Final Feasibility Study Report for Former Adirondack Steel Site Operable Unit OU-2 Town of Colonie Albany County, New York

Site Number 4-01-039

May 2014

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
Albany, New York 12233

Prepared by:
ECOLOGY AND ENVIRONMENT ENGINEERING, P.C.
368 Pleasant View Drive
Lancaster, New York 14086

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I, Gerald A. Strobel, certify that I am currently a NYS registered professional engineer and that this Feasibility Study was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that activities were performed in accordance with the DER-approved *scope of work* and any DER-approved modifications.

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List of Abbreviations and Acronyms

°F	degrees Fahrenheit
APEG	glycolate/alkaline polyethylene glycol
amsl	above mean sea level
BCD	base-catalyzed decomposition
BEST	basic extractive sludge treatment
bgs	below ground surface
BUD	beneficial use determination
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm/sec	centimeters per second
COC	contaminant of concern
COPC	chemical of potential concern
CP	Canadian Pacific
cy	cubic yards
DER	(New York State) Division of Environmental Remediation
EC	engineering control
EEEPC	Ecology and Environment Engineering, P.C.
EPA	United States Environmental Protection Agency
ESMI	Environmental Soil Management, Inc.
FS	Feasibility Study
HTTD	high-temperature thermal desorption
IC	institutional control
IRM	interim remedial measure
ISTD	in situ thermal desorption
ISV	in situ vitrification
KPEG	potassium polyethylene glycol
LTM	long-term monitoring
LTTD	low-temperature thermal desorption
mg/kg	milligrams per kilogram

List of Abbreviations and Acronyms (cont.)

NCP	National Contingency Plan
NFESC	Naval Facilities Engineering Service Center
NYCRR	New York Codes, Rules, and Regulations
NYSDOH	New York State Department of Health
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and monitoring
OM&M	operation, monitoring, and maintenance
OSHA	Occupational Safety and Health Administration/Act
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	perchloroethylene
PPE	personal protective equipment
ppm	parts per million
RAO	remedial action objective
RCC	Resource Conservation Company
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
ROW	right-of way
SCG	standards, criteria, and guidelines
SCO	site cleanup objectives
SITE	Superfund Innovative Technology Evaluation
SPDES	state pollutant discharge elimination system
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
TAGM	Technical Administrative Guidance Memorandum
TCE	trichloroethylene
TOGS	Technical and Operational Guidance Series
TSCA	Toxic Substance Control Act
U.S.C.	United States Code
VOC	volatile organic compound

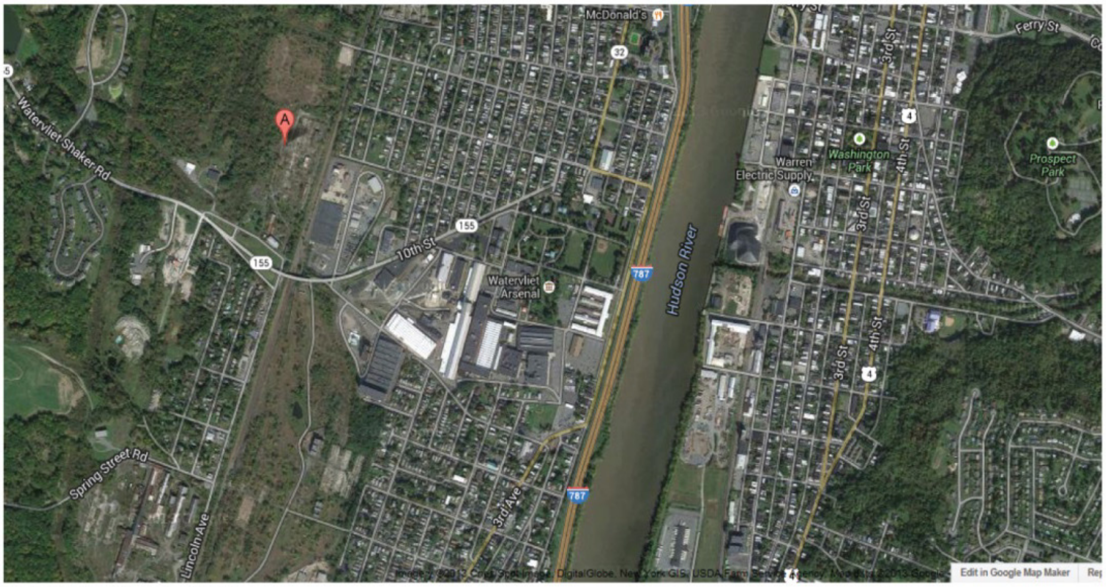
1 Introduction

1.1 Purpose and Organization

Ecology and Environment Engineering, P.C. (EEEPC) has prepared this Feasibility Study (FS) at the Former Adirondack Steel Site (NYSDEC Site 4-01-039) for the Division of Environmental Remediation (DER) in the New York State Department of Environmental Conservation (NYSDEC). This FS was conducted under the State Superfund Standby Contract Work Assignment No. D007617-23. The project site is located in the town of Colonie, Albany County, NY (see Figure 1-1) and is situated between an active Canadian Pacific (CP) railroad right-of-way (ROW) to the east and an abandoned steel mill to the west, the "Adirondack Steel Casting Co. Inc." This FS was developed based on information in the United States Environmental Protection Agency's (EPA) *Guidance for conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 540/G-89/004); NYSDEC's Final Commissioner Policy No. 51 (CP-51), NYSDEC's Technical and Administrative Guidance Memorandum (TAGM) 4030 – Selection of Remedial Actions at Inactive Hazardous Waste Sites; NYSDEC's DER-10 - Technical Guidance for Site Investigation and Remediation; and 6 New York State Codes, Rules, and Regulations (NYCRR) Part 375 - Environmental Remediation Programs.

The Adirondack Steel site consists of three operable units: OU-1 (0.4 acres on-site), OU-2 (2.1 acres off-site), and OU-3 (3.8 acres on-site) (see Figure 1-2). EEEPC completed a remedial investigation (RI) for OU-1 and OU-3 during three field efforts from 2005 to 2007 and submitted a FS for OU-1 in 2014. The RI characterized the nature and extent of contamination at the Former Adirondack Steel site, as described in the *Final Remedial Investigation Report for the Former Adirondack Steel Site, Colonie, New York* (EEEPC 2008a). In 2008, EEEPC further assessed the lateral extent of polychlorinated biphenyls (PCBs) contamination in sediment that was identified during the RI. Based on results of these assessments, an interim remedial measure (IRM) was conducted to excavate PCB-contaminated soil in OU-1 and OU-2, as described in the *Final Interim Remedial Measure Report for the Former Adirondack Steel Site, Colonie, New York* (EEEPC 2010b). In March 2010, NYSDEC completed the Record of Decision (ROD) for OU-1 (NYSDEC 2010b).

02:EN-003285-0001-001TTO\Site Location Map.ai-8/1/13-GRA



SOURCE: Google 2013

Figure 1-1 Site Location Map, Adirondack Steel, Colonie, New York

Additional sampling in 2008 to evaluate the extent of PCB contamination in the OU-2 CP railroad ditch was presented in the *Draft Remedial Investigation Addendum for April 2008 Fieldwork, Former Adirondack Steel Site, Colonie, New York* (EEEPC 2008b). In November and December 2009, EEEPC completed RI supplemental sediment and soil sampling field activities for the OU-2 CP railroad ditch and OU-3 north drainageway (see Figure 1-2). Results of the investigation indicated that PCBs were pervasive in subsurface soils throughout the drainageways (EEEPC 2010a).

In July and August 2011, the EPA conducted additional PCB delineation sampling in the drainageways of OU-2 and OU-3. In September 2013, a supplemental RI was conducted to supplement previous soil data collected in OU-3 to determine potential soil contamination data gaps, to better define the nature and extent of existing soil contamination in OU-3, and to remove and dispose of the debris pile located in OU-3 and collect confirmation soil samples beneath it. EEEPC prepared and submitted a feasibility study earlier in 2014 to assist NYSDEC during remediation of OU-3 (EEEPC 2014).

This FS describes the technologies proposed and evaluated in order to address the off-site sediment contamination in OU-2 identified by the 2008 *Final RI Report for the Former Adirondack Steel Site* (EEEPC 2008a).

02:EN-003286-0001-01TTO\Figure 1-2 Operable Units.ai-1/30/14-GRA

New York State
Department of Environmental
Conservation

Division of
Environmental Remediation

Former
Adirondack Steel

DEC Site No.: 4-01-039

Map Details

Created in ArcMap 10.1
Date of Last
Revision: 01.23.2013

UNAUTHORIZED DUPLICATION
IS A VIOLATION OF
APPLICABLE LAWS

North American Datum 1983
UTM Zone 18

SOURCE: NYSDEC 2013

Figure 1-2
Operable Units
Former Adirondack Steel Site
Feasibility Study
Colonie, New York

This FS report is divided into six sections.

- Section 1 describes the purpose of the study and presents site background information.
- Section 2 presents the process used to identify the appropriate standards, criteria, and guidelines (SCG) values applicable to contaminants found at the site and provides insight into the development of appropriate remedial action objectives (RAOs) for the protection of human health and the environment.
- Section 3 outlines selected remedial technologies deemed applicable to the remediation of contaminants present at the site and the development of remedial alternatives to address the contamination.
- Section 4 discusses the combination of various remedial technologies to form appropriate remedial alternatives and provides a detailed description of each of the proposed alternatives.
- Section 5 presents a detailed and comparative analysis of proposed remedial alternatives along with the supporting rationale and preliminary cost estimates for each proposed remedy.
- Section 6 lists the references cited in this report.

1.2 Background Information

1.2.1 Site Description and Surrounding Land Uses

The 39-acre Adirondack Steel property is located in a mixed industrial-residential area bounded on the south by Watervliet-Shaker Road, Carioto Fruit Co., Passonno Corporation, and Benben, Inc.; on the east by the CP railroad and Enterprise Venture Management; and on the north and west by undeveloped and residential properties (see Figure 1-1).

The northeast end of the property consists of an approximately 9-acre landfill. Just south of the landfill is the former main operation and manufacturing area of Adirondack Steel. At present, all of the large buildings have been demolished, with about 0.4-acres of demolition debris (OU-1) remaining on the site.

OU-2 is a drainage ditch running along the eastern boundary of the main site (off-site) immediately west of the CP railroad ROW. The ditch is a concrete and riprap-lined swale extending the full length of the site. For remedial purposes the ditch is considered to begin at a point to the southeast of Lincoln Avenue/ Watervliet Shaker Road and flows south at this point. The water in the ditch is stagnant at some locations but generally flows north starting at the confluence of the stream with the railroad ditch where the cement-plastered riprap structure has been placed. From this point, it drains in a northerly direction to where it extends below Barker Lane, then to a point east of a residential area near Early Drive where it turns east, crossing below the CP railroad ROW. The ditch contains PCB-contaminated sediments, with higher levels of PCBs at its intersection with a natural creek-type drainageway west of the tracks. The ditch is approximately 2.1 acres in size.

The balance of the site (OU-3) comprises building foundations and debris, a clean fill area, a recyclable material stockpile, and brownfield areas with the previously noted natural creek-type drainageway, which also contains PCB-contaminated sediment.

1.2.2 Site History

The Adirondack Steel site operated as a steel casting foundry from 1918 until 1987. The majority of the site buildings were in place by the early 1950s, which is the date of the earliest available historical documentation, with the following exceptions: the garage on the west side of the property was built between 1951 and 1955; the northern section of the westernmost pattern storage building near the site entrance was built between 1955 and 1962; the building to the west of the fuel oil tanks on the east-central side of the site was constructed between 1974 and 1986; and the south x-ray building was constructed between 1986 and 1995.

Historical aerial photos show that most of the site to the west of the landfill and main manufacturing areas had been used for agriculture or was forested, except for Carioto Fruit (built sometime between 1952 and 1974 and Passonno Corporation (built in approximately 1969). Through the 1990s the Adirondack Steel property was also known as the Adirondack Industrial Park. Various buildings and parcels were leased to businesses, including asphalt paving companies, auto repair facilities, solid waste haulers, and scrap dealers. In addition to the disposal of significant quantities of construction and demolition debris at the site, there was significant potential for the disposal of hazardous wastes as a result of some of these companies' operations.

From 1918 to 1988 the 9-acre landfill on the northeast end of the property received approximately 12,400 tons per year (for an approximate total of 868,000 tons) of spent foundry and core sands, furnace slag and refractories, and dust collected during furnace and slagging operations. These foundry and core sands comprise the majority (about 80%) of the yearly tonnage of material disposed of at the landfill. Some hazardous materials were alleged to have been disposed of at the landfill, although significant amounts of hazardous substances have not been found.

Most, if not all, of the transformers in the outdoor substations were insulated with PCB-containing dielectric fluids. The interior substation transformers, which also contained PCB-contaminated dielectric fluid, were removed from the site in 1988.

Sometime after the end of foundry operations, approximately 3,000 gallons of dielectric fluid containing PCBs were drained from electrical transformers onto the ground around the north and south power stations. These releases contaminated the soils in three locations, totaling less than 0.5 acres. Sediment and soil samples collected along the banks of the CP railroad ROW to the east of the Adirondack Steel property (OU-2) indicate that the railroad ditch is contaminated with PCBs (up to 4.2 parts per million [ppm]) originally released from OU-1(EDR 2005).

NYSDEC listed the site as an inactive hazardous waste disposal site in 1994 and defined the 0.5-acre north switch yard located at the northernmost transformer as Class 2, i.e., causing or presenting a significant threat to public health or the environment and requiring action.

1.2.3 Site Geology and Hydrology

The site lies in the late Ordovician-age Snake Hill Formation, which consists primarily of shales folded and faulted, steeply dipping, and highly fractured. The shales are black and gray, with smaller masses of reddish, purplish, or greenish shales. Occurring in the shales are occasional thinner innerbeds of highly fractured sandstone, siltstone, and/or limestone (Fickies 1982).

The thickness of the overburden/fill across the area of the site varies greatly from east to west. On the east side of the site, in the former main manufacturing area, the overburden/fill is thickest— up to 28 feet thick. On the west side of the site, the overburden is as little as 0.4 feet thick. Fill materials are found across the site but are most predominant and thickest in the northeast corner of the main manufacturing area (potentially up to 13.5 feet thick). The fill materials are typically dark brown or black fine sands but also contain orange, yellow, and tan stains; tan and yellow fine sand-sized material; tan, orange, and yellow brick fragments; and a green homogenous solid. Native materials underlying the fill typically consist of gray or brown clays and fine sands. Bedrock consists of dark gray shale. The top of bedrock elevation varies across the site, ranging from up to 57 feet above mean sea level (amsl) on the western side of the main manufacturing area own to 17 feet amsl on the eastern side of the site (EEEPC 2008a).

Site groundwater was sampled on December 13, 2005 and April 3, 2006. The depth of the groundwater table in OU-2 wells ranged from 3 to 7 feet below ground surface (bgs). Groundwater contour patterns were similar in both rounds, so only one round was contoured. Groundwater at the site generally flows toward the east or east-northeast in the direction of the Hudson River. The horizontal gradient was 0.02 to 0.04 (shallower wells) feet per foot in December 2005 (EEEPC 2008a). On the eastern side of the site, the vertical gradients were downward at moderate to high gradients (23% to 48%), indicating movement of groundwater from the overburden down into the bedrock. On the western side of the site, vertical gradients are slightly upward, indicating upward flow at a very low gradient between the bedrock and overburden (or overburden/bedrock transition) (EEEPC 2010b).

Calculated hydraulic conductivities ranged from 3.8 x 10^{-4} centimeters per second (cm/sec) to 3.70 x 10^{-2} cm/sec. Generally, the wells on the west side of the site had lower hydraulic conductivities than the wells on the east side of the site. The hydraulic conductivities calculated for the bedrock wells are higher than the typical values for shale, which probably reflects the weathered and/or fractured nature of the shale. The overburden/interface wells are set in sands, clays, and weathered shales. The calculated hydraulic conductivities are typical of sands and gravels (Domenico and Schwartz 1990).

Terrain within OU-3 is characterized by east-west trending hills and valleys, with some of the valleys serving as intermittent surface water drainage. One of these drainages flows more consistently. This natural stream-type drainageway flowing along the south edge of the landfill discharges into a north-south ditch (OU-2) at the eastern Adirondack Steel property boundary. Surface runoff from the site enters the ditch adjacent to the CP railroad ROW along its length. A cement plastered riprap structure exists at the confluence of the stream with the railroad ditch. Water in this ditch is stagnant at some locations but generally flows north from this point, eventually crossing below the CP railroad tracks at Barker Lane. In the opposite direction, the ditch flows south from a high point in the invert at Watervliet-Shaker Road.

1.2.4 Nature and Extent of Contamination

This FS focuses on alternatives for the remediation of PCB-contaminated soils and sediments located in OU-2—the ditch along the west CP railroad ROW and the concrete-lined confluence with the drainageway in OU-3. The analyses of samples of surface water, surface soil, drainageway soils, subsurface soil, and groundwater collected during the remedial investigations at the site (EEEPC 2008a, 2010a, 2014) identified dielectric fluid containing PCBs, drained from electrical transformers onto the ground around the northern transformer pad and sections of the floor of the foundry building, as the source area for PCB contamination. Runoff from this area via the north drainageway in OU-3 conveyed significant amounts of PCBs to the ditch. The predominant Aroclor detected in ditch sediment samples was Aroclor 1260, with Aroclor 1242 present in a limited area.

The *Supplemental RI* (EEEPC 2014) preliminarily compared sample analytical results with screening criteria based on NYSDEC's 6 NYCRR 375-6.8(b), Restricted Use Soil Cleanup Objectives (SCOs). Similar SCO constraints have been applied to remedial work planned for OU-2 with the exception that only PCB contamination was addressed. These SCOs are discussed in Section 2. Analytical results that exceeded their respective screening criteria are summarized below:

- Total PCB concentrations exceeded the screening criteria in 53 samples from 38 locations. Samples from eight of these locations (SB-090-1224, SB-090-2436, SD-14D, CTR-035, SB-129, SD-15B, CTR-034, and SB-157-224) also exceeded the Toxic Substances Control Act (TSCA) hazardous waste level of 50 milligrams per kilogram (mg/kg). Seven of these samples are located in the center portion of OU-2, in proximity to the OU-3 North Drainageway outfall (see Figure 1-3).

PCBs also were detected in several surface water samples collected during the RI; however, groundwater monitoring data demonstrate that groundwater is not being significantly impacted by this site: two rounds of groundwater samples were collected from five groundwater monitoring wells installed across the site, and PCBs were not detected in the groundwater samples. Thus, groundwater remediation is not addressed in this FS. Because the RI does note Aroclor 1260 was detected above laboratory reporting limits in surface water samples SW-9 and SW-10, which are located in the ditch adjacent to the CP railroad ROW, surface water collected during the remedial effort will be treated as PCB-contaminated waste and will be pumped to an on-site water treatment system for disposal.

Total PCBs are considered the primary contaminant of concern (COC) at the site because most of the detected contamination at the site was PCBs. This FS focuses on PCB remediation.

1.2.5 Contamination Fate and Transport

PCBs in soils and sediments can be transported by surface water flow. The site drainageways collect runoff during storms, and runoff from the landfill accumulates in areas in the northwestern and northern edges of the landfill. The north drainageway discharges to the ditch adjacent to the CP railroad ROW (OU-2), which in turn discharges to a storm sewer system. The detection of site-related contaminants in site surface water and downgradient surface water by previous investigations (EEEPC 2008a) indicates contaminants may have migrated off-site into these waterways. PCBs are pervasive throughout the drainageways in subsurface soil samples. The highest concentrations were mostly found at the confluence of the north drainageway and the ditch (EEEPC 2010a). To a lesser extent, PCBs in soil can be transported by construction activity.

1.2.6 Qualitative Human Health Risk Evaluation

The former Adirondack Steel site is located in an industrial area bounded by industrial properties on the south and east and undeveloped or residential properties on the north and west. The only buildings apparently in current use are on the southern end of the property, which several tenants use for industrial purposes. The town of Colonie's Department of Public Works, Division of Latham Water, which obtains its water from the Mohawk River, the Stony Creek Reservoir, and five wells on Onderdonk Avenue, provides the water supply for the town of Colonie. All of these water sources are more than 4 miles from the site. Future use of the site is expected to change to commercial/industrial use in perpetuity.

A qualitative human health exposure/risk evaluation during the Final RI prepared by EEEPC in 2008 and during the IRM in 2010 identified areas of concern and COCs, evaluated actual or potential exposure pathways and receptors, and identified how exposure pathways might be eliminated or mitigated in accordance with the *DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010c). The RI presented results of extensive surface soil, subsurface soil, sediment, surface water, and groundwater investigations and evaluations of NYSDEC standards developed to be protective of human and ecological receptors. The evaluations and recommendations contained in the 2008 Final RI thus are considered to be supplemental to the scope of this FS and are therefore not reproduced herein in substantial detail.

In summary, the 2008 RI found that site contamination poses a potential health risk to human receptors when a complete exposure pathway exists and when the magnitude of exposure is sufficient to cause adverse health effects. At the Adirondack Steel site, the major chemicals of potential concern (COPCs) identified in the sampled environmental media were polycyclic aromatic hydrocarbons (PAHs), PCBs, and metals. Under existing site conditions, site workers could potentially be exposed to contaminants through direct contact with soil and sediment contaminants. While current potential exposure to contaminants in soils and sediment are expected to be relatively brief and may be mitigated by appropriate monitoring and engineering controls, all site workers will be required to wear appropriate levels of personal protective equipment (PPE) to protect them against health impacts associated with handling of contaminated materials. Trespassers also could be exposed to contaminants through direct contact with soil and sediment contaminants. Institutional and engineering controls may be required to mitigate the potential for exposure. Exposure to contaminated surface water will be minimal and would not significantly contribute to the overall health risk posed to workers or visitors at the site. The groundwater exposure pathway is incomplete and does not pose a threat to users.

