Binder 4

REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT VOLUME II

BICC Cables Corporation
One Point Street
Yonkers, New York

December 2003; Revised 10 September 2004

Prepared For:

BICC Cables Corporation
254 South Main Street
New City, NY 10956

Prepared by:

Environmental Resources Management, Inc.
475 Park Avenue South
New York, NY 10016

Roux Associates, Inc.
209 Shafter Street
Islandia, NY 11749

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

7.0 REMEDIAL GOALS AND REMEDIAL ACTION OBJECTIVES

This section presents the remedial goals and remedial action objectives (RAOs) established for the Site media of interest (i.e., soil/fill, ground water, Site-related sediment and interior building materials). The remedial goals are common to all inactive hazardous waste sites on the registry and are derived from the statute (i.e., 6NYCRR Part 375), the Administrative Order on Consent Index No. D-3-0001-00-03 between BICC and NYSDEC (hereafter referred to as the "Registry Order") and NYSDEC guidance. The remedial goals express that the intent of the remedial actions is to restore the Site to conditions prior to disposal within certain confines. Examples of relevant remedial goals are set forth in the draft document prepared by the Division of Environmental Remediation (DER) titled *DER-10, Draft Technical Guidance for Site Investigation and Remediation*, December 2002 (NYSDEC, 2002).

The remedial goals for this Site are:

- Restoration to pre-disposal/pre-release conditions, to the extent feasible and authorized by law; and,
- Eliminate or mitigate all significant threats to the public health and the environment caused by Site-related operations through the proper application of scientific and engineering principles.

The remedial goals provide the broad framework in which RAOs can be defined for specific media that have been impacted by the Site operations.

The National Contingency Plan (NCP) requires that remedial action objectives be established for Site media. Compliance with the NCP is a requirement of the Registry Order. In addition, 6NYCRR375-1.10(c) requires that activities conducted as part of the NYSDEC Inactive Hazardous Waste Disposal Site (IHWDS) program not be inconsistent with the NCP. Guidance on developing RAOs is provided in NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. 4030 (NYSDEC, 1990) and examples of RAOs are also set forth in *DER-10, Draft Technical Guidance for Site Investigation and Remediation* (NYSDEC, 2002).

The RAOs are media-specific targets that are aimed at protecting the public health and the environment. As such, the RAOs are based on the results of the human health risk assessment (HHRA) presented in Sections 4.0 and 5.0, the fish and wildlife impact assessment (FWIA) presented in Section 6.0 and the fate and transport analysis presented in Sections 2.6.4 and 3.2.11.

In the case of protection of human health, RAOs usually reflect the concentration of a chemical of potential concern (COPC) and the potential exposure route. Protection may be achieved by reducing potential exposure (e.g., use restrictions, limiting access) as well as by reducing concentrations. RAOs, which are established for protection of environmental receptors, are usually intended to preserve or restore a resource. As such, environmental RAOs are set for a media of interest and a target concentration level.

The media that are candidates for remedial evaluation are identified based on the nature and extent of affected material and applicable or relevant and appropriate Standards, Criteria and Guidelines (SCGs). As discussed in Section 2.0, potential Site media of interest that were identified during the RI are soil/fill, ground water, Site-related sediment and interior building materials. As identified in 6NYCRR375-1.10(c)(1)(ii), SCGs are provided in a guidance provided by the NYSDEC. The most recent NYSDEC guidance containing SCGs is draft *DER-10* (NYSDEC, 2002). SCGs also measure the ability of a remedial action to achieve the RAOs.

In addition to SCGs, certain Site-specific factors are considered when developing the RAOs for Site media of interest. These Site-specific factors relate to the impacted media, types of constituents and potential routes of exposure. The factors that were considered in developing RAOs for interior building material, soil/fill and ground water were discussed in Interim Deliverable No. 11 (ID#11) (ERM, 2003c). NYSDEC provided comments on ID#11 by letter dated 9 June 2003 (NYSDEC, 2003a). The factors used in developing RAOs for Site-related sediment were similarly presented in Interim Deliverable No. 12 (ID#12) (ERM, 2003c). NYSDEC provided comments on ID#12 on 22 August 2003 (NYSDEC, 2003b). A meeting was held with BICC, its representatives and NYSDEC regarding NYSDEC comments on 29 September 2003 (ERM, 2003e) and additional discussion was conducted with NYSDEC following the September meeting (ERM, 2003e). These Site-specific factors and subsequent correspondence with NYSDEC, which were discussed in ID#11 and ID#12, are discussed in the following subsections according to the media evaluated.

Section 7.1 describes the various types of SCGs, and presents an inventory of the SCGs that pertain to the Site media of interest. For each of the four Site media of interest, Section 7.2 presents an overview of the media, the remedial requirements pertaining to that media, its RAOs and finally, the extent of the impacted media based upon the identified remedial requirements and RAOs.

7.1 IDENTIFICATION OF SCGS

The NCP establishes applicable or relevant and appropriate requirements (ARARs) and defines To Be Considered (TBC) information as other advisories, criteria or guidance. Additionally, the NCP acknowledges that proposed standards issued by federal or state agencies, while not meeting the definition of an ARAR, should also be considered in remedial decisions (NCP at 40 CFR 300.400(g)(3)). The preamble to the NCP states that TBCs are to be used on an "as appropriate" basis.

SCGs incorporate both the CERCLA concepts of ARARs and TBCs. They include promulgated requirements and non-promulgated guidance, which govern activities that may affect the environment. The standards and criteria (SCs) are those cleanup standards, standards of control and other substantive requirements, criteria or limitations that are officially promulgated under federal or state law. Though guidance does not represent a legal requirement, it should be considered based on professional judgment when applicable to site conditions (NYSDEC, 2002).

Table 7-1 presents potential SCGs, which may govern remedial actions at the Site. This table lists: the citation; a description of the SCG; SCG type (i.e., chemical, action or location specific); and, reason the SCG is listed (e.g., remedy selection and/or remedial action) and how it applies to the remedy evaluation. Also, there is a TBC category identifying proposed SCGs that are also considered in the remedial alternative evaluation.

Certain SCGs are considered in the development of the Site media of interest RAOs. These SCGs are discussed in remedial requirements for the media of interest in the following sections. The relevance of the SCGs and TBCs to the remedial alternatives is discussed with the evaluation of each alternative in Section 9.0 (i.e., in the evaluation of the ability of each remedial action alternative to comply with the SCGs).

7.2 MEDIA OF INTEREST

As discussed in previous sections, the following four Site media were identified during the RI and evaluated below as potential media of interest: (1) Site soil/fill; (2) Site ground water; (3) Site-related Hudson River sediment and (4) interior building material. The RI sampling results for these media were discussed in Sections 2.0 and 3.0 and assessments of the potential risk associated with these media were presented in Sections 4.0, 5.0, and 6.0.

7.2.1 Soil/Fill

As discussed in Section 2.0, there are four Site soil/fill areas. They are:

- South Yard soil/fill;
- North Yard soil/fill;
- Below Building soil/fill; and
- BICC Parking Lot soil.

Historic fill underlies the North Yard, South Yard and areas beneath Site buildings. As discussed in Section 2.2, historic fill materials are non-indigenous materials deposited to raise the topographic elevation of an area. Historic fill was routinely used as fill material along waterways, such as the Hudson River. The historic fill placed in the North and South Yards and Below Buildings ranges from 10 to 20 feet in depth and, based on visual observations during the boring program, is composed of coarse sand and gravel with brick fragments, cinders, slag, coal, ash and shells. Due to its composition, semi-volatile organic compounds (SVOCs) and inorganic constituents are typically detected in historic fill materials. Concentrations of SVOCs and inorganic constituents at a nearby historic fill site were discussed in Section 2.6.1 and are presented in Appendix F. These values were used for comparative purposes in Section 2.6.1.

As discussed in Section 2.2, the historic fill located in the North Yard, South Yard and beneath portions of the Site Buildings has been impacted by prior Site operations. Operational-related material (e.g., resin material, oily residue, rubber, a white chalky resin-like material, wire, cable and plastic) were observed in the North Yard fill. In addition, as discussed in Section 2.6.1, polychlorinated biphenyls (PCBs), SVOCs and inorganic constituents were observed at concentrations above their historic fill values in the North Yard fill and at select locations in the Below Building fill; thus indicating operational impacts in these areas. A graphical comparison of the soil/fill quality to historic fill values was presented in Figures 2-9 through 2-27.

In the South Yard, PCB concentrations above the TAGM 4046 RSCO were observed in surface soil indicating localized operational impacts to South Yard surface soils. In addition, one out of 45 (i.e., 2%) of the South Yard subsurface locations exhibited PCB concentrations above the TAGM 4046 RSCO. This subsurface sample (i.e., SB-78) was collected 19 to 20 feet below grade in an area of the South Yard that was filled well after the remainder of the South Yard. This samples indicates a very localized operational impact to subsurface South Yard soil along the later filled shoreline.

Based on the presence of historic fill-related constituents (i.e., SVOCs and inorganic constituents) and previous operational impacts, the North Yard, South Yard and Below Building soil/fill have been retained for further evaluation as a media of interest.

In contrast to the North Yard, South Yard and Below Building soil/fill, the soil below the BICC Parking Lot is not historic fill. As discussed in Section 2.2, the fill material placed in this area is consistently graded sandy material and is not of the same character or quality as historic fill material. In addition, the analytical results for this area indicate that the environmental condition of subsurface soil in the BICC Parking Lot has not been impacted from Site activities. Consequently, this soil area has not been retained as a media of interest.

7.2.1.1 Remedial Requirements

The remedial requirements for Site soil/fill have been determined according to three criteria of analysis:

- SCGs and TBCs;
- Results of the HHRA[1]; and
- Results of the fate and transport analysis.

SCGs and TBCs

Chemical specific SCGs that apply to Site soil/fill are derived from the recommended soil cleanup objectives (RSCOs) contained in the NYSDEC TAGM No. 4046 and the Toxic Substances Control Act (TSCA) standards for PCBs in environmental media as documented in 40 CFR 761, PCB Spill Cleanup Policy. The TAGM 4046 RSCOs are

[1] The NYSDEC relies on SCGs and TBCs in making decisions on the appropriate remedy (NYSDEC, 2004).

designated as guidance; while the TSCA PCB remediation waste standards identified in 40 CFR 761 are promulgated standards.

Comparison of the North Yard, South Yard and Below Building soil/fill concentrations to the TAGM 4046 RSCOs was provided in Tables 2-5, 2-6 and 2-8, respectively, and a summary of this comparison was provided in Table 2-10. As shown in these tables, soil/fill in these Site areas exceed a number of the RSCOs for SVOCs, volatile organic compounds (VOCs), PCBs and inorganic constituents. As discussed in Section 4.2.7, the majority of the chemicals that were detected in excess of the RSCOs in Site soil/fill were identified as soil/fill chemicals of potential concern (COPCs).

As discussed in Sections 2.2 and 2.6, exceedance of the TAGM 4046 RSCOs for SVOCs and inorganic constituents in the South Yard, portions of the North Yard and the majority of the Below Building soil/fill areas are attributable to the anthropogenic nature of the historic fill materials placed in these Site areas. As shown in Figures 2-11 through 2-27, the majority of the soil/fill samples within the South Yard, the western shoreline of the North Yard and the majority of the Below Building areas exhibited SVOC and inorganic constituent concentrations below the historic fill values. Additional discussion regarding this subject is presented in Section 7.2.1.3. The remainder of the North Yard and select areas Below the Site buildings exhibited SVOC and inorganic constituent concentrations above the historic fill values. The areas that exhibit SVOC and inorganic constituent concentrations above the historic fill values are characterized as operationally impacted.

In addition to SVOCs and inorganic constituents, PCBs and select VOCs were also detected in the South Yard, North Yard and Below

Building soil/fill at concentrations above their TAGM 4046 RSCOs. As shown in Figure 2-8, exceedances of the VOC COPC RSCOs were localized to select locations within the North Yard and beneath the Site buildings. As shown in Figures 2-9 and 2-10 and discussed above, exceedances of the RSCOs for PCBs occurred in: the South Yard surface soil and in one South Yard subsurface soil location; the North Yard surface and subsurface soils; and localized Below Building surface and subsurface soil areas. {Note: With the exception of one soil location, RSB-10 collected adjacent to the Site buildings near the railroad main line, all below building samples were collected from subsurface soil. The uppermost interval sampled for RSB-10 was surface soil.}

As mentioned above, TSCA also regulates PCB concentrations in environmental media. TSCA PCB remediation waste is defined as environmental media containing PCBs as a result of a spill, release, or other unauthorized disposal, at the following concentrations:

- materials disposed of prior to April 18, 1978 having a PCB concentration greater than or equal to 50 mg/kg regardless of the concentration of the original spill;
- materials which are currently at any volume or concentration where the PCB concentration of the original source was greater than or equal to 500 ppm PCBs beginning on April 18, 1978, or greater than or equal to 50 ppm PCBs beginning on July 2, 1979; and/or
- materials which are currently at any concentration if the PCBs are spilled or released from a source not authorized for use under 40 CFR 761.

The Site soil/fill falls into one or more of these three categories.

Remedial requirements for PCB remediation wastes are identified in 40 CFR 761.61(a)(4) and are summarized in Table 7-2. As shown in this table, the remedial measures for PCB remediation waste are dependent upon the Site use (i.e., low or high occupancy) and the PCB concentration in the environmental media. For TSCA purposes, low occupancy use is defined as exposure for less than 335 hours annually or an average of 6.7 hours per week for any one person; and high-occupancy use is defined as exposure for equal to or more than 335 hours annually or an average of 6.7 hours per week for any one person.

As discussed in Section 4.2.1, it is assumed that current and future access to the North and South Yard soil/fill is and would be limited to the upper eight feet. Consequently, under current and contemplated future Site use, the upper eight feet of the North and South Yard soil/fill would fall under high occupancy use. Although the Below Building soil is currently inaccessible, use restrictions are not in place. The Below Building soil/fill will therefore be considered a high occupancy use under future use conditions. The soil located at depths greater than 8 feet below grade, which would not be accessed under anticipated current and future Site use, would be considered as a low occupancy use. Although future construction work may involve pile driving, this exposure would be of a limited duration and the amount of soil/fill to which construction workers are exposed would be controlled and could be mitigated.

Under TSCA regulations for high occupancy uses:

- No action is required for Site soil containing less than or equal to 1 mg/kg PCBs;
- a surface cover, which can include 10-inches of soil or 6-inches of asphalt or concrete, is required for soil containing greater than 1 mg/kg and less than or equal to 10 mg/kg PCBs; and
- soil containing greater than 10 mg/kg PCBs cannot remain in place.

These high occupancy standards are consistent with the NYSDEC RSCOs for PCBs in surface and subsurface soil.

For low occupancy uses, soils containing PCB concentrations:

- less than or equal to 25 mg/kg can remain in-place without any access restrictions or active remedial measures;
- greater than 25 mg/kg, but less than or equal to 50 mg/kg can be addressed by fencing and signage;
- greater than 50 mg/kg, but less than or equal to 100 mg/kg can be addressed by a cover; and
- greater than 100 mg/kg must be removed.

In conclusion, the following chemical specific SCGs will be used to determine the extent of impacted Site soil/fill:

- TAGM 4046 RSCOs;
- TSCA high occupancy PCB standards for soil/fill accessible more than 335 hours annually or an average of 6.7 hours per week; and
- TSCA low occupancy PCB standards for soil/fill accessible less than 335 hours annually or an average of 6.7 hours per week.

In addition to the chemical specific standards and guidance identified above, additional action specific standards also apply to developing remedial action objectives for the Site soil/fill. These are 6 NYCRR Parts 370 through 373 and 375 and Article 12 of the NYS Navigation Law (New York Oil Spill, Control and Compensation Act).

6 NYCRR Parts 370 through 373 and 375 relate to the identification and management of hazardous waste at the Site. As shown in Figures 2-9 and 2-10, PCBs are present in North Yard soil at concentrations above 50 mg/kg with a maximum concentration of 97,600 mg/kg beneath the East Warehouse. In accordance with 6 NYCRR 371.4(e), contaminated soil having a PCB concentration of 50 mg/kg by weight or greater is classified as a New York State B007 listed PCB hazardous waste. New York State regulations require that sites remain on the Inactive

Hazardous Waste Disposal Site Registry if "consequential amounts of hazardous waste" remain at the site (6NYCRR Part 375-1.10(b)); and, at a minimum, that remedies employed at Registry sites must eliminate or mitigate all significant threats posed by hazardous waste disposal at the site (6 NYCRR 375-1.8(a)(1)). Therefore, at a minimum, a "consequential amount" of NYS listed PCB hazardous waste would need to be removed and all significant threats mitigated to allow the Site to be delisted.

As discussed in Section 2.2.3, Site soil/fill also exhibits leachable lead concentrations above the RCRA characteristic regulatory limit of 5 mg/l using the Toxicity Characteristic Leaching Procedure (TCLP) (40CFR261.24). This soil/fill would therefore be classified as a RCRA D008 hazardous waste when excavated and thus becomes a solid waste (40CFR261.2). As discussed in Section 2.2.3, it has been assumed that soil/fill having a total lead concentration of greater than 15,000 mg/kg could potentially exceed the RCRA characteristic regulatory limit of 5 mg/l using the TCLP method. For FS evaluation purposes, it has been assumed that this soil/fill would become a characteristic hazardous waste if it is excavated.[2] In contrast, a listed hazardous waste (e.g., B007 waste) is hazardous regardless of its location (40CFR 261.3(b)(2)). Since the soil/fill exhibiting hazardous characteristic for lead currently remains in place, it is not currently a hazardous waste. Consequently, all subsequent discussion regarding removal of hazardous waste will be limited to the only known New York State listed hazardous waste at the Site (i.e., New York State B007 listed PCB hazardous waste).

[2] This discussion relates to the characterization of soil/fill containing lead as an ex-situ hazardous waste. The remedial needs for soil/fill containing lead will be based upon SCGs.

As discussed in Section 2.6.1.10, evidence of petroleum (i.e., staining, odors and petroleum sheens) was observed in the North Yard during the RI. As discussed in Section 2.6 and shown in Figure 2-7, evidence of petroleum was noted most frequently in the North Yard. Within the North Yard, evidence of petroleum was more prevalent within the area of PCB-impacted soil/fill. Evidence of petroleum in soil/fill was noted outside of the PCB-impacted soil/fill area in the near surface material or in isolated, subsurface locations. At these locations outside of the PCB-impacted area, concentrations above the historic fill values were observed in approximately 1/3 of the samples for the following total organic compound categories: total SVOCs, total polyaromatic hydrocarbons (PAHs), total carcinogenic polyaromatic hydrocarbons (CaPAHs) and total phenols.

There is no discernible and distinct free phase non-aqueous phase layer (NAPL) on the ground water table present at the Site. The New York State requirements for NAPL removal are described in the New York Oil Spill, Control, and Compensation Act, Article 12 of the New York State Navigation Law, as amended. This statute gives first priority to minimizing environmental damage and establishes NAPL containment as a requirement and NAPL removal as a possible additional task. This statute defines the approach to the cleanup and removal of free phase NAPL that is considered to be proper to include containment, removal or the use of "reasonable measures" to prevent or mitigate damages.

This statute also requires that cleanup and removal of free phase NAPL be performed in accordance with the National Contingency Plan (NCP, 1990). The NCP at 40 CFR 300.310(b) requires that, "as appropriate", free phase NAPL be removed and its effects mitigated and states at 40 CFR 300.320(a)(4) that free phase NAPL removal is being properly conducted when the cleanup is fully sufficient to minimize or mitigate threats.

Overall, Article 12 of the New York State Navigation Law and the NCP require that potential threats or risks posed by free phase NAPL be minimized or mitigated but do not require actions to eliminate any potential threats or risks related to free phase NAPL. As stated above and discussed in Section 2.6.2.3, although evidence of petroleum has been observed at the Site, a discernable free phase NAPL layer has not been observed at the Site.

In conclusion, the following action specific SCGs and their goals will be used to identify impacted Site soil/fill:

- 6 NYCRR Part 375: Removal of "consequential" amounts of hazardous waste; and
- Articles 12 of the NYS Navigation Law: Removal of free phase NAPL and sheens, when encountered, to the extent practicable.

The concentrations of individual chemicals likely associated with NAPL entrained in the soil will be addressed through application of the RSCOs, the chemical specific SCGs discussed above.

<u>Results of the HHRA</u>

The following presents the results of the HHRA conducted in Section 4.0. This summary includes an identification of the risks determined for a given media, its exposure pathways and receptors. Pathways that pose similar risk ranges are grouped together. As discussed in

Section 4.1.2, in accordance with RAGS (USEPA, 1989), future risks were quantitatively evaluated assuming the existing surface (i.e., asphalt, concrete) covers are not present in the Yard.

Carcinogenic Risk < 10^{-6} and/or Hazard Index < 1

- North Yard soil/fill -- inhalation of VOCs from soil/fill by facility workers and tenants (current) and residents (future)[3]; and
- Below Building soil/fill -- inhalation of VOCs from soil/fill by facility workers and tenants (current and future)[3].

Carcinogenic Risk between 10^{-4} and 10^{-6}

- North Yard and South Yard soil/fill -- direct contact with soil containing PCBs, SVOC and inorganic constituents by facility workers (current)
- South Yard and Below Building soil/fill --direct contact with and inhalation of fugitive emissions from soil/fill containing PCBs, SVOC and inorganic constituents by construction workers (future)
- South Yard soil/fill -- direct contact with soil/fill by residents (future) -- See Notes (1)(2) in table below.

Carcinogenic Risk > 10^{-4} and/or Hazard Index > 1

Exposure Pathway	**Carcinogenic Risk > 10^{-4}**	**Hazard Index > 1**	**Lead**
North Yard soil/fill – direct contact by residents (future) (1)(2)	Yes	Yes	> playground criteria > residential yard criteria

[3] The NYSDOH does not agree with the risk quantification presented for inhalation of indoor air (NYSDEC, 2004). It has been agreed that indoor air sampling will be conducted to assess any current risks and mitigative measures will be included in future site construction to address this pathway..

Exposure Pathway	Carcinogenic Risk > 10^{-4}	Hazard Index > 1	Lead
South Yard soil/fill – direct contact by residents (future) (1)(2)	No	Yes	> playground criteria < residential yard criteria
North Yard soil/fill – direct contact with and inhalation of dust from soil by construction workers (future) (2)	Yes	Yes	Not applicable

Notes:

(1) The risk assessment conservatively assumes that surface covers will not be installed under the future use scenario. Installation of appropriate covers would eliminate the direct contact residential exposure pathway.

(2) Carcinogenic and non-carcinogenic risks posed by PCBs, SVOCs and inorganic constituents in Site soil/fill.

Results of the Fate and Transport Analysis

As discussed in Section 2.6, erosion of fill from poorly bulkheaded areas and leaching of chemicals from Site soil/fill to ground water are valid environmental fate and transport mechanisms for Site soil/fill. Based on the evaluation conducted in Section 2.6, barium, iron, lead, manganese, benzene, xylene and BEHP may be leaching from Site soil/fill as these constituents have been identified in ground water under low flow sampling conditions (i.e. sampling that is intended to avoid collection of soil/fill particles in the aqueous sample). Further evaluations of the dissolved concentrations of these chemicals indicate that they do not pose unacceptable potential for exposure via ground water. As discussed in the Interim Deliverable No. 7 Summary Report (Roux, 2003a), the geophysical testing results indicate that there has been erosion of Below Building soil/fill into the Hudson River. Subsidence of concrete slabs in areas behind the bulkhead further indicate that erosion of soil/fill from behind the bulkhead is occurring. In addition, erosion of soil/fill from behind the Building No. 8 bulkhead was also observed during the sediment sampling activities.

Evidence of petroleum was predominantly confined to pores within soil/fill (i.e., residual NAPL). These observations occurred both within the area where the greatest amount of Site-related constituents are found and along the fringes of this area. The absence of a free phase NAPL layer at the Site indicates that the NAPL is entrained in the soil/fill (i.e., in residual saturation) and is not mobile along the ground water table.

When test pit TP-1 was enlarged during excavation, residual NAPL would, on occasion, seep out from the soil/fill pores and collect as a sheen on water in the bottom of the test pit. Based on these observations, the fate and transport mechanisms associated with NAPL are related to instances when the water table encounters residual NAPL in subsurface soil and/or during subsurface disturbances (e.g. intrusive activities).

7.2.1.2 Remedial Action Objectives for Soil/Fill

Based on the remedial requirements discussed above, NYSDEC's comments on ID#11 that contained the above rationale and draft NYSDEC guidance regarding development of RAOs (NYSDEC, 2002) the following RAOs have been established for the Site soil/fill:

- Prevent ingestion, direct contact, and/or inhalation of/with soil/fill that exceeds applicable SCGs;
- Prevent migration of soil/fill that would result in surface water impacts that exceed applicable SCGs or result in fish advisories;
- Prevent inhalation of or exposure from COPCs volatilizing from soil that exceed applicable SCGs.

The following section discusses the extent of impacted Site soil/fill to which these RAOs would apply.

7.2.1.3 *Extent of Impacted Soil/Fill*

The presence of historic fill in the North Yard, South Yard and Below Building soil/fill presents potential current and future direct contact exposures. All Site soil/fill in these areas are considered to be impacted and therefore will require mitigation for these exposure pathways. The depth from the surface to the bottom of historic fill in these areas ranges from 10 to 20 feet below ground surface (bgs). The approximate surface areas of these historic fill areas are:

- South Yard: 199,800 square feet (sf)
- North Yard: 149,600 sf
- Below Buildings: 125,000 sf

As noted above, the RSCOs and the TSCA high occupancy standards for PCBs are 1 mg/kg for surface soil and 10 mg/kg for subsurface soil. As discussed in Section 2.2.1.1, surface soil/fill is defined as exposed (i.e., non-covered) soil located within two feet of the ground surface. Soil/fill containing PCBs and VOC COPCs at concentrations above their RSCOs, TSCA high occupancy standards and TSCA low occupancy standards (i.e., SCGs) are present in the North Yard as shown in Figures 7-1 through 7-5. Figure 7-6 shows South Yard soil/fill PCB areas above surface and subsurface soil SCGs. Figure 7-7 and Figure 7-8 present the Below Building soil/fill areas where PCBs are present at concentrations above their SCGs. As discussed in Section 2.5, due to the presence of the polychlorinated naphthalenes in Site environmental media, PCB results may be biased.

In addition, Figure 7-7 also shows where subsurface concrete structures are located. Additional discussion regarding the contents of these structures, as well as other concrete substructures, is presented in Section 7.2.4.3. These subsurface structures are located in Building Nos. 4 and 5.

Figures 7-1 through 7-8 also indicate which PCB impacted areas would contain soil/fill that would be classified as a lead RCRA characteristic waste if excavated.

The total volumes of soil/fill having concentrations of PCBs above the PCB SCGs are:

	Surface Soil Volume, cubic yards (cy) PCBs>1 mg/kg	**Subsurface Soil Volume, cy PCBs>10 mg/kg**
North Yard	39	17,118
South Yard	2,323	1,182
Below Building	24	1,502

As noted above, PCBs at concentrations above 50 mg/kg are classified as New York State B007 listed PCB hazardous waste. PCB listed hazardous waste is present in the North Yard and Below Building soil/fill. The distribution of B007 listed PCB hazardous waste at the Site is as follows:

Depth,	**Volume of NYS PCB Listed Hazardous Waste, cy**	**Mass Distribution of NYS PCB Listed Hazardous Waste**
North Yard		
0-4 feet bgs	4,752	87%

Depth,	Volume of NYS PCB Listed Hazardous Waste, cy	Mass Distribution of NYS PCB Listed Hazardous Waste
4-8 feet bgs	3,817	8%
8-12 feet bgs	2,150	4%
12-16 feet bgs	2,109	0.7%
16-20 feet bgs	612	0.3%
Total, 0-20 feet bgs	13,440	100%

In addition to PCBs, VOC COPCs are also present in Site soil/fill at concentrations above their RSCOs. With the exception of a localized VOC COPC RSCO exceedance in the 8 to 12 foot samples collected at SB-61, the VOC COPCs present at concentrations above their RSCOs are located within the PCB footprints identified in Figures 7-1 through 7-5. It should be noted that neither PCBs nor VOCs are historic fill related compounds.

Areas that exceed the PCB and VOC COPC SCGs and that may potentially contain RCRA characteristic lead are shown on Figures 7-1 through 7-7. In the North Yard, the estimated volume of soil/fill that could potentially exhibit the RCRA hazardous characteristic for lead within the PCB and VOC COPC-impacted soil/fill footprint is 2,152 cy, approximately 16% of the soil/fill in its PCB and VOC COPC-impacted areas. This represents the quantity of soil/fill that would be characterized as a RCRA hazardous waste if the North Yard PCB and VOC COPC-impacted areas are excavated. None of the South Yard and approximately 26% of the Below Building PCB-impacted soil/fill would be classified as a RCRA characteristic hazardous waste for lead if excavated.

As discussed above, there are a number of soil locations exhibiting exceedances of the RSCOs for SVOCs and inorganic constituents (e.g., arsenic, copper, iron, lead, mercury, nickel and zinc). As shown in Figures 2-11 through 2-27 and the following table, with the exception of iron, the majority of these locations outside of the PCB and VOC-impacted soil/fill area are consistent with historic fill concentrations.

Summary of Samples Located Outside the PCB and VOC-Impacted Soil/Fill Area with Concentrations At Least 15% Above Historic Fill (HF) Values

	Total Number of Yard Samples[(1)]	Total Number of Yard Samples Greater than 15% Above HF Values[(1)]	Percentage of Yard Samples Greater than 15% Above HF Values[(1)]
Total CaPAHs	189	9	5%
Total PAHs	189	4	2%
Total Phenols	189	9	5%
Total Phthalates	189	2	1%
Total SVOCs	189	7	4%
Zinc	190	44	23%
Arsenic	194	63	32%
Iron	194	126	65%
Copper	190	26	14%
Lead	195	51	26%
Nickel	194	92	47%
Mercury	189	31	16%

(1) Relates to locations outside the PCB and VOC-impacted soil/fill areas.

Due to the nature of historic fill at the Site, every soil sample location within the Yard and beneath the Site buildings likely exhibits a chemical concentration for one or more SVOCs or inorganic constituents in excess of its RSCO. The North Yard, South Yard and Below Building soil/fill located outside the PCB and VOC-impacted soil/fill footprint will be retained as a media of interest and addressed in the remedial actions.

Remedial technologies are presented in Section 8.0 for PCB and VOC-impacted Site soil/fill. Remedial technologies (e.g., soil/fill cover caps and access and use restrictions) are also presented in Section 8.0 for the soil/fill locations outside the PCB and VOC-impacted soil/fill areas. In addition, bulkhead restoration will be included as a Common Action to address the RAO to "prevent migration of soil/fill that would result in surface water impacts that exceed applicable SCGs or result in fish advisories" (see Section 8.0 and 9.1.4 for additional discussion).

7.2.2 *Ground Water*

The remedial requirements for Site ground water have been determined according to four criteria of analysis:

- SCGs and TBCs;
- Results of the fate and transport analysis;
- Results of the HHRA[4]; and
- Results of the FWIA.

7.2.2.1 Remedial Requirements

SCGs and TBCs

As shown in Tables 2-15 through 2-18 and summarized in Table 2-10, the Class GA standards were used to screen the chemical concentrations in Site ground water. It should be noted that ground water samples from MW-03, MW-06 and MW-08 met or exceeded the standards for saline water classification (NYCRR Part Section 701.17..

Nevertheless, as discussed in Section 2.6, the Class GA standards were used to determine the potential for Site soil to leach to Site ground water. However, due to its salinity, Site ground water would not be suitable as a potable ground water drinking water supply. Also, there

[4] The NYSDEC relies on SCGs and TBCs when making decisions on the appropriate remedy.

are no potable wells at the Site or within a one-half mile radius of the Site. Since the Hudson River is located immediately downgradient of the Site, any wells installed within one-half mile of the Site would be upgradient or sidegradient to the Site.

As discussed below, the NYS surface water quality standards were used to evaluate the potential impacts posed by Site ground water. Thus these standards, which are contained in NYCRR Part 703.5, are appropriate. Additional guidance values for surface water are contained in TOGS 1.1.1, a guidance document.

Fate and Transport Analysis

The potential impacts from Site ground water discharge to the Hudson River were evaluated in the fate and transport section and the FWIA. As discussed in those sections, Site ground water concentrations do not exceed the surface water quality criteria once discharged to the Hudson River. For inorganic constituents, this was confirmed by analysis of surface water concentrations of inorganic constituents adjacent to the Site.

Results of HHRA and FWIA

Inhalation of VOCs from ground water by facility workers and tenants (current and future) and residents (future) was evaluated in the HHRA (Section 4.0).

Discharge of ground water to surface water and its potential impacts to ecological receptors was evaluated in the FWIA (Section 6.0). As discussed in that section, the carcinogenic risk associated with this exposure pathway is less than one in 10^{-6} and the Hazard Index for non-carcinogens is less than 1.

7.2.2.2 *Remedial Action Objectives for Ground Water*

The following remedial action objectives have been established for Site ground water once discharged to the Hudson River based on the remedial requirements discussed above, NYSDEC's comments on ID#11 (NYSDEC, 2003a), which contained the above rationale, and draft NYSDEC guidance regarding development of RAOs (NYSDEC, 2002):

- Prevent contact with volatile organic compounds in ground water that exceed applicable SCGs; and
- Prevent inhalation of volatile organic compound vapors from ground water that exceed applicable SCGs.

7.2.2.3 *Extent of Impacted Ground Water*

As discussed above,

- Site ground water does not exceed any of its applicable SCGs;
- the HHRA and FWIA did not indicate any carcinogenic risks greater than $1x10^{-6}$ or a noncarcinogenic hazard index greater than 1 posed by Site ground water; and
- the fate and transport evaluation did not indicate any concerns.

However, as discussed in Section 2.6.2.2, ground water flowing onto the Site appears to be impacted by an upgradient source of tetrachloroethene. However, this impacted ground water is not Site-related.

In conclusion, ground water remediation will not be evaluated in this FS report. However, ground water monitoring will be included as a

Common Action for all remedial action alternatives (see Section 8.0 and 9.1.1 for additional discussion).

7.2.3 Hudson River Sediment

7.2.3.1 Remedial Requirements

The remedial requirements for Site related Hudson River sediment have been determined according to four criteria of analysis:

- SCGs and TBCs;
- Results of the HHRA[5].;
- Results of the FWIA; and
- Results of the fate and transport analysis.

<u>SCGs and TBCs</u>

There are fish and wildlife sediment screening criteria, reflected in a number of statutes and regulations, which offer chemical, action or location-specific SCGs. These statutes, regulations and guidance are referenced in Section 6.1.2 and identified in Table 7-1, respectively.

As noted in Table 7-1, there are a number of action and location specific standards that would require remediation of impacted sediment. They are 6NYCRR Part 661 and 19NYCRR Part 600. The chemical specific standards that would apply to the development of remedial action objectives for Site-related sediment are the surface water standards (6NYCRR Part 703.5). The applicability of the surface water standards to the sediment is that Site-related constituents present in sediment should not be present in concentrations that would cause exceedances of surface water standards. Additional

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[5] NYSDEC relies on SCGs and TBCs when making decisions on the appropriate remedy (NYSDEC, 2004).

surface water guidance values are provided in TOGS 1.1.1, a guidance document.

In addition to these chemical specific standards, there is chemical specific guidance that relate to sediment. These chemical specific sediment screening levels are contained in the NYSDEC Technical Guidance for screening of contaminated sediment (NYSDEC, 1999).

Based on the sampling analysis performed during the RI, sediment quality in upriver samples was found to exhibit constituents in excess of guidance values. This factor (i.e., elevated upriver sediment concentrations) must therefore be taken into account when using the sediment guidance for the purpose of making remedial decisions.

NYSDEC has provided a remedial goal for PCBs in sediment of 1 mg/kg (NYSDEC, 2003b)(ERM, 2003e). This value is considered by the department to be the technically achievable value for PCBs in sediment.

Results of HHRA, FWIA and Fate and Transport Analysis

Direct contact with sediment during construction activities was evaluated as a potential exposure pathway in the HHRA. As noted in Section 4.0, this exposure posed a carcinogenic risk between 10^{-4} and 10^{-6}.. The carcinogenic risk was the result of arsenic levels in intertidal sediment. With respect to ground water discharges to surface water, projected COPC concentrations in surface water were found to be less than the surface water quality standards for human receptors. In addition, the FWIA found that projected ground water concentrations to surface water are also less than the surface water quality standards for ecological receptors (See Section 4.2.5.2 and 4.2.5.3).

The FWIA indicated that all sediment sampling areas (i.e., upriver, intertidal and subtidal buildings, and subtidal adjacent to the Yard) exhibit concentrations of COPCs above referenced ecological screening levels. In particular, the sediment from the area beneath and immediately adjacent to the Site buildings exhibits elevated levels of the same COPCs observed in the samples from upriver and downriver adjacent to the Yard.

As previously shown in Figures 6-5 and 6-6, there are differences in sediment quality between the upriver samples and samples from the intertidal (beneath Site buildings) and the subtidal area adjacent to Site buildings. The most pronounced difference (i.e., Site-related constituents most frequently encountered over a large area) occurred in the intertidal sediment beneath the Site buildings. Sediment quality in the subtidal area exhibits a dramatic decrease in Site-related constituent impacts. In fact, recent measurements support the conclusion that defined areas of Site-related sediment impacts in the subtidal area adjacent to the Site are being naturally covered with sediment that is consistent with upriver quality.[6]

The literature review of potential ecological effects resulting from the impacted sediment suggests that chemical form, location, and other factors may mitigate bioavailability and toxicity where COPC concentrations exceed referenced screening levels. Consistent with NYSDEC guidance, these site-specific conditions should be weighed prior to making risk management decisions based solely on the ecological screening results.

[6] NYSDEC does not agree that there is sufficient information to reach this conclusion (NYSDEC, 2004).

As discussed in Section 6.3, because sediment quality in the subtidal area adjacent to the Yard and the majority of sediment in the subtidal area adjacent to the buildings were consistent with upriver conditions, they are not areas of Site-related ecological impacts. In contrast, sediment in the intertidal area beneath the buildings, along with limited areas in the subtidal zone immediately adjacent to the building bulkhead, did exhibit Site-related COPCs that present a potential ecological concern based on the Pathway and Criteria-Specific Analyses. Some of these same COPCs were also detected in the debris that is present below the buildings and in the interior stormwater system and suggest they are potential contributing sources of these constituents.

Sample results indicated that sediment impacted by Site-related COPCs do not extend into the Hudson River Channel. Moreover, the majority of subtidal sediment samples exhibit higher COPC concentrations in the lower, underlying intervals than in the overlying sediment interval(s). Burial of organic and inorganic constituents is a well-documented phenomenon in the Hudson River referred to as natural recovery. Additionally, the absence of PCBs in the Yard sediment samples and the low concentrations of metals in the northernmost Yard samples indicate that impacted sediments from the intertidal and limited subtidal areas adjacent to the Site buildings have not migrated downriver. Additional discussion regarding natural recovery occurring at the Site is presented in Section 6.2.3.5.

7.2.3.2 Remedial Action Objectives for Hudson River Sediment

Based on the remedial requirements discussed above, the additional rationale provided in ID#12 and NYSDEC comments on ID#12, the following RAOs have been established for the Site-related Hudson River sediment:

- Prevent direct contact with sediment where concentrations of COPCs exceed upriver sediment values and applicable SCGs;
- Prevent releases of chemicals in excess of upriver values to or from sediment that would result in surface water concentrations of COPCs in excess of ambient water quality criteria and/or result in fish advisories; and
- Prevent Site-related impacts to biota from ingestion/direct contact with sediment causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain to the extent practicable, by taking upriver sediment quality and applicable SCGs into consideration

7.2.3.3 Extent of Impacted Hudson River Sediment

As previously stated, sediment media is segmented into three zones. They are: intertidal sediment beneath the Site buildings; subtidal sediment adjacent to the Site buildings; and subtidal sediment adjacent to the Yard.

A review of sediment data from these three areas, as presented in Section 2.6.3.1, establishes the basis for defining Site-related impacted sediment. These are areas where Site-related constituents are present at concentrations in excess of upriver levels for SVOCs and where PCBs are present in excess of the NYSDEC remedial goal of 1 mg/kg (NYSDEC, 2003b)(ERM, 2003e). Discussion regarding consideration of upriver results for inorganic constituents is presented below. In accordance with guidance from the NYSDEC (ERM, 2003e), the extent of Site-related impacted sediment requiring remedial action (e.g., MNR, capping or removal) will be limited to two (2) feet in depth. This depth is based on: (1) the NYSDEC assumption that the biologically active zone is the upper 12-inches of sediment, rather than the upper 6-inches as presented in the FWIA; and (2) NYSDEC's assumption that the underlying 12-inches of sediment (i.e., 12 to 24-inches) could be subjected to erosion through storm events.

<u>PCBs</u>

PCBs in excess of the NYSDEC remedial goal were observed in the areas identified as Areas I, II, III and IV in Figure 7-9. The depth of PCB-impacted sediment in these areas ranges from 6-inches to at least two (2) feet in certain areas. In accordance with NYSDEC guidance (ERM, 2003e), a maximum depth of two (2) feet will be assumed in instances where PCB delineation to depths greater than two feet has not been demonstrated by the analytical results.

<u>SVOCs</u>

For evaluation purposes, the SVOC results were divided into the following groups at the request of the NYSDEC: total PAHs, total phenols and total phthalates.

The maximum total PAH concentration for all samples collected (i.e., upriver, intertidal beneath the Site buildings, subtidal adjacent to the Site buildings and subtidal adjacent to the Yard), 46,061 ug/kg, was observed upriver at sample location SEDN-3A in the vicinity of a former power plant. As discussed in Section 6.2.3.1, elevated concentrations of SVOCs in sediment have also been documented by other parties in the vicinity of the former power plant located immediately upriver of the Site. In contrast, all Site samples exhibited total PAH concentrations below the maximum upriver concentration.

Phenols were neither detected in the upriver samples nor in the Site samples. Phenols are therefore not of concern in sediment.

The upriver concentration of total phthalates ranged from 123 to 818 ug/kg. Higher concentrations of total phthalates were observed in the intertidal sediment. However, the location of phthalate concentrations in excess of upriver concentrations was consistent with the locations of samples exhibiting PCBs at concentrations above the remedial goal and/or normalized inorganic constituent concentrations above upriver values (see discussion below).

Inorganic Constituents

As discussed in Section 2.4.3, the concentrations of inorganic constituents in the intertidal sediment beneath the Site buildings; subtidal sediment adjacent to the Site buildings; and subtidal sediment adjacent to the Yard were normalized for aluminum to determine Site-related impacts to Hudson River sediment. This method is widely reported in the scientific literature to account for variability in metals concentrations with the aluminum silicate clay mineral content of soils and sediments (Windom, et al, 1989). In general, substrates with a higher mineral content have higher aluminum concentrations correlated with higher concentrations of metals. Anomalies from this relationship can be observed as outliers on a plot of the metal to aluminum concentrations, and can be interpreted as potentially attributable to Site-related impacts.

As shown in the histograms provided in Section 2.4.3, the subtidal sediment adjacent to the Yard has not been impacted from Site operations (i.e., the average normalized concentrations of all inorganic constituents in this sediment area are consistent with the normalized concentrations of inorganic constituents in upriver sediment).[7] In addition, with the exception of lead, the subtidal sediment samples collected adjacent to the Site buildings have not been impacted by Site operations. Review of the individual lead to aluminum ratios in the subtidal zone indicate that the ratios that exceed upriver values occur at sample locations also containing PCBs in excess of the PCB remedial goal. Furthermore, NYSDEC guidance (NYSDEC, 1999) states that remediation of sediment would be deemed necessary if the "Severe Effects Levels (the ER-Ms) are exceeded in a significant portion of the ecosystem of concern".[8] As discussed in Section 6.2.3.2, the ER-Ms for inorganic constituents are not exceeded in a significant portion of the subtidal sediment samples.

Finally, this comparison indicates that the intertidal sediment samples collected below the Site buildings have been impacted by Site operations by copper, lead, zinc, and, to a lesser degree, barium.

In conclusion, it is BICC's belief that the extent of Site-related impacted sediment in the subtidal zone can be defined as the volume exceeding the NYSDEC PCB remedial goal and does not need to be extended to address inorganic constituents or SVOCs. Based on the normalized concentrations of inorganic constituents, phthalates and PCBs in the intertidal zone, the entire intertidal zone has been identified as a Site-related impacted sediment area.

Using the above information, four areas of Site-related impacted

[7] BICC acknowledges that the NYSDEC Divisions of Environmental Remediation (DER) and Fish and Wildlife do not agree with the use of metals normalization to determine sediment remedial needs for this site.
[8] NYSDEC, 1999 specifically states: "For metals, if Severe Effects Levels are exceeded in significant portions of the ecosystem of concern, biota are most likely impaired …" (page 18). For marine sediments, the ER-M is a conservative measure of the Severe Effects Levels and therefore, it provides a useful additional screening level to evaluate the significance of ecological impacts to benthic life for risk management purposes.

sediment (i.e., Areas I through IV), as shown in Figure 7-9, have been identified. These areas are discussed below.

Further, to address NYSDEC's concern regarding the use of metals normalization in determining remedial needs for the sediment adjacent to the South Yard, an additional sediment area has been identified, Area V. This area will be referred to as a NYSDEC defined "impacted" sediment area. Additional discussion regarding Area V is provided below.

Site-Related Impacted Sediment

Area I

Sediment sample SED12-03 defines the extent of Site-related impacted sediment in the vicinity of an outfall pipe located at the north end of the northern Site buildings. This area, which is designated as Area I, is subtidal and is not located beneath any overhead structures (e.g., docking or buildings). The extent of sediment containing PCBs in excess of the remedial goal in this area is approximately 2,927 square feet in area. This estimation was based on the distribution of PCB-impacted sediment in the vicinity of other discharge pipes at the Site. Sampling will be incorporated into the sediment remedial actions to better define the horizontal delineation of PCB impacts in the Area I sediment. The vertical extent of Site-related impacted sediment in Area I is equal to 24 inches in depth (the deepest sample collected at this location (i.e., 24 inches) exhibited a PCB concentration greater than the goal). Based on discussions with the NYSDEC (ERM, 2003e), the maximum depth for remedial action would be 24 inches. Based on the estimated areal extent and a 24-inch depth, the total volume of Area I Site-related impacted sediment is approximately 217 cubic yards.

Area II

Sediment samples SED12-01, SED12-02, SED09-01, SED09-01-01 and SED09-01-02 define the extent of Site-related impacted sediment in the vicinity of outfall pipes on the western side of the northern buildings. This area, which is designated as Area II, is comprised of sediment that lies both below and beyond Site buildings and is subtidal. The extent of sediment containing PCBs in excess of the remedial goal in this area is approximately 13,066 sf in area. The depth of Site-related impacted sediment in this area ranges from 12 inches to 18 inches. As a conservative estimate, it has been assumed that the depth of Site-related impacted sediment extends to 24 inches, translating to a total Site-related impacted sediment volume of 968 cubic yards.

Area III

Sediment sample SED08W-01 defines the extent of Site-related impacted sediment in the vicinity of an outfall pipe on the western side of the High Bay building. This area, which is designated as Area III, is comprised of sediment that lies both below and beyond Site buildings and is subtidal. The extent of sediment containing PCBs in excess of the remedial goal in this area is approximately 5,517 sf in area. The depth of Site-related impacted sediment in this area is limited to the upper 12 inches. Based on the estimated areal extent and a 12-inch depth, the total volume of Area III Site-related impacted sediment is approximately 204 cubic yards.

Area IV

This area, which corresponds to the intertidal sediment zone beneath Building Nos. 19W, 8, 7 and 9, is represented by numerous sample locations. Based on the presence of PCBs in excess of the remedial goal and the evaluation presented above that indicates Site-related impacts from inorganic constituents and phthalates in this sediment area, the entire surface area of the intertidal zone is included in Area IV. The vertical extent of Site-related impacted sediment in Area IV is equal to or greater than 12-inches. The maximum depth of 24-inches, as provided by NYSDEC, has been assumed for remedial purposes. Based on these dimensions, the total volume of Site related impacted Area IV sediment is estimated to be 5,786 cubic yards.

NYSDEC Defined "Impacted" Sediment

Area V

To determine the extent of NYSDEC defined "impacted" sediment adjacent to the Yard, the concentrations of lead and copper in the sediment adjacent to the Yard were compared to upriver, background concentrations. All PCB concentrations in the sediment adjacent to the Yard were below the NYSDEC PCB remedial goal.

Since the upriver data set is not normally distributed, representative average concentrations of lead and copper in upriver locations and locations adjacent to the Yard are more appropriately determined by nonparametric statistical methods. Hence, the 95% UCL on the geometric mean was used as the comparative average value. This is consistent with the evaluation techniques used in previous sections for Site soil/fill and groundwater.

Consistent with previous discussions with the NYSDEC, the upriver 95% UCL on the mean for lead and copper were determined using the upper 12-inch sample results for the agreed-to set of upriver data points[9]. Following are the upriver data for lead and copper.

[9] The upriver data consist of the following samples collected by ERM and collected by the consultant for the Harbor-at-Hastings (HH) site. HH samples: BKG1 through BKG-10 and EB-4, EB-5 and EB-34. ERM samples: SED-1B, SED-2B, SED-3A and SED-3B. For the statistical evaluation requested by NYSDEC.

Upriver

	95% UCL on the mean, mg/kg	Maximum
Lead	153	142
Copper	81	149

In instances where the 95%UCL on the mean is greater than the maximum concentration, the maximum concentration was used for comparative purposes. This is a standard statistical assumption. Concentrations of lead and copper above the lower of the maximum and the 95% UCL on the mean upriver value are present in the area surrounding sediment sample locations SEDYARD-05 and SEDYARD-06. This area includes: SEDYARD-05, SEDYARD-05-01, SEDYARD- 05-02, SEDYARD-06, SEDYARD-06-01 and SEDYARD-06-02 (see Figure 7-9A). Assuming a maximum depth of 2 feet, the total volume of NYSDEC defined "impacted" sediment adjacent to the Yard would be approximately 1,327 cys.

Since the maximum PCB concentration in both the Site-related impacted sediment and the Area V sediment is less than 50 mg/kg, none of this material would be classified as a NYS B007 listed hazardous waste. In addition, based on the total lead concentrations observed in Site-related impacted sediment and Area V sediment, none of the above sediment (i.e., Areas I through V) would be expected to be a RCRA hazardous waste for lead if removed.

As discussed in Section 2.4.3, debris piles were observed atop the intertidal sediment. The locations of debris piles were presented in Figure 7-9. Sampling results for this material was presented in Section 2.4.3. Based on PCB concentrations, this material would not be classified as a NYS B007 listed PCB hazardous waste or a TSCA regulated waste. One of the debris samples collected did exhibit TCLP lead concentrations in excess of the regulatory limit. The material sampled is suspected to have been lead sheathed cable. This material would either be handled as a RCRA hazardous waste for lead or as a scrap lead metal (if feasible). It is estimated that approximately 40 cy of debris is present beneath the Site buildings in the intertidal sediment zone.

Remedial technologies are presented in Section 8.0 for impacted Site-related sediment. Removal of debris beneath the Site buildings in the intertidal sediment zone will be included as a Common Action to address the RAO to "prevent releases of chemicals in excess of upriver values to or from sediment that would result in surface water concentrations of COPCs in excess of ambient water quality criteria and/or result in fish advisories" (see Sections 8.0 and 9.1.3 for additional discussion).

7.2.4 Interior Building Material

As described in Section 3.1, interior building material includes:

- porous and non-porous interior building construction materials (e.g. concrete and wood surfaces), including lead-based painted surfaces;
- interior stormwater system;
- former process and heating oil tanks; and
- subsurface concrete structures.

These interior building materials are present throughout the Site buildings.

As discussed in Section 1.4.6, the Site buildings were constructed over a period of approximately 60 years to serve various industrial purposes. As such, the construction and condition of the buildings varies from building to building and room to room. The number of floors for each of the Site buildings ranges from one to four floors. As such, the footprint of each of the four floors varies. The footprint of the first floor encompasses approximately 210,000 square feet (SF) while the fourth floor only occupies approximately 16,000 SF.

7.2.4.1 Remedial Requirements

The remedial requirements for the interior building materials have been determined according to three criteria of analysis:

- SCGs and TBCs;
- Results of the HHRA[10]; and
- Fate and transport analysis.

<u>SCGs and TBCs</u>

Interior Building Construction Material

The two COPCs for the interior building material (i.e., concrete and wood) are PCBs and lead. As discussed in Section 3.1, the NYSDEC and NYSDOH-approved interim occupancy criteria (IOC) were used for RI delineation purposes. These values were approved for short-term occupancies of six-months or less. These delineation values were 10 µg/100 cm2 for PCBs and 400 µg/100cm2 for lead. The source of these values was presented in Section 3.1.

Interim Deliverable No. 11 (ERM, 2003b) lists proposed cleanup concentrations for PCBs and lead on interior building material surfaces and threshold bulk concentrations for PCBs within porous interior building materials. In NYSDEC's 9 June 2003 comment letter on Interim Deliverable No.11 (NYSDEC, 2003a), NYSDEC stated that the proposed criteria were not acceptable and that the long-term occupancy criteria (LTOC) for the interior building construction material surfaces (i.e., surface LTOC) would be 1 μg/100cm^2 for total PCBs and 4.3 μg/100cm^2 for lead.

According to NYSDEC, the surface LTOC for PCBs (i.e., 1 μg/100cm^2) was established by the NYSDOH and approved by an expert panel as a re-occupancy guideline following a transformer fire at the Binghamton State Office Building and a transformer fire at the State University of New York (SUNY) New Paltz facility (NYSDEC, 2003a).

