total, estimated	**375,000**	**128,000**

Note:
[1] Other areas include the spoils volume between the Southern and Central basins and the Central and Northern basins and the area around NI-BH-26 (just north of the Central basin) as the PCB concentration at this sample location was greater than 1 ppm.

Table 2-5 Selected Cleanup Goals for Groundwater, Newland Island Dredge Spoil Disposal Area

Analyte	GA Groundawter Standard[a]	GA Groundawter Guidance[a]	Maximum Concentration[c]		Selected Cleanup Goal
PCBs by Method 8082 (µg/L)					
Aroclor 1016	-	-	ND		-
Aroclor 1221	-	-	ND		-
Aroclor 1232	-	-	ND		-
Aroclor 1242	-	-	ND		-
Aroclor 1248	-	-	0.72		-
Aroclor 1254	-	-	0.73		-
Aroclor 1260	-	-	ND		-
Total PCBs	0.09	-	1.45		0.09
Metals by Method 6010/7471 (µg/L)					
Cadmium	5	-	ND		-
Chromium	50	-	61.2		50
Lead	25	-	45.2		25
Mercury	0.7	-	ND		-
Aluminum	-	-	46,900	J	-
Antimony	3	-	ND		-
Arsenic	25	-	17.1		-
Barium	1,000	-	1,040		1,000
Beryllium	-	3	ND		-
Calcium	-	-	324,000	J	-
Cobalt	-	-	37.5		-
Copper	200	-	307		200
Iron	300[b]	-	62,900	J	300
Magnesium	-	35,000	163,000	J	35,000
Manganese	300[b]	-	2,810		300
Nickel	100	-	71.5		-
Potassium	-	-	18,100		-
Selenium	10	-	ND		-
Silver	50	-	ND		-
Sodium	20,000	-	20,700		20,000
Thallium	-	0.5	ND		-
Vanadium	-	-	81.7		-
Zinc	-	2,000	282		-

Notes:

[a] New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 Table 1, Class GA Groundwater (with updates).

[b] Iron and manganese total is 500 µg/L.

[c] Concentration listed is the maximum detected value from groundwater samples collected during the Newland Island RI (EEEPC 2007).

Key:
µg/L = Micrograms per liter.
J = Estimated value.
ND = Not detected.

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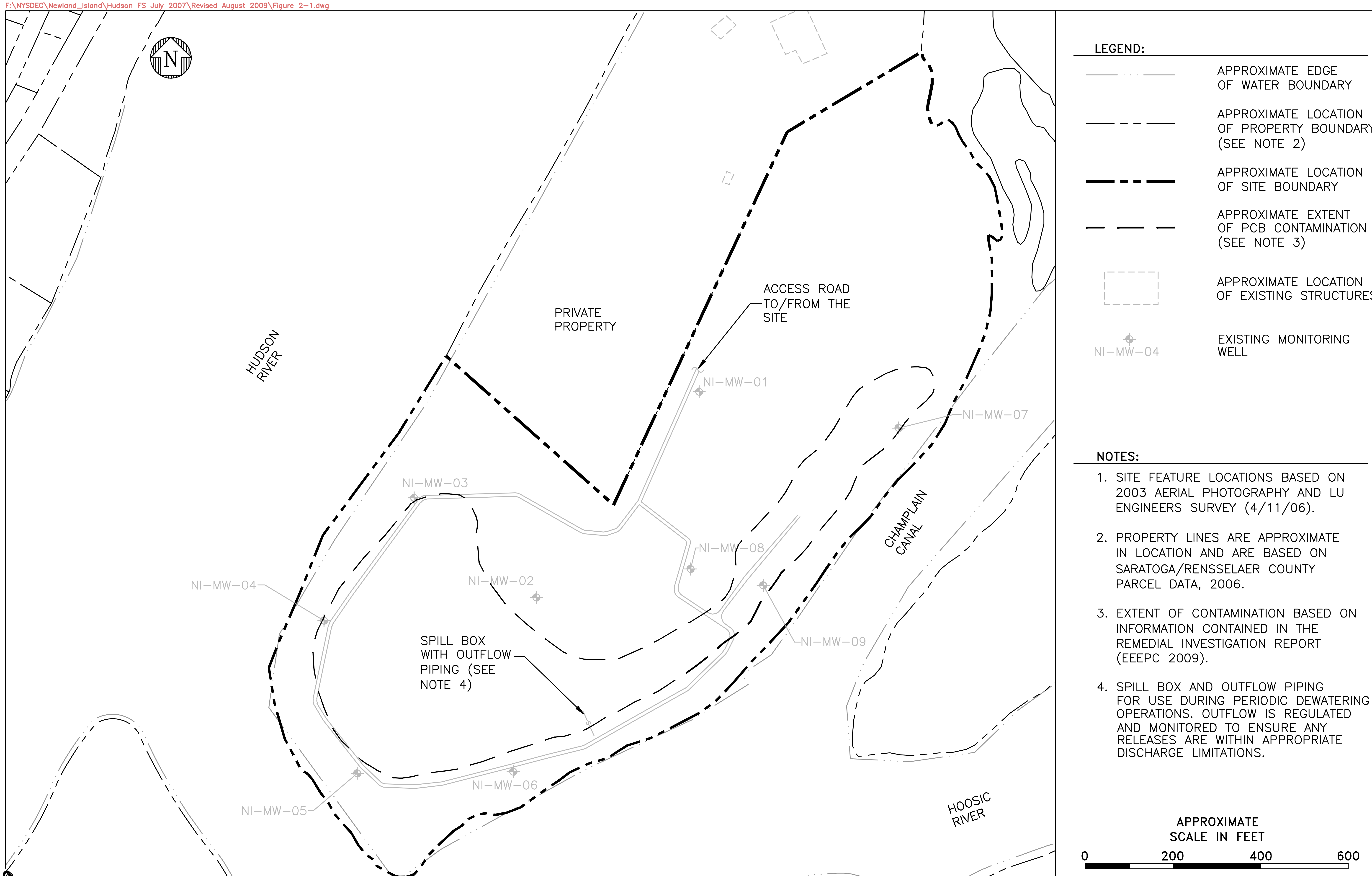


ecology and environment

FIGURE 2-1 EXTENT OF CONTAMINATION
NEWLAND ISLAND DREDGE SPOIL DISPOSAL AREA
SCHAGHTICOKE, NEW YORK

3 Identification and Screening of Remedial Technologies

3.1 Introduction

This section presents the results of the preliminary screening of remedial technologies 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 2007) 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 (TAGM 4030) 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.

In addition to NYSDEC and EPA guidance, the Newland Island site has site-specific conditions related to utilities, access, and the location of adjacent private property that will limit the technologies that can be implemented.

Due to the remote nature of the island itself, utilities at the island are limited. There is limited electrical service to the island for use by the resident to the north of the site. Potable water is provided by means of water wells (that extend into bedrock). Gas lines are not available in the vicinity of the site. Additionally, the only access to the site is by land and by a narrow access road through private property to the north. This access road crosses over two bridges which appear to be adequate for typical car/truck traffic that is not frequently used, but might not be able to handle heavy construction equipment on a routine basis. These site-specific conditions will be considered throughout this section.

3.3 Identification of Remedial Technologies

This section identifies the potential remedial action technologies that may be applicable to remediation of soils at the Newland Island site. 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 and Long-Term Monitoring (LTM)

Institutional controls (ICs) are non-engineered actions such as administrative and/or legal controls that limit the potential for human exposure to a contaminant by restricting land or resource use (EPA 2000). ICs are meant to supplement engineering controls during all phases of cleanup and may be a necessary component of the completed remedy. They typically include easements, deed restrictions, covenants, well drilling prohibitions, zoning restrictions, and building or excavation permits. Physical barriers like fences that restrict access to sites should also be considered in addition to the ICs.

ICs are not generally expected to be the sole remedial action unless active response measures are determined to be impracticable. However for this site, ICs will be evaluated independently as a stand-alone alternative and will also be considered in conjunction with other engineering alternatives to achieve RAOs.

Long-term monitoring (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 COCs. These wells are placed such that they would detect migration toward potential receptors. LTM will not actively reduce contamination levels; it can be useful in demonstrating that exposures do not occur. LTM of groundwater will be further considered.

3.3.3 Containment

3.3.3.1 Covering

Containment of impacted soils can be achieved by covering contaminated materials in place, consolidating and covering, and excavating selective areas and capping or surface sealing. Covering 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. Cover systems use materials, such as soil, synthetic membranes, asphalt, concrete, and chemical sealants.

Covering 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. Covering also may be performed as an interim remedial measure to reduce infiltration of precipitation and to control air releases. The main disadvantages of cover systems are uncertain design life and the need for long-term maintenance and monitoring.

Cover systems (single and multi-layered) considered applicable and that represent the range of available options include asphalt cover (single-layered cover), a clay or soil cover, 6 NYCRR Part 360, and 6 NYCRR Part 373 (Resource Conservation and Recovery Act [RCRA] cover systems). 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 cover system and 6 NYCRR Part 373 RCRA cover system. Furthermore, asphalt is susceptible to cracking and settlement, and thus would require more operation and maintenance (O&M) in the long-term.

- **Clay or Soil Cover.** A clay or 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 is designed to prevent the infiltration of water and needs to be graded for proper drainage. Clay and soil covers are not as protective as an asphalt, 6 NYCRR Part 360, or 6 NYCRR Part 373 cover system as they are more susceptible to cracking thus would require more O&M in the long-term.

- **6 NYCRR Part 360 Cover System.** A 6 NYCRR Part 360 cover system is commonly used in NYS to close municipal solid waste landfills. The cover system consists of the following components:

  1. A 12-inch gas venting layer with a hydraulic conductivity equal or greater than 1×10^{-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 from highly organic waste material. This layer might not be required for the Newland Island site, 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) Cover System.** RCRA covers systems are typically required at hazardous waste sites. An RCRA cover system 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 with Subparts G, K, and N of RCRA of Subtitle C regulations (for hazardous waste). The recommended design for a RCRA Subtitle C cover 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. A minimum 24-inch top vegetative soil layer.

The following presents the preliminary screening of containment as a technology:

- **Effectiveness.** Placement of a cover 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 are available and can be readily implemented.

- **Cost.** Capital costs for installing an NYCRR Part 360 cover system are around $165,000 per acre, while it is $225,000 per acre for a RCRA Subtitle C cover system (FRTR 2002). Capital costs may include materials, labor, and equipment to construct the cover. Beneficial reuse of fill material on Newland Island may reduce capital material costs. O&M costs would be minimal.

Caps/covers are effective in reducing contaminant exposure to human health and the environment as well as limiting infiltration. As the maximum PCB concentration at the site was detected at 43 ppm (less than 50 ppm which is defined by NY as the criteria for hazardous waste for PCBs), an RCRA cover system is not required. Considering the current and anticipated future activities performed at the site by NYSCC, the limited accessibility to the site, and the existing volume of uncontaminated stockpiled material on site, a soil cover appears to be the most appropriate containment for this site. Use of the existing on-site material, which is in the process of being approved for beneficial use, would reduce costs significantly while still achieving site RAOs. Therefore, a soil cover will be retained for further analysis.

3.3.4 In Situ Treatment

In situ treatment technologies for soil remediation typically fall in the following three major 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 treat the gas stream prior to discharge to 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 law constant greater than 0.01), it will not be retained for further consideration.

In Situ Thermal Desorption (ISTD) – Thermal Blankets and 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 degrees 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 mg/kg at a contamination 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, while the Newland Island site has contamination at depths greater than 12 feet.

- **Implementability.** Contractors and treatment facilities are available to implement this technology. 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. Power requirements of this technology and availability of electrical service to the site would limit implementation of this technology.

- **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, due to contaminated soil volumes greater than 10,000 CY, other in situ technologies may be more 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 which 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° Celsius, 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 ISV 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. Additionally, limited access to utilities may prevent this technology from being effectively implemented.

- **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, ISV will not be considered.

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 the Newland Island site. The tendency of PCBs to adsorb to soil particles also reduces the effectiveness.

- **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 not be considered further.

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 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, polycyclic aromatic hydrocarbons (PAHs), 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 Code of Federal Regulations [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.** On-site implementation of this technology is not possible due to limited access to the site and utility availability. Off-site HTTD facilities are currently in operation throughout the United States.

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

In summary, HTTD is a demonstrated technology which could be implemented effectively at this site. Off-site treatment of contaminated material is more easily implementable at the site due to the complexities involved with utility availability. Therefore, off-site HTTD 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 Newland Island, 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 mg/kg may also be subject to the requirements under the Toxic Substance Control Act (TSCA) set forth in 40 CFR Part 761.

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

- **Implementability.** Incineration can not be readily implemented at this site due to the limited access to the site and availability of utilities. In addition, permitting of an on-site incinerator may require significant time and funds to obtain.

- **Cost.** Ex situ incineration is a high cost technology with costs ranging from $600 to $1,100 per CY (FRTR 2002). Costs would be further inflated at this site due to access and utility issues.

The effectiveness of incineration to remediate site contaminated soil would be similar to HTTD, however at much higher costs. Therefore, 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 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.** Vitrification can not be readily implemented at this site due to the limited access to the site and availability of utilities.

■ **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. This upfront cost combined with the costs of upgrading utilities make this option non-cost effective.

In summary, ex situ vitrification is a moderate cost technology with proven effectiveness to remediate PCB contamination. System utility demands and site access issues inhibit this technology's implementability. Therefore, ex situ 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 mg/kg.

- **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. Furthermore, the implementability of this technology is limited by site access and utility availability issues.

- **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 retained for further consideration.

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. Additional concerns with this technology include the potential for the 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 is not being 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. 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 and is readily available.

- **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 (the facility would be operation for approximately one year), 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, and a leachate collection system;

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 soils.

- **Implementability.** The implementability of this option is limited by the shallow groundwater table in the middle of the site, access to and from the site with construction materials and equipment, and the complexities associated with permitting a landfill. However, due to the manageable volume of contaminated material on site, anticipated future land use, and complexities associated with off-site remedial actions, this technology can be implemented at the site.

- **Cost.** The costs of constructing an on-site landfill is estimated at $500,000 per acre and varies widely based on site-specific conditions (MSW Management 2007).

In summary, an on-site landfill is effective in reducing contaminant exposure to humans and the environment, is implementable, and provides for on-site management of contaminated material. Therefore, this technology will be retained for further consideration.

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 further contamination of groundwater.

- **Implementability.** Despite increased complexity due to site access including transporting the material off site, contractors and disposal facilities are available to implement both disposal options.

- **Cost.** Typical costs for disposal of contaminated soils by land ranges between \$100 and \$150 per CY for non-hazardous soils. Additional costs would be incurred due to construction of loading/unloading structures, transportation, permitting fees, and other costs associated with site access.

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 for further consideration.

Table 3-1 Summary of Soil Remedial Technologies, Newland Island 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			
	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
Clay or Soil Cover	Selective excavation and/or clay or soil cover system.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media. A soil cover appears to be the most appropriate cover for the site due to current and anticipated use of the site, limited access to the site, and availability of clean material on site for reuse.	Yes
6 NYCRR Part 360 Cover System	Selective excavation and/or non-RCRA cover system 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) Cover System	Selective excavation and/or RCRA cover system 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

Table 3-1 Summary of Soil Remedial Technologies, Newland Island Dredge Spoil Disposal Area

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Screening
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
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 is 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 implementation 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 effectiveness.	No
Biological			
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

Table 3-1 Summary of Soil Remedial Technologies, Newland Island Dredge Spoil Disposal Area

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Screening
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. HTTDs 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. Limited site access and utility availability inhibit this technology's implementability at the site.	No
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. Limited site access and utility availability inhibit this technology's implementability at the site.	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

Table 3-1 Summary of Soil Remedial Technologies, Newland Island Dredge Spoil Disposal Area

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Screening
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. However, this technology provides on-site management of contaminated soils while protecting human health and the environment.	Yes
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-hazardous/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. In collaboration with NYSDEC, five alternatives were identified for the soil contamination at the Newland Island site, which are briefly described below. A detailed description and evaluation of the alternatives is presented in Section 5.

4.1 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 Alternative No. 2: Institutional Controls and Long-Term Monitoring

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. Fencing and signage will be used as a physical barrier and as a warning to further restrict human contact with site soils. Lastly, long-term monitoring will include monitoring of existing groundwater wells located along the Hudson River and Champlain Canal to demonstrate that PCBs do not migrate into these waters.

4.3 Alternative No. 3: Excavation and Off-Site High Temperature Thermal Desorption

This alternative consists of excavation and thermal treatment of contaminated soils that exceed site cleanup goals. An off-site HTTD system was selected to thermally treat the contaminated soils (see Section 5.2.3). This process uses heat to volatilize contaminants from the soil (i.e., physical separation process), collecting them, and treating them as a gas stream. Remediated soil will not be returned to the site.

4.4 Alternative No. 4: Excavation and Off-Site Disposal

This alternative consists of excavation and off-site disposal of contaminated soils that exceed the site cleanup goals. The excavated material will be stockpiled, sampled, and disposed of accordingly. As maximum PCB concentrations in soil at this site were detected at approximately 43 ppm, contaminated soils are considered non-hazardous waste (i.e., less than 50 ppm) and are anticipated to be disposed of in a non-hazardous/solid waste facility.