IMAGE SOURCE: ESRI, DIGITAL GLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

LEGEND

EXISTING TOPOGRAPHIC CONTOUR

PROPERTY LINE

RESTRICTED USE AREA

SAMPLE LOCATION COLLECTED BY EEEPC IN 2009

SAMPLE LOCATION COLLECTED BY EEEPC IN 2008

SAMPLE LOCATION COLLECTED BY USEPA IN 2011

SAMPLE LOCATION DID NOT EXCEED SCREENING CRITERIA

Samples reported in milligrams/Kilogram (mg/Kg).

Sample locations below the screening criteria are not listed in the exceedance text boxes and are not shaded any color.

Analytical results were compared to New York State Department of Environmental Conservation, 6 NYCRR 375-6.8(b), Restricted Use Soil Cleanup Objectives.

USEPA Delineation Sampling Locations (collected by USEPA in 2011)
Depth Samples collected at:
SB-001-0012-001 = sample collected at 0 to 12 inches bgs.
SB-001-1224-001 = sample collected at 12 to 24 inches bgs.
SB-001-2436-001 = sample collected at 24 to 36 inches bgs.
SB-001-3648-001 = sample collected at 36 to 48 inches bgs.
SB-001-4860-001 = sample collected at 48 to 60 inches bgs.

Highlighted PCB concentrations exceeded screening criteria:
1 to 10 mg/kg
11 to 49 mg/kg
≥50 mg/kg

PCBs = polychlorinated biphenyls
bgs = below ground surface

PLAN VIEW

SURVEY SOURCE: POPLI DESIGN GROUP (APRIL 28, 2010)

SCALE IN FEET
0 60 120 180

FIGURE 1-3
PCB CONCENTRATIONS IN AND ADJACENT TO DRAINAGEWAY
ADIRONDACK STEEL OU2
COLONIE, NEW YORK

ECOLOGY AND ENVIRONMENT ENGINEERING P.C.

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

This section identifies the site COCs and media of interest and establishes proposed cleanup goals and specific RAOs for contaminated on-site media.

2.1 Introduction

PCBs were identified as the primary COC in OU-2 in the 2008 Adirondack Steel RI, the 2008 RI Addendum, and the RI for Supplemental Sediment and Soil Sampling in the OU-2 and OU-3 drainageways (EEEPC 2008a, 2008b, 2010a).

Surface water samples collected at this site during the RI were obtained from low depression areas and drainage ditches, which are not representative of streams and are not flooded for a sufficient duration of the year to support aquatic life. Site soils appear to be the source of contamination in surface water. Since active remediation of site soils is assumed to occur; remediation of site surface water is not addressed in this FS.

RAOs were developed (see Section 2.3) to reduce or eliminate these potential risks by eliminating the 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 all media at the site to evaluate the area or volume of each medium that must be addressed to meet the RAOs.

SCGs—local, state, and federal— are used at inactive hazardous waste sites to establish the locations where remedial actions are warranted and to establish cleanup goals. 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

The remedy must conform to officially promulgated standards and criteria that are directly applicable or that are relevant or appropriate. The selection of a remedy must also take into consideration guidance as appropriate. 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 used directly as actual cleanup goals or as a basis for establishing appropriate cleanup goals for COCs at a site.

2.2.2 Location-Specific SCGs
Location-specific SCGs are either 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 site are noted 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 noted in Table 2-2.

2.3 Remedial Action Objectives
The RAOs for on-site remedial actions were developed based on information contained in the Final RI (EEEPC 2008a), the draft RI Addendum (EEEPC 2008b), and the Final IRM Report (EEEPC 2010b). On-site RAOs for this site are as follows:

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

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.

Table 2-1 Location-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Local Location-Specific SCGs					
Town Code	Noise	Chapter 135	Restricts unnecessary noise and construction equipment noise in the town during certain time frames	Potentially Applicable	
	Solid waste	Chapter 112	Restricts the use of land as a refuse disposal area or landfill site.	Potentially Applicable	
	Vehicles and traffic	Chapter 181	Weight limitations on certain town roads during portions of the year	Potentially Applicable	
	Zoning and Land Use Article 14, Stormwater Management and Erosion and Sediment Control	Chapter 190-74	Establishes minimum storm water management requirements and controls.	Potentially Applicable	
State Location-Specific SCGs					
Environmental Conservation Law	Endangered and threatened species	6 NYCRR 182	Lists endangered and threatened species and species of special interest	Potentially Applicable	
	Freshwater wetlands	6 NYCRR 663-665	Establishes permit requirement regulations, wetland maps, and classifications	Potentially Applicable	
	Floodplains	6 NYCRR 502	Contains floodplain management criterion for state projects	Potentially Applicable	

Table 2-1 Location-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

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

Table 2-2 Action-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

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

Table 2-2 Action-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
New York Waste Transport Permit Regulations	Permitting regulations, requirements, and standards for transport	6 NYCRR 364	The collection, transport, and delivery of regulated waste, originating or terminating at a location within New York, will be governed in accordance with Part 364	Potentially Applicable	Applicable if site's wastes fall into regulated categories
Environmental Conservation Law, Articles 3, 19, 23, 27, and 70	Hazardous waste management system - general	6 NYCRR 370	Defines 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 off-site for disposal
	Hazardous waste treatment, storage, and disposal facility permitting requirements	6 NYCRR 373	Regulates treatment, storage, and disposal of hazardous waste	Potentially Applicable	Relevant to off-site treatment/disposal of hazardous waste

Table 2-2 Action-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

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

Table 2-2 Action-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Primary and Principal Aquifer Determinations (5/87)		NYSDEC Technical and Operational Guidance Series (TOGS) 2.1.3	Provides guidance on determining water supply aquifers in upstate New York	Not Applicable	Drinking water supplied by the local drinking water supply system by the town of Colonie Department of Public Works, Division of Latham Water
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 (NCP)	40 CFR 300, Subpart E	Outlines procedures for remedial actions and for planning and implementing off-site removal actions	Potentially Applicable	

Table 2-2 Action-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Occupational Safety and Health Act (OSHA)	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 the jurisdiction of the National Contingency Plan
Executive Order (EO)	Delegation of authority	Executive Order 12316 and Coordination with Other Agencies	Delegates authority over remedial actions to federal agencies	Potentially Applicable	
Clean Air Act(CAA)	National Primary and Secondary Ambient Air Quality Standards (NAAQS)	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 (NESHAPS)	40 CFR 61	Provides emission standards for 8 contaminants. Identifies 25 additional contaminants, including perchloroethylene (PCE) and trichloroethylene (TCE), as having serious health effects but does not provide emission standards for these contaminants	Potentially Applicable	
Toxic Substances Control Act (TSCA)	Rules for controlling PCBs	40 CFR 761	Provides guidance on storage and disposal of PCB-contaminated materials	Potentially Applicable	

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Table 2-2 Action-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Resource Conservation and Recovery Act (RCRA)	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	
	Standards applicable to generators of hazardous waste	40 CFR 262	Establishes requirements (e.g., EPA ID numbers and manifests) for generators of hazardous waste	Potentially Applicable	

Table 2-2 Action-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

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

Table 2-2 Action-Specific SCGs, Adirondack Steel OU-2, Colonie, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
	EPA pretreatment standards	40 CFR 403	Establishes responsibilities of federal, state, and local government to implement national pretreatment standards to control pollutants that pass through to a publically owned treatment works	Not Applicable	

2.4.1 Selection of Soil Cleanup Objectives

Standards

Numeric cleanup objectives identified for the drainageway spoils at the OU-2 site can be found in 6 NYCRR Part 375-6.8 (NYSDEC 2006a). This regulation presents soil cleanup goals that protect ecological resources, groundwater, and public health. The soil cleanup goals for the protection of public health are based on land use criteria, which include the following:

- ***Unrestricted use*** *is a use without imposed restrictions, such as environmental easements or other land use controls.*
- ***Restricted use*** *is a use with imposed restrictions, such as environmental easements, which as part of the remedy selected for a site require a site management plan that relies on institutional controls or engineering controls to manage exposure to contamination remaining at a site. Restricted use is separated into four different categories:*
  1. ***Residential use*** *is a land use category that allows a site to be used for any use other than raising livestock or producing animal products for human consumption. Restrictions on the use of groundwater are allowed, but no other institutional or engineering controls relative to the residential soil cleanup goals, such as a site management plan, would be allowed. This land use category will be considered for single-family housing.*
  2. ***Restricted-residential use*** *is a land use category that shall only be considered when there is common ownership or a single owner/managing entity of the site. Restricted-residential use shall, at a minimum, include restrictions which prohibit any vegetable gardens on a site, although community vegetable gardens may be considered with NYSDEC's approval and single-family housing. Active recreational uses, which are public uses with a reasonable potential for soil contact, such as parks, are also included under this category.*
  3. ***Restricted-commercial use*** *is a land use category for the primary purpose of buying, selling, or trading merchandise or services. Commercial use includes passive recreational uses, which are public uses with limited potential for soil contact.*
  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.*

Town of Colonie zoning maps (Town of Colonie 2007) show that the site is zoned as industrial. Based on discussions with NYSDEC, it is anticipated that site land use will change to commercial in perpetuity. For protection of public health at this site the 6 NYCRR Part 375-6.8 SCGs presented are those for restricted-industrial and restricted-commercial use.

SCGs presented in 6 NYCRR Subpart 375-6.8 for the protection of groundwater and ecological resources should generally be considered where applicable. NYSDEC's Commissioner Policy (CP)-51, Soil Cleanup Guidance, sections V.C and V.D, summarize the method for determining the applicability of SCGs for the protection of groundwater and ecological resources; these SCGs are incorporated into the unrestricted use SCG in the 6 NYCRR Part 375-6.8 SCGs. Since no threat of impact on groundwater (see Section 1.2.4) or ecological resources has been identified, and the restricted-commercial SCGs have been presented for the site, cleanup goals for the protection of groundwater and ecological resources are not considered here.

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

Table 2-3 Selected Cleanup Goals for Soils/Sediment – Adirondack Steel OU-2, Colonie, New York

Analyte	Cleanup Goals for the Protection of Public Health: NYSDEC Part 375 [a]		NYSDEC CP-51[b]	Background New York State[c]	Number of Detections	Maximum Result OU-2[d]	Proposed Cleanup Goal
	Restricted-Industrial	Restricted-Commercial	Restricted-Commercial				
Soil/Sediment Samples – Summary of Detected Analytes							
Total PCBs	25	1	1/10[e]	<0.018	67	**1,500**	**TBD**[f]

Notes:
All values are in parts per million (ppm).
[a] Cleanup goals obtained from 6 NYCRR Part 375-6.8(a) Soil Cleanup Objective Tables (NYSDEC December 14, 2006)
[b] NYSDEC Final Commissioner Policy #51 (CP-51) (October 2010) Soil Cleanup Guidance.
[c] Background values obtained from NYS background (95th percentile), Source-Distant Data Set from NYS Brownfield Cleanup Program, Technical Support Document, Appendix D, (NYSDEC September 2006).
[d] Concentration listed is the maximum detected value from surface soil, subsurface soil, or drainageway sediment samples collected in OU-2 during the Adirondack Steel RI in 2005 (EEEPC 2008a), the supplemental sediment and soil sampling at OU-2 (EEEPC 2010a), and the EPA in 2011.
[e] Per CP-51, the PCB SCG for industrial sites is 1 ppm in surface soils up to 1 foot deep and 10 ppm in subsurface soils, typically from 1 foot deep to 15 feet deep or the top of bedrock, whichever is shallower.
[f] Three soil cleanup goals have been provided for PCBs: 6 NYCRR Part 375 restricted-commercial, CP-51 restricted-commercial, and 6 NYCRR Part 375 restricted-industrial. The actual cleanup goal will be selected in the Record of Decision.

Criteria and Guidance Values

Guidance values identified for soils are found in NYSDEC CP-51 (2010a). Guidance values for sediment are found in NYSDEC Technical Guidance for Screening Contaminated Sediments (1999). Criteria and guidance values for the contaminants detected at this site are presented in Table 2-3.

Background

Background soil sample data can be used as cleanup objectives when standards and guidance values are not available. Site background samples were collected for inorganic analytes at the Adirondack Steel Site (EEEPC 2008a). For analytes with no site-specific background data, published soil background values from the New York State brownfield cleanup program (NYSDEC 2006b) and eastern

United States background levels (Shacklette et al. 1984) were used as background values.

Selection Process

The cleanup goals for soils and sediments are presented in Table 2-3. These values have been used in the FS to calculate remedial volumes and the subsequent cost estimates. The following rationale was used to select the preliminary cleanup values:

- Detections of PCBs in site soils were screened against:
  1. The 6 NYCRR Part 375-6.8 restricted-commercial-use and restricted-industrial-use soil cleanup standards (public health), and
  2. The NYSDEC CP-51 Soil Cleanup Guidance values for PCBs for restricted-commercial use.
- Detections of other analytes in site soils were screened against the 6 NYCRR Part 375-6.8 restricted-commercial-use soil cleanup standards (public health) to determine which compounds require cleanup.
- Detections of other analytes in sediments were screened against the NYSDEC Technical Guidance for Screening Contaminated Sediments (1999) to determine which compounds require cleanup.
- If neither cleanup standards nor guidance were available, NYS background values were used as the cleanup goals (NYSDEC 2006b).
- Finally, the contaminants identified for cleanup were reviewed to determine whether they are site-related (and not background) and whether cleanup is warranted.

2.4.2 Selection of Contaminants of Concern

Based on the cleanup objectives selected above and historical release of PCBs from on-site transformers via the North Drainageway in OU-3, it was determined that PCBs are the primary soil/sediment contaminant of concern at the site. Table 2-3 lists the detections above the 6 NYCRR Part 375 and CP-51 soil cleanup objectives. The screening of remedial technologies (Section 3) and the identification (Section 4) and evaluation of alternatives (Section 5) focuses on the removal and/or treatment of PCBs.

2.4.3 Determination of Contaminated Soil Volumes

Three potential cleanup goals for sediments were proposed: 1) cleanup to less than 1 ppm for PCBs (Part 375 restricted-commercial), 2) cleanup to CP-51 levels of 1 ppm or less at the surface and 10 ppm or less below surface, and 3) cleanup to less than 25 ppm for PCBs (Part 375 restricted-industrial). For restricted-commercial SCOs CP-51 defines surface as 0 to 1 feet bgs.

The volume of contaminated soils/sediments at the site was estimated using AutoCAD as well as property surveys and depth/concentration sample data. The volume of soil contaminated with PCB concentrations that exceed 50 ppm, which are considered contaminated under TSCA, was similarly estimated. Excavation and treatment volumes are presented with each applicable alternative in Section 5.

3 Identification and Screening of Remedial Technologies

3.1 Introduction

This section presents the results of the preliminary screening of remedial actions that can be used to achieve the RAOs. Potential remedial actions, including general response actions and remedial technologies, were evaluated during the preliminary screening on the basis of effectiveness, implementability, and relative cost. 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. Past performance (e.g., demonstrated technology) and operating reliability were also considered in identifying and screening applicable technologies. Technologies that were not initially considered effective and/or technically or administratively feasible were eliminated from further consideration. The general response actions considered herein 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 remedial investigations of the site (EEEPC 2008a, 2008b, 2010a) 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 and sediment. As previously discussed, PCB contamination in soil is 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
- On- and off-site disposal.

Criteria for Preliminary Screening

In accordance with guidance documents issued by NYSDEC (CP-51) and the EPA (Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA 2008) 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 protects 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 on 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 adequately protect 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 using engineering judgment based on knowledge of site conditions, where each action is evaluated as to whether the costs are high, moderate, or low relative to other remedial actions. A remedial action is eliminated during preliminary screening on the basis of cost if other remedial actions are comparably effective and can be implemented at a much lower cost.

The results of the preliminary screening are summarized below.

3.3 Identification of Remedial Technologies

This section identifies the potential remedial action technologies that may be applicable to remediation of soils at OU-2. Table 3-1 summarizes the results of 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 with other alternatives in the detailed analysis of alternatives.

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

ICs are meant to be non-physical means of enforcing a restriction on the use of real property that limits human and environmental exposure, restricts the use of groundwater, provides notice to potential owners, operators, or members of the public, or prevents actions that would interfere with the effectiveness of the remedial program or with the effectiveness and/or integrity of operation, maintenance, and/or monitoring activities at or pertaining to a remedial site. ICs typically include easements, deed restrictions and covenants, well-drilling prohibitions, zoning restrictions, and building or excavation permits (EPA-OSWER 2000).

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

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

Table 3-1 Screening Summary of Sediment Remedial Technologies

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Passes Screening?
No Action			
	No further action to remedy soil conditions at the site.	Ineffective for the protection of human health and the environment.	Yes[1]
Institutional Controls and Long-Term Monitoring			
	Include public notification, deed restrictions, fencing, and signs.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	Yes
Containment			
Capping			
Bituminous Concrete Cover (Asphalt)	Selective excavation and/or standard asphalt cover system including a layer of stone, asphalt binder course, and final wearing course.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	No
Soil Cover	Selective excavation and/or clay cap system	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	No
6 NYCRR Part 360 Cap	Selective excavation and/or non-RCRA cap typically used to close municipal solid waste landfills.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	No
6 NYCRR Part 373 (RCRA) Cap	Selective excavation and/or RCRA cap typically required at Hazardous Waste Sites.	Does not reduce contamination levels but can reduce potential exposure to the contaminated media.	No
On- and Off-Site Disposal			
On-Site Disposal	Requires construction of a secure landfill that meets RCRA and state requirements.	Migration of soil contamination into groundwater is not a significant transport mechanism, and containment of the waste material in an on-site landfill is not necessary.	No
Off-Site Disposal	Involves the excavation and hauling of contaminated material to appropriate commercially licensed disposal facilities. The non-hazardous spoils would go to a non-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

Table 3-1 Screening Summary of Sediment Remedial Technologies

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Passes Screening?
In Situ Treatment			
Thermal			
Thermally Enhanced Soil Vapor Extraction (SVE)	Uses electrical resistance/electromagnetic/radio frequency heating or hot-air steam injection to facilitate volatilization and extraction of the contaminant vapors.	SVE is not effective in removing non-volatile organics such as PCBs.	No
Thermal Desorption (thermal blankets and wells)	Thermal blankets and thermal wells are placed on contaminated ground surface. A majority of contaminants are vaporized out by thermal conduction. Vapors are drawn out by vacuum system, oxidized, cooled, and passed through activated carbon beds.	More expensive than other established remedial technologies, especially for the volume needing to be treated.	No
In Situ Vitrification (ISV)	Contaminated soils are melted at extremely high temperatures using probes inserted into the ground delivering electricity and are cooled to form a stable, glassy, crystalline mass.	Only a few commercial applications of this technology exist. Treatability studies are generally required to determine the effectiveness of ISV as a remediation technology at a given site. End product of the technology may hinder future site use, and there is a 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 in 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 needed before implementing this technology.	Yes
Soil Flushing	Soil flushing is 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. PCBs strong tendency to adhere to soil particles and soil conditions may limit this technology's effectiveness.	No

Table 3-1 Screening Summary of Sediment Remedial Technologies

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Passes Screening?
Biological Treatment	Uses indigenous or selectively cultured microorganisms to reduce hazardous organic compounds into water, carbon dioxide, and chlorinated hydrogen chloride.	Biological treatment technologies for PCBs have not been well demonstrated. This technology also involves a relatively longer remediation period compared with other treatment technologies.	No
Ex Situ Treatment			
Thermal			
High Temperature Thermal Desorption (HTTD)	A physical separation process that uses heat to volatilize organic wastes, which are collected and treated in a gas treatment system.	Moderate cost, full-scale technology that has been successfully demonstrated in the field to treat PCB-contaminated soils. HTTD units are permitted as incinerators.	Yes
Incineration	Uses high temperatures to volatilize and destroy organic contaminants and wastes.	A moderate cost technology that has a demonstrated success; however, the public is generally adverse to this technology.	No
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 aid in the melting process.	Medium-to-high cost technology that is successful in destroying PCBs. The inert glass aggregate byproduct can be returned to the site for backfill or can be sold as a construction aggregate. However, full-scale demonstration of this technology for remediation purposes has not been performed.	No
Physical/Chemical			
Dehalogenation	A chemical process that is achieved either by replacing the halogen molecule of the organic compound or by decomposition and partial volatilization of the contaminant through adding and mixing specific reagents.	Although the 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

Table 3-1 Screening Summary of Sediment Remedial Technologies

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Passes Screening?
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 of constructing and operating an on-site processing facility are high.	No

[1] The no action alternative is automatically passed through the preliminary screening in order to compare it with other alternatives in the detailed analysis of alternatives.

Long-term monitoring (LTM) is not an IC or an EC, but a part of site operation, monitoring, and maintenance (OM&M). LTM can be used in multiple environmental media but is most applicable to groundwater. 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. Similarly, surface water sampling (or drainage ditch, at this site) would detect contamination migrating toward potential receptors or other water bodies. LTM will not actively reduce contamination levels; it can be useful in demonstrating that exposures do not occur. Migration of soil contamination into groundwater is not a significant transport mechanism; however, LTM of surface water has been considered further.