As discussed above, the NYSDEC has selected 4.3 μg/100cm^2 as the surface LTOC for lead. According to NYSDEC, the basis for this value is 40 CFR Part 745. This standard, which is applicable to lead in paint, dust or soil in residential areas, is focused on the protection of children from lead hazards. Though this standard is directly applicable to residential settings, EPA considers this standard as general guidance for other programs engaged in toxic waste cleanup.

With respect to PCBs and lead within porous interior building construction material, the following bulk LTOC will be used: 1 mg/kg for total PCBs; and 500 mg/kg for lead. As indicated in correspondence from the NYSDEC (NYSDEC, 2003c), the NYSDEC and NYSDOH concur that the bulk LTOC for PCBs (i.e., 1 mg/kg) would apply to the upper 0.5-inch interval and for subsequent 1-inch intervals throughout the entire depth of the porous material. With

[10] NYSDEC relies on SCGs and TBCs when making decisions on the appropriate remedy (NYSDEC, 2004).

regard to lead, the bulk standard of 500 mg/kg will be used for 2-inch intervals throughout the entire depth of the porous material. This value corresponds with the upper limit of the background concentration range provided in TAGM 4046 for lead in soil. This value is within the 40 CFR Part 745 lead range of 400 ppm for bare soil in children's play areas and 1,200 ppm for bare soil in non-play areas.

In conclusion, the following SCGs will be carried forward in the FS for both the surface areas and bulk components of interior building construction material.

Surface LTOC

1 µg/100cm^2 for PCBs

4.3 µg/100cm^2 for lead

The above surface LTOC will be compared to surface wipe results to: (1) determine the extent of impacted interior building construction material (see discussion below); and (2) determine the efficacy of the remedial actions undertaken for these materials following implementation of the selected remedial action alternative. As indicated by the NYSDEC, in the event that either the surface LTOC for lead or the surface LTOC for PCBs is not met, additional measures will be necessary to prevent exposure in areas exceeding these criteria (NYSDEC, 2003a).

Bulk LTOC

1 mg/kg for PCBs (upper 0.5-inch and subsequent 1-inch intervals)

500 mg/kg for lead (2-inch intervals)

The above bulk LTOC will be compared to bulk sample results to: (1) determine the extent of impacted porous interior building material (see discussion below); and (2) determine the efficacy of the remedial actions undertaken for these materials following implementation of the selected remedial action alternative. Based on guidance from the EPA (ERM, 2003b) and correspondence with NYSDEC (NYSDEC, 2003c), the PCB bulk LTOC will be compared to the upper 1/2-inch interval and underlying 1-inch intervals to determine remedial needs for the concrete and wood interior building materials. A 2-inch interval has been assumed to determine bulk impacts from lead.

In addition to the above surface and bulk standards for lead in porous building materials, the standard used by HUD to identify lead-based paints (i.e., 1.0 mg/cm^2) will be used to identify interior building material containing lead-based paint (40 CFR 745.103).

Lastly, 6 NYCRR Parts 370 through 373 and 375 relate to the identification and management of hazardous waste at the Site. PCBs are present in concrete material at the Site at concentrations above 50 mg/kg. In accordance with 6 NYCRR 371.4(e), contaminated solids having a PCB concentration of 50 mg/kg or greater are classified as a New York State B007 listed PCB hazardous waste. New York State regulations require that sites remain on the Inactive Hazardous Waste Disposal Site Registry if "consequential amounts of hazardous waste" remain at the site (6NYCRR Part 375-1.10(b)); and, at a minimum, that remedies employed at Registry sites must eliminate or mitigate all significant threats posed by hazardous waste disposal at the site (6 NYCRR 375-1.8(a)(1)). Therefore, a "consequential amount" of PCB listed hazardous waste would need to be removed and all significant threats mitigated to allow the Site to be delisted.

Other Interior Building Materials

The SCGs and TBCs for the remaining interior building materials (i.e., interior stormwater system, former process and heating oil tanks and subsurface concrete structures) relate to the contents of these structures and their potential to be released from the Site buildings into the environment. As discussed above with relation to the interior building material, materials classified as a listed hazardous waste would require removal from the Site buildings. In addition, OSWER Directive 9360.3-12, *Response Actions at Sites with Contamination Inside Buildings* (USEPA, 1993) requires that discharges of impacted building materials to the environment must be prevented. If such a discharge were to occur, USEPA would have the authority under CERCLA to conduct a response action.

Results of HHRA

The HHRA for building interiors evaluated potential exposures to facility workers (current and future), short-term tenants, and child tenants (future). Under the premise that these potentially exposed populations access currently restricted areas of the buildings, their calculated risks were in excess of 10^{-6} for carcinogens and their Hazard Index was greater than 1 for noncarcinogens (see Table 5-8). These excess calculated risks/hazard indices are caused by PCBs present on the surface of building materials that have not been cleaned. With respect to lead, the potential risk posed under the current and future use scenarios did not result in estimated blood lead levels greater than 10 µg /dL for the most sensitive population evaluated (i.e., child tenants and fetuses of adult female workers).

The surface and bulk LTOC identified above would provide more than adequate protection of human health and the environment.

Fate and Transport Analysis

PCB and lead contamination of building materials in areas that have not been cleaned could persist and migrate to other locations, within or outside of the Site buildings, through traffic by occupants, building deterioration and exposure to the elements. Although traffic in areas that have not been cleaned is prohibited to temporary tenants, these areas do need to be accessed by facility workers for maintenance purposes and hence, there is the potential for contamination to be carried from these areas into cleaned ones. Currently, migration of the contaminants from uncleaned to cleaned areas is being managed by requiring maintenance personnel to wear shoe covers and use dedicated equipment in the uncleaned areas.

Portions of the Site buildings are deteriorating, particularly the older northern buildings that were constructed over 100 years ago. As discussed in Section 1.4.6, portions of the bulkhead have deteriorated as well, resulting in loss of Below Building soil/fill and creating a void space under the Site buildings. Exposure to tidal action through the damaged bulkhead has caused deterioration of timber support piles. Signs of the damaged support piles are evident in fractured and subsided concrete floor slabs. The roof system, currently in varying states of repair, exhibits leaks and allows storm water to enter the Site buildings. Since the building materials in these deteriorated areas are impacted, there is the potential for the lead and PCBs within these materials to migrate into the environment. Also, the deterioration of the roof in certain areas exposes these impacted materials to the elements and causes further deterioration of the physical structure and creating the potential for migration into the environment through the storm drainage system. Finally, as discussed in Section 2.6.4.3, the interior stormwater system contains impacted sludge/sediment that could be a potential source of contamination to the river.

In accordance with OSWER Directive 9360.3-12, *Response Actions at Sites with Contamination Inside Buildings* (USEPA, 1993), migration of impacted building materials (e.g., interior stormwater system sludge and contaminated building materials) must be prevented. If such a discharge were to occur, USEPA would have the authority under CERCLA to conduct a response action.

7.2.4.2 Remedial Action Objectives for Building Materials

Based on the remedial requirements discussed above, the additional rationale provided in ID#11 and NYSDEC comments on ID#11, the following RAOs have been established for the interior building materials:

- Prevent direct contact, ingestion and inhalation of COPCs in the Site buildings, including PCBs and lead, where concentrations exceed applicable SCGs;
- Prevent migration of COPCs within the buildings that would result in concentrations exceeding applicable SCGs; and
- Prevent migration of COPCs outside the Site buildings.

The SCGs used for this evaluation are the surface and bulk LTOC discussed above.

7.2.4.3 Extent of Impacted Building Materials

As discussed above, interior building material includes interior stormwater system trench/drain pipes, former process and heating oil tanks, concrete structures, lead paint surfaces, and bulk materials (e.g. concrete, wood and metal surfaces).

The extent of impacted concrete and wood building materials has been determined using the surface and bulk LTOC for lead and PCBs. With regard to application of the bulk LTOC, the vertical extent of impacted concrete and wood building materials is a function of the permeation of these chemicals into these construction materials.

A review of wipe and bulk sample results (see Tables 3-4B and 3-7B and Figures 3-7 to 3-15) indicates that lead is present in the form of surficial dust/surface accumulation and does not exist in the bulk concrete samples at concentrations exceeding the bulk LTOC for lead (i.e., 500 mg/kg). Therefore, lead does not permeate into the concrete at unacceptable levels. Additional discussion regarding lead in concrete building materials will therefore be limited to surface impacts. Lead has been identified in limited areas in bulk wood samples at concentrations exceeding the bulk LTOC.

In contrast, PCBs are present in concrete at various depths at concentrations greater than the bulk LTOC for PCBs (i.e., 1 mg/kg). The smallest concrete interval sampled during the RI was $^{1}/_{2}$-inch intervals.

Evaluation of smaller sampling increments (i.e. less than $^{1}/_{2}$-inch increments) were required to investigate the vertical distribution of PCBs in the upper $^{1}/_{2}$-inch interval so that appropriate remedial technologies could be evaluated. A treatability study was performed in May 2003 to provide additional information on a micro-scale and to delineate areas that exhibit surficial impacts in concrete building material. This study was conducted in accordance with Supplement No. 1 to Interim Deliverable No. 10 (Roux, 2003b). A summary of the treatability study is provided below.

A discussion of the extent of impacted building material associated with the interior stormwater trench system, the concrete subsurface structures, the process and heating oil tanks, and lead-based paint is also provided below.

Treatability Study

As stated above, the objective of the treatability study was to better define the vertical distribution of PCBs within the top $^{1}/_{2}$-inch interval of the concrete surfaces. Locations where PCB concentrations greater than 1 mg/kg were limited to the upper 1/2-inch interval were selected for treatability testing.

The treatability study was performed on the first and third floors of the Site buildings only, as presented on Figures 7-10 and 7-11. As shown in Figure 3-12, the RI core data from the second floor shows that PCBs are present in all core samples at depths greater than the upper 1/2-inch interval. Consequently, the second floor was excluded from the treatability study. The fourth floor, which is constructed entirely of wood, was excluded from the treatability study since micro-removal cannot be applied to wood (i.e. wood can either be cleaned or removed in its entirety).

The treatability study consisted of making several passes over specified study areas with a concrete shot blaster and collecting concrete core samples in between shot blasting passes. By repeatedly shot blasting the study area and collecting samples following each shot blast pass, the vertical distribution of PCBs within the upper $^{1}/_{4}$-inch interval was determined. Treatability testing was not extended to depths greater than ¼-inch since milling to ½-inch is a more cost-effective technology for concrete impacted at depths between ¼ and $^1/_2$-inch.

Both wipe and core samples were collected during this study. The bulk concrete core samples were collected after each shot blast pass. Wipe samples were collected after the first shot blaster pass ($^1/_{16}$-inch removal) and the second shot blaster pass ($^1/_8$ -inch removal). These wipe samples were used to determine whether there would be acceptable surface concentrations in the newly exposed concrete should large-scale removal at this depth be implemented. Wipe samples were not collected after subsequent shot blast passes since slab restoration, in the form of a topping material, would be needed for large-scale removal at depths greater than $^1/_8$ inch. This topping material would prevent direct exposure to the previously exposed concrete surface.

The results of the wipe and concrete bulk samples were collectively used to determine the vertical distribution of PCBs and subsequently, the extent of concrete removal/treatment required. Concrete removal to depths greater than 1/8-inch would require a topping material for slab restoration. Therefore, remedial requirements for concrete to depths greater than $^1/_8$ inch would be dictated by meeting the PCB bulk LTOC only. Since slab restoration would not be required for concrete removal to depths less than 1/8-inch and the newly exposed concrete would remain as the floor surface, remedial requirements for these areas would be dictated by meeting the PCB bulk LTOC and meeting the surface LTOC for lead and PCBs.

Ten study areas were selected for testing, eight on the first floor and two on the third floor. Initially, the entire study area was shot blasted. The first pass with the shot blaster removed approximately $^1/_{16}$ inch of concrete from the surface. After the first pass with the shot blaster, the study area was vacuumed and a wipe sample was collected and submitted for PCB analysis. A 6-inch concrete core was collected in the same location the wipe sample was collected. The upper $^{1}/_{2}$-inch interval of the concrete core (i.e., $^{1}/_{16}$ to $^{9}/_{16}$ inch below top of surface) was submitted for PCB analysis. The study area was then shot blasted and vacuumed a second time, resulting in an additional $^{1}/_{16}$-inch removal from the surface of the slab, for a total of $^{1}/_{8}$-inch removal. Similarly, a wipe and 6-inch concrete core were collected following the second shot blasting pass. The wipe sample and the upper $^{1}/_{2}$-inch interval of the concrete core (i.e., $^{1}/_{8}$ to $^{5}/_{8}$ inch below top of surface) were submitted for PCB analysis. The entire study area was then shot blasted a third time, and finally a fourth time, resulting in a total of ¼ inch of concrete removal. A final 6-inch concrete core was collected following the fourth shot blasting pass and the upper $^{1}/_{2}$-inch interval of this core (i.e., ¼ to ¾-inch below top of floor surface) was submitted for PCB analysis. No samples were collected following the third shot blasting pass. As stated above, no wipe sample was collected following the fourth shot blast pass since large-scale removal of the concrete slab to this depth would require restoration of the slab. Therefore, a total of two wipe samples and three concrete core samples were collected at each study area. Sampling locations are presented on Figures 7- 10 and 7-11.

The sample results are presented on Figures 7-10 and 7-11 and Tables 7-3 and 7-4. Five out of the ten wipe samples collected following the first shot blast pass ($^{1}/_{16}$ inch total removal) exceeded the wipe PCB SCG. Following the second shot blast pass ($^{1}/_{8}$ inch total removal), six of the ten samples collected exceeded the wipe PCB SCG. Ten of the ten samples collected following the first shot blast pass ($^{1}/_{16}$ inch total removal) exceeded the bulk PCB SCG of 1 mg/kg. Following the second shot blast pass ($^1/_8$ inch total removal), nine of the ten samples collected exceeded the bulk PCB SCG. Lastly, seven of the ten samples collected following the fourth shot blast pass (¼ inch total removal) exceeded the bulk PCB SCG.

Based on the results of the treatability testing, at seven out of the ten testing locations where PCB were limited to the upper ½-inch (i.e., the majority of the testing locations), the PCBs had permeated the building material to greater than ¼-inch in depth. As such, technologies that are designed to remove less than or equal to ¼-inch of concrete (i.e., shot blasting, scarification) would not be appropriate at these locations that exhibit PCB concentrations greater than 1 mg/kg in the upper ½-inch of concrete. Because concrete removal to depths greater than $^1/_8$ -inch would need to be implemented, the wipe sample results from the treatability testing were not needed to determine if suitable surface concentrations existed. Additional discussion regarding the use of the treatability study results in the technology selection process is presented in Section 8.1.2.4.

Extent of Impacted Building Material

With regard to interior building construction materials, three (3) types of impacted materials have been identified. They are:

- impacted interior concrete and wood building materials limited to surface accumulation/ surficial impacts;
- impacted interior concrete and wood building materials at depth; and
- impacted interior concrete and wood building material classified as NYS B007 listed PCB hazardous waste.

The extent of impacted building construction materials limited to surface accumulation and surface impacts (i.e., no exceedance of bulk

LTOC) was determined by comparing the post-clean surface concentrations of PCBs and lead on interior building material construction materials (i.e., wood, concrete and metal) to the surface LTOC. In areas that previously underwent full-scale cleaning and were re-evaluated as part of ID-10 (e.g., Building No. 8), the ID-10 post-clean wipe results supercede the RI post-clean wipe results since they would represent an additional round of cleaning. The extent of surficially impacted interior building construction materials is defined as areas where no bulk sample exceeds the bulk LTOC; the pre-clean wipe sample results exceed the surface LTOC for lead and PCBs and the post-clean wipe sample results are less than the surface LTOC for lead and PCBs (i.e., cleaning would be needed to achieve the compliant post-clean sample results).

Figures 7-12 through 7-15 present the extent of impacted building material as determined by using the ID-10 floor wipe and core sample results. As discussed earlier, the ID-10 dataset was developed to identify the vertical extent of impact at a given location by comparing the surface wipe sample result with corresponding bulk samples at that location. This information would not only identify the vertical extent of impact but would also assist in determining the appropriate remedial action for that location. The majority of the RI dataset (i.e., results collected prior to ID-10) consists of surface wipe samples with only some bulk samples at those locations. For this reason, the extent of impact was developed primarily using the ID-10 dataset.

At the request of the NYSDEC, Figures 7-12A through 7-14A were prepared to present both the RI and the ID-10 floor wipe sample results. As discussed above, in areas that previously underwent full-scale cleaning, the ID-10 results supersede the RI wipe sample results. Consequently, the superseded RI wipe sample results are not included in Figures 7-12A through 7-14A and were not used to define the extent of impacted building materials.

In addition to floor sampling, limited wall sampling was also performed during the initial RI sampling. As previously discussed with NYSDEC and NYSDOH, it was presumed that any dust particles containing lead or PCBs contacting the walls would fall to the floor and would be detected in the floor surface wipe sampling. Therefore, additional wall and ceiling wipe sampling was not conducted. Wall and ceiling cleaning have been included in all previous full-scale floor cleaning performed for tenant occupancy purposes and would be performed as part of any future remedial activities. For this reason, the total wall and ceiling quantities have been presented below in the estimated quantity of impacted media.

Impacted Building Construction Materials Limited To Surface Accumulation/ Surficial Impacts (PCBs and Lead)[(1)]

Floor	Estimated Surficial Concrete Floor Surface Area (SF)	Estimated Surficial Wood Floor Surface Area (SF)	Estimated Surficial Wall and Ceiling Surface Area (SF)[(2)]
First Floor	49,925	NA	273,470
Second Floor	50,385	13,650	231,910
Third Floor	3,095	7,600	98,685
Fourth Floor	NA	11,350	12,000
Stairwells	8,400	NA	25,315

Notes:
NA-This type of building material is not present on this floor
(1) Excludes the East and West Warehouse, Paint Shop and Guard House (see below for additional discussion).
(2) These values conservatively represent the total wall and surface areas since floor and ceiling cleaning would be conducted with any floor remediation.

The extent of surficially impacted interior concrete building material in the East and West Warehouses, Paint Shop and Guard House are neither included in the above summary nor identified in the extent of impacted building materials in the figures. Impacts to these buildings are limited to surficial concrete impacts. These buildings are discussed separately from the other Site buildings since their remedial action will be dependent upon the selected soil/fill alternative (see Section 9.2) and they are therefore not included in the interior building material remedial action alternatives discussed in Section 9.4. In total, approximately 38,560 sf of impacted concrete flooring is present in these buildings.

The extent of impacted concrete and wood building materials at depth was determined by comparing the bulk PCB concentrations in porous media (i.e., wood and concrete) to the bulk LTOC. Based on this comparison, for concrete, permeation depths range from < $^{1}/_{16}$ inch below floor surface to throughout the entire floor slab (i.e. average thickness of concrete slab is 8-inches). For wood, the permeation depths extend up to 2-inches below the floor surface. The following summarizes the impacted surface areas for each floor at depth and provides an estimate of the volume of impacted building material.

Impacted Concrete Building Material Floors at Depth (PCBs Only)[(1)(2)(3)]

Floor	Maximum Depth of PCBs Exceeding LTOC	Estimated Concrete Surface Area (SF)	Total Estimated Percent of Concrete With PCB Impact At Depth (Per Floor)	Estimated Concrete Volume (CY)	Total Estimated Volume By Floor (CY)
First Floor	≤ $^{1}/_{16}$-Inch	5,635	67%	1.08	1,525
	≤ $^{1}/_{8}$-Inch	6,870		2.65	
	≤ $^{1}/_{2}$-Inch	41,055		64	
	≤ 1-Inch	1,470		4.5	
	> 1-Inch	59,575		1,450	
Second Floor	≤ $^{1}/_{16}$-Inch	9,745	34.5%	1.8	360
	≤ $^{1}/_{2}$-Inch	1,345		2.06	
	≤ 1-Inch	1,370		4.2	
	> 1-Inch	14,100		346	
Third Floor	≤ $^{1}/_{16}$-Inch	NA	83%	NA	300
	≤ $^{1}/_{2}$-Inch	3,400		5.2	
	≤ 1-Inch	NA		NA	
	> 1-Inch	11,930		293	

Notes:
(1) Does not include surficial quantities provided above.
(2) With the exception of the stairwells, no concrete building material is located on the fourth floor.

(3) The depth intervals provided correlate to the intervals for which the Section 8 technologies will be evaluated.
NA- Maximum depth of contamination exceeds this interval

Impacted Wood Building Material Floors at Depth (PCBs Only)[(1)]

Floor	**Estimated Wood Surface Area (SF)**	**Estimated Wood Volume (CY)**
First Floor	NA	NA
Second Floor	11,340	105
Third Floor	2,105	20
Fourth Floor	4,170	40

Note:
(1) Does not include surficial quantities provided above
NA-Wood building material is not present on this floor

Remedial technologies are presented in Section 8.0 for impacted interior building materials.

Extent of Impacted Media in the Lead Extrusion Pits

There are two former lead extrusion pits located on the second floor of the High Bay Building. In this area, lead sheathing was extruded around paper-insulated cable. Two lead extruders were removed in 1997 and the concrete pits below the machines were inspected. As indicated in Section 3.1, a sample of solidified oil was collected from each pit. The oil samples were composited and submitted for analysis for RCRA toxicity characteristics using the TCLP. TCLP lead concentrations in these samples exceeded 5 milligrams per liter, indicating the oil composite is a characteristic hazardous waste for lead. However, the concrete chip samples collected from the floor and four walls of each of the two lead extrusion pits indicated the concrete floors and walls of the pits are not a hazardous waste. The lead extrusion pits were sealed with plywood and fencing was installed around the perimeter of the pits to avoid exposure.

The lead extrusion pits will be addressed as a Common Action for all remedial action alternatives, except the No Action Alternative (see Section 8.0 and 9.1.7 for additional discussion).

Extent of Sludge in Interior Stormwater Trench System

The floor trench system is estimated to be approximately 1,100 linear feet in length and is constructed with concrete walls throughout the length of the trench. As discussed in Section 3.2 and shown in Figure 2-1, a competent trench bottom was missing at certain locations within the interior floor trench system. As discussed in Section 3.2.7, sludge was sampled and removed from the trench system, to the extent possible, as part of Interim Deliverable No.1 (Roux, 2001). Residual sludge remains in inaccessible areas and areas of the trench without competent bottoms. It is estimated that approximately 115 CY of residual sludge remain in the trench system. Soil/fill beneath the bottomless portions of the trench are evaluated in the Below Building soil/fill (see Section 7.2.1.3).

As discussed in Section 3.2.7, SVOCs, inorganic constituents, and PCBs were detected in the sludge samples collected prior to cleaning of the trench. The residual sludge that remains in the floor trench likely contains similar organic compounds and inorganic constituents to the sludge that has been removed. All of this remaining sludge will be carried forward as impacted media requiring remedial action since it has the potential to be released to the environment.

The soil/fill underlying open portions of this system will be evaluated in the context of the Below Building soil/fill (see Section 7.2.1.3). The remaining sludge present in this system will be addressed as a Common Action for all remedial action alternatives, except the No Action Alternative (see Section 8.0 and 9.1.5 for additional discussion).

Extent of Residual Product in Process Oil Tanks

The process oil tanks located on the walls and ceiling of the second floor High Bay were previously drained of their contents, but were not cleaned. The locations of these tanks are presented in Figure 7-13. Residual oil is located in these process oil tanks and associated piping. As discussed in Section 3.2.8, wipe samples were collected from the interior of the tanks and manifold piping. The wipe samples indicated that the residual oil contained PCBs at concentrations ranging from non-detect to 9 $\mu g/100\ cm^2$. The amount of residual oil in the tanks is not quantifiable. This material requires removal to comply with the aboveground storage tank requirements provided in 6 NYCRR 613.9(b)(1) for permanent closure of out-of service tanks.

These tanks will be addressed as a Common Action for all remedial action alternatives, except the No Action Alternative (see Section 8.0 and 9.1.6 for additional discussion).

Extent of Impacted Material Within Concrete Subsurface Structures

Five (5) concrete subsurface structures were identified during the subsurface structure geophysical investigation performed as part of Interim Deliverable No. 7 (Roux, 2002a) and subsequent to Interim Deliverable No. 7. These subsurface structures include:

- the subsurface vault located in Building No. 2 (south of the Pipe Shop) (i.e., reel pit);

- the subsurface pit located in Building No. 2 (i.e., lead press pit) identified by historical drawings;
- the subsurface anomaly identified in Building No. 4 by historical drawings and verified during the geophysical investigation; and
- the two potential subsurface structures identified in Building No. 5 (i.e., reel pits) based on a review of historical drawings.

The locations of these structures are presented in Figure 7-7.

Building No. 2 Subsurface Structures

Two subsurface structures were identified in Building No. 2. The larger of the two is referred to as Building No.2 reel pit. As discussed in Section 3.2.6.4, when discovered, the subsurface vault was filled with water and an overlying layer of petroleum-type product. The product layer varied in thickness from less than $^1/_4$ to ½-inch. Based on the assumed dimensions of the vault (i.e., 18 feet by 38 feet) and the water and product thickness measurements, it is estimated that the vault contained approximately 250 gallons of petroleum-type product and 40,000 gallons of water. The location of this structure is provided in Figure 7-7.

In accordance with Interim Deliverable No. 7, the 250 gallons of petroleum-type product and approximately 10,130 gallons of water were pumped out of the vault. This work was conducted in November 2002. Samples of the petroleum-type product and water were collected for characterization purposes. Based on the analytical results presented in Tables 3-11A through 3-11F, the petroleum-type product layer and the water were identified as non-hazardous waste. Neither the water nor the product contained detectable levels of PCBs. The petroleum-type product was characterized by petroleum fingerprinting to be weathered crude oil (see Appendix H). Removal of the petroleum-like product was requested verbally by NYSDEC.

Approximately 30,000 gallons of water remained in the vault. The water level had not changed within the vault during the investigation, indicating that there was neither infiltration into nor exfiltration from this structure into the environment. The water in this vault was subsequently removed from this structure. As agreed to with NYSDEC, details of the water removal and additional investigation of this subsurface structure will be included in as a pre-design study for future work (see Section 9.1.1.3).

During the removal of the petroleum-like product from the vault, it was noted that the southern sidewall is constructed out of concrete debris and an earthen wall may be present behind this debris. Debris was also observed at the base of this structure. Additional investigation would be needed to confirm that product did not previously exfiltrate through the southern wall of this structure to the adjacent soil/fill and to characterize the debris at the base of this structure. The materials requiring investigation and remedial action related to this structure would include: the walls of the structure; and potentially the soil/fill to the south of the structure.

An additional subsurface structure was later identified in Building No. 2. It is a former lead press pit, located to the west of the above subsurface vault. This structure, which was identified during a review of historical drawings, was not identified in the geophysical investigation and therefore, was not specifically investigated during the Interim Deliverable No. 7 investigation. However, during a subsequent investigation, an inspection core was performed in this area. The inspection core indicated that soil/fill material consistent with the Below Building soil/fill was present. Further evaluation of this potential subsurface structure, including sampling and analysis of the structure's contents and identification of competent sidewalls and bottom would be performed as a pre-design study. Based on the historical drawings, the dimensions of this subsurface structure are approximately 8 feet by 25 feet and 6-feet in depth. Therefore, it is assumed that approximately 45 cy of soil/fill would require remedial action. The location of this subsurface structure is presented on Figure 7-7.

<u>Building No. 4 Subsurface Structure</u>

The subsurface structure located in Building No. 4 was initially identified during a review of historical drawings and its presence was then verified by the geophysical investigation. The former usage of this subsurface structure is unknown. The location of this structure is provided in Figure 7-7.

The structure is approximately ten feet by ten feet in size. A competent bottom to this structure was identified at approximately 1.5 feet below the concrete slab. During the subsurface structure inspection, core holes drilled into the structure revealed that the structure was filled with soil, concrete, and brick debris prior to covering with a concrete slab. A soil sample was collected from within the structure and submitted for analysis for SVOCs, metals, PCBs, and RCRA characteristics. This sample location, SS-246, is shown in Figure 7-7 and the analytical results for this sample are presented in Table 3-12A through 3-12D. PCBs were detected in this sample at 1,800 mg/kg, well above the NYS B007 listed PCB hazardous waste limit of 50 mg/kg. As such, the material in this structure would be classified as a NYS B007 listed PCB hazardous waste and thus require removal. It is estimated that the subsurface structure contains approximately 6 CY of impacted material.

<u>Building No. 5 Subsurface Structures</u>

The two subsurface structures located in Building No. 5 were identified in historical drawings as former reel pits. Soil borings were attempted in this area during the subsurface structure investigation. However, the configuration of these structures could not be delineated. A subsequent geophysical investigation in Building No. 5 yielded the configuration presented on Figure 7-7. As shown in this figure, four soil borings (SS-224, SS-224A, SS-245, and SS-255) were completed within the two subsurface structures. The analytical results are presented in Tables 3-12A through 3-12D. The PCB concentrations in these structures ranged from 1.3 to 33.9 mg/kg. The contents of each of the Building No. 5 structures included soil, concrete, brick debris, rubber, and lime. A bottom was encountered at each of the borings at a depth of approximately 4 feet; however, the competency of these bottoms cannot be determined without removing the materials within these structures. It is estimated that the two subsurface structures contain a total of approximately 90 cy of material. Based on the concentrations observed in these samples, this material would be classified as a non-hazardous waste.

These subsurface structures will be addressed as a Common Action for all remedial action alternatives, except the No Action Alternative (see Section 8.0 and 9.1.3 for additional discussion).

Extent of Lead-Based Paint

As discussed in Section 3.2.10, a lead paint survey was conducted on the building material surfaces of each floor of the Site buildings. The survey identified painted building material surfaces that contains lead concentrations of greater than 1.0 mg/cm^2, the standard used by HUD to identify lead-based paints. A total of 1,525 locations were sampled during this survey. Of these 1,525 locations, 191 locations tested positive for lead-based paint.

Maps presenting the locations of the rooms identified with lead-based paint are provided in Appendix I. The following provides a summary of the number of rooms/stairwells identified as containing lead-based paint:

Floor/Stairwells	No. of Rooms in Previously Cleaned Areas	No. of Rooms in Uncleaned Areas
First Floor	4	13
Second Floor	8	4
Third Floor	18	9
Fourth Floor	NA	8

Note: Multiple samples may have been collected from a single room.

Peeling paint was identified in several areas at the time of the survey (November 2001). It is expected that additional areas may currently contain peeling paint. A detailed discussion of the location of peeling lead-based paint was provided in Section 3.2.10.

Remedial actions with respect to lead-based paint would be limited to paint that exceeds the HUD standard of 1.0 mg/cm^2. Lead-based paint in exceedance of this standard is subject to abatement. Removal of lead-based paint would serve to eliminate a potential future source of lead dust on interior building material surfaces. Lead based paint will be evaluated along with the PCBs and lead on building surfaces and within building materials.

8.0 IDENTIFICATION AND SCREENING OF REMEDIAL ACTION TECHNOLOGIES

This section screens a variety of remedial technologies that may be employed individually, or in combination, to achieve the RAOs for Site environmental media and interior building materials. The remedial technologies that pass the screening process described in this section are organized into specific remedial alternatives, which together with a number of common actions, are presented and evaluated in Section 9.0.

Section 8.1 describes the technology screening and evaluation process conducted for the media of interest. Technologies are then identified and evaluated in Section 8.1.1 for Site environmental media of interest (i.e., soil/fill and sediment) and in Section 8.1.2 for interior building materials.

Common actions involve technologies that would be included in all of the remedial action alternatives that are evaluated in Section 9.0, with the exception of the No Action alternatives. As a result, the technologies included in these common actions are excluded from the screening and evaluation process discussed in this section. There are seven Common Actions associated with the exterior environmental media and interior building material remedial alternatives discussed in Section 9.0. They are:

1) Ground water monitoring;

2) Preparation and implementation of a soil management plan (SMP);

3) Removal of debris in the intertidal sediment zone and within building subsurface structures;

4) Bulkhead restoration beneath Site buildings;

5) Removal of the interior stormwater trench system;

6) Removal of process tanks; and

7) Cleaning of the lead extrusion pits.

All seven common actions are comprised of selected technologies that will address certain RAOs for the Site and are discussed more fully in Section 9.0. As these technologies are proven, they are not screened in this section.

8.1 TECHNOLOGY SCREENING AND EVALUATION

The remedial technologies considered for environmental media and interior building materials represent engineering approaches that would rely on ex-situ, in-situ or institutional/containment types of general response actions that could meet one or more of the RAOs. The considered technologies were identified through a review of NYSDEC information, USEPA guidelines, relevant literature, Site conditions, and experience in developing feasibility studies and remedial action plans for similar types of environmental conditions.

The identified technologies underwent a preliminary screening against a number of criteria. The preliminary screening initially assessed which, if any, specific technologies have been demonstrated in a full-scale application and apply to one or more of the COPCs present at the Site. As discussed in Section 4.0, the COPCs for the Site soil/fill fall into the following four categories: VOCs, SVOCs, PCBs and inorganic constituents. As discussed in Section 6.0, the COPCs for Site-related sediment fall into the following three categories: SVOCs, PCBs and inorganic constituents. As discussed in Section 5.0, the two COPCs for building materials are PCBs and lead. For purposes of conducting the technology evaluation, lead and PCBs were considered to be the two major COPCs for Site soil/fill, Site-related sediment and interior building materials.

The technology was rated based primarily upon its applicability to address the RAOs with regard to specific COPCs. The COPC category ratings indicate whether the technology was demonstrated:

1) To be effective for a COPC;
2) To have limited effectiveness for a COPC;
3) To have no effectiveness for a COPC; or
4) To be effective for a COPC, but its effectiveness is highly dependent on site specific conditions or is not consistently reliable for the COPC.

The system reliability/maintainability ratings indicate whether the technology has:

1) High reliability and/or low maintenance;
2) Average reliability and/or average maintenance; or
3) Low reliability and/or high maintenance.

In addition, some basic performance information was considered in further screening the technology. The performance information was intended to provide insight into whether use of the technology offered any advantage with respect to: residuals that are produced; intensity of capital or operation, monitoring and maintenance costs (OM&M); system reliability/maintainability; cleanup time; or, overall (general) costs.

For a technology to pass the preliminary screening, it had to effectively address one or generally both of the two major Site COPCs. Further, the comparison of the technologies gave a preference to those technologies that: were regarded as reliable or maintainable; could be implemented in a reasonable time frame; and/or comparably required less capital or OM&M dollars. The preliminary screening was used to narrow the ex-situ, in-situ and institutional/containment types of remedial technologies to those that were determined, on balance, to offer an advantage with respect to the aforementioned criteria.

The selected ex-situ, in-situ, and institutional/containment remedial technologies, which were deemed to offer an advantage given the conditions at the Site, were carried forward for further evaluation. This evaluation considered more Site-specific criteria pertaining to effectiveness and implementability, as well as the technology's ability to meet the remedial action objectives identified in Section 7.0.

In the subsequent evaluation, the effectiveness criteria considered short-term effectiveness, long-term effectiveness, and overall ability of the technology to protect human health and the environment. Short-term effectiveness refers to the effects during the construction and implementation of the technology. The long-term effectiveness refers to the period after the remedial action is in place and effective. The protection of human health and environment criterion considers potential positive and adverse impacts that may result from the use of the technology. This evaluation incorporates elements of the NYSDEC guidance documents TAGM 4030 and the draft DER-10 (NYSDEC, 1990; NYSDEC, 2002) and the Guidance for *Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988).

The evaluation of implementability focused on institutional aspects associated with use of the remedial technology, along with constructability and continued OM&M requirements. These subcategories are consistent with the approach for remedial alternative screening in TAGM 4030. Institutional aspects involve potential permits or access approvals for on-site use, off-site work, and off-site treatment, storage and disposal services. Constructability, or technical feasibility, refers to the ability to construct, reliably operate and meet technical specifications or criteria, and the availability of specific equipment and technical specialty personnel to operate necessary process units.

The evaluation of effectiveness, implementability and ability to meet the RAOs further reduced the list of remedial technologies. Those exhibiting more favorable characteristics in the evaluated areas were carried forward. The remedial technologies that were kept after the effectiveness and implementability evaluation were then combined into various remedial action alternatives for more detailed evaluation in Section 9.0.

8.1.1 ENVIRONMENTAL MEDIA TECHNOLOGIES

The institutional/containment, in-situ and ex-situ environmental media remedial technologies that may be applicable to the Site are identified and described in Table 8-1. As shown in this table, there are two (2) institutional/containment, five (5) in-situ and 12 ex-situ remedial technologies that offer options to destroy, treat/separate, solidify/stabilize, contain and/or land dispose of affected environmental media. The preliminary screening of these 19 technologies is summarized in Table 8-2.

Both of the institutional/containment technologies identified in Table 8-2 were retained for further evaluation. These were access/use restrictions and cover/cap. Both technologies would seek to eliminate exposures to soil/fill and/or sediment as a means of meeting the RAOs. These technologies would not require significant capital investment but would require ongoing, long-term OM&M. The reliability of these technologies is strongly linked to the consistent application of barriers and long term compliance with restrictions and maintenance of engineering controls.

Of the in-situ technologies identified, one was retained for further evaluation, in-situ chemical oxidation. This technology would be potentially effective for the majority of soil/fill COPCs under specific Site conditions. This technology would not create residuals, would have simple OM&M (e.g., periodic introduction of oxidant) and would not result in major Site disturbances. These conditions are discussed in the further evaluation (Section 8.1.1.3). Although this technology could be suitable for COPCs in Site-related impacted sediment, access constraints would prevent its use.

Although in-situ solidification/ stabilization would address the potential lead hazardous characteristics of the soil/fill, this material would not require treatment unless it was excavated. In-situ solidification/stabilization would have limited effectiveness for PCBs. The remaining in-situ technologies are not effective for either PCBs or lead. Based on the above reasoning, in-situ chemical oxidation is the only in-situ technology with the potential to achieve the RAOs for the Site soil/fill. This technology will be carried forward for further evaluation.

Of the ex-situ technologies identified in Table 8-2, four were retained for further evaluation. These were: ex-situ solvent extraction (i.e., soil washing); solidification/stabilization; excavation & off-site disposal; and sediment removal/dredging. With the exception of solidification/ stabilization, these technologies would be appropriate and reliable for both PCBs and lead. Ex-situ Solidification/stabilization is an appropriate technology to address characteristic lead hazardous waste in the excavated soil/fill. While the solvent extraction technology would have the largest OM&M burden and would need to operate over a slightly longer time period as compared to the other three retained ex-situ technologies, it represents a treatment option for identified COPCs that warrants further consideration. In contrast, the remaining eight (8) ex-situ technologies were found not to be effective for PCBs and lead. Hence, these technologies would be unable to achieve the RAOs for the Site.

In summary, seven technologies have been retained after the preliminary screen and are evaluated further below. These technologies are:

Type	**Technology**
Institutional/ Containment	1. Access/Use Restrictions 2. Cover/Cap • Soil/Fill Cover • Monitored Natural Recovery Sediment Cap • Constructed Sediment Cap
In-Situ	3. Chemical Oxidation
Ex-Situ	4. Excavation & Off-Site Disposal 5. Sediment Removal/Dredging • Vacuum Pumping

Type	Technology
	• Mechanical/Hydraulic Dredging 6. Solvent Extraction 7. Solidification/Stabilization (lead only)

Based on this preliminary screening, these remaining technologies were carried forward for an evaluation of effectiveness and implementability. This further evaluation considered, among other things, Site-specific conditions that would positively or negatively impact the applicability of the technology to address the environmental media in achieving the RAOs.

The following sections describe each of the seven environmental media technologies carried forward, present an evaluation of their effectiveness and implementability and recommend whether the technology should be carried forward or eliminated from further consideration in the development of remedial action alternatives.

8.1.1.1 Access/Use Restrictions

This technology would involve restricting certain activities and preventing access at the Site to minimize the potential for direct contact with Site soil/fill and sediment. Institutional controls for this Site would include:

- placing restrictions on the performance of subsurface soil/fill work (e.g., construction, utility);
- placing restrictions on the work in the intertidal sediment area;
- filing a deed notice documenting the presence of constituents in Site soil/fill and sediment that exceed the NYSDEC TAGM 4046 RSCOs; and
- placing a covenant on the deed regarding future Site use.

Access restrictions in the form of engineering controls would be continued by maintaining existing fencing. Additional fencing would be installed/maintained around the southwestern parcel of land not currently fenced. Fencing would reduce unauthorized access and potential damage to the existing cover systems from trespassers. Signage could also be posted at equal intervals along the perimeter of the Site and along roads leading to the Site indicating access restriction.

Access/use restrictions are commonly coupled, as necessary, with other remedial technologies.

Evaluation

Effectiveness

- Minimal short-term effects expected.
- Long-term effectiveness dependent upon respect of institutional controls, maintenance of controls, and has some limited degree of reliability.
- May not prove to be reliable in the long-term for protection of human health and environment as a stand-alone technology – would need to be combined with other technologies.

Implementability

- Relative ease of constructability.
- Average effort for OM&M: NYSDEC requires that an annual inspection and certification by a professional engineer be provided, stating that controls are in place and effective (NYSDEC, 2002).
- Average administrative feasibility to develop work plan, gain NYSDEC approval, and develop institutional controls, though again, this technology would be combined with others.

Some access/use restrictions are currently in place at the Site. Existing zoning regulates the type of current site use. In the future, Site buildings could remain and be used for commercial purposes, though the structures would have to be renovated to accommodate these uses. The current owner has secured the Site through the use of fencing and posting of guards and Site entrances 24 hours per day, 7 days per week. The owner also regulates on-Site occupants. Maintaining these access and use restrictions is a relatively high cost activity.

Access/use restrictions would fulfill the soil/fill, ground water and sediment RAOs associated with the prevention of ingestion, direct contact and or inhalation for these media. Although this technology would have considerable long-term effectiveness concerns, it is likely that some degree of access/use restrictions would need to be part of any selected soil/fill remedial action since chemicals associated with the historic fill would remain under all soil/fill remedial action alternatives. For example, TSCA imposes use restrictions when containment (e.g., caps, fences) is employed. Based on the above evaluation, this technology will therefore be carried forward and considered along with the development of remedial alternatives.

8.1.1.2 Cover/Cap

A cover/cap can be used to address environmental conditions in the soil/fill or sediment. A cover/cap would be used to create a barrier that prevents contact between future users of the Site and/or biota and COPCs. A cover/cap on the soil/fill would need to prevent direct contact, ingestion, or inhalation of soil/fill that exceeds applicable SCGs. Similarly, a cover/cap on sediment would also need to isolate sediment above COPCs as a habitat for biota. The various types of cover/caps that apply to soil/fill and sediment are briefly discussed below.

<u>Soil/Fill Cover</u>

Covers/caps may be constructed with clean soil, asphalt, concrete or other less permeable materials. Currently, there is no NYSDEC guidance regarding the construction of a non-regulated cover/cap. TSCA does however, provide requirements for covers/caps in high occupancy areas that overly materials containing PCBs at concentrations between 1 mg/kg and 10 mg/kg and covers/caps in low occupancy areas containing PCBs at concentrations up to 100 mg/kg. Such a cover/cap (hereafter referred to as a TSCA cap) would have to meet the requirements of 40 CFR 761.61(a)(7). These requirements are identified in Table 7-2. TSCA low occupancy standards require PCBs in excess of 100 mg/kg to be removed.

A TSCA cap of compacted soil must have a minimum thickness of 10 inches. A concrete or asphalt TSCA cap must have a minimum thickness of 6 inches. A TSCA cap must be of sufficient strength to maintain its effectiveness and integrity during the use of the cap surface that is exposed to the environment. In addition, any person designing and constructing a TSCA cap must do so in accordance with 40 CFR Part 264.310(a) and ensure that it complies with the permeability, sieve, liquid limit, and plasticity index parameters in 40 CFR Part 761.75(b)(1)(ii) through (b)(1)(v). The owner of the site must also maintain the cover in perpetuity. In accordance with 40 CFR 761.61 (a)(8), whenever a TSCA cap is used, the owner of the site must meet the following conditions within 60 days of completion of a cleanup activity:

- Record, in accordance with State law, a notation on the deed to the property, or on some other instrument which is normally examined during a title search, that will in perpetuity notify any potential purchaser of the property:
    - That the land has been used for PCB remediation waste disposal.
    - That the area is restricted to low-occupancy use if PCBs are present above 10 mg/kg.
    - Of the existence of the cap and the requirements to maintain the cap.

    - The chemical concentrations left at the site under the cap.
- Submit a certification to the EPA Regional Administrator, signed by the Site owner that they have recorded the notation specified above.

In the absence of NYSDEC cover/cap construction requirements, covers/caps over non-PCB impacted historic soil/fill may be similar to the TSCA cap construction parameters provided above. This construction is similar to covers/caps that NYSDEC has required at other sites where prevention of direct contact has been a remedial requirement. NYSDEC has required, at other Sites, that covers/caps comprised of soil also include an underlying demarcation barrier to identify where contaminated soil/fill remains. This demarcation barrier would be included in any covers/caps constructed of soil installed at the Site. At these sites, NYSDEC has required a two-foot soil cap or an asphalt or concrete cover.

Since the fate and transport analysis concluded that leaching of COPCs from Site soil/fill to ground water is not of concern, a cover that provides a direct contact barrier but no infiltration control would be sufficient. Therefore, either an asphalt, concrete or soil cover/cap would be installed.

Evaluation

Effectiveness

- With proper maintenance, this technology would be effective in reducing direct contact exposures in the long term, but would still leave chemicals in place.
- Proven to be reliable in the long term for protection of human health and environment with proper OM&M.
- May increase the potential for short-term inhalation and direct contact exposure to construction workers during site work. A slight increase in dust and noise would occur from construction and truck traffic. These concerns could be reduced/eliminated through engineering controls.

Implementability

- Relative ease of constructability with standard construction equipment.
- Average effort for OM&M; NYSDEC requires that an annual inspection and certification be provided by a professional engineer, stating that engineering controls are in place and effective. Also, regular repairs to the cap must be conducted.
- Average administrative feasibility to develop work plan, gain NYSDEC approval, and obtain permits.

Placement and maintenance of a cover over soil/fill is a proven technology that has been employed at many sites. Asphalt and concrete currently cover much of the Yard and Below Building soil/fill that contains COPCs in excess of their SCGs. These existing covers prevent direct contact with much of the impacted Site soil/fill. The Yard is relatively uniform in its topography and accessible. Installation of a cover/cap over this area would be implementable and reliable with adequate OM&M. However, due to the presence of PCBs in Site soil/fill in excess of 100 mg/kg at numerous North Yard locations, a cover would not comply with the regulatory requirements identified in TSCA for these locations.

As stated above, the Below Building soil/fill is currently covered with a concrete cover (i.e., building floors). Although deteriorating in a number of places, this cover when restored would effectively prevent direct contact with underlying soil/fill.

Installation of a cover/cap at the Site in conjunction with additional technologies, would be effective and readily implementable in preventing ingestion with, direct contact with and inhalation of material containing COPCs above SCGs. This technology would fulfill the soil/fill RAO associated with the prevention of ingestion, direct contact and/or inhalation. As noted above, this technology would not comply with the TSCA regulatory requirements for high and low occupancy areas and a number of Yard areas would need to be restricted to low occupancy use. However, since cover technologies have been used at other sites having similar subsurface PCB concentrations and surface covers would be needed for the historic fill areas, this technology will therefore be carried forward and considered along with the development of remedial alternatives.

Monitored Natural Recovery Sediment Cover/Cap

The natural process of deposition of cleaner sediment over impacted sediment is referred to as monitored natural recovery (MNR). It is a process that can, without human intervention, act to reduce mass, toxicity, mobility, volume, and/or chemical concentrations in the sediment bed. The natural processes can include: 1) physical processes such as sedimentation, advection, diffusion, dilution, bioturbation, and volatilization; 2) biological processes such as biodegradation, biotransformation, phytoremediation, and biological stabilization; and 3) chemical processes, such as oxidation/reduction, stabilization, and sorption (USEPA, 2002). The ability of MNR to reduce mass, toxicity, mobility, volume, and/or chemical concentrations in the sediment bed is dependant upon the COPCs and the sediment environment.

The naturally occurring physical process of sedimentation acts to reduce risk by containing contaminants in place. Naturally-occurring biological processes, such as biodegradation, are facilitated by microorganisms living in sediment. These are dependent upon Site-specific conditions and are highly variable. Highly chlorinated PCBs may gradually dechlorinate naturally in anaerobic sediment. Aerobic processes may then biodegrade the less chlorinated PCB congeners. Sediment concentrations of other chemicals and the total organic content tend to control these processes. The natural recovery due to chemical processes is difficult to predict because many environmental variables govern the chemical state of constituents in sediment. As well, many chemical processes in sedimentary environments are biologically mediated. Environmental variables include pore water, pH and alkalinity, sediment grain size, oxidation-reduction (redox) conditions, and the amount of sulfides and organic carbon present in the sediments.

MNR is typically evaluated over the course of a year to document the naturally occurring processes at the Site. This monitoring would include data collection to demonstrate a trend of decreasing chemical concentrations, mass, or toxicity over time. Data from field studies would be used to demonstrate the depth of the sediment mixing zone or zone that is currently bioavailable or likely to become so in the future. As discussed in Section 6.2.3.5, MNR is currently occurring at the Site based on the sediment sampling results and contaminant concentration depth, i.e., more highly contaminated sediment is covered by less contaminated sediment.[11]

Evaluation

Effectiveness

- Natural processes can result in an effective cover of impacted sediment. These processes are monitored to gauge success in the long-term and to determine that recovery is occurring.
- Potential exposures during the recovery period would be monitored and controlled.
- Minimal short-term effects. This process is currently taking place at the Site.

Implementability

- Process is already occurring at Site, monitoring would be implemented to ensure reliability.
- On-going documentation of natural processes would be necessary and may include various data collection
- Relative ease of administrative feasibility to develop work plan, gain NYSDEC approval, and obtain permits. OM&M would need to be conducted in perpetuity.

As discussed in Section 6.2.3.5, with few exceptions, sediment sampling results indicated higher COPC concentrations in the deeper (i.e., 6 to 12-inch) intervals. The manufacturing operations, which are alleged to have been responsible for the sediment impacts, have ceased. This suggests that cleaner Hudson River sediment is accumulating over the impacted sediment. In addition, as discussed in Section 6.2.3.5, the grain size analysis indicates that the vast majority of samples from subtidal locations have greater than 80% fines in the surface 0 to 6-inch layer, which is indicative of deposition. By contrast, the samples taken from intertidal locations beneath the buildings included both depositional sediments (10 samples with > 80% fines) and coarser sediments (8 samples with <80% fines, varying from 1.2% to 73.7% fines) in the surface layer. This is indicative of the erosion

[11] NYSDEC does not agree that there is sufficient information to reach this conclusion (NYSDEC, 2004).

influence of tidal action in the intertidal zone, which would tend to re-suspend sediments and move them to deeper parts of the river channel. In the intertidal area, there also appears to be a correlation of higher PCB concentrations with an increasing percentage of fine sediments, which is consistent with expectations based on the tendency of PCBs to adsorb to fine particles.

In light of the short-term effects of active sediment remediation, the ability of this environment to restore itself naturally is an option that requires further evaluation as a remedial alternative. It should be noted that monitored natural attenuation has been used successfully at a number of regulated sites. For example, in a June 2003 EPA decision, the agency selected MNR for the Green Bay, Wisconsin site. PCB concentrations in sediment at this site were as high as 710 ppm, well above the maximum Site intertidal and subtidal sediment PCB concentrations of 7.8 mg/kg and 11.6 mg/kg, respectively.

On-going OM&M would be needed in the form of confirmation testing to confirm that sufficient natural deposition is occurring in the short and long-term. In addition, baseline testing would be needed to further substantiate the fact that natural sediment deposition is occurring at the Site and to collect pre-design data.

This technology would fulfill the sediment RAOs associated with the prevention of direct contact, prevention of release of chemicals from sediment to the river and prevention of impacts to biota. Since MNR has already been observed at the Site, this technology has been selected and proven at other impacted sediment sites and this technology would meet the sediment RAOs, this technology will be carried forward and considered along with the development of remedial alternatives.

Constructed Sediment Cap

This technology is similar to deposition with the exception that the cover is man-made. It involves placement of inert materials to cap the impacted sediment. Caps can also be designed with geotextile, liner, and/or multiple layers. Inert materials used for capping include clay, silt, sand, clay liners, geomembranes, and/or AquaBlok™ or equivalent. A cap physically isolates underlying sediment from the aquatic environment. It stabilizes material and prevents erosion, which prevents resuspension of contaminants. Furthermore, chemicals within impacted sediment are isolated and or/the movement of dissolved and colloidally transported materials is reduced.

AquaBlok™ is a capping system consisting of gravel particles to which bentonite clay is bonded. The composite particle (gravel and bentonite) is created by a special manufacturing process. Gravel or crushed stone is obtained from a local quarry and is initially coated with a polymer. The bentonite is then added, forming a dry, hard aggregate. The composite particles, herein referred to as AquaBlok™, are spread on the surface of the water and sink quickly to the bottom of the river on top of the sediment. In a laboratory flume test there was little loss of AquaBlok™ particles in a current velocity of 3 feet per second when compared with the amount of sand loss at the same velocity. As the bentonite hydrates, a uniform, continuous cohesive low permeability (1×10^{-8} cm/sec) cap is formed over the contaminated sediments. Conventional construction equipment such as front-end loaders, conveyors, and barges are used to place AquaBlok™. The hydrated particles are cohesive and more resistant to erosion than sand. The potential success and innovative aspect of the AquaBlok™ composite particle system is as follows:

- it overcomes the technical difficulties associated with other aqueous placement technologies by using the innovative delivery system; and
- it utilizes readily available materials such as bentonite and gravel or aggregate.

Due to these factors, the use of AquaBlock™ will be evaluated. Performance monitoring of constructed sediment caps typically involves periodic coring to confirm that the integrity of the cap is maintained. The frequency of such performance monitoring would be dependent upon the environment in which the cap is placed. The number of cores would take into account the size of the capped area. The activity of performance monitoring using cores would, depending on the material being used to construct the cap, require restoration following collection of the core.