4.5 Alternative No. 5: Excavation and On-Site Disposal

This alternative consists of excavation and on-site disposal of contaminated soils that exceed the site cleanup goals. An on-site landfill meeting the requirements of 6 NYCRR Part 360, a non-RCRA landfill (see Section 5.2.5), will be constructed. This alternative reduces direct contact exposure, migration of fugitive dust, potential groundwater contamination, and limits the infiltration of precipitation. Institutional controls, long-term monitoring and long-term O&M would be implemented according to applicable regulations to maintain the integrity of the landfill.

4.6 Alternative No. 6: Selective Excavation and Consolidation, Stormwater Management, Institutional Controls, and Long-Term Monitoring

This alternative consists of selective excavation and on-site consolidation of contaminated dredge spoils in the Southern, Central, and Northern basins. A clean soil cover will be constructed to reduce contact exposure and limit the migration of contaminated material. On-site, stockpiled material will be beneficially reused to construct the soil cover. A diversion trench will also be constructed to manage stormwater runoff near the Northern basin to limit migration of contaminants in groundwater. Institutional controls and long-term monitoring and O&M would be implemented to maintain the integrity of the soil cover and to ensure that contaminants are not migrating off-site.

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 Section 4 are described in detail and evaluated on the basis of environmental benefits and costs using criteria established by NYSDEC in TAGM 4030, Draft 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 RAOs 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 of the effectiveness of the remedial action is made of how it manages the risk posed by untreated wastes and/or the residual contamination that remain 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 COCs 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

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, CERCLA 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 site's 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 5-4. Table 5-5 presents a summary of these costs.

5.2 Remedial Alternatives

5.2.1 Alternative No. 1: No Action

5.2.1.1 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. Soil 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 is a risk.

Compliance with SCGs
Site 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 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.

Land Use

The Newland Island site is located in the town of Schaghticoke on a 28.6-acre parcel of land owned by the NYS. The remaining 16.5 acres of land on the island is privately owned and is occupied by a single dwelling, equine stables, and several small service structures. The site is approximately 80% wooded and the remaining 20% is exposed dredge spoils (Southern basin). The Southern basin is an active dredge soil disposal site located adjacent to a private residence to the north. Town of Schaghticoke zoning maps (Town of Schaghticoke 2005) indicate that the site is zoned as Marine. The purpose of the Marine zoning is to support the historic role played by the town's waterfront in the development of the town, to encourage river-oriented activities consistent with sound environmental practices, and to enhance public access to the river (Town of Schaghticoke 2007). Discussions with NYSDEC indicated the future land use of the site would continue to be for active dredge disposal activities. Implementation of this alternative may limit future uses at this site as contaminated material would remain on site.

5.2.2 Alternative No. 2: Institutional Controls and Long-Term Monitoring

5.2.2.1 Description

Institutional controls including access/use and deed restrictions (herein referred to as institutional controls), will be applied at this site. Deed restrictions would be filed to control future use/activities at the site. Long-term monitoring of seven existing monitoring groundwater wells will be performed to monitor PCB levels in groundwater. Figure 5-1 shows the locations of the monitoring wells at the site. Monitoring wells NI-MW-01, NI-MW-03, NI-MW-04, NI-MW-05, NI-MW-06, NI-MW-07, and NI-MW-09 are located between the contaminated soil and the Hudson River or Champlain Canal. These wells will be sampled every five years and analyzed for TCL PCBs (EPA Method 8082) at an off-site laboratory. A five-year duration between sampling events was selected because PCB contamination was detected in only one of the nine groundwater monitoring wells sampled during the RI. Thus, frequent groundwater monitoring is not warranted.

New York State DER-10 requires a site management plan for sites that implement remedial actions that, upon completion, require institutional controls/engineering controls, monitoring and/or operation and maintenance.

5.2.2.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

Placement of institutional controls, such as access and deed restrictions (that would control future use/activities at the site), would provide some long-term protection of human health.

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. Controlling future use and activities on site would protect workers' health. This alternative would provide some protection to the community by notifying the public and limiting site access. This alternative will achieve one of the three site RAOs through limiting direct ecological contact with impacted material.

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. The risks involved with direct contact with on-site contaminants would be limited to some extent with this alternative. In addition, the potential for erosion to occur would remain. Deed or other restrictions would be effective in the long-term as long as they are interpreted correctly, are not modified by future site users, and are enforced.

Reduction in Toxicity, Mobility, or Volume through Treatment
This alternative does not involve the removal or treatment of contaminated soil. Therefore, neither the toxicity, nor mobility, nor volume of contamination is expected to be reduced.

Implementability
This alternative can be readily implemented on a technical and administrative basis using typical institutional control practices and procedures. However, it may be difficult to ensure long-term enforcement.

Cost
The 2009 total present-worth cost of this alternative based on a 30-year period is $66,000. Table 5-1 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. Groundwater sampling and renewal of institutional controls are assumed with this alternative.

Land Use
The Newland Island site is located in the town of Schaghticoke on a 28.6-acre parcel of land owned by NYS. The remaining 16.5 acres of land on the island is privately owned and is occupied by a single dwelling, equine stables, and several small service structures. The site is approximately 80% wooded and the remaining 20% is exposed dredge spoils (Southern basin). The Southern basin is an active dredge soil disposal site located adjacent to a private residence to the north. Town of Schaghticoke zoning maps (Town of Schaghticoke 2005) indicate that the site is zoned as Marine. The purpose of the Marine zoning is to support the historic role played by the town's waterfront in the development of the town, to encourage river-oriented activities consistent with sound environmental practices, and to enhance public access to the river (Town of Schaghticoke 2007). Discussions with NYSDEC indicated the future land use of the site would continue to be for active dredge disposal activities. Implementation of this alternative may limit future uses at this site as contaminated material would remain on site.

5.2.3 Alternative No. 3: Excavation and Off-Site High-Temperature Thermal Desorption

5.2.3.1 Detailed Description
This alternative involves excavation and off-site thermal treatment of contaminated soils. Figure 5-2 presents the extent of the excavation while Figure 5-3 presents the conceptual process for this alternative. As indicated in Section 2.4.3, approximately 128,000 CY of spoils will be excavated from the site and transported to an off-site HTTD facility for treatment. It is assumed that the existing monitoring wells will be decommissioned without replacement in the excavated areas, as groundwater monitoring is not included in this alternative (see Figure 5-2).

Excavation of the spoils will be performed using conventional construction equipment, such as hydraulic excavators and bulldozers. As shown in Figure 5-2, the excavation area includes the Southern, Central, and Northern basins with a maximum depth of excavation at approximately 15.6 feet BGS. It is assumed that no cutback will be required during the excavation of the spoils at the site. In addition, excavation at this site may require a permit as portions of excavation are located within the extent of potential wetlands.

During the excavation process, PCB field screening tests will be used in accordance with 40 CFR 761.61, analytical sampling for metals, and the approval of the NYSDEC to verify contamination levels. The goal will 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 cleanup goals. A sampling grid will be developed over the soil area for approval by the NYSDEC.

Dewatering may be necessary in the northwest portion of the Northern basin once depths of 5 feet or more (approximately 90 feet above mean sea level or greater) are encountered based on groundwater data obtained from the RI (EEEPC 2007). However, groundwater elevations were generally observed to be less than 90 feet above mean sea level in the Northern basin during the four observations conducted from April through December 2006. As a result, if dewatering activities are required, they are expected to be limited in duration, and groundwater extraction volumes are expected to be relatively small. Means and methods of dewatering will 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 will be appropriately discharged off site.

The site can be accessed either by land or water. The only road on the island is a dirt road that extends north of the site to Route 125 (Stillwater Bridge Road) and is located primarily on private property. This road passes over two bridges which appear to be adequate for periodic car and truck traffic. The structural integrity of the road and its ability to handle heavy construction equipment on a routine basis is unknown. Furthermore, use of this access road would require an agreement with the property owner. Further study is recommended to determine the extent of improvements necessary for the road to handle the type and volume of truck traffic associated with the following alternatives. If land access is used for this alternative, it is likely the bridges would need upgrades, which would involve a significant design effort as well as permitting requirements. On the other hand, access to the site by water would only require the construction of a temporary dock. Historic aerial photographs show a dock located at the end of a pathway from the site along the Champlain Canal indicating that construction of a dock is plausible. Furthermore, initial review of navigational charts for the Champlain Canal show a navigable channel approximately 12 feet deep along the eastern edge of the island, along the canal. Although the logistics appear to be more complicated for access to and from the site by water, overall this option appears to be the most easily implementable means of accessing the site. Therefore, for purposes of this FS, access to and from the site by water was assumed. However, means of accessing the site may be modified later during the design phase.

Contaminated material will be excavated from the site and loaded into lined and covered roll-off containers for transport off site. The containers will be loaded onto barges using a crane located on a temporary loading dock. This loading dock will be installed along the edge of the island adjacent to the Champlain Canal, as shown on Figure 5-2. The temporary dock will consist of a car-float type barge which will be delivered to the site by tug and anchored at the island to act as a crane platform and dock.

Each roll-off container can hold approximately 15 CY of soil and each barge will be able to transport an estimated 39 containers (or approximately 585 CY of material) based on size/weight limitations provided by vendors. As a result, approximately 246 barge loads will be required to transport the contaminated soil off site. Three barges will be rented and utilized to deliver roll-off containers to the site and to transport contaminated soil from the site. Although the proposed type of tug boat can transport up to five barges at a time, for purposes of this FS it is assumed the tug boat will transport only one barge to minimize loading and unloading time at the site and port as well as to maintain a constant supply of contaminated material to the treatment facility. At any give time, one barge will be located at the site being loaded while one barge will be in transit to or from the site with either empty or full roll-off containers and one barge will be unloaded at the port for transport. Loading of empty roll-off containers and unloading of excavated soil will be performed at the closest port that is able to accept this type of material, which is the Port of Albany, nearly 25 miles south of the site.

At the port, the roll-off containers will be loaded onto specially designed roll-off trucks, provided by a transportation company, which will then transport the contaminated material to an HTTD treatment facility that can accept site soils.

Up to 5 feet of backfill will be added to portions of the Central and Northern basins to restore grade and/or bring final grades above the groundwater table. With the exception of the Southern basin (as it is anticipated to be an active dredge spoil disposal cell into the future), 6 inches of topsoil will be placed and graded to the final surface elevation. Since the backfill/topsoil do not represent a contamination hazard, it is not necessary to use roll-off containers to transport the material. Instead, hopper barges designed for the transportation of clean bulk materials can be used. These hopper barges are non-mechanical ships which can carry up to 1,000 tons of material at the same time, thereby reducing the number of barge trips. The same car-float style temporary barge will be required to unload the barges, and it was assumed that soils would be delivered to the Port of Albany and then transported to Newland Island. Once backfill operations are completed, the site will be restored to preconstruction conditions including 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 off site to meet site cleanup objectives. Because the contaminants will be treated and destroyed, exposure risks associated with soil contamination will be eliminated.

Compliance with SCGs
This alternative will meet SCGs since the PCB contamination in site soils will be effectively treated to meet cleanup goals at the site. Action and location-specific SCGs, including noise limitations, Occupational Safety and Health Administration (OSHA) regulations, wetlands permits (as required), and barge loading and unloading permits, will be in compliance 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 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. Noise impacts can be reduced through engineering controls, such as noise barriers. Dredge disposal operations would likely need to temporarily cease during excavation activities. Furthermore, water traffic along the Champlain Canal may be impacted during the implementation of this alternative due to loading and unloading barge activities at the site. Health and safety measures, including air monitoring, use of appropriate personal protective equipment (PPE), and decontamination of equipment leaving the site, will be in place to protect the workers and surrounding community. Action levels for the site will be set prior to any intrusive activities, and an appropriate correction action will be implemented if these action levels are exceeded.

Off-site transportation of contaminated soil to the disposal facility will be a two-step process. First, contaminated materials will be loaded into lined and covered roll-off containers and barged to an appropriate unloading facility. Then the containers will be loaded onto trucks and hauled to the treatment facility by a licensed transporter. While there is a risk of spills due to accidents, this risk will be limited by keeping the soil in a single, closed and lined container during these phases of transport.

This alternative involves treatment of contaminated soil off site, so the preliminary remediation goals will be achieved at the completion of this work. Excavation and thermal treatment of the contaminated soil is estimated to be completed in two to four 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 will be destroyed using thermal treatment. Treated soil will meet site cleanup criteria, therefore, human health and environmental risks will be eliminated.

Reduction in Toxicity, Mobility, or Volume through Treatment

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

Implementability

This alternative can be readily implemented using standard construction means and methods. The treatment facility has been contacted and can readily accept contaminated site soils. An increased complexity is inherent to this alternative due to the use of barging as a means of transporting contaminated material off-site. However, a local barging company has been contacted who can readily support this means of transportation.

Cost

The 2009 total present-worth cost of this alternative is $43,741,000. 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 Hampshire in 2007, 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

The Newland Island site is located in the town of Schaghticoke on a 28.6-acre parcel of land owned by NYS. The remaining 16.5 acres of land on the island is privately owned and is occupied by a single dwelling, equine stables, and several small service structures. The site is approximately 80% wooded and the remaining 20% is exposed dredge spoils (Southern basin). The Southern basin is an active dredge soil disposal site located adjacent to a private residence to the north. Town of Schaghticoke zoning maps (Town of Schaghticoke 2005) indicate that the site is zoned as Marine. The purpose of the Marine zoning is to support the historic role played by the town's waterfront in the development of the town, to encourage river-oriented activities consistent with sound environmental practices, and to enhance public access to the river (Town of Schaghticoke 2007). Discussions with NYSDEC indicated the future land use of the site would continue to be for active dredge disposal activities. Implementation of this alternative may limit future uses at this site as contaminated material would remain on site.

5.2.4 Alternative No. 4: Excavation and Off-Site Disposal

5.2.4.1 Detailed Description

This alternative involves the excavation, transportation, and off-site disposal of contaminated soils from the Newland Island site (see Figure 5-2). Excavated soils with PCB concentrations less than 50 mg/kg are considered non-hazardous. These soils can be disposed of in a permitted NYSDEC approved non-hazardous/solid waste landfill.

Excavation, confirmation sampling, and transportation of the contaminated soil will be performed as described in Alternative 3. Excavated soils will be stockpiled on plastic-lined areas on site for characterization in accordance with disposal facility requirements. The contractor will be responsible for the characterization sampling, which will be conducted at a NYSDOH certified laboratory.

After the results of the characterization sampling are received, the soil can be cleared for disposal by the NYSDEC. Once approved for disposal, the soil will be transported off site as described in Alternative 3. For this alternative, it is assumed that the contaminated material will be transported in lined and covered roll-off containers from the port to the disposal facility by roll-off trucks.

A number of disposal locations are available for non-hazardous soils. For example, Waste Management, Inc., accepts soil with PCBs less than 50 mg/kg at a landfill in Fairport, New York. For costing purposes, unit costs from this Waste Management, Inc. facility were used, with the understanding that a landfill closer to the site may be located at the design stage. The contractor will be responsible for characterization sampling in accordance with disposal facility requirements. At a minimum, it was assumed for this analysis that toxicity characteristic leaching procedure (TCLP), pesticides/PCB, PAH, RCRA ignitability, RCRA corrosivity, and RCRA reactivity analyses will be performed on samples collected every 1,000 CY. Based on the volume estimate in Section 2.4.3, approximately 128,000 CY of contaminated soil will be excavated and disposed of as non-hazardous material.

Up to 5 feet of backfill will be added to portions of the Central and Northern basins to restore grade and/or bring final grades above the groundwater table. With the exception of the Southern basin (as it is anticipated to be an active dredge spoil disposal cell into the future), 6 inches of topsoil will be placed and graded to the final surface elevation. Backfilling and restoration will be performed as described for Alternative 3.

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 will be removed from the site and properly disposed of in an environmentally acceptable facility. The contaminated soil will no longer present an exposure risk.

Compliance with SCGs

This alternative complies with SCGs since contaminated soils will be removed from the site and properly disposed of in an environmentally acceptable facility.

Off-site disposal will comply with all applicable land disposal restrictions and analytical requirements. Action and location-specific SCGs, including noise limitations, OSHA requirements, wetlands permits (as required), barge loading and unloading permits, will be in compliance during the 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 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. Noise impacts can be reduced through engineering controls, such as noise barriers. Dredge disposal operations would likely need to temporarily cease during excavation activities. Furthermore, water traffic along the Champlain Canal may be impacted during the implementation of this alternative due to loading/unloading activities by barge at the site. Health and safety measures, including air monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, will be in place to protect the workers and surrounding community. Action levels for the site will be set prior to any intrusive activities, and an appropriate correction action will be implemented if these action levels are exceeded.

Off-site transportation of contaminated soil to the disposal facility will be a two-step process. First, contaminated materials will be loaded into lined and covered roll-off containers and barged to an appropriate unloading facility. Then they will be loaded onto trucks and hauled to a disposal facility by a licensed transporter. While there is a risk of spills due to accidents, this risk will be limited by keeping the soil in a single, closed and lined container during these phases of transport.