3.3.3 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 are on-site disposal in a constructed landfill or off-site disposal in a commercial facility.

3.3.3.1 On-Site Disposal

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

1. The landfill must be designed so that the local groundwater table will not be in contact with the landfill.
2. The landfill must be lined with natural and synthetic material of low permeability to inhibit leachate migration.
3. A low permeability cover must be used to limit infiltration and leachate production.
4. Periodic monitoring of surface water, groundwater, and soils adjacent to the facility must be periodically monitored to confirm the integrity of the liner and leachate collection system.

- **Effectiveness.** Construction of an on-site landfill would be an effective technology because it would limit the direct contact with and mobility of the contaminated material.
- **Implementability.** The implementability of this option is limited by the shallow groundwater table, the high volume of contaminated soil at the site, and the anticipated difficulty in meeting permit requirements.
- **Cost.** The costs involved in the construction of an on-site landfill are high.

In summary, soil contamination migrating into groundwater is not a significant transport mechanism and the waste material could be contained by capping.

Therefore, construction of an on-site landfill is not warranted and on-site disposal of contaminated materials has not been retained as an applicable technology.

3.3.3.2 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 be disposed of only in a RCRA-permitted facility. In accordance with New York State Hazardous Waste Regulations and TSCA, materials containing PCBs at or above 50 ppm (if excavated and removed from the site) are subject to regulation as both hazardous waste and TSCA waste. Contaminated waste materials containing less than 50 ppm of PCBs are considered non-hazardous waste and can be disposed of in a non-hazardous/solid waste facility.

- **Effectiveness.** Excavation and disposal of contaminated soil at a permitted landfill is an effective method of reducing potential for direct contact with contaminated soils. In addition, this action reduces the potential for future contamination of groundwater.
- **Implementability.** Contractors and disposal facilities are available to implement both disposal options.
- **Cost.** The cost for disposal of contaminated soils ranges between $100 and $150 per cubic yard (cy) for hazardous soils. For purposes of this FS, a distinction is made between hazardous TSCA and non-TSCA, non-hazardous PCB-contaminated soils. It is presumed that non-hazardous and hazardous soil will be transported and disposed of at different landfills. The cost of transporting and disposing TSCA hazardous soil will be more than that for non-hazardous contaminated soil because of a longer transport distance to a Subtitle C disposal facility and a higher tipping fee.

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

3.3.4 In Situ Treatment

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

- Thermal treatment
- Physical/chemical treatment
- Biological treatment.

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

3.3.4.1 Thermal Treatment

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

Thermally enhanced SVE is a full-scale technology that uses electrical resistance/electromagnetic/radio frequency heating or hot-air steam injection to facilitate volatilization and extraction of the contaminated 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 semi-volatile organic compounds [SVOCs] with Henry's constant greater than 0.01), it has not been retained for further consideration.

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

This type of technology was developed in Shell Research laboratories 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. 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 feet by 20 feet that are placed on top of the contaminated ground surface. The blankets can be heated to 1,800° Fahrenheit (°F) and by thermal conduction are able to vaporize most contaminants down to about 3 feet. Vapors are drawn out of the soil and through the blanket system by a vacuum system. The contaminated vapors are then oxidized at high temperature in a thermal oxidizer near the treatment area and then cooled and passed through activated carbon beds to collect any trace levels of organics not oxidized before being discharged to the atmosphere.

Thermal wells use the same process as thermal blankets, except that heating elements are placed in well boreholes drilled 7 feet to 10 feet apart. Similar to the blanket modules, the vacuum is drawn on the manifold so that extracted vapors are collected and destroyed. Estimated ISTD treatment costs obtained from TerraTherm range from $140/cy for large and deep SVOC sites to more expensive per unit volume for shallow and small sites (TerraTherm, Inc. 2013). A laboratory treatability test for thermal desorption may cost between $15,000 and $50,000, depending on the number of samples and the complexity of testing (TerraTherm Inc. 2013).

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 as high as 20,000 ppm at a contaminated site in Missouri. Contamination depths varied between 6 to 18 inches where blankets were used and up to 12 feet where thermal wells were used 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 demonstrated its effectiveness in treating PCB-contaminated soil at depths less than 12 feet. As the OU-2 contamination generally occurs at depths up to 8 feet or more (samples were taken during the RI as deep as 16 feet), this technology could be effective in treating the contaminants at the site.
- **Implementability.** Contractors and treatment facilities are available to implement this technology. However, the presence of on-site drainageways and surface water would limit implementation of this technology. A treatability study would be needed to evaluate the effectiveness of the type of thermal treatment needed to treat the soil at the site to acceptable levels.
- **Cost.** The cost of an in situ treatment is high but comparable to other in situ treatment technologies, considering the treatment and O&M costs of other technologies.

In summary, in situ thermal desorption is not considered feasible, based on implementability and cost. This technology has not been retained for further analysis.

In Situ Vitrification

In situ vitrification (ISV) 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 in 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 that heat the surrounding soil to 2,000ºC, 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 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 before 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 soil treatment volume.

- **Implementability**. ISV is considered an emerging technology. The only vendor currently supplying commercial systems for in situ vitrification of hazardous wastes is Kurion, Inc. Four units ranging from bench-scale to commercial-scale are available. A large-scale test on mixed radioactive and chemical wastes that contained chromium was conducted at Hanford, Washington. A fire involving the protective hooding occurred during the test. Materials of construction (e.g., for the collection hood) and electrode-feeding mechanisms are still being tested and developed. Another project completed in 1996 in Spokane, Washington, demonstrated the ability of the technology to destroy and remove TSCA-level PCB contamination. The project demonstrated more than 99.9999% PCB destruction and removal efficiency.

- **Cost**. Two studies conducted on the West Coast and in the Midwest estimated ISV costs between $267 and $850 per cy of contaminated soil (FRTR 2013). 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, few full-scale applications of this technology exist and this technology has relatively high implementation costs. Pilot tests have proved to be effective at removal of PCB contamination; however, treatability studies are required to determine the effectiveness of vitrification at a site. ISV has a relatively high implementation cost compared with the other technologies screened herein and, therefore, ISV has not been retained for further analysis.

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, trap or immobilize contaminants in 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 in the solidified matrix. Solidification/stabilization systems generally target inorganics (i.e., heavy metals) and radionuclides. Stabilization methods usually involve the addition of materials such as molten bitumen, asphalt emulsion, and portland cement, which 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, 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 demonstrated effectiveness in treating PCBs, and the fixed treatment end point can be reached relatively quickly. The effectiveness of auger/caisson and reagent/injector head systems in treating organics is limited.
- **Implementability.** Treatability studies are generally required to assess compatibility of waste material and the reagent used. This technology can be readily implemented with available equipment and materials.
- **Cost.** In situ solidification/stabilization costs vary widely according to the materials and reagents used, their availability, project size, and the chemical nature of contaminants. The in situ costs average $40 to $60 per cy for shallow applications and $150 to $250 per cy for deeper applications (FRTR 2013). Treatability studies would be required to better determine the cost of this alternative in a full-scale operation.

In summary, this technology has successfully demonstrated full-scale treatment of PCB-contaminated soil and this technology has been 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 contaminated area, and the contaminated 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 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 to treat recovered fluids.

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/poorly drained sediments such as those found at OU-2.
- **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 $32 to $49 per cy (FRTR 2013) for small sites. Treatability studies would needed to estimate the cost of installing a full-scale system. Also, the aboveground separation and treatment of recovered fluids can drive up the cost of the whole process.

In summary, it is believed that in situ soil flushing would not be effective in the heterogeneous/poorly drained soils found at this site (typically fine sands and clays). Because of its limited success and difficulty in ensuring effectiveness in situ, this technology has not been considered.

3.3.4.3 Biological Treatment

Biological treatment processes use indigenous or selectively cultured microorganisms to reduce hazardous organic compounds into water, carbon dioxide, and chlorinated hydrogen chloride. Available in situ biological treatment technologies include bioventing, enhanced biodegradation (aerobic and anaerobic), natural attenuation, and phytoremediation. Factors that affect the rate of biodegradation include the type and concentrations of contaminants, oxygen, nutrients, moisture, pH, and temperature. Treatability studies are typically used 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 because the microbial degradability of PCBs is very low. In addition, the length of time required to achieve satisfactory results with highly contaminated soils can be prohibitive.
- **Implementability.** Organisms that can be used 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 2013).

Since biological treatment of PCBs has not been well demonstrated and because of the relatively longer remediation periods, these technologies have not been retained for further consideration.

3.3.5 Ex Situ Treatment

To be treated by ex situ technologies, whether on-site or off-site, soil must first be excavated. 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 generally involves applying heat to physically separate, destroy, or immobilize the contaminant. Some of the ex situ thermal treatment technologies that treat a range of contaminants include high-temperature and low-temperature thermal desorption, hot gas decontamination, open burning/open detonation, pyrolysis, and incineration. This section discusses only 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

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. 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 an applicable technology for PCB contamination.

HTTD systems heat materials to temperatures in the range of 600°F to 1,200°F and target SVOCs, 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) owns and operates two fixed location thermal treatment facilities in the northeast region, one in New York and one in New Hampshire (2013) and also owns a portable thermal treatment unit that can be transported as needed, based on site-specific conditions. Depending on the volume of the material to be treated and chemical concentrations, material may be more appropriately treated on-site with the portable thermal treatment unit or sent to one facility rather than 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 bag house to remove any trace organics not oxidized before being discharged into the atmosphere. HTTD units are considered to be incinerators and must meet RCRA incinerator emission requirements (40 CFR Parts 264 and 265, Subpart O).

- **Effectiveness.** HTTD technology is effective in treating PCB contamination and the treated soils can be returned to the site as backfill.
- **Implementability.** This technology can be implemented fairly quickly. The equipment can be set up on-site or it may be a mobile unit that could be moved from site to site.
- **Cost.** HTTD is a moderate cost technology with costs typically ranging from $300 to $500 per cy, depending on the volume of contaminated soils (FRTR 2013).

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

Incineration

Incineration uses high temperatures (1,600°F 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 where initial destruction takes place, and a secondary combustion chamber where combustion byproducts (products of incomplete combustion) are oxidized and destroyed. The off-gases are drawn from the secondary chamber under negative pressure into an air pollution control system that 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 and operates at temperatures up to 1,800°F. The kilns can range in size from 6 feet to 14 feet in diameter. The liquid injection incinerators are used to treat combustible liquid, sludge, and slurries. Liquid injectors would not be appropriate to use for the contamination at OU-2 because 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 the greater than 99% PCB-reduction requirement and dioxins concentrations in soil, thus providing long-term protection. Incinerators burning hazardous wastes must meet the RCRA incinerator regulations (40 CFR Parts 264 and 265, Subpart O) as well as state and local regulations. Furthermore, on-site incinerators used to treat PCB-contaminated material with concentrations greater than 50 ppm may also be subject to the requirements under TSCA set forth in 40 CFR Part 761.

- **Effectiveness.** Incineration is an effective, demonstrated technology that can treat PCB-contaminated soils.
- **Implementability.** Incineration can be implemented at this site. However, permitting an incinerator may prove to be a significant effort as the public may mount an effort to keep it out of their community.
- **Cost.** Ex situ incineration is a high-cost technology with costs ranging from $796 to $1,171 per cy for smaller sites (FRTR 2013).

In summary, because the effectiveness of incineration to remediate site contaminated soil would be similar to HTTD, but at a much higher cost, incineration was not 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. Soils must be excavated, segregated, and stockpiled before 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 raises 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. 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's beneficial use determination (BUD) requirements.

Bench-scale testing would be required to establish design parameters for full-scale implementation of this technology.

- **Effectiveness.** Ex situ vitrification of soils is an effective method of treating PCB-contaminated soils. In addition, this action reduces/eliminates the potential for future contamination of groundwater from soil contamination.
- **Implementability.** Contractors are available to implement this technology. The system would be set up at a location central to the site and the soil would be transported to it. A bench-scale study would be necessary before implementing this technology.
- **Cost.** Estimated costs for vitrification obtained from Minergy range from $50 to $475 per cy (Minergy Corporation 2003, 2007). Compared with other ex situ treatment technologies, vitrification has a much greater upfront capital cost. There are some financial risks associated with this technology, e.g., a major cost factor is the price of natural gas, which can fluctuate significantly over the life of the operation.

In summary, ex situ vitrification is a moderate cost technology with proven effectiveness in remediating PCB contamination. However, since the full-scale technology has not been demonstrated for remediation purposes, vitrification has not been 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 replacing the halogen molecule of the organic compound or by 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 replaces 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 a 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 for cleanup of contaminated soils containing PCBs ranging between 2 ppm and 45,000 ppm has been successfully used and demonstrated.

- **Effectiveness.** This technology has been approved by the EPA's Office of Toxic Substances under TSCA for PCB treatment and has been selected for cleanup at three Superfund sites.
- **Implementability.** The 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. Most notably it has been used in the cleanup of 10,000 tons of PCB-contaminated soil in Guam in 1997 and to treat 40,000 tons of PCB-contaminated soil in Warren County, North Carolina.
- **Cost.** Ex situ dehalogenation is a high-cost technology with costs ranging from $440 to $1,100 per cy (FRTR 2013). Excavation and material handling costs would be higher with this alternative compared with more established technologies.

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

Solvent Extraction

Solvent extraction is a chemical process whereby the target contaminant is physically separated from its medium (soil) using an appropriate organic solvent. This technology does not destroy the waste but reduces the volume of material that must be treated. Solvent extraction is typically accomplished by homogeneously mixing the soil, flooding it with the solvent, then mixing thoroughly again to allow the waste to come in contact with the solution. Once mixing is complete, the solvent is drawn off by gravity, vacuum filtration, or some other conventional dewatering process. The solids are then rinsed with a neutralizing agent (if needed), dried, and placed back on-site or otherwise treated/disposed. 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 primarily containing 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 site similarly 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 with 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 presence of solvent in the treated soil and regeneration and reuse of the spent solvent.
- **Cost.** The costs involved in implementing this technology would typically range between $275 to $1,300 per cy depending on site-specific conditions and the volume of material needing treatment (FRTR 2013).

In summary, solvent extraction has not been commercially implemented and it is costly compared with other ex situ treatment technologies and so has not been 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 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 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 needed before implementing 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, but the effectiveness of the technology decreases with complex waste mixtures, which make choosing the washing fluid difficult. However, because contaminated site soils at OU-2 are primarily glacial deposits that consist of unsorted glacial till and lacustrine deposits of gravel, sand, silt, and clay, rather than 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 needed before implementing 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 and mobile.
- **Cost.** Ex situ soil washing is a moderate-cost technology ranging between $53 to $142 per cy depending on the site conditions, target waste quantity, and concentration (FRTR 2013).

In summary, the level of confidence in the effectiveness of washing PCB-contaminated soil is not high, and, since the cost of constructing an on-site processing facility and the cost of operating the facility for the contaminated volume are high, ex situ soil washing is not feasible at this site. Therefore, ex situ soil washing has not been retained for further consideration.

4 Identification of Alternatives

As directed by NYSDEC, alternatives have been identified for the OU-2 site. A detailed description and evaluation of the alternatives is presented in Section 5.

4.1 Alternative 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.

4.2 Alternative 2: No Further Action with Site Management

This alternative consists of using ECs such as fencing and signs to further restrict human contact with site soils/sediments. ICs such as restrictions on subsurface excavation of the project area and monitoring would also be implemented to protect human health and the environment.

4.3 Alternative 3: Excavation and Off-Site Disposal

This alternative consists of excavation and off-site disposal of contaminated soils/sediments that exceed the site cleanup goals. The excavated material would be stockpiled, sampled, and disposed of accordingly. Because maximum PCB concentrations in soil at the site were detected above 50 ppm, some of the contaminated soils would be disposed of at hazardous waste facilities and some of them and would be disposed of in a permitted NYSDEC-approved non-hazardous/solid waste facility.

4.4 Alternative: Excavation and On-Site Treatment by High Temperature Thermal Desorption

This alternative consists of excavation and thermal treatment of contaminated soils/sediments from OU-2 that exceed the site cleanup goals. An on-site mobile HTTD system was selected to thermally treat the contaminated soils. This process applies heat to the contaminated material and volatilizes the contaminants (i.e., physical separation process). The resulting gas stream is then collected and treated separately. An air pollution control system would also be included as part of the treatment system to ensure that the air emissions meet regulatory criteria before being discharged into the atmosphere.

4.5 Alternative 5: In Situ Solidification

This alternative consists of in situ treatment and demobilization of contaminated soils/sediments that exceed the site cleanup goals. Before treatment, a treatability study would have to be conducted in order to determine how well this system would treat the PCB contamination at OU-2.

4.6 Alternative 6: Excavation and Off-Site Disposal of PCB-Contaminated Soil/Sediment Exceeding Restricted-Industrial SCOs

This alternative consists of excavation and off-site disposal of contaminated soils/sediments exceeding the Part 375 Restricted-Industrial SCO for PCBs of 25 ppm as well as bulk removal of all TSCA soils/sediments. The reduced level materials would be excavated then stockpiled, sampled, and disposed of in a permitted, NYSDEC-approved non-hazardous/solid waste facility.

PCB concentrations in soils/sediments at the site were also detected above 50 ppm. As a result, all TSCA-level materials will require disposal at a Subtitle C class hazardous waste facility.

Under this alternative, all material excavations will be backfilled with clean soil. Riprap from TSCA-level contaminated areas will be removed off-site and replaced with clean stone, and the ditch invert will be re-graded for positive drainage. Topsoil, erosion control blanket(s), ornamental plantings, and fertilized hydroseed will be applied to all disturbed areas, including the access road, during site restoration activities.

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 this 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 CP-51, DER-10, and 6 NYCRR Part 375. This approach is intended to provide needed information to compare the merits of each alternative and select an appropriate remedy that satisfies the site RAOs. The 10 evaluation criteria that were used to evaluate the alternatives are described below.

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 the 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 in 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 completing the remedial action. The effectiveness of the remedial action in managing the risk posed by untreated wastes and/or the residual contamination remaining after treatment and the long-term reliability of the remedial action is assessed.

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

The estimated capital costs, long-term O&M costs, and environmental monitoring costs are evaluated. The estimates included herein (unless otherwise noted) assume engineering and administrative costs would equal 10% of the capital costs and contingency costs would equal 15% of the capital costs. A present-worth analysis compares the remedial alternatives on the basis of a single dollar amount for the base year. For the present-worth analysis, assumptions were made regarding the interest rate applicable to borrowed funds and the average inflation rate. According to the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, the Superfund program recommends that a discount rate of 5% before taxes and after inflation be assumed. Also, the 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%.

Alternatives 3 through 5 present two costs for remediating site contamination to restricted-commercial SCOs through excavation or treatment because two potential restricted-commercial SCOs for PCBs have been proposed. Alternative 6 presents the cost for excavating contaminated soil to the proposed SCO for restricted-industrial uses. The actual PCB SCO will be selected in the ROD for the site.

State Acceptance
This assessment evaluates several technical and administrative issues and concerns the state may have regarding each alternative; however, this criterion will be addressed in the ROD after comments are received on the proposed plan. Therefore, state acceptance is not 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 is not discussed further in this report.

Land Use
The land use criterion evaluates the issues and concerns regarding the current, intended, and reasonably anticipated future land uses of the site. Other considerations include the sites' surroundings, compatibility with applicable zoning laws, compatibility with comprehensive community master plans, proximity to incompatible property near 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 5-5. Table 5-6 presents a summary of costs for all alternatives.

5.2 Remedial Alternatives for OU-2
5.2.1 Alternative 1: No Action
5.2.1.1 Detailed Description
The no action alternative involves taking no further action to remedy site conditions. The NCP at 40 CFR §300.430(e) (6) provides that the no action alternative be considered at every site as a baseline for comparison with other alternatives. This alternative does not include remedial action, institutional or engineering controls, or long-term monitoring.

5.2.1.2 Detailed Evaluation of Criteria

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

Compliance with SCGs

The primary contaminants of concern (PCBs) are resistant compounds by nature and are not expected to decrease appreciably over time. Therefore, the no action alternative would not comply with the chemical-specific SCGs for the site.

Short-Term Impacts and Effectiveness

No short-term impacts are anticipated during the implementation of this alternative since there are no remedial activities involved. However, short-term impacts may result from the existing site conditions.

This alternative does not include source removal or treatment of the drainageway material within the OU-2 area 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 with and ingestion of the soil and migration of contaminants to groundwater will essentially remain the same. This alternative is, therefore, not effective in the long-term.

Reduction of Toxicity, Mobility, and Volume through Treatment

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

Implementability

There are no actions to implement under this alternative.

Cost

There are no costs associated with this alternative for OU-2.

Land Use

The site comprises just one property parcel that is owned by CP Railway. The town of Colonie zoning map (Town of Colonie 2007) shows the site is zoned as industrial. Implementation of this alternative would limit the future uses at this site to industrial/commercial activities; however, NYSDEC has indicated that the future use of the site will not change.

5.2.2 Alternative 2: No Further Action with Site Management

5.2.2.1 Detailed Description

Site management would primarily include ICs with some ECs and OM&M. ICs would consist of access/use and deed restrictions at the site to limit the potential for human exposure to contaminated site soils. Some ECs such as fencing or signs would be used as a physical barrier and as a warning to further restrict human contact with site soils. OM&M for this alternative would primarily include maintaining the existing conditions at the site and long-term monitoring of PCB concentrations in storm water runoff.

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

5.2.2.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

Although contamination would remain on-site, this alternative will be protective of human health because the ICs and ECs would reduce the potential for direct human and wildlife exposure. However, this alternative is not designed to reduce the potential for migration of contaminants in the saturated zone.