Evaluation

Effectiveness

- Effective in the long-term for preventing direct contact, release of chemicals to surface water and biota and marine life exposure.
- Some disturbance to existing COPCs in sediment may occur during implementation.
- May disturb biota and marine life during construction.

Implementability

- Would be extremely difficult to construct a cap underneath the existing Site buildings in the intertidal zone.
- Application in the subtidal area adjacent to buildings would need to account for near shore velocities and tides in the Hudson River.
- Periodic confirmation inspections/testing would be necessary to ensure continued presence of cap.
- Moderate administrative efforts are anticipated to implement this technology. However,

Effectiveness	Implementability
	OM&M would need to be conducted in perpetuity.

Constructed sediment caps have been successfully implemented to isolate impacted sediment. However, the implementability of installing a sediment cover is dependent upon its location. Installation of capping materials is difficult because of the inability to apply capping materials in the low overhead clearance and limited access conditions and interference by below deck structures (e.g., piling, cross-beams, etc.). In addition, sediment removal is required in areas where the depth of sediments below the lowest high-water mark is less than the cap thickness. Thus, installation of a sediment cap in intertidal areas beneath Site buildings would likely require sediment removal. As discussed further below, sediment removal in intertidal areas also has considerable implementability concerns.

Finally, removal of sediment may also be required in subtidal areas subject to scouring.

This technology would fulfill the sediment RAOs associated with the prevention of direct contact, prevention of release of chemicals from sediment to the river and prevention of impacts to biota. Although this technology has considerable implementability concerns for sediment located beneath buildings, it will be carried forward and considered along with the development of remedial alternatives.

8.1.1.3 *In-Situ Chemical Oxidation*

In-situ chemical oxidation involves the injection of an oxidizing agent into subsurface soil/fill. Ozone, which is a strong oxidant used in a wide range of residential, agricultural, industrial and commercial applications, has been selected for this evaluation. Ozone is used to purify water (potable and process) and air; treat a wide variety of industrial, manufacturing, mining and food wastes; sanitize pools and spas; and bleach paper and other materials. Ozone has been used in industrial processes since the late 1800s.

Because it is a strong oxidant, ozone is the preferred oxidant for in situ treatment of recalcitrant (difficult to treat) organic compounds, such as PAHs, pesticides, plasticizers, phenolics, and PCBs. Ozone preferentially attacks organic compounds containing double bonds, such as PCBs, and has been shown to be very effective in oxidizing these chemicals. In general, approximately 8 to 10 pounds of ozone is required to oxidize 1 pound of PCBs. The reaction of ozone with organic molecules, such as PCBs, results in the complete oxidation of the molecule. That is, the end products of the reaction of ozone and PCBs are carbon dioxide, oxygen, chloride ion, and water.

The delivery system for ozone would consist of vertical injection points screened into the ground water table. The injection system would employ an ozone-oxygen-air mixture at a ratio and injection rate determined during system pilot testing.

A collection system would be installed to collect any fugitive ozone and/or any potential off-gases. This would consist of both horizontal points that would be installed in shallow galleries and a number of vertical collection points. The collection system would be optimized for the flow rate used during injection. The final collection system design would be determined by the results of the collection system design test. During operation of the system, detectors would be set up at monitoring station points at the Site boundary to monitor any fugitive ozone.

Evaluation

Effectiveness

- May have unpredictable success in the long term in breaking down COPCs due to the heterogeneity of fill and the mix of chemicals at the Site.
- May leave residual or untreated material at the Site.
- Documented success of this technology at a similar site (i.e., high PCB concentrations in historic fill) is not available.
- Moderate short-term effects during construction and operation. Special precautions need to be utilized and process optimization must be conducted.

Implementability

- Known procedures can be used to construct the system at the Site. Significant debris in the subsurface fill may be a hindrance to installation of injection points, distribution of ozone in the subsurface and collection of fugitive ozone.
- Long-term, on-going OM&M would need to be conducted during the remediation period.
- Significant effort and time would be involved to obtain permits, submit work plans, perform pilot tests and gain NYSDEC approval of the Remedial Design.

The heterogeneous nature of historic fill, particularly in the North Yard, would affect delivery of any oxidant. Similarly, confirming the degree of cleanup, in light of the heterogeneity of the historic fill, would leave uncertainties as to the effectiveness of remediation. There is a wide range of organic compounds contained in historic soil/fill. Although these other constituents may not be Site-related or dictate the extent of the required remedy, they would nonetheless compete for the same oxidant that is intended to target PCBs. The technology would require a period of pilot work and plan development to secure regulatory approval for its use. Based upon these limitations and the other implementability concerns referenced above, the in-situ chemical oxidation technology (via ozonation) is not carried forward for consideration in the development of remedial alternatives.

8.1.1.4 Excavation and Off-Site Disposal

This technology would entail excavation and off-site disposal of impacted Site soil/fill. This technology would be used for the PCB impacted surficial soil in the South Yard, the PCB and VOC COPCs impacted surface and subsurface North Yard and Below Building soil/fill.

The depth to Site ground water in the Yard generally ranges from approximately three feet below grade to eight feet below grade. The average depth to ground water is approximately four feet below grade.

Under this technology, soil would be excavated, transferred into trucks and transported to an off-site facility for disposal. The excavated soil would be stockpiled and free liquids removed prior to transportation. Sheeting and/or shoring, as well as dewatering during excavation, would be required to enable excavation below the ground water table. Removed construction liquids would then be treated and disposed at either the Yonkers POTW, if feasible, or the Hudson River under a SPDES permit, if permitted. Provisions would be made to access impacted soil/fill beneath the Site buildings, if the buildings remain in place.

As discussed in Sections 2.2 and 7.2.1, North Yard soil/fill is comprised of historic fill and operation-related debris, which is generally less dense, unconsolidated material with little cohesion. PCB concentrations in the North Yard range from non-detect to 97,600 mg/kg. New York State regulation 6 NYCRR 371-4(e)(1) requires that waste materials containing PCBs in concentrations equal to or greater than 50 mg/kg be classified for disposal as a New York State B007 listed PCB hazardous waste. TSCA also requires those materials containing greater than 50 mg/kg be classified as a TSCA PCB remediation waste. Approximately 13,440 cy of North Yard soil/fill and 578 cy of Below Building soil/fill contain PCBs at concentrations above 50 mg/kg and thus would be classified as a New York State B007 listed hazardous waste and a TSCA PCB remediation waste. Of these totals, it is estimated that approximately 2,152 cy of North Yard soil/fill and 19 cy of Below Building soil/fill would also be classified as a RCRA lead characteristic hazardous waste when excavated. Any New York State hazardous PCB listed waste/TSCA PCB remediation waste that is also classified as a RCRA characteristic hazardous waste for lead when excavated would undergo stabilization prior to off-Site disposal to render it a non-RCRA hazardous waste. See Section 8.1.1.7 for discussion regarding solidification/stabilization.

Excavated material containing PCBs at concentrations less than 50 mg/kg and considered hazardous for lead by TCLP analysis would also undergo stabilization prior to off-Site disposal to render it non-hazardous. Approximately 395 cy of Below Building soil/fill fit this criteria. Excavated material containing PCBs at concentrations less than 50 mg/kg and considered non-hazardous by TCLP analysis for lead would be disposed off-site as a non-hazardous waste.

Once the material is excavated, associated debris would be separated from the soil/fill. Each media would be placed in staging areas to undergo disposal characterization analysis, loading, and finally, transport off-Site for disposal. Additional evaluation of possible geotechnical and hydrogeological considerations for excavation stability would need to be performed as a pre-design activity to evaluate the feasibility of deep excavations and to develop the adequate safeguards for constructability of excavations beneath the water table.

Evaluation

Effectiveness

- Effective in the long term by removing material containing COPCs from the Site. COPCs may remain due to depth of excavation limitations.
- Short-term effects may include increased truck traffic and significant health and safety concerns with respect to worker safety in accessing fill material containing COPCs. Dependent upon the depth of excavation, there would be concern for excavation stability.
- May increase the potential for exposure during implementation. This could be addressed through proper health and safety plan implementation.

Implementability

- Constructability issues increase with increasing excavation depth into ground water.
- Access concerns regarding excavation of soil/fill beneath buildings.
- Some degree of access restrictions and possibly OM&M will be required based on amount of the COPC mass left in the subsurface.
- Administrative effort needed with respect to permitting for discharge of dewatered water either to the Yonkers POTW or the Hudson River. Excavated materials that are managed aboveground during implementation may be subject to administrative requirements.
- Discharge to the POTW would be limited to a small amount of construction liquids. As a result, this discharge option may not be viable.

Excavation and off-site disposal is a proven remedial technology that has been applied at numerous sites. The short-term effects are typically offset by the high confidence provided by the physical removal of impacted media from a Site. By removing impacted media, excavation and off-site disposal ensure the remedy will be effective over the long-term. Although, this technology has potential implementability concerns associated with excavation beneath the ground water table, it directly addresses chemical specific SCGs in an aggressive manner. This technology would address all three of the soil/fill RAOs. Based on the above evaluation, excavation and off-site disposal will be carried forward and considered along with the development of remedial alternatives.

8.1.1.5 Sediment Removal/Dredging and Off-Site Disposal

Site-related impacted sediment and Area V sediment is located in two distinct zones: the intertidal zone beneath the Site buildings; and the subtidal zone adjacent to the Site buildings and the Yard. All intertidal sediment and a large portion of the subtidal sediment are located beneath Site buildings. The location of Site-related impacted sediment would require different technologies to extract the material from its current environment. These techniques, which apply to the sediment beneath and beyond Site buildings, are discussed and evaluated separately below.

Removed sediment, using either technique, would be transported off-Site for disposal. Based on the RI sediment sampling results, none of the removed Site-related sediment would be classified as a TSCA waste or a NYS listed PCB hazardous waste. All removed sediment would be transported to a non-RCRA hazardous landfill for disposal.

<u>Sediment Removal in the Intertidal Zone</u>

Removal of Site-related impacted sediment from beneath the Site buildings may be accomplished by a limited number of methods. Some technologies involve isolating the water from the sediment to be removed. Others do not require this isolation.

Potential technologies may include a dragline, manual removal, hydraulic dredging and vacuum/suctioning. The vacuum/suction removal and hydraulic dredging method could handle residual water and sediment together. These media would then be separated in a centralized location on the Site. When removal is complete, the area would be restored to the extent required for structural integrity of the overlying Site buildings.

Evaluation

Effectiveness

- Effective in the long term in removing COPCs from the Site-related sediment.
- Short-term effects to biota and marine life expected to occur (though such habitats were not prevalent in the intertidal zone due to lack of water and sunlight in this area).
- Potential effects to the estuarine environment expected to recover over time.

Implementability

- Implementability concerns associated with water diversion and dewatering.
- Significant implementability concerns associated with removal of sediment from below Site buildings.
- Removal around pilings would need geotechnical evaluation.
- Administrative approvals would be required for level of construction within subtidal zone of the Hudson River environment. Excavated materials that are managed aboveground during implementation may be subject to administrative requirement.

Removal of Site-related impacted sediment needs to be considered as a remedial alternative to meet the Site-remedial goals and comply with 6 NYCRR Part 375. With the Site buildings in place, removal of intertidal sediment would require a different approach than subtidal sediment. Access beneath the Site buildings varies. During sampling, divers were able to access sediment beneath the Site buildings more readily in areas farther to the west from the shoreline. Access became more problematic as the divers moved east, toward the shoreline. The void space between the top of sediment and the building floor slab narrows from west to east. Hence, sediment removal with the buildings in place will need to adopt different engineering approaches to extract the intertidal sediment. Discussions with marine contractors have indicated that sediment removal from the intertidal zone and beneath the Site buildings would be extremely difficult and would require the use of extensive manual labor and reduce the dredging efficiencies to a fraction of typical dredging efficiencies.

This technology would address all the sediment RAOs. Although this technology has considerable implementability concerns, it will be carried forward for consideration in the development of remedial alternatives.

Sediment Removal in the Subtidal Zone

Removal of sediment from the subtidal zone would be accomplished via either mechanical or hydraulic dredging. These engineering approaches would be applicable to address sediments in the subtidal zone. Hydraulic dredging may be more appropriate than mechanical dredging for areas beneath Site buildings.

Mechanical dredging removes sediment at nearly the same solids content and volume as the in-place sediment. As such, limited additional water is collected when the sediment is removed. Mechanical dredging may be accomplished using clamshell buckets and backhoes.

Hydraulic dredging removes and transports sediment in a slurry through the addition of high volumes of water. The additional water volume that is added can increase the amount of excess water that is generated as effluent and needs subsequent treatment and/or disposal. Hydraulic dredges may be equipped with rotating blades, augers, or high-pressure water jets to loosen sediment. Factors to consider in equipment selection for dredging include: 1) solids concentration, 2) production rate, 3) dredging accuracy, 4) water depth, 5) ability to handle large debris, 6) sediment resuspension, release and residual concentration, 7) site restrictions, 8) compatibility, and 9) distance to treatment or disposal sites. When removal is complete, the area would be restored to the extent required for structural integrity of the overlying Site buildings.

Evaluation

Effectiveness

- Effective in the long term for removing COPCs from the sediment.
- Short-term effects and significant disturbance to biota and marine life expected to occur.
- Resuspension of disturbed sediment containing COPCs expected to occur and may have potential negative effects to marine environment.

Implementability

- Access concerns associated with removal of sediment located beneath Site buildings.
- Access would require land/surface water equipment components.
- Mitigation measures and monitoring are needed to ensure sediment particles do not migrate beyond dredging areas.
- Average administrative efforts anticipated in obtaining permits

Effectiveness	Implementability
	and approvals.

As previously mentioned, the removal of impacted sediment needs to be considered as a remedial alternative to meet the Site remedial goals and comply with 6 NYCRR Part 375. The subtidal areas adjacent to the buildings would need to be included in such an evaluation. Both mechanical and hydraulic dredging are proven technologies that can accomplish sediment removal in these environs.

Dredging would address all the sediment RAOs. Based on the above evaluation, mechanical and hydraulic dredging will be carried forward for consideration in the development of remedial alternatives.

8.1.1.6 Ex-Situ Solvent Extraction

This technology involves the excavation and on-Site treatment of soil/fill. The treatment would entail extracting COPCs from the soil/fill using a solvent. The treatment technique evaluated in this section is similar to a commercial, proprietary technology known as the Terra-Kleen solvent extraction technology.

The application of this technology would require sequenced excavation of impacted soil/fill (sediment could also be considered for treatment using this technology), stockpiling and processing through on-Site treatment units. The treatment units would employ an extraction solvent at ambient temperatures to transfer organic contaminants from soil to a liquid phase. The organic laden solvent would then be filtered and passed through a proprietary purification unit to remove the organic contaminants from the solvent. The regenerated solvent would then be continuously recycled through the excavated soil/fill until the desired cleanup levels are attained. When all required extraction cycles have been completed, the treated soil/fill in the units would be subjected to vacuum extraction and biological treatment to remove residual solvent. (USEPA, 1998)

This technology would yield treatment residues that would require off-site disposal. In order for the treated soil/fill to be placed back into the open excavations at the Site for restoration, it would need to meet media specific cleanup goals for all COPCs. This could require additional treatment prior to placement back on the Site.

Evaluation

Effectiveness

- Residual COPCs may be left in treated soil.
- Documented success of this technology at a similar site (i.e., high PCB concentrations in historic fill) is not available.
- The heterogeneity of the soil/fill may impact the effectiveness of this technology.
- Significant short-term effects associated with excavating remediation pits to conduct solvent extraction. Concerns for excavation of soil/fill are the same as for excavation and off-site disposal.
- Potential effects to human health and environment associated with the use of the technology. The solvent is highly flammable.

Implementability

- Constructability expected to be difficult. Space for aboveground treatment units could be problematic.
- Due to its heterogeneity and its high water content, excavated soil/fill may require significant pre-processing (e.g., screening, dewatering) prior to treatment.
- Treated material may need to be reprocessed to reach desired levels of cleanup (extending the duration of the remedy).
- Significant on-going OM&M expected to be necessary as remedy is implemented.
- Multiple passes through solvent may be necessary to reduce COPCs to cleanup levels.
- Staging of soil for pre-treatment, post-treatment and, re-treatment would be necessary and occupy additional Site space requiring

Effectiveness	Implementability
	management control. • Additional control of open excavations until treated material is eligible for backfill. • Significant administrative issues would be involved in gaining approval for technology use.

The heterogeneity, chemical content and high moisture content of the Site soil/fill render the effectiveness of this technology questionable. Success of this technology for PCBs in historic fill is not proven. In addition, the moisture content of excavated soil/fill or sediment would need to be reduced to less than 15%. For optimal performance, the moisture content should be less than 5%. This would require substantial dewatering equipment. Furthermore, on-Site ex-situ solvent extraction of environmental media containing COPCs poses a number of logistic and project duration issues that off-set any perceived benefit that may be obtained by concentrating the COPCs in a smaller volume of extracted solvent and using treated materials to restore the excavated areas around the Site. The technology would require a period of pilot work and plan development to secure regulatory approval for its use. Once approved, it would require an on-site infrastructure for which there is limited space available. As a result of treating on-Site, the components of excavation, storage and treatment would occur simultaneously in a limited area adjacent to an important environmental habitat (i.e. Hudson River). The chemical composition of the soil/fill and its heterogeneity, particularly in the North Yard, would likely influence the treatment effectiveness. Therefore, frequent confirmation sampling and probable re-treatment of batches of environmental media would be necessary. This would prolong on-Site activities and intensify on-Site management controls in the excavation, storage and treatment areas. These potential issues would offset any benefit gained by on-Site treatment using solvent extraction. Therefore, ex-situ solvent extraction is not a technology that is carried forward for consideration in the development of remedial alternatives.

8.1.1.7 Ex-situ Solidification/Stabilization

This technology would address the inorganic constituent group of COPCs only. Specifically, it offers an opportunity to render any excavated soil/fill (or sediment) that is a characteristic hazardous waste for lead as non-hazardous. Hence, the regulatory burden associated with the removal and off-Site disposal of a hazardous waste would be avoided.

Solidification/stabilization would be accomplished by mixing chemical reagents with excavated soil/fill (and/or sediment) that is classified as a RCRA characteristic hazardous waste for lead. The mixture would create physical and/or chemical changes in the material that result in a final waste form with reduced solubility, toxicity, and/or mobility. Solidification immobilizes contaminants within the crystalline structure of the solidified material, thus reducing the leaching potential and mobility. Bench-scale testing would be conducted to determine design elements for mixing ratio of waste material to stabilization agent, particle size range, and other considerations. The process may be affected or limited by high initial moisture content, high organic content (such as clays, silts, and diatomaceous fine sandy or silty soils), non-homogeneous material, and chemical interference. Furthermore, the preparation of non-homogeneous materials (rock, debris, etc.) for processing may include sorting, crushing, or possibly hand-sorting.

This technology is typically conducted in an open pit/trench/area within a mixing unit. Reagent is applied directly to the waste material in the open pit/trench/area and mixed using conventional earth handling equipment. USEPA guidelines require a minimum unconfined compressive strength (UCS) of 50 pounds per square inch (psi) for land disposal of the final stabilized waste product. The addition of stabilization agent increases the total volume of material for off-Site disposal.

Evaluation

Effectiveness

- Technology has been proven effective for stabilization of lead. The effectiveness would be further evaluated during pre-design studies.
- Long-term immobilization of contaminants may be affected by environmental conditions at the off-Site disposal facility. This has a low probability. Waste would be transported off-site following stabilization, thus removing it from the Site.
- Short-term effects may include difficulty in controlling odors or dust during processing. Debris and other large items would need to be separated out of excavated material. Same short-term effects as those identified for excavation technologies as they relate to removal of material.
- May increase the potential for exposure during implementation. This could be addressed through proper

Implementability

- Treatability studies needed to determine feasibility and design parameters, if feasible. Potential difficulty implementing due to heterogeneous nature of fill material. As such, additional pre-processing activities (e.g., screening may be needed).
- Average administrative feasibility to develop work plan, gain NYSDEC approval, and obtain permits.

Effectiveness	Implementability
health and safety plan implementation.	

Ex-situ solidification/stabilization is a technology that could be used in conjunction with excavation and off-site removal and/or sediment removal and off-Site disposal. This technology could be used to treat excavated soil/fill and/or sediment classified as a RCRA characteristic hazardous waste for lead to render it non-hazardous. It also would provide a level of treatment, thereby contributing to the reduction in toxicity of the environmental media. Therefore, the solidification/stabilization technology will be carried forward for consideration as a technology component in the development of remedial alternatives.

8.1.1.8 Summary of Selected Environmental Media Remedial Technologies

Based on the above evaluation, all of the institutional/containment technologies (i.e., access/use restrictions and covers/caps) will be retained. These technologies are readily constructed, experiencing few to moderate short-term effects during the construction period and would address the soil/fill, ground water and sediment RAOs. Their ability to protect human health and the environment is achieved by eliminating the pathway of exposure while the COPCs remain in place. Hence, the long-term effectiveness of these technologies is directly related to the performance monitoring, OM&M of the engineering controls and compliance with administrative restrictions. The OM&M would vary in scope with the media and require more effort for the sediment medium.

The sole in-situ technology that underwent further evaluation, chemical oxidation, will not be retained. Although its short-term effects would be minimal, since it would require the least construction disruption, its long-term effectiveness is uncertain given the heterogeneity of the soil/fill at the Site. This would impact the degree to which the oxidant could be delivered throughout the soil/fill and the competition from other chemicals in the soil/fill for the oxidant. Consequently, this uncertainty would extend to the technology's ability to protect human health and the environment. The administrative burden to gain approval of work plans, pilot studies, system design and performance monitoring and confirmation of effectiveness make this technology unattractive when compared to other options.

All the ex-situ technologies that underwent further evaluation, with the exception of solvent extraction, were retained. This solvent extraction treatment would rely on processing/handling of additional chemicals on-Site adjacent to a sensitive receptor (Hudson River). Additionally, the required infrastructure, together with other remedial construction components that would occur simultaneously (e.g., excavation, staging and restoration), would stress the available area. Although the application of the solvent extraction technology would ultimately be based on bench and pilot studies, the heterogeneity and the high moisture content of the environmental media would not eliminate the uncertainty regarding mix ratios and process time. The solvent extraction technology produces a concentrated residual whose volume would vary depending on the amount of treatment required; this residual would require further treatment. OM&M would be intensive and closely regulated during treatment. Administrative burdens similar to the previously discussed in-situ chemical oxidation technology would also apply. Further, TSCA requirements for ex-situ treatment of PCB remediation waste could also broaden these administrative requirements. Based on this evaluation, this technology was not carried forward in this FS.

The excavation and off-site disposal and sediment removal/dredging and off-Site disposal technologies are proven, conventional methods that can achieve the environmental media RAOs for the Site. These technologies can also be used in alternatives to restore the Site to pre-disposal conditions. Although these technologies have numerous short-term effects, these effects have been successfully managed at other sites. Since these technologies remove affected environmental media, they have a high degree of certainty in their ability to protect human health and the environment. Moreover, depending on the amount of removal, these technologies generally are not burdened with OM&M and are effective over the long-term.

Ex-situ solidification/stabilization was retained simply because it complements excavation and removal technologies by removing the RCRA hazardous waste characteristic for lead for excavated soil/fill and sediment (if needed). Lead can be readily treated with a variety of solidification/stabilization agents to ensure it does not leach in excess of regulatory criteria over the long term. Remedial construction would need to include an on-Site treatment component, though the application of the treatment agent would involve a simple physical mixing.

In summary, five (5) remedial technologies for environmental media are carried forward for alternative development in Section 9.0. These technologies are:

Type	Technology
Institutional/ Containment	1. Access/Use Restrictions 2. Cover/Cap • Soil/Fill Cover • Monitored Natural Recovery Sediment Cap • Constructed Sediment Cap
Ex-Situ	3. Excavation & Off-Site Disposal 4. Sediment Removal/Dredging • Vacuum Pumping • Mechanical/Hydraulic Dredging 5. Solidification/Stabilization (lead only)

8.1.2 BUILDING INTERIOR REMEDIAL TECHNOLOGIES

The institutional/containment, in-situ and ex-situ building interior remedial technologies that may be applicable to the Site buildings are identified as described in Table 8-3. As shown in this table, two (2) institutional/containment, nine (9) in-situ and four (4) ex-situ building interior remedial technologies that offer options to destroy, treat/separate, solidify/stabilize, contain and/or land dispose affected building materials were evaluated. The preliminary screening of these 16 technologies is summarized in Table 8-4.

Both institutional/containment technologies identified in Table 8-4 were retained for further evaluation. These are access/use restrictions and encapsulation. Both technologies would seek to eliminate exposures and, thus, if properly and adequately executed and maintained, would meet the building interior RAOs associated with preventing direct contact. They could require significant capital investment and would require ongoing, long-term OM&M. The reliability of these technologies is strongly linked to the physical state of the Site buildings and the consistent application of barriers, compliance with restrictions and maintenance of engineering controls for the long-term.

Of the nine in-situ technologies identified, one was retained for further evaluation. This was pressure washing/vacuuming. This technology has demonstrated an ability to address PCBs and lead in surface accumulations. The residue this technology produces is a waste stream comprised of a mixture of surface accumulations and water, which would be collected via wet vacuuming. The technology is neither OM&M nor capital intensive and has proven reliable at the Site in areas where lead and PCBs are limited to the surface accumulations (i.e., not impregnated into the building materials). Pressure washing/vacuuming can be completed in a timely manner at a reasonable cost. Moreover, pressure washing/vacuuming will be a necessary component of other remedial technologies.

The eight remaining in-situ technologies identified in Table 8-4, which were not retained for further consideration, involve comparatively more aggressive removal via washing (i.e., double wash rinse), dry removal or varied forms of chemical extraction. These technologies do not provide any improved effectiveness in comparison to pressure washing/vacuuming, a demonstrated technology at the Site. All of these technologies would be applied to in-place building materials. The ability of these remaining technologies to address PCBs and lead tend to be more appropriate/ reliable for lead (except solvent washing which is not appropriate for this COPC). The effectiveness of these technologies in removing lead and PCBs from wood and concrete building materials is highly dependent upon the condition of the building material. As a result, even if one or more of these technologies were successful in one area, there would be no assurance that it would be successful in another area. Each of these remaining in-situ technologies would generate a waste product that would need to be managed as a new waste stream. Finally, the degree of PCB penetration into interior building material limits the effectiveness of chemical extraction in many areas of the Site buildings and thus, renders it unsuitable for consideration as even a companion technique.

Of the four ex-situ technologies listed in Table 8-3, two were retained from the preliminary screening. These were concrete micro-removal and building material removal and off-site disposal. Both of these technologies are able to address both lead and PCBs in building materials, regardless of whether they are only in the surface or penetrate to depth. Both technologies would generate waste product in the form of concrete dust or bulk building material. However, neither technology would produce any waste requiring further treatment prior to disposal. Additionally, both of these technologies are capital intensive and once completed, would not require any significant OM&M.

In contrast, the remaining two ex-situ technologies, laser etching and building material removal and on-site disposal, were eliminated at this screening phase. Although both would address PCBs and lead, these two technologies were not retained due to the size, magnitude and types of affected building material. Laser etching is a focused technology that is generally more suited to limited areas. Hence, its application to the larger, and varied, building interior area of the Site is not practical. On-Site disposal of all removed building materials is not practical, as the bulk concentrations of COPCs in some building materials would likely exceed the SCGs for placement into the environment. Though portions of building materials may be candidates for on-Site placement, provided they meet regulatory criteria, a technology that is predicated on the on-Site disposal of building materials is not appropriate.

In summary, there are five technologies retained after the preliminary screen. These technologies are:

Type	Technology
Institutional/ Containment	1. Access/Use Restrictions 2. Encapsulation
In-Situ	3. Pressure Wash/Vacuuming
Ex-Situ	4. Concrete Micro Removal and Off-Site Disposal • Shot Blasting • Scarifying • Milling 5. Building Material Removal & Off-Site Disposal

Based on this preliminary screen, these technologies were carried forward for an evaluation of effectiveness and implementability. This further evaluation considered, among other things, Site-specific conditions that would positively or negatively influence the applicability of the technology to address the ability to achieve the RAOs for the interior building materials.

The five remedial action technologies selected from Table 8-4 are described and evaluated in this section. The evaluation focuses on effectiveness, implementability and ability to meet the building interior RAOs, assessing the criteria presented in Section 8.1 with respect to the performance of the technology at this Site and/or similar Sites with similar environmental conditions.

The following describes each of the interior building material technologies, presents an evaluation of effectiveness and implementability, and recommends whether the technology should be carried forward or eliminated from further consideration in the development of remedial alternatives.

8.1.2.1 *Access/ Use Restrictions*

This technology would involve restricting activities within the Site buildings to minimize the potential for occupants to come into contact with building materials impacted with PCBs and lead. Institutional controls for the building interior would include:

- placing restrictions on access to areas of the Site buildings that have not been previously addressed through remedial action and contain lead and PCBs at concentrations above the surface or bulk LTOC;
- placing restrictions on access to areas of the Site buildings that have been previously addressed through remedial action and contain residual lead and PCBs at concentrations above the surface or bulk LTOC;
- filing a deed notice documenting the presence of PCBs and lead in building materials;
- imposing requirements to maintain the structure to prevent the deterioration and subsequent release of PCBs and lead from building materials into the surrounding environment; and,
- placing a covenant on the deed regarding future building use.

Access/use restrictions would be coupled with other technologies that employ other engineering controls to achieve the RAOs (e.g., encapsulation). Access/use restrictions alone provide no active remediation of building materials that contain PCBs and lead.

Access/use restrictions would also include engineering controls, such as: warning signs, barriers, security fences, and any other physical barriers placed around the perimeter of the Site buildings and within the Site buildings, where needed. Ongoing compliance with access/use restrictions along with maintenance of the Site buildings is the only means of consistently assuring that exposures to building materials are avoided.

Evaluation

Effectiveness

- Effective in preventing direct contact exposure in the short term.
- Long-term effectiveness is completely dependent on enforcement and maintenance of access controls and future use controls, which may be unreliable.
- As a stand-alone technology, access/use restrictions would not be effective at removing the potential threat of exposure of humans and the surrounding environment to contaminated building materials.
- Minimal short-term impacts.

Implementability

- Relative ease of constructability. Permits are attainable, additional fencing and gates must be installed, and constant Site surveillance would be necessary.
- OM&M would involve periodic inspection of access controls, such as fencing, and locked gates to ensure effectiveness. OM&M would need to be strictly monitored to ensure compliance.
- Average administrative feasibility if used as a stand-alone technology. The development of a deed restriction can be accomplished with average effort.

Existing zoning regulates the type of current Site use. In the future, Site buildings could remain and be used for commercial purposes, though the structures would have to be renovated to accommodate these uses.

Access/use restrictions are currently in place for the Site buildings. They involve interior sign posting, chain link fencing, and locked gates and doors. Also, use is restricted via short-term lease arrangements where use is cleared through the NYSDEC and NYSDOH. Further access/use restrictions would need to be put in place as part of any long-term remedial solutions that do not entail removal of the impacted building materials (e.g., encapsulation). Provided access/use restrictions are combined with an appropriate engineering control (e.g., encapsulation), this technology could be effective and in combination, address the RAOs. As such, this technology will be carried along with encapsulation (if selected as a remedial technology) and considered along with the development of remedial alternatives.

8.1.2.2 Encapsulation

Encapsulation employs a sealant material to isolate contaminants, such as PCBs and lead, in building materials. The encapsulant is a coating that is applied over the building material surface to serve as a barrier and prevent direct contact with the impacted surface. Epoxy is a commonly used encapsulant. The epoxy coating, which is a polymer containing an epoxide group, bonds with and adheres to the building material surface and acts as a barrier between the residual contamination and the potential receptor. The coating industry produces a wide variety of epoxies for the purpose of encapsulating concrete.

The selected encapsulation would have to be impermeable and resistant to chemicals and water as well as sufficiently durable to support commercial traffic conditions (i.e., forklift, trucks, etc.) and slip-resistant. As specified in 40CFR760(p)(iii), a double-layer liquid-based epoxy encapsulation of different colors would be applied for quality assurance purposes. As the surface wears, discoloration would be an indicator that the epoxy needs to be replaced.

Building conditions must be suitable to epoxy application. In accordance with TSCA, prior to any encapsulation, the surface must be cleaned using the double wash and rinse procedure to comply with 40CFRPart 761.375. This required surface preparation is needed to remove grease, oil, water or dust from the floor surface and thus allow proper coating adhesion. Additional surface preparation in the form of abrasion of the concrete surface and filling of cracks would also be conducted to maximize the bonding between the encapsulation layer and the floor surface and maximize the longevity of the epoxy encapsulation.

The use of encapsulation requires OM&M, which would include periodic inspections of the encapsulation for cracking, peeling, rips and tears and the collection of performance wipe testing, to make sure the encapsulation is still providing a competent barrier from the contamination. Repairs to cracks, peeling, rips and tears in the encapsulant would also be included in the required OM&M.

Evaluation

Effectiveness

- Effective in preventing direct contact exposure in the short term.
- Long-term effectiveness is dependent on proper application of the encapsulant over the variable building surfaces, continued OM&M of the encapsulant, maintenance of the building structures.
- Contamination would still be present in the building materials. If the encapsulation fails there could be an exposure risk to humans and the surrounding environment.
- Increased exposure risk for workers and Site personnel

Implementability

- Because of the heterogeneous nature of the interior building materials that would require encapsulation, the poor condition of the Site buildings and the numerous structural and non-structural building components (i.e., columns, pipes, etc.) implementability of this technology would be complicated.
- Highly OM&M intensive. Periodic maintenance and inspection of the encapsulation would be required for the life of the Site buildings, or as long as the contamination remains in place. The long-term

Effectiveness	Implementability
during implementation. The use of appropriate PPE and engineering controls can greatly reduce this potential risk.	effectiveness of this technology would also require maintenance of the Site buildings to ensure that the encapsulant is not damaged. • Average administrative feasibility to develop and obtain approval of a work plan, and secure the proper permits. Would likely be subject to close administrative scrutiny by regulatory agency to ensure compliance.

Encapsulants have been applied to limited areas of the concrete building surfaces at the Site to address residual surface concentrations of PCBs and lead. As discussed in Section 3.1.1, four areas on the second floor of High Bay Building were encapsulated due to exceedance of the lead IOC following cleaning activities. However, the encapsulants in these areas were applied without extensive surface preparation and the encapsulant deteriorated with time and traffic and additional remedial actions were implemented.

The Annealing Line Transformer area and the Transformer #14 area on the first floor of the High Bay Building were encapsulated using a two-layer epoxy to address residual PCB concentrations after surface cleaning. PCBs are also present in these areas at depth. Prior to encapsulation, the concrete surfaces in these areas were prepared using shot blasting. The two-layer encapsulation was applied following the surface preparation. These areas were fenced off to prevent contact with the existing transformers and to prolong the life of the encapsulant. Each of the encapsulants is currently intact with no signs of deterioration. However, subsequent surface wipe sampling of this encapsulated area has shown areas of recontamination. This recontamination is not thought to be a failure of the encapsulant.

An encapsulant was also applied to the floor of the Pipe Shop located on the first floor. Due to the uneven and fractured condition of the floor in this room, a more malleable encapsulant was required to provide a consistent coating. This encapsulant was applied on the floor surface and around structural and non-structural items. Following installation, certain non-structural items were removed from the Pipe Shop. This resulted in localized tearing of the encapsulant.

The above Site experience has demonstrated that the effectiveness of the encapsulant in small isolated areas is a function of the traffic through the area, the encapsulant selected, the presence of non-structural items in an area that may later be removed and the condition of the surface to which the encapsulant is applied. For larger areas of the Site buildings, the construction and condition of the Site buildings are important factors that directly relate to the effective application of the technology. These conditions also factor into the long-term effectiveness of this technology.

As discussed in Section 1.4.6, the Site buildings were constructed at various times and are of different construction and some of the Site buildings are in deteriorating condition and in some areas are subsiding. Additionally, the structures that prevent environmental conditions from impacting the Site buildings (i.e., the roof) are in poor condition. These conditions would directly impact the installation and long-term OM&M of any encapsulation materials.

Due to structural instability and/or excessive cracking, certain portions of the Site buildings would not be amenable to encapsulation. These areas include: the Building No. 4 storage room, Building Nos. 12A and 12B, the Asbestos Roving Room, the Carpenter Shop, and a portion of Building No. 7.

Prior to large-scale encapsulation, all non-structural and moveable items would need to be removed, surfaces would need to be adequately prepared to allow uniform application of the encapsulant. Site experience has proven that additional surface preparation in the form of abrasion of the concrete surface and filling of cracks is also needed to maximize the bonding between the encapsulation layer and the floor surface and maximize the longevity of the epoxy encapsulation.

Application of an encapsulant in the northern portions of the Site buildings would require considerable surface preparation and may require leveling of the floors to provide a uniform elevation from room to room and building to building. Application of an encapsulant in the High Bay building would be less intensive since this area has already been cleaned.

As discussed above, non-structural items are present throughout the building. These include utility equipment including the winter and summer boilers, the fire suppression pumps, and electrical distribution panels. Encapsulation materials would need to be installed around these non-structural units that cannot be moved. In the event that these items are removed, the encapsulant would need to be repaired. All movable equipment would require removal or relocation prior to application of the encapsulant.

Encapsulation would require a comprehensive OM&M plan to be put in place along with access and use restrictions. The OM&M plan would need to be specific to each encapsulated area to ensure that the varied building conditions are accounted for in the OM&M schedule (e.g., the encapsulant in some areas may be subject to more rapid deterioration than in others). Additionally, since encapsulation essentially manages the PCBs and lead in building materials on the Site, the OM&M plan would need to incorporate the maintenance of the building structures around the encapsulated areas. Performance monitoring would accompany inspections and involve periodic wipe sampling to document that the encapsulant continues to be an effective barrier. The need for continual performance testing for the life of the encapsulant increases the uncertainty associated with any alternative employing this technology. This must be considered when assessing the significance of the long-term obligations of any remedy using encapsulation.

Encapsulation can be an effective technology. Application of this technology will require proper preparation of the building materials and appropriate OM&M as long as the encapsulant is being used to isolate impacted interior building materials. The encapsulation technology will be carried forward for consideration in the development of remedial alternatives along with access and use restrictions.

8.1.2.3 Pressure Washing/Vacuuming

Pressure washing utilizes high-pressure water used to remove accumulated dirt, dust, residues, and surface contaminants, such as lead and PCBs (collectively referred to as surface accumulation), on concrete surfaces. These materials are removed through application of water sprayed at an average pressure of 3,000 pounds per square inch (psi). A low-pressure wash would be used on wood flooring to prevent splintering and water absorption in the wood flooring. The resulting wash-water generated from pressure washing would be collected using a vacuum truck and contained for proper disposal. Water generation is estimated at approximately 0.5 gallons per square foot cleaned. Pressure washing can effectively remove contaminants from floor, wall, and ceiling surfaces but is not effective at removing contamination at depth. The pressure washing process will generate airborne particulates, making it necessary to wear appropriate PPE, and conduct appropriate air monitoring. Pressure washing generates large quantities of water requiring treatment, or off-Site disposal.

Evaluation

Effectiveness

- Technology is only effective for removal of contaminants limited to surface accumulation. As a stand-alone technology, pressure washing/vacuuming would not address PCBs at depth in building materials. This technology would be combined with other technologies to address PCBs at depth.
- Increased exposure risk for workers and Site personnel during implementation. The use of appropriate PPE and engineering controls can greatly reduce this potential risk.

Implementability

- Technology is readily implementable. Wastewater generated would require off-Site disposal or on-Site treatment and disposal.
- Technology has low capital requirements with no on-going OM&M.
- Limited administrative requirements.

This technology has been applied frequently throughout the facility. It has been particularly successful when PCBs and lead were confined to surface accumulations. This technology can, therefore, be effective and meet the RAOs for select areas of interior building materials. Pressure washing could be used as a stand-alone technology in some areas. Pressure washing is also a necessary component of the concrete micro-removal technologies retained from the preliminary screen. Therefore, this technology will be carried forward for consideration in the development of remedial alternatives.

8.1.2.4 *Concrete Micro-Removal and Off-Site Disposal*

The main objective of concrete micro-removal technologies would be the removal and off-Site disposal of PCB and lead contamination from concrete interior building construction materials. The concrete micro-removal technologies considered in this FS include:

- Shot Blasting;
- Scarifying; and
- Milling.

Shot Blasting

Shot blasting is a technology used to remove surface concrete from concrete floor slabs in $^{1}/_{16}$-inch intervals. Shot blasting is effective at removing surficial concrete over large areas. This widely used technology is a mechanical process whereby a large number of steel pellets, or shot, are propelled onto the concrete surface at high velocity by the means of a rotating blast wheel. The impact of the propelled shot abrades the concrete surface, resulting in a uniform surface profile. In the process, concrete dust and debris are transferred to a HEPA vacuum unit while the steel shot, continuously recycled within the closed system, return to the rotating blast wheel. The enclosed rotating blast wheel prevents the contaminants and the shot from escaping the unit. The shot may be cleaned for immediate reuse. The HEPA vacuum unit minimizes airborne dust generated during shot blasting activities. Based on Site-related experience, shot blasting activities would be followed by pressure washing and additional vacuuming to collect any residual debris.

A shot blaster is capable of removing thin layers of concrete surfaces, generally up to $^{1}/_{16}$-inch per pass, depending on the condition, age and construction of the concrete. Multiple passes would be required to remove concrete below this depth.

Where soft residue or surface accumulations are present on the floor, preparation of the surface is required prior to shot blasting. If the surface accumulation is not removed, the steel shot may be absorbed by the surface accumulation, making the process less effective. Preparation of the surface can be achieved through mechanical methods such as scraping or wire brushing.

Once shot blasting is completed, the treated surface is cleaned with a magnetic broom that attracts any loose shot that fell out of the recycling engine. All debris generated from shot blasting activities are removed from the equipment and contained for proper off-Site disposal. The containerized shot blasting debris would be sampled for waste characterization purposes prior to off-Site disposal.

Although multiple shot blast passes can be made to remove greater than $^{1}/_{16}$-inch of concrete, shot blasting has been found to be cost effective for large areas when the depth of contamination is less than $^{1}/_{16}$-inch.

<u>Scarifying</u>

Scarifying is a mechanical process generally applied for the removal of concrete at depths equal to or greater than $^{1}/_{8}$-inch. In contrast to shot blasters, which propel steel shot to pulverize the concrete surface, scarifiers are equipped with rotating wheel-shaped steel or carbide cutters attached to a steel drum that rotates at high velocity to scratch the upper concrete surface. Scarifiers remove concrete more aggressively than shot blasters and are therefore capable of removing hard and soft materials, existing paint on floor surfaces, and high build-ups of surface accumulation. Thus, surface preparation is not required prior to scarifying concrete surfaces.

The equipment is pushed over the surface while the rotating cutters scour the concrete floor. The result is a rough surface profile. Different styles and shapes of cutters will dictate the surface profile of the area. Scarifiers are capable of removing concrete layers at depths than can be accurately controlled, usually ranging from $^{1}/_{8}$-inch to a maximum depth of ¼-inch per pass, depending on the equipment. Additional passes may be made to achieve greater depths. The production rate of scarification would depend on the targeted depth, concrete density, presence of steel reinforcing, and presence of substantial cracks in the concrete. Smaller scarifying equipment would be used near walls and columns.

The process of scarifying produces noise and vibrations as well as substantial waste volumes and airborne dust. To reduce airborne contaminants, a collection system would be attached to the unit. A HEPA dust and particulate collection system is generally recommended within the working area when scarifying. Scarification generates a significant quantity of concrete waste in the form of dust. All waste generated from scarifying must be contained, samples submitted for waste characterization, and disposed of properly off-Site. Following the scarification of the concrete floor slab, concrete epoxy sealant would be applied to fill any substantial cracks and a concrete topping material would be applied to level the surface with the surrounding slab.

Milling

Milling is a more aggressive form of scarifying. Milling devices are capable of removing ½ inch to 1 inch of concrete per pass depending on the equipment selected. Like scarifiers, a selection of rotating wheel-shaped cutters will determine the surface profile. These cutters are attached to a rotating drum to etch the concrete floor slab, resulting in a rough surface profile. The depth of milling can be limited by the presence of rebar. At this Site, rebar is generally encountered at a depth of approximately 1-inch below the top of the surface.

Milling devices remove concrete more aggressively than scarifiers, and are capable of removing surface accumulation or paint on the floor surfaces. As with other concrete micro-removal technologies, milling may generate significant airborne particulates. A HEPA dust collection system would be attached to the device to minimize airborne contaminants. Milling would also generate significant concrete waste that requires containerization and proper off-Site disposal. Following the milling of the concrete floor slab, concrete epoxy sealant would be applied to fill any substantial cracks and a concrete topping material would be applied to level the surface with the surrounding slab.

Evaluation

Effectiveness

- Shot blasting is a demonstrated effective technology for the removal of residual lead on concrete building material surfaces.

Implementability

- This technology has an average constructability. Equipment and personnel that provide concrete micro-removal services are readily available. Permanent

Effectiveness

- Given the depth of penetration of PCBs in concrete building materials at the Site, neither shot blasting nor scarification is a consistently effective or cost-effective technology for PCBs in concrete at depth.
- Milling can be used to remove PCBs in the upper ½-inch of concrete and may be used, given Site specific conditions, to remove PCBs in concrete up to 1-inch in depth. Rebar is generally found at 1-inch in depth.
- Micro-removal, where effective, would eliminate long-term exposure risks, thus offering a permanent solution for this subset of impacted building materials.
- These technologies would present potential short-term dermal, inhalation and ingestion exposure pathways for workers and Site personnel during micro-removal operations. Proper PPE, engineering controls and health and safety monitoring would minimize risk to workers, building occupants and the community during construction operations.
- Waste generated from micro-removal activities would be landfilled. The long-term protection afforded would be a function of the landfill selected.

Implementability

structures, such as columns, increase the difficulty of concrete micro-removal in all areas, but smaller scale equipment is available to address these issues.

- Where the technology is applied and is effective, contamination would be removed. As such, no long-term OM&M would be required for these treated areas.
- Average administrative efforts (i.e. work plan preparation, NYSDEC approvals) relative to other technologies.
- Disposal tracking may be intensive due to the large volume of waste generated, the number of waste characterization samples that would have to be collected, and the potential for wastes to be transported to several different facilities.

Micro-removal technologies are evaluated for:

- residual lead present in concrete building material surfaces at concentrations above the surface LTOC (i.e., 4.3 μg/100 cm^2 lead) in the post-clean sample; and
- PCBs present in concrete building materials at concentrations above the bulk LTOC (i.e., 1 mg/kg PCBs) at depth.

Shot blasting has been applied to impacted building material and was successful in reducing residual lead concentrations in concrete building material after surface cleaning to below the surface LTOC (i.e., 4.3 μg/100 cm^2). As discussed in Section 3.1.1, shot blasting was conducted at four locations that had previously been pressure washed and then encapsulated for lead. At these locations, shot blasting removed the encapsulant and reduced the surface concentrations of lead from a maximum of 2,970 μg/100 cm^2 to a maximum of 4.8 μg/100 cm^2.

The effectiveness of the micro-removal technologies to address PCBs at depth in concrete is dependent upon the depth of PCB penetration, the depth of steel reinforcement, the location within the Site buildings (i.e. concrete slabs on grade or supported by piles). Although certain micro-removal technologies can be used to address deep contamination, they become less cost effective than more aggressive technologies as the depth of contamination increases. For example, shot blasting is most cost effective for addressing PCBs at depths less than $^1/_{16}$-inch. For PCBs at greater depths, the more aggressive micro-removal technologies would be more cost effective.

As discussed in Section 8.1.2.5, removal of the entire concrete slab or portions of the slab is the most cost-effective technology for:

- first floor concrete slabs supported by piles that are impacted to depths greater than 1-inch (due to structural complications associated with removing concrete slabs in these areas); and

- all concrete floor slabs that are impacted to depths greater than ½-inch with the exception of first floor concrete slabs supported by piles.

The maximum depth of milling is limited by the presence of steel reinforcement in concrete at a depth of 1-inch below the top of the concrete surface. Concrete micro-removal was therefore evaluated for all areas where PCBs impacts extend to a maximum depth of ½-inch and for the first floor concrete slabs supported by piles where PCB impacts extend to a maximum depth of 1-inch. As discussed in Section 7.2.4.3, treatability testing was conducted to determine, on a micro-scale, the vertical distribution of PCBs within the upper ½-inch of concrete. The treatability study also evaluated whether removal of discrete intervals up to a maximum of ¼-inch using shot blasting or scarification could be used to effectively meet the bulk LTOC for PCBs. Due to the vertical distribution of PCB in concrete (i.e., generally greater than ¼-inch), removal of discrete intervals using shot blasting or scarification would not be consistently effective for PCB-impacted concrete. As such, milling to remove ½-inch increments would be the only cost-effective micro-removal technology for PCBs within the bulk concrete building material. Milling would be cost-effective for PCB impacts limited to the upper ½-inch in all areas and limited to the upper 1-inch in concrete slabs supported by piles.

Since PCBs are present at greater depths in concrete building materials and concrete micro-removal cannot be used for wood building materials, milling would need to be combined with bulk concrete and wood removal technologies (see Section 8.1.2.5) to address all of the porous building materials impacted at depth by PCBs.

Both shot blasting and milling are readily implementable at the Site.

The micro-concrete removal technologies used at the Site would require confirmation testing to assure that PCBs and lead in the residual materials are below the applicable surface and bulk LTOC.

Based on the above discussion, shot blasting will be carried forward as a technology for residual lead concentrations on building surfaces and milling will be carried forward for all areas where PCBs are limited to the upper ½-inch and for concrete slabs supported by piles where PCBs are limited to the upper 1-inch.

8.1.2.5 Building Material Removal and Off-Site Disposal

This technology includes: (1) demolition and off-Site disposal of entire buildings; and (2) removal of impacted building material. If removal were implemented, the removed building material (i.e., concrete or wood) would be replaced in kind.

Building material removal would be accomplished using mechanical equipment (i.e., hand-held equipment, demolition equipment, cranes, etc.). Removed media would be sampled for waste characterization and loaded onto trucks for transportation off-Site to a permitted disposal facility. Based on concrete and wood samples collected during RI investigation activities, it is anticipated that building material will be classified as construction and demolition (C&D) debris, TSCA waste and non-hazardous waste. TSCA waste would be sent to an approved TSCA waste facility for land disposal and non-hazardous waste would be disposed at a RCRA Subtitle D-permitted (non-hazardous) waste facility. Permit requirements for each waste facility would mandate characterization sampling frequency and analysis of the waste stream.

Evaluation

Effectiveness

- Building material removal through demolition of entire buildings would be effective in removing all building materials impacted surficially or at depth from the Site.
- Concrete removal is the most cost-effective technology for PCB permeation in concrete at the following depths:

Implementability

- Since contamination is permanently removed from the Site, long-term OM&M is not required.
- Equipment and contractors capable of performing these services are readily available. The proximity of the Site to the Hudson River and the fact that a portion of the building is

Effectiveness	Implementability
- o Greater than 1-inch in first floor concrete slabs supported by piles; and - o Greater than 1/2-inch in all other areas.	constructed on piles, and not underlain with soil/fill will complicate the implementation of this technology.
• Bulk wood removal is the only effective technology for PCBs that have permeated wood.	• Average administrative feasibility relative to other technologies.
• Where applicable, this technology will permanently eliminate any on-Site risk to humans and the surrounding environment posed by impacted interior building materials.	
• In the short-term, a considerable potential exposure risk exists for demolition contractors and other personnel working on-Site during construction activities. Exposure risks would be minimized with the use of proper PPE, engineering controls, health and safety monitoring, and decontamination procedures.	
• Contaminated media would be removed from the Site buildings. The long-term protection afforded would be a function of the landfill selected.	

With the exception of first floor concrete slabs supported by piles, removal of the entire concrete slab or portions of the concrete slab is the most cost-effective technology for concrete that is impacted to depths greater than 1/2-inch. Due to structural complications, in areas where first floor concrete slabs are supported by piles, milling is more cost effective than bulk concrete removal up to a permeation depth of 1-inch due to the average depth of steel reinforcement. At depths greater than 1-inch, bulk concrete removal is required.

In addition, bulk removal of wood is the only technology for wood that has been impacted at depth (i.e., exhibits PCBs and/or lead concentrations above their bulk LTOC).

Building removal through demolition of entire buildings and off-Site disposal can be applied to all Site buildings and would be effective at removing all impacted building materials. Removal of impacted building materials (e.g. concrete slabs on grade or supported by piles) would also be effective in removing the COPCs within the building material.

The removal of building materials for off-Site disposal is a conventional technology that provides a high degree of confidence in eliminating PCBs and lead from building surfaces. This technology would produce the greatest short-term effects, as it would entail demolition of entire buildings or portions of the Site buildings. These short-term effects would be offset by the long-term effectiveness, as impacted building materials would be removed from the Site. Consequently, removal of building materials for off-Site disposal would have a high degree of certainty in the protection of human health and environment into the future.

The removal of building materials for off-Site disposal would eliminate any need for OM&M or confirmation testing. Hence, it is perceived to face few, if any, administrative hurdles.

Based on the above and the ability of this technology to meet the building material RAOs, this technology will be carried forward for consideration in the development of remedial alternatives.

8.1.2.6 Summary of Selected Building Material Remedial Technologies

The effectiveness and implementability evaluation serves to further reduce the number of remedial technologies that will be considered for development into remedial alternatives in Section 9.0.

Based on the above evaluation, two (2) of the institutional/ containment technologies (access/use restrictions and encapsulation) are retained. Both technologies would be used together to prevent direct contact with impacted building materials. Neither technology is permanent since COPCs would remain in the building materials. Encapsulation has been successful at the Site in the short-term. Encapsulation cannot be applied in certain areas due to building conditions and its effectiveness and implementability can be adversely impacted by building conditions. The long-term effectiveness of both of these technologies is dependent upon extensive on-going OM&M.