Because this alternative involves removal of the contaminated soil from the site, site RAOs will be achieved at the completion of this work. The time to complete this alternative is estimated to be between two to four 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 will no longer represent an ecological risk.

Reduction in Toxicity, Mobility, or 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 will eliminate concerns associated with toxicity and mobility of the contaminants at the site. Since the contaminated, non-hazardous soil will be disposed of in an engineered and permitted facility, the mobility of the contaminants will be within acceptable limits and would be practically reduced.

Implementability

This alternative is readily implemented using standard construction means and methods. Contaminated soil will 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. An increased complexity is inherent to this alternative due to the use of barging as a means of transporting contaminated material off site. However, a local barging company has been contacted that can readily support this means of transportation. Finally, no delay is anticipated in obtaining the necessary approvals from the state and local agencies for implementation of this alternative.

Cost

The 2009 total present-worth cost of this alternative is $47,972,000. 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 (Waste Management, Inc. 2007), 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

The Newland Island site is located in the town of Schaghticoke on a 28.6-acre parcel of land owned by the New York State. The remaining 16.5 acres of land on the island is privately owned and is occupied by a single dwelling, equine stables, and several small service structures. The site is approximately 80% wooded and the remaining 20% is exposed dredge spoils (Southern basin). The Southern basin is an active dredge soil disposal site located adjacent to a private residence to the north. Town of Schaghticoke zoning maps (Town of Schaghticoke 2005) indicate that the site is zoned as Marine. The purpose of the Marine zoning is to support the historic role played by the town’s waterfront in the development of the town, to encourage river-oriented activities consistent with sound environmental practices, and to enhance public access to the river (Town of Schaghticoke 2007). Discussions with NYSDEC indicated the future land use of the site would continue to be for active dredge disposal activities. Implementation of this alternative may limit future uses at this site as contaminated material would remain on site.

5.2.5 Alternative No. 5: Excavation and On-Site Disposal

5.2.5.1 Detailed Description

This alternative involves excavation and disposal of contaminated soils at a newly constructed on-site NYSDEC approved and permitted non-hazardous/solid waste landfill at the Newland Island site (see Figure 5-4). The on-site landfill would be constructed, operated, and maintained in accordance with 6 NYCRR Part 360 as contaminated site soils that contain PCB concentrations less than 50 mg/kg, which is considered non-hazardous. Institutional controls are also included in this alternative to protect the integrity of the landfill.

The proposed location of the landfill is roughly at the center of the island between the private property and the Northern basin. This location was selected because it is sufficiently large to contain the contaminated soils and also because this portion of the site has a sufficient difference between surface and groundwater elevations to keep landfill materials above the groundwater table. In addition to the contaminated soil volume presented in Section 2.4.3, the proposed landfill dimensions will be calculated to hold approximately 20 % of the clean soil that will be used as the daily cover during construction. Daily cover is required as per the 6 NYCRR Part 360 regulations and for purposes of this FS assumed to originate from the excavated soils from the landfill footprint. The approximate dimensions of the landfill at the ground surface (including cutback) used for cost estimating purposes are 730 feet in length by 330 feet in width by 31 feet in height, of which 5 feet is below ground.

Excavation of the contaminated soil, analytical testing, and dewatering will be performed as described in Alternative 3. Due to limited available open space, the logistics involved in performing excavation activities and construction of the landfill may overlap.

In order to limit the transport of material onto the island, geosynthetic liner materials were assumed in some instances instead of traditional fill material. The total proposed bottom liner thickness will be approximately 6 feet while the cover thickness will be approximately 4 feet. The landfill will consist of the following layers, starting from the deepest layer of the bottom liner to the top layer of the cover (see Figure 5-5).

Bottom Liner

1. A 24-inch layer of barrier layer consisting of clay will act as the base of the entire landfill and a secondary containment for generated leachate. The clay material must exhibit a hydraulic conductivity of 1 x 10^{-7} cm/s.

2. A 60-mil geomembrane liner overlies the 24-inch barrier layer, which will help to prevent leachate from migrating through the barrier layer.

3. Next, the Secondary Leachate Collection System (SLCS) will consist of a 12-inch-thick layer of soil with a minimum hydraulic conductivity of 1 x 10^{-2} cm/s to allow for drainage. A 6-inch perforated pipe will be installed within this layer and used to collect the leachate.

4. A 12-inch layer of structural fill will be placed over the SLCS. This is intended to provide separation between the primary and secondary leachate collection systems.

5. A barrier layer will be placed next that consists of a geosynthetic clay liner (GCL) and a geosynthetic membrane. The GCL combines two geotextiles encapsulating a layer of bentonite. A GCL is proposed to replace the typical 6-

inch layer of clay for the following reasons: 1) similar to clay, GCLs exhibit self-sealing properties in the event of puncture, 2) there would be an overall reduction in installation costs, 3) GCLs limit the amount of material imported to the site, and 4) GCLs reduce use of natural resources (soil). A 60-mil thick geomembrane cover will be placed over the GCL.

6. Lastly a 24-inch thick layer of drainage material and piping will be installed for the Primary Leachate Collection System (PLCS). A 6-inch diameter pipe (similar to SLCS) will provide a drainage pathway for the leachate.

Cover System

1. An 18-inch barrier layer consisting of low permeability, clay material will be placed overlying the compacted, contaminated soil followed by a 60-mil geosynthetic membrane.

2. A 24-inch compacted soil layer, used to protect the low permeability layer and geomembrane from root penetration, desiccation, and freezing while also promoting stormwater run-off.

3. The final layer will consist of 6 inches of topsoil seeded to promote vegetative growth for erosion control. The surface cover will be seeded with low maintenance grassy vegetation native to the area.

To construct the landfill as described above, approximately 83,000 CY of soil and gravel material will need to be transported to Newland Island. Based on the condition of the access road, as discussed in Alternative 3, it was assumed that the landfill materials would be transported to the site by barge. Because the landfill construction materials do not represent a contamination hazard, it is not necessary to use roll-off containers to transport the material. Instead, hopper barges designed for the transportation of clean bulk materials can be used. These hopper barges are non-mechanical ships which can carry up to 1,000 tons of material at the same time, thereby reducing the number of barge trips. The same car-float style temporary barge will be required to unload the barges, and it was assumed that soils would be delivered to the Port of Albany and then transported to Newland Island. Several material stockpiles will be required to accommodate clean and contaminated excavated soil and landfill materials, as shown on Figure 5-4.

Leachate and stormwater captured by the drainage layers will be distributed through the perforated pipes located around the border of the landfill. The perforated pipe will be sloped to promote drainage of water to the collection manholes. From the manholes, water will be either pumped out and disposed of off site or discharged through an on-site treatment system, then to the Hudson River or Champlain Canal. For costing purposes, it was assumed that an on-site treatment system would be used to treat the water. Furthermore, it is assumed that a State

Pollutant Discharge Elimination System (SPDES) permit would be required to discharge the water to the river or canal.

Once the landfill has been constructed, a berm would be constructed around the landfill to minimize the transfer the landfill material due to runoff and erosion.

To comply with 6 NYCRR Part 360 regulations, several studies, plans, manuals, and drawings must be developed as part of the landfill permit application package. For example, a hydrogeologic study, leachate management plan, construction quality assurance/quality control plan, and proposed engineering drawings must be developed. In addition, a water quality monitoring program needs to be developed prior to the construction of the landfill. The program will establish the existing water quality for the site prior to land filling, operational water quality during landfill construction, and during the post-closure period.

To fulfill monitoring requirements, it is assumed that a total of four new monitoring wells will be constructed around the proposed landfill. To establish baseline water quality parameters for the site, groundwater from the monitoring wells will be sampled and analyzed for four rounds of quarterly sampling prior to landfill construction. The first of these sampling rounds will be analyzed for expanded parameters (refer to 6 NYCRR Part 360 for a complete list) and the other three rounds will be analyzed for baseline parameters.

During operation, closure, and post-closure of the landfill, an operational water quality monitoring plan will be developed to distinguish the landfill-derived contamination from the existing water quality at the site. For each calendar year, the plan will include quarterly sampling and analysis, once for baseline parameters and three times for routine parameters.

For excavated areas (excluding the landfill footprint), it is assumed that existing stockpiles of uncontaminated soil on site will be used as backfill. Up to 5 feet of backfill will be added to portions of the Central and Northern basins to restore grade and/or bring final grades above the groundwater table. With the exception of the Southern basin (as it is anticipated to be an active dredge spoil disposal cell into the future), 6 inches of topsoil will be placed and graded to the final surface elevation. Once backfill operations are completed, the site will be restored to pre-construction conditions to include seeding and tree planting.

Institutional controls and groundwater monitoring will be implemented similarly as described in Alternative 2 in combination with the landfill installation in order to prevent future uses of the site that would compromise the integrity of the landfill. In addition, New York State DER-10 requires a site management plan for sites that implement remedial actions that, upon completion, require institutional controls/engineering controls, monitoring and/or operation and maintenance.

5.2.5.2 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 will be disposed of in a permitted disposal facility. The contaminated soil will no longer present an exposure risk.

Compliance with SCGs

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

Short-Term Impacts and Effectiveness

Several short-term impacts to the community and workers may arise during the construction of the landfill and excavation of contaminated soil at the site. These include dust, noise, and potential cross contamination of materials during handling and movement of the contaminated soils. Dredge disposal operations would likely need to temporarily cease during excavation activities. Furthermore, water traffic along the Champlain Canal may be impacted during the implementation of this alternative due to loading and unloading activities by barge at the site. Health and safety measures, including air monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, will be in place to protect the workers and surrounding community. Action levels will be set prior to any intrusive activities, and an appropriate correction action will be implemented if these action levels are exceeded.

Because contaminated material will be contained and managed in an on-site landfill, site RAOs will be achieved at the completion of the constructed landfill. The time required to complete this alternative is estimated to be one year for permitting and preconstruction monitoring followed by an additional six months to one year to construct the landfill.

Long-Term Effectiveness and Permanence

With proper inspection, maintenance, and monitoring, excavation and on-site disposal is considered to be an adequate and effective remedy in the long-term since the contaminated soil will be contained and will no longer represent a human or ecological risk. Deed or other restrictions would be effective in the long-term as long as they are interpreted correctly, not modified by future site users, and are enforced.

Reduction in Toxicity, Mobility, or Volume through Treatment

This alternative does not reduce the toxicity or volume of contaminated soil through treatment. However, the mobility of contaminated materials is greatly reduced by containment in a permitted landfill; thereby the mobility of the contaminants will be within acceptable limits and would be practically reduced.

Implementability

This alternative is readily implemented using standard construction means and methods. Contaminated soil will be excavated for disposal at a newly constructed, permitted, on-site non-hazardous landfill. Due to open space availability on site, there may be some logistical issues with excavation and construction of the landfill occurring at the same time. Although the materials, equipment, and labor required to implement this alternative are readily available, there is an increased complexity to this alternative due to the use of barging as a means of transporting materials to the site. However, a local barging company has been contacted who can readily support this means of transportation.

Cost

The 2009 total present-worth cost of this alternative is $19,524,000. Table 5-4 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Earthwork and landfill construction costs were obtained from RS Means Cost Data series and engineering judgment while transportation and monitoring costs were determined using vendor quotes and engineering judgment.

Land Use

The Newland Island site is located in the town of Schaghticoke on a 28.6-acre parcel of land owned by NYS. The remaining 16.5 acres of land on the island is privately owned and is occupied by a single dwelling, equine stables, and several small service structures. The site is approximately 80% wooded and the remaining 20% is exposed dredge spoils (Southern basin). The Southern basin is an active dredge soil disposal site located adjacent to a private residence to the north. Town of Schaghticoke zoning maps (Town of Schaghticoke 2005) indicate that the site is zoned as Marine. The purpose of the Marine zoning is to support the historic role played by the town's waterfront in the development of the town, to encourage river-oriented activities consistent with sound environmental practices, and to enhance public access to the river (Town of Schaghticoke 2007). Discussions with NYSDEC indicated the future land use of the site is expected to be the same as its current use, which is an active dredge disposal site. Implementation of this alternative may limit future uses at this site as contaminated material would remain on site.

5.2.6 Alternative No. 6: Selective Excavation and Consolidation, Stormwater Management, Institutional Controls, and Long-Term Monitoring

5.2.6.1 Detailed Description

This alternative would address the PCB-contaminated dredge spoil material/soil at the site by selective excavation and consolidation of contaminated dredge spoils located in all three disposal basins at the Newland Island site (see Figure 5-7). Containment of material above selected cleanup goals will be achieved through the use of a clean soil cover. A drainage diversion trench will be constructed around a portion of the Northern basin to manage stormwater at the site, in order to further reduce stormwater infiltration to this area which has been identified as a transport mechanism for site COCs. Institutional controls and long-term monitoring are included in this alternative to maintain the integrity of the soil cover and to monitor contaminant levels in groundwater.

Construction of the clean soil cover will be implemented using standard means and methods. For costing purposes, it was assumed that heavy construction equipment would need to be transported to the site by barge. To reduce costs and make room for future navigational dredging operations, all backfill and cover material required for this project would come from the NYSCC's stockpile of nearly 130,000 CY of clean dredge spoil material at the southern portion of the site, once the NYSDEC approves the material for beneficial use and if the material meets the NYSDEC's criteria for backfill. It is assumed that since this material is currently in the process of being approved for beneficial use through the NYSDEC, once approved, the stockpiled material will be considered "clean" and will therefore not need to be sampled to confirm it is "clean" material. Based on volume estimates for the backfill and cover material needed, the available volume will be sufficient for the proposed construction and no additional backfill or cover materials will need to be imported to the site.

Currently, on-site contaminated dredge spoils in the southern basin are covered by a geotextile fabric, followed by several feet of material that has been detected at levels less than selected cleanup goals. The material above the geotextile fabric will be excavated and stored on site for reuse as fill material in the Central and Northern basins, and/or for construction of the soil cover throughout the site. Upon excavation of the material above the geotextile fabric in the southern basin, a high-visibility demarcation layer will be placed over the existing geotextile fabric barrier in order to identify a breach in the cover system during future work activities at the site. Following this demarcation layer, clean soils will be placed and compacted at varying thicknesses. Based on knowledge of historic use of the site and anticipated future use, the most active portion of the cell where the dredge slurry is discharged and more susceptible to grading is the western half of the Southern basin. The eastern half of the Southern basin receives overflow from the western portion and is rarely graded. Therefore, the thickness of the soil cover was assumed to be 12" to 18" in the western section and 12" in the eastern section. PCB-contaminated dredge spoil materials/soils that were identified at or near the surface in some parts of the containment berm for the Southern basin and around the Central basin would be excavated and placed in the Northern basin prior to proceeding with cover construction. It is assumed that approximately 20,000 CY of contaminated material would be excavated to a depth of 3 feet and moved to the Northern basin by trucks.

As the Central and Northern basins are no longer used, their berms will be deconstructed to match the adjacent ground surface elevations to the extent practical and consolidated in the basins. Similar to the Southern basin, construction of the soil cover over the Central and Northern basins will involve placement of a geotextile fabric and high visibility demarcation layer over the Central and Northern basins followed by fill and compaction to restore these basins to match adjacent grades. A slight pitch will be incorporated with these basins to promote surface runoff drainage on the basins to the Champlain Canal. For costing purposes, it was assumed that the soil cover will be 12” in these basins (in addition to the fill needed to bring the basins to grade).

The soil cover will be hydroseeded to stabilize the soils, except in the intermittently-active Southern basin. The soil cover over all three basins will need to be inspected annually and repaired as needed to maintain their integrity.

This alternative also includes construction of a diversion trench on the northwestern margin of the Northern basin to intercept and redirect any intermittent overland water flow in this area and adequately impede/eliminate the migration of this surface water into and through the known dredge spoil materials. Sampling conducted during the RI indicated the presence of PCBs in groundwater above the screening criteria of 0.09 micrograms per liter in one well (NI-MW-07) near the Northern basin, between the basin and the Champlain Canal. The diversion trench will reduce the potential for migration of contaminants in groundwater via infiltration in this area. As a permanent stormwater management measure, the diversion trench will be constructed in accordance with NYSDEC Standards and Specifications for Erosion and Sediment Control (NYSDEC 2005). For costing purposes, it is assumed that the trench will be grassed and will have a trapezoidal design with width of 4 feet and a depth of 1.5 feet.

Finally, since contaminated material will remain on-site, institutional controls and long-term monitoring will be implemented similarly as described in Alternative 2 in order to prevent future uses of the site that would compromise the integrity of the covers. It is assumed the soil cover will be installed around existing monitoring wells and no new wells need to be installed. In addition, New York State DER-10 requires a site management plan for sites that implement remedial actions that, upon completion, require institutional controls/engineering controls, monitoring and/or operation and maintenance.

5.2.6.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment since contaminated spoils will be properly covered by clean soil. This will reduce the risk of direct contact exposure with contaminants by human and ecological receptors as well as reduce the risk of further contamination of the site groundwater.