Compliance with SCGs

The contaminant levels in soils and sediments 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 during site activities.

Short-Term Impacts and Effectiveness

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

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

Long-Term Effectiveness and Permanence

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

Reduction of Toxicity, Mobility, and Volume through Treatment

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

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

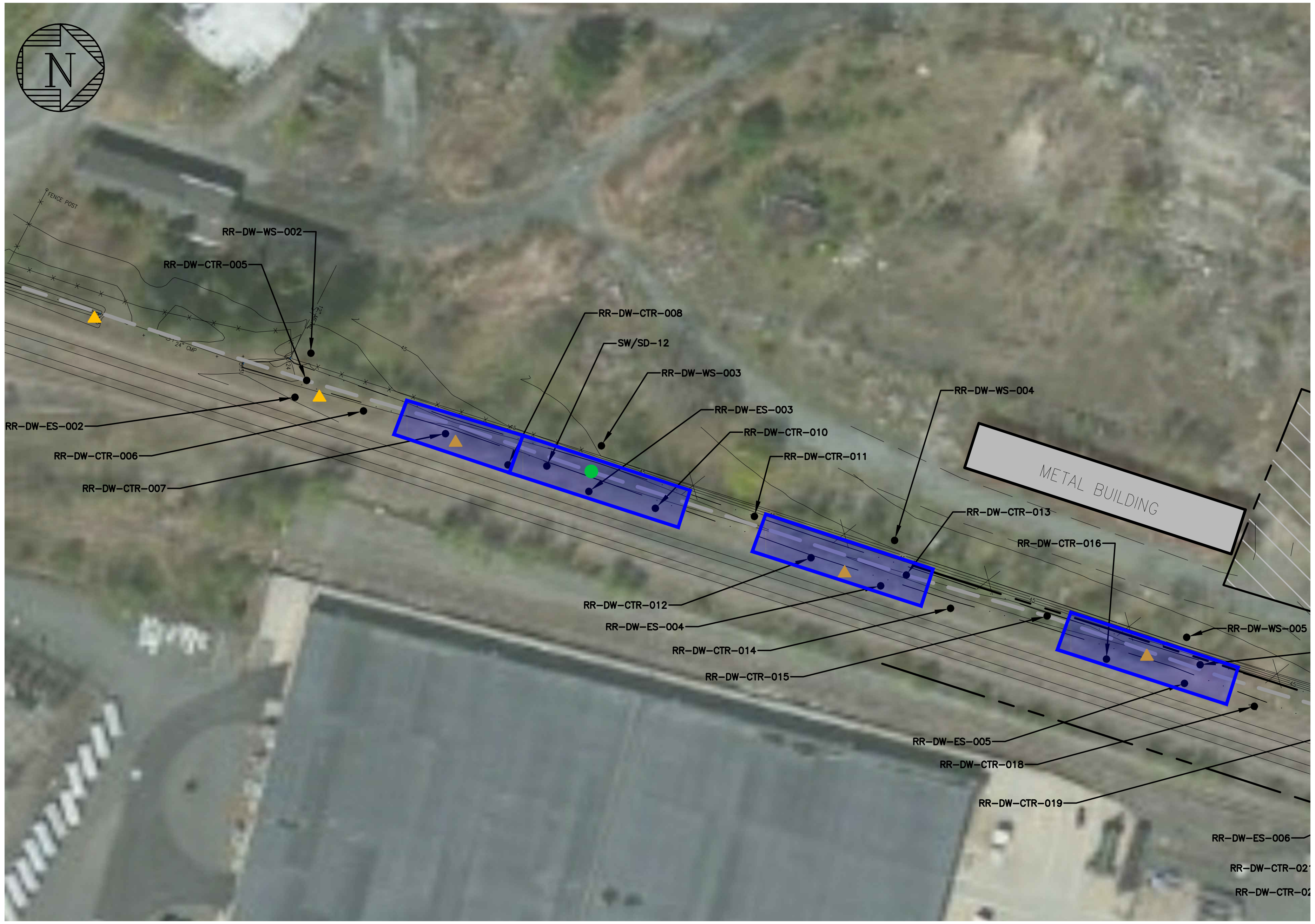
Cost
The 2014 total present value cost of this alternative for the OU-2 site, based on a 30-year period, is $187,000. Table 5-1 presents the quantities, unit costs, and subtotal cost for the various work items in Alternative 2.

Land Use
Land use at the OU-2 site is described in Section 5.2.1.2. The town of Colonie zoning map (Town of Colonie 2007) shows that the site is zoned as industrial. Implementation of this alternative would limit the future uses at this site to industrial/commercial activities; however, NYSDEC has indicated that the future use of the site will not change.

5.2.3 Alternative 3: Excavation and Off-Site Disposal
5.2.3.1 Detailed Description
This alternative involves excavation and off-site disposal of contaminated soils, sediments, and riprap that exceeds site cleanup goals. The contaminated materials would be excavated, stockpiled, characterized, and properly disposed of at an off-site NYSDEC-permitted facility. As described in Section 3.3.3.2, TSCA soils, or soil containing PCBs at concentrations greater than or equal to 50 ppm, are considered hazardous, while those with PCB concentrations less than 50 ppm are considered non-hazardous. Figures 5-1a, 5-1b, and 5-1c show the extent of TSCA and non-TSCA excavations at the OU-2 site of both CP-51 and Part 375 restricted-commercial SCOs.

Before excavation an environmental assessment of the project area shall be completed to identify existing habitat and wildlife that may be protected by the potentially applicable SCGs described in Section 2. During excavation, care shall be taken through the installation of silt fences to protect existing habitat and wildlife within the project area.

The contaminated materials would be excavated using conventional construction equipment, primarily limited to a hydraulic excavator. During the excavation process, PCB field screening tests would be performed in accordance with 40 CFR 761.61. NYSDEC's construction oversight observer would use the results of the field screening tests to verify contamination levels. A sampling grid would be developed over the excavation area for the NYSDEC construction oversight observer's approval. The maximum depth of excavation in the excavation areas would be at least 8 feet bgs, based on contaminated sample depths; however, excavation would continue at the direction of NYSDEC until confirmatory sampling reveals that SCGs have been met.



LEGEND

EXISTING TOPOGRAPHIC CONTOUR

PROPERTY LINE

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RESTRICTED USE AREA

NOTE

1. PART 375 BOUNDARY FOLLOWS THE CP−51 BOUNDARY.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB−CONTAMINATED SOILS ABOVE CP−51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0−1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB−CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED − COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

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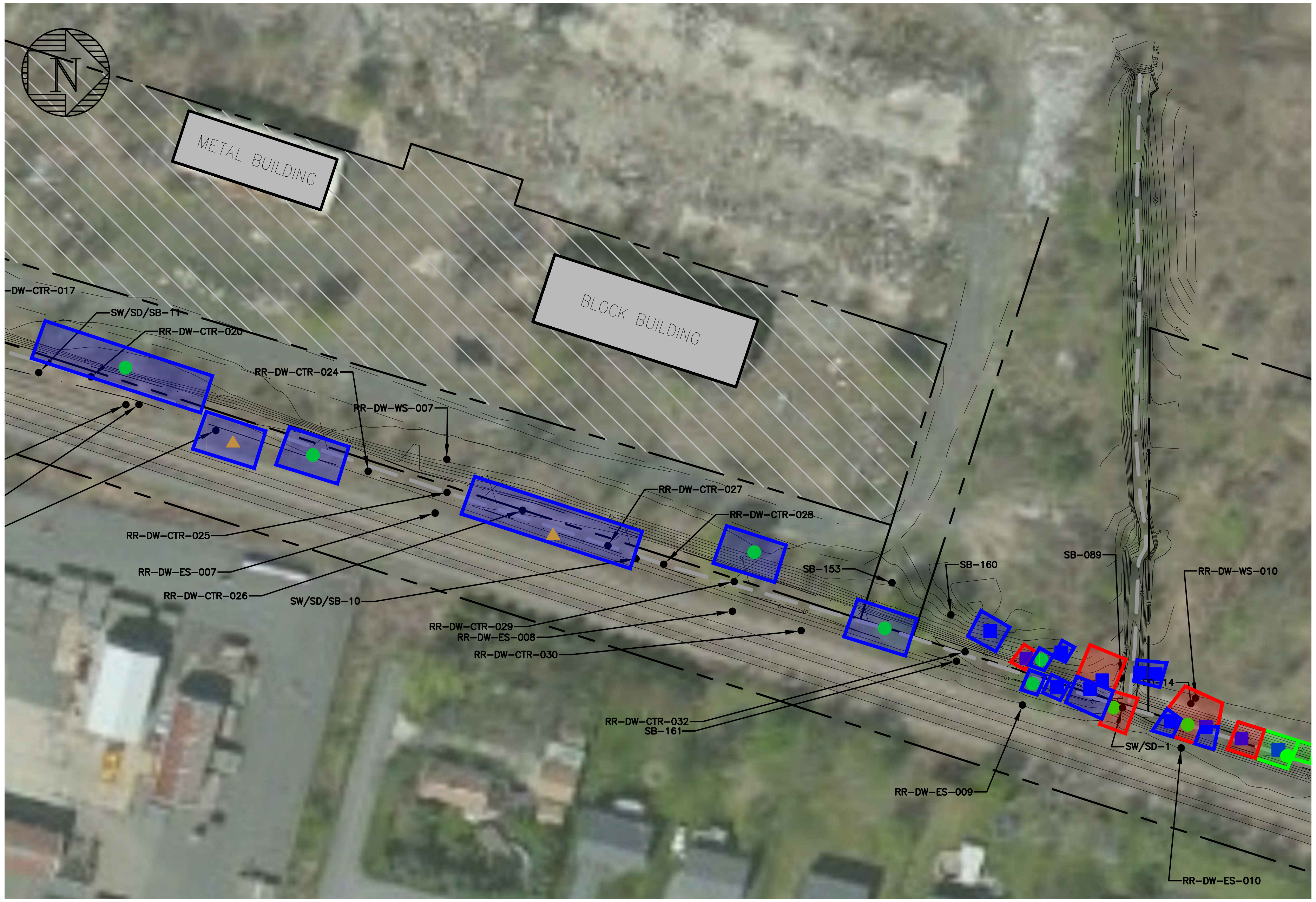
FIGURE 5−1a: EXCAVATION AND OFF−SITE DISPOSAL, ADIRONDACK STEEL OU−2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK



LEGEND

EXISTING TOPOGRAPHIC CONTOUR

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NOTE

1. PT–375 BOUNDARY FOLLOWS THE CP–51 BOUNDARY.
2. EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS BETWEEN 25 ppm and TSCA LEVELS FOLLOWS THE TSCA BOUNDARY EXCEPT WHERE INDICATED.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE CP–51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0–1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED – COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE TSCA LEVELS OF 50 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS BETWEEN 25 ppm TO TSCA LEVELS OF 50 ppm

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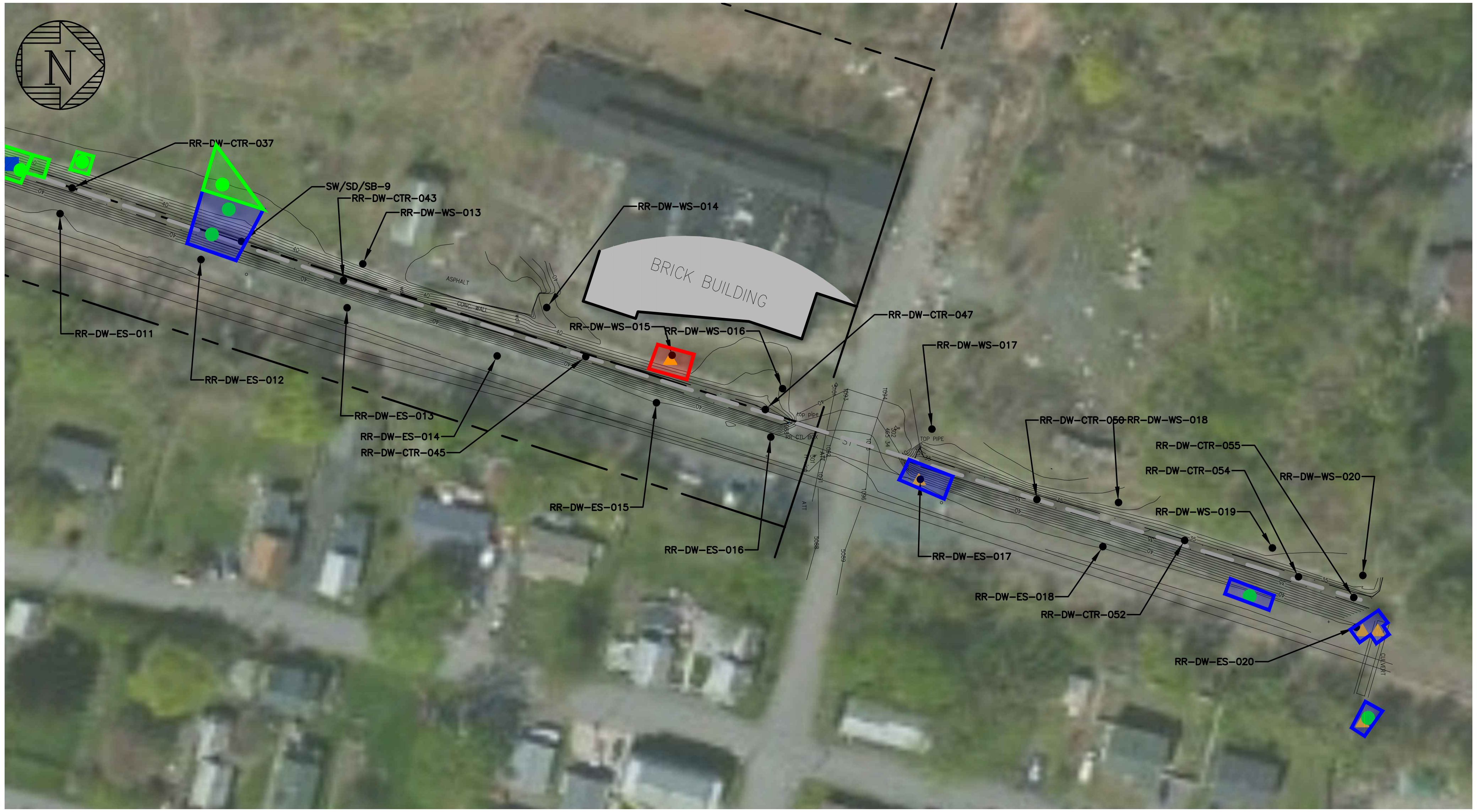
FIGURE 5–1b: EXCAVATION AND OFF–SITE DISPOSAL, ADIRONDACK STEEL OU–2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK



LEGEND

EXISTING TOPO CONTOUR

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NOTE

1. PT–375 BOUNDARY FOLLOWS THE CP–51 BOUNDARY.
2. EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS BETWEEN 25 ppm and TSCA LEVELS FOLLOWS THE TSCA BOUNDARY EXCEPT WHERE INDICATED.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE CP–51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0–1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE TSCA LEVELS OF 50 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED – COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS BETWEEN 25 ppm TO TSCA LEVELS OF 50 ppm

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FIGURE 5–1c: EXCAVATION AND OFF–SITE DISPOSAL, ADIRONDACK STEEL OU–2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK

While direct loading of transport trucks is the preferred methodology, temporary facilities could be needed for on-site storage of contaminated material after excavation, depending on the contractor's methods of operation. Excavated materials that are contaminated and not directly loaded on to trucks would be stockpiled on plastic liners or containment pads on-site for characterization in accordance with disposal facility requirements. The contractor would be responsible for characterization sampling, which would be conducted at a New York State Department of Health (NYSDOH)-certified laboratory.

After the results of the characterization sampling are received, the soil would be cleared for disposal by the NYSDEC construction oversight observer. Trucks would be manifested then weighed with an empty load. The soil would be loaded onto the trucks then weighed again to determine the approximate loaded weight of the vehicle. The trucks would then transport the soil to the appropriate disposal facility. The final tipping weight of each truck would be recorded on the Hazardous Waste Manifest and retained for EPA and NYSDEC reporting purposes.

TSCA materials would be disposed of at a NYSDEC-approved RCRA Subtitle C landfill. According to the United States Army Corps of Engineers Hazardous, Toxic, and Radioactive Waste Center of Expertise Information, five hazardous waste landfill facilities operating in the United States are permitted to accept these soils. Of those five, only one of the facilities is located east of the Mississippi River, Chemical Waste Management (CWM) in Model City, New York. The CWM facility in Model City, Niagara County, New York, is the closest facility to the site and, therefore, the likely destination for the TSCA-level PCB-contaminated soils from the site.

A number of disposal locations are available for non-hazardous materials. For example, the Clinton County landfill, operated by Casella, is relatively close to the site and accepts soil/sediments and stone with PCBs less than 50 ppm. Unit costs from the CWM facility at Model City near Niagara Falls, NY have been used for costing purposes with the understanding that landfill(s) closer to the site may be identified at the design stage.

Based on the groundwater elevations collected during the RI (EEEPC 2008a), dewatering may be necessary in portions of the site. Means and methods of dewatering would be determined by the contractor's approach to the site work. EEEPC assumed a temporary water treatment system would be established on-site and that the Contractor would employ a series of earth dikes and bypass pumps to move water in ditch areas not under excavation around established exclusion zones. Treated water would be appropriately discharged off-site.

Following excavation and removal of designated materials from the site, a uniform invert elevation at the ditch centerline would be restored to promote positive drainage. Imported clean fill would be placed and compacted in the excavation areas to restore grades and to reconstruct the ditch. Six inches of topsoil would be placed and graded across the entire excavation area. Erosion protection in the form of clean riprap would be installed as a part of the ditch reconstruction. After backfill and ditch reconstruction operations are complete, the surrounding site would be restored using hydroseeding.

As stated above, two restricted-commercial SCOs for PCBs have been proposed for the site: cleanup to 6 NYRCR Part 375 SCOs or CP-51 SCOs. The excavated areas are the same under each scenario; however, the volumes vary due to the difference in cleanup levels required. The soil volume estimated to be excavated to the proposed Part 375 SCOs in OU-2 comprises approximately 2,600 cy of non-TSCA soil and 230 cy of TSCA soil. The soil volume estimated to be excavated to the proposed CP-51 SCOs for PCBs and restricted-commercial SCOs for non-PCBs comprises approximately 1,200 cy of non-TSCA soil and 230 cy of TSCA soil. These volumes are composed of drainageway soils (sediments), surface soil, contaminated subsurface soils, and cutbacks.

A cutback of the excavation or other means of safe access and exit must be provided in trench excavations 4 feet or deeper to ensure safe working conditions in the excavation and to meet Occupational Safety and Health Act (OSHA) requirements.

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

5.2.3.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment because contaminated soils and sediments would be removed from the site and properly disposed of in a NYSDEC-permitted facility. Because the contaminants would be removed from the site, exposure risks associated with soil contamination would be reduced to levels acceptable for restricted-commercial use.

Compliance with SCGs

This alternative complies with SCGs since contaminated soils and sediments would be removed from OU-2 and the site and properly disposed of in an environmentally acceptable facility. Off-site disposal would comply with all applicable land disposal restrictions and analytical requirements. Action- and location-specific SCGs, including noise limitations, wetlands permits (as required), and OSHA regulations, would be complied with during implementation of this alternative or included and enforced with institutional controls.

Short-Term Impacts and Effectiveness

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

A licensed hauler would provide off-site transportation of contaminated soil to the disposal facility. While there is a risk of accidental spills, this risk would be limited by using closed and lined containers for transport. A Hazardous Waste Manifest complying with EPA requirements will be issued for each load shipped from the site.

Because this alternative involves removal of the contaminated soil from the site and replacement with clean fill, site RAOs would be achieved at the completion of this work. The time to complete this alternative is estimated to be approximately two to three months plus time for the engineering design, bid, and procurement.

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 remaining soil would meet site cleanup criteria. Therefore, human health and environmental risks would be reduced to levels appropriate for restricted-commercial site use.

Reduction of Toxicity, Mobility, and Volume through Treatment

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

Implementability

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

Cost

The 2014 total present-value cost of achieving Part 375 SCOs under this alternative is approximately $1,008,000. The 2014 total present-value cost of achieving CP-51 SCOs under this alternative is approximately $767,000. Tables 5-2a and 5-2b present the respective quantities, unit costs, and subtotal costs for the various work items in Alternative 3.

Land Use

Land use at the Adirondack Steel OU-2 site is described in Section 5.2.1.2. The town of Colonie zoning map (Town of Colonie 2007) shows the site is zoned as industrial. Implementation of this alternative would limit the future uses at this site to industrial/commercial activities; however, NYSDEC has indicated that the future use of the site will not change.

5.2.4 Alternative 4: Excavation and On-Site Treatment by High Temperature Thermal Desorption

5.2.4.1 Detailed Description

This alternative involves excavation and on-site thermal treatment of contaminated soils and sediments to site cleanup goals. Soil would be excavated from the CP railroad ditch and hauled to a mobile HTTD unit staged in OU-3 for on-site treatment. Figures 5-2a, 5-2b, and 5-2c show the extent of TSCA and non-TSCA excavation at the OU-2 site for both CP-51 and Part 375 restricted-commercial SCOs. After backfill and ditch reconstruction operations are complete, the surrounding site would be restored by planting trees and hydroseeding.