The sole in-situ technology that was carried forward for further evaluation, pressure washing/vacuuming, was retained. This technology has been used successfully in the Site buildings to remove surface accumulations that contain PCBs and lead on both concrete and wood building material. It is also an important preparation following shot blasting activities in lead impacted areas and may also be required to complete restoration following removal of concrete from select areas within the building.

Certain micro-removal technologies evaluated for effectiveness and implementability were retained for specific Site conditions. Shot blasting was retained for the removal of residual lead on building surfaces. Based on the results of the treatability testing, which indicated that shot blasting would not be the most cost-effective technology for removing PCBs at depth, shot blasting was eliminated as a treatment technology for PCBs at depth in concrete. Scarification was also eliminated as a cost-effective treatment technology for PCBs at depth in concrete based on the results of the treatability study. Milling was retained as the most cost-effective micro-removal technology for PCBs up to 1-inch in concrete slabs supported by piles and up to ½-inch in concrete slabs that are not supported by piles. Therefore, shot blasting has been retained to address surficial exceedances of the LTOC and milling has been retained to address exceedances of the bulk LTOC in certain instances.

Bulk building material removal and off-Site disposal, including both building demolition and removal of any remaining building material was retained. Bulk building material removal and off-Site disposal provides an engineering solution to remove impacted building materials. It is a proven, conventional method to handle impacted building materials. Elimination of building materials that contain PCBs and lead from the Site guarantees long-term effectiveness of this technology and ensures protection of human health and avoids the potential for impacted building materials to migrate into the surrounding environment in the future.

In summary, five (5) remedial technologies are carried forward for alternative development in Section 9.0. These technologies are the following:

Type	Technology
Institutional/ Containment	1. Access/Use Restrictions 2. Encapsulation
In-Situ	3. Pressure Wash/Vacuuming
Ex-Situ	4. Concrete Micro Removal and Off-Site Disposal • Shot Blasting (for residual lead on building surfaces following pressure washing) • Milling (for PCBs in concrete to depths of ½ -inch [concrete slabs on grade] and 1-inch [concrete slabs on piles]) 5. Building Material Removal & Off-Site Disposal

9.0 *DESCRIPTION AND EVALUATION OF REMEDIAL ACTION ALTERNATIVES*

In this section, the remedial technologies retained after the screening and evaluation in Section 8.0 are assembled into remedial action alternatives that address the environmental media of interest (i.e., soil/fill, Site-related sediment and Area V sediment) and interior building materials. Additionally, a separate set of Common Actions, which are coupled with the remedial action alternatives to meet the RAOs, are also evaluated in this section.

The remedial technologies for the environmental media and interior building materials that are targeted for remedial evaluation are:

Environmental Media	**Interior Building Materials**
Access/Use Restrictions	Access/Use Restrictions
Soil/Fill Cover	Encapsulation
Monitored Natural Recovery (MNR) Sediment Cap	Concrete Micro-Removal and Off-Site Disposal
Constructed Sediment Cap	Building Material Removal and Off-Site Disposal
Sediment Removal/Dredging	
Excavation and Off-Site Disposal	
Ex-Situ Solidification/Stabilization	

Each of these aforementioned technologies generally satisfies one or more of the RAOs defined in Section 7.0. Therefore, these technologies are combined in this section to form remedial action alternatives, thus maximizing the technologies' ability to meet the RAOs. A set of Common Actions also accompany the remedial action alternatives to form comprehensive approaches for the environmental media of interest (i.e., soil/fill and Site-related sediment) and interior building materials.

The Common Actions are:

Common Action C1: Ground water monitoring;

Common Action C2: Preparation and implementation of a soil management plan (SMP);

Common Action C3: Removal of debris within building subsurface structures;

Common Action C4: Bulkhead restoration beneath Site buildings;

Common Action C5: Removal of the interior trench system;

Common Action C6: Removal of process and fuel oil tanks; and

Common Action C7: Cleaning of the lead extrusion pits.

Common Action C8: Debris Removal Beneath the Site Buildings and Hot Spot Sediment Removal within the Building No. 8 Bulkhead.

The remedial action alternatives developed for the Site soil/fill are:

Alternative E1: No Action (Section 9.2.1)

Alternative E2: Surface Cover (Section 9.2.2)

Alternative E3: Excavation and Off-Site Disposal with Surface Cover (Section 9.2.3)

Alternative E4: Excavation and Off-Site Disposal to Pre-Disposal Conditions and Surface Cover (Section 9.2.4)

The remedial action alternatives for sediment are:

Alternative S1: No Action (Section 9.3.1)

Alternative S2: Monitored Natural Recovery (Section 9.3.2)

Alternative S3: Sediment Removal (Section 9.3.3)

Alternative S4: Sediment Capping (Section 9.3.4)

The remedial action alternatives for the interior building materials are:

Alternative I1: No Action (Section 9.4.1)

Alternative I2: Encapsulation (Section 9.4.2)

Alternative I3: Building Interior Remediation (Section 9.4.3)

Alternative I4: Building Demolition and Off-Site Disposal (Section 9.4.4)

Remedial action alternatives are conceptual approaches to Site remediation. They demonstrate how the technologies selected for the alternative can be used to achieve the RAOs and provide a basis for a comparative evaluation to demonstrate which alternative(s) is best suited for the Site.

As previously introduced in Section 8.0, there are seven common actions that would be coupled with all of the aforementioned remedial action alternatives with the exception of the No Action alternatives. They represent certain engineering, construction and/or administrative actions that would occur in each of the environmental media and interior building material remedial action alternatives.

In accordance with the NYSDEC TAGM 4030, Selection of Remedial Actions at Inactive Hazardous Waste Sites (NYSDEC, 1990), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988), Draft DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002) and the NCP, each alternative has been evaluated for the following seven (7) criteria:

- overall protection of human health and the environment;
- compliance with Standards, Criteria and Guidance (SCGs);

- long-term effectiveness and permanence;
- reduction of toxicity, mobility or volume;
- short-term effectiveness;
- implementability; and
- cost.

The first two criteria, overall protection of human health and the environment and compliance with standards, criteria and guidance (SCGs), are considered threshold criteria. Consequently, there is an expectation that the remedial action alternative would achieve these two criteria. Standards and criteria are promulgated, while guidance is not. Engineering judgement factors into the extent to which a remedial action alternative complies with guidance (e.g., non-promulgated cleanup levels, etc.).

The next five evaluation criteria are referred to as balancing criteria. They offer a basis to compare the remedial action alternatives as part of the decision-making process that results in a recommended remedial action alternative.

According to 6 NYCRR 375 1.10(c)(5), the criterion, reduction of toxicity, mobility or volume, relates to a reduction in these factors for site hazardous wastes and/or constituents. For purposes of this evaluation, hazardous waste will be defined as federal and New York State RCRA listed hazardous wastes. NYSDEC guidance (NYSDEC, 2002) also includes all Site contamination. Both NYSDEC regulations and guidance are consistent with EPA guidance (EPA, 1988), which indicates that this criterion relates to changes in one or more of the characteristics of the hazardous substances or contaminated media. Under all definitions, preference is given to those alternatives that include treatment to address this criterion. As such, this criterion will review changes in the toxicity, mobility and volume of federal and New York State listed hazardous waste and the Site COPCs.

Descriptions of the Common Actions and remedial action alternatives are provided in Sections 9.1 through 9.4. An evaluation of each of the above criterion for the Common Actions and the remedial action alternatives is provided with the remedial action alternative descriptions. The associated costs for the alternatives are conceptual design cost estimates. Changes in the quantities of the media of interest requiring remediation (e.g., volume of waste requiring excavation, extent of regrading, etc.), detailed engineering, as well as other factors not foreseen at the time this report was prepared, could increase costs by as much as 50 percent or decrease costs by as much as 30 percent, as defined in Section 6.2.3.7 of *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988). An inflation rate of two percent (2%) was used to determine future costs and an interest rate of five percent (5%) was used to compute the present worth of all future costs. The inflation rate is consistent with the US Department of Labor Consumer Price Index (CPI) change between 2002 and 2003 (USDOL, 2003). The assumed interest rate, which corresponds to the current interest rate for a 30-year treasury bond, was selected to "produce an amount at which the environmental liability theoretically could be settled in an arm's length transaction with a third party, or if such a rate is not readily determinable, the discount should not exceed the interest rate on "risk-free" monetary assets with maturities comparable to the environmental liability" in accordance with the US Securities and Exchange Commission (SEC) Staff Accounting Bulletin (SAB) No. 92 (SEC, 1993). SAB No. 92 provides generally accepted accounting principles for estimating and reporting environmental liability.

9.1 COMMON ACTIONS

As discussed above, remedial action alternatives would be developed for soil/fill, sediment and interior building materials. Common Actions have been developed that address one or more of these three media. Each of the remedial action alternatives evaluated in Sections 9.2 through 9.4, with the exception of No Action alternatives and the Area V sediment alternatives, would incorporate the Common Actions related to their media. Common Actions related to sediment are instead included in the remedial alternatives addressing the Site-related impacted sediment (i.e., Areas I through IV). These Common Actions are designed to provide at least the minimum required protection of human health and the environment. However, most of the Common Actions discussed below include removal of COPCs from the Site, thus providing the maximum protection of human health and the environment. As discussed above, the Common Actions are:

Common Action C1:	Ground water monitoring;
Common Action C2:	Preparation and implementation of a soil management plan (SMP);
Common Action C3:	Removal of debris within building subsurface structures;
Common Action C4:	Bulkhead restoration beneath Site buildings;
Common Action C5:	Removal of the interior trench system;
Common Action C6:	Removal of process and fuel oil tanks;
Common Action C7:	Cleaning of the lead extrusion pits; and
Common Action C8:	Debris Removal Beneath the Site Buildings and Hot Spot Sediment Removal within the Building No. 8 Bulkhead.

Set forth below are descriptions of the Common Actions and the media to which they apply.

9.1.1 Descriptions of Common Actions

9.1.1.1 Common Action C1: Ground Water Monitoring

Ground water monitoring would be conducted following completion of the soil/fill remedial action. Semi-annual groundwater monitoring would be conducted for a period of two (2) years. The purpose of this monitoring would be to document the post-remedial ground water concentrations and the groundwater concentrations migrating onto the Site ground water containing tetrachloroethene, a VOC, is migrating onto the Site from an upgradient source. To monitor this situation, on-Site ground water monitoring for VOCs would be conducted. NYSDEC has been notified that a potential upgradient source of ground water contamination may be present. This Common Action, along with the provision for vapor barriers or other mitigative measures in future deed restrictions (see Alternatives E2, E3 and E4) would address a ground water RAO.

The post remedial ground water monitoring network would include five (5) ground water monitoring wells. An upgradient ground water monitoring well would be installed in the BICC Parking Lot to monitor the concentration of VOCs in ground water entering the Site. The remaining wells would include: a downgradient well, and Site central, eastern, and western wells. All wells would be screened across the ground water table at the Site. The proposed locations of these monitoring wells are shown in Figure 9-1. Depending upon the ultimate remedial action selected for the Site, it may be necessary to abandon existing wells to implement the remedy (i.e., for excavation of soil/fill, monitoring wells in the excavation footprint would be destroyed). For cost estimation purposes, it has been assumed that new permanent ground water monitoring wells would need to be installed at all five (5) locations.

Semi-annual ground water monitoring for VOCs would be conducted using the well network described above.The results of the ground water monitoring would be reported to NYSDEC semi-annually. As discussed above, the ground water monitoring would be conducted for 2 years.

The scope of the ground water monitoring, evaluation, and reporting activities would be documented in a Monitoring and Maintenance Plan (MMP) or an Operations and Maintenance Plan (O&M Plan), depending upon the ultimate remedy selected for the Site.

This Common Action would be included in all of the soil/fill remedial action alternatives, with the exception of the soil/fill No Action Alternative, and, thus, evaluated in the context of those alternatives. Costs associated with this Common Action would be included in the soil/fill remedial action alternatives.

9.1.1.2 Common Action C2: Preparation and Implementation of a Soil Management Plan

As discussed in Section 7.2.1, historic fill underlies the entire Site west of the railroad tracks (i.e., North Yard, South Yard and Below Buildings). As shown in Figures 7-1 through 7-7, portions of this Site soil/fill are VOC and PCB-impacted. In addition, the Site soil/fill, which is comprised of historic fill, also contains SVOCs and inorganic constituents both within and in excess of the historic fill values. The presence of these chemicals (i.e., PCBs, VOCs, SVOCs and inorganic constituents) is attributable to both past Site activities and the indigenous constituents contained in historic fill. Some quantity of historic fill would remain at the Site under all soil/fill remedial action alternatives evaluated in Section 9.2. VOC and PCB-impacted soil/fill would also remain at the Site under Alternative E2: Surface Cover and under certain Alternative E3: Excavation and Off-Site Disposal with Surface Cover scenarios.

In addition to the RI delineation samples discussed in Section 2.2, additional composite soil management samples were collected below the Site buildings. In October 2002, twenty-five (25) composite soil samples were collected from below the Site buildings for soil management purposes and submitted for analysis for SVOCs, PCBs and inorganic constituents. Select soil samples were submitted for analysis for VOCs. These sampling results are summarized in Tables 9-1 through 9-4 and the locations of these samples are presented in Figure 9-2. The majority of the soil management sample results are consistent with historic fill values. Where concentrations above the historic fill values were encountered, RI delineation samples were subsequently collected. These subsequent delineation samples were discussed in Section 2.2.2.

As discussed in Section 7.2.1.1, COPCs in Site soil/fill pose direct contact risks to Site occupants and construction workers. With the exception of the No Action alternatives, all remedial action alternatives would include a barrier to prevent direct contact between Site occupants and COPCs in the historic fill. In addition, a Soil Management Plan (SMP) would be prepared and implemented to eliminate the potential for construction worker exposure to chemicals present in the Site soil/fill remaining after the selected remedial action is implemented. The goals of the SMP would be to ensure that: (1) disturbance of any remaining Site soil/fill be conducted in a manner that would protect construction workers; and (2) the proper management of the disturbed Site soil/fill would be conducted. As such, this Common Action would address a portion of the soil/fill RAOs related to preventing direct contact with soil/fill.

Site maintenance activities that involve excavation of Site soil/fill and any post-remedial site work that disturbs direct contact barriers with remaining soil/fill (e.g., future slab or asphalt removal activities utility work, soil grading, landscaping, pile driving, etc.) would pose the potential for workers to come into contact with residual COPCs in the remaining post-remedial Site soil/fill, and would generate waste materials that require proper management. The SMP would identify reasonable procedures and precautions to ensure that future work activities are implemented safely and without impacting Site workers or the environment.

The SMP would address: PPE requirements, the need for respiratory protection, dust monitoring requirements, other health and safety precautions and any sampling and analysis requirements for areas for which sufficient analytical information is not available. The SMP would require that all excavated Site soil/fill would be stockpiled on Site, or staged in rolloffs, until final determinations are made regarding disposal or re-use. Stockpiles would be lined with seamless plastic sheeting and covered with polyethylene sheeting. Debris material, such as wire, plastic, etc., would be segregated for off-Site disposal. The stockpiled soil and/or other excavated materials would be stored in a secure area of the Site until analytical results were obtained. Site soil/fill that has chemicals at concentrations below TAGM 4046 RSCOs or below the historic fill 95% UCL on the mean, may be reused as backfill. Site soil/fill having chemical concentrations above both of these values would be transported off-Site for disposal. To demonstrate that excavated soil is suitable for reuse as fill, a statistically significant number of samples would be collected from the excavated soil/fill. There would not be any SMP requirements imposed on the placement of clean backfill at the Site.

The SMP would also address soil disposal requirements and serve as a guideline for future Site workers to ensure the proper management of excavated soil that would be disposed of off-Site. The SMP would provide general guidelines related to soil disposal. Any future soil disposal, if necessary, would have to be conducted in accordance with the regulations current at the time of the disposal activity. All applicable and appropriate standards, guidance and criteria would be followed to properly manage any waste that is generated.

If off-Site disposal of soil were required, the soil would be characterized for disposal purposes in accordance with the requirements of the disposal facilities. Once disposal facility approval has been obtained, the soil would be transported in disposal trailers or rolloffs to the appropriate, selected off-Site disposal facility. Any applicable recording-keeping (e.g. bill of lading or manifest), truck placarding, or other requirements would similarly be followed.

In general, the three categories of soil that could be generated for off-Site disposal would include:

- Non-hazardous waste;
- RCRA-regulated hazardous waste; and
- TSCA PCB remediation waste/New York State B007 listed PCB hazardous waste.

Non-hazardous waste would consist of soil that does not contain constituents at concentrations high enough to be considered a TSCA, New York State hazardous or RCRA-regulated waste. RCRA-regulated hazardous waste for this Site would likely be limited to materials that are characteristic hazardous waste for lead.

The SMP would also address construction worker contact with Site ground water to address a ground water RAO.

The SMP would be implemented with either a Monitoring and Maintenance Plan (MMP) or Operations and Maintenance Plan (O&M Plan), depending upon the ultimate remedy selected for the Site. A copy of the SMP would be maintained at the facility with the property management. The schedule for completion of the SMP is dependent upon the time for remedial action.

This Common Action would be included in the soil/fill and sediment remedial action alternatives (except for No Action) and, thus, evaluated in the context of those alternatives. Since the majority of the areas addressed by this plan are soil/fill, costs associated with this Common Action would be included in the soil/fill remedial action alternatives.

9.1.1.3 *Common Action C3: Removal of Debris Within Building Subsurface Structures*

During the RI, operational and/or construction and demolition (C&D) debris was identified in the following three areas of the Site:

- the North Yard soil/fill (see Section 2.2 for additional discussion);
- in piles below the Site buildings in the sediment intertidal zone (see Section 2.4.2 for additional discussion); and
- within concrete structures below Site buildings located atop Below Building soil/fill (see Section 3.2.6 for additional discussion).

The debris located in the North Yard soil/fill are addressed in the soil/fill remedial action alternatives presented in Section 9.2. The debris located in the sediment intertidal zone is discussed in Common Action C8. The debris within the concrete structures is addressed in this Common Action, C3, as described below.

Debris within Building Subsurface Structures

Debris was identified within three concrete subsurface structures within Buildings Nos. 4 and 5 and the former reel pit and lead press pit in Building No. 2, as discussed in Section 3.2.6. Fill material and construction debris (i.e., brick, concrete, wood and steel) were used to fill these structures prior to sealing the structures with a concrete slab. Samples of the fill collected from these subsurface structures indicate the presence of PCBs at concentrations ranging from 1.3 to 1,800 mg/kg.

Based on the geophysical investigation conducted, the footprints of these structures have been estimated. The approximate quantity of debris/fill in the Building No. 4 concrete structure is 6 cy, in the Building No. 5 concrete structures is 90 cy, in the Building No. 2 lead press pit is 45 cy, and in the Building No. 2 reel press pit is 25 cy. As discussed with the NYSDEC, additional investigation of these subsurface structures as specified in the approved scope of work submitted on 10 June 2003 (Roux, 2003c) would be completed as a pre-design study.

Water and petroleum-type product were removed from the former reel pit in Building No. 2. Additional investigation of the south wall of this structure, as well as detail of the water and debris removed from this structure, would be included in the pre-design study.

As discussed in Section 7.2.4.3, the material present in these subsurface structures requires removal for the following reasons: to determine whether the structure has competent sidewalls and/or bottoms (Building No. 2 and Building No. 5 subsurface structures) and because the material is a NYS B007 listed PCB hazardous waste (Building No. 4 subsurface structure).

To enable removal of the debris/fill within the concrete subsurface structures, the concrete slab above the approximate footprint of each subsurface structure would be removed by sawcutting. The debris/fill would then be removed using mechanical equipment (e.g. small excavator).

The contents of the subsurface structures would be stockpiled and sampled for disposal characterization prior to off-Site transportation and disposal. Based on the limited sampling conducted, the debris in the Building No. 5 structures is expected to be a non-hazardous waste and the debris in the Building No. 4 structure is expected to be a NYS B007 listed PCB hazardous waste and a TSCA remediation waste. The debris in the Building No. 2 lead press pit is expected to be non-hazardous wastes.

This Common Action also includes sampling and analysis of the contents of the Building No. 2 lead press pit and evaluation of its structural integrity.

Completion of this Common Action is estimated to require a two to three-month time frame.

This Common Action would be included in the interior building materials remedial action alternatives and, thus, evaluated in the context of those alternatives. Costs associated with this Common Action would be included in the interior building material remedial action alternatives.

9.1.1.4 *Common Action C4: Bulkhead Restoration Beneath Site Buildings*

Bulkhead restoration is included as a Common Action to meet the soil/fill RAO of preventing migration of soil/fill that would result in surface water impacts that exceed applicable SCGs. Erosion of soil/fill to the Hudson River via sloughing of soil/fill from areas where the bulkhead has lost its integrity has been observed beneath the Site buildings from the High Bay

Building to the northern Site buildings. The portion of the bulkead exposed to water beneath the High Bay and northern Site buildings is in very poor condition. The erosion of fill material has resulted in subsidence of some of the dock structures and building floors in the northern Site buildings.

New bulkheads would be constructed alongside the existing bulkhead as discussed below. This would provide a vertical barrier to contain and prevent potential migration of impacted soil/fill, thus preventing erosion of fill material and particulate transport into the Hudson River. In addition, restoration of the bulkhead would separate the intertidal sediment located within the bulkhead line from the river environment. The bulkhead would be installed from west of the High Bay Building, along Building Nos. 7, 9 and 12 and on the northern Site boundary. Special construction measures would be taken for restoration work conducted underneath the existing buildings.

Based on condition of these bulkheads and the observed erosion of soil/fill from behind the existing bulkheads, the NYSDEC Region 3 coastal wetlands' contact has verbally indicated that the proposed bulkhead restoration appears to be "reasonable and necessary". The contact also stated that the area that is currently in contact with the river and is proposed for bulkhead restoration (i.e., the area beneath Building No. 8) would likely not be classified as a significant tidal wetland (ERM, 2003d). In addition, based on information provided to the NYSDEC (ERM, 2004), the proposed bulkhead restoration is acceptable to NYSDEC (NYSDEC, 2004).
Proposed repair to the existing bulkhead along the west side of the High Bay Building would include the installation of steel sheet formwork along the inner face of the existing bulkhead. This framework would be used to retain a marine grade slurry mix installed on the existing fill where erosion has occurred. The estimated quantity assumes a typical wall height of approximately 5 feet along the bulkhead. This slurry would extend

approximately 25 feet east beneath the High Bay building. The sediment remedial action alternatives would take into consideration the placement of this bulkhead.

The bulkhead adjacent to Buildings No. 7, 9, and 12 currently consists of heavy timber sheet piling. These timbers are deteriorated and are no longer present in many areas, particularly adjacent to Building Nos. 7 and 9. As described for the High Bay Building , a steel formwork would be installed along the inner face of the lower portion of the existing timber wall to retain a marine grade slurry mix to fill areas of erosion below the buildings.

Lastly, the existing bulkhead along the north wall of Building Nos. 4 and 12 consists of heavy timber piling that begins at the Hudson River shoreline on the eastern edge of the dock. This bulkhead section is perpendicular to the flow of the Hudson River, which makes it the most susceptible to erosion. New steel sheet pile bulkhead would be installed along the outer face of the existing bulkhead to twice the depth of the river at that location to adequately stabilize the bulkhead. Installation of sheet piling to this depth is assumed necessary to prevent lateral movement due to the forces imposed by the river's current.

Protective measures that mitigate direct contact with Site-related impacted sediment (e.g., gloves, clothing) would be employed, as needed, during the bulkhead restoration activities.

Implementation of this Common Action is estimated to require four months to complete. This Common Action would be included in the soil/fill and sediment remedial action alternatives and, thus, evaluated in the context of those alternatives.

Following restoration of the bulkhead, the bulkhead would be inspected every five years and repaired as needed.

Since the primary purpose of this Common Action is to stabilize the Below Building soil/fill and to prevent continued erosion of soil/fill into the Hudson River, costs associated with this Common Action would be included in the soil/fill remedial action alternatives.

9.1.1.5 Common Action C5: Removal of Interior Stormwater System

This section provides a general description of the work to be performed for the cleanup and removal of the interior floor trench system. As described in Section 3.1.2, and in Interim Deliverable No. 1 (Roux, 2001), this interior trench system is comprised of a series of subsurface trenches and subsurface pipes located below the concrete slab on the first floor. Figure 3-4 shows the location and configuration of this trench system. Currently, this trench system is used to discharge stormwater runoff from roof drains. The total length of this system is approximately 1,100 feet and is located throughout the Site, north of Building No. 8. The width of the trench varies, but is generally about 3 feet wide. The depth of the trench also varies, from approximately 1 foot to about 4 feet below floor surface. The average depth is approximately 2.5 feet.

When inspected in June 2001, it was discovered that sludge had accumulated in the base of the trench system. Sludge samples were collected at three locations to characterize the material within the trench system. As discussed in Section 3.7.2, the sludge contained elevated concentrations of PCBs, SVOCs and inorganic constituents.

As described in Section 3.1.2, sludge was removed to the extent possible with a high vacuum Guzzler truck and shipped off-Site for proper disposal.

However, residual sludge still remains in portions of the trench that were not accessible to the Guzzler truck without removal of the concrete flooring.

A portion of the stormwater system is connected to this drainage system. Hence, stormwater has the potential to come into contact with residual contaminated sludge present in the trench. Since this trench is connected to outfalls leading to the river, the remaining sludge in this system would need to be addressed to fulfill the sediment RAO to "prevent releases of chemicals in excess of upriver values to or from sediment that would result in surface water concentrations in excess of ambient water quality criteria and/or result in fish advisories". Since portions of the trench do not have competent bottoms, the trench system would have to be cleaned further to prevent discharges to soil/fill at these locations. Cleaning of the trench would therefore satisfy the requirements of OSWER Directive 9360.3-12 (USEPA, 1993) that discharges of impacted building materials to the environment (i.e., sediment and soil/fill) be prevented. As a common action to all alternatives, the entire trench system would be exposed, cleaned out, and removed from the Site.

Replacement and rerouting of the stormwater drainage from roof drains are evaluated in the remedial alternatives for interior building material, presented in Section 9.4.

As an initial step, the floor slab located above the subsurface trenching and piping associated with this system would be cut out and removed using a concrete saw and demolition equipment, such as jackhammers and backhoes. All concrete removed from above the trench system would be contained in roll-off containers, sampled for waste characterization, and transported off-Site for proper disposal. The removal of the floor slab located above the trench system would allow access for the removal of all remaining sludge in the system. Sludge would be removed using a high vacuum Guzzler truck. All sludge removed from the trench and piping would be contained in roll-off containers, sampled for waste characterization, and shipped off-Site for proper disposal. After the concrete slab has been removed from above the system and all sludge is removed, the sidewalls and bottom of the trench would be removed. Removal would be accomplished using demolition equipment. Concrete from the trench would be broken up into manageable sized pieces and placed into on-Site roll-off containers, sampled for waste characterization, and transported off-Site for proper disposal.

As shown in Figures 7-7 and 7-8, a portion of the floor trench system does not have a competent bottom and PCB-impacted soil/fill is present at these locations. Removal of the sidewalls of the floor trench system in these areas would be conducted under this Common Action. However, the impacted Below Building soil/fill at these locations are addressed in the soil/fill remedial action alternatives discussed in Section 9.2.

Completion of this Common Action is estimated to require one month to complete. This Common Action would be included in the sediment and interior building materials remedial action alternatives and, thus, evaluated in the context of those alternatives. Costs associated with this Common Action would be included in the interior building material remedial action alternatives.

9.1.1.6 Common Action C6: Removal of Process Tanks and Fuel Oil Tanks

Existing aboveground storage tanks to be removed as part of this Common Action include:

- Eleven process oil tanks located on the second floor of Buildings Nos. 2A and 8; and

- Two, 25,000 gallon fuel oil tanks located on the first floor adjacent to the Boiler Room.[12]

Process Oil Tanks

As discussed in Section 3.1.4, eleven process oil tanks are currently located on the second floor. Tanks 1 through 8 are suspended from the ceiling of the interior Railroad Siding and Tanks 9 through 11 are also elevated and located on the north wall of the High Bay Building. The locations of these tanks are provided in Figure 7-13. The tanks in the High Bay Building are accessible by entering the High Bay Building from the third floor level. Each of these tanks has been emptied of its contents; however, residual oil remains. The capacities of the tanks in the Railroad Siding area are each either 7,700 or 13,000 gallons. The process tanks in the High Bay Building are each approximately 5,000 gallons in capacity.

The process oil tanks have been out of service for several years and have not been maintained nor inspected. In accordance with 6 NYCRR 613.6 (e), these tanks must be permanently taken out of service. This would include removal of any residual sludge in the tanks and their associated piping. As stated above, these tanks are either suspended from the ceiling or located on the wall. Consequently, these tanks must be removed from their elevated locations prior to cleaning. Cleaning these tanks in-place would require that the connecting lines to these tanks be removed, thus compromising the mounting of these tanks.

As noted above, each of the tanks and its associated piping would be dismantled from its current location. The tanks and piping would be staged

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12 The contents of these tanks were removed in July 2004 as a spill response measure.

in a designated area on the second floor level or transported to the exterior of the buildings for further dismantling and cleaning activities. The process tanks and all associated piping would be cleaned and triple rinsed in accordance with all applicable local regulations regarding storage tank cleaning. Wash water would be contained to the designated dismantling locations and containerized for disposal. All related piping would be removed and disposed off-Site. Any residual liquid/product remaining in the process tanks would be absorbed by sawdust or fine sand. This absorbent material would also be disposed off-Site.

Initial cleaning would consist of introducing water into the high end of the process tank and water, along with any remaining sludge or sediment, would be pumped out of the lower end. Secondary cleaning procedures would involve actual entry into the process oil tanks for manual cleaning. A large opening would be cut into the process tank in conformance with all confined space entry safety requirements. All remaining sludge/product would be removed using a squeegee or absorbed with suitable fabric. The recovered residual material would be characterized, drummed, labeled and properly disposed of in accordance with all applicable federal, state and local regulations. The tank would then be pressure washed thoroughly prior to removal activities.

Each of the eleven process tanks would then be cut into sections prior to removal. The tank and piping debris would be removed from the Site and disposed at an approved facility. The resulting wash water generated from pressure washing would be contained for disposal at a permitted oil/water recycling facility.

Fuel Oil Tanks

Two aboveground tanks are located on the first floor, just north of Building No. 9 and west of the Compressor Room. These two tanks each have an approximate capacity of 25,000 gallons and were used to store No. 6 fuel oil for use in the two boilers located in Building No. 11. These tanks are located in an enclosed , sand-filled vault approximately 40 feet long by 30 feet wide. The only access to these tanks is from the outside of the building. A small hatch is located by the fill ports above each of these tanks. In accordance with 6 NYCRR 611 the fuel tanks would be removed as part of this Common Action.

On 8 July 2004, Roux Associates and Boswell Underwater Engineering observed a sheen on the river in the vicinity of the two, 25,000-gallon No. 6 fuel oil tanks. On 8 July 2004, Roux contacted the NYSDEC Spill Hotline to report the release and received Spill No. 0403747. This spill was also reported to the NYSDEC DER. A boom was promptly installed in the river to capture and contain the petroleum release. No additional indications of any further releases have been identified. On 12 July 2004, Petroleum Tank Cleaners, Inc. of Brooklyn, New York was on-site to commence the removal of the fuel oil from these two tanks and cleaning of these tanks. This work was completed on 4 August 2004. The removed fuel oil was transported off-site to be reclaimed, and the tank sludge and wash water were contained in 55-gallon drums to await off-site disposal. Sand removal is scheduled to be completed in September 2004. Sand that will be removed from the vault will be placed in roll off containers and disposed off site.

This Common Action will include cutting the metal tanks into manageable sized pieces and loading them onto trucks for disposal. All piping associated with the tanks would be cut and capped.

All contaminated scrap metal associated with these tanks would be properly disposed as petroleum-contaminated waste.

This Common Action, which would take approximately two weeks to complete, would be included in the interior building materials remedial action alternatives and, evaluated in the context of those alternatives. Costs associated with this Common Action would be included in the interior building material remedial action alternatives.

9.1.1.7 Common Action C7: Cleaning of Lead Extrusion Pits

A lead extrusion line was previously operated on the second floor of the High Bay Building. Two lead extruders were removed in 1997 and the concrete pits below the machines were inspected. As discussed in Section 7.2.4.3, the residual oily sludge in these pits would be a RCRA characteristic waste, if removed. While the surface of this structure indicates surface impacts for lead and PCBs, these chemicals have not permeated into the structure.

The cleanup activities would consist of the removal, proper disposal, and handling of all collected surface materials from the floors and wall surfaces of each of the lead extrusion pits. Surface scraping of the floors and walls utilizing hand and mechanical methods within the lead extrusion pits would be performed to remove the surface accumulation. Following the surface scraping, surface cleaning of floors and walls utilizing pressure washing combined with a commercial detergent would be performed. All waste generated during the lead extrusion pit cleaning would be containerized for proper disposal at a permitted waste disposal facility(s). Confirmatory wipe and concrete bulk samples would be collected following all cleaning activities.

This Common Action, which would take approximately one month to complete, would be included in the interior building materials remedial action alternatives and, evaluated in the context of those alternatives. Costs associated with this Common Action would be included in the interior building material remedial action alternatives.

9.1.1.8 Common Action C8: Debris Removal Beneath the Site Buildings and Hot Spot Sediment Removal within the Building No. 8 Bulkhead

Under this Common Action, debris piles identified beneath the High Bay Building and the West Warehouse by divers during the sediment sampling effort and hot spot intertidal sediment areas within the bulkhead beneath Building No. 8 will be addressed. This Common Action would be conducted prior to bulkhead restoration (i.e., Common Action C4).

Debris Piles

The debris piles contain scrap metal and cable, plastic pellets, slag, rubber, and plastic strips. Debris piles are located in the intertidal sediment zone, and are submerged underwater during high tide. The locations of debris piles were presented in Figure 2-32. Sampling results for this material was presented in Section 2.4.3. This material would not be classified as a NYS B007 listed PCB hazardous waste or a TSCA regulated waste based on the PCB concentrations observed in these samples. One of the debris samples collected did exhibit a TCLP lead concentration in excess of the RCRA regulatory limit of 5 ug/l. The material sampled is suspected to have been lead sheathed cable. This material would either be handled as a RCRA hazardous waste for lead or as a scrap lead metal (if feasible). It is estimated that approximately 40 cy of debris is present beneath the Site buildings in the intertidal sediment zone.

These debris piles present a potential for future impacts to the intertidal sediment. To address the sediment RAO to "prevent releases of chemicals in excess of upriver values to or from sediment that would result in surface water concentrations in excess of ambient water quality criteria and/or result in fish advisories", these debris piles would be removed as a Common Action and disposed of at an appropriately permitted facility.

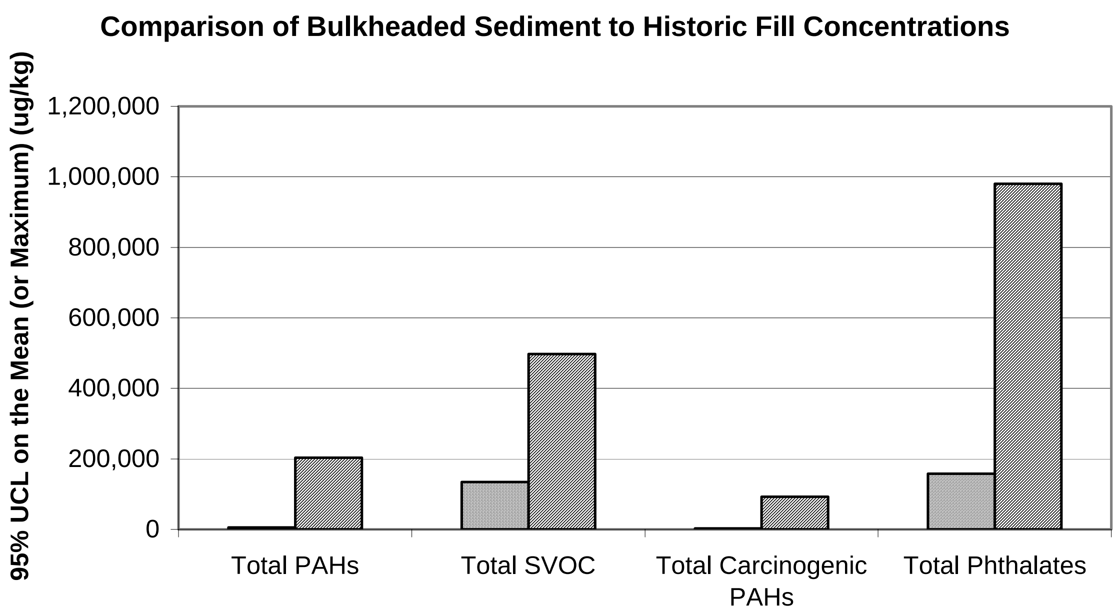
The debris would be accessed by: cutting holes in the foundation floors, removing floor plates in the areas of the debris and/or by sending divers below the buildings for collection of these materials. The collected debris would be stockpiled and sampled for disposal characterization prior to off-Site transportation and disposal. As discussed above, based on the previous sampling results, it is expected that this material would be characterized as a non-hazardous waste.

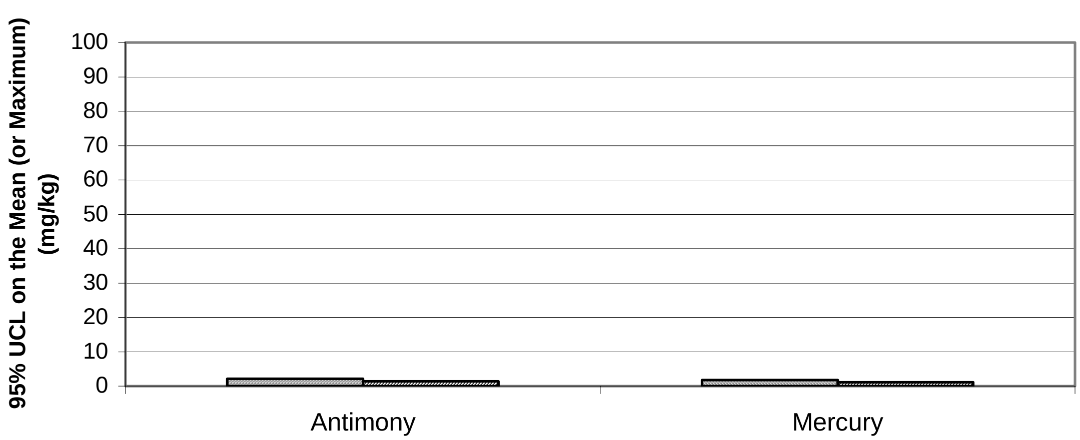
Hot Spot Removal

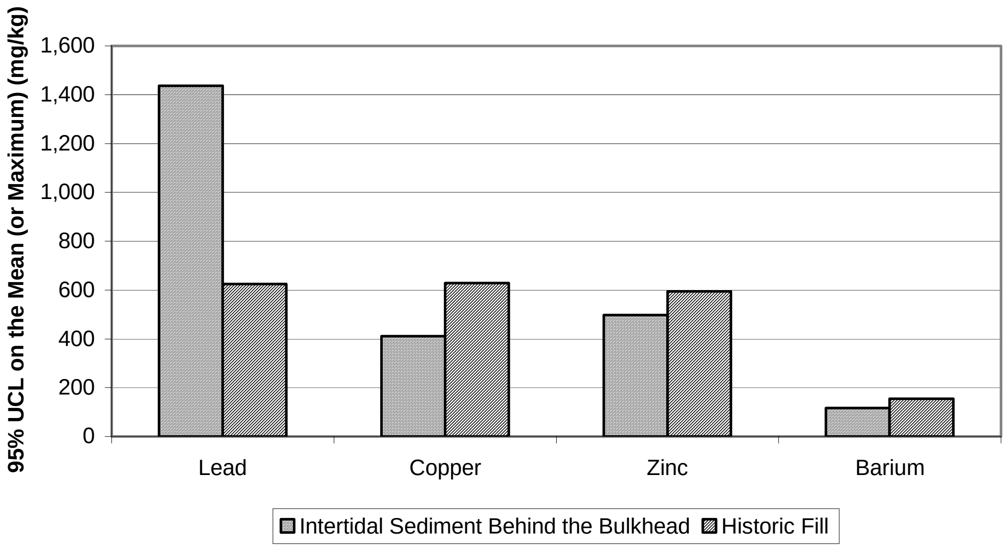
Under Common Action C4, the bulkhead would be restored. As a result of this action, the intertidal sediment located beneath Building No. 8, which was previously bulkheaded historic fill, would be isolated from the river environment. To address NYSDEC's request (NYSDEC, 2004), limited hot spot removal would be conducted in this area prior to restoration of the bulkhead.

As previously discussed, the High Bay building was constructed atop of bulkheaded historic fill. Consequently, the quality of historic fill is a reasonable benchmark to use to identify "hot spots" in intertidal sediment behind the bulkhead.

The following figures present a comparison of the intertidal sediment concentrations behind the bulkhead to the historic fill values for organic compound categories and two specific metals. As shown in these figures, with the exception of lead, the chemical concentrations within the bulkheaded sediment are below the historic fill concentrations. Therefore, elevated levels of lead in intertidal sediment behind the bulkhead would identify "hot spots".







Review of the dataset for the intertidal sediment behind the bulkhead (i.e., samples numbers SED8W-02 through SED8W-05, SED8E-01 through SED8E-06 and SED07-06) indicates that the highest lead concentrations in bulkheaded sediment are located in the 6 to 12-inch intervals at the following locations: SED8E-01 (6,440 mg/kg); SED8W-05 (48,160 mg/kg); and SED8E-05 (1,040 mg/kg). Two of these three locations (i.e., SED8E-01 and SED8E-05) are coincident with debris piles.

Removal of sediment from the 6 to 12-inch interval at these hot spots would reduce the 95% UCL on the mean lead concentration from 1,443 mg/kg to 629 mg/kg. This value (i.e., 629 mg/kg) is consistent with the 95%UCL on the mean for historic fill (i.e., 624 mg/kg). Removal of sediment from individual locations with lead concentrations greater than historic fill is not needed to reach this area wide concentration. This is consistent with other Yard and below building locations where concentrations greater than the historic fill values would remain in place and their exposure would be mitigated through bulkhead restoration and surface covers.

This hot spot removal would remove additional lead as well as some of the highest concentrations of copper, PCBs, phthalates and total SVOCs in the bulkheaded sediment. Consequently, with the exception of PAHs, the hot spot removal would also decrease the residual concentrations of these chemicals (see below). (Please note, based on the widespread distribution of PAHs, which are not Site related, the residual PAH 95% UCL on the mean concentration is essentially unchanged by the hot spot removal). Also note in the following table, these residual concentrations are well below historic fill values.

ug/kg	Concs prior to hot spot removal	Residual concs after hot spot removal	Historic Fill Concs
Lead	1,433	629	624
Copper	411	279	629
Total PCBs	679	539	5,000
Total Phthalates	117,878	31,226	980,000
Total SVOCs	116,217	44,919	497,814
Total PAHs	5,590	6,297	203,153

Prior to bulkhead restoration and in conjunction with the above debris removal, sediment would be removed from sediment locations SED8E-01, SED8W-05 and SED8E-05. An area approximately 10 feet by 10 feet by 2 feet deep would be removed, if feasible, from each of these locations. No post-excavation sampling would be conducted since: (1) the purpose of this effort is to remove limited, localized known areas of elevated lead concentrations; and (2) the bulkhead would be constructed to prevent river water infiltration into this and other soil/fill areas.

9.2 SOIL/FILL REMEDIAL ACTION ALTERNATIVES

This section presents the four remedial action alternatives for the impacted Site soil/fill identified in Section 7.2.1.3. The impacted soil/fill includes the PCB and VOC-impacted North Yard, South Yard and Below Building soil/fill identified in Figures 7-1 through 7-7 and the remaining historic fill located in these areas that has not been impacted by PCBs or

VOC COPCs. As discussed in Section 7.2.1, Site soil/fill has also been impacted by SVOCs and inorganic constituents. These impacts are either due to Site activities or are due to the indigenous constituents in historic fill. The footprint of PCB and VOC COPC impacts presented in Figures 7-1 through 7-7 also encompasses the majority of the Site activity related SVOC and inorganic constituent impacts as identified in Figures 2-11 to 2-27. The PCB and VOC COPC-impacted soil/fill areas and the soil/fill areas outside the PCB and VOC COPC impacted footprint that contain SVOC and inorganic constituent impacts would both be addressed under the soil/fill remedial action alternatives.

The soil/fill remedial action alternatives developed for detailed evaluation are:

- Alternative E1: No Action
- Alternative E2: Surface Cover
- Alternative E3: Excavation And Off-Site Disposal With Surface Cover
- Alternative E4: Excavation And Off-Site Disposal To Pre-Disposal Conditions

With the exception of the Alternative E1: No Action, all of the remaining soil/fill alternatives also include the Common Actions discussed in Section 9.1 that are associated with soil/fill. The evaluation of Alternatives E2, E3 and E4 would each include Common Actions C1, C2 and C4. The Common Actions associated with sediment and interior building materials are discussed in Sections 9.3 and 9.4, respectively.

A description of each remedial alternative is provided in the following sections.

9.2.1 ALTERNATIVE E1: NO ACTION

9.2.1.1 Description

Section 300.430(e)(6) of the NCP recommends describing and evaluating a no action alternative as a measure of identifying the potential risks posed by a site if no remedial action were implemented. Pursuant to 6 NYCRR Part 375-1.10(c), a remedial program for a site listed on the Registry must not be inconsistent with the NCP. Accordingly, a soil/fill No Action Alternative (Alternative E1) has been developed to fulfill the NCP requirement. This alternative is evaluated in this section.

Under the Alternative E1, no remedial actions would be implemented at the Site and the existing engineering controls (i.e., fencing, guards, surface covers in the North and South Yard) would not be maintained.

9.2.1.2 Evaluation

9.2.1.2.1 Overall Protection of Human Health and the Environment

Alternative E1 would not be protective of human health and the environment. This alternative would not meet soil/fill remedial goals or the remedial action objectives identified in Sections 7.0 and 7.1.1.1, respectively. As discussed in Section 7.2.1.1, exposed Site soil/fill poses carcinogenic risks greater than $1x10^{-6}$ and noncarcinogenic risks to future Site trespassers and construction workers. In addition, should the existing surface covers be removed or breached, currently covered soil/fill would also pose carcinogenic risks greater than $1x10^{-6}$ and noncarcinogenic risks to current and future Site trespassers and construction workers. Since Alternative E1 would not maintain the existing Site soil/fill surface covers and allow exposure to exposed soil/fill, this alternative would not meet the threshold criterion of being protective of human health and the environment.

9.2.1.2.2 Compliance with SCGs

A summary of the applicable SCGs for the Site soil/fill is presented in Table 9-5. Since no remedial actions would be conducted under this alternative, none of the location specific and a limited number of the action specific SCGs are not applicable to this alternative. The alternative would not comply with the applicable action or chemical specific SCGs.

Specifically, Alternative E1 would not:

- comply with any of the applicable chemical specific soil/fill SCGs (i.e., TSCA, TAGM 4046);
- comply with any of the applicable chemical specific SCGs related to protection of surface water bodies;
- address the 6 NYCRR Part 375 goals to eliminate or mitigate all significant threats to the public health and the environment and restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law; and
- address the 6 NYCRR Part 375 requirement to remove "consequential" amounts of hazardous waste.

9.2.1.2.3 Long Term Effectiveness and Permanence

Under Alternative E1 the existing volume of impacted soil/fill would remain at the Site. As previously discussed, the exposed and currently unexposed Site soil/fill pose future risks to Site trespassers and construction workers. Since no action would be performed, this alternative would not provide any long term effectiveness or permanence.

9.2.1.2.4 Reduction of Toxicity, Mobility or Volume

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility and volume of NYS listed hazardous waste and COPCs. As previously discussed, NYS B007 listed PCB hazardous waste is present in North Yard and Below Building soil/fill.

Alternative E1 would not be effective in reducing the mobility, toxicity or volume of NYS listed hazardous wastes or COPCs. Because of the relative stability of PCBs and inorganic constituents in Site soil/fill, reduction in toxicity or volume is not expected for these chemicals due to natural degradation. Some limited degradation of VOCs and SVOCs in soil/fill would be expected; however, this would not be significant. Based on the observed low solubility and low mobility of the PCBs, inorganic constituents and SVOCs in Site soil/fill, these chemicals are expected to remain in the soil matrix.

9.2.1.2.5 Short-Term Effectiveness

There are no short-term effects associated with the Alternative E1 since there are no actions included with this alternative.

9.2.1.2.6 Implementability

As there are no specific actions related to this alternative, it would be readily implementable.

9.2.1.2.7 Cost

There are no actions taken under this alternative. As such, there are no costs associated with the implementation of Alternative E1.

9.2.2 ALTERNATIVE E2: SURFACE COVER

9.2.2.1 Description

Under this remedial action alternative, E2: Surface Cover, all North Yard, South Yard and Below Building soil/fill would be covered with either asphalt or concrete and these covers would be maintained in perpetuity.

The total area of the North and South Yards is approximately 350,000 sf or 8 acres. As shown in Figure 9-3, approximately 155,000 sf of this total area (i.e., 44%) is currently exposed. Of the remaining 195,000 sf that is currently covered, 155,000 sf is asphalt covered, and 40,000 sf is concrete covered. The existing thickness of the asphalt and concrete surface covers vary across the Yard and the condition of these covers is also variable. On average, the asphalt covers are six inches thick and the concrete covers are four inches thick. The Below Building soil/fill, approximately 125,000 sf in area, is currently covered with concrete flooring having a minimum thickness of 6 inches.

The purpose of the surface cover would be to prevent direct contact with PCBs, VOC COPCs, SVOCs and inorganic constituents in the North Yard, South Yard and Below Building soil/fill. As discussed above, the extent of PCBs and VOC COPCs present in the North Yard, South Yard and Below Building soil/fill at concentrations in excess of their SCGs is presented in Figures 7-1 through 7-7. In addition, SVOCs and inorganic constituents are also present in excess of their SCGs (as shown in Figures 2-11 through 2-27) in the soil/fill areas outside the PCB and VOC COPC footprints.

PCBs are present in the South Yard, North Yard and Below Building surface soil at concentrations above the surface soil PCB SCG (i.e., 1 mg/kg). In the South Yard, PCBs in excess of the subsurface soil PCB SCG (i.e., 10 mg/kg) are limited to one location, SB-78 at 19 to 20 feet bgs. The concentration at this location, which is thought to have been filled in the 1970s, is 23.3 mg/kg. In the North Yard, subsurface soil also contains PCBs in excess of the subsurface soil PCB SCG. The maximum PCB concentration in the North Yard is 97,600 mg/kg. This concentration occurs at SB-65 at 0-4 feet bgs. Approximately 60% of the PCB-impacted North Yard soil/fill locations (i.e., locations exhibiting PCBs in excess of the subsurface PCB SCG) have PCBs at concentrations above 50 mg/kg. In the Below Building soil/fill, subsurface soil contains PCBs in excess of the subsurface soil PCB SCG. The maximum PCB concentration in the Below Building soil/fill is 5,510 mg/kg. This concentration occurs at TS-03 at 0-1 feet below the bottom of the trench. Approximately 30`% of the PCB-impacted Below Building soil/fill locations (i.e., locations exhibiting PCBs in excess of the subsurface PCB SCG) have PCBs at concentrations above 50 mg/kg.

Based on the concentrations of PCBs in Site soil/fill, covers proposed under this alternative would need to comply with the TSCA requirements for surface covers as outlined in 40 CFR Part 761.61 and summarized in Table 7-2. In accordance with TSCA, PCBs can remain in Site soil/fill in excess of the high occupancy criteria (i.e., 10 mg/kg):

- up to 25 mg/kg if the area is limited to low occupancy use;
- up to 50 mg/kg if the area is fenced off and limited to low occupancy use; and
- up to 100 mg/kg if the area is covered and limited to low occupancy use.

This alternative would include the following remedial tasks and incorporate the following Common Actions associated with soil/fill discussed in Section 9.1:

- Access and Use Restrictions (Task No. 1)
- Site Preparation and Mobilization (Task No. 2)
- Installation of a Surface Cover (Task No. 3)
- Cleaning of the Existing Warehouse and Paint Shop Surface Covers (Task No. 4)
- Ambient Air Monitoring for Particulates (Task No. 5)
- Maintenance of the Surface Cover (Task No. 6)
- Ground Water Monitoring (Common Action C1)
- Preparation and Implementation of a SMP (Common Action C2)
- Bulkhead Restoration Beneath Site Buildings (Common Action C4)

This alternative could be completed within six months of NYSDEC approval of the Remedial Design for this Site. Ground water monitoring would be conducted beyond this time frame as outlined in Section 9.1.1.1. Access/use restrictions and annual OM&M activities would be implemented in perpetuity.

Descriptions of the common actions considered for this alternative (i.e., Common Actions C1, C2 and C4) were provided in Sections 9.1.1.1, 9.1.1.2 and 9.1.1.4, respectively. Evaluation of these common actions is included along with the other tasks of this alternative.

9.2.2.1.1 Task No. 1: Access/Use Restrictions

Under this alternative, soil/fill containing chemicals at concentrations above the RSCOs and PCB concentrations above the TSCA high and/or low occupancy standards would remain in place and be covered. Institutional controls would therefore be implemented to address the NYSDEC's requirement to issue a notice regarding chemicals present in Site media above the RSCOs and TSCA's requirement to provide a notice regarding PCB concentrations remaining beneath surface covers.