Compliance with SCGs

This alternative does not comply with SCGs, since contaminated soils will remain on site above selected cleanup goals. However, the SCO will be achieved at the surface as surface soils would be less than 1 ppm of PCBs after installation of the soil cover.

Short-Term Impacts and Effectiveness

Several short-term impacts to the community and workers may arise during construction of the soil cover and drainage diversion trench. These include dust, noise, and potential exposure to contaminated spoils by site workers. Dredge disposal operations would likely need to temporarily cease during excavation activities. Furthermore, water traffic along the Champlain Canal may be impacted during the implementation of this alternative due to the loading and unloading activities by barge at the site. Health and safety measures, including air-monitoring, use of appropriate PPE, and decontamination of equipment leaving the site, will be in place to protect the workers and surrounding community. Action levels will be set prior to any intrusive activities, and an appropriate corrective action will be implemented if these action levels are exceeded.

Because contaminated material will be sufficiently contained on site and SCOs will be achieved at the surface, RAOs will be achieved at the completion of construction of the soil cover. The time required to complete this alternative is estimated to be one year.

Long-Term Effectiveness and Permanence

With proper inspection, maintenance, and monitoring, containment of on-site spoils is considered to be an adequate and effective remedy in the long-term since the contaminated soil will represent a minimal risk to human and ecological receptors. Although the potential for contact with contaminated spoils at the site will always exist, these risks will be mitigated by proper maintenance of the soil cover. Similarly, the potential for migration of contaminants into groundwater will be further reduced by construction of the drainage diversion trench.

Reduction in Toxicity, Mobility, or Volume through Treatment

This alternative does not reduce the toxicity or volume of contaminated soil through treatment. However, the mobility of contaminated materials is reduced by containment of spoils by a soil cover and construction of the drainage diversion trench.

Implementability

This alternative is readily implemented using conventional construction means and methods. Although the materials, equipment, and labor required to implement this alternative are available, there is an increased complexity due to the use of barging as a means of transporting materials to the site, as was selected for Alternative 3. However, the amount of material needed to be transported to the site will be minimal since on-site clean soils are readily available for construction of the cover. For these reasons, site access by land was assumed in the development of this alternative.

Cost

The 2009 total present-worth cost of this alternative is $1,414,000. Table 5-5 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Earthwork and landfill construction costs were obtained from RS Means Cost Data series and engineering judgment while transportation and monitoring costs were determined using vendor quotes and engineering judgment.

Land Use

The Newland Island site is located in the town of Schaghticoke on a 28.6-acre parcel of land owned by NYS. The remaining 16.5 acres of land on the island is privately owned and is occupied by a single dwelling, equine stables, and several small service structures. The site is approximately 80% wooded and the remaining 20% is exposed dredge spoils (Southern basin). The Southern basin is an active dredge soil disposal site located adjacent to a private residence to the north. Town of Schaghticoke zoning maps (Town of Schaghticoke 2005) indicate that the site is zoned as Marine. The purpose of the Marine zoning is to support the historic role played by the town's waterfront in the development of the town, to encourage river-oriented activities consistent with sound environmental practices, and to enhance public access to the river (Town of Schaghticoke 2007). Discussions with NYSDEC indicated the future land use of the site is expected to be the same as its current use, which is an active dredge disposal site. Implementation of this alternative may limit future use at this site as contaminated material would remain on site.

5.3 Comparative Evaluation of Alternatives

Overall Protection of Human Health and the Environment

Since Alternative 1 employs no action, contaminated site soils will remain on site providing no protection against future exposure. Alternatives 2, 3, 4, 5, and 6 are more protective of human health and the environment to varying degrees. By only using institutional controls in Alternative 2, fencing and signage could reduce human exposure; however, inadequate enforcement could lead to potential health risks. Wildlife may also not be properly protected with this alternative. Alternative 3 provides a higher level of protection than the other active Alternatives 4, 5, and 6 because the contamination is both removed from the site and subsequently destroyed. Alternatives 4 and 5 are more protective of human health and the environment than Alternative 6 because site-wide contaminated soils will be excavated and properly disposed of even though the contamination is not destroyed. Although contaminated soils will remain on site with Alternative 6, this alternative is protective of human health and the environment because contaminated soils are covered in place, thereby reducing the potential for exposure and infiltration.

Compliance with SCGs

PCBs are recalcitrant compounds by nature. Therefore, their levels in the soil are not expected to decrease over time. Alternatives 1, 2, and 6 do not comply with SCGs because contaminated soils will remain on site. However, for Alternative

6, the SCO will be achieved at the surface as surface soils would be less than 1 ppm of PCBs after installation of the soil cover. Alternatives 3, 4, and 5 comply with SCGs since soil contamination will be either treated or properly disposed of on or off site.

Short-Term Impacts and Effectiveness

Short-term impacts are not anticipated for Alternatives 1 and 2 since no remediation activities will take place. Several similar short-term impacts may affect the community during remedial activities for Alternatives 3, 4, 5, and 6 such as dust and noise, due to construction activities. Tug boats, barges, excavators, bulldozers, and cranes would be operated on a daily basis for Alternatives 3 and 4 and the potential for spills of contaminated soils during the off-site transport also exists. There is less risk for spills to the environment during transport with Alternative 5 as contaminated materials would remain on site. Alternative 6 would have fewer short-term impacts than Alternatives 3, 4, and 5 since contaminated material will not be disturbed.

Long-Term Effectiveness and Permanence

Since Alternative 1 employs no action, contaminated soil will remain on site providing no protection for potential future exposure. Alternative 2 is effective in the long-term provided that there is proper enforcement. Alternatives 3, 4, and 5 have a higher level of long-term effectiveness and permanence than Alternatives 1 and 2 because site-wide contaminated soils will be excavated and either treated or properly disposed of on or off site. Alternatives 5 and 6 are effective in the long-term provided proper inspection, maintenance, and monitoring is performed.

Reduction in Toxicity, Mobility, or Volume through Treatment

Reduction in toxicity, mobility, or volume through treatment will not be achieved by implementing Alternatives 1 and 2. Alternative 3 reduces the toxicity, mobility, and volume of contamination by treating the contaminated materials. Alternatives 4 and 5 reduce the mobility of site contaminants by containing contaminated materials in permitted disposal facilities. Similarly, Alternative 6 reduces the mobility of contaminants by covering the spoils in place. Construction of a drainage diversion trench further reduces the mobility of contaminants in groundwater.

Implementability

There are no actions to implement for Alternative 1. Alternatives 2 through 6 can be readily implemented using standard construction means and methods. Alternatives 3 and 4 are logistically complex compared to the other alternatives because the contaminated materials must be removed from the site by barge, and then transported to a separate location for treatment or disposal. Alternative 5 has a similar logistical issue with the barging of materials to the site as well as open space issues when excavation and landfill construction occurs at the same time. These logistical issues are reduced for Alternative 6 since no contaminated material will be transported off the island, and clean soils on-site will be used for backfill and construction of the soil cover.

Cost

Alternative 1 calls for no action, and thus incurs no costs. Alternative 2 has a lower total present worth and O & M cost than Alternatives 3 through 6 because no soil excavation is required for this alternative. Alternative 5 is significantly less than Alternatives 3 and 4 because there is no need to transport contaminated materials. Alternatives 3 and 4 are of a relatively comparable cost, with Alternative 4 being the most expensive due primarily to the greater cost of landfilling than HTTD treatment. Alternative 6 is less than Alternatives 3, 4, and 5 because contaminated soils will not be disturbed and existing, onsite soils will be used for construction of the cover, therefore reducing material costs.

Land Use

As contaminated soil will be left in place, uncontained in Alternatives 1 and 2, future uses at the site may be limited. For Alternatives 3 and 4, contaminated material will be either removed and either treated or disposed of properly off site, thus, future uses at the site would not be limited. Although Alternative 5 would contain contaminated materials on site in a permitted landfill, the land occupied by the landfill could not be modified. Similarly for Alternative 6, the soil cover may limit the ability to modify the land significantly.

Table 5-1 Cost Estimate for Alternative 2 - Institutional Controls and Long-term Monitoring
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Institutional Controls	Legal Fees to Implement Restrictions Etc.	LS	1	$5,000.00	$5,000
Subtotal					$5,000
Site Preparation					
Cut and Chip Trees	Trees to 12" dia.	Acre	0.5	$5,250.00	$2,489
Grub Stumps and Remove		Acre	0.5	$3,275.00	$1,553
Subtotal					$5,000
				Capital Cost Subtotal:	$10,000
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$9,200
				10% Legal, administrative, engineering fees:	$920
				20% Contingencies:	$2,024
				Total Capital Cost:	**$13,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$0
				10% Legal, administrative, engineering fees:	$0
				20% Contingencies:	$0
				Annual Cost Total:	**$0**
				30-Year Present Worth of Annual Costs:	**$0**
5-Year Costs					
Groundwater Sampling (Labor)	2-people @ $105/hr; 8 hr/day; total of 7 wells; assume 4 wells/day	Day	2	$1,680.00	$3,360
Parameter Analysis	Includes TCL PCBs	Each	7	$120.00	$840
Data Evaluation and Reporting		HR	40	$105.00	$4,200
Institutional Controls	Maintain/update documentation	Each	1	$5,000.00	$5,000
Subtotal					$14,000
				5-Year Cost Subtotal:	$14,000
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$12,880
				10% Legal, administrative, engineering fees:	$1,288
				20% Contingencies:	$2,834
				5-Year Total:	**$18,000**
				30-Year Present Worth of 5-Year Costs:	**$51,000**
				2008 Total Present Worth Cost:	*$64,000*
				2009 Total Present Worth Cost:	**$66,000**

Assumptions:
1. Width of the area to be cleared = 5 feet
2. Wooded area assumed to be = 0.5 acres of contaminated area, or
3. Present worth of costs assumes 5% annual interest rate.
4. Unit costs listed were obtained from 2008 RS Means Cost Data and engineering judgement.
5. RS Means Historical Cost Index used to escalate 2008 costs to 2009 costs.

Year	Index
2008	180.4
2009	185.9

Abbreviations:
HR = Hour.
LF = Linear foot.

Table 5-2 Cost Estimate for Alternative 3 - Excavation and Off-Site High Temperature Thermal Desorption
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (5% of total capital cost)	Includes submittals, reporting, meetings, trailer, insurance etc.	LS	1	$1,986,300.00	$1,986,300
Permitting		LS	1	$2,000.00	$2,000
Subtotal					$1,988,000
Site Preparation					
Mobilization/Demobilization	15% of Capital Costs Requiring Mobilizations excluding Transportation	LS	1	$329,245.85	$329,246
Surveying Crew	2-person crew @ $105/hr, 8hr/day; assume 50% of project duration	Day	274	$1,680.00	$459,480
Cut and Chip Trees	Trees to 12" dia.	Acre	2.3	$5,250.00	$12,004
Grub Stumps and Remove		Acre	2.3	$3,275.00	$7,488
Subtotal					$809,000
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,200.00	$6,400
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,000.00	$32,000
Site Safety Officer	10 hrs/day, 5days/wk, $105/hr; 100% of project	Manweeks	78	$5,250.00	$409,126
Subtotal					$448,000
Excavation					
Excavation	Excavator, hydraulic, 2 CY bucket = 165 CY/hr	BCY	128,000	$1.54	$197,120
Off Road Hauler	22 CY, 1000' round trip haul distance	LCY	143,360	$2.45	$351,232
Transport Soil from Stockpile to Roll offs	Front End Loader, 5 CY bucket	LCY	143,360	$1.59	$227,942
Haul Road Maintenance	Includes Labor and Equipment	Day	61	$1,075.00	$65,575
On-Site Roll Off Truck	Includes Vehicle Costs Only	Day	427	$200.00	$85,400
Dewatering	Methodology to be determined by contractor; unit cost assumed as 2-4" pumps operating 24 hr/day; assume dewatering necessary for up to 1 month	Day	30	$880.00	$26,400
Water Treatment	Up to 50 GPM capacity, carbon treatment, 30 day rental	LS	1	$5,400.00	$5,400
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	765	$80.00	$61,196
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	76	$107.00	$8,185
Confirmation Sampling (Metals)	TAL metals	Each	765	$213.00	$162,933
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	4	$200.00	$800
Subtotal					$1,192,000
Transportation					
Initial Delivery Cost for Roll-Off Container		Each	117	$650.00	$76,050
6-mil Roll Off Container Liner		Each	117	$45.00	$5,265
Mob/Demob for Transportation	Includes Car Float and barges	LS	1	$101,000.00	$101,000
Rental Cost for Roll-Off Containers	Rental cost @ $14/day; 117 Roll-offs	Days	427	$1,638.00	$699,426
Temporary Dock / Container Loading and Unloading at $	150 ton crane, Crew, Fuel, 36' x 250' Car Float	Days	427	$6,500.00	$2,775,500
Barges	Includes 3 165' x 35' Inland Deck Barges	Days	427	$1,800.00	$768,600
1600 H.P Tug	Includes Labor, Fuel Etc.	Days	427	$8,500.00	$3,629,500
Port of Albany Roll Off Loading Operations	Includes Loading/Unloading, Gate Charge, Wharfage	Each	9,594	$455.00	$4,365,270
Transporting Soil to HTTD Facility (off site)	Includes trucks, labor and Fuel	Ton	192,000	$45.00	$8,640,000
Subtotal					$21,061,000
High Temperature Thermal Desorption					
HTTD (Treatment)	Includes off-site equipment, labor, maintenance, utilities, testing of effluent at ESMI facility in New Hampshire	Ton	192,000	$38.00	$7,296,000
Soil Testing (Characterization)	Includes TPH, VOCs, PAHs, RCRA 8 metals, PCBs	Each	396	$580.00	$229,680
Subtotal					$7,526,000
Backfilling					
Backfill (Material only)	Includes material and transportation to site; assume an average of 5' layer of backfill in central and northern basins	LCY	20,658	$10.65	$219,991
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	18,444	$1.34	$24,715
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	18,444	$0.46	$8,484
Subtotal					$253,000

Table 5-2 Cost Estimate for Alternative 3 - Excavation and Off-Site High Temperature Thermal Desorption
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Transportation of Backfill and Topsoil to the Site					
Mobilization/Demobilization	Car Float, Barges, Tug, Unloading Equipment (Crane, Off Road Trucks, Bull Dozer etc)	LS	1	$110,000.00	$110,000
Soil Unloading at Newland Island	150 ton crane, Crew, Fuel, 36' x 250' Car Float Off road Trucks, Bull Dozer etc	Days	31	$12,200.00	$373,827
Barges	Includes 3 165’ x 35’ Hopper Barges	Days	31	$1,800.00	$55,155
1600 H.P Tug	Includes Labor, Fuel Etc.	Days	31	$8,500.00	$260,453
Port of Albany Soil Loading Operations	Includes Loading/Unloading, Gate Charge, Wharfage	LS	1	$800,000.00	$800,000
Subtotal					$1,599,000
Site Restoration					
Topsoil (Material only)	0.5 ft thick layer; in pre-existing grassy areas	LCY	2,221	$14.00	$31,099
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	1,983	$1.34	$2,658
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 30% for disturbed areas outside of excavation area	MSF	139	$52.50	$7,310
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	111	$250.00	$27,667
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	111	$62.00	$6,861
Subtotal					$76,000
				Capital Cost Subtotal:	$34,952,000
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$32,155,840
				10% Legal, administrative, engineering fees:	$3,215,584
				20% Contingencies:	$7,074,285
				Total Capital Cost:	**$42,446,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$0
				10% Legal, administrative, engineering fees:	$0
				20% Contingencies:	$0
				Annual Cost Total:	**$0**
				Present Worth of Annual Costs	**$0**
5-Year Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				5-Year Cost Subtotal:	$0
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$0
				10% Legal, administrative, engineering fees:	$0
				20% Contingencies:	$0
				5-Year Total:	**$0**
				30-Year Present Worth of 5-Year Costs:	**$0**
				2008 Total Present Worth Cost:	*$42,446,000*
				2009 Total Present Worth Cost:	**$43,741,000**

Assumptions:

1. Total contaminated soil volume =	128,000	BCY, or
	143,360	LCY
Total excavated volume =	128,000	BCY
2. Soil excavation areas:		
Southern Basin	267,740	SF
Central Basin	21,137	SF
Northern Basin	78,462	SF
Other Areas	7,500	SF
3. Total Contaminated soil excavation area =	374,840	SF, or
	8.6	acres, as obtained from EEEPC CAD dept June 2008, see Figure 5-2
4. Excavation perimeter =	4,130	ft
5. Wooded area assumed to be =	27%	of total excavation area (assumes central and northern basins, 100% wooded),
	2.3	acres
6. Assume confirmation sampling spacing =	25	foot grid spacing (per 40 CFR 761.265)
7. Maximum excavation depth =	15.6	ft BGS
8. Assumed production rate of excavation =	165	BCY/hr
	50%	assumed effective production rate, considering site complexities
	83	BCY/hr, effective production rate
	660	BCY/day, effective production rate
	240,900	BCY/year, effective production rate
9. Estimated volume of soil to be transported off-site per barge trip =	585	LCY/day
10. Number of Barge trips required =	246	trips

Table 5-2 Cost Estimate for Alternative 3 - Excavation and Off-Site High Temperature Thermal Desorption
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost

11. HTTD facility can process up to = 450 tons/day, or
336 LCY/day

12. Based on the assumed production rate and the amount of material the HTTD facility can accept, the treatment time is = 427 days 1.17 years

13. Mob/demob assumed to be = 120 days 0.33 years

14. Total Project Duration = 547 Days 1.50 Years

15. Soil testing for off-site HTTD unit assumes:
Characterization - 1 sample for every 200 Tons, up to 4,000 tons then 1 sample every 500 Tons

16. Backfill volume for site restoration (Central and Northern basins only) = 18,444 BCY, or 20,658 LCY

17. Topsoil volume required for site restoration (0.5ft thick) - Central and Northern basins & Other areas only = 1,983 BCY, or 2,221 LCY

18. No storage facilities are assumed for contaminated soil. However, these facilities may be added at a later time.

19. Final elevations will be graded to drain to surrounding water bodies.

20. Based on geotechnical data from the RI (EEEPC 2007) and typical soil properties, in-situ bulk density of site soils = 1.5 Tons/BCY

21. For loose soil assume sandy, dry soil with swell factor = 12%
(Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).