The contaminated soil would be excavated using conventional construction equipment, primarily limited to a hydraulic excavator and bulldozers. Contaminated riprap, which extends throughout the ditch, would be removed and disposed off-site. During the excavation process, PCB field screening tests and dewatering would be conducted, as described in Section 5.2.3.1. The maximum depth of excavation in the excavation area would be at least 8 feet bgs, based on contaminated sample depths; however, excavation would continue deeper until confirmatory sampling reveals that SCOs have been met.

Excavated TSCA soil would be disposed of at a RCRA Subtitle C facility, as described in Section 5.2.3.1. Excavated non-TSCA soil would be placed in storage piles near the mobile treatment unit. While awaiting treatment, the storage piles would be mechanically mixed (typically a front-end loader) and screened or crushed such that the material is 3 inches or smaller in the stockpile. For costing purposes, it is assumed that the material would contain 85% solids or greater and dewatering (or drying) of this material would not be required. The HTTD unit is assumed to work eight hours per day and six days a week. The HTTD unit would be shut down one day per week for regular maintenance.

LEGEND

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RESTRICTED USE AREA

NOTE

1. PT–375 BOUNDARY FOLLOWS THE CP–51 BOUNDARY.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE CP–51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0–1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED – COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE TSCA LEVELS OF 50 ppm PCBs

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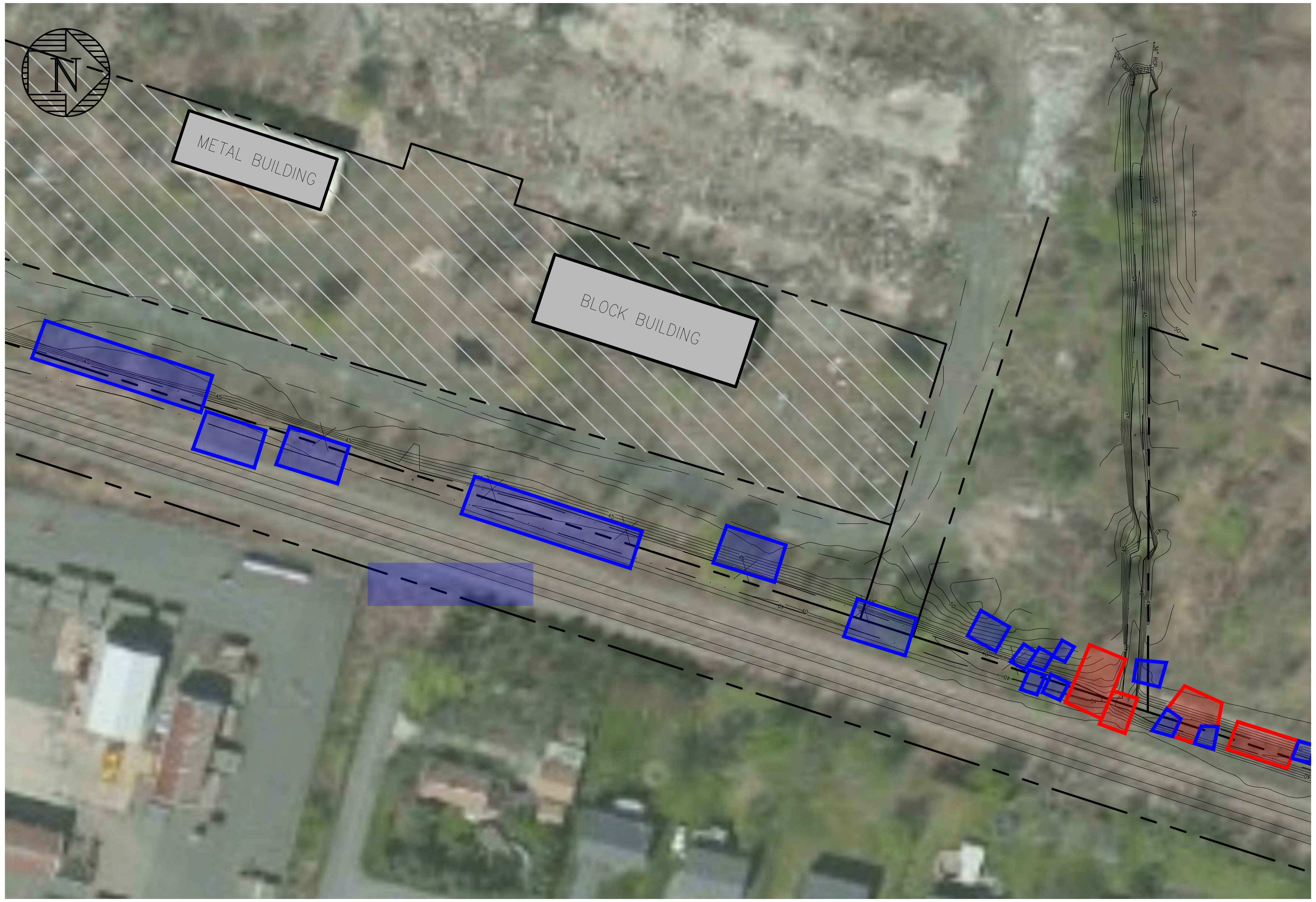
FIGURE 5–2a: ON SITE THERMAL TREATMENT, ADIRONDACK STEEL OU–2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK



LEGEND

EXISTING TOPOGRAPHIC CONTOUR

PROPERTY LINE

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NOTE

1. PT–375 BOUNDARY FOLLOWS THE CP–51 BOUNDARY.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE CP–51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0–1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED – COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE TSCA LEVELS OF 50 ppm PCBs

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FIGURE 5–2b: ON SITE THERMAL TREATMENT, ADIRONDACK STEEL OU–2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK

LEGEND

EXISTING TOPO CONTOUR

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NOTE

1. PT–375 BOUNDARY FOLLOWS THE CP–51 BOUNDARY.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE CP–51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0–1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED – COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE TSCA LEVELS OF 50 ppm PCBs

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FIGURE 5–2c: ON SITE THERMAL TREATMENT, ADIRONDACK STEEL OU–2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK

The mobile treatment unit provided by ESMI (ESMI 2013) will be able to treat at a rate of 30 tons to 45 tons per hour. The treatment plant would need a storage area for the storage piles that would provide the feed to the system as well as a discharge area for the treated soil. Approximately three-quarters of an acre would be needed for the plant and the storage piles and treatment piles.

Soils would be thermally treated using direct-fired technology, i.e., fire is directly applied to the surface of the contaminated soil. Typically, soils would reach a maximum temperature of 950°F within the unit. The relatively low temperatures used to vaporize contaminants do not affect the physical and mineral characteristics of the soil or sediment materials. The mobile treatment unit would discharge the treated material into a treated-soil stockpile.

Several on-site facilities would be needed to operate the HTTD unit. Based on the past use of the site as an industrial park, it is anticipated that water, natural gas, and electrical utility connections are available in the vicinity of the site.

Before implementing this alternative, a permit equivalency would be required for operating the on-site mobile treatment systems. As part of the permit equivalency, the mobile treatment unit would be tested to verify the destruction removal efficiency of contaminants, particulate matter emissions, etc. (ESMI 2013). Water would be sprayed over the treated soil and sediments to allow cooling and to reduce wind dispersion. Contractor specifications indicate negligible loss is anticipated through the treatment process.

Prior to backfilling, a uniform invert elevation at the ditch centerline will be restored to promote positive drainage. Imported clean fill would be placed and compacted in excavated areas to restore grades and to offset the volume of TSCA soil disposed off-site. Six inches of topsoil would be placed and graded across the entire excavation area. Erosion protection in the form of clean riprap would be installed as a part of the ditch reconstruction. After backfill and ditch reconstruction operations are complete, the surrounding site would be restored by hydroseeding and planting trees.

As stated in the beginning of Section 5, two restricted-commercial SCOs for PCBs have been proposed for the site: cleanup to 6 NYRCR Part 375 SCOs or CP-51 SCOs. The soil volume estimated to be excavated and treated to the proposed Part 375 SCOs in OU-2 comprises approximately 2,600 cy of non-TSCA soil and 225 cy of TSCA soil. The soil volumes estimated to be excavated and treated to the proposed CP-51 SCOs for PCBs comprises approximately 1,200 cy of non-TSCA soil and 230 cy of TSCA soil. These volumes comprise drainageway soils (sediments), surface soil, and subsurface soil.

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

5.2.4.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is considered protective of human health and the environment because the contaminated soils and sediments would be excavated and thermally treated on-site to meet site cleanup levels. Because the contaminants would be treated and destroyed, exposure risks associated with soil contamination would be reduced to levels acceptable for restricted-commercial use.

Compliance with SCGs

This alternative would meet SCGs because the PCB contamination in site soils and sediments would be effectively treated to meet cleanup goals at the site. Applicable action- and location-specific SCGs, including air discharge permits and requirements, noise limitations, wetland permits (as required), storm water requirements, and OSHA regulations, would be met during implementation of the alternative or with inclusion and enforcement of site institutional controls.

Short-Term Impacts and Effectiveness

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

This alternative involves treating contaminated soil at the site, so the RAOs would be achieved at the completion of this work. Excavation and thermal treatment of the contaminated soil is estimated to achieve site RAOs in approximately four to five months plus time for the engineering design, bid, and procurement.

Long-Term Effectiveness and Permanence

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

Reduction of Toxicity, Mobility, and Volume through Treatment

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

Implementability

This alternative can be readily implemented using standard construction means and methods. A subcontractor specializing in thermal treatment systems would likely be employed to mobilize and operate the thermal treatment system. Although start-up problems and periodic downtime may be encountered due to mechanical complexity, thermal treatment could reliably meet cleanup goals. Because of the variability of the PCBs and other parameter concentrations (e.g., metals, debris) operational parameters may be have to be adjusted to treat this material. However, this should not affect the overall performance or implementability of the alternative. The HTTD system would be monitored and sampled during the treatment phase to ensure that site cleanup criteria are met and air discharge standards are not exceeded.

Cost

The 2014 total present-value cost of achieving Part 375 restricted-commercial SCOs under this alternative for the OU-2 site, based on a 30-year period, is $2,170,000. The 2014 total present-value cost of achieving CP-51 SCOs under this alternative is approximately $1,709,000. Tables 5-3a and 5-3b present the respective quantities, unit costs, and subtotal costs for the various work items in this alternative. Technology-specific costs were obtained from ESMI of New York; other cost estimate information was obtained from the RS Means Cost Data series and by engineering judgment. No long-term O&M costs are anticipated with this alternative.

Land Use

Land use at the Adirondack Steel OU-2 site is described in Section 5.2.1.2. The town of Colonie zoning map (Town of Colonie 2007) shows the site is zoned as industrial. Implementation of this alternative would limit the future uses at this site to industrial/commercial activities; however, NYSDEC has indicated that the future use of the site will not change.

5.2.5 Alternative 5: In Situ Solidification/Stabilization

5.2.5.1 Detailed Description

This alternative involves in situ mechanical mixing of contaminated soils with a binder material to solidify and stabilize the contaminants within the affected soil/sediment areas. Only non-TSCA materials would be stabilized and solidified. TSCA soils and sediments would be excavated and disposed of off-site. Excavation, confirmatory sampling, dewatering, and off-site disposal of TSCA material would be as described in Section 5.2.3.1. Figures 5-3a, 5-3b, and 5-3c show the extent of TSCA excavations in the treatment/stabilization area at the OU-2 site to both CP-51 and Part 375 restricted-commercial SCOs.

Non-TSCA soils and sediments would be mixed in situ by a track-mounted soil auger system and stabilized/solidified with Portland cement. The appropriate binder material would be selected during a comprehensive test system, in which the effects of various binders on the unconfined compressive strength, shearing strength, and leachability of contaminants would be evaluated. Cement is the most common binder material used for most applications (Ramboll Norge AS 2009). Test samples for leachate and diffusion would be analyzed at a New York State Department of Health (NYSDOH)-certified laboratory.

Stabilization and solidification of non-TSCA soils would create a monolithic block in place of the existing soil. To accommodate the additional volume of the monolithic block created by stabilization/solidification and the need to maintain the elevation of the invert from the drainageway to the railroad ditch, all excess non-TSCA soil generated during the solidification process would be landfilled off-site.

Following stabilization/solidification of contaminated soils, a uniform invert elevation at the ditch centerline would be restored to promote positive drainage. Imported clean fill would be placed and compacted in excavated areas to restore grades and to offset the volume of TSCA soil disposed off-site. Six inches of topsoil would be placed and graded across the entire excavation area. Erosion protection in the form of clean riprap would be installed as a part of ditch reconstruction. After backfill and ditch reconstruction operations are complete, the surrounding site would be restored and the excavated and equipment staging areas will be restored to pre-construction conditions by planting trees and by hydroseeding . As noted above, two restricted-commercial SCOs for PCBs have been proposed for the site: cleanup to 6 NYRCR Part 375 SCOs or CP-51 SCOs. The volume to be solidified in situ that represents soil with PCBs above the proposed Part 375 SCOs in OU-2 is approximately 2,600 cy of non-TSCA soil. The volume to be solidified in situ and representing soil with PCBs above the proposed CP-51 SCOs and non-PCB contamination above the Part 375 SCOs in OU-2 is approximately 1,200 cy of non-TSCA soil. An additional 230 cy of TSCA soil would be excavated and disposed of off-site under each cleanup scenario. These volumes comprise drainageway soils (sediments), surface soil, contaminated subsurface soils.

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

LEGEND

EXISTING TOPOGRAPHIC CONTOUR

PROPERTY LINE

PROFILE

RESTRICTED USE AREA

NOTE

1. PT–375 BOUNDARY FOLLOWS THE CP–51 BOUNDARY.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE CP–51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0–1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED – COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE TSCA LEVELS OF 50 ppm PCBs

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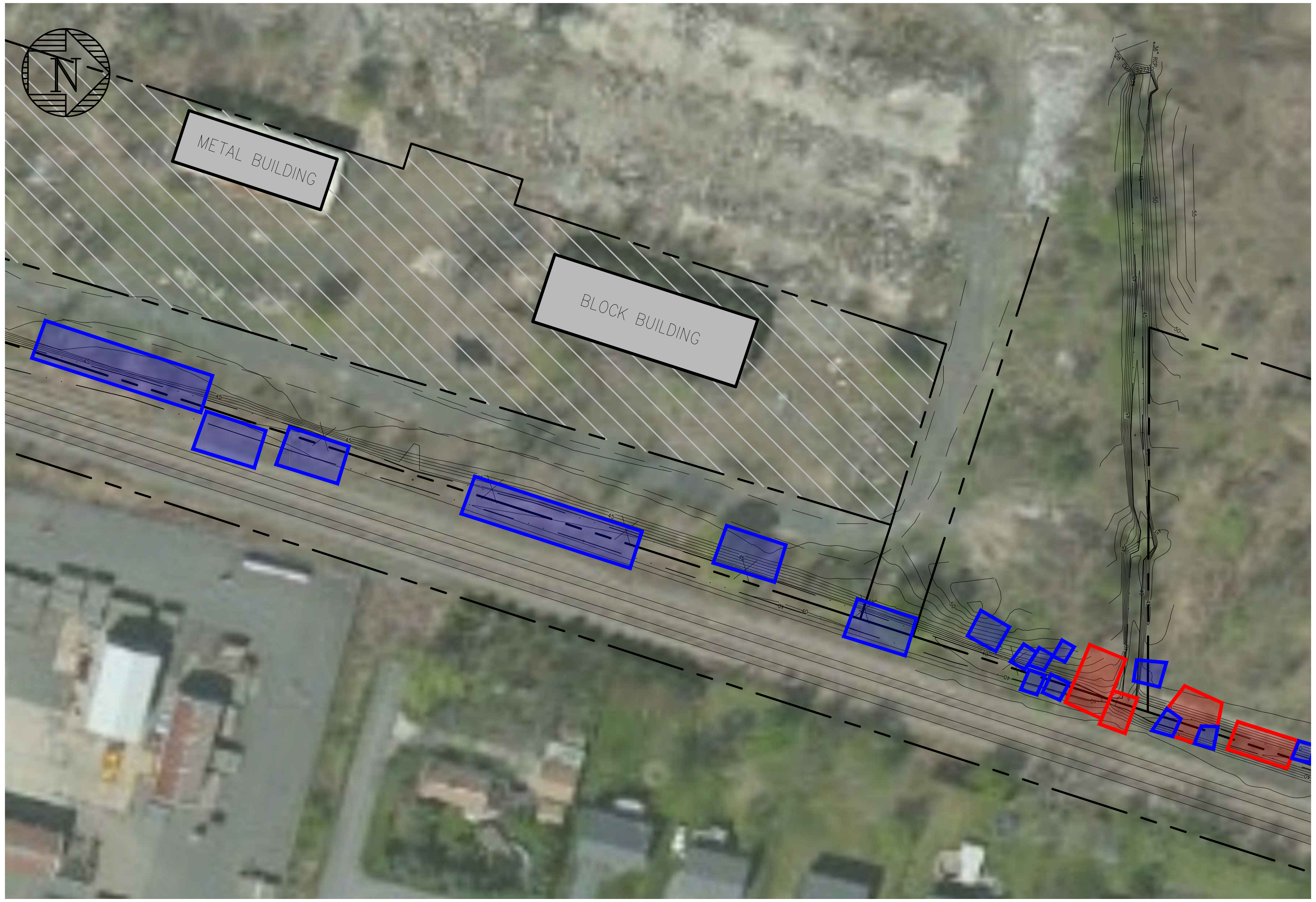
FIGURE 5–3a: IN SITU SOLIDIFICATION/STABILIZATION, ADIRONDACK STEEL OU–2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK



LEGEND

EXISTING TOPOGRAPHIC CONTOUR

PROPERTY LINE

PROFILE

RESTRICTED USE AREA

NOTE

1. PT–375 BOUNDARY FOLLOWS THE CP–51 BOUNDARY.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE CP–51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0–1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED – COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE TSCA LEVELS OF 50 ppm PCBs

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FIGURE 5–3b: IN SITU SOLIDIFICATION/STABILIZATION, ADIRONDACK STEEL OU–2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK

LEGEND

EXISTING TOPO CONTOUR

PROPERTY LINE

PROFILE

RESTRICTED USE AREA

NOTE

1. PT–375 BOUNDARY FOLLOWS THE CP–51 BOUNDARY.

SCALE IN FEET

0 80 160 240

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE CP–51 SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs IN SURFACE SOILS (0–1 ft BELOW SURFACE) AND 10 ppm PCBs IN SUBSURFACE SOILS (GREATER THAN 1 ft BELOW SURFACE)

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE 6 NYCRR PART 375 RESTRICTED – COMMERCIAL SOIL CLEANUP OBJECTIVES OF 1 ppm PCBs

EXCAVATION BOUNDARY FOR PCB–CONTAMINATED SOILS ABOVE TSCA LEVELS OF 50 ppm PCBs

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FIGURE 5–3c: IN SITU SOLIDIFICATION/STABILIZATION, ADIRONDACK STEEL OU–2
FORMER ADIRONDACK STEEL SITE
COLONIE, NEW YORK

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 contamination in OU-2 soils and sediments would be physically bound or enclosed within a stabilized mass. Because contaminant mobility would be reduced, exposure risks associated with soil contamination would be reduced to levels acceptable for restricted-commercial use.

Compliance with SCGs
This alternative complies with SCGs since contaminated soils and sediments would be stabilized/solidified; as such, this alternative is often considered non-hazardous. Leachate from stabilized/solidified material would be analyzed during the comprehensive system test to demonstrate that contamination is successfully bound in the binder material and that migration is reduced. Action- and location-specific SCGs, including noise limitations, wetlands permits (as required), storm water requirements, and OSHA regulations, would be complied with during implementation of this alternative or included and enforced with institutional controls.

Short-Term Impacts and Effectiveness
Several short-term impacts on the community and workers may arise during excavation of contaminated soil at OU-2, including dust, noise, and potential spills during handling and transportation of contaminants. To minimize short-term impacts, site access would be restricted during construction and remediation activities. Health and safety measures, including air monitoring, using appropriate PPE, and decontaminating equipment leaving the site, would be in place to protect the workers and surrounding residence and community. Action levels would be set prior to any intrusive activities and an appropriate correction action would be implemented if these action levels are exceeded.

Because this alternative involves the transformation of the contaminated soil to a stabilized/solidified non-hazardous block, site RAOs would be achieved at the completion of this work. The time to complete this alternative is estimated to be approximately three to four months plus time for the engineering design, bid, and procurement.

Long-Term Effectiveness and Permanence
Because this alternative involves stabilizing the contaminated soils and sediments, the risks associated with direct contact with and ingestion of the soil and migration of contaminants to groundwater will be reduced. As this alternative includes ICs and ECs, this alternative will be effective in the long-term. Unstabilized soil would meet site cleanup criteria, and therefore human health and environmental risks would be reduced to restricted-commercial-use levels.

Reduction of Toxicity, Mobility, and Volume through Treatment

The volume of contamination would be reduced at the site because this alternative stabilizes PCB contamination currently in contaminated soils and sediments into a solid monolithic block and all TSCA materials would be removed from the site. The remaining low-level PCBs would be physically encased and bound in the binder material. Consequently, the toxicity and mobility of the contaminants would also be reduced.

Implementability

This alternative can be readily implemented using standard construction means and methods. A subcontractor specializing in soil and sediment stabilization/solidification systems would likely be employed to mobilize and operate the thermal treatment system. Although start-up problems and periodic downtime may be encountered due to mechanical complexity, soil stabilization/solidification could reliably meet cleanup goals. Because the PCBs and other parameter concentrations are variable, operational parameters may have to be adjusted to stabilize this material. However, this should not affect the performance or implementability of this alternative. After stabilization the solidified material would be leachate-tested to ensure that site cleanup criteria are met.