In accordance with 40 CFR 761.61(a)(8), a deed notice would be prepared and filed within 60 days of implementation of this remedial alternative. This deed notice would provide for the following:

- indicate that the land has been used for PCB remediation waste disposal;
- indicate the existence of the asphalt and concrete covers
- specify required OM&M of the surface covers (see Task No. 6);
- specify low occupancy use in all Site soil/fill areas having PCBs in excess of 10 mg/kg (see Figure 9-3);
- potentially prohibit use in Site soil/fill areas having PCBs in excess of 100 mg/kg (see Figure 9-3 and additional discussion below);
- identify the areas where the total PCB concentration exceeds 50 mg/kg;

- identify acceptable Site uses;
- identify the locations and concentrations of COPCs in excess of their RSCOs; and
- require installation of a vapor barrier or vapor venting layer beneath all future buildings constructed at the Site.

After this deed notice is filed, the Site owner would submit a signed certification to the EPA Administrator stating that the deed notice has been filed. In addition, agreement would need to be obtained from the EPA to allow soil/fill having PCBs at concentrations in excess of 100 mg/kg to remain at the Site. If allowable, these areas would, at a minimum, be restricted to low-occupancy use.

The existing fence would be inspected and repaired, as needed, to prevent access to the Site. In addition, fencing would be installed around the southwestern portion of the South Yard soil/fill, which is currently not fenced in.

As discussed in Section 9.1.1.2, a SMP would also be implemented under this alternative as a Common Action.

The institutional controls portion of this task would commence immediately following Remedial Design approval. The engineering controls of this task would be conducted concurrently with installation of the surface cover.

9.2.2.1.2 Task No. 2: Site Mobilization and Preparation

Construction equipment would be mobilized to the Site. This equipment would be used to install the cover materials and the drainage system. Site preparation would be conducted in the form of clearing/weeding, removal of debris, removal of deteriorated asphalt and limited grading.

9.2.2.1.3 *Task No. 3: Installation of an Asphalt Cover*

With the exception of the East and West Warehouse, the Paint Shop and the Guard House, an asphalt cover would be installed over all of the North and South Yard soil/fill. Under this alternative, the East and West Warehouse, the Paint Shop and the Guard House would remain. As such, the existing concrete slabs in these buildings would serve as the surface cover for these North Yard soil/fill areas. Cleaning of these structures is discussed in Task No. 4.

During Site preparation any deteriorated existing asphalt would be removed. These areas and the unpaved areas would be covered with a 4-inch gravel sub-base and a 6-inch layer of asphalt. For areas overlying PCBs, these cover materials would be designed in accordance with 40 CFR Part 761.61(a)(7). In the areas that are currently covered and in good condition, a small layer of supplemental pavement would be installed so that there is a continuous surface in the Yard. The locations of these covers are identified in Figure 9-3. Design considerations would take into account the expected vehicular traffic and drainage modifications. Although a 4-inch gravel and 6-inch asphalt cover has been assumed in the cost estimate for the historic fill areas that are not PCB impacted, the surface cover over these areas may consist of 6-inches of gravel and 4-inches of asphalt. The final cover design for these areas will be determined in the remedial design.

Based on the assumption that 10,000 sf of paving could be installed per day, this task would take seven weeks to complete once begun. However, work would need to be conducted in warm weather between the months of April and October.

9.2.2.1.4 Task No. 4: Cleaning of the Existing Warehouse and Paint Shop Surface Covers

Four buildings are located to the south of the High Bay building. They are the East and West Warehouses, the Paint Shop and the Guard House. These buildings have been excluded from the interior building material remedial action alternatives discussed in Section 9.4 since the soil/fill remedial action alternatives would impact the fate of these structures. Under this alternative, these four buildings remain and their existing floors would serve as surface covers for the underlying soil/fill. Although the West Warehouse overlies water, its floor would also be maintained since demolition of this building and its floor slab could not be completed without a significant impact to the East Warehouse structure.

As discussed in Section 7.2.4, the remedial requirements for the interior building material are based upon their bulk and surface long-term occupancy criteria (LTOC) (i.e., 1 ug/100 cm2 for PCBs on porous surfaces, 4.3 ug/100 cm2 for lead of porous surfaces, 1 mg/kg for PCBs in bulk porous materials and 500 mg/kg for lead in bulk porous materials). Review of Figures 3-10 and 3-13 indicate that the Warehouse and Paint Shop have pre-clean PCB and lead concentrations above their LTOC. Consequently, these areas would have to be remediated. Pressure washing would be conducted to meet the LTOC. This work would be conducted concurrently with the selected remedy for the interior building materials. Additional detail regarding the methodology for pressure washing of interior building material and the selection of pressure washing as the remedial technology for PCB and lead concentrations similar to those observed in the Warehouses and Paint Shop is presented in Section 9.4. In the absence of data for the Guard House, pressure washing would also be assumed for this structure.

9.2.2.1.5 *Task No. 5: Ambient Air Monitoring*

During all construction activities, an ambient air monitoring program would be implemented to measure the concentration of particulates in ambient air in the work zone and at the perimeter of the Site. A Perimeter Air Monitoring Plan (PAMP) that specifies the components of this program would be developed in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP) contained in Appendix 1A of the Draft DER-10 (NYSDEC, 2002).

Dust control measures, such as water or foam sprays, would be implemented, if necessary. However, since Alternative E2 is a cover activity, soil disturbance is not expected to be substantial. The degree to which these measures would be used would depend on particulate levels in ambient air, at the perimeter of the Site, and in work areas as determined through the PAMP. Given the limited extent of soil disturbance under this alternative, the NYSDOH CAMP would likely be adopted as the PAMP.

9.2.2.1.6 *Task No. 6: Maintenance of the Surface Cover*

An OM&M Plan would be prepared for the surface cover. As part of this plan, the asphalt and concrete covers would be inspected on an annual basis. For the purpose of preparing a comparative cost estimate for this alternative, these annual inspections were considered for a period of thirty years to monitor the effects of weathering, traffic, and aging, and to ensure that the integrity of the cover is maintained. If the surface cover begins to degrade or crack, repairs would be made to these areas in accordance with the OM&M Plan. The OM&M Plan would also include provisions for maintaining the access/use restrictions implemented under this alternative. For cost estimation purposes it has been assumed that the entire surface cover would require repair over a 30-year period.

9.2.2.2 *Evaluation*

9.2.2.2.1 Overall Protection of Human Health and the Environment

Alternative E2 would provide adequate protection of human health and the environment for the considered media (i.e., Site soil/fill and ground water). As discussed in Section 7.2.1.1, exposed Site soil/fill poses carcinogenic risks greater than $1x10^{-6}$ and noncarcinogenic hazard indices greater than one for current and future Site occupants and construction workers. In addition, the soil/fill beneath the existing surface covers would also pose these risks if covers were not maintained. Since Alternative E2 would entail: 1) installation of surface covers over exposed soil/fill; 2) upgrade of the existing Site soil/fill surface covers; 3) on-going OM&M of these covers; and 4) implementation of protective measures via Common Action C2 for construction workers, this alternative would eliminate the direct contact exposure pathway for soil/fill, address this soil/fill RAO, and would be protective of human health and the environment.

In addition, Common Action C4 (bulkhead restoration beneath Site buildings and maintenance) would prevent migration of soil/fill that would result in surface water impacts, thus satisfying another soil/fill RAO. Through implementation of Common Action C1, Site ground water would be monitored to ensure that future ground water concentrations continue not to pose any unacceptable inhalation and direct contact risks. In addition, Common Action C2 would also address direct contact with ground water risks. Therefore, this alternative would address the two ground water RAOs.

9.2.2.2.2 Compliance with SCGs

A summary of the applicable SCGs that apply to this alternative is presented in Table 9-5. As shown in this table, Alternative E2 would comply with the location specific soil/fill SCGs, but would not comply with all of the chemical and action specific SCGs. Following is a summary of the major SCGs that this alternative would and would not address:

Alternative E2 would:

- address the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to the public health;
- address the RSCOs provided in TAGM 4046 for non-historic fill parameters (i.e., PCBs and VOCs) or historic fill parameters (i.e., inorganic constituents and SVOCs) through installation of a surface cover;
- at some locations, comply with the TSCA low occupancy upper limit permissible concentration (i.e., 100 mg/kg) for surface covers overlying PCB remediation waste soil/fill that is accessible less than 335 hours annually or an average of 6.7 hours per week;
- meet the PCB LTOC for interior building material surfaces (i.e., the NYSDEC goal of 1µg /100cm^2) in the warehouses, paint shop and guard house (NYSDEC, 2003a) – see Section 9.4 for evaluation of this TBC in other interior building materials;
- meet the lead LTOC for interior building material surfaces (i.e., the NYSDEC goal of 4.3µg /100cm^2) in the warehouses, paint shop and guard house (NYSDEC, 2003a and 40 CFR Part 745) – see Section 9.4 for evaluation of this relevant and appropriate SCG in other interior building materials; and
- comply with applicable chemical specific SCGs that relate to protection of surface water bodies through bulkhead restoration and subsequent maintenance (Common Action C4).

Alternative E2 would not:

- address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law; and
- address the 6 NYCRR Part 375 requirement to remove consequential amounts of hazardous waste;
- at some locations, comply with the TSCA high occupancy upper limit (i.e., 10 mg/kg) for PCB remediation waste soil/fill that is accessible greater than 335 hours annually or an average of 6.7 hours per week; and

- at all locations, comply with the TSCA low occupancy upper limit permissible concentration (i.e., 100 mg/kg) for surface covers overlying PCB remediation waste soil/fill that is accessible less than 335 hours annually or an average of 6.7 hours per week.

9.2.2.2.3 *Long Term Effectiveness and Permanence*

With the implementation of a SMP and the access/use restrictions, this alternative could provide long-term effectiveness and permanence. However, its reliability is contingent on consistent maintenance of the surface cover. As discussed above and shown in Figure 9-3, certain areas of the Site would be restricted to low occupancy and certain portions of the Site may not be usable. These areas identified in Figure 9-3 may require high occupancy clearance in the future. As such, this alternative would require that potential high-occupancy areas to be restricted to low-occupancy use.

9.2.2.2.4 *Reduction of Toxicity, Mobility or Volume*

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility and volume of NYS listed hazardous waste and COPCs. As previously discussed, NYS B007 listed PCB hazardous waste is present in the North Yard and Below Building soil/fill.

This alternative would reduce the mobility of the NYS listed hazardous wastes and COPCs, to some degree, through installation of new covers and maintenance of the new and existing surface covers and through the bulkhead restoration in Common Action C4.

Alternative E2 would not be effective in reducing the toxicity or volume of NYS listed hazardous waste or COPCs. In the absence of any treatment, the toxicity and volume of the NYS listed hazardous waste and COPCs in soil/fill would remain the same. Due to the relative stability of PCBs and inorganic constituents in Site soil/fill, reduction in toxicity or volume due to natural degradation is not expected for these chemicals. Some limited degradation of VOCs and SVOCs in soil/fill would be expected; however, not a significant extent. Based on the observed low solubility and low mobility of the PCBs, inorganic constituents and SVOCs in Site soil/fill, these chemicals are expected to remain in the soil matrix.

9.2.2.2.5 *Short-Term Effectiveness*

Installation of a surface cover would be completed in less than six months. Normal construction safety measures would be utilized during paving activities. A PAMP would be implemented during paving activities and efforts would be taken to minimize disturbance to Site soil/fill. If particulate concentrations exceed action plans identified in the PAMP, control of particulate emissions (dust) through the use of dust control measures, such as water or foam sprays, would be evaluated. These measures would effectively minimize the short-term effects posed by this alternative. Planning for Common Actions C1 and C2 would begin immediately following approval of the Remedial Design and implemented on an on-going basis. Both of these Common Actions would have minimal short-term impacts. Common Action C4 would take approximately four (4) months to complete. Short-term impacts would be posed to construction workers during bulkhead installation; these would be managed via a construction worker HASP. Short-term impacts would also be posed to the sediment during these construction activities. In addition, work would need to proceed in a manner to protect the integrity of the Site buildings.

9.2.2.2.6 *Implementability*

Under this alternative, all Site soil/fill, would need to be restricted to low use and approval would have to be obtained from the EPA to allow soil/fill containing PCBs at concentrations above 100 mg/kg to remain at the Site (40 CFR Part 761.61). Under this alternative, PCBs would remain in North Yard and Below Building soil/fill in excess of 100 mg/kg and up to a maximum concentration of 97,600 mg/kg. As discussed in Section 4.2.1, the depth of potential construction worker access to Site soil/fill would likely be limited to the upper 8 feet. The majority of the PCB mass is in the upper 8 feet of soil and a number of locations within this interval contain PCBs at concentrations in excess of 100 mg/kg. EPA approval, under TSCA, to allow these concentrations to remain is questionable. In addition, as discussed above and shown in Figure 9-3, a significant portion of the North Yard would need to be restricted to low occupancy use. This would significantly restrict future options for Site use.

Common Actions C1 and C2 would be readily implementable. Restoration of the bulkhead (Common Action C4) would be difficult in certain areas. The current location of the bulkhead line beneath Building Nos. 4 and 12 is readily accessible by boat The existing bulkhead line beneath the High Bay building is located farther back beneath the dock and is less accessible to boat access. Finally, the existing bulkhead line beneath Building Nos. 7 and 9 is well beneath the Site buildings and is not accessible by boat. Under Alternatives I2, I3 and I4, the concrete slab for Building Nos. 7 and 7A would be removed. This would allow some access for restoration of the Building No. 7 and 9 bulkheads.

Although the installation of an asphalt cover is readily implementable and most of the Common Actions are readily implementable, use of an asphalt cover for soil/fill containing PCBs at concentrations well above 100 mg/kg may present regulatory approval concerns that would affect the overall implementability of the alternative.

9.2.2.2.7 Cost

The capital cost of this alternative is estimated to be $3,331,448. The net present value of the OM&M cost of this alternative is estimated to be $867,745. The components of capital and OM&M costs are provided in Table P-1 of Appendix P. The total net present value of Alternative E2 is estimated to be $4,199,194. These costs include Common Actions C1, C2, C4 and C8.

9.2.3 ALTERNATIVE E3: EXCAVATION AND OFF-SITE DISPOSAL WITH SURFACE COVER

9.2.3.1 Description

As discussed in Section 7.2.1.3, North Yard, South Yard and Below Building soil/fill contains one or more of the following chemical categories: VOCs, SVOCs, PCBs and/or inorganic constituents. As discussed in Section 2.6.1, data presented for the nearby Brownfields site in Appendix F indicated that elevated concentrations of SVOCs and inorganic constituents are contained in historic fill. Although observed in low concentrations in the Brownfields site data, neither PCBs nor VOCs are indigenous to historic fill. Under this remedial action alternative, E3: Excavation and Off-Site Disposal with Surface Cover, the PCB and VOC-impacted soil/fill discussed below would be excavated and transported off-Site for disposal. The remaining North Yard, South Yard and Below Building historic fill areas that have not been impacted by non-historic fill components (i.e., PCBs and VOCs) would be covered to prevent direct contact with the residual chemical concentrations in these areas above RSCOs.

The extent of PCB and VOC-impacted North Yard soil/fill is presented in Figures 7-1 through 7-5. As discussed in Section 7.2.1 and shown in these figures, North Yard PCB and VOC-impacted soil/fill extends to a maximum depth of 20 feet bgs. Excavation depths, in four-foot intervals, were evaluated in this alternative for the PCB and VOC-impacted North Yard soil/fill. Five North Yard excavation options were evaluated. They are identified as: E3: 0-4 feet, E3: 0-8 feet, E3: 0-12 feet, E3: 0-16 feet and E3: 0-20 feet. The depth range noted indicates the total depth of soil/fill removal below the top of ground surface. The depth of excavation includes any overlying concrete or asphalt cover materials; thus, in areas currently covered with asphalt and/or concrete, less than four feet of soil/fill would be removed in the upper four foot interval. The area of impacted fill within each four foot segment varies and decreases in size with depth. The area of impacted soil fill at the maximum depth of 20 feet bgs occupies the smallest area.

In addition to the removal of each incremental interval of North Yard soil/fill, PCB and VOC-impacted South Yard surface soil/fill identified in Figure 7-6 and Below Building soil/fill identified in Figures 7-7 and 7-8 would be removed in each of the excavation options under this alternative. As discussed above, there is an isolated exceedance of the subsurface soil PCB RSCO in the South Yard along the shoreline at SB-78 at20 feet below grade. Because the average concentrations of total PCBs in the South Yard soil at this depth is below the PCB RSCO (i.e., 10 mg/kg) this location does not pose a high potential for direct contact or leaching to ground water exposure and removal of soil from this isolated location would require considerable engineering controls (i.e., sheeting, dewatering) due to its depth and its proximity to the river. Therefore, removal of this isolated area is not included in this alternative.

The total approximate areal extent of PCB and VOC-impacted soil/fill subject to excavation under this alternative is: 55,606 sf in the North Yard, 32,735 in the South Yard and 6,907 sf in the Below Building area. Excavated areas would be backfilled and restored with either soil, asphalt or concrete covers depending upon their location.

Exposed soil/fill areas that are not excavated would be covered with an asphalt cover. Existing covers over remaining historic fill that are currently in good condition would remain, and those that are not in good condition would be removed and replaced. All surface covers would be maintained and access and use restrictions would limit and specify procedures for conducting intrusive work in these areas. These procedures would be included in the SMP and in the deed notice.

The volume of PCB and VOC COPC-impacted North Yard and South Yard soil/fill that would be excavated under the five excavation options are shown in the following table. These soil volumes exclude the volume of overlying asphalt and concrete.

Excavation Scenario	North Yard and South Yard Soil/Fill Volume (cy)
E3: 0-4 feet	9,577
E3: 0-8 feet	14,609
E3: 0-12 feet	17,677
E3: 0-16 feet	19,786
E3: 0-20 feet	20,397

In addition, 1,526 cy of Below Building soil/fill would be removed in each excavation scenario.

As discussed further below in the evaluation criteria, as the excavation depth increases the alternatives need to account for one or more of the following: increased dewatering; increased construction fluid treatment and discharge needs; potential upheaval of underlying geologic units; and increased sheeting requirements. Benefits of increased depth of excavation include: increased reduction of toxicity, mobility and volume; and reduction in the impact that residual COPCs pose as a threat to human health and the environment.

Alternative E3 outlines the engineering approach for the removal of PCB and VOC-impacted Site soil/fill. Alternative E3 includes the following remedial tasks and would incorporate the following Common Actions associated with soil/fill discussed in Section 9.1:

- Conduct Pre-Design Studies (Task No. 1)
- Site Preparation and Mobilization (Task No. 2)
- Warehouse, Guard House and Paint Shop Demolition (Task No. 3)
- Installation of Sheeting (Task No. 4)
- Dewatering, Construction Liquids Treatment and Discharge (Task No. 5)
- Excavation of PCB and VOC-Impacted North Yard Soil/Fill (Task No. 6)
- Excavation of PCB and VOC-Impacted South Yard Surface Soil and Below Building Soil/Fill (Task No. 7)
- Ambient Air Monitoring for Particulates (Task No. 8)
- Transportation and Off-Site Disposal (Task No. 9)
- Backfill of Excavated Areas (Task No. 10)
- Installation of a Cover (Task No. 11)
- Site Restoration (Task No. 12)
- Access and Use Restrictions (Task No. 13)
- Cover Inspections and Maintenance (Task No. 14)
- Ground Water Monitoring (Common Action C1)
- Preparation and Implementation of a SMP (Common Action C2)
- Bulkhead Restoration Beneath Site Buildings (Common Action C4)

The remedial tasks may differ slightly for each excavation depth. Similarly, the time frame for completion of the main components of this alternative would vary upon the excavation depth. It is estimated that the time required to complete the various excavation scenarios of Alternative E3 would range from two to three years following NYSDEC approval of the Remedial Design for this Site. Ground water monitoring, access and use restrictions, and annual OM&M activities would continue beyond the three and a half year time frame.

Descriptions of the common actions considered for this alternative (i.e., Common Actions C1, C2 and C4) were provided in Sections 9.1.1.1, 9.1.1.2 and 9.1.1.4, respectively. Evaluation of these common actions is included along with the other tasks of this alternative.

9.2.3.1.1 Task No. 1: Conduct Pre-Design Studies

Prior to the Remedial Design, a geotechnical study would be conducted to evaluate Site-specific excavation constraints. According to studies conducted for the Harbor at Hastings site (Shaw, 2002), excavation at depths greater than 12 feet at that site would result in upheaval of the underlying Basal Sand geologic layer. According to their study, upheaval and a resulting disturbance in the stability of this filled area would be caused by an insufficient remaining thickness of silt above the Basal Sand Unit following removal of greater than 12 feet of overlying material. The Harbor at Hastings site is located approximately two miles to the north of the BICC Site along the Hudson River and was also constructed on land created with historic fill. Therefore, conditions limiting the feasibility of excavation at that site may also apply to the BICC Site. Since soil borings were only advanced to the silt layer during the Site RI, sufficient information is not available to evaluate the Site-specific vertical lithology and geotechnical parameters for deep excavation. Additional discussion regarding excavation is provided in Section 9.2.3.1.5.

As further discussed in Section 9.2.3.1.3, installation of water tight sheeting has been assumed in the FS to allow soil excavation and to prevent ground water infiltration into the excavation cells. Based on the construction of the

High Bay Building (i.e., piling construction into bedrock), the FS has assumed that shoring would not be needed alongside the High Bay Building for deep excavation scenarios. The geotechnical study would refine the excavation control requirements (e.g., sheeting) for the selected excavation depth, confirm that shoring is not needed during soil/fill excavation and further evaluate the dewatering requirements associated with the selected excavation scenario. Additional discussion regarding sheeting and dewatering is presented in Sections 9.2.3.1.3 and 9.2.3.1.4.

As discussed in Section 9.2.3.1.5, a portion of the soil/fill, upon excavation, would be classified as a RCRA characteristic hazardous waste for lead (i.e., D008). During pre-design, an analysis would be performed to evaluate the benefit of on-Site stabilization, prior to off-Site transport and disposal. This analysis would also evaluate compliance with the universal treatment standards (UTS) for underlying constituents of this characteristic hazardous waste. For the purpose of the FS, on-Site stabilization of lead to eliminate the hazardous characteristic prior to off-Site transport and disposal is considered as part of this alternative.

As discussed in Section 8.1.1.6, ex-situ treatment of the excavated soil/fill was eliminated as a potential technology. However, since new technologies continue to emerge, the possibility of ex-situ treatment of excavated soil/fill may be evaluated during the Remedial Design.

Pre-design studies would take approximately six months to complete.

9.2.3.1.2 Task No. 2: Site Preparation and Mobilization

Site preparation and mobilization would include: relocation of existing utilities; provision of temporary facilities and utilities, as needed; mobilization of equipment to the Site; set up of staging, stockpiling and stabilization areas; set up of the decontamination area; and construction of a waste transfer station. During Site Preparation, the sewer main that traverses the area of soil/fill removal would be relocated outside the excavation area. Existing fencing that may impede Site access in its current position would be removed and fencing to prevent unauthorized access would be installed and properly sited.

The Site preparation and mobilization task would take approximately four (4) to five (5) months to complete.

9.2.3.1.3 Task No. 3: Warehouse, Guard House and Paint Shop Demolition

During Site preparation, the East and West Warehouses, Guardhouse and Paint Shop would be demolished. The Warehouses would be demolished to access PCB and VOC-impacted soil/fill underlying the East Warehouse. Under this alternative, the Guardhouse and the Paint Shop would be removed to provide areas for easements, access to Site buildings for excavation equipment and storage during the remedial action and to eliminate the need for costly underpinning. This task would be concurrently with Site preparation.

9.2.3.1.4 Task No. 4: Installation of Sheeting

The average depth to ground water in the area to be excavated is approximately four (4) feet bgs. However, a minimum depth to ground water of 2.3 feet was observed in the area to be excavated. Dewatering and slope stabilization controls would therefore be needed for all excavation scenarios. For cost estimation purposes, it has been assumed that geotechnical measures would be employed for all excavation alternatives to allow excavation immediately adjacent to the river (where needed), allow deeper excavation and prevent migration of ground water and river water into the excavated areas. For FS cost estimation purposes, it has been assumed that water-tight interlocking sheeting would be installed. Alternative\supplemental excavation control technologies, such as slurry walls with stepped back excavation and possibly ground freezing, would be evaluated during the Remedial Design.

As discussed in Task No. 1, it has been assumed that shoring would not be needed alongside the High Bay building for deep excavation scenarios. This would be confirmed during the Remedial Design. In addition, the excavation engineering approach would be further developed during the pre-design phase. This pre-design geotechnical evaluation would rely on additional information collected during the pre-design studies to determine excavation depth feasibility and the use of alternative/supplemental excavation controls.

The extent of North Yard soil/fill removal for the various depth intervals is shown on Figures 7-1 through 7-5. Excavation of the surface soil in the South Yard (i.e., upper 2 feet) would not require sheeting. However, since a large portion of the surface soil to be removed is in close proximity to the river, some ground water management may be needed during these excavation activities.

The outer limit of North Yard subsurface soil/fill excavation that would require sheeting corresponds with the outer limit of impacted North Yard soil/fill in the 4 to 8 foot interval provided in Figure 7-2. During the remedial action sheeting may be installed in smaller sub-excavation areas within the overall footprint rather than around the entire excavation perimeter. As discussed above, the final selection of the excavation control technique would be made during Remedial Design.

The duration of sheeting installation would depend upon whether the entire area is sheeted or smaller areas are sheeted along with excavation.

9.2.3.1.5 Task No. 5: Dewatering, Construction Liquids Treatment and Discharge

Dewatering would be required for all excavations that extend below the water table. As discussed above, the minimum depth to ground water in the excavation area is 2.3 feet bgs. Consequently, dewatering has been evaluated for all excavation scenarios.

Dewatering wells would extend to the excavation depth selected and would be installed, removed and reinstalled progressively along with the excavation sequence. The volume of ground water contained in the pore space under the various soil excavation options is based upon the following assumptions:

Effective Porosity = 25%

Saturated Thickness = Excavation depth – 2.3 ft (i.e. minimum depth to ground water in the excavation area)

Volume = Saturated Thickness x Excavation Area x Porosity (25%) x 7.48 gal/cf

Excavation Scenario (ft)	Saturated Thickness (ft)	Volume of Ground Water Contained in Pore Space (gal)
E3: 0-4 feet	1.7	107,987
E3: 0-8 feet	5.7	362,076
E3: 0-12 feet	9.7	728,535
E3: 0-16 feet	13.7	1,028,962
E3: 0-20 feet	17.7	1,329,388

In addition, upward ground water seepage would contribute additional water that would need to be extracted. The upward ground water seepage volume, as well as the seepage volumes through the sheeting and its contribution to the above pore water would be confirmed during the Pre-Design studies.

The three potential options for discharge of extracted ground water (i.e., construction liquids) are: discharge to the Yonkers Publicly Owned Treatment Works (POTW), discharge to the Hudson River under a State Pollution Discharge Elimination System (SPDES) permit and recharge to ground water. Because of the shallow depth of ground water at the Site, recharge to ground water outside of the excavation area would not be possible. The Yonkers POTW would accept a maximum of 25,000 gallons of construction liquids per day. Based on the estimated dewatering volumes, a significant amount of storage would be needed to allow gradual discharge to the POTW over time. If discharge to the POTW is not feasible and/or permitted, a SPDES permit would have to be obtained to allow discharge of treated construction liquids to the Hudson River. For FS cost estimation purposes, discharge of treated excavation fluids to the Hudson River under a SPDES permit has been assumed.

NAPL that is currently present in residual saturation in the soil/fill and is entrained in soil/fill materials may potentially be removed along with water during dewatering activities. Consequently, treatment of the construction liquids would consist of free phase NAPL separation using an oil/water separator, along with suspended solids sedimentation and removal, and liquid carbon media filtering to remove organics. Construction liquids would be treated to meet the appropriate limits.

The dewatering system and treatment system associated with this task would take one (1) month to install. Installation could be conducted concurrently with mobilization and Site preparation. Dewatering and treatment of construction liquids would be conducted on an on-going basis during excavation activities.

9.2.3.1.6 *Task No. 6: Excavation of PCB and VOC-Impacted North Yard Soil/Fill*

Prior to excavation, any overlying asphalt and/or concrete would be removed. The following PCB and VOC COPC-impacted North Yard soil/fill volumes would be excavated under the various excavation scenarios.

Excavation Scenario	North Yard Soil/Fill Volume (surface and subsurface soil) (cy)
E3: 0-4 feet	7,254
E3: 0-8 feet	12,287
E3: 0-12 feet	15,353
E3: 0-16 feet	17,463
E3: 0-20 feet	18,074

The impacted surface soil, which is reflected in the above soil volumes, would be removed to a depth of two feet. In areas where deeper excavation is not needed, the excavated surface soil areas would then be backfilled with approved fill. Areas undergoing subsequent excavation would not be backfilled until all underlying subsurface soil excavation was completed. All excavated surface soil would be stockpiled, characterized and transported off-Site for disposal. Additional discussion regarding these items are provided below.

Excavation of remaining subsurface soil/fill would then proceed in a staged approach. Soil/fill would be stockpiled in roll-offs located on the southern portion of the Site. The stockpiled soil/fill would be sampled for waste disposal characterization. Debris and operational waste (e.g., cables, wire, rubber, lead jackets) would be separated out for bulk disposal.

Excavated soil/fill that is deemed a characteristic hazardous waste for lead upon excavation (i.e., TCLP results above 5 mg/l) may be stabilized on-Site prior to off-Site disposal. Based on the RI results and the assumption that soil/fill containing total lead at concentrations in excess of 15,000 mg/kg would likely exhibit the RCRA hazardous characteristic for lead, approximately 512 cy of RCRA characteristic waste for lead is located in the 0-4 foot interval and an additional 1,640 cy of RCRA characteristic hazardous waste for lead is located in the 4-8 foot interval. Based on the RI data, there is no additional RCRA characteristic hazardous waste for lead in the underlying intervals. For cost estimation purposes, it was assumed that the volume of soil/fill stabilized would increase by approximately 20% through the addition of the stabilization agent.

As shown in Figures 7-1 through 7-3, at sample location SB-61, VOC-impacted soil is located in the 8 to 12 foot interval and the overlying 0 to 8 foot soil/fill has not been impacted by VOCs. Under the E3: 0-12 feet, E3: 0-0-16 feet and E3: 0-20 feet alternatives, the overlying non-PCB and non-VOC impacted soil/fill would be removed to access this VOC-impacted soil/fill. This overlying material would then be stockpiled for reuse as backfill. All other VOC-impacted North Yard soil/fill is located with the PCB-impacted soil/fill footprint.

The total soil/fill excavation volumes for each scenario, and the estimated time frame for excavation would be as follows (based on an excavation rate of 100 cy per day):

Excavation Scenario	Soil/Fill Volume* (cy)	Time to Excavate** (months)	Time to Load and Transport Off-Site (months)	Time to Backfill (months)	Total Time (months)
E3: 0-4 feet	7,254	5	1	1	7
E3: 0-8 feet	12,287	7	1.5	1.5	10
E3: 0-12 feet	17,100	10	2	2	14
E3: 0-16 feet	19,210	12	2.5	2.5	17
E3: 0-20 feet	19,821	13	3	3	19

* includes volume of overlying asphalt and concrete
**time includes stabilization (where needed) and excludes dewatering preparation and sheeting installation

Once stockpiled and characterized, soil/fill requiring stabilization would be treated. Both the non-stabilized and stabilized soil/fill would be loaded into dump trucks for off-Site disposal. The loading and transport times assume a truck capacity of 25 cy (i.e., less than 40 tons per truck based on an assumed unit weight of 1.23 tons per cy) and an average of 20 trucks per day would leave the facility. The same rate has been assumed for backfilling. Based upon these assumed rates, the total time for excavation and backfilling is summarized above.

Post- excavation samples would be collected at a frequency of one sample every 100 feet of the excavation perimeter and 1 sample per 10,000 sf of the bottom excavation. The post-excavation samples would be submitted for analysis for PCBs using Method 8082 analysis and for TCL VOCs using USEPA SW-846 Method 8260B.

9.2.3.1.7 Task No. 7: Excavation of PCB and VOC-Impacted South Yard Surface Soil and Below Building Soil/Fill

Under this alternative, all PCB and VOC-impacted South Yard surface soil/fill and Below Building soil/fill shown on Figures 7-6, 7-7 and 7-8 would be excavated and transported off-Site for disposal.

South Yard surface soil excavation would be conducted to a depth of 2 feet bgs. Because of the shallow depth of surface soil removal, waste disposal characterization would be conducted prior to excavation and transferred directly into dump trucks for off-Site transportation, without stockpiling. The volume of South Yard surface soil/fill to be removed would be approximately 2,323 cy. Based upon the RI sampling, none of the South Yard surface soil/fill would be characterized as a RCRA characteristic hazardous waste for lead. The excavated surface soil/fill would be backfilled with 14 inches of approved fill, and 4 inches of gravel to form a base for a 6-inch asphalt cover. This would return the excavated areas to their original elevation.

Based upon an average of twenty 25-cy trucks per day leaving the facility, and placement of 200 cy of approved fill per day, it would take approximately two weeks to complete this portion of Task 6.

In addition to soil excavation in the South Yard, this task would also include excavation of PCB and VOC-impacted Below Building soil/fill. The locations of this soil removal are presented in Figures 7-7 and 7-8. The volume of Below Building soil/fill to be removed would be approximately 1,536 cy. Based upon the RI sampling, it is estimated that approximately 414 cy of excavated Below Building soil/fill would be characterized as a RCRA characteristic hazardous waste for lead.

The method of Below Building soil/fill removal would be dependent upon the building interior remedy selected. If Alternative I1: No Action (see Section 9.4.1), Alternative I2: Encapsulation (see Section 9.4.2) or Alternative I3: Building Interior Remediation (see Section 9.4.3) is selected, the concrete floor slab over the impacted soil/fill would be removed and excavation equipment would be brought into the Site buildings to remove the soil/fill. Alternatively, if Alternative I4: Building Demolition (see Section 9.4.4) is selected, the soil/fill excavation would be conducted following building demolition and removal of the concrete floor slab. Under any interior building remedial alternative, following excavation, the area would be backfilled and the overlying cover restored. Restoration of the cover is included in the remedial action alternatives discussed in Section 9.4. The excavated soil/fill would be stockpiled and sampled for disposal characterization prior to off-Site transportation. This portion of the task would take approximately two months to complete. Excavation for the Below Building soil/fill from within the Site buildings (Alternatives I1, I2, and I3) would require special excavation equipment and additional soil handling and stockpiling. For Alternative E3 cost estimation purposes, it has been assumed that excavation of Below Building soil/fill would proceed with the Site buildings still in place. Costs would decrease somewhat if the Site buildings were demolished.

Post- excavation samples would be collected at a frequency of one sample every 100 feet of the excavation perimeter and 1 sample per 10,000 sf of excavation bottom. The post-excavation samples would be submitted for analysis for PCBs using Method 8082 analysis and for TCL VOCs using USEPA SW-846 Method 8260B.

9.2.3.1.8 Task No. 8: Ambient Air Monitoring

During soil excavation an ambient air monitoring program would be implemented to measure the concentration of particulates and VOCs in ambient air in the work zone and at the perimeter of the Site. Real-time VOC concentrations in ambient air would be measured using a photoionization detector (PID).

Realtime PCB and lead concentrations in ambient air would be estimated using particulate concentrations correlated to PCB and lead concentrations.

In addition, at the request of the Agencies, the FS includes performance of PCB air monitoring using polyurethane foam (PUF) samplers or equivalent. This methodology would not yield realtime results but will rather serve as a laboratory confirmation of the realtime estimates. The feasibility and need for PUF sampling, as well as the frequency needed to correlate realtime measurements, would be confirmed during the Remedial Design.

A PAMP that specifies the components of this program would be developed in accordance with the NYSDOH Generic Community Air Monitoring Plan contained in Appendix 1A of the Draft DER-10 (NYSDEC, 2002). During preparation of this plan, a worst case air quality impact analysis would be prepared to estimate the potential impacts from fugitive dusts arising from soil/fill disturbance so that mitigative measures can be evaluated.

During excavation, dust control measures such as water or foam sprays, or limiting areas of soil to be disturbed at any one time would be used at the Site if perimeter action levels established in the PAMP are exceeded. The degree to which these measures would be used would depend on particulate levels in ambient air at the perimeter of the Site as determined through the implementation of the PAMP.

In addition, a HASP would be prepared for Site work. The HASP would include air monitoring for particulates in the work and exclusion zones. This plan would identify the level of PPE required for Site work, action levels for the work and exclusion zones, and PPE upgrades and engineering controls that correspond to action level exceedances.

This task would be conducted during all excavation activities.

9.2.3.1.9 Task No. 9: Transportation and Off-Site Disposal

Under this task, the remediation-derived waste would be transported and disposed off-Site. Remediation derived waste would include:

- Excavated soil/fill classified as:
  - Non-hazardous waste
  - TSCA regulated/NYS B007 PCB listed hazardous waste
- Overlying asphalt and concrete classified as construction and demolition (C&D) debris
- Spent carbon and filters from construction liquid treatment

Characterization and segregation of excavated materials would be conducted as described in Section 9.2.3.1.5. Non-hazardous soil/fill would be transported to and disposed at an off-Site Subtitle D, non-hazardous waste landfill. TSCA regulated waste would be sent to a TSCA-permitted facility, and likewise, C&D debris would be sent to a facility permitted under 6 NYCRR Part 360-7. The spent carbon and filters used for treating the construction liquids would be characterized and sent to an appropriate disposal facility. For cost estimation purposes, it has been assumed that these materials would be RCRA non-hazardous waste.

To determine the weight of the materials to be disposed, the following densities were assumed: an average bulk density of 1.23 tons/cy for soil/fill as determined during the RI (see Table 2-13); and an average bulk density of 1.5 tons/cy for asphalt and concrete.

Based on these assumptions, the following waste volumes from North and South Yard areas would be transported off-Site for disposal:

Excavation Scenario	Overlying Asphalt & Concrete (cy)	Non-Hazardous Waste Soil/Fill (cy)	TSCA-Regulated Waste/B007 Listed Hazardous Waste (i.e. PCBs > 50 mg/kg) (cy)	Number of Disposal Samples (1)
E3: 0-4 feet	1160	4,825	4,752	15
E3: 0-8 feet	1160	6,040	8,569	24
E3: 0-12 feet	1235	6,958	10,719	31
E3: 0-16 feet	1235	6,958	12,828	35
E3: 0-20 feet	1235	6,958	13,439	36

(1) Account for a 10% increase in volume of excavated materials due to bulking

In addition, there would be a total of 1,033 cy of non-hazardous waste and 576 cy of TSCA-regulated and NYS B007 listed PCB hazardous waste from the Below Building soil excavations. These totals include volume increases attributable to the addition of stabilization agents.

For cost estimation purposes, it was assumed that one (1) waste characterization sample would be collected every 750 cy of excavated soil/fill.

9.2.3.1.10 Task No. 10: Backfill of Excavated Areas

Following soil/fill removal, the Site would be restored to its present grade. The excavation areas would be backfilled with approved fill from off-Site sources. Backfill would be defined, at a minimum, as soil containing chemicals at concentrations below the TAGM 4046 RSCOs. In accordance with Draft DER-10, the source of fill material would be approved by the NYSDEC Division of Environmental Remediation (DER) in advance, and bills of lading would be available for NYSDEC review (NYSDEC, 2002). Excavation and backfilling would be sequenced and performed concurrently. If Remedial Alternative I4: Building Demolition is selected, use of C&D debris (e.g., concrete) from Site building demolition may be considered as a potential backfill material.

9.2.3.1.11 *Task No. 11: Installation of a Cover*

Under this task, an asphalt cover would be installed over the remaining North Yard and South Yard soil/fill that has not been excavated based on the selected excavation depth and to provide a cover for the historic fill (see Figure 9-4). The cover would consist of a six-inch gravel base and four-inch asphalt cover. The asphalt cover would prevent direct contact with the remaining historic fill. For excavation scenarios that leave PCB and VOC COPC-impacted soil/fill (i.e. all scenarios except E3: 0-20 feet), overlying clean backfill provides a surface cover for these residual materials. Although a 4-inch gravel and 6-inch asphalt cover has been assumed in the cost estimate for the historic fill areas that are not PCB impacted, the surface cover over these areas may consist of 6-inches of gravel and 4-inches of asphalt. The final cover design for these areas will be determined in the remedial design.

Historic fill is present beneath the Site buildings. Under the interior building material remedial action alternatives evaluated in Section 9.4, portions of the concrete slab would be removed to facilitate soil removal, as identified in Figures 7-7 and 7-8. The concrete slabs in these areas would be replaced with concrete or asphalt as part of the interior building material remedial action alternatives.

Installation of an asphalt cover over portions of the North and South Yard would take approximately one month to complete. The time to complete the surface covers for the below building soil/fill are discussed in the Section 9.4 alternatives.

9.2.3.2.12 Task No. 12: Site Restoration

After the Site soil/fill has been excavated and backfilled, the Site would be restored. This would include removal of dewatering equipment, temporary services, and surplus fencing. This task would take two months to complete.

9.2.3.1.13 Task No. 13: Access and Use Restrictions

Institutional controls would be recorded with the deed to document the presence of chemicals in Site soil/fill that exceed the TAGM 4046 RSCOs. Under this alternative, historic fill containing chemicals at concentrations in excess of the RSCOs would remain in the South Yard, North Yard and Below Buildings. Depending upon the depth of excavation conducted, operationally impacted historic fill would also remain at depth at the Site. Based on the existing RI dataset, there is sufficient information available to make this determination. As discussed above, soil/fill that exceeds the RSCOs would be covered. Use restrictions that require conformance with the SMP (a Common Action) would be implemented for any future intrusive work in the remaining historic fill areas. The SMP would specify the manner in which intrusive work can be done.

Finally, a covenant would be placed on the deed regarding future Site use. This deed restriction would require installation of a vapor barrier or vapor venting layer beneath all future buildings constructed at the Site.

9.2.3.1.14 Task No. 14: Cover Inspection and Maintenance

The asphalt cover overlying the North and South Yard historic fill and the asphalt/concrete cover overlying the Below Building soil/fill would be inspected on an annual basis. For the purpose of preparing a comparative cost estimate for this alternative, these annual inspections were considered for a period of thirty years to monitor the effects of weathering and aging and to ensure that the integrity of the cover is maintained. If any of the cover material begins to degrade or crack, repairs would be made to areas where needed. Provisions for cover inspection and maintenance would be included in a OM&M Plan.

9.2.3.2 *Evaluation*

9.2.3.2.1 *Overall Protection of Human Health and the Environment*

Protection of human health and the environment can be measured by the alternative's ability to address the RAOs. The Site RAOs for soil/fill and ground water were presented in Sections 7.2.1.2 and 7.2.2.2, respectively. This alternative would meet all of the RAOs for soil/fill and ground water. Exposure to soil/fill and ground water in exceedance of the applicable SCGs via ingestion, inhalation and direct contact would be prevented. The bulkhead adjacent to the Site buildings would be restored to retain the remaining Below Building historic fill and to prevent the potential migration of soil/fill to surface water.

As discussed in Section 4.2.1, given the high ground water table at the Site, construction worker access to the Site soil/fill would be limited to the upper eight (8) feet of soil/fill (i.e., the accessible construction worker soil zone). Under Alternative E3: 0-4 feet, the PCB and VOC-impacted soil/fill in the upper four feet would be removed and exposure to the remaining underlying PCB and VOC-impacted soil/fill would be mitigated through installation of a surface cover over the remaining impacted PCB and VOC-impacted Site soil/fill and implementation of an SMP for work conducted in the area of remaining impacted soil/fill. The excavation scenarios that involve removal of at least eight (8) feet of soil/fill would remove all the soil in this construction worker accessible area and would prevent exposure to any underlying remaining PCB and VOC-impacted soil/fill through installation of a surface cover and implementation of an SMP for work conducted in the area of remaining impacted soil/fill. Remaining historic fill would be covered with a surface cover to prevent direct contact. Institutional controls would prevent disturbance to underlying material to protect workers during potential future subsurface work, through enforcement of a SMP and OM&M Plan. Excavated areas would be backfilled with approved fill from an off-Site source. Because the remaining PCB-impacted soil/fill would not be accessible, and PCBs are relatively immobile in the environment and have not impacted ground water, all of the excavation scenarios are equally protective of human health and the environment. Ground water monitoring would be conducted to confirm that upgradient ground water flowing onto the Site does not pose an unacceptable potential for exposure. As discussed in previous Sections, chemicals present in Site soil/fill are not causing unacceptable ground water impacts.

9.2.3.2.2 Compliance with SCGs

A summary of the applicable SCGs that apply to this alternative is presented in Table 9-5. As shown in this table, Alternative E3 would comply with the location specific soil/fill SCGs and would generally comply with all of the chemical and action specific SCGs. The degree of compliance would be a function of the excavation depth.

Alternative E3 would:

- address the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to the public health and the environment under all excavation scenarios – see Section 9.2.3.2.1 for additional detail;
- remove "consequential" amounts of NYS listed hazardous waste (6 NYCRR Part 375) from the Site environmental media under all excavation scenarios (i.e., 87% of PCB NYS listed hazardous waste mass at 4 feet, 95% at 8 feet, 99% at 12 feet, 99.7% at 16 feet and 100% at 20 feet) and all PCB NYS listed hazardous waste mass in the Below Building

soil/fill under all excavation scenarios {Note: the South Yard does not contain any PCB NYS listed hazardous waste};

- eliminate all PCB RSCO and TSCA high occupancy standards exceedances in the construction worker accessible soil zone (i.e., upper 8 feet) under Alternative E3: 0-8 feet;
- eliminate TSCA low occupancy standard exceedances in the construction worker accessible soil zone (i.e., upper 8 feet) under Alternatives E3: 0-8 feet, E3: 0-12 feet, E3: 0-16 feet and E3: 0-20 feet;
- address all of the PCB RSCO exceedances in the South Yard surface soil and the Below Building soil/fill under all excavation scenarios;
- addresses the RSCO exceedances for VOCs in Yard soil/fill to varying degrees with depth {Note: 31% of these locations are eliminated under Alternative E3: 0-4 feet or E3:0-8 feet and 69% are eliminated under Alternative E3: 0-12 feet} and address the remaining exceedances through surface cover;
- address the one RSCO exceedance for VOC COPCs in the Below Building soil/fill;
- address the RSCO exceedances for SVOCs and inorganic constituents in the intervals excavated through soil/fill removal;
- address the RSCO exceedances for SVOCs and inorganic constituents through installation of a surface cover over the historic fill not excavated;
- meet the PCB surface LTOC for interior building material (i.e., the NYSDEC goal of 1 µg /100cm^2) in the Warehouses, Paint Shop and Guard House (NYSDEC, 2003a);
- meet the lead surface LTOC for interior building material (i.e., the NYSDEC goal of 4.3µg /100cm^2) in the Warehouses, Paint Shop and Guard House (NYSDEC, 2003a and 40 CFR Part 745); and
- comply with applicable chemical specific SCGs that relate to protection of surface water bodies through bulkhead restoration (Common Action C4).

Alternative E3, would:

- not address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law.

9.2.3.2.3 *Long-Term Effectiveness and Permanence*

This alternative would be effective in the long term, and its continued effectiveness would be mandated through institutional controls. Any remaining PCB and/or VOC-impacted soil/fill would be inaccessible by the construction of a surface cover, thus preventing the potential for exposure. The E3: 0-8 feet scenario would place approved fill to a depth of eight feet below grade, which is the most likely interval to be disturbed in future construction activities. The average depth to ground water at the Site is four feet. In addition, piling must be installed for any building construction. Thus construction worker access below eight feet, in the saturated soil zone, is not likely.

The excavation scenarios at depths greater than eight feet below grade does not provide any additional level of protection above the E3: 0-8 feet scenario. This is assured because the potential for exposure to Site-related materials would be eliminated by removing PCBs from the near surface and limiting accessibility to underlying soil through placement of approved fill, installation of an asphalt cap and institutional controls. The risks associated with excavated soil/fill would be transferred to a secure off-Site disposal facility.

Remaining historic fill would be covered to prevent exposure (e.g., direct contact and ingestion). Institutional controls would be implemented that outline cover maintenance requirements, and limit/condition intrusive activities beneath the cover. Use restrictions would also be implemented for the remaining historic fill areas. These are generally accepted remedial and administrative measures that are effective with proper enforcement and maintenance.

9.2.3.2.4 *Reduction of Toxicity, Mobility or Volume*

As discussed in Section 9.0, this criterion evaluates changes in the toxicity, mobility and volume of NYS listed hazardous waste and COPCs. As previously discussed, NYS B007 listed PCB hazardous waste is present in North Yard and Below Building soil/fill.

Under this alternative, various quantities of soil/fill containing PCBs in excess of the PCB SCGs would be excavated and transported off-Site for disposal. Presented below is a summary of the volume of North Yard soil/fill, PCB mass and NYS PCB-listed hazardous waste that would be removed under each excavation scenario. Also included are the percentage reductions in PCB mass and NYS PCB-listed hazardous waste that each excavation scenario would achieve.

North Yard

Depth of Excavation (ft bgs)	Volume of PCB-Impacted Soil/Fill (cy)	Estimated PCB Mass Removed (kg)	Estimated% Reduction of Total PCB Mass	Estimated Mass of NYS Listed PCB Hazardous Waste (kg)	Estimated % Reduction of NYS Listed PCB Hazardous Waste
4	7,254	35,930	86%	35,873	87%
8	12,287	39,465	94%	39,356	95%
12	14,436	41,455	99%	41,028	99%
16	16,545	41,720	99.7%	41,303	99.7%
20	17,157	41,829	100%	41,412	100%

In addition to the North Yard soil/fill, an additional 8 kg of PCB mass would be removed with South Yard and Below Building soil/fill.

Under this alternative, 86% to 100% of the North Yard total PCB mass would be removed and 87% to 100% of the NYS listed PCB hazardous waste mass would be removed. In addition, toxicity and mobility associated with the removed soil/fill would no longer present an on-Site threat as it would be relocated to a secure land disposal facility.

Excavated soil/fill that exhibits hazardous waste characteristics for lead could be stabilized. This treatment would reduce the mobility of lead in excavated soil/fill prior to its placement in an off-Site landfill. The volume of the excavated material would increase slightly due to the addition of a stabilization agent. Any removed stabilized soil/fill would be relocated from the Site to a secure land disposal facility.

Since any existing hazardous wastes at the Site would be removed or permanently capped and maintained, this alternative is considered to be a permanent remedy.

9.2.3.2.5 Short-Term Effectiveness

The increasing depths of excavation would require successively more earthwork. Consequently, the potential for short-term impacts to the community from construction activities and off-Site transport increases with the depth of excavation. Similarly, this alternative presents potential impacts to remedial contractors, requiring ongoing protection during earthwork activities in accordance with the HASP and PAMP. Furthermore, since excavation stability poses significant safety concerns, the depth of safe excavation would need to be defined in Pre-Design studies.

The potential for a temporary increase of risk to the community and workers due to particulate emissions (dust) during soil excavation would be controlled, if needed, by the use of dust control measures, such as water or foam sprays. The degree to which these measures would be used would depend upon particulate and VOC levels in ambient air at the property boundary as determined through the PAMP. Workers would also be protected by respirators (if needed) and protective clothing.

Potential short-term risks to the community would be posed by this alternative from transportation of excavated soil to off-Site landfill disposal facilities. Potential exposure of spilled material to the community and the environment along the transportation route, as well as truck related injuries and increased emissions from trucks would be potential concerns. Because approximately 400 to 950 truckloads would be required to transport excavated soil/fill waste to an off-Site landfill disposal facility; there are significant potential short-term risks associated with the transportation of excavated materials from the Site to an off-Site landfill. Barging of materials may be considered during the RD in lieu of truck transport.

Excavation to depths greater than 2.3 feet would require dewatering and treatment and discharge of dewatering fluids. Short-term impacts may be posed to the POTW or Hudson River depending upon the discharge scenario selected.

9.2.3.2.6 Implementability

The main components of this alternative could be completed within two to three and a half years of NYSDEC approval of the Remedial Design for this Site. Ground water monitoring, access and use restrictions, and limited annual OM&M activities would continue beyond the three and a half years time frame.

This alternative would require pre-design studies to evaluate possible excavation constraints and, if appropriate, stabilization options. The excavation depths may be limited by the proximity of the impacted area to the Hudson River and the geological strata underlying the silt layer. Furthermore, the volume of construction liquid generated would need to be addressed appropriately and may pose significant administrative concerns. Because of the large quantity of construction liquid and the shallow ground water elevation at the Site, recharging the construction liquid would not be possible. As previously discussed, a SPDES permit would need to be obtained from the NYSDEC. In either case, the discharge limits to be determined by the POTW or NYSDEC would govern the treatment requirements. Under either scenario, considerable testing of the effluent and OM&M would be required.

The duration of this alternative would increase the potential for adverse weather conditions to pose problems during implementation. For example, asphalt can only be installed during warm months.

With the exception of E3: 0-20 feet, PCBs would remain in soil/fill at concentrations greater than 100 mg/kg. As such, approval from EPA would need to be obtained to leave PCBs in soil at concentrations above the low occupancy standard provided in 40 CFR Part 761.61. Because under the shallowest excavation scenario (E3: 0-4 feet), the vast majority of PCBs are removed and project experience indicates that approval from USEPA is not anticipated to be a major impediment.

Common Actions C1 and C2 would be readily implementable. Restoration of the bulkhead (Common Action C4) would be difficult in certain areas. The current location of the bulkhead line beneath Building Nos. 4 and 12 is readily accessible by boat The existing bulkhead line beneath the High Bay building is located farther back beneath the dock and is less accessible to boat access. Finally, the existing bulkhead line beneath Building Nos. 7 and 9 is well beneath the Site buildings and is not accessible by boat. Under Alternatives I2, I3 and I4, the concrete slab for Buildings No. 7 and 7A would be removed. This would allow access for restoration of the Building No. 7 bulkhead and some access for the restoration of the Building No. 9 bulkhead.

9.2.3.2.7 *Cost*

The capital, OM&M, and total costs for these alternative scenarios are as follows. Detailed cost estimates are provided in Appendix P.