22. Topsoil density assumed to be 1.2 Tons/LCY

23. Present worth of costs assumes 5% annual interest rate.

24. HTTD costs supplied by vendor, Environmental Soil Management, Inc. (ESMI), January, 2008. Transportational Costs supplied by NYS Marine Highway Transportation Company, LLC, February, 2008. Other unit costs listed were obtained from 2008 RS Means Cost Data and engineers judgement

25. Number of trees based on replacement over the areas of central and northern basins with a 30 foot central packaging arrangement

26. No additional cutback will be required at the site.

27. Number of Barges Trips needed to transport backfill & topsoil material on-site, assumes one hopper barge trip carries a load of 1000 tons 31

28. RS Means Historical Cost Index used to escalate 2008 costs to 2009 costs.

Year	Index
2008	180.4
2009	185.9

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 5-3 Cost Estimate for Alternative 4 - Excavation and Off-Site Disposal
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (5% of total capital cost)	Includes submittals, reporting, meetings, trailer, insurance etc.	LS	1	$1,986,300.00	$1,986,300
Permitting		LS	1	$2,000.00	$2,000
Subtotal					$1,989,000
Site Preparation					
Mobilization/Demobilization	15% of Capital Costs Requiring Mobilizations	LS	1	$503,421.39	$503,421
Surveying Crew	2-person crew @ $105/hr, 8hr/day; assume 50% of project duration	Day	183	$1,680.00	$306,650
Cut and Chip Trees	Trees to 12" dia.	Acre	2.3	$5,250.00	$12,004
Grub Stumps and Remove		Acre	2.3	$3,275.00	$7,488
Subtotal					$830,000
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,200.00	$6,400
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,000.00	$32,000
Site Safety Officer	10 hrs/day, 5days/wk, $105/hr; 100% of project duration	Manweeks	52	$5,250.00	$273,045
Subtotal					$312,000
Excavation					
Excavation	Excavator, hydraulic, 2 CY bucket = 165 CY/hr	BCY	128,000	$1.54	$197,120
Off Road Hauler	22 CY, 1000' round trip haul distance	LCY	143,360	$2.45	$351,232
Transport Soil from Stockpile to Roll offs	Front End Loader, 5 CY bucket	LCY	143,360	$1.59	$227,942
Dewatering	Methodology to be determined by contractor; unit cost assumed as 2-4" pumps operating 24 hr/day; assume dewatering necessary for up to 1 month	Day	30	$880.00	$26,400
Water Treatment	Up to 50 GPM capacity, carbon treatment, 30 day rental	LS	1	$5,400.00	$5,400
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	765	$80.00	$61,196
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	76	$107.00	$8,185
Confirmation Sampling (Metals)	TAL metals	Each	765	$213.00	$162,933
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	4	$200.00	$800
Subtotal					$1,042,000
Transportation					
Initial Delivery Cost for Roll-Off Container		Each	117	$650.00	$76,050
6-mil Roll Off Container Liner		Each	117	$45.00	$5,265
Mob/Demob for Transportation	Includes Car Float and barges	LS	1	$101,000.00	$101,000
Rental Cost for Roll-Off Containers	Rental cost @ $14/day; 117 Roll-offs	Days	427	$1,638.00	$699,426
Temporary Dock / Container Loading and Unloading at Site	150 ton crane, Crew, Fuel, 36' x 250' Car Float	Days	427	$6,500.00	$2,775,500
Barges	Includes 3 165' x 35' Inland Deck Barges	Days	427	$1,800.00	$768,600
1600 H.P Tug	Includes Labor, Fuel Etc.	Days	427	$8,500.00	$3,629,500
Port of Albany Roll Off Loading Operations	Includes Loading/Unloading, Gate Charge, Wharfage	Each	9,594	$455.00	$4,365,270
Transport Soil Off Site to Disposal Facility	Dump truck transport from Port of Albany to Fairport, NY; includes taxes/fees and fuel	Ton	192,000	$54.00	$10,368,000
Subtotal					$22,788,611
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	144	$1,562.00	$224,709
Waste Disposal	Disposal at High Acres Landfill (Fairport, NY); includes taxes/fees	Ton	192,000	$48.00	$9,216,000
Subtotal					$9,441,000
Backfilling					
Backfill (Material only)	Includes material and transportation to site; assume an average of 5' layer of backfill in central and northern basins	LCY	20,658	$10.65	$219,991
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	18,444	$1.34	$24,715

Table 5-3 Cost Estimate for Alternative 4 - Excavation and Off-Site Disposal
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	18,444	$0.46	$8,484
Subtotal					$254,000
Transportation of Backfill and Topsoil to the Site					
Mobilization/Demobilization	Car Float, Barges, Tug, Unloading Equipment (Crane, Off Road Trucks, Bull Dozer etc)	LS	1	$110,000.00	$110,000
Soil Unloading at Newland Island	150 ton crane, Crew, Fuel, 36' x 250' Car Float Off road Trucks, Bull Dozer etc	Days	31	$12,200.00	$373,827
Barges	Includes 3 165' x 35' Hopper Barges	Days	31	$1,800.00	$55,155
1600 H.P Tug	Includes Labor, Fuel Etc.	Days	31	$8,500.00	$260,453
Port of Albany Soil Loading Operations	Includes Loading/Unloading, Gate Charge, Wharfage	LS	1	$800,000.00	$800,000
Subtotal					$1,600,000
Site Restoration					
Topsoil (Material only)	0.5 ft thick layer; in pre-existing grassy areas	LCY	2,221	$14.00	$31,099
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	1,983	$1.34	$2,658
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 30% for disturbed areas outside of excavation area	MSF	139	$52.50	$7,310
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	111	$250.00	$27,667
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	111	$62.00	$6,861
Subtotal					$76,000
				Capital Cost Subtotal:	$38,332,611
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$35,266,002
				10% Legal, administrative, engineering fees:	$3,526,600
				20% Contingencies:	$7,758,520
				Total Capital Cost:	**$46,552,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$0
				10% Legal, administrative, engineering fees:	$0
				20% Contingencies:	$0
				Annual Cost Total:	**$0**
				Present Worth of Annual Costs:	**$0**
5-Year Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				5-Year Cost Subtotal:	$0
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$0
				10% Legal, administrative, engineering fees:	$0
				20% Contingencies:	$0
				5-Year Total:	**$0**
				30-Year Present Worth of 5-Year Costs:	**$0**
				2008 Total Present Worth Cost:	*$46,552,000*
				2009 Total Present Worth Cost:	**$47,972,000**

Assumptions:

1. Total contaminated soil volume =	128,000	BCY, or
	143,360	LCY
Total excavated volume =	128,000	BCY
2. Soil excavation areas:		
Southern Basin	267,740	SF
Central Basin	21,137	SF
Northern Basin	78,462	SF
Other Areas	7,500	SF
3. Total Contaminated soil excavation area =	374,840	SF, or
	8.6	acres, as obtained from EEEPC CAD dept June 2008, see Figure 5-2
4. Excavation perimeter =	4,130	ft
5. Wooded area assumed to be =	27%	of total excavation area (assumes central and northern basins, 100% wooded),
	2.3	acres
6. Assume confirmation sampling spacing =	25	foot grid spacing (per 40 CFR 761.265)
7. Maximum excavation depth =	15.6	ft BGS
8. Assumed production rate of excavation =	165	BCY/hr

Table 5-3 Cost Estimate for Alternative 4 - Excavation and Off-Site Disposal
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost

	50%	assumed effective production rate, considering site complexities		
	83	BCY/hr, effective production rate		
	660	BCY/day, effective production rate		
	240,900	BCY/year, effective production rate		
9. Estimated volume of soil to be transported off-site per barge trip =	585	LCY/day		
10. Number of Barge trips required =	246	trips		
11. Based on the assumed production rate and the transportation rate, the time to transport material is =	245	days	1.17	years
12. Mob/demob assumed to be =	120	days	0.33	years
13. Total Project Duration =	365	Days	1.00	Years
14. Backfill volume for site restoration (central and northern basins only) =	18,444	BCY, or		
	20,658	LCY		
15. Topsoil volume required for site restoration (0.5ft thick) - Central and Northerr basins & Other Areas only =	1,983	BCY, or		
	2,221	LCY		
16. Final elevations will be graded to drain to surrounding water bodies.				
17. Based on geotechnical data from the RI (EEEPC 2007) and typical soil properties, in-situ bulk density of site soils =				
	1.5	Tons/BCY		
18. For loose soil assume sandy, dry soil with swell factor =	12%			
(Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).				
19. Topsoil density assumed to be	1.2	Tons/LCY		
20. Present worth of costs assumes 5% annual interest rate.				

21. Transportational Costs supplied by NYS Marine Highway Transportation Company, LLC, February, 2008. Other unit costs listed were obtained from 2008 RS Means Cost Data and engineers judgement

22. Number of trees based on replacement over the areas of Central and Northern Basins with a 30 foot central packaging arrangement.

23. No additional cutback will be required at the site.

24. Number of Barges Trips needed to transport backfill & topsoil material on-site, assumes one hopper barge trip carries a load of 1000 tons — 31

25. RS Means Historical Cost Index used to escalate 2008 costs to 2009 costs.

Year	Index
2008	180.4
2009	185.9

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 Alternative 5 - Excavation and On-site Disposal
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (5 % of total capital cost)	Includes submittals, reporting, meetings	LS	1	$733,287.58	$733,288
Landfill Permit Application	Hydrogeologics study, Leachate Management Plan, Quality Control Plan, Proposed Engineering Drawings, etc.	LS	1	$300,000.00	$300,000
Subtotal					$1,033,000
Site Preparation					
Mobilization/Demobilization	15% of Capital Costs Requiring Mobilizations	LS	1	$1,086,806.58	$1,086,807
Install Monitoring Wells	Four new wells will be installed	Each	4	$10,000.00	$40,000
Water Quality Monitoring Program	2-people @ $105/hr; 8 hr/day; total of 10 wells; assume 3 wells/day. Assume 4 Monitoring Events	Day	16	$1,680.00	$26,880
Parameter Analysis	Includes TCL PCBs, Metals (refer to 6 NYCRR Part 360 for the expanded list)	Each	40	$500.00	$20,000
Data Evaluation and Reporting	Assumes 40 hours/event 4 events	HR	160	$105.00	$16,800
Surveying Crew	2-person crew @ $105/hr, 8hr/day; assume 50% of project duration	Day	365	$1,680.00	$613,200
Cut and Chip Trees	Trees to 12" dia.	Acre	7.8	$5,250.00	$41,038
Grub Stumps and Remove		Acre	7.8	$3,275.00	$25,600
Subtotal					$1,870,000
Health and Safety					
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$3,000.00	$6,000
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,000.00	$32,000
Site Safety Officer	10 hrs/day, 5days/wk, $105/hr; 100% of project duration	manweeks	104	$5,250.00	$546,000
Subtotal					$584,000
Excavation					
Excavation	Excavator, hydraulic, 2 CY bucket = 165 CY/hr	BCY	128,000	$1.54	$197,120
Off Road Hauler	22 CY, 1000' round trip haul distance	LCY	143,360	$2.45	$351,232
Stockpiling of Materials	300 Horsepower Bulldozer w/ 50' haul	LCY	143,360	$1.34	$192,102
Transport Soil from Stockpile to Landfill	Front End Loader, 5 CY bucket	LCY	143,360	$1.59	$227,942
Dewatering	Methodology to be determined by contractor; unit cost assumed as 2-4" pumps operating 24 hr/day; assume dewatering necessary for up to 1 month	Day	30	$880.00	$26,400
Water Treatment	Up to 50 GPM capacity, carbon treatement, 30 day rental	LS	1	$5,400.00	$5,400
Confirmation Sampling (PCB Screening)	Immunoassay testing; includes bottom and sidewall testing	Each	765	$80.00	$61,196
Confirmation Sampling (PCB)	10% samples collected by PCB screening	Each	76	$107.00	$8,185
Confirmation Sampling (Metals)	TAL metals	Each	765	$213.00	$162,933
Off-Site Disposal (Drums)	Waste decon water (<500 mg/kg PCB, <1% solids); price per 55 gal drum including transportation	Drum	4	$200.00	$800
Subtotal					$1,233,000
Landfill Construction (Excavation and Bottom Liner)					
Excavation	Excavator, hydraulic, 2 CY bucket = 165 CY/hr, 700 X 300 with a 3:1 Slope	BCY	41,717	$1.54	$64,245
Compaction of In-situ Soil	Vibrating roller, 12" compacted lifts, 4 passes	BCY	8,930	$0.46	$4,108
Protection Layer below the Secondary Leachate Collection System (Material Only)	Clay; 24" depth of material	LCY	17,930	$10.00	$179,300
Placement of Protection Layer	300 Horsepower Bulldozer w/ 50' haul	BCY	16,003	$1.34	$21,444
Compaction of Protection Layer	Vibrating roller, 12" compacted lifts, 4 passes	BCY	16,003	$0.46	$7,361
Geomembrane Cover below the Secondary Leachate Collection system	60-mil VLDPE, incl. side slopes, incl. material & labor for installation, add 5 % for overlaps/seams	SF	235,402	$3.03	$714,328
Perforated Pipe for Secondary Leachate Collection System	6" Dia PVC pipe around the perimeter	LF	2,048	$10.95	$22,426
Fill for Secondary Leachate Collection System	Gravel for drainage; incl material and installation, 12" Fill	BCY	8,342	$34.50	$287,790
Structural Fill	Soil mixture, some cobblestone; 12" depth of material	BCY	8,572	$10.00	$85,720
Placement of Structural Fill	300 Horsepower Bulldozer w/ 50' haul	BCY	8,572	$1.34	$11,486
Compaction of Structural Fill	Vibrating roller, 12" compacted lifts, 4 passes	BCY	8,572	$0.46	$3,943

Table 5-4 Cost Estimate for Alternative 5 - Excavation and On-site Disposal
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Geosynthetic Clay Liner below the Primary Leachate Collection System	Area of Landfill, Add 5% for overlap/seams; incl material and installation	SF	250,706	$0.56	$139,591
Geomembrane Cover below the Primary Leachate Collection System	60-mil VLDPE, incl side slopes, add 5 % for overlaps/seams	SF	250,706	$3.03	$760,770
Perforated Pipe for Primary Leachate Collection System	6" Dia PVC pipe around the perimeter	LF	2,096	$10.95	$22,951
Fill for Primary Leachate Collection System	Gravel for drainage; incl material and installation, 24" Fill	BCY	17,610	$34.50	$607,535
Manholes (Material only)	Assume concrete pre-cast 4' inner diameter; up to 10' deep; one per corner and another in the center of the eastern and western edges of the landfill	Each	6	$2,586.00	$15,516
Manhole Installation		Each	6	$5,000.00	$30,000
Placement of Contaminated Soil	Off Road Hauler, 22 CY, 1000 ft Roundtrip	BCY	128,000	$2.45	$313,600
Compaction of Contaminated Soil	Vibrating roller, 12" compacted lifts, 4 passes	BCY	128,000	$0.46	$58,880
Subtotal					$3,351,000
Cap Installation					
Protection Layer Over Contaminated Soil (Material only)	Clay; 18" depth of material, including side slopes	LCY	13,262	$10.00	$132,615
Stockpiling of Materials	300 Horsepower Bulldozer w/ 50' haul	LCY	13,262	$1.34	$17,770
Placement of Protection Layer	300 Horsepower Bulldozer w/ 50' haul	BCY	11,841	$1.34	$15,866
Compaction of Protection Layer	Vibrating roller, 12" compacted lifts, 4 passes	BCY	11,841	$0.46	$5,447
Geomembrane Cover	60-mil VLDPE, incl side slopes, add 5 % for overlaps/seams	SF	217,282	$3.03	$659,343
Barrier Protection Layer for Geomembrane Cover (Material only)	Clay; 24" depth of material	LCY	16,813	$10.00	$168,130
Placement of Barrier Protection Layer	300 Horsepower Bulldozer w/ 50' haul	LCY	16,813	$1.34	$22,529
Compaction of Barrier Protection Layer	Vibrating roller, 12" compacted lifts, 4 passes	BCY	15,011	$0.46	$6,905
Treatment System	Assumes mobilization/demobilization, equipment, electrical set-up, start up and pilot testing; incl material and installation	LS	1	$67,634.00	$67,634
Subtotal					$1,096,240
Transportation					
Mobilization/Demobilization	Car Float, Barges, Tug, Unloading Equipment (Crane, Off Road Trucks, Bull Dozer etc)	LS	1	$110,000.00	$110,000
Bottom Liner and Cover material Unloading at Newland Island	150 ton crane, Crew, Fuel, 36' x 250' Car Float Off road Trucks, Bull Dozer etc	Days	124	$12,200.00	$1,515,339
Barges	Includes 3 165’ x 35’ Hopper Barges	Days	124	$1,800.00	$223,575
1600 H.P Tug	Includes Labor, Fuel Etc.	Days	124	$8,500.00	$1,055,769
Port of Albany Soil Loading Operations	Includes Loading/Unloading, Gate Charge, Wharfage	LS	1	$800,000.00	$800,000
Subtotal					$3,704,682