Cost

The 2014 total present-value cost of achieving Part 375 SCOs under this alternative for the OU-2 site is approximately $1,559,000. The 2014 total present-value cost of achieving CP-51 SCOs under this alternative is approximately $1,070,000. Tables 5-4a and 5-4b present the respective quantities, unit costs, and subtotal costs for the various work items in this alternative. In situ solidification costs were obtained from a 1988 EPA Test Study and escalated to a 2014 cost. Other cost-estimating information was obtained by engineering judgment and from the RS Means Cost Data series. No long-term OM&M costs are anticipated with this alternative.

Land Use

Land use at the Adirondack Steel OU-2 site is described in Section 5.2.1.2. Based on the town of Colonie zoning map (Town of Colonie 2007), the site is zoned as industrial. Implementation of this alternative would limit the future uses at this site to industrial/commercial activities; however, NYSDEC has indicated that the future use of the site will not change.

5.2.6 Alternative 6: Excavation and Off-Site Disposal of PCB-Contaminated Sediment to Restricted-Industrial SCOs

5.2.6.1 Detailed Description

This alternative involves excavation and off-site disposal of contaminated soils, sediments, and riprap that exceed the 25 ppm site cleanup goal. The contaminated materials would be excavated, stockpiled, characterized, and properly disposed of at an off-site NYSDEC-permitted facility. As described in Section 3.3.3.2, TSCA soils, or soil containing PCBs at concentrations greater than or equal to 50 ppm, are considered hazardous, while those with PCB concentrations less than 50 ppm are considered non-hazardous. Figures 5-1a, 5-1b, and 5-1c show the extent of TSCA and non-TSCA excavations at the OU-2 site of both CP-51 and Part 375 restricted-commercial SCOs.

Before excavation an environmental assessment of the project area shall be completed to identify existing habitat and wildlife that may be protected by the potentially applicable SCGs described in Section 2. During excavation, care shall be taken through the installation of silt fences to protect existing habitat and wildlife within the project area.

The contaminated materials would be excavated using conventional construction equipment, primarily limited to a hydraulic excavator. During the excavation process, field screening tests for PCBs would be performed in accordance with 40 CFR 761.61. NYSDEC's construction oversight observer would use the results of the field screening tests to verify contamination levels. A sampling grid would be developed over the excavation area for the NYSDEC construction oversight observer's approval. The maximum depth of excavation in the excavation areas would be at least 8 feet bgs, based on contaminated sample depths; however, excavation would continue at the direction of NYSDEC until confirmatory sampling reveals that SCGs have been met.

While direct loading of transport trucks is the preferred methodology, temporary facilities could be needed for on-site storage of contaminated material after excavation, depending on the contractor's methods of operation. Excavated materials that are contaminated and not directly loaded on to trucks would be stockpiled on plastic liners or containment pads on-site for characterization in accordance with disposal facility requirements. The contractor would be responsible for characterization sampling, which would be conducted at a NYSDOH-certified laboratory.

After the results of the characterization samples are received, the soil would be cleared for disposal by the NYSDEC construction oversight observer. Trucks would be manifested then weighed with an empty load. The soil would be loaded onto the trucks then weighed again to determine the approximate loaded weight of the vehicle. The trucks would then transport the soil to the appropriate disposal facility. The final tipping weight of each truck would be recorded on the Hazardous Waste Manifest or Non-Hazardous Waste Manifest and retained for EPA and NYSDEC reporting purposes.

TSCA materials would be disposed of at a NYSDEC-approved RCRA Subtitle C landfill. According to the United States Army Corps of Engineers Hazardous, Toxic, and Radioactive Waste Center of Expertise Information, five hazardous waste landfill facilities operating in the United States are permitted to accept these soils. Of those five, only one of the facilities is located east of the Mississippi River, Chemical Waste Management (CWM) in Model City, New York. The CWM facility in Model City, Niagara County, New York, is the closest facility to the site and, therefore, the likely destination for the TSCA-level PCB-contaminated soils from the site.

A number of disposal locations are available for non-hazardous materials. For example, the Clinton County landfill, operated by Casella, is relatively close to the site and accepts soil/sediments and stone with PCBs less than 50 ppm. Unit costs from the CWM facility at Model City near Niagara Falls, New York, have been used for costing purposes with the understanding that landfill(s) closer to the site may be identified at the design stage.

Based on the groundwater elevations collected during the RI (EEEPC 2008a), dewatering may be necessary in portions of the site. Means and methods of dewatering would be determined by the contractor's approach to the site work. EEEPC assumed a temporary water treatment system would be established on-site and that the contractor would employ a series of earth dikes and bypass pumps to move water in ditch areas not under excavation around established exclusion zones. Treated water would be appropriately discharged off-site.

Following excavation and removal of designated materials from the site, a uniform invert elevation at the ditch centerline would be restored to promote positive drainage. Imported clean fill would be placed and compacted in the excavation areas to restore grades and to reconstruct the ditch. Six inches of topsoil would be placed and graded across the entire excavation area. Erosion protection in the form of clean riprap would be installed as a part of the ditch reconstruction. After backfill and ditch reconstruction operations are complete, the surrounding site would be restored using hydroseeding.

The soil volume estimated to be excavated under the proposed 6 NYCRR Part 375 restricted-industrial SCO of 25 ppm and above for PCBs in OU-2 comprises approximately 70 cy of non-TSCA soil and 230 cy of TSCA soil. These volumes are composed of contaminated drainageway soils (sediments), surface soil, and subsurface soils. Excavation, backfill, and compaction of existing soil to restore the invert of the ditch to a positive flow condition are included.

A cutback of the excavation or other means of safe access and exit must be provided in trench excavations 4 feet or deeper to ensure safe working conditions in the excavation and to meet OSHA requirements. .

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

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 because contaminated soils and sediments would be removed from the site and properly disposed of in a NYSDEC-permitted facility. Because the contaminants would be removed from the site, exposure risks associated with soil contamination would be reduced to levels acceptable for restricted-commercial use.

Compliance with SCGs
This alternative complies with SCGs since contaminated soils and sediments would be removed from OU-2 and the site and properly disposed of in an environmentally acceptable facility. Off-site disposal would comply with all applicable land disposal restrictions and analytical requirements. Action- and location-specific SCGs, including noise limitations, wetlands permits (as required), and OSHA regulations would be complied with during implementation of this alternative or included and enforced with institutional controls.

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

A licensed hauler would provide off-site transportation of contaminated soil to the disposal facility. While there is a risk of accidental spills, this risk would be limited by using closed and lined containers for transport. A Hazardous Waste Manifest complying with EPA requirements will be issued for each load shipped from the site.

Because this alternative involves removal of the contaminated soil from the site and replacement with clean fill, site RAOs would be achieved at the completion of this work. The time to complete this alternative is estimated to be approximately one to two months plus time for the engineering design, bid, and procurement.

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 remaining soil would meet site cleanup criteria. Therefore, human health and environmental risks would be reduced to levels appropriate for restricted-industrial site use.

Reduction of Toxicity, Mobility, and Volume through Treatment

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

Implementability

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

Cost

The 2014 total present-value cost of achieving Part 375 Restricted-Industrial SCOs under this alternative is approximately $405,000. Table 5-5 presents the respective quantities, unit costs, and subtotal costs for the various work items in Alternative 6.

Land Use

Land use at the Adirondack Steel OU-2 site is described in Section 5.2.1.2. The town of Colonie zoning map (Town of Colonie 2007) shows the site is zoned as industrial. Implementation of this alternative would limit the future uses at this site to industrial activities in line with current zoning.

5.3 Comparative Evaluation of Alternatives

Overall Protection of Human Health and the Environment

Since Alternative 1 employs no action, contaminated soils and sediments in OU-2 would remain on-site, providing no protection for potential future exposure. Alternative 2 would provide some limited protection of human health and the environment because the ICs and ECs would reduce the potential for direct human and wildlife exposure. Alternatives 3, 4, and 5 would provide a higher level of protection than Alternative 2 because the contamination would be removed, treated, or stabilized. Alternative 5 would be protective of human health because stabilization/solidification would reduce the potential for direct human and wildlife exposure. However, Alternatives 3 and 4 would provide a higher level of protection than Alternative 5, in which the potential for migration of PCBs by diffusion would remain.

Compliance with SCGs

PCBs are recalcitrant compounds by nature and, therefore, their levels in the soil and sediments are not expected to decrease over time. Alternatives 1 and 2 do not comply with SCGs because the contaminated soils and sediments would remain on-site. Alternatives 3, 4, 5 and 6 comply with SCGs because PCB contamination would be stabilized, destroyed, or properly disposed of off-site. However, approval from the town must be obtained in order to process contaminated soils and sediments on-site before implementing Alternatives 4 or 5.

Short-Term Impacts and Effectiveness

Short-term impacts are not anticipated for Alternatives 1 and 2 as no remediation activities would take place. Several similar short-term impacts may affect the community during remedial activities for Alternatives 3 and 4, e.g., dust and noise due to the excavation of the contaminated soil and, to a lesser extent, Alternative 5 during excavation of uncontaminated soil to re-shape the drainage ditch. A continuous influx of dump trucks would be needed on a daily basis, and spills of contaminated soils under Alternative 3 during the off-site transport of soils by trucks are possible. Noise impacts are inherent with excavation and soil stabilization activities and therefore are inherent in Alternatives 3, 4, and 5. Alternative 4 could have an increased noise impact due to the combination of excavation activities and operation of the HTTD system. Alternative 6 poses many of the same impacts as Alternative 3 but with a higher level of PCB contamination remaining on-site.

Long-Term Effectiveness and Permanence

Since Alternative 1 employs no action, contaminated soils and sediments would remain on-site providing no protection for potential future exposure. Alternative 2 is not effective in the long-term because the contaminated soils and sediments are neither removed nor treated. Removal and treatment of contaminants in Alternatives 3 and 4 are both considered adequate and effective remedies in the long-term since the human health and/or ecological risks would be reduced to levels acceptable for restricted-commercial uses. Alternative 5 provides a similar long-term effectiveness at reducing the risk of direct exposure of humans and wildlife to contaminants; however, its permanent effectiveness is less than that of Alternatives 3 and 4 because PCBs can still migrate by diffusion. While Alternative 6 offers a permanently effective condition, the risk of direct exposure of humans and wildlife is increased due to higher levels of residual contamination remaining on the site.

Reduction in Toxicity, Mobility, or Volume through Treatment

Alternatives 1 and 2 would not treat contaminated soils and sediments and thus would not reduce toxicity, mobility, or volume. Alternative 3 would essentially eliminate concerns of toxicity, mobility, and the volume of contaminated soils and sediments at the site through off-site disposal of contaminated materials at a permitted disposal facility. Reduction in mobility and volume would be achieved through treatment in Alternative 4. Depending on the degree of mixing, Alternative 5 would achieve some reduction in toxicity, and solidification would reduce mobility. However, Alternative 5 would not reduce the volume of PCBs on-site.

Implementability
There are no actions to implement for Alternative 1. Alternatives 2 through 6 can be readily implemented using standard construction means and methods. Due to their complexity, initial problems may be encountered during the start-up phases of the on-site HTTD or soil stabilization systems in Alternatives 4 and 5; however, technical difficulties are not anticipated once the systems are fully operational.

Cost
Table 5-6 summarizes the costs for all alternatives

Alternative 1 calls for no action and thus incurs no costs.

Alternative 2 has a significantly lower total present value than Alternatives 3, 4, 5 and 6 because the main activity is site management.

Alternatives 3 and 6 are the most cost-effective remedial strategy. They are invasive and would require preparing design drawings and specifications for public bid.

Alternative 4 carries the highest remedial cost over all, primarily due to the initial capital cost needed for the on-site HTTD unit, and shares much of the document preparation and coordination requirements of Alternatives 3 and 6. In addition, a staging area for setup and operation of the HTTD process would be needed.

Alternative 5 is more expensive than Alternatives 1 through 3 and 6; however, it is considered a realistic alternative to off-site disposal since this strategy combines in situ stabilization with off-site disposal of TSCA-level contamination.

Alternative 6 offers an attractive remedial cost, but it is also invasive and would require preparing design drawings and specifications for public bid.

Land Use
As contaminated soils and sediments with PCB concentrations above the CP-51and 6 NYCRR Part 375 soil cleanup guidelines would be left in place for Alternatives 1 and 2, future uses at the site would be limited, based on current and anticipated future zoning. Alternatives 3, 4, 5, and 6 are designed to remove contaminated soils and sediments to levels acceptable for industrial/commercial uses and implementation of these alternatives would not necessarily limit future uses of the site to industrial/commercial uses; however, NYSDEC has indicated that the future use of the site will not change.

Table 5-1 Cost Estimate for Alternative 2 - Institutional Controls with Long Term Site Management

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Institutional Controls	Deed Restrictions Commercial/Industrial	Each	1	$6,000	$6,000
Subtotal					$6,000
Physical Barriers/Warnings					
Signs	Reflectorized 24"x24" sign mounted to fence	Each	4	$195.00	$780
Subtotal					$780
				Capital Cost Subtotal:	$6,780
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$6,658
				10% Legal, administrative, engineering fees, construction management:	$666
				15% Contingencies:	$1,099
				Total Capital Cost:	**$9,000**
Annual Costs					
Sediment/Soil Sampling (Labor)	2-people @ $100/hr; 8 hr/day; total of 10 samples	Day	1	$1,936.00	$1,936
Parameter Analysis	Includes TCL PCBs	Each	10	$100.00	$1,000
Data Evaluation and Reporting		HR	32	$100.00	$3,200
Subtotal					$6,136
				Annual Cost Subtotal:	$6,136
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$6,026
				10% Legal, administrative, engineering fees:	$603
				15% Contingencies:	$994
				Annual Cost Total:	**$7,622**
				30-Year Present Worth of Annual Costs:	**$118,000**
5-Year Costs (Periodic Costs)					
Institutional Controls	Maintain/update documentation	Each	1	$7,500.00	$7,500
5-year CERCLA reviews		Hr	80	$120.00	$9,600
Subtotal					$17,100
				5-Year Cost Subtotal:	$17,100
				Adjusted Annual Cost Subtotal for Albany, New York Location Factor (0.982):	$16,792
				10% Legal, administrative, engineering fees:	$1,679
				15% Contingencies:	$2,771
				5-Year Total:	**$21,242**
				30-Year Present Worth of 5-Year Costs:	**$60,000**
				2014 Total Present Worth Cost:	**$187,000**

Assumptions:

1. Present worth of costs assumes 5% annual interest rate.
4. Unit costs listed were obtained from 2014 RS Means Cost Data and engineering judgement.

Key:

HR = hour
LF = linear foot
LS = lump sum

Table 5-2a Cost Estimate for Excavation and Off-Site Disposal, Alternative 3

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings over 93 day duration	LS	1	$22,791.14	$22,791
Institutional Controls	Deed Restrictions Commercial	Each	1	$6,000	$6,000
Subtotal					$28,791
Site Preparation					
Surveying Crew	1-person crew @ $100/hr, 8hr/day; assume 30% of project duration	Day	18	$800.00	$14,400
ALTA Survey	For Easement and DEC Compliance	LS	1	$20,000.00	$20,000
Install Construction Fence	Chain link fence rental, 6' high	LF	3,364	$7.00	$23,548
Site Services	NYSDEC Field Office, 100% project duration	DAY	60	$500.00	$30,000
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$7,000.00	$14,000
Clearing and Grubbing	15' W EZ + 12' W accessway on opposite side of CP Rail ROW = 1655 LF x 27' W	SY	4,965	$1.83	$9,086
Subtotal					$111,034
Health and Safety					
Health and Safety	HSO, CAMP and Security Reporting	DAY	60	$950.00	$57,000
Subtotal					$57,000
Excavation					
Excavation (TSCA Soil)		CY	225	$14.70	$3,308
Excavation non-TSCA soil above CP-51 cleanup objectives		CY	2,589	$14.70	$38,064
PCB Contaminated Soil Disposal (Non-TSCA)	inclusive of all Non-TSCA soils, includes fees, taxes, transport costs and 40% fuel surcharge	TON	4,195	$30.00	$125,845
PCB Contaminated Soil Disposal (TSCA)	inclusive of TSCA soils only, includes fees, taxes, transport costs and 40% fuel surcharge	TON	365	$100.00	$36,450
Special Transport Fee	Albany NY to Model City & Return, 30-ton loads	Load	152	$500.00	$76,025
Dewatering	Methodology to be determined by Contractor; unit cost presumed as 2-4" pumps operating 24 hr./day, assume 80% of project duration	Day	48	$930.00	$44,640
PCB Wastewater Treatment during Remediation of Ditch and Sediments	Incl. 2,280 GPD Packaged WWTP, 40,000 Gal Baker Tank for Surge Capacity, 50 GPM Carbon Adsorption Tank 1,050 Fill and 3" Portable Trash Pump 300 GPM	LS	1	$27,653.00	$27,653
Waste Characterization Sampling	As req'd to satisfy off-site Landfill Requirements	Each	23	$93.84	$2,140
Confirmation Sampling - EPA SW-846, Method SW-8082	DEC Spec Section 01425; includes bottom and sidewall testing @ 1 per 500 ft^2	Each	84	$125.12	$10,560
Subtotal					$364,685
Reconstruction					
Common Fill	Restore ditch invert; includes 95% Compaction	CY	2,814	$38.91	$109,508
Restore Invert	Grade Full Length of ditch	SY	4,965	$1.83	$9,086
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	2,814	$1.05	$2,955
Erosion and Soil Control Blanket	Biodegradable blankets to temporarily stabilize invert and slopes until natural growth is	SY	3,189	$6.55	$20,887
Medium Rip Rap	To restore ditch invert, includes trucking and Installation	TON	235	$68.68	$16,140
Subtotal					$158,576
Site Restoration					
Topsoil	0.5 ft thick layer, material and installation	LCY	569	$39.60	$22,520
Hydroseeding	Native Steep Slope Mix with Annual Rye Grass mix incl. mulch and fertilizer; add 10% for disturbed areas outside of excavation area	SY	3,508	$1.48	$5,191
Plantings	Replant cleared trees along ditch, assume a density of one every 25 feet on center	Each	46	$215.00	$9,890
Demobilization		LS	1	$5,000.00	$5,000
Subtotal					$42,601
				Capital Cost Subtotal:	$762,687
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$748,959
				10% Legal, administrative, engineering fees:	$74,896
				15% Contingencies:	$123,578
				Total Capital Cost:	**$948,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				Present Worth of Annual Costs	**$0**

Table 5-2a Cost Estimate for Excavation and Off-Site Disposal, Alternative 3

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
5-Year Costs (Periodic Costs)					
Institutional Controls	Maintain/update documentation	Each	1	$7,500.00	$7,500
5-year CERCLA reviews		Hr	80	$120.00	$9,600
Subtotal					$17,100
				5-Year Cost Subtotal:	$17,100
				Adjusted Annual Cost Subtotal for Albany, New York Location Factor (0.982):	$16,792
				10% Legal, administrative, engineering fees:	$1,679
				15% Contingencies:	$2,771
				5-Year Total:	**$21,242**
				30-Year Present Worth of 5-Year Costs:	**$60,000**
				2014 Total Present Worth Cost:	**$1,008,000**

Assumptions:

1. Combined area of excavations = 28,699 SF, Estimated based on Figure 5-1a, 5-1b, and 5-1c
2. Excavation soil volume, TSCA and non-TSCA = 2,814 BCY, Estimated based on surface areas and contamination depths.
3. Disposal costs supplied by vendor, Waste Management, Inc., in 2013. Other unit costs listed were obtained from RS Means Cost Data and engineering judgment.
4. Length of Fence 3364 ft
5. Based typical soil properties, in-situ bulk density of site soils assumed =
   120 pounds per cubic foot
   1.62 Tons/BCY
6. Present value of costs assumes 5% annual interest rate.
7. Unit costs listed were obtained from 2014 RS Means Cost Data and engineering judgement.
8. RS Means Historical Cost Index used to escalate costs:

Year	Index #
2006	162
2007	169.4
2012	192.8
2014	202.7

Key:

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

Table 5-2b Cost Estimate for Excavation and Off-Site Disposal, Alternative 3

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings over 93 day duration	LS	1	$16,963.79	$16,964
Institutional Controls	Deed Restrictions Commercial	Each	1	$6,000	$6,000
Subtotal					$22,964
Site Preparation					
Surveying Crew	1-person crew @ $100/hr, 8hr/day; assume 30% of project duration	Day	14	$800.00	$10,800
ALTA Survey	For Easement and DEC Compliance	LS	1	$20,000.00	$20,000
Install Construction Fence	Chain link fence rental, 6' high	LF	3,364	$7.00	$23,548
Site Services	NYSDEC Field Office, 100% project duration	DAY	45	$500.00	$22,500
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$7,000.00	$14,000
Clearing and Grubbing	15' W EZ + 12' W accessway on opposite side of CSX ROW =1655 LF x 27' W	SY	4,965	$1.83	$9,086
Subtotal					$99,934
Health and Safety					
Health and Safety	HSO, CAMP and Security Reporting	DAY	45	$950.00	$42,750
Subtotal					$42,750
Excavation					
Excavation (TSCA Soil)		CY	225	$14.70	$3,308
Excavation non-TSCA soil above CP-51 cleanup objectives		CY	1,203	$14.70	$17,684
PCB Contaminated Soil Disposal (Non-TSCA)	inclusive of all Non-TSCA soils, includes fees, taxes, transport costs and 40% fuel surcharge	TON	1,949	$30.00	$58,466
PCB Contaminated Soil Disposal (TSCA)	inclusive of TSCA soils only, includes fees, taxes, transport costs and 40% fuel surcharge	TON	365	$100.00	$36,450
Special Transport Fee	Albany NY to Model City & Return, 30-ton loads	Load	77	$500.00	$38,575
Dewatering	Methodology to be determined by Contractor; unit cost presumed as 2-4" pumps operating 24 hr./day, assume 80% of project duration	Day	36	$930.00	$33,480
PCB Wastewater Treatment during Remediation of Ditch and Sediments	Incl. 2,280 GPD Packaged WWTP, 40,000 Gal Baker Tank for Surge Capacity, 50 GPM Carbon Adsorption Tank 1,050 Fill and 3" Portable Trash Pump 300 GPM	LS	1	$27,653.00	$27,653
Waste Characterization Sampling	As req'd to satisfy off-site Landfill Requirements	Each	12	$93.84	$1,089
Confirmation Sampling - EPA SW-846, Method SW-8082	DEC Spec Section 01425; includes bottom and sidewall testing @ 1 per 500 ft^2	Each	82	$125.12	$10,298
Subtotal					$227,002
Reconstruction					
Common Fill	Restore ditch invert; includes 95% Compaction	CY	1,428	$38.91	$55,563
Restore Invert	Grade Full Length of ditch	SY	4,965	$1.83	$9,086
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	1,428	$1.05	$1,499
Erosion and Soil Control Blanket	Biodegradable blankets to temporarily stabilize invert and slopes until natural growth is	SY	3,074	$6.55	$20,138
Medium Rip Rap	To restore ditch invert, includes trucking and Installation	TON	235	$68.68	$16,140
Subtotal					$102,426
Site Restoration					
Topsoil	0.5 ft thick layer, material and installation	LCY	1,379	$39.60	$54,608
Hydroseeding	Native Steep Slope Mix with Annual Rye Grass mix incl. mulch and fertilizer; add 10% for disturbed areas outside of excavation area	SY	3,382	$1.48	$5,005
Plantings	Replant cleared trees along ditch, assume a density of one every 25 feet on center	Each	44	$215.00	$9,525
Demobilization		LS	1	$5,000.00	$5,000
Subtotal					$74,138
				Capital Cost Subtotal:	$569,214
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$558,968
				10% Legal, administrative, engineering fees:	$55,897
				15% Contingencies:	$92,230
				Total Capital Cost:	**$707,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				Present Worth of Annual Costs	**$0**

Table 5-2b Cost Estimate for Excavation and Off-Site Disposal, Alternative 3

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
5-Year Costs (Periodic Costs)					
Institutional Controls	Maintain/update documentation	Each	1	$7,500.00	$7,500
5-year CERCLA reviews		Hr	80	$120.00	$9,600
Subtotal					$17,100
				5-Year Cost Subtotal:	$17,100
				Adjusted Annual Cost Subtotal for Albany, New York Location Factor (0.982):	$16,792
				10% Legal, administrative, engineering fees:	$1,679
				15% Contingencies:	$2,771
				5-Year Total:	**$21,242**
				30-Year Present Worth of 5-Year Costs:	**$60,000**
				2014 Total Present Worth Cost:	**$767,000**

Assumptions:

1. Combined area of excavations = 27,670 SF, Estimated based on Figure 5-1a, 5-1b, and 5-1c
2. Excavation soil volume, TSCA and non-TSCA = 1,428 BCY, Estimated based on surface areas and contamination depths.
3. Disposal costs supplied by vendor, Waste Management, Inc., in 2013. Other unit costs listed were obtained from RS Means Cost Data and engineering judgment.
4. Length of Fence 3364 ft
5. Based typical soil properties, in-situ bulk density of site soils assumed =
   120 pounds per cubic foot
   1.62 Tons/BCY
6. Present value of costs assumes 5% annual interest rate.
7. Unit costs listed were obtained from 2014 RS Means Cost Data and engineering judgement.
8. RS Means Historical Cost Index used to escalate costs:

Year	Index #
2006	162
2007	169.4
2012	192.8
2014	202.7

Key:

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

Table 5-3a Cost Estimate for Excavation and On-Site Thermal Treatment, Alternative 4

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings over 124 day duration	LS	1	$50,960.87	$50,961
Institutional Controls	Deed Restrictions Commercial	Each	1	$6,000.00	$6,000
Subtotal					$56,961
Site Preparation					
Surveying Crew	1-person crew @ $100/hr., 8hr/day; assume 30% of project duration	Day	36	$800.00	$28,800
ALTA Survey	For Easement and DEC Compliance	LS	1	$20,000.00	$20,000
Install Construction Fence	Chain link fence rental, 6' high	LF	3,364	$7.00	$23,548
Site Services	NYSDEC Field Office, 100% project duration	DAY	120	$500.00	$60,000
Temporary Utility tie in for HTTD unit	80 GPM non-potable and 3 phase/480V/1200 amp (Generator is available through EMSI)	LS	1	$6,000.00	$6,000
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$7,000.00	$14,000
Clearing and Grubbing	15' W EZ + 12' W accessway on opposite side of CSX ROW =1655 LF x 27' W	SY	4,965	$1.83	$9,086
RCRA Permit for HTTD Unit	Verify destruction removal efficiency of contaminants and particulate emissions, etc.	Each	1	$100,000.00	$100,000
Subtotal					$261,434
Health and Safety					
Health and Safety	HSO, CAMP and Security Reporting	DAY	120	$950.00	$114,000
Subtotal					$114,000
Excavation					
Excavation	Backhoe, hydraulic, 2 CY bucket = 130 CY/hr.	BCY	2,814	$1.92	$5,404
Transport contaminated soil to Stockpile	Front End Loader, 5 CY bucket	BCY	2,589	$1.94	$5,023
Transport contaminated soil from Stockpile	Front End Loader, 5 CY bucket	BCY	2,589	$1.94	$5,023
Stockpiling (prior to treatment)	300 Horsepower Bulldozer w/ 50' haul	BCY	2,589	$1.70	$4,402
Stockpiling (after treatment)	300 Horsepower Bulldozer w/ 50' haul	BCY	2,589	$1.70	$4,402
Excavation - TSCA only		CY	225	$14.70	$3,308
PCB Contaminated Soil Disposal	inclusive of TSCA soils only, includes fees, taxes, transport costs and 40% fuel surcharge	TON	365	$100.00	$36,450
Special Transport Fee	Albany NY to Model City & Return, 30-ton loads	Load	12	$500.00	$6,075
Dewatering	Methodology to be determined by Contractor; unit cost presumed as 2-4" pumps operating 24 hr./day, assume 80% of project duration	Day	96	$930.00	$89,280
PCB Wastewater Treatment during Remediation of Ditch and Sediments	Incl. 2,280 GPD Packaged WWTP, 40,000 Gal Baker Tank for Surge Capacity, 50 GPM Carbon Adsorption Tank 1,050 Fill and 3" Portable Trash Pump 300 GPM	LS	1	$27,653.00	$27,653
Waste Characterization Sampling	As req'd to satisfy off-site Landfill Requirements	Each	2	$93.84	$178
Confirmation Sampling - EPA SW-846, Method SW-8082	DEC Spec Section 01425; includes bottom and sidewall testing @ 1 per 500 ft^2	Each	84	$125.12	$10,560
Subtotal					$197,759
High Temperature Thermal Desorption					
HTTD (Installation)	Includes mob/demob, equipment, labor, permitting (if necessary)	LS	1	$107,156.98	$107,157
HTTD (Treatment)	Includes equipment, labor, maintenance, utilities	Ton	4,195	$142.86	$599,270
Soil Testing (influent)	Includes TCL PCBs (Engineers Allowance for operational days)	Each	50	$125.12	$6,256
Soil Testing (effluent)	Includes TCL PCBs (Engineers Allowance for operational days)	Each	50	$125.12	$6,256
Subtotal					$718,939
Utilities					
Electrical					
Electric Utility Pole	Wooden pole, 40' high	Each	1	$1,575.00	$1,575
Wiring to Electric Service	3 - 1/0 Wires	CLF	0	$465.00	$0
Wiring Connections to treatment facility	200 amp w/ 18 branch breakers, includes main breaker, meter, socket, panel board, ground rod (20' avg runs, #14/2 wiring)	EA	4	$2,825.00	$11,300
Switchboard	1200 amp	EA	1	$7,150.00	$7,150
Transformer	Dry type transformer, 3 Phase, 500 kVA	EA	1	$14,800.00	$14,800
Electrical Connection Fee		LS	1	$3,000.00	$3,000
Install Electrical Connections/Testing	0.25 Electrician Foreman, 1 electrician, 2	Day	5	$1,663.60	$8,318
Electric Meter	AC recording ammeter	Each	1	$8,475.00	$8,475
Water					
Pump Station	10' x 10' x 10' Fiberglass (insulated)	Each	1	$20,000.00	$20,000
Foundation	12' x 12' x 12" thick	Each	1	$1,275.00	$1,275
Treatment	6' Diameter Electric Automatic Pressure Filter Unit, 140 GPM	Each	1	$36,869.63	$36,870
Pump	125 GPM, 150' Head, 10 HP, Centrifugal Pump	Each	1	$3,910.58	$3,911
Pump Station Heater	1500 watt wall type, with blower	Each	1	$345.00	$345
Trenching	4'-6' Deep, 1/2 CY excavator	BCY	1,471	$8.95	$13,166
Pipe	4" PVC	LF	1,655	$8.55	$14,150
Pipe Bedding	6" Sand	LCY	787	$32.00	$25,185
Compaction (Trench only)	90% modified proctor	BCY	1,471	$5.25	$7,723
Backfill	4'-6' Deep, 1/2 CY excavator	BCY	787	$7.25	$5,706
Water meter		Each	1	$3,000.00	$3,000
Administrative Costs	Permitting	LS	1	$6,000.00	$6,000
Subtotal					$191,950

Table 5-3a Cost Estimate for Excavation and On-Site Thermal Treatment, Alternative 4

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Backfilling					
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	2,589	$1.70	$4,402
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	2,589	$1.05	$2,719
Subtotal					$7,121
Reconstruction					
Common Fill	Restore ditch invert; includes 95% Compaction	CY	225	$38.91	$8,755
Restore Invert	Grade Full Length of ditch	SY	4,965	$1.83	$9,086
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	225	$1.05	$236
Erosion and Soil Control Blanket	Biodegradable blankets to temporarily stabilize invert and slopes until natural growth is established	SY	3,189	$6.55	$20,887
Medium Rip Rap	To restore ditch invert, includes trucking and Installation	TON	235	$68.68	$16,140
Subtotal					$55,104
Site Restoration					
Topsoil	0.5 ft thick layer, material and installation	LCY	569	$39.60	$22,520
Hydroseeding	Native Steep Slope Mix with Annual Rye Grass mix incl. mulch and fertilizer; add 10% for disturbed areas outside of excavation area	SY	3,508	$1.48	$5,191
Plantings	Replant cleared trees along ditch, assume a density of one every 25 feet on center	Each	46	$215.00	$9,890
Demobilization		LS	1	$5,000.00	$5,000
Subtotal					$42,601
Physical Barriers/Warnings					
Fence at HTTD Unit	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	1,600	$30.00	$48,000
Gate	Double swing gates, incl posts with 12' opening	Each	3	$1,100.00	$3,300
Signs	Reflectorized 24"x24" sign mounted to fence	Each	4	$195.00	$780
Subtotal					$52,080
				Capital Cost Subtotal:	$1,697,949
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$1,667,386
				10% Legal, administrative, engineering fees:	$166,739
				15% Contingencies:	$275,119
				Total Capital Cost:	**$2,110,000**
Annual Costs					
Not applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				30-Year Present Worth of Annual Costs:	**$0**
5-Year Costs					
Institutional Controls	Maintain/update documentation	Each	1	$7,500.00	$7,500
5-year CERCLA reviews		Hr	80	$120.00	$9,600
Subtotal					$17,100
				5-Year Cost Subtotal:	$17,100
				Adjusted Annual Cost Subtotal for Albany, New York Location Factor (0.982):	$16,792
				10% Legal, administrative, engineering fees:	$1,679
				15% Contingencies:	$2,771
				5-Year Total:	**$21,242**
				30-Year Present Worth of 5-Year Costs:	**$60,000**
				2014 Total Present Worth Cost:	**$2,170,000**

Assumptions:

1. Combined area of excavations = 28,699 SF, Estimated based on Figure 5-2a, 5-2b, and 5-2c
2. Excavation soil volume, TSCA and non-TSCA = 2,814 BCY, Estimated based on surface areas and contamination depths.
3. TSCA soil volume to be disposed off-site = 225
4. Non-TSCA volume to be treated on-site = 2,589
3. Disposal costs supplied by vendor, Waste Management, Inc., in 2013. Other unit costs listed were obtained from RS Means Cost Data and engineering judgment.
4. Length of Fence 3364 ft
5. Based typical soil properties, in-situ bulk density of site soils assumed =
   120 pounds per cubic foot
   1.62 Tons/BCY
6. Present value of costs assumes 5% annual interest rate.
7. Unit costs listed were obtained from 2014 RS Means Cost Data and engineering judgement.
8. RS Means Historical Cost Index used to escalate costs:

Year	Index #
2006	162
2007	169.4
2012	192.8
2014	202.7

Key:

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

Table 5-3b Cost Estimate for Excavation and On-Site Thermal Treatment, Alternative 4

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings over 124 day duration	LS	1	$39,787.84	$39,788
Institutional Controls	Deed Restrictions Commercial	Each	1	$6,000.00	$6,000
Subtotal					$45,788
Site Preparation					
Surveying Crew	1-person crew @ $100/hr., 8hr/day; assume 30% of project duration	Day	35	$800.00	$27,600
ALTA Survey	For Easement and DEC Compliance	LS	1	$20,000.00	$20,000
Install Construction Fence	Chain link fence rental, 6' high	LF	3,364	$7.00	$23,548
Site Services	NYSDEC Field Office, 100% project duration	DAY	115	$500.00	$57,500
Temporary Utility tie in for HTTD unit	80 GPM non-potable and 3 phase/480V/1200 amp (Generator is available through EMSI)	LS	1	$6,000.00	$6,000
Construct Decontamination Pad & Containmen	For equipment & personnel	Setups	2	$7,000.00	$14,000
Clearing and Grubbing	15' W EZ + 12' W accessway on opposite side of CSX ROW =1655 LF x 27' W	SY	4,965	$1.83	$9,086
RCRA Permit for HTTD Unit	Verify destruction removal efficiency of contaminants and particulate emissions, etc.	Each	1	$100,000.00	$100,000
Subtotal					$257,734
Health and Safety					
Health and Safety	HSO, CAMP and Security Reporting	DAY	115	$950.00	$109,250
Subtotal					$109,250
Excavation					
Excavation	Backhoe, hydraulic, 2 CY bucket = 130 CY/hr.	BCY	1,428	$1.92	$2,742
Transport contaminated soil to Stockpile	Front End Loader, 5 CY bucket	BCY	1,203	$1.94	$2,334
Transport contaminated soil from Stockpile	Front End Loader, 5 CY bucket	BCY	1,203	$1.94	$2,334
Stockpiling (prior to treatment)	300 Horsepower Bulldozer w/ 50' haul	BCY	1,203	$1.70	$2,045
Stockpiling (after treatment)	300 Horsepower Bulldozer w/ 50' haul	BCY	1,203	$1.70	$2,045
PCB Contaminated Soil Disposal	inclusive of TSCA soils only, includes fees, taxes, transport costs and 40% fuel surcharge	TON	365	$100.00	$36,450
Special Transport Fee	Albany NY to Model City & Return, 30-ton loads	Load	12	$500.00	$6,075
Dewatering	Methodology to be determined by Contractor; unit cost presumed as 2-4" pumps operating 24 hr./day, assume 80% of project duration	Day	92	$930.00	$85,560
PCB Wastewater Treatment during Remediation of Ditch and Sediments	Incl. 2,280 GPD Packaged WWTP, 40,000 Gal Baker Tank for Surge Capacity, 50 GPM Carbon Adsorption Tank 1,050 Fill and 3" Portable Trash Pump 300 GPM	LS	1	$27,653.00	$27,653
Waste Characterization Sampling	As req'd to satisfy off-site Landfill Requirements	Each	2	$93.84	$178
Confirmation Sampling - EPA SW-846, Method SW-8082	DEC Spec Section 01425; includes bottom and sidewall testing @ 1 per 500 ft^2	Each	82	$125.12	$10,298
Subtotal					$177,714
High Temperature Thermal Desorption					
HTTD (Installation)	Includes mob/demob, equipment, labor, permitting (if necessary)	LS	1	$107,156.98	$107,157
HTTD (Treatment)	Includes equipment, labor, maintenance, utilities	Ton	1,949	$142.86	$278,413
Soil Testing (influent)	Includes TCL PCBs (Engineers Allowance for operational days)	Each	50	$125.12	$6,256
Soil Testing (effluent)	Includes TCL PCBs (Engineers Allowance for operational days)	Each	50	$125.12	$6,256
Subtotal					$398,082
Utilities					
Electrical					
Electric Utility Pole	Wooden pole, 40' high	Each	1	$1,575.00	$1,575
Wiring to Electric Service	3 - 1/0 Wires	CLF	1	$465.00	$465
Wiring Connections to treatment facility	200 amp w/ 18 branch breakers, includes main breaker, meter, socket, panel board, ground rod (20' avg runs, #14/2 wiring)	EA	4	$2,825.00	$11,300
Switchboard	1200 amp	EA	1	$7,150.00	$7,150
Transformer	Dry type transformer, 3 Phase, 500 kVA	EA	1	$14,800.00	$14,800
Electrical Connection Fee		LS	1	$3,000.00	$3,000
Install Electrical Connections/Testing	0.25 Electrician Foreman, 1 electrician, 2	Day	5	$1,663.60	$8,318
Electric Meter	AC recording ammeter	Each	1	$8,475.00	$8,475
Water					
Pump Station	10' x 10' x 10' Fiberglass (insulated)	Each	1	$20,000.00	$20,000
Foundation	12' x 12' x 12" thick	Each	1	$1,275.00	$1,275
Treatment	6' Diameter Electric Automatic Pressure Filter Unit, 140 GPM	Each	1	$36,869.63	$36,870
Pump	125 GPM, 150' Head, 10 HP, Centrifugal Pump	Each	1	$3,910.58	$3,911
Pump Station Heater	1500 watt wall type, with blower	Each	1	$345.00	$345
Trenching	4'-6' Deep, 1/2 CY excavator	BCY	1,471	$8.95	$13,166
Pipe	4" PVC	LF	1,655	$8.55	$14,150
Pipe Bedding	6" Sand	LCY	787	$32.00	$25,185
Compaction (Trench only)	90% modified proctor	BCY	1,471	$5.25	$7,723
Backfill	4'-6' Deep, 1/2 CY excavator	BCY	787	$7.25	$5,706
Water meter		Each	1	$3,000.00	$3,000
Administrative Costs	Permitting	LS	1	$6,000.00	$6,000
Subtotal					$192,415

Table 5-3b Cost Estimate for Excavation and On-Site Thermal Treatment, Alternative 4

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Backfilling					
Placement of Backfill	300 Horsepower Bulldozer w/ 50' haul	BCY	1,428	$1.70	$2,428
Restore Invert	Grade Full Length of ditch	SY	4,965	$1.83	$9,086
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	1,428	$1.05	$1,499
Subtotal					$13,013
Reconstruction					
Erosion and Soil Control Blanket	Biodegradable blankets to temporarily stabilize invert and slopes until natural growth is established	SY	3,074	$6.55	$20,138
Medium Rip Rap	To restore ditch invert, includes trucking and Installation	TON	235	$68.68	$16,140
Reinstall Remediated soil fill/Rip-Rap	300 Horsepower Bulldozer w/ 50' haul	BCY	2,000	$1.70	$3,400
Subtotal					$39,677
Site Restoration					
Topsoil	0.5 ft thick layer, material and installation	LCY	548	$39.60	$21,712
Hydroseeding	Native Steep Slope Mix with Annual Rye Grass mix incl. mulch and fertilizer; add 10% for disturbed areas outside of excavation area	SY	3,382	$1.48	$5,005
Plantings	Replant cleared trees along ditch, assume a density of one every 25 feet on center	Each	44	$215.00	$9,525
Demobilization		LS	1	$5,000.00	$5,000
Subtotal					$41,241
Physical Barriers/Warnings					
Fence at HTTD Unit	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	1,600	$30.00	$48,000
Gate	Double swing gates, incl posts with 12' opening	Each	3	$1,100.00	$3,300
Signs	Reflectorized 24"x24" sign mounted to fence	Each	4	$195.00	$780
Subtotal					$52,080
				Capital Cost Subtotal:	$1,326,994
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982)	$1,303,108
				10% Legal, administrative, engineering fees:	$130,311
				15% Contingencies:	$215,013
				Total Capital Cost:	**$1,649,000**
Annual Costs					
Not applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982)	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				30-Year Present Worth of Annual Costs:	**$0**
5-Year Costs					
Institutional Controls	Maintain/update documentation	Each	1	$7,500.00	$7,500
5-year CERCLA reviews		Hr	80	$120.00	$9,600
Subtotal					$17,100
				5-Year Cost Subtotal:	$17,100
				Adjusted Annual Cost Subtotal for Albany, New York Location Factor (0.982)	$16,792
				10% Legal, administrative, engineering fees:	$1,679
				15% Contingencies:	$2,771
				5-Year Total:	**$21,242**
				30-Year Present Worth of 5-Year Costs:	**$60,000**
				2014 Total Present Worth Cost:	**$1,709,000**