Excavation Scenario	Capital	OM&M Present Value	Total Cost
E3: 0-4 feet	$7,686,365	$803,515	$8,489,879
E3: 0-8 feet	$12,091,716	$803,515	$12,895,231
E3: 0-12 feet	$14,861,791	$803,515	$15,658,149
E3: 0-16 feet	$17,941,556	$803,515	$18,737,914
E3: 0-20 feet	$19,439,307	$803,515	$20,235,665

9.2.4 ALTERNATIVE E4: EXCAVATION AND OFF-SITE DISPOSAL TO PRE-DISPOSAL CONDITIONS

9.2.4.1 Description

As discussed in Section 7.1, returning the Site to pre-disposal conditions, to the extent feasible and authorized by law, is a remedial goal. This is the overall goal of the IHWS program as identified in 6NYCRR Part 375. Alternative E4 has been developed to evaluate satisfaction of this goal for the Site soil/fill. Under Alternative E4, all of the post-1940s fill is removed (a footprint larger than E3) and all fill within this area is removed to 20 feet in depth (see Figure 9-5). In addition to the post-1940s soil/fill, PCB and VOC-impacted surface soil in the South Yard and PCB and VOC-impacted Below Building soil/fill would also be removed under this alternative.

This alternative is intended to remove Site soil/fill placed after the 1940s. As discussed below, the post-1940s soil/fill was installed by the Site owners/operators listed in Table 1-1, and as discussed in Section 2.6.1, evidence of operational debris was observed within this soil/fill.

As shown in Figure 1-3, the area beneath the northern Site buildings was filled prior to 1898. The filling was likely conducted by or for S. S. Hepworth & Co., the owner of the Site in the late 1880s (see Table 1-1). As shown in Figures 1-3 through 1-7, the majority of the South Yard and a southerly portion of the North Yard were filled between 1898 and 1942. This filling, which entailed placement of historic fill, was likely conducted by the railroad, the occupant of that portion of the Site at that time. This pre-1940s fill area was purchased by the Phelps Dodge Corporation (PDC) or one of its subsidiaries in 1961 and then became part of the currently defined Site.

In 1937, 1946 and 1961, PDC or one of their subsidiaries obtained title to the lots and blocks that now comprise the remainder of the South and North Yards. As shown in Figures 1-5 through 1-10, between 1942 and 1976, the remainder of the North Yard and the portion of the South Yard along the shoreline was filled. The filling that occurred between 1942 and 1976 is defined as occurring during Site operations.

To address the NYSDEC requirement to restore the Site to pre-disposal conditions, filling that occurred during Site operations and entailed placement of operationally related materials (i.e., post 1940s fill) would be removed. Although the early Site buildings were constructed on historic fill placed by the then Site owners during early Site operations, operationally related materials were not observed in the Below Building soil/fill. As such, bulk removal of all of the Below Building soil/fill would not be needed to address pre-disposal conditions.

The approximate areal extent of the post-1940s historic soil/fill is 129,043 sf, as depicted on Figure 9-5. Under this alternative, all post-1940s soil/fill would be removed to the underlying silt layer. The depth to silt in the area of the post-1940s soil/fill is approximately 20 feet below ground surface (bgs). Following excavation, the area would be backfilled and graded with approved fill. Based upon a 20-foot depth, the total amount of soil/fill within the post-1940s fill area is approximately 47,196 cy. In contrast, Alternative E3: 0-20 feet removes a total of 20,397 cy of North Yard soil/fill in progressively smaller footprints down to a depth of 20 feet. These excavation areas are shown in Figure 9-5. Approximately 1,628 cy of South Yard surface soil and approximately 1,526 cy of Below Building soil/fill would be removed.

The remaining historic fill located in the North and South Yards (i.e., pre-1940s soil/fill) would not be subject to the pre-disposal requirements since its placement was not related to Site operations. The remaining historic fill would be capped with four inches of gravel overlain by six inches of asphalt. The areal extent of remaining historic fill would be approximately 166,004 sf.

Alternative E4 provides an engineering approach to achieve the remedial goal of restoration of the environmental media (i.e. soil/fill) to pre-disposal conditions to the extent feasible and authorized by law. It would provide for the greatest reduction of contaminant volume, compliance with SCGs, permanence, and future Site use potential. This alternative would result in the removal of approximately 47,196 cy of soil/fill from the Site, less than 43% of which contains PCB and/or VOC-impacted soil/fill. Under this alternative all listed NYS B007 listed PCB hazardous waste, TSCA regulated waste and all soil/fill containing PCBs and/or VOCs above their SCGs would be removed. This alternative would include the following remedial tasks and incorporate the following Common Actions associated with soil/fill discussed in Section 9.1:

- Conduct Pre-Design Studies (Task No. 1)
- Site Preparation and Mobilization (Task No. 2)
- Warehouse Demolition (Task No. 3)
- Installation of Sheeting (Task No. 4)
- Dewatering, Liquids Treatment and Discharge (Task No. 5)
- Excavation of Post-1940s Yard Soil/Fill (Task No. 6)
- Excavation of VOC and PCB-Impacted South Yard Surface Soil and Below Building Soil/Fill (Task No. 7)

- Ambient Air Monitoring for Particulates (Task No. 8)
- Transportation and Off-Site Disposal (Task No. 9)
- Backfill of Excavated Areas (Task No. 10)
- Installation of a Cover (Task No. 11)
- Site Restoration (Task No. 12)
- Access and Use Restrictions (Task No. 13)
- Cover Inspections (Task No. 14)
- Ground Water Monitoring (Common Action C1)
- Preparation and Implementation of an SMP (Common Action C2)
- Bulkhead Restoration Beneath Site Buildings and Maintenance (Common Action C4)

The time to complete this alternative has been estimated to be approximately five years following NYSDEC approval of the Remedial Design for this Site. Ground water monitoring, access and use restrictions, and annual OM&M activities would continue beyond the five-year time frame.

Descriptions of the common actions considered for this alternative (i.e., Common Actions C1, C2 and C4) were provided in Sections 9.1.1.1, 9.1.1.2 and 9.1.1.4, respectively. Evaluation of these common actions is included along with the other tasks of this alternative.

9.2.4.1.1 Task No. 1: Conduct Pre-Design Studies

Prior to the Remedial Design, a geotechnical study would be conducted to evaluate Site-specific excavation constraints. According to studies conducted for the Harbor at Hastings site (Shaw, 2002), excavation at depths greater than 12 feet at that site would result in upheaval of the underlying Basal Sand geologic layer. According to their study, upheaval and a resulting disturbance in the stability of this filled area would be caused by an insufficient remaining thickness of silt above the Basal Sand Unit following removal of greater than 12 feet of overlying material. The Harbor at Hastings site is located approximately two miles to the north of the BICC Site along the Hudson River and was also constructed on land created with historic fill. Therefore, conditions limiting the feasibility of excavation at that site may also apply to the BICC Site. Since soil borings were only advanced to the silt layer during the Site RI, sufficient information is not available to evaluate the Site-specific vertical lithology and geotechnical parameters for deep excavation. Additional discussion regarding excavation is provided in Section 9.2.4.1.5.

As further discussed in Section 9.2.4.1.3 installation of water tight sheeting has been assumed in the FS to allow soil excavation and to prevent ground water infiltration into the excavation cells. Based on the construction of the High Bay Building (i.e., piling construction into bedrock), the FS has assumed that shoring would not be needed alongside the High Bay Building for deep excavation scenarios. The geotechnical study would refine the excavation control requirements (e.g., sheeting) for the selected excavation depth, confirm that shoring is not needed during soil/fill excavation and further evaluate the dewatering requirements associated with the selected excavation scenario. Additional discussion regarding sheeting and dewatering is presented in Sections 9.2.4.1.3 and 9.2.4.1.4.

As discussed in Section 9.2.4.1.5, a portion of the soil/fill, would be classified as a RCRA characteristic hazardous waste for lead (i.e., D008) upon excavation. During pre-design, an analysis would be performed to evaluate the benefit of on-Site stabilization prior to off-Site transport and disposal. This analysis would also evaluate compliance with the universal treatment standards (UTS) for underlying constituents of this characteristic hazardous waste. For the purpose of the FS, on-Site stabilization of lead waste to eliminate the hazardous characteristic prior to off-Site transport and disposal is considered as part of this alternative.

As discussed in Section 8.1.1.6, ex-situ treatment of the excavated soil/fill was eliminated as a potential technology. However, since new technologies continue to emerge, the possibility of ex-situ treatment of excavated soil/fill may be evaluated during the Remedial Design.

Pre-design studies would take approximately six months to complete.

9.2.4.1.2 *Task No. 2: Site Preparation and Mobilization Including Warehouse Demolition*

Site preparation and mobilization would include: relocation of existing utilities; provision of temporary facilities and utilities, as needed; mobilization of equipment to the Site; set up of staging, stockpiling and stabilization areas; set up of the decontamination area; and construction of a waste transfer station. During Site Preparation, the sewer main, which traverses the area of soil/fill removal would be relocated outside the excavation area. Existing fencing that may impede Site access in its current position would be removed and fencing to prevent unauthorized access would be installed and properly sited.

The Site preparation and mobilization task would take approximately four (4) to five (5) months to complete.

9.2.4.1.3 *Task No. 3: Warehouse, Guard House and Paint Shop Demolition*

During Site preparation, the East and West Warehouses, Guardhouse and Paint Shop would be demolished. The Warehouses would be demolished to access PCB and VOC-impacted soil/fill underlying the East Warehouse. Under this alternative, the Guardhouse and the Paint Shop would be removed to provide areas for easements, access to Site buildings for excavation equipment and storage during the remedial action and to eliminate the need for costly underpinning. This task would be concurrently with Site preparation.

9.2.4.1.4 *Task No. 4: Installation of Sheeting*

Geotechnical measures would be needed to allow deep excavation and prevent migration of ground water and surface water into the excavated areas. For FS cost estimation purposes, it has been assumed that water-tight interlocking sheeting would be installed to allow deep excavation and to prevent vertical migration of ground water and river water into the excavation area. Alternative\supplemental excavation control technologies, such as slurry walls with stepped back excavation and possibly ground freezing, would be evaluated during the Remedial Design.

As discussed in Task No. 1, it has been assumed that shoring would not be needed alongside the High Bay building. This would be confirmed during the Remedial Design. In addition, the excavation engineering approach would be further developed during the pre-design phase. This evaluation would rely on additional information collected during the pre-design studies to determine excavation depth feasibility and the use of alternative/ supplemental geotechnical controls.

The perimeter of the area of deep excavation under this alternative is approximately 2,020 lf, and the surface area is approximately 135,862 sf. For cost estimation purposes, it has also been assumed that the sheeting would be installed around the perimeter of the excavation area (See Figure 9-5). During the remedial action, sheeting may be installed in smaller sub-excavation areas within the overall footprint rather than around the entire excavation perimeter. As discussed above, the final selection of the excavation control technique would be made during Remedial Design.

The duration of sheeting installation would depend upon whether the entire area is sheeted or smaller areas are sheeted along with excavation.

9.2.4.1.5 Task No. 5: Dewatering, Liquids Treatment and Discharge

Dewatering wells would extend 20 feet below grade and would be installed, removed and reinstalled progressively along with the excavation sequence. Approximately 4 million gallons (MG) of water are contained within the pore volume of the deep excavation area. This is based on the following assumptions:

Saturated Thickness = Excavation depth – 2.3 ft (i.e. minimum depth to ground water) = 17.7 feet

Volume = Saturated Thickness x Excavation Area x Porosity (25%) x 7.48 gal/cf
= 4,271,194 gal

In addition, upward ground water seepage is expected to contribute some amount of ground water to be treated and discharged. The upward ground water seepage volume, as well as the seepage volumes through the sheeting and its contribution to the above pore water, would be confirmed during the Pre-Design studies.

The three potential options for discharge of extracted ground water are: discharge to the Yonkers POTW, discharge to the Hudson River under a SPDES permit or recharge to ground water. Due the shallow depth of ground water at the Site, recharge of ground water outside of the excavation area would not be possible. The Yonkers POTW would accept a maximum of 25,000 gallons per day. Given the high discharge rates needed under this alternative, discharge to the POTW would not be feasible. Discharge to the Hudson River would, therefore, be the only option.

NAPL that is currently present in residual saturation in the soil/fill and is entrained in soil/fill materials may potentially be removed along with water during dewatering activities. Consequently, treatment of the construction liquids would consist of separating free phase NAPL using an oil/water separator, along with suspended solids sedimentation and removal, and liquid carbon media filtering to remove organics. Construction liquids would be treated to meet the appropriate permit limits.

The dewatering and treatment systems would take approximately one (1) month to install and could be conducted concurrently with mobilization and Site preparation. Dewatering and treatment of construction liquids would be conducted on an on-going basis during excavation activities.

9.2.4.1.6 Task No. 6: Excavation of Post-1940s Yard Soil/Fill

Under this alternative, approximately 100,638 cy of post-1940s Yard soil/fill would be excavated. Excavation would proceed in a staged approach. Overlying asphalt and/or concrete would first be removed from each excavation area cell. Soil/fill would be stockpiled in roll-offs located on the southern portion of the Site. The stockpiled soil/fill would be sampled for waste disposal characterization. This information would be used to confirm the disposal requirements for the excavated materials. Debris and industrial waste would be separated out for bulk landfilling.

Excavated soil/fill that upon waste characterization sampling exhibits RCRA hazardous waste characteristics for lead (i.e., leachable lead concentrations via TCLP above 5 mg/l) may be stabilized on-Site prior to off-Site disposal. Based on the RI results and the assumption that soil/fill containing total lead at concentrations in excess of 15,000 mg/kg would likely exhibit the RCRA hazardous characteristic for lead, the estimated volume of excavated soil/fill that would require stabilization would be approximately 3,687 cy. For cost estimation purposes, it was assumed that the volume of soil stabilized would increase by approximately 20% through the addition of stabilization.

Assuming soil/fill is excavated in 10,000-sf subareas, each subarea would yield 7,400 cy of excavated material (based on a maximum excavation depth of 20 feet in all areas). Based upon an excavation rate of 200 cy per day, it would take 37 working days to excavate each excavation cell.

Once stockpiled, characterized, and stabilized when needed, the excavated material would be loaded into dump trucks. Assuming a truck capacity of 25 cy (i.e. less than 40 tons per truck based on an assumed unit weight of 1.23 tons/cy), and an average of 20 trucks per day leave the facility, it would take approximately fifteen working days to transport one cell of excavated material off-Site. The same rate can be assumed for backfilling. Therefore, each 10,000-sf excavation subarea would be completed in approximately three months. Based upon 14 excavation subareas, this task would take three and one-half years to complete. The time frame could be reduced if two subareas were conducted concurrently, though location specific SCGs could place restrictions on the size of the work area (e.g., fugitive dust generation).

Post- excavation samples would be collected at a frequency of one sample every 100 feet of the excavation perimeter and one sample per 10,000 sf of excavation base. The post-excavation samples would be sent for analysis for PCBs using a Method 8082 analysis and for TCL VOCs plus Tentatively Identified Compounds (TICs) using USEPA SW-846 Method 8260B.

9.2.4.1.7 Task No. 7: Excavation of South Yard PCB-Impacted Surface Soil and Below Building Soil/Fill

Under this alternative, all PCB and VOC-impacted South Yard surface soil/fill shown in Figure 9-5 and Below Building soil/fill shown on Figures 7-7 and 7-8 would be excavated and transported off-Site for disposal. As noted in Figure 9-5, the PCB-impacted subsurface soil/fill located at SB-78 (19 to 20 feet bgs) is located within the limits of pre-1940s soil/fill.

Because of the shallow depth of surface soil removal, waste disposal characterization would be conducted prior to excavation and transferred directly into dump trucks for off-Site transportation without stockpiling. The volume of South Yard surface soil/fill to be removed would be approximately 1,628 cy. Based upon the RI sampling, none of the South Yard surface soil/fill would be characterized as a RCRA characteristic hazardous waste for lead. The excavated surface soil/fill would be backfilled with 14 inches of approved fill, and 4 inches of gravel to form a base for a 6-inch asphalt cover. This would return the excavated areas to their original elevation.

Based upon an average of twenty 25-cy trucks per day leaving the facility, and placement of 200 cy of approved fill per day, it would take approximately two weeks to complete this portion of Task 7.

In addition to soil excavation in the South Yard, this task would also include excavation of PCB and VOC-impacted Below Building soil/fill. The locations of this soil removal are presented in Figures 7-7 and 7-8. The volume of Below Building soil/fill to be removed would be approximately 1,526 cy. Based upon the RI sampling, it is estimated that approximately 414 cy of excavated Below Building soil/fill would be characterized as a RCRA characteristic hazardous waste for lead.

The method of Below Building soil/fill removal would be dependent upon the building interior remedy selected. If Alternative I2: Encapsulation (see Section 9.4.2) or Alternative I3: Building Interior Remediation (see Section 9.4.3) is selected, the concrete floor slab over the impacted soil/fill would be removed and excavation equipment would be brought into the Site buildings to remove the soil/fill. Alternatively, if Alternative I4: Building Demolition (see Section 9.4.4) is selected, the soil/fill excavation would be conducted following building demolition and removal of the concrete floor slab. The area would then be backfilled and the overlying cover restored following excavation. Restoration of the cover is included in the remedial action alternatives discussed in Section 9.4. The excavated soil/fill would be stockpiled and sampled for disposal characterization prior to off-Site transportation. This portion of the task would take approximately two months to complete. Excavation for the Below Building soil/fill from within the Site buildings (Alternatives I2, and I3) would require special excavation equipment and additional soil handling and stockpiling. Therefore, for cost estimation purposes, it has been assumed that excavation of soil/fill would proceed with the Site buildings still in place.

Post- excavation samples would be collected at a frequency of one sample every 100 feet of the excavation perimeter and one sample per 10,000 sf of excavation bottom. The post-excavation samples would be submitted for analysis for PCBs using Method 8082 analysis and for TCL VOCs using USEPA SW-846 Method 8260B.

9.2.4.1.8 Task No. 8: Ambient Air Monitoring

During soil excavation, an ambient air monitoring program would be implemented to measure the concentration of particulates and VOCs in ambient air in the work zone and at the perimeter of the Site. Realtime VOC concentrations in ambient air would be measured using a PID.

Realtime PCB and lead concentrations in ambient air will be estimated using particulate concentrations correlated to PCB and lead concentrations. In addition, at the request of the Agencies, PCB monitoring would also be conducted using PUF samplers or equivalent. This methodology will not yield realtime results but with rather serve as a laboratory confirmation of the realtime estimates. The feasibility and need for PUF sampling, as well as the frequency needed to correlate realtime measurements, would be confirmed during the Remedial Design.

A PAMP that specifies the components of this program would be developed in accordance with the NYSDOH Generic Community Air Monitoring Plan contained in Appendix 1A of the Draft DER-10 (NYSDEC, 2002). During preparation of this plan, a worst case air quality impact analysis would be prepared to estimate the potential impacts from fugitive dusts arising from soil/fill disturbance so that mitigating measures can be evaluated.

During excavation, dust control measures such as water or foam sprays, or limiting areas of soil to be disturbed at any one time would be used at the Site if perimeter action levels established in the PAMP are exceeded. The degree to which these measures would be used would depend on particulate levels in ambient air at the perimeter of the Site as determined through the implementation of the PAMP.

In addition, a HASP would be prepared for Site work. The HASP would include air monitoring for particulates in the work and exclusion zones. This plan would identify the level of PPE required for Site work, action levels for the work and exclusion zones, and PPE upgrades and engineering controls that correspond to action level exceedances.

9.2.4.1.9 Task No. 9: Transportation and Off-Site Disposal

Under this task, the remediation-derived waste would be transported and disposed of off-Site. Remediation derived waste would include:

- Excavated soil/fill classified as:
  - Non-hazardous waste
  - TSCA regulated waste/NYS B007 PCB listed hazardous waste
- Overlying asphalt and concrete classified as construction and demolition (C&D) debris
- Spent carbon and filters from construction liquid treatment

As discussed above, waste characterization samples for the excavated soil/fill would be collected; and soil/fill that exhibits a TCLP lead concentration of greater than 5 mg/l may be segregated, stabilized on-Site and disposed of in accordance with its residual waste characteristics. Characterization and segregation of excavated materials would be conducted as described in Section 9.2.4.1.5. Non-hazardous soil/fill would be transported to and disposed of at an off-Site Subtitle D, non-hazardous waste landfill. TSCA regulated waste would be sent to TSCA-permitted facility, and likewise, C&D debris would be sent to a facility permitted under 6 NYCRR Part 360-7. The spent carbon and filters used for treating the construction liquids would be characterized and sent to an appropriate disposal facility. For cost estimation purposes, it has been assumed that these materials would be RCRA non-hazardous waste.

To determine the weight of the materials to be disposed, the following densities were assumed: an average bulk density of 1.23 tons/cy for soil/fill as determined during the RI (see Table 2-13); and an average bulk density of 1.5 tons/cy for asphalt and concrete.

Based on these assumptions, the following mass of waste would be transported off-Site for disposal:

- Excavated soil/fill classified as:
    - Non-hazardous waste: 57,314 cy (i.e., 56,281 cy North and South Yard + 1,033 cy Below Building soil/fill)
    - NYS listed PCB hazardous waste\TSCA regulated waste: 14,015 cy (13,439 cy North Yard + 576 cy Below Building soil/fill)
- Overlying asphalt and concrete classified as construction and demolition (C&D) debris: 1,874 cy

These totals include volume increasing due to the addition of stabilization agents to soil/fill characterized as lead hazardous.

For cost estimation purposes, it was assumed that one (1) sample would be collected every 750 cy of excavated soil/fill and submitted for analysis for disposal characteristics.

9.2.4.1.10 Task No. 10: Backfill of Excavated Areas

Following soil/fill removal, the Site would be restored to its present grade. The pre-1940 soil/fill excavation area would be filled with approximately 101,000 cy of approved fill from off-Site sources. Backfill of the South Yard surface soil/fill areas and the Below Building excavated areas was discussed above. Backfill would be defined, at a minimum, as soil containing chemicals at concentrations below the TAGM 4046 RSCOs. In accordance with Draft DER-10, the source of fill material would be approved by DER in advance, and bills of lading would be available for Department review. Excavation and filling would be sequenced and partially phased concurrently during the soil/fill excavation. If Remedial Alternative I4: Building Demolition were selected, use of C&D debris from Site building demolition (e.g., concrete, steel) may be considered as a potential backfill material. This could be further evaluated during Remedial Design.

9.2.4.1.11 Task No. 11: Installation of a Cover

Under this task, an asphalt cover would be installed over the remaining North Yard and South Yard soil/fill that has either not been excavated or is not currently covered (see Figure 9-5). The cover would consist of a six-inch gravel base and four-inch asphalt cover. The asphalt cover would prevent direct contact with the remaining historic fill. Although a 4-inch gravel and 6-inch asphalt cover has been assumed in the cost estimate for the historic fill areas that are not PCB impacted, the surface cover over these areas may consist of 6-inches of gravel and 4-inches of asphalt. The final cover design for these areas will be determined in the remedial design.

Historic fill is present beneath the Site buildings. Under the interior building material remedial action alternatives evaluated in Section 9.4, portions of the concrete slab would be removed to facilitate soil removal, as identified in Figures 7-7 and 7-8. The concrete slabs in these areas would be replaced with concrete or asphalt as part of the interior building material remedial action alternatives.

Installation of an asphalt cover over portions of the North and South Yard would take approximately one month to complete. The time to complete the surface covers for the below building soil/fill are discussed in the Section 9.4 alternatives.

9.2.4.1.12 Task No. 12: Site Restoration

After the Site soil/fill has been excavated and backfilled, the Site would be restored. This would include removal of dewatering equipment, temporary services, and surplus fencing. This task would take two months to complete.

9.2.4.1.13 Task No. 13: Access and Use Restrictions

Institutional controls would document the presence of COPCs in Site soil/fill that exceed the NYSDEC TAGM 4046 RSCOs. Under this alternative, historic fill containing chemicals at concentrations in excess of the RSCOs would remain in the South Yard, a small portion of the North Yard, and Below Buildings. As discussed above, these areas would be covered with a surface cover. Use restrictions that require conformance with the SMP (a Common Action), would be implemented for any future intrusive work in the remaining historic fill areas. The SMP would specify the manner in which intrusive work can be done. Finally, a covenant would be placed on the deed regarding future Site use. This deed restriction would require installation of a vapor barrier or vapor venting layer beneath all future buildings constructed at the Site.

9.2.4.1.14 Task No. 14: Cover Inspection and Maintenance

The asphalt cover overlying the remaining North and South Yard historic fill and the asphalt/concrete cover overlying the Below Building soil/fill would be inspected on an annual basis. For the purpose of preparing a comparative cost estimate for this alternative, these annual inspections to monitor the effects of weathering and aging, and to ensure that the integrity of the cover is maintained were estimated for a period of thirty years. If any of the cover material begins to degrade or crack, repairs would be made to areas where needed. Provisions for cover inspection and maintenance would be included in a OM&M Plan.

9.2.4.2 Evaluation

9.2.4.2.1 *Overall Protection of Human Health and the Environment*

Protection of human health and the environment can be measured by the alternative's ability to address the RAOs. The Site RAOs for soil/fill and ground water were presented in Sections 7.2.1.2 and 7.2.2.2, respectively. This alternative would meet all of the RAOs for soil/fill and ground water. All soil/fill containing PCBs and all post-1940s soil/ fill located in the Yard would be removed under this alternative. This material would be replaced with approved fill from an off-Site source. Pre-1940s historic fill would be covered with asphalt to prevent direct contact. Institutional controls would define the areas of remaining historic fill at the Site and engineering controls would manage excavation in these areas. Under Common Action C4, the bulkhead adjacent to the Site buildings would be restored to retain the remaining Below Building historic fill and to prevent migration of historic fill to surface water. Ground water monitoring would be conducted to confirm that upgradient ground water flowing onto the Site does not pose an unacceptable potential for exposure.

This alternative would provide an acceptable level of protection for human health and the environment.

9.2.4.2.2 *Compliance with SCGs*

A summary of the applicable SCGs that apply to this alternative is presented in Table 9-5. As shown in this table, Alternative E4 would comply with the location, chemical and action specific soil/fill SCG.
Specifically, Alternative E4 would:

- address the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to the public health and the environment – see Section 9.2.4.2.1 for additional detail;
- address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law;
- remove "consequential" amounts of NYS listed hazardous waste (6 NYCRR Part 375) from the Site environmental media;
- address all PCB RSCO and TSCA high occupancy standards exceedances in Site soil/fill;
- address all the RSCO exceedances for VOC COPCs in Site soil/fill through excavation;
- address the RSCO exceedances for SVOCs and inorganic constituents in the post-1940s fill through excavation;
- address the RSCO exceedances for SVOCs and inorganic constituents in the areas not excavated through installation of a surface cover;
- meet the surface PCB LTOC for interior building material (i.e., the NYSDEC goal of 1µg /100cm^2) in the warehouses, Paint Shop and Guard House (NYSDEC, 2003a) – see Section 9.4 for evaluation of this TBC in other interior building materials;
- meet the surface lead LTOC for interior building materials (i.e., the NYSDEC goal of 4.3µg /100cm^2) in the Warehouses, Paint shop and Guard house (NYSDEC, 2003a and 40 CFR Part 745) – see Section 9.4 for evaluation of this relevant and appropriate SCG in other interior building materials; and
- would comply with applicable chemical specific SCGs that relate to protection of surface water bodies through bulkhead restoration and subsequent maintenance (Common Action C4).

9.2.4.2.3 *Long-Term Effectiveness and Permanence*

This alternative would be effective in the long term and is a permanent remedy. There would be no potential for exposure associated with Site-related materials since the post-1940s soil/fill and the PCB and VOC-impacted South Yard surface soil/fill and Below Building soil/fill would be removed from the Site. This would eliminate the need for any future controls within the footprint of the material that is removed. The risks associated with this material would be transferred to an off-Site facility. The remaining pre-1940s historic fill would be covered with asphalt and/or concrete to prevent exposure (e.g., direct contact and ingestion). Institutional controls would be implemented that outline cover maintenance requirements, and limit/condition intrusive activities beneath the cover. Use restrictions would also be implemented for the remaining historic fill areas. These are generally accepted remedial and administrative measures that are effective with proper enforcement and maintenance.

9.2.4.2.4 *Reduction of Toxicity, Mobility or Volume*

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility and volume of NYS listed hazardous waste and COPCs. As previously discussed, NYS B007 listed PCB hazardous waste is present in some of the North Yard and Below Building soil/fill.

Under this alternative, all of the Site soil/fill exhibiting concentrations in excess of the PCB and VOC COPC SCGs and 100% of the NYS listed PCB hazardous waste would be removed and transported off-Site. In addition, non PCB and/or VOC-impacted post-1940s soil/fill would also be removed under this alternative. As a result, any toxicity associated with the post-1940s soil/fill, as well as the removed South Yard surface soil/fill and Below Building soil/fill would no longer present an on-Site threat as the material would be relocated to a secure land disposal facility. In addition, excavated soil/fill that exhibits hazardous waste characteristics for lead would be stabilized. This treatment would reduce the mobility of lead in excavated soil/fill prior to its placement in an off-Site landfill. The volume of the excavated material would increase slightly due to the addition of stabilization agent, though any removed stabilized soil/fill would be relocated from the Site to a secure land disposal facility.

9.2.4.2.5 *Short-Term Effectiveness*

This alternative, with the exception of ground water monitoring and cover maintenance, can be completed within five years after Remedial Design approval.

This alternative would require the largest degree of earthwork, particularly with respect to excavation and restoration. Consequently, it presents the greatest potential for short-term impacts to the community from construction activities and off-Site transport. Similarly, this alternative presents the greatest degree of potential impact to remedial contractors and would require ongoing protection during earthwork activities. Furthermore, since excavation stability poses significant safety concerns, the depth of safe excavation would need to be defined in pre-design studies.

The potential for a temporary increase of risk to the community and workers due to particulate emissions (dust) during soil excavation would be controlled, if needed, by the use of dust control measures such as water or foam sprays. The degree to which these measures would be used would depend upon particulate levels in ambient air at the property boundary as determined through the PAMP. Workers would also be protected by respirators (if needed) and protective clothing.

Potential short-term risks to the community would be posed by this alternative from transportation of excavated soil to off-Site landfill disposal facilities. Potential exposure of spilled material to the community and the environment along the transportation route, as well as truck related injuries and increased emissions from truck, would be potential concerns. Because approximately 4,000 truckloads would be required to transport excavated soil/fill waste to an off-Site landfill disposal facility, there are significant potential short-term risks associated with the transportation of excavated materials from the Site to an off-Site landfill. Barging of materials may be considered during the RD in lieu of truck transport.

Excavation to depths greater than 2.3 feet would require dewatering and treatment and discharge of dewatering fluids. Short-term impacts would be posed to the Hudson River through discharge of construction liquids. However, any impacts would be mitigated through treatment under the SPDES permit.

9.2.4.2.6 Implementability

The main components of this alternative could be completed within five years of NYSDEC approval of the Remedial Design for this Site. Ground water monitoring, access and use restrictions, and limited annual OM&M activities would continue beyond the five-year time frame.

This alternative would require detailed pre-design studies to evaluate this large-scale construction effort along the Hudson River. The ultimate excavation depth may be limited by the proximity of the impacted area to the Hudson River and the geological strata underlying the silt layer. Given the volume of water that would be removed, recharge to ground water and discharge to the POTW would not be feasible. Instead, a SPDES permit would need to be obtained. Once this permit is obtained, the treatment requirements would be finalized. Under this alternative, considerable testing and OM&M would be required.

Common Actions C1 and C2 would be readily implementable. Restoration of the bulkhead (Common Action C4) would be difficult in certain areas. The current location of the bulkhead line beneath Building Nos. 4 and 12 is readily accessible by boat. The existing bulkhead line beneath the High Bay building is located farther back beneath the dock and is less accessible to boat access. Finally, the existing bulkhead line beneath Building Nos. 7 and 9 is well beneath the Site buildings and is not accessible by boat. Under Alternatives I2, I3 and I4, the concrete slab for Building Nos. 7 and 7A would be removed. This would allow some access for restoration of the Building No. 7 and 9 bulkhead restoration.

The duration of this alternative would increase the potential for adverse weather conditions to pose problems during implementation.

9.2.4.2.7 Cost

The capital cost of this alternative is estimated to be $42,988,725. The total present worth of OM&M as part of this alternative is estimated to be $657,399 for a period of 30 years. The components of capital and OM&M costs are provided in Table P-7. The total net present value of Alternative E4 is estimated to be $43,646,124.

9.3 SEDIMENT REMEDIAL ACTION ALTERNATIVES

This section presents the four remedial action alternatives for the Site-related impacted sediment identified in Section 7.2.3.3. Preceding the discussion of the remedial action alternatives is a discussion of the Site-related impacted sediment, including its characterization, access concerns and sediment mechanisms. In addition, at the request of the NYSDEC (NYSDEC, 2004), remedial action alternatives have also been developed for the NYSDEC defined "impacted" sediment (i.e., Area V).

As discussed in Section 6.1.2, based on information provided by the New York Department of State (NYS DOS) Division of Coastal Resources & Waterfront Revitalization, the Site falls within a designated significant coastal fish and wildlife habitat, named the Lower Hudson Reach. This area extends for 19 river miles from Battery Park in Manhattan to Glenwood just north of the Site in Yonkers. The Site is located on the New York side of the Lower Hudson Reach. The depth, tide, and salinity of the Hudson River vary according to location. The average depth of the Hudson River ranges from 6 to 70 feet. Throughout the tidal reach the Hudson River is considered a drowned-river estuary with an average tidal fluctuation of 5.5 feet. A tidal fluctuation of 3 feet was observed at the Site during the October 2001 tidal study conducted during the RI. Under normal inflow and tidal conditions, chloride concentrations range from <25 milligrams per liter (mg/l) at Clinton Point, near New Hamburg to >3,000 mg/l at Hastings-on-Hudson. As such, the tidal reach (i.e., the tidally influenced portion of the Hudson River) extends well to the north of the Site.

As discussed in Section 2.0, sediment sampling was conducted in the intertidal sediment zone beneath the Site buildings; in the subtidal sediment zone located adjacent to the Site buildings; and in the subtidal sediment zone adjacent to the Yard.

Areas of Site-related impacted sediment were identified through use of the RI sampling results and the evaluation criteria provided in Section 7.2.3.3[13]. These four Site-related impacted areas are listed below and their horizontal extent was presented in Figure 7-9.

	Area, sf	Depth, ft	Volume, cy	Location
Area I	2,927*	2**	217	Subtidal Zone Adjacent to Buildings 4 and 12
Area II	13,066	2	968	Subtidal Zone Adjacent to and Below the North Dock, Decking and the EPRI Laboratory
Area III	5,517	1	204	Subtidal Zone Adjacent to and Below Building No. 8 and its Dock
Area IV	78,060	2**	5,786	Intertidal Zone Beneath Buildings 7, 9 and the West Warehouse (Building No. 19W)
Of the total:				
- Behind bulkhead line	52,460	2**	3,890	
- outside bulkhead line	25,600	2**	1,896	

* Areal extent to be refined during remedial design/remedial action.
**Extent of Site-related impacted sediment may be greater than 2 feet; however, NYSDEC has designated this to be the maximum depth requiring remediation at this Site (ERM, 2003e).

Following is a summary of the Site-related impacted sediment access constraints associated with these materials and sediment mechanisms.

Characterization of Site-Related Impacted Sediment

The following concentration ranges were observed in sediment Areas I, II, III and IV:

Total PCBs: non-detect to 33.3 mg/kg

Total PAHs: 0.4 mg/kg to 38.2 mg/kg

[13] BICC acknowledges that the NYSDEC DER and DFWL do not agree with the use of metals normalization to identify Site related impacted sediment requiring remediation (NYSDEC, 2004).

Total Phthalates: 0.05 mg/kg to 802 mg/kg

Copper: 14 mg/kg to 967 mg/kg

Lead: 9 mg/kg to 6,440 mg/kg

The maximum concentrations of total PCBs, total SVOCs, total PAHs, total phthalates, copper and lead were observed in the Site-related impacted intertidal sediment area, Area IV. Some of these maximum locations were within the bulkhead line and others were outside of the bulkhead line. Based on the RI data, the Site-related impacted sediment areas are anticipated to be classified as a non-RCRA hazardous waste. In addition to these sediment areas, debris piles are located atop the Site-related impacted intertidal sediment. Some of these piles would be classified as a RCRA characteristic hazardous waste for lead once removed. As discussed below, these debris piles would be removed under Common Action C8, Debris Removal Beneath the Site Buildings and Hot Spot Sediment Removal within the Building No. 8 Bulkhead (see Section 9.1.1.8).

Area V Sediment

In addition to the above Site-related impacted sediment areas, NYSDEC requested evaluation of the sediment adjacent to the Yard. As discussed in Section 7.2.3.3, this led to development of Area V, a NYSDEC defined "impacted" sediment area. The location of this NYSDEC defined "impacted" sediment area is presented in Figure 7-9A. This area is approximately 17,920 sf. Assuming a depth of 2 feet, the extent of NYSDEC defined "impacted" sediment in this area is 1,327 cys. The following concentrations of lead and copper, the chemicals of interest in this area, were observed in Area V:

Lead: 82.3 mg/kg to 470 mg/kg

Copper: 85.7 mg/kg to 322 mg/kg

The higher of these concentrations were observed in the 6 to 12-inch interval.

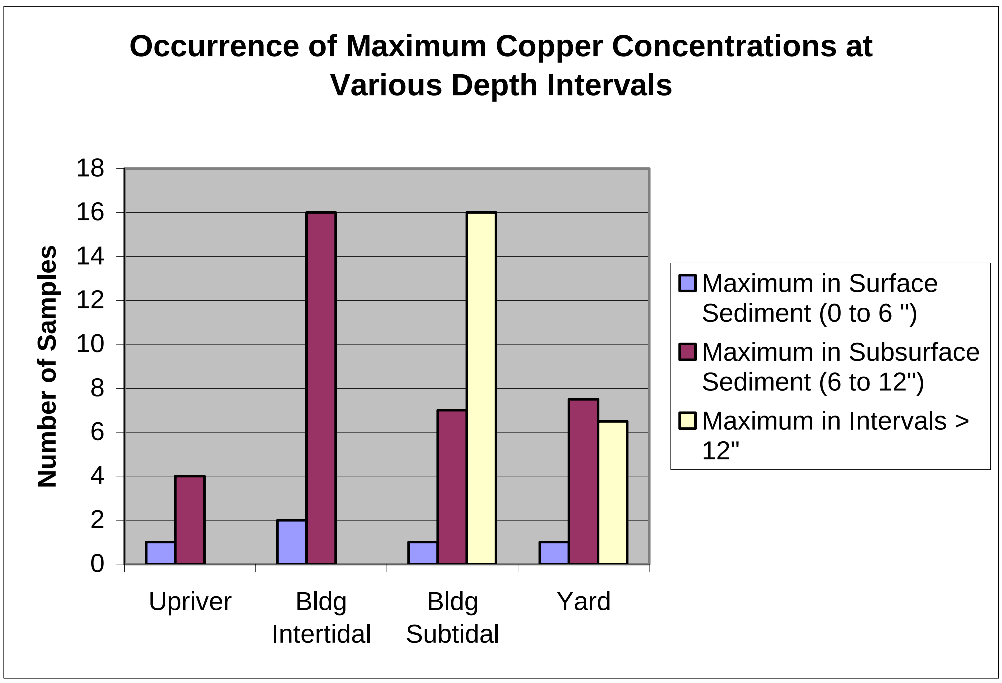
Access Concerns Associated with Area I through V Sediment

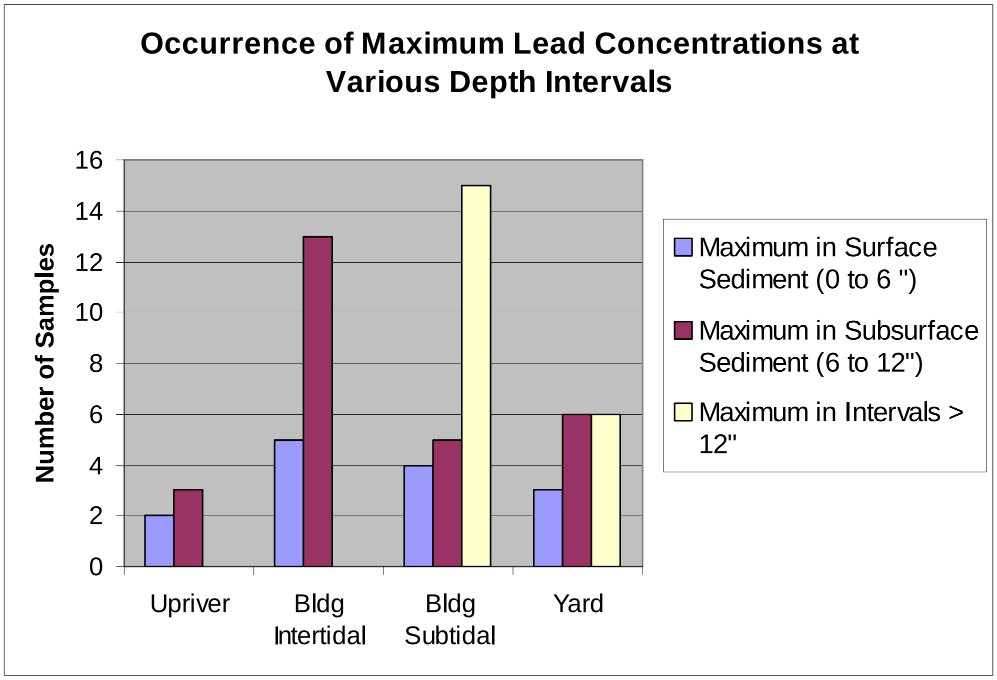
As shown in Figure 7-9, Area I is located adjacent to the northern dock and is not located beneath any Site buildings or decking and as shown in Figure 7A, Area V is located adjacent to the Yard. As such, the sediment in Area I and V is accessible. In contrast, approximately 60%, 70% and 100% of the Area II, III and IV sediment, respectively, is currently located beneath Site buildings and/or decking. Under certain soil/fill remedial action alternatives (see Section 9.2) and certain interior building materials alternatives (see Section 9.4), buildings would be demolished thus increasing accessibility to these sediment areas. The impacts of these non-sediment alternatives on the accessibility of the Site-related impacted sediment are as follows;

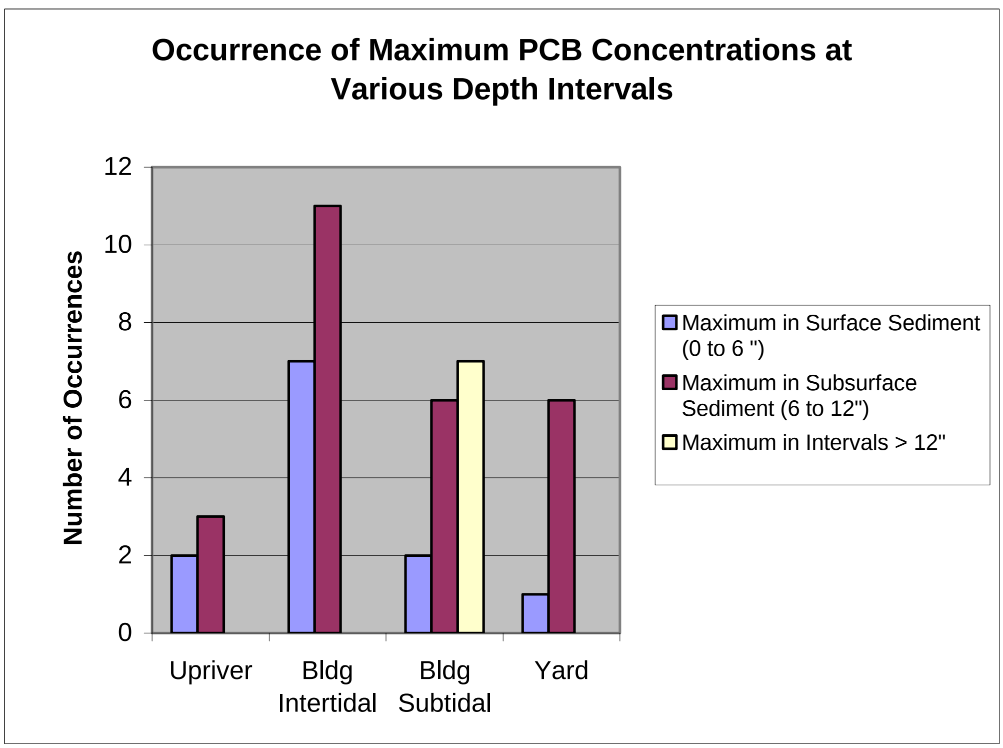
- Under soil/fill Alternatives E3 and E4, the East and West Warehouse (i.e., Building Nos. 19E and 19W) are removed, thus allowing access to the Site-related Area IV intertidal sediment located beneath this building. In addition, removal of this building would provide another route of access to the Area III impacted sediment.
- Under interior building material Alternatives I2, I3 and I4, the concrete slab in Building Nos. 7 and 7A are removed. Removal of these slabs would increase the accessibility to the Site-related impacted Area IV intertidal sediment located beneath Buildings No. 7 and 7A and would increase the accessibility to the Site-related impacted Area IV intertidal sediment located beneath Building No. 9 somewhat. However, there would still be some accessibility concerns associated with this impacted sediment.

Sediment Mechanisms

As discussed in Sections 2.6.4.3 and 6.0, sediment deposition is occurring at the Site. A summary of this previous discussion is provided below. Current sediment burial (i.e., deposition) was evaluated by determining at which sampling interval the maximum chemical concentrations of lead, copper and PCBs occurred. This evaluation is presented in the following histograms for the upriver, intertidal building, subtidal building and Yard sediment data.







As shown in these histograms, the majority of the maximum concentrations are occurring at deeper intervals. This indicates that sediment deposition is occurring at these locations.[14] It should be noted that samples greater than 12 inches were not collected at the upriver locations or beneath the Site buildings. Access restrictions prevented collection of the latter samples.

This evaluation demonstrates that the Site-wide sediment deposition is occurring. With the exception of sediment samples collected in the vicinity of Site outfalls, review of the individual sample results supports that sediment deposition is occurring. As discussed in Section 2.6.4.3, COPCs are present in residual sludge located within the interior stormwater system and these COPCs may come into contact with stormwater prior to its discharge to the Site's various outfalls.

As noted above, four Site-related impacted sediment areas and one NYSDEC defined sediment area have been identified. These two distinct types of sediment areas are evaluated separately in this section. The sediment remedial action alternatives, which have been developed for detailed evaluation for each of these two types of sediment areas, are:

- Alternative S1: No Action
- Alternative S2: Monitored Natural Recovery (MNR)
- Alternative S3: Sediment Removal
- Alternative S4: Sediment Capping

Thus Alternatives S1A, S2A, S3A and S4A address only sediment Areas I through IV and Alternatives S1B, S2B, S3B and S4B address only sediment Area V.

With the exception of the Alternative S1A: No Action – Areas I through IV, all of the remaining sediment remedial action alternatives associated

[14] NYSDEC does not agree that there is sufficient information to reach this conclusion (NYSDEC, 2004).

with Areas I through V would include the Common Actions discussed in Section 9.1 that are associated with Site-related impacted sediment (i.e., Common Actions C2, C4 and C8). The evaluation of Alternatives S2A through S4A each include Common Actions C2, C4, and C8. Some of these Common Actions are also included in the soil/fill and interior building materials remedial action alternatives discussed in Sections 9.2 and 9.4, respectively.

Under Common Action C4, the bulkhead beneath Building Nos. 4, 7, 7A, 8, 9 and 12 would be restored. This Common Action is also included in the soil/fill remedial action alternatives to prevent erosion of soil/fill containing chemicals at concentrations above the SCGs into the Hudson River. The bulkhead restoration, along with its subsequent inspection and maintenance would separate the Site-related impacted intertidal sediment located beneath Building No. 8 from the river environment. The remaining Site-related impacted intertidal sediment, which is located beneath Building Nos. 7 and 9 and the West Warehouse (i.e., Building No, 19W) and is not within the bulkhead line, would continue to be in contact with the river environment.

As discussed in Section 9.1.1.4, restoration of the bulkhead is necessary to contain soil/fill exhibiting chemical concentrations above the SCGs beneath Building Nos. 4, 7, 7A, 8, 9 and 12. Based on these factors, the NYSDEC Region 3 coastal wetlands' contact has verbally indicated that the proposed bulkhead restoration appears to be "reasonable and necessary" and that the area behind the restored bulkhead would not be a significant tidal wetland. In addition, based on information provided to the NYSDEC (ERM, 2004), the proposed bulkhead restoration is acceptable to the NYSDEC Region III Article 15 and Article 25 reviewers.

Under Common Action C8, the debris beneath the Site buildings and the hot spot areas within the bulkhead beneath Building No. 8 would be removed. This would occur prior to bulkhead restoration.

Since the above Common Actions are associated with the Site-related impacted sediment, none of the Area V remedial action alternatives will include the above Common Actions.

In summary, the following remedial alternatives have been evaluated:

- No action for the Site-related impacted subtidal sediment and the Site-related impacted intertidal sediment that is not behind the bulkhead line and is in contact with the river environment (i.e., Areas I through IV sediment)
- MNR, capping or removal of the Area I through IV sediment;
- Separation of the remaining Site-related intertidal sediment from the river environment through restoration of the bulkhead;
- No action for the Area V sediment; and
- MNR, capping or removal of the AreaV sediment.

Evaluation of remedial alternatives for the Area V sediment has been conducted at the request of the NYSDEC (NYSDEC, 2004).

A description of each of the above listed remedial alternatives is provided in the following sections.

9.3.1 ALTERNATIVE S1: NO ACTION

9.3.1.1 Description

As discussed in Section 9.2.1.1, a no action alternative is needed pursuant to Section 300.430(e)(6) of the NCP to identify the potential risks posed by a site if no remedial actions were implemented. To address this requirement, sediment No Action Alternatives have been developed for both Areas I through IV (Alternative S1A) and Area V (Alternative S1B). These alternatives are evaluated in this section.

Under Alternative S1A, no remedial actions would be implemented in sediment Areas I through IV and the existing engineering controls (i.e., fencing, guards) would not be maintained. Alternative S1A does not include any means to ensure that adequate sediment deposition is occurring in the long-term. In addition, neither Common Action C8 nor Common Action C5, which involve the removal of debris piles from atop the Area IV sediment, removal hot spot sediment areas within the bulkhead and removal of sludge from the interior stormwater system, would be implemented under Alternative S1A. As discussed in Section 2.6.4.3, the debris piles and the interior stormwater system are two potential sources for continued COPC discharge to Area I through IV sediment. In addition, at the request of the NYSDEC, the hot spot areas are also being considered to be potential sources for continued COPC discharge to Area I through IV sediment (NYSDEC, 2004).

Under the Alternative S1B, no remedial actions would be implemented in sediment Area V and the existing engineering controls (i.e., fencing, guards) would not be maintained. As discussed above, none of the Alternatives associated with sediment Area V will include any Common Actions.

9.3.1.2 Evaluation

9.3.1.2.1 Overall Protection of Human Health and the Environment

Alternative S1A would not be protective of human health and the environment. This alternative would not meet the Site remedial goals or the sediment remedial action objectives identified in Sections 7.0 and

7.2.3.1, respectively. As discussed in Section 7.2.3.2, direct contact with Site-related impacted sediment during construction activities poses a carcinogenic risk between 10^{-4} and 10^{-6} to construction workers. The carcinogenic risk was the result of arsenic levels in Site-related impacted intertidal sediment. Sediment in the intertidal area beneath the buildings, along with limited areas in the subtidal zone immediately adjacent to the Site building's bulkhead did exhibit Site-related COPCs that present a potential ecological concern based on the Pathway and Criteria-Specific Analyses. Some of these same COPCs were also detected in the debris atop the Area IV impacted sediment, hot spot areas located below the buildings and in the interior stormwater system. As discussed above, the debris piles, hot spot areas and the residual sludge in the interior stormwater system are potential sources for continued chemical discharge to the Site-related impacted sediment

Alternative S1A would not be adequately protective of human health and the environment because it: (1) would not address direct contact with Site-related impacted sediment during potential future construction activities; (2) would not remove the debris piles or the hot spots from beneath the Site buildings or sludge in the interior stormwater system; and (3) would not include measures to confirm that existing sediment deposition is adequately addressing the Site-related impacted sediments.

Alternative S1B would be protective of human health and the environment. This alternative would meet the Site remedial goals for the sediment remedial action objectives identified in Sections 7.0 and 7.2.3.2, respectively. Since Area V sediment results are consistent with upriver sediment quality, this no action alternative would provide adequate protection.

9.3.1.2.2 *Compliance with SCGs*

A summary of the applicable SCGs for the Site soil/fill is presented in Table 9-5.

Alternative S1A would not:

- address the 6 NYCRR Part 375 goals to eliminate or mitigate all significant threats to the public health and the environment and restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law;
- comply with any of the applicable chemical specific sediment SCGs (i.e., NYSDEC sediment screening criteria, TSCA);
- comply with any of the applicable chemical specific SCGs related to protection of surface water bodies; and
- address the location specific SCGs.

Alternative S1B would:

- address the 6 NYCRR Part 375 goals to eliminate or mitigate all significant threats to the public health and the environment and restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law;
- comply with any of the applicable chemical specific SCGs related to protection of surface water bodies; and
- address the location specific SCGs.

Alternative S1B would not:

- comply with any of the applicable chemical specific sediment SCGs (i.e., NYSDEC sediment screening criteria) – however, the upriver sediment concentrations do not comply with these criteria either.

Because no remedial actions would be conducted under these alternatives, the action specific SCGs are not applicable. In addition, since neither Site-related impacted sediment nor Area V sediment is a hazardous waste and the debris would not be removed under this alternative, the SCGs and remedial goals related to removed hazardous waste would not apply to these alternatives.