Table 5-4 Cost Estimate for Alternative 5 - Excavation and On-site Disposal
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Site Restoration (of Excavated Area and Landfill Cap)					
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	18,444	$1.34	$24,715
Compaction of Backfill	Vibrating roller, 12" compacted lifts, 4 passes	BCY	18,444	$0.46	$8,484
Topsoil (Material only)	0.5 ft thick layer	LCY	6,078	$12.50	$75,979
Placement of Topsoil	300 Horsepower Bulldozer w/ 50' haul	BCY	5,427	$1.34	$7,272
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 30% for disturbed areas outside of excavation area	MSF	380	$52.50	$19,931
Tree Planting (Material)	Conifer trees, assume Douglas Fir in pre-construction wooded area	Each	324	$250.00	$81,119
Tree Planting (Labor & Equipment)	Up to 24" ball	Each	324	$62.00	$20,118
Subtotal					$237,619
				Capital Cost Subtotal:	$13,109,541
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$12,060,778
				10% Legal, administrative, engineering fees:	$1,206,078
				20% Contingencies:	$2,653,371
				Total Capital Cost:	**$15,921,000**
Annual Costs					
Site Monitoring	2-people @ $105/hr; 8 hr/day; total of 10 wells; assume 3 wells/day. Assume 4 Monitoring Events per Year	Day	16	$1,680.00	$26,880
Parameter Analysis	Includes TCL PCBs, Metals (refer to 6 NYCRR Part 360 for the expanded list)	Each	40	$600.00	$24,000
Data Evaluation and Reporting	Assumes 40 hours/event	HR	160	$105.00	$16,800
Treatment System Maintenance	Includes pump/filter rental, misc. equipment rental, sampling and maintenance	LS	1	$91,755.00	$91,755
Mowing	Riding mower 48"-58", twice per year	MSF	759	$1.45	$1,101
Subtotal					$160,536
				Annual Cost Subtotal:	$160,536
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$147,693
				10% Legal, administrative, engineering fees:	$14,769
				20% Contingencies:	$32,492
				Annual Cost Total:	**$195,000**
				30-Year Present Worth of Annual Costs	**$2,998,000**
5-Year Costs					
Institutional Controls	Maintain/update documentation	Each	1	$5,000.00	$5,000
Subtotal					$5,000
				5-Year Cost Subtotal:	$5,000
				Adjusted Annual Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$4,600
				10% Legal, administrative, engineering fees:	$460
				20% Contingencies:	$1,012
				5-Year Total:	**$7,000**
				30-Year Present Worth of 5-Year Costs:	**$27,000**
				2008 Total Present Worth Cost:	*$18,946,000*
				2009 Total Present Worth Cost:	**$19,524,000**

Assumptions:

1. Total contaminated soil volume =	128,000	BCY
Additional excavation volume to construct landfill w/ cutback	41,717	BCY
Total excavated volume =	169,717	BCY, or
	190,083	LCY
2. Soil excavation areas:		
Soutern Basin	267,740	SF
Central Basin	21,137	SF
Northern Basin	78,462	SF
Other Areas	7,500	SF
Total Contaminated soil excavation area =	374,840	SF, or
	8.6	acres, as obtained from EEEPC CAD dept June 2008, see Figure 5-2
4. Contaminated Soil Excavation perimeter =	4,130	ft
5. Wooded area assumed to be =	27%	of total excavation area, or
	2.3	acres from contaminated area
	100.0%	of landfill area, or
	5.5	acres of wooded landfill area
Total wooded area =	7.8	total acres to restore to wooded conditions
6. Assume confirmation sampling spacing =	25	foot grid spacing (per 40 CFR 761.265)
7. Maximum excavation depth =	15.6	ft BGS
8. Assumed production rate of excavation =	165	BCY/hr

Table 5-4 Cost Estimate for Alternative 5 - Excavation and On-site Disposal
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost

	50%	assumed effective production rate, considering site complexities		
	83	BCY/hr, effective production rate		
	660	BCY/day, effective production rate		
	240,900	BCY/year, effective production rate		
9. Assuming effective production rate, time to excavate contaminated soil =	194	days		
10. Landfill Dimensions	730	Length (assumed)		
	330	Width (assumed)		
11. Bottom Liner Area =	240900	SF, or		
	5.5	acres		
12. Assumed time to install bottom Liner =	63	days for landfill excavation		
	206	BCY/hr, placement of protection layer for secondary liner using a bull dozer		
	75%	assumed effective production rate		
	155	BCY/hr, effective production rate		
	1,236	BCY/day, effective production rate		
	13	days for placement of protection layer for secondary system		
	11	days for geomembrane cover for secondary system		
	7	days for placement of secondary leachate system		
	7	days for placement of protection layer for secondary leachate collection system		
	12	days for geosynthetic clay liner		
	12	days for geomembrane cover for primary system		
	14	days for placement of primary leachate system		
	138	days, in total to install liner, or		
13. Time to fill the Landfill	125.0	days		
14. Cap area including side slopes=	4.4	acres, as obtained from EEEPC CAD dept June 2008, see Figure 5-2		
	192,430	SF		
15. Assumed time to install cap =	160	BCY/hr, placement of protection layer		
	75%	assumed effective production rate		
	120	BCY/hr, effective production rate		
	960	BCY/day, effective production rate		
	28	days for placement of protection layer		
	10	days for placement of geomembrane cover		
	40	days assumed for topsoil/site restoration		
	78	days, in total to install cap, or		
16. Total Time to Construct Landfill	18.0	months, or	2	years
17. Mob/demob assumed to be =	4	months, or	0.33	years
18. Total project duration =	22.0	months, or	1.83	years
19. Backfill volume for site restoration (Central and Northern basins only)	18,444	BCY, or		
	20,658	LCY		
20. Topsoil volume for site restoration (0.5ft thick in excavated areas and landfill cap) =	5,427	BCY, or		
	6,078	LCY		
21. Additional volume required as Daily Cover (20 % of total volume)	25,600	BCY		
22. Based on geotechnical data from the RI (EEEPC 2007) and typical soil properties, in-situ bulk density of site soils =	1.5	Tons/BCY		
23. For loose soil assume sandy, dry soil with swell factor = (Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).	12%			
24. For dry gravel assume swell factor of (Means Estimating Handbook. United States of America : Means Southern Construction Information Network, 1990).	13%			
25. Topsoil density assumed to be	1.2	Tons/LCY		

26. Uncontaminated excavation material from landfill area will be used as backfill for the Central and Northern basins and also for the construction of a berm around the proposed landfill.
27. Present worth of costs assumes 5% annual interest rate.
28. Unit costs listed were obtained from 2008 RS Means Cost Data and engineering judgement.
29. No additional cutback is assumed to be required at this time.

30. Number of Barges Trips needed to transport landfill construction material on-site, assumes one hopper barge trip carries a load of 1000 tons: 124

31. RS Means Historical Cost Index used to escalate 2008 costs to 2009 costs.

Year	Index
2008	180.4
2009	185.9

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.
SY = Square yard.

Table 5-5 Cost Estimate for Alternative 6 - Selective Excavation and Consolidation, Stormwater Management, Institutional Controls, and Long Term Monitoring
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Institutional Controls	Legal Fees to Implement Restrictions Etc.	LS	1	$5,000.00	$5,000
Construction Management (5% of total capital cost)	Includes submittals, reporting, meetings	LS	1	$53,505.00	$53,505
Subtotal					$59,000
Site Preparation					
Mobilization/Demobilization	15% of Capital Costs Requiring Mobilizations	LS	1	$125,128.85	$125,129
Surveying Crew	2-person crew @ $105/hr, 8hr/day; assume 50% of project duration	Day	70	$1,680.00	$117,600
Cut and Chip Trees	Trees to 12" dia.	Acre	2.3	$5,250.00	$12,004
Grub Stumps and Remove		Acre	2.3	$3,275.00	$7,488
Subtotal					$262,000
Health and Safety					
Community/Exclusion Zone Air Monitoring	Particulate meter purchase (Qty 4)	Each	4	$8,000.00	$32,000
Site Safety Officer	10 hrs/day, 5days/wk, $105/hr; 100% of project duration	Manweeks	28	$5,250.00	$147,000
Subtotal					$179,000
Excavation and Temporary Stockpiling of Clean Overburden (Southern basin)					
Excavation (in Western Portion of the basin)	Excavator, hydraulic, 2 CY bucket = 165 CY/hr; excavate only net volume of material needed to backfill Central and Northern basins + cover volume over all basins	BCY	19,051	$1.54	$29,338
Excavation (Contaminated Material in Berms)	Excavator, hydraulic, 2 CY bucket = 165 CY/hr; excavate only volume of contaminated material within some parts of the containment berm in the southern basin and around the central basin.	BCY	20,000	$1.54	$30,800
Load to Off Road Hauler for Transport to Other basins for Use as Cover	Front End Loader, 5 CY bucket	LCY	21,337	$1.59	$33,926
Load Contaminated Material to Off Road Hauler for Transport to Northern basin	Front End Loader, 5 CY bucket	LCY	22,400	$1.59	$35,616
Off Road Hauler	22 CY, 1000' round trip haul distance	LCY	43,737	$2.45	$107,155
Stockpiling	Front End Loader, 5 CY bucket	LCY	43,737	$1.59	$69,542
Reconstruct Berm	Front End Loader, 5 CY bucket	LCY	22,400	$1.59	$35,616
Compaction (of Berm)	Vibrating roller, 12" compacted lifts, 4 passes	BCY	20,000	$0.46	$9,200
Subtotal					$351,000
Cover (Southern basin, Eastern portion only; after excavation in Western portion, no additional action)					
Geofabric		SY	9,916	$2.58	$25,584
High Visibility Demarcation Layer		SF	89,247	$0.30	$26,774
Placement of Soil	300 Horsepower Bulldozer w/ 50' haul	BCY	3,305	$1.34	$4,429
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	3,305	$0.46	$1,521
Subtotal					$33,000
Backfill and Cover (Central and Northern basins)					
Geofabric		SY	11,067	$2.58	$28,552
High Visibility Demarcation Layer		SF	99,600	$0.30	$29,880
Collapse Berms (in Northern basin)	Front End Loader, 5 CY bucket	LCY	1,269	$1.59	$2,018
Backfill and Cover Material (Material Only)	Assume use of existing on-site material	LCY	17,700	$0.50	$8,850
Placement of Soil (Backfill and Cover)	Backfill to Grade; 300 Horsepower Bulldozer w/ 50' haul	BCY	16,879	$1.34	$22,617
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	16,879	$0.46	$7,764
Seeding (w/ mulch and fertilizer)	Bluegrass 4#/MSF w/ mulch and fertilizer, hydroseeding; add 30% for disturbed areas outside of excavation area	MSF	129	$52.50	$6,798
Subtotal					$106,000

Table 5-5 Cost Estimate for Alternative 6 - Selective Excavation and Consolidation, Stormwater Management, Institutional Controls, and Long Term Monitoring
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Stormwater Diversion Trench					
Excavation	Excavator, hydraulic, 1 CY bucket = 100 CY / hr	BCY	292	$3.96	$1,155
Geomembrane Liner	60-mil VLDPE, incl side slopes, add 5 % for overlaps/seams	SF	8,433	$3.03	$25,589
Placement of Backfill	Assume 6" of soil	BCY	156	$1.34	$209
Seeding (w/ mulch and fertilizer)	Costs considered in *Backfill and Cover (Central and Northern basins 2)*	MSF	0	$52.50	$0
Stabilized Rock Outfall	Stone riprap; assume dimensions of 10' x 10' x 1' ; assume 2 outfalls	BCY	10	$110.00	$1,100
Subtotal					$28,100
				Capital Cost Subtotal:	$1,018,100
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$936,700
				10% Legal, administrative, engineering fees:	$93,700
				20% Contingencies:	$187,400
				Total Capital Cost:	**$1,218,000**
Annual Costs					
Site Monitoring	Inspection of Soil Cover; 2-people @ $105/h; 8 hr/day	Day	1	$1,680	$1,680
Data Evaluation and Reporting		HR	20	$105	$2,100
Subtotal					$3,780
				Annual Cost Subtotal:	$3,780
				Adjusted Capital Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$3,478
				10% Legal, administrative, engineering fees:	$348
				20% Contingencies:	$696
				Annual Cost Total:	$4,600
				30-Year Present Worth of Annual Costs:	**$71,000**
Periodic Costs (5-Year)					
Groundwater Sampling (Labor)	2-people @ $105/hr; 8 hr/day; total of 7 wells; assume 4 wells/day	Day	2	$1,680	$3,360
Parameter Analysis	Includes TCL PCBs	Each	7	$120	$840
Data Evaluation and Reporting		HR	40	$105	$4,200
Institutional Controls	Maintain/update documentation	Each	1	$5,000	$5,000
Subtotal					$13,400
				5-Year Cost Subtotal:	$13,400
				Adjusted Periodic Cost Subtotal for Glens Falls, New York Location Factor (0.92):	$12,400
				10% Legal, administrative, engineering fees:	$1,300
				20% Contingencies:	$2,500
				5-Year Total:	$29,600
				30-Year Present Worth of 5-Year Costs:	**$83,000**
				2008 Total Present Worth:	*$1,372,000*
				2009 Total Present Worth:	**$1,414,000**

Assumptions:

1. Assumed depth of clean soil available for use as backfill/cover in the Southern basin — 6 ft — (From RI [EEEPC 2007] and Additional Investigation [EEEPC 2008])

   Total Volume of Clean Soil to be available for use as backfill/cover in the western portion of the Southern basin — 39,665 BCY

Table 5-5 Cost Estimate for Alternative 6 - Selective Excavation and Consolidation, Stormwater Management, Institutional Controls, and Long Term Monitoring
Newland Island Dredge Spoil Disposal Area

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
2. Soil Cover Areas					
Total Southern basin	267,740	SF			
Southern basin (West)	178,494	SF	(assume 2/3 the total area of Southernbasin)		
Southern basin (East)	89,247	SF	(assume 1/3 the total area of Southern basin)		
Central basin	21,137	SF			
Northern basin	78,462	SF			
Other Areas	7,500	SF	(incl areas between Southern/Central and Central/Northern basin)		
Total Cover Area	374,840	SF			
	8.6	Acres			
3. Perimeter of Contamination	4,130	LF			
4. Wooded Area Assumed to be	27%	of total area (assumes Central and Northern basins are 100% wooded)			
	2.3	Acres			
5. Avg depth of Central basins to be backfilled	2	ft	(backfill to grade)		
Avg depth of Northern basins to be backfilled	4	ft			
Gross Backfill Volume Needed for Central & Northern basins	13,190	BCY			
6. Volume of Contaminated Berms in some parts of the southern basin and around the Central basin	20,000	BCY			
Avg Cross-Sectional Area of Berms in Northern basin	18	SF	(From Figure 5-6 of RI [EEEPC 2007])		
Perimeter of Northern basin	1,700	LF	(From Figure 3-1 of RI [EEEPC 2007])		
Volume of Berms in the Northern basin	1,133	BCY			
7. Net volume of material needed to backfill Central and Northern basins (Gross Backfill Volume - Volume of Berms in Central and Northern basins)					
	12,056	BCY			
	13,503	LCY			
8. Volume of Material for Cover					
Southern basin West (0' of cover)	0	BCY	no additional cover material in the western portion		
Southern basin East (1' of cover)	3,305	BCY			
Central and Northern basins (1' of cover)	3,689	BCY			
Total Cover Volume	6,994	BCY			
9. Dimensions of Stormwater Diversion Trench (Trapezoidal, based on specifications for Temporary Swale (NYSDEC 2005)					
Length	750	LF			
Bottom Width	4	ft			
Depth	1.5	FT	net depth of 1' after 6" backfill placed inside the trench		
Side Slopes	2	:1			
Top Width	10	ft			
10. Volume of soil to be excavated for trench	292	BCY			
11. Surface Area of Trench (for seeding);	833	SY			
12.Total Construction Duration	7	mo			
13. Based on geotechnical data from the RI (EEEPC 2007) and typical soil properties, in-situ bulk density of site soils =	1.5	Tons/BCY			
14. For loose soil assume sandy, dry soil with swell factor =	12%				
15. Present worth of costs assumes 5% annual interest rate.					
16. Unit costs listed were obtained from 2008 RS Means Cost Data and engineering judgement.					
17. No additional cutback is assumed to be required at this time.					
18. RS Means Historical Cost Index used to escalate 2008 costs to 2009 costs.	Year	Index			
	2008	180.4			
	2009	185.9			

Abbreviations:
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.
SF = Square feet.