Assumptions:

1. Combined area of excavations = 27,670 SF, Estimated based on Figure 5-2a, 5-2b, and 5-2c
2. Excavation soil volume, TSCA and non-TSCA = 1,428 BCY, Estimated based on surface areas and contamination depths.
3. TSCA soil volume to be disposed off-site = 225
4. Non-TSCA volume to be treated on-site = 1,203
3. Disposal costs supplied by vendor, Waste Management, Inc., in 2013. Other unit costs listed were obtained from RS Means Cost Data and engineering judgment.
4. Length of Fence 3364 ft
5. Based typical soil properties, in-situ bulk density of site soils assumed =
   120 pounds per cubic foot
   1.62 Tons/BCY
6. Present value of costs assumes 5% annual interest rate.
7. Unit costs listed were obtained from 2014 RS Means Cost Data and engineering judgement.
8. RS Means Historical Cost Index used to escalate costs:

Year	Index #
2006	162
2007	169.4
2012	192.8
2014	202.7

Key:

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

Table 5-4a Cost Estimate for Alternate 5 - In Situ PCB Solidification w/ Off-Site Disposal of TSCA Waste

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings over 124 day duration	LS	1	$36,001.99	$36,002
Institutional Controls	Deed Restrictions Commercial	Each	1	$6,000.00	$6,000
Subtotal					$42,002
Site Preparation					
Surveying Crew	1-person crew @ $100/hr., 8hr/day; assume 30% of project duration	Day	24	$800.00	$19,200
ALTA Survey	For Easement and DEC Compliance	LS	1	$20,000.00	$20,000
Install Construction Fence	Chain link fence rental, 6' high	LF	3,364	$7.00	$23,548
Site Services	NYSDEC Field Office, 100% project duration	DAY	80	$500.00	$40,000
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$7,000.00	$14,000
Health and Safety					$0
Health and Safety	HSO, CAMP and Security Reporting	DAY	80	$950.00	$76,000
Subtotal					$192,748
Excavation					
Dewatering	Methodology to be determined by Contractor; unit cost presumed as 2-4" pumps operating 24 hr./day, assume 80% of project duration	Day	64	$930.00	$59,520
PCB Wastewater Treatment during Remediation of Ditch and Sediments	Incl. 2,280 GPD Packaged WWTP, 40,000 Gal Baker Tank for Surge Capacity, 50 GPM Carbon Adsorption Tank 1,050 Fill and 3" Portable Trash Pump 300 GPM	LS	1	$27,653.00	$27,653
Excavation (TSCA Soil)		CY	225	$14.70	$3,308
PCB Contaminated Soil Disposal	inclusive of TSCA soils only, includes fees, taxes, transport costs and 40% fuel surcharge	TON	365	$100.00	$36,450
Special Transport Fee	Albany NY to Model City & Return, 30-ton loads	Load	12	$500.00	$6,075
Excavation and regrading of west bank	Due to increase in soil volume from solidification of about 50%	CY	2,364	$14.70	$34,757
Waste Characterization Sampling	As req'd to satisfy off-site Landfill Requirements	Each	2	$93.84	$178
Confirmation Sampling - EPA SW-846, Method SW-8082	DEC Spec Section 01425; includes bottom and sidewall testing @ 1 per 500 ft^2	Each	84	$125.12	$10,560
Subtotal					$178,501
In Situ Stabilization and Solidification					
Soil Augering and Amendment	Geo-Con Excavator Mounted Auger w/ pressure feed mobile Mixer	CY	2,589	$250.00	$647,350
Subtotal					$647,350
Site Restoration					
Backfill	to offset TSCA volume removed from site	CY	225	$38.91	$8,755
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	225	$1.05	$236
Topsoil	0.5 ft thick layer, material and installation	LCY	569	$39.60	$22,520
Erosion and Soil Control Blanket	Biodegradable blankets to temporarily stabilize invert and slopes until natural growth is established	SY	3,189	$6.55	$20,887
Medium Rip Rap	To restore ditch invert, includes trucking and Installation	TON	235	$68.68	$16,140
Hydroseeding	Native Steep Slope Mix with Annual Rye Grass mix incl. mulch and fertilizer; add 10% for disturbed areas outside of excavation area	SY	3,508	$1.48	$5,191
Plantings	Replant cleared trees along ditch, assume a density of one every 25 feet on center	Each	46	$215.00	$9,890
Demobilization		LS	1	$5,000.00	$5,000
Subtotal					$88,619
Physical Barriers/Warnings					
Fence at HTTD Unit	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	1,600	$30.00	$48,000
Gate	Double swing gates, incl posts with 12' opening	Each	3	$1,100.00	$3,300
Signs	Reflectorized 24"x24" sign mounted to fence	Each	4	$195.00	$780
Subtotal					$52,080
				Capital Cost Subtotal:	$1,206,491
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$1,184,774
				10% Legal, administrative, engineering fees, construction management:	$118,477
				15% Contingencies:	$195,488
				Total Capital Cost:	**$1,499,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				30-Year Present Worth of Annual Costs:	**$0**

Table 5-4a Cost Estimate for Alternate 5 - In Situ PCB Solidification w/ Off-Site Disposal of TSCA Waste

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
5-Year Costs (Periodic Costs)					
Institutional Controls	Maintain/update documentation	Each	1	$7,500.00	$7,500
5-year CERCLA reviews		Hr	80	$120.00	$9,600
Subtotal					$17,100
				5-Year Cost Subtotal:	$17,100
	Adjusted Annual Cost Subtotal for Albany, New York Location Factor (0.982):				$16,792
				10% Legal, administrative, engineering fees:	$1,679
				15% Contingencies:	$2,771
				5-Year Total:	**$21,242**
				30-Year Present Worth of 5-Year Costs:	**$60,000**
				2014 Total Present Worth Cost:	**$1,559,000**

Assumptions:

1. Combined area of excavations = 28,699 SF, Estimated based on Figure 5-3a, 5-3b, and 5-3c
2. Excavation soil volume, TSCA and non-TSCA = 2,814 BCY, Estimated based on surface areas and contamination depths.
3. TSCA soil volume to be disposed off-site = 225
4. Non-TSCA volume to be treated on-site = 2,589
3. Disposal costs supplied by vendor, Waste Management, Inc., in 2013. Other unit costs listed were obtained from RS Means Cost Data and engineering judgment.
4. Length of Fence 3364 ft
5. Based typical soil properties, in-situ bulk density of site soils assumed =
   120 pounds per cubic foot
   1.62 Tons/BCY
6. Present value of costs assumes 5% annual interest rate.
7. Unit costs listed were obtained from 2014 RS Means Cost Data and engineering judgement.
8. RS Means Historical Cost Index used to escalate costs:

Year	Index #
2006	162
2007	169.4
2012	192.8
2014	202.7

Key:

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

Table 5-4b Cost Estimate for Alternate 5 - In Situ PCB Solidification w/ Off-Site Disposal of TSCA Waste

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings over 124 day duration	LS	1	$24,153.83	$24,154
Institutional Controls	Deed Restrictions Commercial	Each	1	$6,000.00	$6,000
Subtotal					$30,154
Site Preparation					
Surveying Crew	1-person crew @ $100/hr., 8hr/day; assume 30% of project duration	Day	23	$800.00	$18,000
ALTA Survey	For Easement and DEC Compliance	LS	1	$20,000.00	$20,000
Install Construction Fence	Chain link fence rental, 6' high	LF	3,364	$7.00	$23,548
Site Services	NYSDEC Field Office, 100% project duration	DAY	75	$500.00	$37,500
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$7,000.00	$14,000
Health and Safety					
Health and Safety	HSO, CAMP and Security Reporting	DAY	75	$950.00	$71,250
Subtotal					$184,298
Excavation					
Dewatering	Methodology to be determined by Contractor; unit cost presumed as 2-4" pumps operating 24 hr./day, assume 80% of project duration	Day	60	$930.00	$55,800
PCB Wastewater Treatment during Remediation of Ditch and Sediments	Incl. 2,280 GPD Packaged WWTP, 40,000 Gal Baker Tank for Surge Capacity, 50 GPM Carbon Adsorption Tank 1,050 Fill and 3" Portable Trash Pump 300 GPM	LS	1	$27,653.00	$27,653
Excavation (TSCA Soil)		CY	225	$14.70	$3,308
PCB Contaminated Soil Disposal	inclusive of TSCA soils only, includes fees, taxes, transport costs and 40% fuel surcharge	TON	365	$100.00	$36,450
Special Transport Fee	Albany NY to Model City & Return, 30-ton loads	Load	12	$500.00	$6,075
Excavation and regrading of west bank	Due to increase in soil volume from solidification of about 50%	CY	978	$14.70	$14,377
Waste Characterization Sampling	As req'd to satisfy off-site Landfill Requirements	Each	2	$93.84	$178
Confirmation Sampling - EPA SW-846, Method SW-8082	DEC Spec Section 01425; includes bottom and sidewall testing @ 1 per 500 ft^2	Each	82	$125.12	$10,298
Subtotal					$154,138
In Situ Stabilization and Solidification					
Soil Augering and Amendment	Geo-Con Excavator Mounted Auger w/ pressure feed mobile Mixer	CY	1,203	$250.00	$300,750
Subtotal					$300,750
Site Restoration					
Backfill	to offset TSCA volume removed from site	CY	225	$38.91	$8,755
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	225	$1.05	$236
Topsoil	0.5 ft thick layer, material and installation	LCY	548	$39.60	$21,712
Erosion and Soil Control Blanket	Biodegradable blankets to temporarily stabilize invert and slopes until natural growth is established	SY	3,074	$6.55	$20,138
Medium Rip Rap	To restore ditch invert, includes trucking and Installation	TON	235	$68.68	$16,140
Hydroseeding	Native Steep Slope Mix with Annual Rye Grass mix incl. mulch and fertilizer; add 10% for disturbed areas outside of excavation area	SY	3,382	$1.48	$5,005
Plantings	Replant cleared trees along ditch, assume a density of one every 25 feet on center	Each	44	$215.00	$9,525
Demobilization		LS	1	$5,000.00	$5,000
Subtotal					$86,510
Physical Barriers/Warnings					
Fence at HTTD Unit	Chain link industrial, 6' H, 6 gauge wire with 3 strands barb wire	LF	1,600	$30.00	$48,000
Gate	Double swing gates, incl posts with 12' opening	Each	3	$1,100.00	$3,300
Signs	Reflectorized 24"x24" sign mounted to fence	Each	4	$195.00	$780
Subtotal					$52,080
				Capital Cost Subtotal:	$812,935
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$798,302
				10% Legal, administrative, engineering fees, construction management:	$79,830
				15% Contingencies:	$131,720
				Total Capital Cost:	**$1,010,000**

Table 5-4b Cost Estimate for Alternate 5 - In Situ PCB Solidification w/ Off-Site Disposal of TSCA Waste

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	**$0**
				30-Year Present Worth of Annual Costs:	**$0**
5-Year Costs (Periodic Costs)					
Institutional Controls	Maintain/update documentation	Each	1	$7,500.00	$7,500
5-year CERCLA reviews		Hr	80	$120.00	$9,600
Subtotal					$17,100
				5-Year Cost Subtotal:	$17,100
				Adjusted Annual Cost Subtotal for Albany, New York Location Factor (0.982):	$16,792
				10% Legal, administrative, engineering fees:	$1,679
				15% Contingencies:	$2,771
				5-Year Total:	**$21,242**
				30-Year Present Worth of 5-Year Costs:	**$60,000**
				2014 Total Present Worth Cost:	**$1,070,000**

Assumptions:

1. Combined area of excavations = 27,670 SF, Estimated based on Figure 5-3a, 5-3b, and 5-3c
2. Excavation soil volume, TSCA and non-TSCA = 1,428 BCY, Estimated based on surface areas and contamination depths.
3. TSCA soil volume to be disposed off-site = 225
4. Non-TSCA volume to be treated on-site = 1,203
3. Disposal costs supplied by vendor, Waste Management, Inc., in 2013. Other unit costs listed were obtained from RS Means Cost Data and engineering judgment.
4. Length of Fence 3364 ft
5. Based typical soil properties, in-situ bulk density of site soils assumed =
   120 pounds per cubic foot
   1.62 Tons/BCY
6. Present value of costs assumes 5% annual interest rate.
7. Unit costs listed were obtained from 2014 RS Means Cost Data and engineering judgement.
8. RS Means Historical Cost Index used to escalate costs:

Year	Index #
2006	162
2007	169.4
2012	192.8
2014	202.7

Key:

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

Table 5-5 Cost Estimate for Excavation and Off-Site Disposal TSCA + >25ppm, Alternative 6

Item Description	Comment	Unit	Quantity	Unit Cost	Cost
Capital Costs					
Construction Management (2.5% of total capital cost)	Includes submittals, reporting, meetings over project duration	LS	1	$8,173.38	$8,173
Institutional Controls	Deed Restrictions Industrial	Each	1	$6,000	$6,000
Subtotal					$14,173
Site Preparation					
Surveying Crew	1-person crew @ $100/hr, 8hr/day; assume 30% of project duration	Day	9	$800.00	$7,200
ALTA Survey	For Easement and DEC Compliance	LS	1	$10,000.00	$10,000
Install Construction Fence	Chain link fence rental, 6' high	LF	3,364	$7.00	$23,548
Site Services	NYSDEC Field Office, 100% project duration	DAY	30	$500.00	$15,000
Construct Decontamination Pad & Containment	For equipment & personnel	Setups	2	$7,000.00	$14,000
Clearing and Grubbing	15' W EZ + 12' W accessway on opposite side of CP Rail ROW = 1655 LF x 27' W	SY	4,965	$1.83	$9,086
Subtotal					$78,834
Health and Safety					
Health and Safety	HSO, CAMP and Security Reporting	DAY	30	$950.00	$28,500
Subtotal					$28,500
Excavation					
Excavation 6 NYCRR Part 375 Restricted Industrial	TSCA and Non-TSCA remediation	CY	288	$14.70	$4,234
PCB Contaminated Soil Disposal (Non-TSCA)	inclusive of all Non-TSCA soils, includes fees, taxes, transport costs and 40% fuel surcharge	TON	103	$30.00	$3,090
PCB Contaminated Soil Disposal (TSCA)	inclusive of TSCA soils only, includes fees, taxes, transport costs and 40% fuel surcharge	TON	365	$100.00	$36,500
Special Transport Fee	Albany NY to Model City & Return, 30-ton loads	Load	12	$500.00	$6,075
Transport clean soil (cutback) to OU-3 and grade	Front End Loader, 5 CY bucket	BCY	889	$1.94	$1,724
Dewatering	Methodology to be determined by Contractor; unit cost presumed as 2-4" pumps operating 24 hr./day, assume 80% of project duration	Day	24	$930.00	$22,320
PCB Wastewater Treatment during Remediation of Ditch and Sediments	Incl. 2,280 GPD Packaged WWTP, 40,000 Gal Baker Tank for Surge Capacity, 50 GPM Carbon Adsorption Tank 1,050 Fill and 3" Portable Trash Pump 300 GPM	LS	1	$27,653.00	$27,653
Waste Characterization Sampling	As req'd to satisfy off-site Landfill Requirements	Each	2	$93.84	$225
Confirmation Sampling - EPA SW-846, Method SW-8082	DEC Spec Section 01425; includes bottom and sidewall testing @ 1 per 500 ft2	Each	35	$125.12	$4,342
Subtotal					$106,163
Reconstruction					
Common Fill	Restore ditch invert; includes 95% Compaction	CY	288	$38.91	$11,222
Restore Invert	Grade Full Length of ditch	SY	4,965	$1.83	$9,086
Compaction	Vibrating roller, 12" compacted lifts, 4 passes	BCY	288	$1.05	$303
Erosion and Soil Control Blanket	Biodegradable blankets to temporarily stabilize invert and slopes until natural growth is	SY	432	$6.55	$2,832
Medium Rip Rap	To restore ditch invert, includes trucking and Installation	TON	235	$68.68	$16,140
Subtotal					$39,582
Site Restoration					
Topsoil	0.5 ft thick layer, material and installation	LCY	77	$39.60	$3,053
Hydroseeding	Native Steep Slope Mix with Annual Rye Grass mix incl. mulch and fertilizer; add 10% for disturbed areas outside of excavation area	SY	476	$1.48	$704
Plantings	Replant cleared trees along ditch, assume a density of one every 25 feet on center	Each	6	$215.00	$1,355
Demobilization		LS	1	$5,000.00	$5,000
Subtotal					$10,111
				Capital Cost Subtotal:	$277,364
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$272,371
				10% Legal, administrative, engineering fees:	$27,237
				15% Contingencies:	$44,941
				Total Capital Cost:	**$345,000**
Annual Costs					
Not Applicable				$0.00	$0
Subtotal					$0
				Annual Cost Subtotal:	$0
				Adjusted Capital Cost Subtotal for Albany, New York Location Factor (0.982):	$0
				10% Legal, administrative, engineering fees:	$0
				15% Contingencies:	$0
				Annual Cost Total:	$0
				Present Worth of Annual Costs	**$0**
5-Year Costs (Periodic Costs)					
Institutional Controls	Maintain/update documentation	Each	1	$7,500.00	$7,500
5-year CERCLA reviews		Hr	80	$120.00	$9,600
Subtotal					$17,100
				5-Year Cost Subtotal:	$17,100
				Adjusted Annual Cost Subtotal for Albany, New York Location Factor (0.982):	$16,792
				10% Legal, administrative, engineering fees:	$1,679
				15% Contingencies:	$2,771
				5-Year Total:	**$21,242**
				30-Year Present Worth of 5-Year Costs:	**$60,000**
				2014 Total Present Worth Cost:	**$405,000**

Assumptions:

1. Combined area of excavations = 3,891 SF, Estimated based on Figure 5-1a, 5-1b, and 5-1c
2. Excavation soil volume, TSCA and non-TSCA = 288 BCY, Estimated based on surface areas and contamination depths.
3. Disposal costs supplied by vendor, Waste Management, Inc., in 2013. Other unit costs listed were obtained from RS Means Cost Data and engineering judgment.
4. Length of Fence 3364 ft
5. Based typical soil properties, in-situ bulk density of site soils assumed =
   120 pounds per cubic foot
   1.62 Tons/BCY
6. Present value of costs assumes 5% annual interest rate.
7. Unit costs listed were obtained from 2014 RS Means Cost Data and engineering judgement.
8. RS Means Historical Cost Index used to escalate costs:

Year	Index #
2006	162
2007	169.4
2012	192.8
2014	202.7

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

Table 5-6 Summary of Total Present Values of Remedial Alternatives at Adirondack Steel OU-2 CP Rail Ditch under the Two Proposed Soil Cleanup Objectives for PCBs[1,2]

Description	Alternative 1	Alternative 2	Alternative 3		Alternative 4		Alternative 5		Alternative 6
			Excavation and Off-Site Disposal [1,2]		Excavation and On-Site Treatment by HTTD [1,2]		In-Situ Solidification [1,2]		Excavation and Off-Site Disposal[9]
	No Action	No Further Action with Site Management	PART 375 Commercial PCB SCOs	CP-51 PCB SCOs	PART 375 Commercial PCB SCOs	CP-51 PCB SCOs	PART 375 Commercial PCB SCOs	CP-51 PCB SCOs	PART 375 Industrial PCB SCOs
Estimated Total Project Duration[3]	0	30 Years	3 Months	2 Months	5 Months	4 Months	4 Months	3.5 Months	1 Month
Capital Cost	$0	$9,000	$948,000	$707,000	$2,110,000	$1,649,000	$1,499,000	$1,010,000	$345,000
Annual O&M[4,5]	$0	$118,000	$0	$0	$0	$0	$0	$0	$0
Periodic O&M[4,6,8]	$0	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000
2014 Total Present Value[7]	**$0**	**$187,000**	**$1,008,000**	**$767,000**	**$2,170,000**	**$1,709,000**	**$1,559,000**	**$1,070,000**	**$405,000**

Key:

HTTD = High-temperature thermal desorption
NYCRR = New York Code of Rules and Regulations
O&M = Operations and Maintenance
OU = Operable Unit
PCB = Polychlorinated biphenyl
ppm = parts per million
SCO = Soil Cleanup Objective

Notes:

1 - Soil Cleanup Objective for PCBs under 6 NYCRR Part 375-Restricted Use-Commercial Table 375-6.8 (b) is 1 ppm in surface and subsurface soils.
2 - Soil Cleanup Objective for PCBs under NYSDEC CP-51 Restricted Use-Commercial is 1 ppm in surface (0-1 feet below ground surface) and 10 ppm subsurface soils.
3 - Durations based on Engineers Estimate of NYSDEC Div. of Environmental Remediation Construction Observation Projects through Substantial Completion
4 - Project duration after installation of engineering control includes 30 years of OM&M and periodic costs
5 - Annual costs would typically include groundwater monitoring and reporting.
6 - Periodic costs would typically include maintaining/updating institutional controls and partial fence replacement.
7 - The Total Present Value of Alternative represents the estimated present value of the capital costs and 30 years of annual and periodic costs.
8 - Under CERCLA 121 (c) five-year reviews should be conducted for sites that implement remedial actions that, upon completion, would leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure.
9 - Soil Cleanup Objective for PCB's under 6 NYCRR Part 375-Restricted Use-Industrial Table 375-6.8 (b) is 25 ppm in surface and subsurface soils.

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