9.3.1.2.3 *Long Term and Permanence*

Under Alternative S1A, the existing volume of Site-related impacted sediment would remain at the Site. As previously discussed, this Site-related impacted sediment poses potential future risks to construction workers and ecological risks to existing habitats. Alternative S1A would not provide any long-term effectiveness or permanence as no action is performed (including confirmation of sediment deposition, removal of debris piles and hot spots beneath Site buildings and cleaning of the interior stormwater system).

Under Alternative S1B, Area V sediment would remain. As previously discussed, Area V sediment is consistent with upriver sediment quality. Consequently, this alternative would provide long-term effectiveness or permanence. In addition, there are no current sources of contaminants to Area V sediment. A future potential source of contaminants to the Area V sediment is erosion of soil/fill from the South Yard. This potential future source of contaminants will be addressed through stabilization of the South Yard erosion controls.

9.3.1.2.4 *Reduction of Toxicity, Mobility or Volume*

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility and volume of hazardous waste and COPCs. As discussed above, the Site-related impacted sediment is not a hazardous waste and the debris piles would not be classified as a hazardous waste until removed.

Neither Alternative S1A nor Alternative S1B would be effective in reducing the mobility, toxicity or volume of hazardous wastes or COPCs. Because of the relative stability of PCBs and inorganic constituents in sediment, reduction in toxicity or volume is not expected for these chemicals by natural degradation. While some limited degradation of SVOCs in sediment would be expected, this would not be significant. Based on the observed low solubility and low mobility of the PCBs, inorganic constituents and SVOCs in sediment, these chemicals would be expected to remain in the sediment matrix barring significant storm and hurricane events causing movement of the sediments. These disruptive events could increase the mobility of COPCs in Site-related impacted sediment.

9.3.1.2.5 Short-Term Effectiveness

There are no short-term effects associated with the Alternatives S1 or S1B since there are no actions included with these alternatives.

9.3.1.2.6 Implementability

As there are no specific actions related to either of these alternatives, they would each be readily implementable.

9.3.1.2.7 Cost

There are no costs associated with the implementation of either Alternative S1A or S1B.

9.3.2 *ALTERNATIVE S2: MONITORED NATURAL RECOVERY*

9.3.2.1 *Description*

MNR is a sediment cleanup method that uses ongoing, naturally occurring processes to contain, destroy or otherwise reduce the bioavailability or toxicity of COPCs in sediment. These processes may include multiple physical, chemical, and biological mechanisms that act together to reduce the risk imposed by the COPCs in sediment. Depending on the COPCs and the sediment environment, this risk reduction may occur in one or more of the following ways:

- exposure levels are reduced by a decrease in COPC concentrations in the near surface sediment zone due to burial or mixing in place with clean sediment;
- the COPCs are converted to a less toxic form via destructive processes, such as biodegradation or abiotic transformations; or
- the mobility and bioavailability of the COPCs are reduced through increased sorption onto the sediment matrix.

The major components of an MNR remedy generally include the following:

- a detailed understanding of the natural processes that are affecting COPCs in sediment at the Site;
- a conceptual model regarding these effects in the future;
- a means to control any significant ongoing COPC sources;
- a means to control COPC exposure during the recovery, to the extent possible; and
- the ability to monitor the effects of natural processes in their effects to see if recovery is occurring.

- An MNR alternative has been developed for Areas I through IV (Alternative S2A) and Area V (Alternative S2B). Alternative S2A would include all of the following remedial tasks and incorporate the following Common Actions associated with Site-related impacted sediment discussed in Section 9.1. Alternative S2B would only include Task Nos. 1 and 2. Baseline Studies (Task No. 1)

- MNR Monitoring (Task No. 2)
- Preparation and Implementation of a Soil Management Plan (Common Action C2)
- Bulkhead Restoration Beneath Site Buildings (Common Action C4)
- Removal of the Interior Stormwater System (Common Action C5)
- Debris Removal Beneath the Site Buildings and Hot Spot Sediment Removal within the Building No. 8 Bulkhead (Common Action C8)

Descriptions of the common actions considered for this alternative (i.e., Common Actions C2, C4, C5 and C8) were provided in Sections 9.1.1.2, 9.1.1.4, 9.1.1.5 and 9.1.1.8, respectively. Evaluation of these Common Actions is included along with the other tasks of Alternative S1A. As discussed above, Common Action C4 would separate Site-related impacted intertidal sediment located within the bulkhead from the river environment. As such, this material, which is not in contact with the river, would not be subject to MNR. Under Alternative S2A, the MNR tasks would apply to the remaining Site-related impacted sediment. This includes: approximately 1,389 cy of Site-related impacted Area I, II and III subtidal sediment and approximately 1,896 cy of Site-related impacted Area IV intertidal sediment. Under Alternative S2B, the MNR tasks would apply to the approximately 1,327 cy of Area V sediment.

9.3.2.1.1 Task No. 1: Baseline Studies

Baseline studies would be conducted as part of the Remedial Design/Remedial Action (RD/RA) to determine the following information in the areas proposed for MNR:

- the topography of the sediment,

- the depth of overlying water during the tidal cycles,
- the dominant river currents;
- the layering of sediment and areas of potential sediment deposition and scouring; and
- horizontal delineation in Area I.

The sediment topography and layering information would be collected after restoration of the bulkhead (see Common Action C4) since the bulkhead restoration may alter the layer mechanism and thus the sediment topography in the vicinity of the restored bulkhead.

The studies, which would be conducted during the RD/RA process, include:

- geophysical surveys (e.g., bathymetric, multibeam);
- current and float (i.e., current) surveys; and
- additional sediment sampling in Area I.

9.3.2.1.2 Task No. 2: MNR Monitoring

Following completion of the baseline studies, a MNR Monitoring Plan would be prepared. The anticipated monitoring components are discussed below. These components would be refined following completion of Task No. 1. The purpose of the MNR monitoring would be to evaluate the effectiveness of this technology and its ability to provide adequate protection of human health and the environment.

The anticipated MNR monitoring components would include:

- Seasonal current and float studies. These quarterly studies would be conducted to ensure that gross sediment erosion is not occurring on a seasonal basis. The results of these studies would be documented in an annual report to the NYSDEC. After three years, this study would be conducted annually. The timing of this annual study would be determined based on the results of the previous seasonal studies.

- Shallow sediment sampling. This sampling would be conducted in shallow intervals (e.g., 2 cm increments) to document whether sediment deposition is occurring at the Site. The collected samples would be submitted for analysis for PCBs, lead, copper and inorganic constituents used for normalization (e.g., aluminum). This sampling would be conducted every three- (3) years.
- Geophysical surveys. These surveys would be conducted every three- (3) years, as needed, and used along with the shallow sediment sampling to establish whether adequate sediment deposition is occurring.

A summary report would be prepared every three (3) years to document the results of the shallow sediment sampling and geophysical surveys and the evaluation of this information.

The scope of the MNR Monitoring Plan would be refined following completion of Task No. 1. The need for continued MNR monitoring would be re-evaluated every 5 years. The evaluation criteria for the 5-year review would be proposed in the MNR Monitoring Plan. For cost estimation purposes a monitoring period of 30 years has been assumed.

9.3.2.2 Evaluation

9.3.2.2.1 Overall Protection of Human Health and the Environment

Provided the baseline studies and the MNR monitoring demonstrate that adequate sediment deposition is occurring, Alternative S2A would provide adequate protection of human health and the environment for the Site-related impacted sediment. Protection of human health and the environment would be achieved through:

- separation of the majority of the Site-related impacted intertidal sediment from the river environment;
- confirming adequate sediment deposition in the remaining Site-related impacted sediment areas;

- prevention of direct contact with Area IV intertidal sediment behind the bulkhead through restoration and maintenance of the bulkhead via Common Action C4 and implementation of the SMP via Common Action C2;
- prevention of direct contact with the remaining Site-related impacted sediment through implementation of the SMP via Common Action C2; and
- removal of debris piles and hot spots and interior stormwater system sludge via implementation of Common Action C8 and C5.

Although COPCs may pose ecological risks in exposed Site-related impacted sediment prior to adequate sediment deposition, as discussed in Section 6.0, the chemical form, location, and other factors serve to mitigate bioavailability and toxicity of constituents to ecological receptors.

Alternative S1B would be protective of human health and the environment. This alternative would meet the Site remedial goals for the sediment remedial action objectives identified in Sections 7.0 and 7.2.3.2, respectively. Since the quality in the subtidal area adjacent to the Yard is consistent with upriver conditions, no action would provide adequate protection. This alternative, which would also collect additional information documenting sediment deposition in Area V, would further support this conclusion.

9.3.2.2.2 Compliance with SCGs

A summary of the applicable SCGs that apply to this alternative is presented in Table 9-5. As shown in this table, Alternative S2A would comply with the location specific sediment SCGs, but would not comply with all of the chemical and action specific SCGs.

Alternatives S2A and S2B would:

- comply with the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to the public health and the environment for the Site-related impacted sediment;
- remove "consequential" amounts of hazardous waste (6 NYCRR Part 375) through implementation of Common Action C3 (not applicable for Alternative S2B);
- comply with the applicable chemical specific sediment SCGs for the Site-related impacted sediment outside of the bulkhead and the Area V sediment to the extent practicable (i.e., NYSDEC sediment screening criteria, TSCA) {Note: This SCG would not be applicable to the Site-related impacted sediment located behind the bulkhead which is separated from the river environment. In addition, the NYSDEC sediment screening criteria would not be applicable for chemicals that have a higher upriver concentration than the criteria.};
- comply with the applicable chemical specific soil/fill SCGs for the Site-related impacted sediment within the bulkhead that is separated from the river environment (i.e., TAGM 4046 RSCOs, TSCA)(not applicable for Alternative S2B); and
- comply with the applicable chemical specific SCGs related to the protection of surface water bodies for the Site-related impacted sediment outside of the bulkhead and the Area V sediment {Note: This SCG would not be applicable to the Site-related impacted sediment located behind the bulkhead which is separated from the river environment}.

Alternative S2A would not:

- address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law since COPCs would remain in buried Site-related sediment.

In addition, Alternative S2B would:

- address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law since a release is not believed to have occurred in Area V.

9.3.2.2.3 *Long-Term Effectiveness and Permanence*

According to EPA guidance (EPA, 2000), MNR is effective:

- When continuing sources of COPCs are controlled;

- When COPC concentrations in the biologically active zone of the sediment are near cleanup goals and declining;
- When COPC concentrations in biota are near cleanup goals and declining;
- Where institutional controls effectively restrict human exposure;
- When natural recovery processes have a high degree of certainty to continue at rates that will contain, destroy or reduce the bioavailability or toxicity of contaminants within the acceptable timeframe; and
- Where the sediment is hydraulically stable and likely to remain stable.

These criteria were used below to evaluate the long-term effectiveness and permanence of MNR for the Site-related impacted sediment.

<u>Source Control</u>

As discussed in Section 9.1.1.5, two potential continuing sources of COPCs exist for the Site-related impacted sediment. They are debris located atop the Site-related intertidal sediment below the Site buildings and residual sludge located in the interior stormwater system. Both items would be addressed under the Common Actions. The debris would be removed under Common Action C8 (see Section 9.1.1.8) and the interior stormwater system would be cleaned and all residual sludge removed under Common Action C5 (see Section 9.1.1.5).

In addition to the potential sources noted above, existing COPCs in Site related sediment could also be considered to be sources in the context of this evaluation. Common Action C4 (see Section 9.1.1.4) would result in the separation of the COPCs in the Site-related intertidal sediment from the river environment. With the exception of lead, the 95% UCL on the mean concentration of all other COPCs (i.e., copper, total PCBs, total PAHs, total CaPAHs, total SVOCs and total phenols) in the intertidal sediment behind the bulkhead are consistent with the 95% UCL on the mean historic fill concentrations. NYSDEC has requested that hot spot removal be completed to address the lead concentrations in the intertidal sediment within the bulkhead. This is being conducted under Common Action C8. In addition, burial of COPCs is currently occurring in the Site-related impacted intertidal and subtidal sediment. These activities would provide additional source control in the bioavailable zone.

There are no current sources of contaminants to Area V sediment. A future potential source of contaminants to the Area V sediment is erosion of soil/fill from the South Yard. This potential future source of contaminants will be addressed through stabilization of the South Yard erosion controls in September 2004.

<u>Contaminant Concentrations in the Biologically Active Zone of the Sediment are Near Risk-Based Cleanup Goals and Declining</u>

For this Site evaluation of this criterion would relate to achieving the upriver concentrations of inorganic constituents by taking aluminum content into consideration along with the NYSDEC PCB remedial goal of 1 mg/kg in sediment. As discussed in Section 2.4.3, the majority of the samples collected in the subtidal building and subtidal Yard area exhibited aluminum normalized concentrations of inorganic constituents consistent with upriver concentrations. Areas of Site-related impacted subtidal sediment are localized and represent a small portion of the sediment surrounding the Site.

As discussed in Section 9.3, review of the maximum sediment concentrations in the intertidal zone beneath the Site buildings, subtidal zone adjacent to the Site buildings and subtidal zone adjacent to the Yard indicates that sediment deposition is occurring at the Site. However, review of the individual sample locations indicates that there are some localized areas where sediment deposition is not demonstrated by the analytical results. However, these areas are located in the vicinity of outfalls to the interior stormwater system. This system contains residual amounts of sludge that may come into contact with stormwater that is discharged to the river. As discussed above, this potential source area would be removed under Common Action C5. After Common Action C5 is implemented, sediment concentrations in the bioavailable zone adjacent to these outfall locations are expected to decrease as they have decreased in the sediment areas that are not adjacent to outfalls.

In addition, the majority of the Site-related impacted intertidal sediment would be separated from the river environmental and its ecological community through the restoration of the bulkhead. As discussed in Section 9.1.1.4, restoration of the bulkhead would include installation of a slurry wall within the existing bulkhead line. In comparison to sheeting, slurry walls are considerably more impermeable. As such, once restored, minimal, if any, infiltration of river water into the bulkheaded areas and subsequent exfiltration of river water carrying COPCs from the bulkheaded area to the river environment is anticipated. This, along with hot spot removal, would prevent migration of COPCs in the bulkheaded historic fill and from the intertidal sediment within the bulkhead to the river environment.

In conclusion, COPC concentrations in the biological zone are declining in most areas and are expected to continue to decline in other areas once potential source areas are addressed and hot spot removal is conducted.

<u>Contaminant Concentrations in Biota are Near Cleanup Goals and Declining</u>

The FWIA indicated that all sediment sampling areas (i.e., upriver, intertidal and subtidal buildings, and subtidal adjacent to the Yard) exhibit concentrations of COPCs above referenced ecological screening levels. While a number of the subtidal samples exhibited COPCs at similar concentrations to the upriver samples, the intertidal and subtidal sediment located beneath and immediately adjacent to the buildings exhibited higher levels of COPCs than the upriver locations. However, due to the dynamic properties of the Hudson River (i.e., migratory nature of biota, tidal fluctuations, saltwater wedge, etc.), it is difficult to determine whether biota are being impacted by Site-related releases to sediment. In general, because of the small size of the Site relative to the home range of most species of fish and wildlife, exposure to Site-related releases to sediment would only be a fraction of their total exposure to COPCs. Sessile organisms (such as benthos) that could have a more consistent exposure to Site-related releases were not observed in the intertidal sediment area during the investigations, possibly as a result of poor habitat conditions beneath the Site buildings. Furthermore, the literature review of potential ecological effects resulting from the impacted sediment suggests that chemical form, location, and other factors may mitigate bioavailability and toxicity where COPC concentrations exceed referenced screening levels.

As discussed in Section 6.3, because sediment quality in the subtidal area adjacent to the Yard and the majority of sediment in the subtidal area adjacent to the buildings were consistent with upriver conditions, they are not areas of Site-related ecological impacts. In contrast, sediment in the intertidal area beneath the buildings, along with limited areas in the subtidal zone immediately adjacent to the building bulkhead, did exhibit concentrations of Site-related COPCs that present a potential ecological concern based on the Pathway and Criteria-Specific Analyses. Under this Alternative S2A, the majority of the intertidal sediment would be separated from the river environment through the restoration of the bulkhead. The remaining subtidal and intertidal Site-related impacted sediment would be subject to MNR following implementation of the other common actions (i.e., debris and hot spot removal and interior stormwater system cleaning).

Institutional Controls Effectively Restrict Human Exposure

Institutional controls can effectively restrict access to the COPCs in the Site-related impacted sediment. The Site-related impacted intertidal sediment would be isolated from human exposure through restoration and maintenance of the bulkhead and the presence of the building floor slabs. In addition, a SMP would be implemented at the Site to address potential direct contact risks posed to construction workers for work associated with Site-related impacted sediment. The Remedial Design would also address potential risks to construction workers during restoration of the former bulkhead. This is further discussed in the Common Action discussion provided in Section 9.1.1.4.

Natural Recovery Processes Have a High Degree of Certainty to Continue at Rates That Will Contain, Destroy or Reduce the Bioavailability or Toxicity of Contaminants within the Acceptable Timeframe

Limited, if any, biodegradation of COPCs is expected to occur for the Site-related impacted sediment and the COPCs in Area V sediment. Rather, it is anticipated that the COPC concentrations in the biologically active surface layer of the Site-related impacted subtidal sediment, intertidal sediment and Area V sediment in contact with the river would continue to improve over time as cleaner sediment is deposited. In addition, as discussed in Section 6.3, the COPCs in Site-related impacted sediment are expected to have limited potential ecological impacts due to their chemical form, location, and other factors that may mitigate bioavailability and toxicity of constituents that exceed the referenced screening levels and the Area V sediment does not pose site-related ecological concerns. Finally, bulkhead restoration would separate the majority of the Site-related impacted intertidal sediment from the river environment and thus, reduce the bioavailabilty of the COPCs to ecological receptors within a very short time frame. The time frame for sediment deposition would be evaluated using the baseline study information and the MNR monitoring.

<u>The Sediment Is Hydraulically Stable and Likely to Remain Stable</u>

Exposure to the majority of the Site-related impacted intertidal sediment would be controlled through restoration and continued maintenance of the bulkhead (Common Action C4) and removal of debris and hot spot sediment in the intertidal zone within the bulkhead (Common Action C8). As discussed in Section 9.1.1.4, restoration of the bulkhead would include installation of a slurry wall within the existing bulkhead line. In comparison to sheeting, slurry walls are considerably more impermeable. As such, once restored, minimal, if any, infiltration of river water into the bulkheaded areas and subsequent exfiltration of river water carrying COPCs from the bulkheaded area to the river environment is anticipated. This, along with hot spot removal, would prevent migration of COPCs in the bulkheaded historic fill and from the intertidal sediment within the bulkhead to the river environment.

The stability of the Site-related impacted sediment would be confirmed through baseline studies and MNR monitoring.

With performance of the MNR monitoring, Alternative S2A would be effective in the long term in preventing exposure to Site-related impacted sediment. The long-term effectiveness and permanence would be predicated on the results of the baseline and MNR monitoring results. Since COPCs would remain in the Site-related sediment at depth, this is not a permanent remedy.

Alternative S2B would be effective in the long term in preventing exposure Area V sediment. Because the Area V sediment quality is consistent with upriver sediment quality, this alternative would provide long-term effectiveness or permanence even if future sediment deposition is not demonstrated.

9.3.2.2.4 Reduction of Toxicity, Mobility or Volume

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility and volume of listed NYS hazardous waste and COPCs. As discussed above, the Site-related impacted sediment is not a NYS listed or characteristic hazardous waste once removed; however, some of the debris would be a RCRA characteristic hazardous waste for lead once removed.

The Common Actions associated with Alternative S2A would reduce the toxicity, mobility and volume of NYS characteristic hazardous waste through the removal of debris piles and would result in a reduction in toxicity, mobility and volume of COPCs through removal of debris, hot spots and sludge from the interior stormwater system. In addition, the remaining Site-related impacted intertidal sediment within the bulkhead and its COPCs would be separated from the river environment. None of the Site-related impacted sediment areas within the bulkhead would require soil/fill excavation (see Section 9.2 for Below Building soil/fill excavation requirements).

Under Alternative S2A, sediment deposition would reduce the mobility of COPCs in Site-related impacted subtidal sediment and Site-related intertidal sediment in contact with the river environment through burial with cleaner sediment in the bioavailable zone. As discussed above, under the No Action alternative, Area V sediment quality would continue to be consistent with upriver sediment quality. Thus, Area V sediment would be overlain by upriver sediment of similar quality under this alternative.

Because of the relative stability of PCBs and inorganic constituents in sediment, reduction in toxicity or volume is not expected for these chemicals due to natural degradation. Some limited degradation of SVOCs in sediment would be expected; however, this would not be significant. Based on the observed low solubility and low mobility of the PCBs, inorganic constituents and SVOCs in sediment, these chemicals are expected to remain in the sediment matrix barring disruptive storm events or nearby use of watercrafts.

Since biodegradation or transformation would not be a major process at the Site, MNR would not meet the CERCLA paragraph 121 (b) (1) preference for treatment. Consequently, on-going review would be necessary.

9.3.2.2.5 Short-Term Effectiveness

Under Alternatives S2A and S2B, intrusive work would be experienced during baseline sampling, MNR monitoring bulkhead restoration (S2A only), debris and hot spot removal (S2A only) and interior stormwater system cleaning (S2A only). Potential short-term impacts during these activities would be managed through the implementation of the HASP for these activities.

9.3.2.2.6 *Implementability*

Execution of the baseline studies and Common Actions C2 and C5 are readily implementable. Implementation of Common ActionC8 would pose difficulties due to the location of the debris piles and hot spots beneath the Site buildings. These debris piles and hot spots would be removed by divers or by accessing the areas through access points in the floor slab. As discussed in Section 9.2, the ease of implementing Common Action C4 would be a function of the location of the bulkhead line. Restoration of the bulkhead in areas on the outer limits of the buildings is more implementable than restoration of the bulkhead farther beneath the building (i.e., Building Nos. 7 and 9). Although, the concrete slab would be removed in Building Nos. 7 and 7A under Alternatives I2, I3 and I4, restoration of the bulkhead in this portion of the Site would still be difficult. Bulkhead restoration would also require significant permitting. Since the docking in the vicinity of Building Nos. 7 and 7A cannot support vehicular traffic, all work would need to be conducted from barges.

Monitored natural recovery is considered to be implementable, both technically and administratively. As discussed above, MNR is most appropriate for areas where, based on existing data, natural sedimentation and other processes have been observed or are strongly expected to reduce exposure concentrations, and where there are no predicted adverse impacts on potential human or ecological receptors. Natural recovery that depends primarily on sediment burial would not be appropriate in the navigation channel of the river or future navigation channels. Neither Site-related impacted sediment nor Area V sediment is located within the navigation channel. However, it is unknown whether future use of the Site would include watercraft access to the Site buildings. This potential future access could be addressed by use restrictions for these areas.

In summary, the implementability concerns associated with Alternative S2A are limited to those associated with the Common Actions. They are:

- The need to conduct removal of debris from under the buildings and decking with limited overhead access; and
- Restoration of the bulkhead beneath the Site buildings in areas with limited accessibility and overhead clearance.

There are no implementability concerns associated with Alternative S2B.

9.3.2.2.7 Cost

The capital cost of Alternative S2A is estimated to be $346,500. The net present value of the O&M cost of this alternative is estimated to be $785,200. The components of capital and O&M costs are provided in Table Q-1A of Appendix Q. The total net present value of Alternative S2A is estimated to be $1,131,666. These cost include the cost for Common Action C8. The costs for Common Actions C2 and C4 are included in the soil/fill alternatives (see Section 9.2) and the cost for Common Action C5 is included in the interior building material alternatives (see Section 9.4).

The capital cost of Alternative S2B is estimated to be $138,600. The net present value of the O&M cost of this alternative is estimated to be $557,121. The components of capital and O&M costs are provided in Table Q-1B of Appendix Q. The total net present value of Alternative S2B is estimated to be $695,721. These costs do not include the cost for Common Actions.

9.3.3 ALTERNATIVE S3: SEDIMENT REMOVAL

9.3.3.1 Description

Alternative S3A involves removal of the Site-related impacted sediment and Alternative S3B involves the removal of Area V sediment. These alternatives would include Tasks 1 through 6. In addition, Alternative S3A would incorporate the following Common Actions associated with Site-related impacted sediment discussed in Section 9.1:

- RD/RA Studies and Permitting (Task No. 1)
- Site Preparation (Task No. 2)
- Sediment Removal (Task No. 3)
- Dewatering, Construction Fluids Treatment and Discharge (Task No. 4)
- Off-Site Disposal of Removed Sediment (Task No. 5)
- Backfilling of Dredged Areas (Task No. 6)
- Preparation and Implementation of a SMP (Common Action C2)
- Bulkhead Restoration Beneath Site Buildings (Common Action C4)
- Removal of the Interior Stormwater System (Common Action C5)
- Debris Removal Beneath the Site Buildings and Hot Spot Sediment Removal within the Building No. 8 Bulkhead (Common Action C8)

Descriptions of the Common Actions considered for this alternative (i.e., Common Actions C2, C4, C5 and C8) were provided in Sections 9.1.1.2, 9.1.1.4, 9.1.1.5 and 9.1.1.8, respectively. Evaluation of these Common Actions is included along with the other tasks of this Alternative S3A. As discussed above, Common Action C4 would separate Site-related impacted intertidal sediment located within the bulkhead from the river environment. As such, this material would not be subject to dredging. The dredging tasks under Alternative S3A would apply to the remaining approximately 1,896 cy of Site-related impacted Area IV intertidal sediment that is beyond the bulkhead and approximately 1,389 cy of Site-related impacted subtidal sediment in Areas I, II and III. The dredging tasks under Alternative S3B would apply to the approximately 1,327 cy of Area V sediment.

As previously discussed, the intertidal sediment areas and a portion of the subtidal sediment areas are located beneath Site buildings or decking. Under current conditions, approximately 80% of the Site-related impacted sediment identified for removal is located beneath Site buildings or decking. Approximately 11% of the Site-related impacted sediment is located beneath the West Warehouse. Therefore, if Alternative E3 or E4 is selected and the West Warehouse is removed, approximately 66% of the sediment identified for removal would still be located beneath Site buildings or decking. A portion of this sediment would be accessible if Alternative I2, I3 or I4 is selected.

9.3.3.1.1 Task No. 1: RD/RA Studies and Permitting

Additional Site-specific information, discussed below, would be collected during the RD/RA process to implement either Alternative S3A or S3B. Some of this information would be collected during the RD phase and some would be collected during the implementation of the alternatives. In addition to this work, permitting must be secured prior to conducting the dredging activities.

As discussed in Section 7.2.4.3, the areal extent of Site-related impacted sediment in Area I and the vertical extent of Site-related impacted sediment beneath Building Nos. 7 and 9 and the West Warehouse (Building No. 19W) is not known at this time. The depth of sediment samples beneath Building Nos. 7 and 9 and the West Warehouse (Building No. 19W) was limited due to overhead clearance. As a result deeper samples could not be collected. NYSDEC agreed that vertical delineation in these areas and the horizontal delineation in Area I would be determined during the remedial action (ERM, 2003d). Using this information, the sediment quantities assumed for Alternative S3A would be confirmed. It should be noted that the vertical delineation sampling would not increase the intertidal sediment removal quantities identified for Alternative S3A since a maximum sediment depth of two (2) feet has already been assumed. In lieu of collecting these additional vertical samples, the maximum value of two (2) feet may be assumed. The horizontal extent of Site-related impacted sediment in Area I was based on the observed distribution of impacted sediment around other outfall locations. This sediment volume could change.

Under Alternative S3B, additional delineation sampling may also be conducted for Area V to refine the horizontal dredging limits in this area. This pre-design sampling would be conducted in lieu of collecting post-dredging confirmation samples. As a result of this potential pre-design sampling, the Area V sediment horizontal limits may be extended to these "clean" samples and the sediment volume could change. Similar to Alternative S3A, the vertical delineation sampling would not increase the overall depth of Area V sediment removal identified for Alternative S3B since a maximum sediment depth of two (2) feet has already been assumed. In lieu of collecting these additional vertical samples, the maximum value of two (2) feet may be assumed.

Existing information indicates that the buildings and decking that overly the site-related impacted sediment areas to be dredged are constructed on pilings installed into bedrock. Given the condition of some of these pilings, removal of sediment around them may pose structural concerns. Under Alternative S3A, the potential for this to occur would be further evaluated during the RD.

As discussed above, the majority of the Site-related sediment to be removed is located beneath Site buildings and decking. The numerous pilings, cross members, and overhead clearance limitations, which would complicate the removal of sediment, must be taken into consideration during the RD. Existing information regarding the location of these subdeck structures, along with Site-specific river conditions in these areas would be used to finalize the sediment dredging technique. Due to the poor access conditions, it is anticipated that labor-intensive dredging techniques would be implemented for Alternative S3A. As noted above in Section 9.3, these access concerns would still exist even if Alternative I4, Building Demolition, is implemented.

Prior to implementation of the RA, a bathymetry survey would be conducted for both Alternatives S3A and S3B. This survey would provide a baseline for determining dredging depths and allow for design of operational parameters such as location of barges, and finalization of the dredging method(s). A tide and float (i.e., current) survey would be conducted to select the sediment control method (e.g., silt curtain) and to determine the optimum location of the sediment control measures. The bathymetry survey and tide and float survey would be conducted after bulkhead restoration since the bulkhead restoration may have an impact on some of these parameters.

Given the limited area of impacted sediment at the Site compared to the entire river, dredging activities under either Alternative S3A or S3B are not expected to have potentially destructive effects on benthos and benthic habitat on the river as a whole. Since, the areas to be dredged are typical of a continuous portion of the Hudson River, the surrounding areas are expected to allow the benthos and benthic habitat of the dredged areas to naturally return to their original conditions over time. This can be accelerated by the return of backfill materials similar in nature to removed sediments. Alternatives S3A and S3B both assume that 100% of the dredged sediments would be replaced with suitable backfill. Based on these assumptions, habitat studies would not be warranted under this alternative.

As discussed in Section 9.3, the sediments to be excavated under either Alternative S3A or S3B would be classified as non-hazardous waste. During pre-design, a treatability study would be conducted to determine the expected water content of sediments, optimal handling, dewatering requirements and dewatering techniques to allow off-Site disposal. Should Alternative E3 or E4 be selected, the system used to treat the construction fluids generated during this remedial alternative could also be used to treat the dewatering liquids from the sediment dredging.

To execute the dredging activities and remove impacted sediments, a number of permits would need to be obtained. A permit under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) may be required. Under this program, a permit would be needed for any structure or work that affects the course, capacity, or condition of a navigable water of the United States. This permit program is managed by the Army Corps of Engineers (ACOE) under 33 CFR Parts 320-330 (Regulatory Programs of the Corps of Engineers). Dredging, construction of silt curtains and mooring of vessels associated with the sediment removal would likely require a Section 10 permit. Permits issued under the authority of Section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act (see below) are typically handled concurrently by ACOE district offices. The ACOE coordinates Section 10 permits with the U.S. Coast Guard, which issues a notice to navigation of when and where the construction activities would take place. An Article 15 permit or its equivalent would also be needed.

Since the Site falls within a designated significant coastal fish and wildlife habitat, sediment remedial activities must be consistent to the maximum extent practicable with the State plan developed under the Coastal Zone Management (CZM) Act of 1972 (16 U.S.C. section 1455b et. seq.). Activities associated with a sediment dredging would likely require a CZM consistency determination by the State to determine whether it is consistent with their approved CZM plan. A submittal would be made to the State documenting the manner in which the proposed actions are consistent with the CZM plan.

Additional regulatory approvals that may be needed include: State Environmental Quality Review Act (SEQRA) (NYSDEC), Wildlife (U.S. Fish and Wildlife Service), zoning ordinances (Town and County), riparian authorities, right-of-way restrictions (Town, County, and State) and floodplain/floodway construction restrictions (Town).

9.3.3.1.2 Task No. 2: Site Preparation

This task would include: mobilization of equipment to the Site; set up of the decontamination and dewatering area; provision of temporary facilities and utilities, as needed; and construction of sediment transfer station in the Yard. This task would require one to four (4) months to complete depending on whether the sediment is dewatered on-Site or barged to an offsite handling location.

A silt curtain would be installed prior to sediment removal. River velocities up to 4 feet/sec were measured adjacent to the Harbor at Hastings site (Earth Tech, 2003). More robust curtain systems are needed at river velocities greater than 2 to 3 feet/sec. Depending on the Site-specific readings collected during the RD/RA studies, it may be determined that a robust system would be needed at this Site.

Installation of the silt curtains would first require installation of curtain anchor points. The points would need to have sufficient holding power to retain the curtain under the existing flow conditions before the furled curtain is deployed into the water. Anchor buoys would be employed on all anchors to prevent the current from submerging the anchor points. Since the flow adjacent to the Site is tidal, anchors would be provided on both sides of the curtains to minimize curtain movement during tidal current reversals and to prevent the curtain from overrunning the anchors and pulling them out when the tide reverses.

When the anchors are secure, the furled curtain would be secured to the upstream anchor point and then sequentially attached to each next downstream anchor point until the entire curtain is in position. At this point, and before unfurling, the "lay" of the curtain would be assessed and any necessary adjustments made to the anchors. Finally, when the location is ascertained to be as desired the furling lines would be cut to allow the curtain to drop. Since currents are expected to exist in both an upstream and downstream direction, the silt anchor controls discussed would have to be position for both directions. Once baseline studies of currents and bottom profiles are completed, a complete engineering design of the silt curtain installation would be conducted by taking these factors into consideration.

Under this task, materials handling equipment would be mobilized to the Site. As discussed in the following task, considerable materials handling equipment would be needed under this alternative.

9.3.3.1.3 Task No. 3: Sediment Removal

Because of the presence of overhead structures (i.e., decking and Site buildings), hydraulic dredging was assumed for removal of all site-related impacted sediment associated Alternative S3A. This methodology has also been assumed for purposes of the FS report for the Area V sediment. The following text relates to the difficulties associated with removal of the Site-related impacted sediment.

Of the various hydraulic systems, the conventional cutterhead suction dredge method would normally be considered; however, conventional equipment is usually sized and directed by large surface operations. Application of this technology may be challenging since consistently deep water (at least 6 to 8 feet) and large open areas are needed. Although there are challenges to using this technique, this technique has more flexibility than other technologies for removal of sediment below Buildings and decking. The final sediment removal methods would be refined during the RD.

The two principal operating components of a cutterhead suction dredge are: a leading suction pipe with an attached cutting head; and an onboard slurry pump. The pump hydraulically entrains river sediments that have been loosened by action of the cutterhead and discharges the resultant slurry (water and sediment) into a length of trailing pipe. Using a boom or ladder, the inlet or suction pipe and cutterhead can be extended sufficiently beyond the leading edge of the dredge to reach targeted materials. The slurry pump is sized to meet project productivity requirements and to convey slurried sediments to a processing facility. The entire assembly of suction piping and slurry pump is mounted on a barge that allows the dredging system to be towed to and maneuvered within a particular work area.

Because of the restricted conditions of the areas to be dredged a small, 6-inch suction line and a 1,000-gallon main pump has been assumed. The dredge unit could be mounted on a barge that can operate in shallower depths of 2.5- to 3-foot. The dredging unit advances by raising and lowering spuds located at the rear of the hull and swings by pulling on anchors positioned off to either side of the hull. Sediment can be removed beneath the decking and the Site buildings from the position of the dredge through extension of a boom, installation of rigging beneath structures and providing diver-assistance. Based on the presence of support pilings and cross bracing, the dredging unit would most likely need to be repositioned frequently and some areas would be inaccessible to this approach and require alternate methods.

During operation, the hydraulic dredge discharges the sediment slurry into a larger diameter, high-density polyethylene (HDPE) pipeline. The length of the pipeline depends on the distance from the dredge to the location where the sediment slurry would be processed. The slurry pipeline is configured in three principal sections. The first pipeline section would float immediately behind the dredge on a system of pontoons to enable repositioning of the dredge. The second pipeline section would be submerged. Lastly, the slurry line would emerge from the river and run to the Yard for sediment slurry processing.

The removal of the majority of the Site-related impacted subtidal and intertidal sediment located beneath Site buildings and beyond the bulkhead would require frequent manual surveying and lead line depth positioning to be conducted. This would result in less exact positioning and baseline measurements of the hydraulic dredging system so that the work would be performed less efficiently and precisely and result in increased dredging costs. The amount of materials accessible from the main waterway can be removed with the aid of electronic positioning equipment, and, thus, with much greater precision and efficiencies.

Under Alternative S3A, a total of 3,285 cy of Site-related impacted intertidal and subtidal sediment would be removed. For cost estimation purposes, 20% contingency factor was assumed. This results in total Alternative S3A sediment volume of 3,940 cy.

Under Alternative S3B, a total of 1,327 cy of Area V sediment would be removed. For cost estimation purposes, 20% contingency factor was assumed. This results in total Alternative S3B sediment volume of 1,593 cy.

During the design, the dredging rates and sediment treatment rates would be matched to the available size of the staging and dewatering areas. Additional discussion regarding staging and dewatering is provided in the following task.

Dust generation during sediment removal activities is not anticipated due to the high moisture content of the materials being handled under this alternative. However, dust may be generated during the addition of absorptive agents to reduce water content. It has been assumed that the dust monitoring conducted under the soil/fill alternative could be expanded to address dust monitoring needed during the sediment remedial action.

Under each alternative, this task would take two weeks to one month to complete.

9.3.3.1.4 Task No. 4: Dewatering, Construction Fluids Treatment and Discharge

Sediment would be stored, dewatered and treated in the Yard. Since the majority of the soil/fill alternatives and interior building material alternatives under consideration would involve or otherwise utilize the Yard, this task would need to be coordinated with the selected alternatives for the soil/fill.

If hydraulic dredging were conducted, the incoming slurry would likely have a water content of approximately 80% by weight. The dredged sediment would undergo three principal stages of processing: primary coarse solids separation; fine solids sedimentation and dewatering; and water treatment. In addition, depending on overall system efficiency, it may be necessary to stabilize the free liquids in the dewatered fine material prior to shipping, whereas the separated coarse solids may not need additional dewatering through the addition if absorptive agents. The production rates required for shipping may dictate more intensive treatment to eliminate the need for longer, on-Site storage of materials as determined during the remedial design.

For the purposes of the FS, it is estimated that settled solids would be dewatered using belt presses and that a 10% concrete stabilizer would be added to remove the free liquids. The remaining slurry stream would be discharged to a series of tanks wherein flocculants or polymers would be added to enhance coagulation and sedimentation. The supernatant would be pumped to a construction liquids treatment system that includes a series of settling and filtration units. The treatment system would include primarily filtration and polishing by granular activated carbon adsorption media. For cost estimation purposes, it is assumed that the treated water would be discharged to the river under a SPDES permit (see Section

9.2.3.1.4 and 9.2.4.1.4 for additional discussion regarding construction fluids treatment and discharge assumed for the soil/fill alternatives).

For cost estimation purposes, it was assumed that the addition of a stabilization agent would increase the in-situ volume of sediment by approximately 20%. Under this Alternative S3A, approximately 3,942 bulk cubic yards of sediment would be generated and transported off-Site for disposal and under Alternative S3B, approximately 1,593 bulk cubic yards of sediment would be generated and transported off-Site for disposal.

This task would be completed concurrently with Task No. 4.

9.3.3.1.5 *Task No. 5: Transportation and Off-site Disposal of Removed Sediment*

Under this task, the remediation-derived waste would be transported and disposed of off-site. Remediation derived waste would include:

- Dredged sediment; and
- Spent carbon and filters from construction liquid treatment.

Dewatered sediments would be transported to an off-Site disposal facility. For cost estimation purposes, it was assumed that one (1) waste characterization sample would be collected for every 750 cy of dewatered sediment. This information would be used to verify the disposal requirements for the dredged sediment and spent treatment media. For cost estimation purposes, it has been assumed that both media are classified as RCRA non-hazardous wastes.

To determine the weight of the materials to be disposed, a density of 1.5 tons/cy was assumed for the dewatered sediment. For cost estimation purposes, it has been assumed that the dewatered sediment would be loaded into dump trucks. Assuming a truck capacity of 25 cys and an average of 20 trucks per day leaving the facility, it would take approximately one week to transport the dredged material generated under Alternative S3A off-Site for disposal and less than one week to transport the dredged material generated under Alternative S3B off-Site for disposal . However, the duration of this task may be expanded due to materials handling constraints.

9.3.3.1.6 *Task No. 6: Backfilling of Dredged Areas*

After sediment removal, the dredged areas would be backfilled to restore pre-remedial topography of the river bottom. Backfill material would consist of material that is consistent with the particle size distribution of the sediment removed. Grain size analysis for the RI sediment samples is provided in Appendix C. A bathymetric survey would be conducted to confirm proper restoration of the river bottom.

9.3.3.2 ***Evaluation***

9.3.3.2.1 *Overall Protection of Human Health and the Environment*

Alternative S3A would provide adequate protection of human health and the environment for the Site-related impacted sediment. Protection of human health and the environment would be achieved through:

- separation of the majority of the Site-related impacted intertidal sediment from the river environment;
- removal of the remaining Site-related impacted intertidal and subtidal sediment;
- prevention of direct contact with Area IV intertidal sediment behind the bulkhead through restoration and maintenance of bulkhead via Common Action C4, the presence of the existing building floors and implementation of the SMP via Common Action C2; and

- removal of debris piles and hot spot areas within the bulkhead and sludge from the interior stormwater system via implementation of Common Action C8 and C5.

Alternative S3B would provide adequate protection of human health and the environment for the Area V sediment. Protection of human health and the environment would be achieved through removal of the Area V sediment. However, it should be noted that even if the Area V sediment was not removed, the Area V sediment does not pose site-related ecological impacts.

9.3.3.2.2 Compliance with SCGs

A summary of the applicable SCGs for this alternative is presented in Table 9-5. As shown in this table, Alternatives S3A and S3B would comply with the location, chemical and action specific SCGs.

Alternatives S3A and S3B would:

- comply with 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to the public health and the environment;
- address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law;
- remove "consequential" amounts of hazardous waste (6 NYCRR Part 375) through implementation of Common Action C8 (not applicable for Alternative S3B);
- comply with the applicable chemical specific sediment SCGs for the Site-related impacted sediment outside of the bulkhead (i.e., NYSDEC sediment screening criteria, TSCA) {Note: This SCG would not be applicable to the Site-related impacted sediment located behind the bulkhead, which is separated from the river environment. In addition, the NYSDEC sediment screening criteria would not be applicable for chemicals that have a higher upriver concentration than the criteria.} (not applicable for Alternative S3B);

- comply with the applicable chemical specific soil/fill SCGs for the Site-related impacted sediment behind the bulkhead, which is separated from the river environment (i.e., TAGM 4046 RSCOs, TSCA) (not applicable for Alternative S3B); and
- comply with the applicable chemical specific SCGs related to protection of surface water bodies for the Site-related impacted sediment outside of the bulkhead {Note: This SCG would not be applicable to the Site-related impacted sediment located behind the bulkhead, which is separated from the river environment}.

9.3.3.2.3 Long-Term Effectiveness and Permanence

This alternative would be effective in the long term and is a permanent remedy. Through sediment removal, Alternative S3A would eliminate the potential for exposure to the majority of the Site-related impacted sediment outside of the bulkhead and Alternative S3B would eliminate the potential for exposure to chemicals in the Area V sediment. However, this area would be covered with sediment of similar quality as the Area V sediment. However, because of the technological limitations of the dredging technologies and the re-deposition of sediment that was suspended during dredging, some residual Site-related impacted sediment would remain after remediation has been completed. The presence of pilings, and other shoreline structures would also interfere with the complete removal of all Site-related impacted sediment. The potential for residual impacted surficial sediment and the associated degree of risk should be considered during the RD, particularly with respect to achieving remedial goals via dredging and verification requirements. However, it is anticipated that the residual Site-related impacted sediment would be addressed through continual sediment deposition.

With regard to the intertidal sediment behind the bulkhead, restoration and continued maintenance of the bulkhead (Common Action C4), the presence of the concrete slabs and implementation of the SMP (Common Action C2) would prevent human exposure to this sediment in the long term. In addition, Common Actions C8 and C5 would eliminate potential sources of COPCs to sediment.

As discussed in Section 9.1.1.4, restoration of the bulkhead would include installation of a slurry wall within the existing bulkhead line. In comparison to sheeting, slurry walls are considerably more impermeable. As such, once restored, minimal, if any, infiltration of river water into the bulkheaded areas and subsequent exfiltration of river water carrying COPCs from the bulkheaded area to the river environment is anticipated. This, along with hot spot removal, would prevent migration of COPCs in the bulkheaded historic fill and from the intertidal sediment within the bulkhead to the river environment.

As previously discussed, Area V sediment is consistent with upriver sediment quality. This alternative, which includes removal of non-Site related sediment, would provide long-term effectiveness or permanence. There are no current sources of contaminants to Area V sediment. A future potential source of contaminants to the Area V sediment is erosion of soil/fill from the South Yard. This potential future source of contaminants was to be addressed through stabilization of the South Yard erosion controls in September 2004.

9.3.3.2.4 *Reduction of Toxicity, Mobility or Volume*

As discussed in Section 9.0, this criterion would evaluate changes in the toxicity, mobility and volume of NYS listed and potential characteristic hazardous waste and COPCs. As discussed above, the Site-related sediment is not a hazardous waste; however, some of the debris would be a RCRA characteristic hazardous waste for lead once removed.

The Common Actions associated with Alternative S3A would reduce the toxicity, mobility and volume of hazardous waste through the removal of debris piles and would result in a reduction in toxicity, mobility and volume of COPCs through removal of debris, hot spots and sludge from the interior stormwater system. In addition, Site-related impacted intertidal sediment within the bulkhead and its COPCs would not be mobile to the river environment. None of the Site-related impacted sediment areas within the bulkhead would require soil/fill excavation (see Section 9.2 for Below Building soil/fill excavation requirements). Under Alternative S3A, sediment removal would reduce the volume and mobility of COPCs in the Site-related impacted subtidal sediment and intertidal sediment beneath Building Nos. 7, 9 and the West Warehouse (Building No. 19W). Under Alternative S3B, sediment removal would reduce the volume and mobility of chemicals present in the Area V sediment. However, it should it should be noted that the Area V sediment being removed is consistent with the upriver sediment quality and under future deposition, sediment of similar quality will be deposited in this area.

Both alternatives would be considered to be a permanent remedy.

9.3.3.2.5 Short-Term Effectiveness

Alternative S3A and S3B would each take one to four months to complete. This time estimate is highly variable and is dependent upon the method of dredging and the size of treatment equipment that can be utilized on-Site.

Under Alternative S3A, intrusive work would include RD/RA sampling efforts, sediment dredging, bulkhead restoration, debris pile and hot spot removal and interior stormwater system cleaning. Under Alternative S3B, intrusive work would include RD/RA sampling efforts and sediment dredging.

Under either alternative, potential short-term impacts during these activities would be managed through the implementation of the HASP. More significant short-term impacts would be posed during the sediment dredging and materials handling activities.

Because of the physical impacts of sediment removal, siltation, sedimentation and turbidity on the living resources in the river water, studies have indicated that dredging can be more damaging to the river ecosystem than the impacts posed by the chemicals in the sediment. In the absence of sediment removal, these COPCs in the Site-related sediment and Area V are relatively stable, barring severe storm and hurricane movement of the sediments. Potential impacts associated with sediment re-suspension during disruptive sediment actions can be mitigated to some extent by silt curtains, etc.

Given the moisture content of the sediment to be removed, dust inhalation would not be of concern during sediment removal activities. However, dust may be generated during the addition of absorptive agents to reduce water content. It has been assumed that the dust monitoring conducted under the soil/fill alternative could be expanded to address dust monitoring needed during the sediment remedial action. Workers would also wear protective clothing to address direct contact risks.

Potential short-term risks to the community would be posed by Alternatives S3A and S3B from transportation of dredged sediment to off-Site landfill disposal facilities. Potential exposure of spilled material to the community and the environment along the transportation route, as well as automotive related injuries and increased emissions from trucks would be potential concerns. Because approximately 173 truckloads and 70 truckloads would be required to transport dredged sediment to an off-Site landfill disposal facility for Alternatives S3A and S3B, respectively; there would be considerable potential short-term risks associated with the transportation of these materials from the Site to an off-Site landfill under both sediment removal alternatives. Barge transport of these materials may be considered during the RD.

9.3.3.2.6 Implementability

Execution of the baseline studies and Common Actions C2 and C5 are readily implementable. Implementation of Common Action C8 would pose difficulties due to the location of the debris piles beneath the Site buildings. These debris piles would be removed by divers or by accessing the areas through access points in the floor slab. As discussed in Section 9.2, the ease of implementing Common Action C4 would be a function of the location of the bulkhead line. Restoration of the bulkhead in areas on the outer limits of the buildings is more implementable than restoration of the bulkhead farther beneath the Site buildings (i.e., Building Nos. 7 and 9). Although the concrete slabs would be removed in Building Nos. 7 and 7A under Alternatives I2, I3 and I4, restoration of the bulkhead in this portion of the Site would still be difficult. Bulkhead restoration would also require significant permitting. Since the docking in the vicinity of Building Nos. 7 and 7A cannot support vehicular traffic, all work would need to be conducted from barges.

Dredging technologies are conventional systems and are readily available. Based on the location of the Site-related impacted sediment, landside access to sediments to be removed would be severely limited. In addition, dredging in areas with low overhead clearance is more difficult. Since a large percentage of Area II and III are beneath docks and/or Site buildings, dredging would be more difficult in these areas. In addition, dredging in portions of the sediment areas that are farther under the buildings would still be more difficult to implement. Due to its location, dredging of the Area V sediment would be less difficult to implement.

The implementability of sediment dredging beneath the West Warehouse (Building No. 19W) would be dependent upon which soil/fill alternative is chosen. If Alternative E3 or E4 is selected, the East and West Warehouses (Building Nos. 19E and 19W) would be demolished and their slab removed. Sediment dredging would therefore be less difficult to implement if either Alternative E3 or E4 is selected. If Alternative E1 or E2 were selected, dredging would have to occur with the building still in place. This would result in more time consuming, manual, costly sediment removal. Although difficult, this removal would be possible. If Alternative I2, I3 or I4 were selected, the concrete slabs in Building No. 7 and 7A would be removed. This would allow access to the Site-related impacted intertidal sediment located beneath Building Nos. 7 and 7A and some access to the Site-related impacted sediment located beneath Building No. 9. These are older buildings and as such have numerous pilings and other obstructions that would make complete sediment removal beneath these Site buildings extremely difficult to achieve effectively with conventional means. In conclusion, significant river-based operations and custom, Site-specific sediment removal methods may still be required for Alternative S3A.

Sediment handling would be implementable. Equipment would need to be mobilized to the Site to adequately dewater the sediment prior to off-Site disposal. In addition, treatment equipment and a SPDES permit would be needed for the liquids removed from the sediment. If Alternative E3 or E4 were selected, the treatment equipment mobilized to the Site for the soil/fill dewatering liquids could be designed to also handle the sediment dewatering liquids. If Alternative E1 or E2 were chosen, a treatment system and SPDES permit would need to be obtained for just the sediment dewatering fluids. Alternately, the sediment slurry could be pumped into a barge and transported to an off-Site facility that could manage this material. This latter option would be evaluated during the RD. Finally, sediment dredging would require numerous permits.

In conclusion, Alternatives S3A and S3B have significant implementability concerns. They include:

- Complex coordination with selected soil/fill and interior building materials alternatives (less so for Alternative S3B);
- The need to conduct removal of sediment and debris from under the buildings and decking with limited overhead access – this would be mitigated to some extent through the removal of Building No. 7 and 7A floor slabs if either Alternatives I2, I3 and I4 is selected (not applicable for Alternative S3B);
- Extensive permitting for dredging and discharge of treated dewatering fluids;
- Installation of silt curtains in rapid river currents;
- Installation and operation of dewatering equipment;
- Manual measurements beneath buildings and decking leading to imprecise dredging (not applicable for Alternative S3B); and
- Restoration of the bulkhead beneath the Site buildings in areas with limited accessibility and overhead clearance (not applicable for Alternative S3B).

9.3.3.2.7 Cost

The capital cost and total net present value of Alternative S3A is estimated to be $2,964,617. There are no O&M costs associated with this alternative. The components of capital costs are provided in Table Q-3A of Appendix Q. These costs include the cost for Common Action C8. The costs for Common Actions C2 and C4 are included in the soil/fill alternatives (see Section 9.2) and the costs for Common Action C5 are included in the interior building material alternatives (see Section 9.4).

The capital cost and total net present value of Alternative S3B is estimated to be $857,615. There are no O&M costs associated with this alternative. The components of capital costs are provided in Table Q-3B of Appendix Q. These costs do not include any Common Action costs.

9.3.4 ALTERNATIVE S4: SEDIMENT CAPPING (WITH LIMITED DREDGING)

9.3.4.1 Description

In-situ capping (ISC) is an active remediation option in which a layer of clean isolating material is placed over the sediment to contain and stabilize the COPCs in Site-related sediment. Inert materials used for capping include clay, silt, sand, geosynthetic clay liners (GLC), geomembranes, and AquaBlok™. As discussed in Section 8.1.1.2, use of AquaBlok™ or an equivalent capping material would be assumed for this alternative. Final selection of capping materials would be dependent on RD/RA studies.