Table 5-6 Summary of Total Present Worth Values of Alternatives at Newland Island Dredge Spoil Disposal Area

Description	Alternative 1 No Action	Alternative 2 Institutional Controls and Long-term Monitoring	Alternative 3 Excavation and Off-Site High Temperature Thermal Desorption	Alternative 4 Excavation and Off Site Disposal	Alternative 5 Excavation and On Site Consolidation/ Containment	Alternative 6 Selective Excavation and Consolidation, Stormwater Management, Institutional Controls, and Long-term Monitoring
Estimated Total Project Duration (years)	0	30	2 to 4	2 to 4	30	30
Capital Cost	$0	$13,000	$42,446,000	$46,552,000	$15,921,000	$1,218,000
Annual O&M	$0	$0	$0	$0	$195,000	$71,000
Periodic O&M	$0	$18,000	$0	$0	$7,000	$83,000
2008 Total Present Worth Value of Alternative	$0	$64,000	$42,446,000	$46,552,000	$18,946,000	$1,372,000
2009 Total Present Worth Value of Alternative	**$0**	**$66,000**	**$43,741,000**	**$47,972,000**	**$19,524,000**	**$1,414,000**

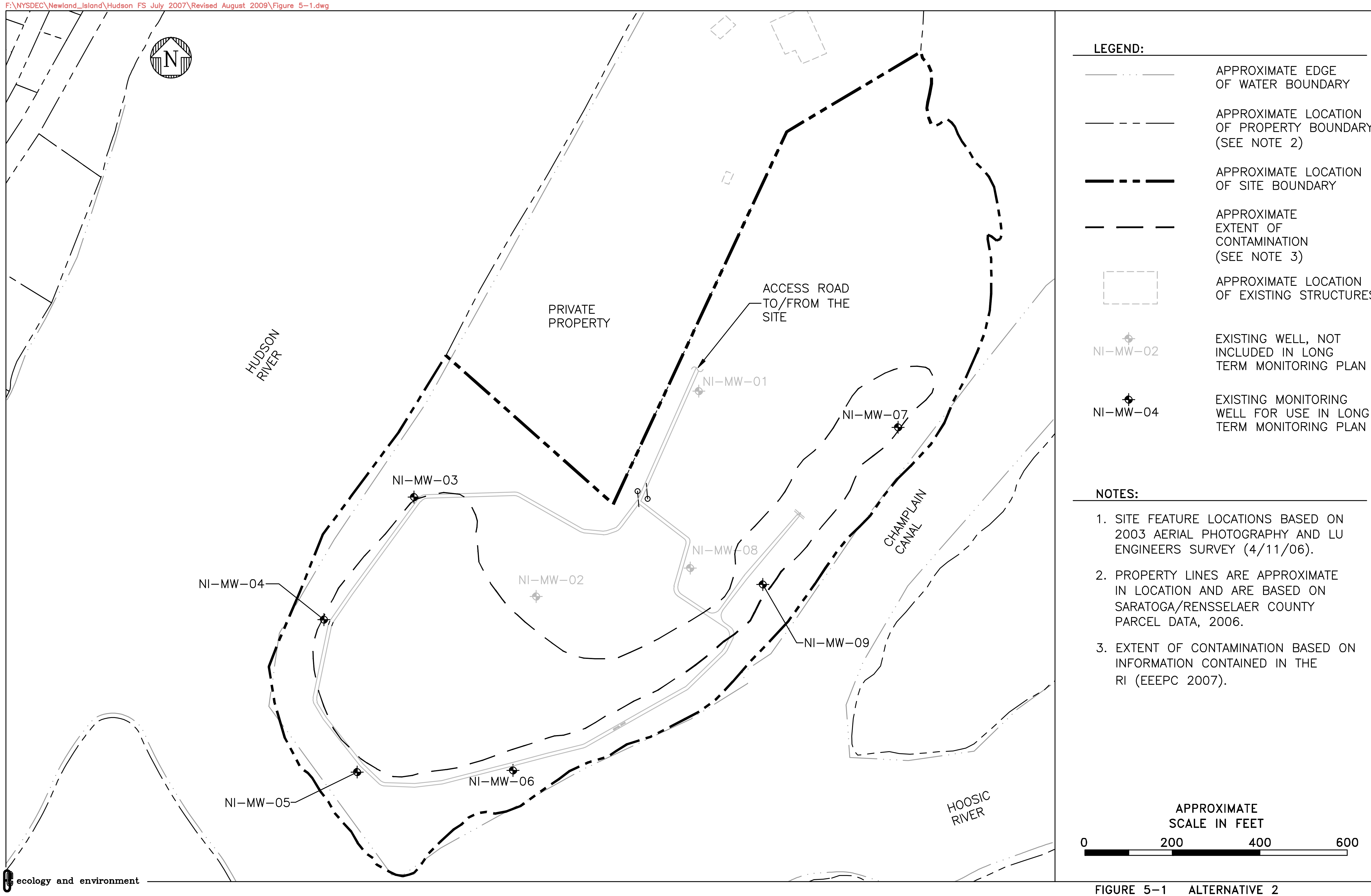
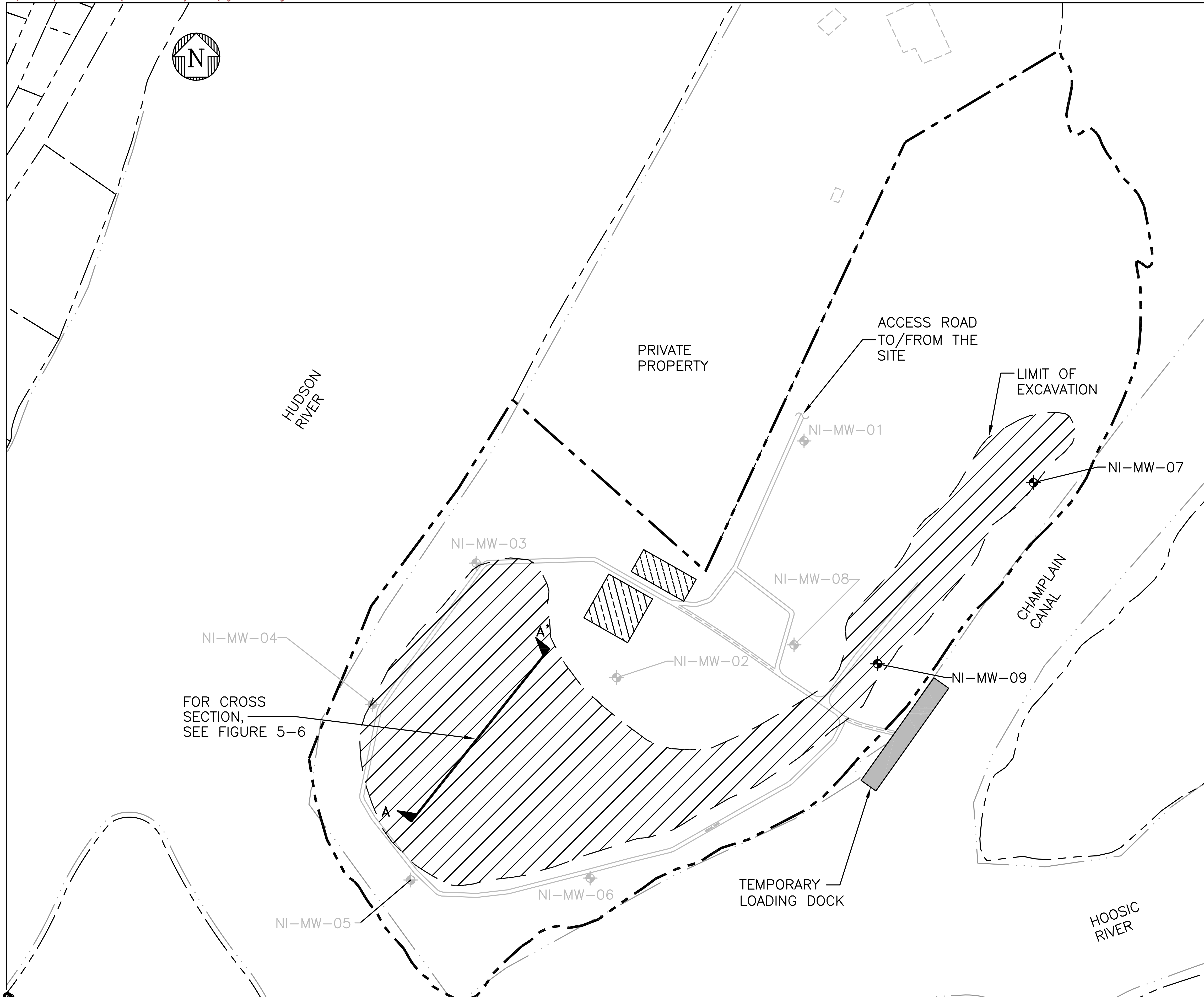


FIGURE 5-1 ALTERNATIVE 2
INSTITUTIONAL CONTROLS AND LONG-TERM MONITORING
NEWLAND ISLAND DREDGE SPOIL DISPOSAL AREA
SCHAGHTICOKE, NEW YORK



LEGEND:

- APPROXIMATE EDGE OF WATER BOUNDARY
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE NOTE 2)
- APPROXIMATE LOCATION OF SITE BOUNDARY
- APPROXIMATE LOCATION OF EXISTING STRUCTURES
- NI-MW-07 EXISTING MONITORING WELL TO BE DECOMMISSIONED
- NI-MW-02 EXISTING MONITORING WELL
- TEMPORARY ACCESS ROAD
- PROPOSED LIMIT OF EXCAVATION
- TEMPORARY ROLL OFF STAGING AREA
- CONTAMINATED SOIL STAGING AREA

NOTES:

1. SITE FEATURE LOCATIONS BASED ON 2003 AERIAL PHOTOGRAPHY AND LU ENGINEERS SURVEY (4/11/06).
2. PROPERTY LINES ARE APPROXIMATE IN LOCATION AND ARE BASED ON SARATOGA/RENSSELAER COUNTY PARCEL DATA, 2006.
3. LIMITS OF EXCAVATION ARE SHOWN AT GRADE.
4. DEPTH OF CONTAMINATION EXTENDS TO A MAXIMUM OF APPROXIMATELY 15.6 FEET BELOW GROUND SURFACE IN THE SOUTHERN PORTION OF THE SITE.

APPROXIMATE SCALE IN FEET

0 200 400 600

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FIGURE 5-2 ALTERNATIVES 3 AND 4
EXCAVATION AND OFF-SITE HTTD OR
EXCAVATION AND OFF-SITE DISPOSAL
NEWLAND ISLAND DREDGE SPOIL DISPOSAL AREA
SCHAGHTICOKE, NEW YORK

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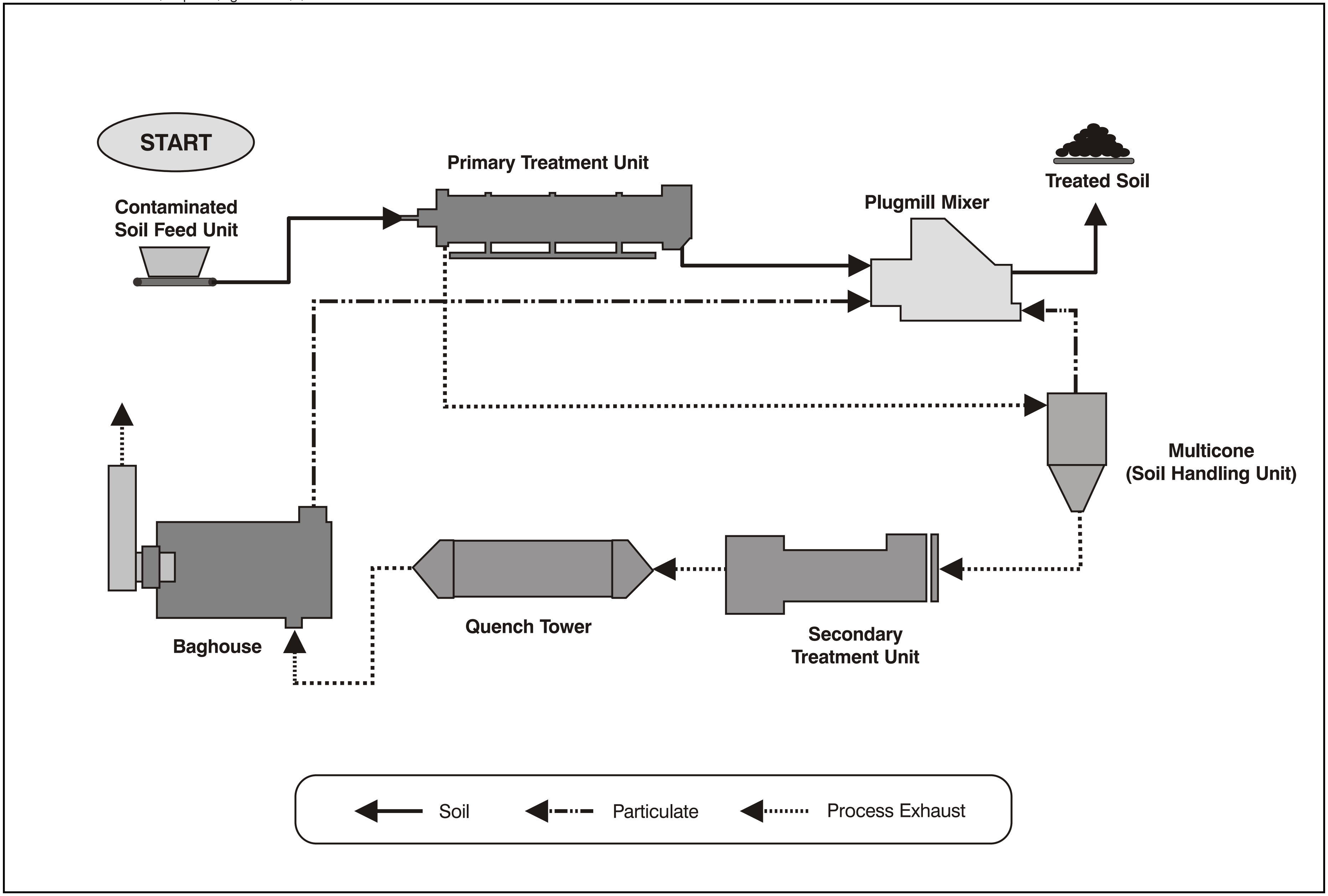

SOURCE: Environmental Soil Management Inc., 2007

Figure 5-3 High Temperature Thermal Desorption System (off-site) Process Flow Diagram

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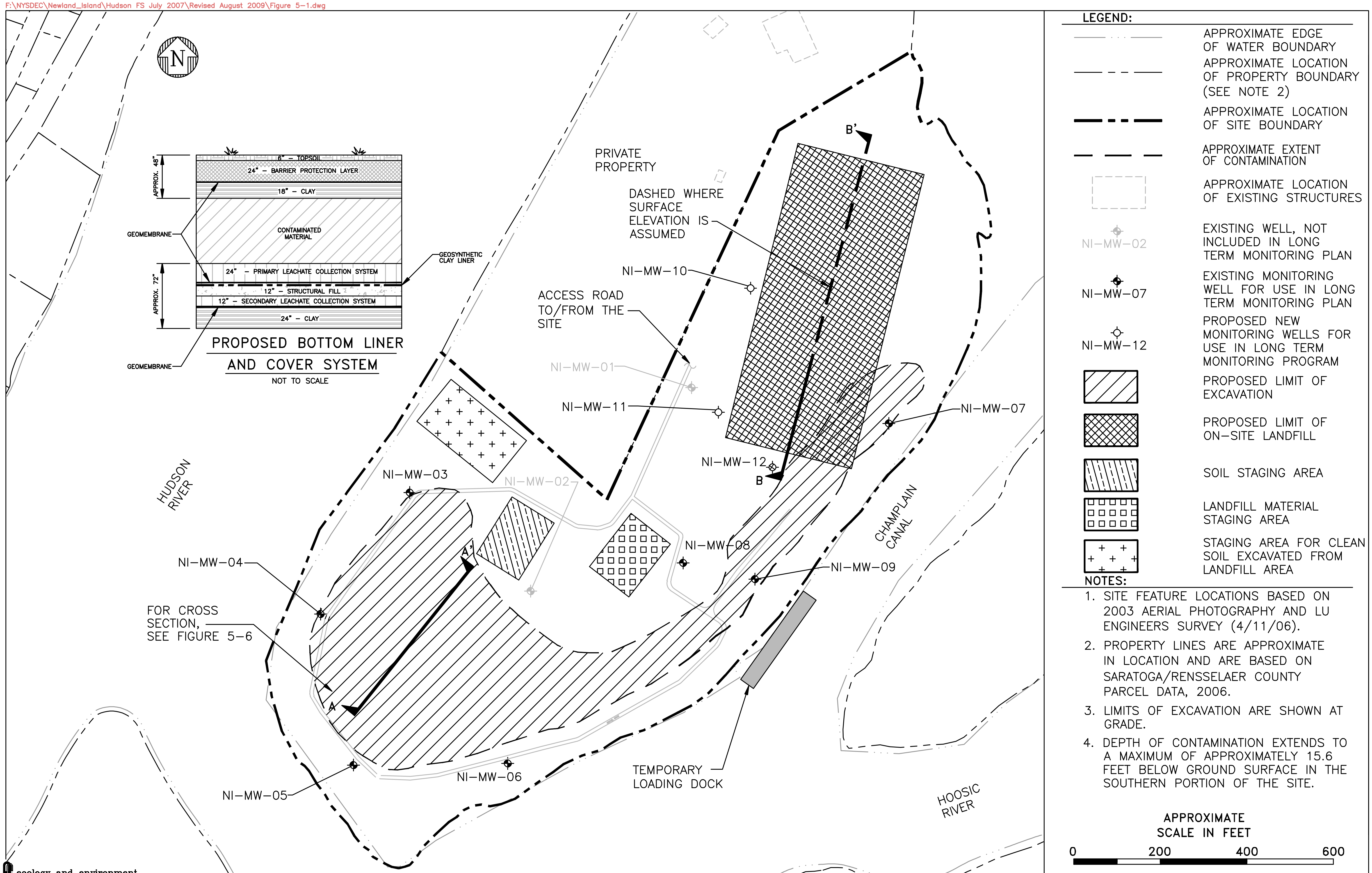

FIGURE 5-4 ALTERNATIVE 5
EXCAVATION AND ON-SITE DISPOSAL
NEWLAND ISLAND DREDGE SPOIL DISPOSAL AREA
SCHAGHTICOKE, NEW YORK

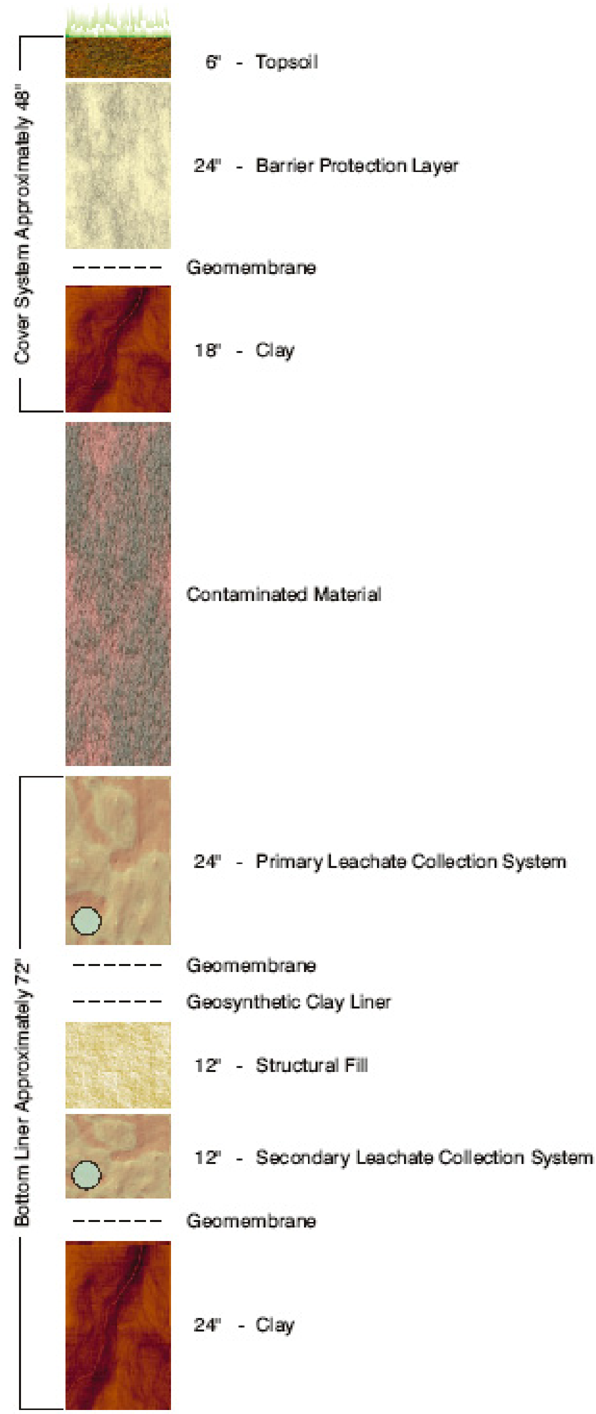

Figure 5-5 Cross-Section of the Proposed 6 NYCRR Part 360 Landfill

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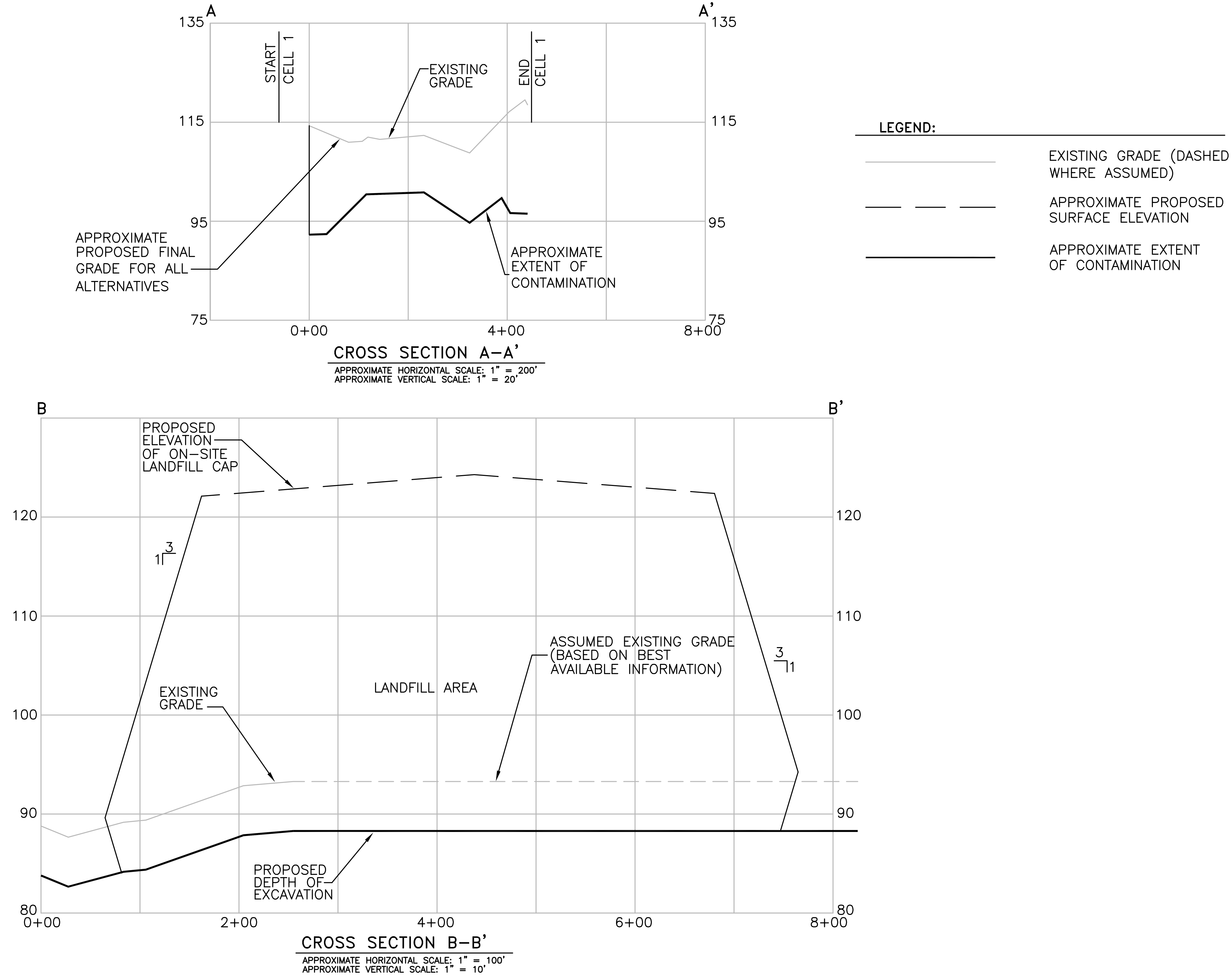

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FIGURE 5–6 CROSS SECTION A–A' AND B–B'
NEWLAND ISLAND DREDGE SPOIL DISPOSAL AREA
SCHAGHTICOKE, NEW YORK

02:002699.ID03.01\Figure 5-7 Existing.AI-08/20/09-GRA

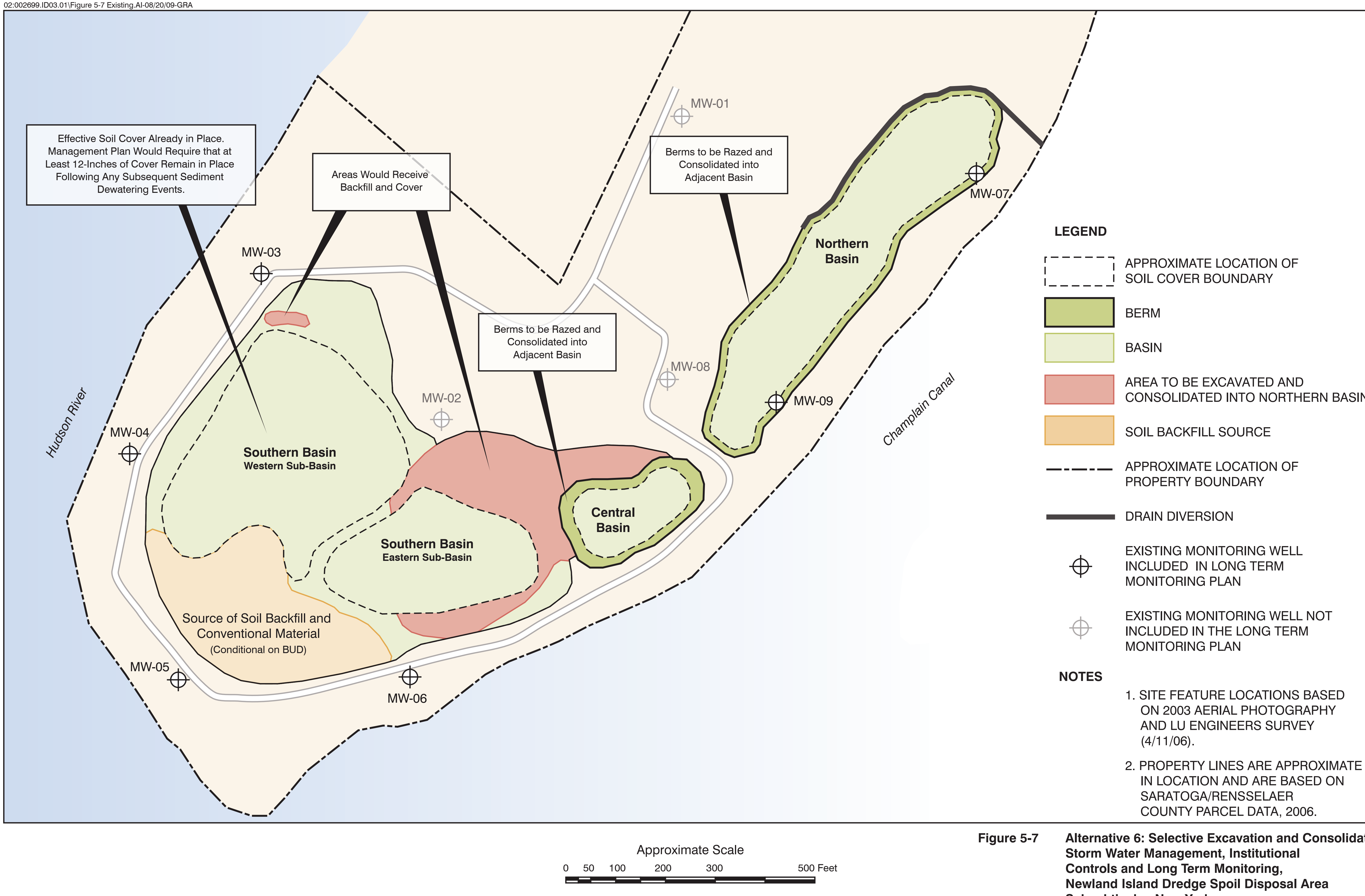

Figure 5-7 **Alternative 6: Selective Excavation and Consolidation, Storm Water Management, Institutional Controls and Long Term Monitoring, Newland Island Dredge Spoil Disposal Area Schaghticoke, New York**

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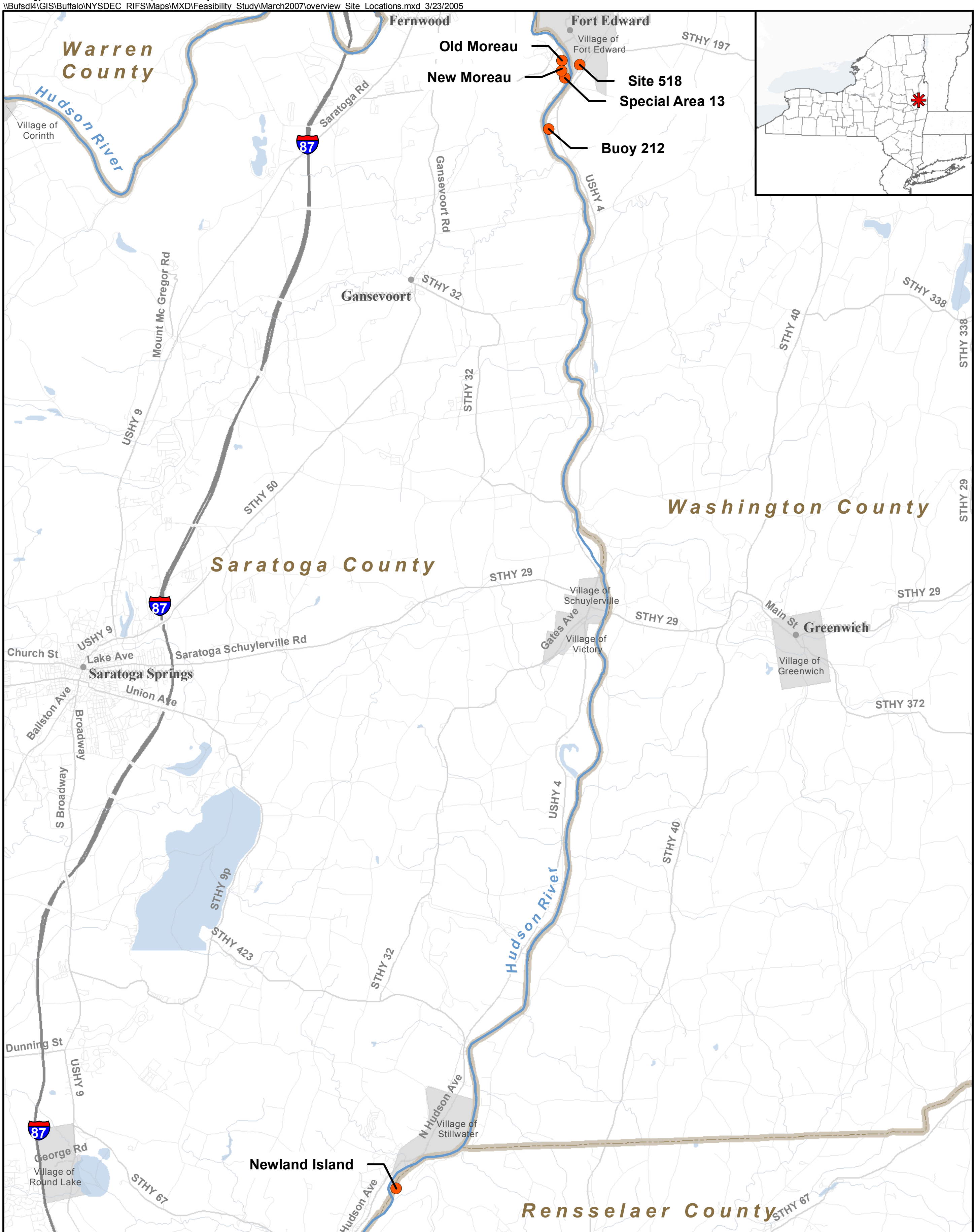
A Overview Map of Dredge Spoil Disposal Sites



Hudson Dredge Spoil Site Locations

County Boundary

N W E S

0 1 2 4

Miles

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