Alternative S4A involves the capping (or removal) of the Site-related impacted sediment and Alternative S4B involves the capping of Area V sediment. Both alternatives would include the Tasks 1 through 4. In addition, Alternative S4A would incorporate the following Common Actions associated with Site-related sediment discussed in Section 9.1:

- RD/RA Studies and Permitting (Task No. 1)
- Site Preparation (Task No. 2)
- Capping and Limited Dredging (Task No. 3)
- Post-Capping Monitoring (Task No. 4)
- Preparation and Implementation of a SMP (Common Action C2)

- Bulkhead Restoration Beneath Site Buildings (Common Action C4)
- Removal of the Interior Stormwater System (Common Action C5)
- Debris Removal Beneath the Site Buildings and Hot Spot Sediment Removal within the Building No. 8 Bulkhead (Common Action C8)

Descriptions of the common actions considered for this alternative (i.e., Common Actions C2, C4, C5 and C8) were provided in Sections 9.1.1.2, 9.1.1.4, 9.1.1.5 and 9.1.1.8, respectively. Evaluation of these common actions is included along with the other tasks of Alternative S4A. Restoration of the bulkhead (i.e., Common Action C4) and its maintenance would separate Site-related impacted intertidal sediment located behind the bulkhead from the river environment. As such, this material would not be subject to capping.

Site-related impacted intertidal Area IV sediment exists beneath Building Nos. 7 and 9 and the West Warehouse (Building No. 19W) beyond the bulkhead line. If a cap were to be installed over this intertidal sediment, a sufficient amount of sediment would need to be removed from these areas to ensure that the areas covered are still submerged for some portion of the day to maintain integrity of the cap. This could amount to up to 12-inches of sediment removal. In addition, the cap would need to be installed around numerous pilings and other below deck structures. Finally, because of the pilings, cross members, and overhead clearance limitations, ensuring installation of a sufficiently thick cap would be difficult. To avoid these issues, Alternative S4A assumes that the sediment beneath Building Nos. 7 and 9 and the West Warehouse (Building No. 19W) would be removed via dredging.

Under Alternative S4B, all of the Area V sediment would be capped. However, due to Area V's proximity to the shoreline and the potential to raise the sediment surface above the low water line at this location, sediment topography would need to be maintained in this area. Consequently, 12-inches of sediment would need to be removed prior to capping in this area.

Under Alternative S4A, approximately 21,510 sf of Site-related impacted subtidal sediment would be capped and approximately 1,896 cys of Site-related impacted intertidal sediment would be removed. Under Alternative S4B, approximately 17,920 sf of Area V sediment would be capped and approximately 796 cys of Area V sediment would be removed prior to capping.

As previously discussed, the intertidal sediment areas and a portion of the Site-related impacted subtidal sediment areas are located beneath Site buildings or decking. Under current conditions, 54% of the Site-related impacted subtidal sediment areas to be capped are located beneath Site buildings or decking and 100% of the intertidal sediment areas identified for removal are located beneath Site buildings or decking. If Alternative E3 or E4 is selected and the West Warehouse is removed, approximately 77% of the sediment identified for removal under Alternative S4A would still be located beneath Site buildings or decking. A portion of this sediment would be accessible if Alternative I2, I3 or I4 is selected

9.3.4.1.1 *Task No. 1: RD/RA Studies and Permitting*

Additional Site-specific information would be collected during the RD/RA process to implement either Alternative S4A or S4B. Some of this information would be collected during the RD phase and some would be collected during the implementation of the alternative. In addition, permitting would be secured prior to conducting the dredging and capping activities associated with these alternatives.

As discussed in Section 7.2.4.3, the areal extent of Site-related impacted sediment in Area I and the vertical extent of Site-related impacted sediment beneath Building Nos. 7 and 9 and the West Warehouse (Building No. 19W) is not known at this time. The depth of sediment samples beneath Building Nos. 7 and 9 and the West Warehouse (Building No. 19W) was limited due to overhead clearance. As a result, samples could not be collected. NYSDEC agreed that vertical delineation in these areas and the horizontal delineation in Area I would be determined during the RD/RA (ERM, 2003d). Using the vertical delineation samples, the sediment quantities assumed for removal under Alternative S4A would be confirmed. It should be noted that the vertical delineation sampling would not increase the intertidal sediment removal quantities identified in Alternative S4A since a maximum sediment depth of two (2) feet has already been assumed. In lieu of collecting these additional vertical samples, the maximum value of two (2) feet may be assumed. The horizontal extent of sediment in Area I was based on the observed distribution of impacted sediment around other outfall locations. The actual horizontal extent of the impacted sediment in this area would be needed prior to installation of the capping materials.

Under Alternative S4B, additional delineation sampling may also be conducted for Area V to refine the horizontal capping limits in this area. As a result of this potential pre-design sampling, the Area V sediment horizontal capping limits may be extended to these “clean” samples and the sediment area to be capped could change.

Existing information indicates that the buildings and decking that overly the sediment areas to be dredged are constructed on pilings installed into bedrock. Given the condition of some of these pilings, removal of sediment around them may pose structural concerns. The potential for subsidence to occur under Alternative S4A would be further evaluated during the RD.

As discussed above, a portion of the sediment to be removed and a portion of the sediment to be capped is located beneath Site buildings and decking. The numerous pilings, cross members, and overhead clearance limitations, which would complicate the removal of Alternative S4A sediment, must be taken into consideration during the RD. Existing information regarding the location of these subdeck structures, along with Site-specific river conditions in these areas would be used to finalize the sediment dredging technique. Due to the poor access conditions, it is anticipated that labor-intensive dredging techniques would be implemented for Alternative S4A.

A current and float (i.e., current) survey would be conducted to select and determine the location of the sediment control measures, such as silt curtains.

Additional physical characteristics would also be determined for the areas subject to capping. Physical characteristics needed for capping design to evaluation resistance to displacement include: in-situ density (or solids content), plasticity, shear strength, consolidation, and grain size distribution. The RI results regarding solids content and grain size distribution would be used in the capping design. The other parameters would be collected during the RD/RA studies.

As discussed in Section 9.3, the sediments to be excavated under either Alternative S3A or S3B would be classified as non-hazardous waste. During pre-design, a treatability study would be conducted to determine the expected water content of sediments, optimal handling, dewatering requirements and dewatering techniques to allow off-Site disposal.

Should Alternative E3 or E4 be selected, the system used to treat the construction fluids generated during this remedial alternative could also be used to treat the dewatering liquids from the sediment dredging.
As discussed above, since the Site falls within a designated significant coastal fish and wildlife habitat, sediment remedial activities must be consistent to the maximum extent practicable with the State plan developed under the Coastal Zone Management Act of 1972 (16 U.S.C. section 1455b et. seq.). Activities associated with a capping and sediment dredging alternative would likely require a CZM consistency determination by the State to confirm that the activities comport with the State's approved CZM plan. A submittal would be made to the State documenting the manner in which the proposed actions are consistent with the CZM plan. As discussed for Alternative S3, additional permitting would be needed for sediment removal activities and for bulkhead restoration. An Article 25 permit would also be needed for the capping activities.

9.3.4.1.2 Task No. 2: Site Preparation

Prior to installation of the in-situ cap, silt screens and/or silt curtains would be installed around the areas to be capped and dredged to contain re-suspended sediment. The type of containment measure (i.e., screen or curtain) would be determined following the RD/RA studies since the selection would depend upon the tidal flows in the vicinity of these Site buildings. While a silt curtain would more effectively contain re-suspended sediment, tidal flows would place a greater stress on a curtain than on a screen. River velocities up to 4 feet/sec were measured adjacent to the Harbor at Hastings site (Earth Tech, 2003). Since more robust curtain systems are needed at river velocities greater than 2 to 3 feet/sec, a more substantial system may be needed at this Site. The type of siltation control would be confirmed using the results of the RD studies. For this alternative installation of a silt curtain has been assumed.

Installation of the silt curtains would first require installation of curtain anchor points. The points must have sufficient holding power to retain the curtain under the existing flow conditions before the furled curtain is deployed into the water. Anchor buoys would be employed on all anchors to prevent the current from submerging the anchor points. Since the flow adjacent to the Site is tidal, anchors would be provided on both sides of the curtains to minimize curtain movement during tidal current reversals and to prevent the curtain from overrunning the anchors and pulling them out when the tide reverses.

When the anchors are secure, the furled curtain would be secured to the upstream anchor point and then sequentially attached to each next downstream anchor point until the entire curtain is in position. At this point, and before unfurling, the "lay" of the curtain would be assessed and any necessary adjustments made to the anchors. Finally, when the location is ascertained to be as desired, the furling lines would be cut to allow the curtain to drop. Since currents are expected to exist in both upstream and downstream directions, the silt controls discussed would have to be positioned for both directions. Once baseline studies of currents and bottom profiles are completed, comprehensive engineering design of the silt curtain installation would be conducted taking these factors into consideration.

Materials handling equipment associated with sediment dredging operations would also be mobilized and set-up during this task. See Section 9.3.4.1.3 for additional discussion.

Under either alternative, this task is expected to take 1 month to complete.

9.3.4.1.3 Task No. 3: Capping and Limited Dredging

Under Alternative S4A, the Site-related subtidal impacted sediment would be capped. Under Alternative S4B, the Area V sediment would be capped. As discussed above, prior to installing the Area V sediment cap, 12-inches of sediment would need to be removed.

Capping of the sediment under either Alternative S4A or S4B would involve the placement of a low permeability material over identified sediment to prevent suspension of COPCs into the water column and to prevent exposure of aquatic organisms to COPCs.

The cap would consist of a 6-inch layer of hydrated AquaBlok™ or equivalent overlain by a 6-inch layer of backfill/benthic substrate. For cost estimation purposes, installation of a 30-lb/sf AquaBlok™ or equivalent product was assumed. As discussed above, the final capping material and its thickness would be determined following completion of the RD/RA studies.

The AquaBlok™ or equivalent would be spread across the water surface from a barge. It would then sink quickly to the bottom of the river on top of the Site-related impacted sediment. As discussed in Section 8.1.1.2, AquaBlok™ consists of gravel particles to which bentonite clay is bonded. As the bentonite hydrates, a uniform, continuous cohesive low permeability (1×10^{-8} cm/sec) cap would be formed over the sediment. A sufficient amount of AquaBlok™ or equivalent would be deployed to achieve a minimum 6-inch thick cover. Due to its physical properties, AquaBlok™ is more appropriate than other cover materials in rivers with strong current and tidal fluctuations (see Section 8.1.1.2 for additional discussion). To confirm that an adequate thickness of AquaBlok™ has been installed, sediment cores would be collected around the perimeter of the covers. Once it has been determined that at least a 6-inch cap has been installed, sufficient backfill would be installed to provide a 6-inch layer for benthic activity.

As noted above, the total thickness of the cover is estimated to be 12-inches. Sediment removal has not been assumed for the sediment areas to be capped under Alternative S4A because these areas are submerged and installation of a cap in these areas would not raise the sediment surface above the water line under low tide conditions. Sediment removal prior to cap installation has been assumed for the sediment area to be capped under Alternative S4B because installation of a cap in this area would likely raise some portion of the sediment surface above the water line under low tide conditions.

After review of the RD/RA information, the amount of sediment removal for Alternative S4A (if any) would be determined and the amount of sediment removal needed for Alternative S4B would be confirmed. This would include areas where the RD/RA studies indicate the potential for scouring of the river bottom and where the final sediment surface would extend above the water surface during low tide conditions. At these locations, an amount of sediment equal to the cover thickness would be removed prior to cap installation. For cost estimation purposes, it has been assumed in Alternative S4A that all Site-related subtidal sediment is located in areas that would not be subject to scouring and would not require removal and that the entire Area V surface area would require 12-inches of sediment removal prior to capping.

As discussed above, the AquaBlok™ or an equivalent hydrated cover materials must be covered by water for some portion of the day. Therefore, in intertidal areas, where the depth of water above the sediment during high tide is less than the cap thickness (12-inches), sediment would need to be excavated to 12-inches below this mark prior to capping. The Site-related impacted intertidal sediment located beneath Building Nos. 7, 8 and the West Warehouse (Building No. 19W) would likely fall into this category. Rather than removing 12-inches of sediment and installing a 12-inch cap, the Site-related impacted sediment in this area would be removed to a maximum depth of 24-inches and backfilled with material that is similar in grain size distribution to the sediment removed. If either Alternative E3 or E4, both of which include demolition of the West Warehouse (Building No. 19W), were selected, access to the sediment under the West Warehouse (Building No. 19W) would be easier. Under Alternatives I2, I3 and I4, the concrete slabs in Building Nos. 7 and 7A would be removed and make removal of sediment beneath Building Nos. 7 and 9 somewhat easier. The lowest high-water mark beneath Building Nos. 7 and 9 and the West Warehouse (Building No. 19W) would be confirmed during the RD/RA studies.

The type of dredging equipment and equipment productivity factors are described in Section 9.3.3.1.2. Transfer facilities would be needed to process and load out the dredged sediments. Transportation modes and management options for dredged sediments would be similar to those considered under Alternative S3.

Dust generation during sediment removal activities is not anticipated due to the high moisture content of the materials being handled under this alternative. However, dust may be generated during the addition of absorptive agents to reduce water content. It has been assumed that the dust monitoring conducted under the soil/fill alternative could be expanded to address dust monitoring needed during the sediment remedial action.

Under both Alternatives, this task is expected to take one to two months to complete.

9.3.4.1.4 Task No. 4: Post-Capping Monitoring

Float and tide studies would be conducted every year and geophysical surveys would be conducted every 3 years following installation of the cap. These surveys would monitor changes in the river conditions and changes in the installed capping material to identify areas undergoing scouring or deposition. These data would be used to assess the long-term integrity of the cap. For cost estimation purposes, it was assumed that 5% of the cap would require replacement (i.e., patching) every year for a period of 30 years. A five-year review would also be conducted since this is not a permanent remedy.

9.3.4.2 Evaluation

9.3.4.2.1 Overall Protection of Human Health and the Environment

Alternative S4A would provide adequate protection of human health and the environment for the Site-related impacted sediment. Protection of human health and the environment would be achieved through:

- separation of the majority of the Site-related impacted intertidal sediment from the river environment ;
- removal of the remaining Site-related impacted intertidal sediment;
- installation and maintenance of a cap on the Site-related impacted subtidal sediment,
- prevention of direct contact with the Area IV intertidal sediment behind the bulkhead through restoration and continued maintenance of the bulkhead via Common Action C4, presence of the floor slabs and implementation of the SMP via Common Action C2; and

- removal of debris and hot spots within the bulkhead and sludge from the interior stormwater system via implementation of Common Actions C8 and C5.

Alternative S4B would provide adequate protection of human health and the environment for the Area V sediment. Protection of human health and the environment would be achieved through removal and subsequent capping of the underlying Area V sediment. However, it should be noted that even if the Area V sediment was not removed, the Area V sediment does not pose site-related ecological impacts.

9.3.4.2.2 Compliance with SCGs

A summary of the applicable SCGs that apply to this alternative is presented in Table 9-5. As shown in this table, Alternative S4A and S4B would comply with the location specific sediment SCGs, but would not comply with all of the chemical and action specific SCGs.

Alternatives S4A and S4B would:

- comply with the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to the public health and the environment;
- address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law in the Site-related intertidal sediment areas that are removed;
- remove "consequential" amounts of hazardous waste (6 NYCRR Part 375) through implementation of Common Action C8;
- comply with the applicable chemical specific sediment SCGs for the Site-related impacted sediment outside of the bulkhead (i.e., NYSDEC sediment screening criteria, TSCA) {Note: This SCG would not be applicable to the Site-related impacted sediment located behind the bulkhead which is separated from the river environment};
- comply with the applicable chemical specific soil/fill SCGs for the Site-related impacted sediment behind the bulkhead which is separated from the river environment (i.e., TAGM 4046 RSCOs, TSCA); and

- comply with the applicable chemical specific SCGs related to protection of surface water bodies for the Site-related impacted sediment outside of the bulkhead {Note: This SCG would not be applicable to the Site-related impacted sediment located behind the bulkhead which is separated from the river environment}.

Alternative S4A would not:

- address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law in the Site-related impacted subtidal sediment areas that are capped since COPCs would remain in the Site-related sediment under the cap.

In addition, Alternative S4B would:

- address the 6 NYCRR Part 375 goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law since COPCs since a release is not believed to have occurred in Area V.

9.3.4.2.3 *Long-Term Effectiveness and Permanence*

Provided adequate OM&M is conducted, Alternative S4A would be effective in the long term in preventing exposure to Site-related impacted subtidal sediment. Given sufficient thickness and composition, capping would:

- minimize re-suspension and leaching of COPCs into the water column;
- prevent bioturbation; and
- withstand hydraulic conditions, such as scour events associated with extreme floods.

To ensure that the cap has a sufficient thickness, the RD/RA would take into consideration:

- the potential for a large groundwater flux component to impair the effectiveness of the cap;
- scouring due to movement of ice chunks during spring thaw (ice rafting);

- possible damage due to watercraft navigation and drying/cracking of or result of freeze/thaw cycles on cap areas exposed during low-flow periods.

Since COPCs would remain in the capped areas, Alternative S4A would not be a permanent remedy for the Site-related impacted subtidal sediment.

Under Alternative S4A, removal of the Site-related impacted intertidal sediment would provide a permanent remedy for that media. However, because of the technological limitations of the dredging technologies and the potential re-deposition of sediment that was suspended during dredging, some residual Site-related impacted sediment would remain after remediation has been completed.

The presence of pilings, and other shoreline structures would also interfere with the complete removal of all Site-related impacted intertidal sediment. The potential for residual impacted surficial sediment and the associated degree of risk would be considered during the RD, particularly with respect to achieving remedial goals via dredging and verification requirements. However, it is anticipated that the residual Site-related impacted sediment would be addressed through continual sediment deposition.

With regard to the intertidal sediment behind the bulkhead, restoration and continued maintenance of the bulkhead (Common Action C4), the presence of the concrete slabs and implementation of Common Action C4 would prevent human exposure to this sediment in the long term. In addition, Common Actions C8 and C5 would eliminate potential sources of COPCs to sediment.

As discussed in Section 9.1.1.4, restoration of the bulkhead would include installation of a slurry wall within the existing bulkhead line. In comparison to sheeting, slurry walls are considerably more impermeable. As such, once restored, minimal, if any, infiltration of river water into the bulkheaded areas and subsequent exfiltration of river water carrying COPCs from the bulkheaded area to the river environment is anticipated. This would prevent migration of COPCs in the bulkheaded historic fill and from the intertidal sediment within the bulkhead to the river environment.

Through restoration and continued maintenance of the bulkhead (Common Action C4), the presence of the floor slabs and removal of debris and hot spots and residual interior stormwater system sludge (Common Actions C8 and C5), exposure to the majority of the Site-related impacted intertidal sediment would be controlled.

Provided adequate OM&M is conducted, Alternative S4B would be effective in the long term in preventing exposure to chemicals in the underlying Area V sediment. Given sufficient thickness and composition, capping would:

- minimize re-suspension and leaching of lead and copper into the water column;
- prevent bioturbation; and
- withstand hydraulic conditions, such as scour events associated with extreme floods.

To ensure that the cap has a sufficient thickness, the RD/RA would take into consideration:

- the potential for a large groundwater flux component to impair the effectiveness of the cap;
- scouring due to movement of ice chunks during spring thaw (ice rafting);

- possible damage due to watercraft navigation and drying/cracking of or result of freeze/thaw cycles on cap areas exposed during low-flow periods.

Since COPCs would remain in the capped areas, Alternative S4B would not be a permanent remedy for the Area V sediment. It should be noted that the Area V sediment does not pose site-related ecological concerns.

In addition, there are no current sources of contaminants to Area V sediment. A future potential source of contaminants to the Area V sediment is erosion of soil/fill from the South Yard. This potential future source of contaminants will be addressed through stabilization of the South Yard erosion controls in September 2004.

9.3.4.2.4 Reduction of Toxicity, Mobility or Volume

As discussed in Section 9.0, this criterion would evaluate changes in the toxicity, mobility and volume of NYS listed and potential characteristic hazardous waste and COPCs. As discussed above, the Site-related impacted sediment is not a hazardous waste; however, some of the debris would be a RCRA characteristic hazardous waste for lead once removed.

The Common Actions associated with Alternative S4 would reduce the toxicity, mobility and volume of hazardous waste through the removal of debris piles and would result in a reduction in toxicity, mobility and volume of COPCs through removal of debris, hot spots and sludge from the floor drain system. In addition, Site-related impacted intertidal sediment behind the bulkhead and its COPCs would not be mobile to the river environment. None of the Site-related impacted sediment areas within the bulkhead would require soil/fill excavation (see Section 9.2 for Below Building soil/fill excavation requirements).

Under Alternative S3A, sediment removal would reduce the volume and mobility of COPCs in the Site-related impacted intertidal sediment beneath Building Nos. 7, 9 and the West Warehouse (Building No. 19W). This portion of the alternative would be considered to be a permanent remedy.

Capping would reduce the mobility of COPCs in Site-related impacted subtidal sediment (Alternative S4A) and the mobility of COPCs in the Area V sediment (Alternative S4B) in contact with the river environment. Although severe storms may scour the cap, the density of the cover and on-going maintenance would greatly minimize, if not eliminate, the redistribution of COPCs under the cover in these conditions.

Due to the relative stability of PCBs and inorganic constituents in sediment, reduction in toxicity or volume is not expected for these chemicals due to natural degradation. Some limited degradation of SVOCs in sediment would be expected; however, this would not be significant.

Since biodegradation or transformation would not be a major process at the Site, capping would not meet the CERCLA paragraph 121 (b) (1) preference for treatment. Consequently, on-going review would be necessary. The capping portion of the alternative would not be a permanent remedy.

9.3.4.2.5 Short-Term Effectiveness

Alternative S4A and S4B would each take one to four months to complete. This time estimate is highly variable and is dependent upon the method of dredging and the size of treatment equipment that can be utilized on-Site.

Under Alternative S4A, intrusive work would include RD/RA sampling efforts, sediment dredging, cap installation, bulkhead restoration, debris pile and hot spot removal and interior stormwater system cleaning. Under Alternative S4B, intrusive work would include RD/RA sampling efforts and sediment dredging prior to cap installation.

Under either alternative, potential short-term impacts during these activities would be managed through the implementation of the HASP. More significant short-term impacts would be posed during the sediment dredging and materials handling activities.

As discussed in Alternative S3, studies have indicated that dredging can be more damaging to the river ecosystem than the impacts posed by the chemicals in the sediment. However, potential impacts associated with sediment re-suspension during disruptive sediment actions can be mitigated to some extent by silt curtains, etc..

Given the moisture content of the sediment to be removed, dust inhalation would not be of concern during sediment removal activities. However, dust may be generated during the addition of absorptive agents to reduce water content of the dredged sediment and during the handling of the capping material. It has been assumed that the dust monitoring conducted under the soil/fill alternative could be expanded to address dust monitoring needed during the sediment remedial action. Workers would also wear protective clothing to address direct contact risks.

Potential short-term risks to the community would be posed by Alternatives S4A and S4B from transportation of dredged sediment to off-Site landfill disposal facilities and transport of capping materials to the Site. Potential exposure of spilled material to the community and the environment along the transportation route, as well as automotive related injuries and increased emissions from trucks would be potential concerns. Under Alternative S4A, approximately 100 truckloads would be required to transport dredged sediment to an off-Site landfill disposal facility and approximately 32 truckloads would be required for transport of capping materials to the Site. Under Alternative S4B, approximately 35 truckloads would be required to transport dredged sediment to an off-Site landfill disposal facility and approximately 27 truckloads would be required for transport of capping materials to the Site. There would be some potential short-term risks associated with the transportation of these materials from the Site (i.e., accidents, air emissions and spills) to an off-Site landfill. Barge transport of these materials may be considered during the RD.

9.3.4.2.6 Implementability

Execution of the RD/RA studies and Common Actions C2 and C5 are readily implementable. Implementation of Common Action C8 would pose difficulties due to the location of the debris piles and hot spots beneath the Site buildings. These debris piles and hot spots would be removed by divers or by accessing the areas through access points in the floor slab. As discussed in Section 9.2, the ease of implementing Common Action C4 would be a function of the location of the bulkhead line. Restoration of the bulkhead in areas on the outer limits of the buildings is more implementable than restoration of the bulkhead farther beneath the Site buildings (i.e., Building Nos. 7 and 9). Although, the concrete slab would be removed in Building Nos. 7 and 7A under Alternatives I2, I3 and I4, restoration of the bulkhead in this portion of the Site would still be difficult. Bulkhead restoration would also require significant permitting. Since the docking in the vicinity of Building Nos. 7 and 7A cannot support vehicular traffic, all work would need to be conducted from barges.

Installation of a cap would be readily implementable in areas with adequate overhead clearance. Deployment of capping materials in areas with low overhead clearance would be more difficult. It will be difficult to install a cap of adequate thickness in areas of low overhead clearance. The coverage of the cap around pilings and cross bracing may not be continuous. A large percentage of Area II and III is beneath docks and buildings and capping will be difficult to implement in these areas. In addition, installation of the cap over portions of the sediment areas that are farther under the buildings would be still more difficult to implement. Implementation of a cap in shallow sediment areas may be limited due to reasons stated above (i.e., drying/cracking, freeze/thaw cycles, scour due to ice chunks, etc.).

The implementability of sediment dredging beneath the West Warehouse (Building No. 19W) would be dependent upon which soil/fill alternative is chosen and which building interior alternative is chosen. If Alternative E3 or E4 is selected, the West Warehouse (Building No. 19W) would be demolished and its slab removed. Sediment dredging would therefore be more implementable in the limited area uncovered by demolition of the West Warehouse. If Alternative E1 or E2 were selected, dredging would have to occur with Building No. 19W still in place. This would result in more time consuming, manual, costly sediment removal. Although difficult, this removal would be possible. If Alternative I2, I3 or I4 were selected, the concrete slab in Building No. 7 and 7A would be removed. This would allow access to the Site-related impacted intertidal sediment located beneath Building Nos. 7 and 7A and some access to the Site-related impacted intertidal sediment located beneath Building No. 9. These are older buildings and as such have numerous pilings and other obstructions that would make sediment removal beneath these Site buildings difficult absent their demolition.

Sediment handling (i.e., dewatering, stockpiling, loading, etc.) would be difficult, but could be implemented. Equipment would be mobilized to the Site to adequately dewater the sediment prior to off-Site disposal. In addition, treatment equipment and a SPDES permit would be needed for the liquids removed from the sediment. If Alternative E3 were E4 is selected, the treatment equipment mobilized to the Site for the soil/fill dewatering liquids could be designed to also handle the sediment dewatering liquids. If Alternative E1 or E2 were chosen, a treatment system and SPDES permit would need to be obtained for just the sediment dewatering fluids. Alternately, the sediment slurry could be pumped into a barge and transported to an off-Site facility that could manage this material.

Finally, as discussed in Section 9.3.4.1.1, sediment dredging would require considerable permitting efforts. Given the relatively small volume of sediment dredged under this alternative, the level of effort and cost associated with obtaining the permits would not be justifiable. As such, the dredging and sediment handing portion of this alternative has considerable implementability concerns.

In conclusion, Alternatives S4A and S4B have significant implementability concerns. They include:

- Complex coordination with selected soil/fill and interior building materials alternatives (less so for Alternative S4B);
- The need to conduct removal of sediment and debris from under the buildings and decking with limited overhead access – this would be mitigated to some extent through the removal of Building No. 7 and 7A floor slabs if either Alternatives I2, I3 and I4 is selected (not applicable for Alternative S4B);
- The need to install capping material under the buildings and decking with limited overhead access – this would be mitigated to some extent through the removal of Building No. 7 and 7A floor slabs if either Alternatives I2, I3 and I4 is selected(not applicable for Alternative S4B);

- Installation of the capping materials around numerous pilings and below deck structures(not applicable for Alternative S4B);
- Extensive permitting for dredging, capping and discharge of treated dewatering fluids;
- Installation of silt curtains in rapid river currents;
- Installation and operation of dewatering equipment;
- Manual measurements beneath buildings and decking leading to imprecise dredging (not applicable for Alternative S4B); and
- Restoration of the bulkhead beneath the Site buildings in areas with limited accessibility and overhead clearance (not applicable for Alternative S4B).

9.3.4.2.7 Cost

The capital cost of Alternative S4A is estimated to be $2,859,431. The net present value of the O&M cost of this alternative is estimated to be $961,791. The components of capital and O&M costs are provided in Table Q-3A of Appendix Q. The total net present value of Alternative S4A is estimated to be $3,821,223. These costs include the costs for Common Action No. 8. The costs for Common Actions C2 and C4 are included in the soil/fill alternatives (see Section 9.2) and the costs for Common Actions C8 and C5 are included in the interior building material alternatives (see Section 9.4).

The capital cost and total net present value of Alternative S4B is estimated to be $1,438,010. The net present value of the O&M cost of this alternative is estimated to be $907,443. The components of capital costs are provided in Table Q-4B of Appendix Q. The total net present value of Alternative S4B is estimated to be $2,345,452. These costs do not include any Common Action costs.

9.4 *INTERIOR BUILDING MATERIAL REMEDIAL ACTION ALTERNATIVES*

This section presents the four remedial action alternatives developed to address the impacted interior building materials identified in Section 7.4.1.3. The following interior building material remedial alternatives have been developed based on preliminary screening of the remedial technologies presented in Section 8.2. These alternatives may be comprised of a single remedial technology or a combination of technologies to address both COPCs (i.e., PCBs and lead) and/or both concrete and wood building materials. The remedial alternatives selected for detailed evaluation include:

- Alternative I1: No Action
- Alternative I2: Building Material Encapsulation and Remediation
- Alternative I3: Building Interior Remediation
- Alternative I4: Building Demolition

As discussed in Section 7.4.1.3, the impacted interior building materials include:

<u>Impacted Interior Building Construction Materials</u>

- Concrete building materials containing PCBs and/or lead at concentrations above the bulk and/or surface LTOC;
- Wood building materials containing PCBs and/or lead at concentrations above the bulk and/or surface LTOC; and
- Building materials containing lead-based paint.

<u>Other Impacted Interior Building Materials</u>

- Debris in the subsurface concrete structures;
- Residual sludge in interior stormwater system;
- Residual product in former process tanks; and

- Residual sludge in the lead extrusion pits.

The impacted interior building construction materials are addressed in the remedial action alternatives developed in this section. Figures 7-12 through 7-15 and Figures 7-12A through 7-14A show the locations of surficial PCB and lead impacts and Figures 7-12 through 7-15 show the locations of PCB impacts at depth.

Common Action C3 (Removal of debris within subsurface concrete structures), Common Action C5 (Removal of the interior stormwater system), Common Action C6 (Removal of process and fuel oil tanks), and Common Action C7 (Cleaning of the lead extrusion pits), which are included in Alternatives I2, I3, and I4, address the other impacted interior building materials. The Common Actions associated with soil/fill and sediment are discussed in Sections 9.2 and 9.3, respectively.

It should be noted that the remedial actions for the concrete building construction material in the East and West Warehouses, the Guard House, and the Paint Shop are discussed in Section 9.2 along with the soil/fill remedial alternatives (i.e., Alternatives E1 through E4). Since the fate of these Site buildings is dependent upon the remedial action alternatives for the Site soil/fill, these building materials were excluded from the interior building material remedial evaluation.

A description of each remedial alternative is provided in the following sections.

9.4.1 ALTERNATIVE I1: NO ACTION

9.4.1.1 Description

As discussed in Section 9.2.1.1, a no action alternative is needed pursuant to Section 300.430(e)(6) of the NCP to identify the potential risks posed by a site if no remedial actions were implemented. To address this requirement, Alternative I1 has been developed for the interior building material.

Under Alternative I1 limited access restrictions would be implemented at the Site.

9.4.1.1.1 Task No. 1: Access Restrictions

Under this alternative existing access controls, including exterior perimeter fencing and locked gates and interior fencing and locked gates, would be maintained. Additional fencing would be installed along the eastern wall of Building Nos. 4 and 5 to provide continuous perimeter fencing and deter trespassers from entering the Site. In addition, signs would be posted on the exterior perimeter fencing stating that contamination is present at the Site. However, no security guards would be provided to deter further trespassing.

9.4.1.2 Evaluation

9.4.1.2.1 Overall Protection of Human Health and the Environment

Alternative I1 would not provide adequate protection of human health and the environment. Exterior and interior fencing would serve as the only deterrent for direct contact with impacted interior building materials. The impacted interior building materials would remain in place and would pose a potential for direct contact exposure to persons that access the Site and trespass beyond the fencing.

In addition, under this alternative no actions would be conducted to maintain the infrastructure of the Site buildings. As discussed in Section 1.4.6, portions of the Site buildings are currently deteriorating and are subsiding into the river. Under this alternative there is the potential for the Site buildings to subside and for impacted building materials to be released into the environment. Storm water that leaks through the deteriorating roofing poses a potential risk for COPCs in and on the building material to migrate to the surrounding environment and into the river. In addition, storm water that is discharged to the interior stormwater system and ultimately is discharged into the river may come into contact with residual sludge in this system.

9.4.1.2.2 Compliance with SCGs

A summary of the SCGs for the interior building material is provided in Table 9-5. As shown in this table, this alternative would not meet any of the applicable SCGs for interior building material. Most importantly, this alternative would not address the SCGs related to the surface and bulk LTOC for the interior building material and would not address the directive related to preventing releases to the environment (i.e., OSWER Directive 9360.3-12, *Response Actions at Sites with Contamination Inside Buildings* (USEPA, 1993)).

Alternative I1 would not:

- address the 6 NYCRR Part 375 goals to eliminate or mitigate all significant threats to public health and the environment and restore the

Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law;

- address the 6 NYCRR Part 375 requirement to remove "consequential amounts" of hazardous waste in both building material and subsurface concrete structure fill;
- meet the OSWER Directive 9360.3-12 by mitigating the potential for release of COPCs to the surrounding environment;
- meet the surface and bulk LTOC for PCBs (i.e., 1 µg/100 cm^2 and 1 mg/kg, respectively) in encapsulated areas;
- meet the surface LTOC for lead (i.e., 4.3 µg/100 cm^2) in encapsulated areas;
- address the 40 CFR 745 and 40 CFR 763 requirements for lead-based paint and asbestos abatement, respectively;
- address the 6 NYCRR Part 613 requirement to remove the fuel oil tanks; and
- address the 6 NYCRR Part 613 requirement to remove the process tanks that have been out of service for several years.

9.4.1.2.3 *Long-term Effectiveness and Permanence*

Alternative I1 would not provide long-term effectiveness and permanence. The existing COPCs in the impacted interior building materials would remain on-Site. The use restrictions included in this alternative would not be effective in preventing exposure to the impacted interior building materials and would not prevent recontamination of previously cleaned areas. Although the areas that have not been previously cleaned would remain fenced to deter entrance to these areas, the impacted areas are contiguous to the previously cleaned areas. Since this fencing is not impermeable, a potential exists for recontamination of these previously cleaned areas. Continual risks to trespassers and future construction workers in the fenced areas would include direct contact with impacted building materials.

9.4.1.2.4 Reduction of Toxicity, Mobility, and Volume

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility, and volume of hazardous waste and COPCs. At certain locations within the Site buildings, concrete exhibiting bulk PCB concentrations above 50 mg/kg is present. In addition, fill contained in some of the subsurface concrete structures exhibits PCB concentrations above 50 mg/kg. Both of these materials are therefore classified as NYS B007 listed PCB hazardous wastes. Under this alternative, none of the listed hazardous waste associated with interior building materials would be removed from the Site.

In addition, Alternative I1 would not be effective in reducing the toxicity, volume, or mobility of the COPCs in the impacted interior building materials. The toxicity and volume of the PCBs and lead within the building material would remain the same. Likewise, without continual maintenance of the Site buildings, the mobility of COPCs would not decrease and would likely increase. In addition to increased mobility within the Site buildings, without infrastructure repair, the potential mobility of COPCs to migrate from the Site buildings and into the surrounding environment would increase.

9.4.1.2.5 Short-Term Effectiveness

Since there are no remedial activities associated with Alternative I1, there would be minimal short-term impacts posed to workers or the community during implementation of this alternative.

9.4.1.2.6 Implementability

Alternative I1 can be easily implemented.

9.4.1.2.7 Cost

The capital costs associated with Alternative I1 is $14,775. The OM&M annual cost for inspection and maintenance of Site fencing is estimated to be $2,000 per year with a present value cost of $37,900. The total net present value of Alternative I1 is $60,255. The detailed estimate of long-term OM&M present worth costs associated with Alternative I1 is presented in Table R-1 in Appendix R.

9.4.2 ALTERNATIVE I2: BUILDING MATERIAL ENCAPSULATION AND REMOVAL

9.4.2.1 Description

This alternative addresses the impacted interior building construction material identified in Section 7.2.4.3 primarily through the use of encapsulation.

Interior building construction materials that exhibit bulk concentrations in excess of the bulk LTOC and/or post-clean surface concentrations in excess of the surface LTOC would be encapsulated if they are amenable to encapsulation. The following technologies would be used for the remainder of interior building materials not suited for encapsulation:

- Bulk removal of interior building materials that exhibit concentrations in excess of the bulk LTOC and/or post-clean surface concentrations in excess of the surface LTOC and are not amenable to encapsulation (i.e., uncovered wood in trafficked areas, subsiding concrete flooring, etc.);

- Washing and vacuuming of interior building materials that exhibit bulk and post-clean surface concentrations below the LTOC since the post-clean results assume some degree of cleaning is conducted {Note: A more aggressive washing technique would be used for the concrete building materials than the wood building materials.};
- Since the remedial work in the other areas would generate dust that may contaminate previously cleaned areas, all areas that are not encapsulated or subjected to bulk removal would be washed/vacuumed; and
- Maintenance of the existing coverings on the wood floors (i.e., tile, carpet, or both) in the renovated portions of the third and fourth floors that are not heavily trafficked.

Figures 9-9 through 9-12 show the remedial technologies proposed for the fourth, third, second and first floors, respectively, under Remedial Alternative I2.

As discussed in Section 9.4, the other impacted interior building materials (i.e., debris in the subsurface concrete structures; residual sludge in interior stormwater system; residual product in former process tanks and residual sludge in the lead extrusion pits) are addressed through Common Actions C3, C5, C6, and C7, respectively.

This alternative would include the following remedial tasks and incorporate the following Common Actions associated with building materials discussed in Section 9.1:

- Site Preparation and Mobilization (Task No. 1)
- Restoration of the Interior Stormwater System (Task No. 2)
- Concrete Surface Encapsulation and Wood Surface Covers (Task No. 3)
- Concrete Building Material Removal and Replacement (Task No. 4)
- Pressure Washing/Vacuuming of Concrete Surfaces (Task No. 5)
- Wood Building Material Removal and Replacement (Task No. 6)
- Manual Cleaning/Vacuuming of Wood Surfaces (Task No. 7)
- Lead-based Paint and Asbestos Abatement (Task No. 8)
- Ambient Air Monitoring (Task No. 9)

- Transportation and Off-Site Disposal (Task No. 10)
- Infrastructure Restoration of Deteriorated Pilings, Building Floors and Roof System (Task No. 11)
- OM&M Associated With Building Material Covers (Task No. 12)
- Demolition and Remediation of Site Buildings at Year 30 (Task No. 13)
- Access and Use Restrictions (Task No. 14)
- Removal of Debris Within Building Subsurface Structures (Common Action C3)
- Bulkhead Restoration Beneath Site buildings (Common Action C4)
- Removal of the Interior Stormwater System (Common Action C5)
- Removal of Process Tanks and Fuel Oil Tanks (Common Action C6)
- Cleaning of the Lead Extrusion Pits (Common Action C7)

It is estimated that it would take between 8 to 12 months to implement the above Tasks 1 through 12 and the Common Actions. These tasks would begin upon NYSDEC approval of the Remedial Design for this alternative. For cost estimation purposes, it has been assumed that annual OM&M activities would be conducted for 30 years. Demolition of the Site buildings would take place in Year 30. It is estimated that demolition would be completed in 8 to 12 months.

Descriptions of the Common Actions considered for this alternative (i.e., Common Actions C3 through C7) were provided in Sections 9.1.1.3 through 9.1.1.7. Evaluation of these common actions is included below along with the other tasks of this alternative.

9.4.2.1.1 Task No. 1: Site Preparation and Mobilization

Prior to the beginning of any remediation activities associated with this alternative, it would be necessary to prepare the Site and mobilize all necessary equipment to the Site. Initially, all occupants currently at the

Site (including property management and maintenance personnel, and temporary tenants) would be relocated from the Site and remain off-Site for the duration of the remedial activities. All non-permanent structures within the Site buildings (i.e. machinery, tools, furniture, etc.) would be relocated from the Site to allow open access to all areas that would be remediated.

Under this alternative, concrete, wood, wash water, lead-based paint, and asbestos wastes would be generated. It would be necessary to stage roll-off containers and wash water storage containers/tanks on-Site in the North Yard. Equipment needed for concrete slab and wood building material removal and replacement, such as demolition equipment, excavators and loaders, as well as construction trailers, would be mobilized to the Site and staged in the North Yard. Debris stockpile zones would also be established in the North Yard. Runoff control measures would be implemented to prevent impacts to the Hudson River during pressure washing activities. This task would need to be coordinated with the selected soil/fill remedial action alternative since a number of the potential alternatives for this media include extensive work in the North Yard.

9.4.2.1.2 Task No. 2: Restoration of the Interior Stormwater System

As described in Section 9.1.1.5, the interior stormwater system located below the floor slab on the first floor would be cleaned and removed as a Common Action. After removal of the stormwater system, a void would remain in the location of the former interior stormwater system. Under this alternative, a functional stormwater management system for the northern Site buildings would be installed in the trench void. New piping would be installed where the trench formerly was located. The existing roof drains that formerly discharged to the interior stormwater system would be tied into this new piping. The pipe trench would then be filled with gravel backfill, and a reinforced concrete slab would be installed over the entire area. Cleanouts would be installed through the concrete slab throughout the length of the stormwater piping.

As shown on Figure 7-7, two areas of impacted soil/fill below the building have been identified and delineated in association with the interior stormwater system. Both of these areas are located in portions of the trench believed to have no competent bottom. The first impacted area is located near the southern portion of the Pipe Shop, and the second impacted area is located in Building No. 10. The investigation of Below Building soil/fill is discussed in detail in Section 2.2, and the evaluation for addressing these two areas was discussed in Section 9.2.

9.4.2.1.3 *Task No. 3: Concrete Surface Encapsulation and Wood Surface Covers*

As discussed in Section 7.2.4.3, COPCs are present within and on building surfaces throughout the Site. Under this alternative an epoxy floor encapsulant would be applied to impacted interior building materials that are amenable to encapsulation and meet either of the following criteria:

- Concrete floor slabs where PCBs within the slab are present at concentrations greater than the bulk LTOC; and/or
- Concrete floor slabs with PCBs and/or lead surface concentrations in the post-clean wipe samples above the surface LTOC.

As discussed in Section 1.4.6, because of the varying periods of construction of the Site buildings, the age and physical condition of the concrete building material is dissimilar from one building to the next. Deterioration of the bulkhead and timber support piles has contributed to fracturing and subsidence of the first floor concrete floor slabs on grade. Encapsulation with epoxy coatings is best suited for concrete slabs that are in good structural condition and with minimal fractures. Therefore, encapsulation would be applied to those areas of the Site buildings with concrete surfaces in good structural condition and amenable to epoxy encapsulation. Concrete slabs that are not amenable to encapsulation are Building No. 12A, Building No. 4, the Asbestos Roving Room (Building 12), the Carpenter and Electrical Shops (Building Nos. 9A, 9B, and 9C), and Building No. 7. In addition, wood flooring is not amenable to encapsulation.

Prior to beginning encapsulation activities, the concrete surface would have to be prepared. Adequate surface preparation is vital to ensure that a good bond is formed between the epoxy encapsulant and the concrete surface. The concrete surface would be prepared by first removing gross surface accumulations by scraping the surface, either manually or using a power scraper. The surface would then be shot-blasted. Shot blasting would remove approximately $^{1}/_{16}$-inch of concrete from the floor surface. After shot blasting is completed, the concrete surface would then be pressure washed to remove any residual loose particles, then vacuumed using a HEPA-filter equipped vacuum to remove any residual dust and debris. After completing the aforementioned procedures, the concrete floor slab would now be exposed and ready for the application of the epoxy encapsulant. The encapsulation material would be applied as discussed in Section 8.1.2.2. For purposes of the cost estimate, application of a 30-year epoxy has been assumed.

Within the areas proposed for encapsulation, there are three areas that have residual surficial lead impacts that may meet the lead surface LTOC following the shotblasting surface preparation. These areas are located on the first floor of the High Bay building (Building No. 8), the second floor of the High Bay building and the first floor of Building No. 10 (drying ovens area). These areas would be sampled after shotblasting and prior to application of the encapsulant to determine whether encapsulation is needed. For cost estimation purposes, it has been assumed that these areas would be encapsulated.

All solid and liquid waste generated from surface preparation activities would be temporarily stored on-Site in the appropriate containers (i.e. 55-gallon drums, roll-off containers, temporary on-Site storage tanks) during remediation activities. Each waste stream would then be sampled for waste characterization, and transported off-Site to the appropriate disposal facility. During remediation activities dust collection systems equipped with HEPA filters would be utilized to minimize the level of airborne particulates. Air monitoring would also be conducted to ensure the appropriate PPE is being utilized.

The areas to be encapsulated either extend to a permanent building wall, are located adjacent to an area of concrete flooring that would be removed and replaced, or are adjacent to an area to be pressure washed/vacuumed. For this reason, confirmatory wipe and concrete core samples would not be collected around the perimeter of each of the areas encapsulated. In the case of encapsulation abutting either a building wall or a replaced section of concrete floor slab, it is not necessary to collect samples confirming that the horizontal extent of the encapsulation is sufficient to cover all potential COPCs. In the cases where the encapsulant would abut a portion of the concrete slab that has been pressure washed/vacuumed, confirmatory samples collected in the pressure washed/vacuumed area would verify that the horizontal extent of the encapsulation was sufficient. The pressure washing/vacuuming component of this alternative is discussed in detail in Task No. 5

As discussed above, the renovated portions of the third and fourth floors are constructed of wood flooring and have been covered with vinyl tiling and/or carpeting. Wipe and bulk samples collected from under the vinyl tiling and carpeting during the RI identified exceedances of the surface LTOC for PCBs and lead and bulk LTOC for PCBs. As discussed above, wood flooring is not amenable to epoxy encapsulation. These renovated areas are currently designated as office space. Because of their location and lower overhead clearance in comparison to the first and second floors, heavy traffic through these areas via commercial/industrial equipment is not likely. As such, maintenance of the existing vinyl tiling and/or carpeting in these areas would be an appropriate remedial technology. Remedial activities for more heavily trafficked wooden floor areas that are not amenable to tiling and/or carpeting are discussed in Task No 6. Figures 9-9 and 9-10 present the wood surface cover areas on the fourth and third floors, respectively.

All areas covered by an epoxy encapsulant or the existing tiling or carpeting would be inspected periodically to ensure no tears, rips, or cracks have developed that may compromise the integrity of these barriers. The inspection and OM&M of these barriers are discussed in more detail in Section 9.4.2.1.12. The institutional controls needed for these areas are discussed in Section 9.4.2.1.14.

The portions of the Site buildings that are being evaluated for concrete surface encapsulation and maintenance of existing wood surface covers are discussed below on a floor-by-floor basis.

<u>Fourth Floor</u>

As shown on Figure 9-9, the renovated portion of the fourth floor, located in Building No. 1, is currently covered with carpeting. The existing carpeting would be maintained as the surface cover.

Third Floor

As shown on Figure 9-10, concrete surface encapsulation would be completed throughout the majority of Building Nos. 2 and 7. A total combined area of 16,500 sf would be encapsulated on the third floor. As discussed above, the renovated portions of the third floor, located in Building No. 1, are constructed of wood and are currently covered with carpeting and/or vinyl tile. These existing floor coverings would be maintained as surface covers.

Second Floor

As shown on Figure 9-11, concrete surface encapsulation would be performed in eight areas within six buildings. These areas are located within:

- the High Bay Building (15,825 sf);
- the Railroad Siding at the track level (3,510 sf);
- Building No. 2 and 2A (2,390 sf);
- Building No. 5 (4,400 sf); and
- the elevated loft located in Building No. 4 (2,135 sf).

The total area of the concrete surface to be encapsulated on the second floor is 28,260 sf.

First Floor

As shown on Figure 9-12, concrete surface encapsulation has been evaluated for a large portion of the northern Site Buildings and several localized areas within the High Bay Building on the first floor. Listed below are the areas requiring concrete surface encapsulation:

- Five localized areas within the High Bay Building, 8,640 sf in total;

- Building No. 2 (with the exception of the stairwell), 14,490 sf;
- The southern portion of Building No. 7, 465 sf;
- Building No. 7A (High Voltage Test Lab), 5,000 sf;
- Building Nos. 6, 13, 10 (with the exception of the Storage Room, Men's Room and Stairwells next to the Pipe Shop), 11,540 sf;
- Building No. 1 (with the exception of the stairwell), 5,620 sf;
- Building Nos. 12 and 12B, 13,115 sf;
- Building Nos. 14 (with the exception of the Men's Room) and 17, 4,535;
- Building Nos. 10A, 11 (Boiler Room), 20 (Compressor Room), 3, 15, and northern portion of Building No. 1, 13,165 sf;
- Building No. 9 (with the exception of the new Boiler Room), 7,370 sf; and
- Building Nos. 5 and 2A, 4,625 sf;

The combined area of concrete surfaces to be encapsulated on the first floor is 88,565 sf.

9.4.2.1.4 Task No. 4: Concrete Building Material Removal and Replacement

Under this task, localized portions of the concrete floor slab that are not amenable to encapsulation due to structural conditions (i.e. evident subsidence of the floor slab, excessive fracturing) would be removed and replaced. As discussed in Task No. 3, the age and physical condition of the concrete building material is dissimilar from one building to the next. Deterioration of the Site buildings structure (i.e. pile supports and bulkhead) is evident and has resulted in fractured and subsided concrete floor slabs. The concrete floor slabs that have deteriorated and fractured or collapsed are located on the first floor. Since these areas are not amenable to encapsulation, these concrete floor slabs would be removed and replaced with reinforced concrete.

In areas where concrete removal would be applicable, the existing slab to be removed would be cut around the perimeter using either a handheld gas-powered concrete saw or a large walk-behind, gas-powered concrete saw, depending on the size of the area to be cut. The slab would then be broken up into small, manageable pieces using a jackhammer. The concrete debris would be removed and placed in roll-off containers, sampled for waste characterization, and transported off-Site for proper disposal. Each area of concrete slab removal would be replaced with reinforced concrete. In locations where the new slab would be installed on grade, backfill would be added, if necessary, to level the ground and repair any subsidence of the soil/fill prior to pouring the new slab. In the location where the concrete slab is supported by piles, engineering controls (i.e. fencing, stockpile locations) would be implemented to minimize the potential impact to the Hudson River.

The concrete floor slabs on the second and third floors are amenable to encapsulation and have been discussed in Task No. 3. The fourth floor is constructed entirely of wood and discussed in Task Nos. 3 and 6.

The locations of concrete slab removal and replacement are shown on Figure 9-12. These areas are limited to the first floor where deterioration of the Site buildings structures has impacted the concrete floor slabs. A discussion of these areas is provided below.

Concrete floor slabs to be removed on the first floor include Building No. 12A, Building No. 4, the Asbestos Roving Room (Building 12), the Carpenter and Electrical Shops (Building Nos. 9A, 9B, and 9C), and Building No. 7. Building No. 7 is the only concrete slab mentioned above that is constructed on piles. The remainder of the concrete slabs requiring removal is located over soil/fill. The total surface area of concrete slab to be removed on the first floor is 31,725 sf.

As shown on Figure 9-12, in addition to these areas that are not amenable to encapsulation, additional portions of the first floor concrete slab would have to be removed to facilitate the removal of impacted Below Building soil/fill (Alternative E3 or E4) and the removal of fill from subsurface concrete structures (Common Action C3). The excavation of impacted Below Building soil/fill is discussed in detail in Sections 9.2, and the removal of fill from subsurface concrete structures is discussed in Common Action C3 (see Section 9.1.3).

9.4.2.1.5 Task No. 5: Pressure Washing/Vacuuming of Concrete Surfaces

Pressure washing/vacuuming has been selected for all concrete floor surfaces where encapsulation and bulk concrete removal is not being conducted (see Task Nos. 3 and 4). This includes:

- Areas where the post-clean wipe sample results are less than the surface LTOC for lead and PCBs (Note: Post-clean wipe samples are samples taken where the sampling point area was cleaned. Consequently, pressure washing/vacuuming is required to attain these levels.); and
- Areas where the pre-clean wipe samples are less than the surface LTOC for lead and PCBs (see rationale presented below).

Cleaning of concrete building surfaces, as discussed above, including those building surfaces that meet the surface and bulk LTOC, would be required since the other tasks discussed in this alternative (i.e., surface preparation for encapsulation, bulk building material removal) would be performed in adjacent buildings and may potentially generate dust containing the COPCs. Dust control measures are discussed further in Task No. 9. The adequacy of cleaning in these areas would be confirmed through post-clean sampling (see discussion below).

All liquid waste generated from pressure washing/vacuuming activities would be temporarily stored on-Site in the appropriate containers (i.e. 55-gallon drums, roll-off containers, temporary on-Site storage tanks) during remediation activities. The wash water would then be sampled for waste characterization, and transported off-Site to the appropriate disposal facility. Dust collection systems equipped with HEPA filters would be utilized to minimize the level of airborne particulates during remediation activities. Air monitoring would also be conducted to ensure the appropriate PPE is being utilized.

After the pressure washing/vacuuming activities are completed, confirmatory wipe and/or concrete core samples would be collected to verify the effectiveness of this technology, and compliance with the surface and bulk LTOC. These confirmatory wipe and concrete core samples would also provide horizontal confirmation for adjoining encapsulated areas. Confirmatory samples would be collected at a frequency of one sample for every 1,500 sf of area cleaned. This sampling frequency is based on the approximate frequency of the current dataset collected during the RI activities. Three, ½-inch concrete samples taken from the top of the core, would be submitted for analysis for PCBs for every core collected. These three ½-inch samples would be sequential, thus representing the top 1 ½ inch of the core. Wipe samples would be collected and submitted for analysis for PCBs and lead. Any areas with exceedances of the surface or bulk LTOC, as indicated by the confirmatory samples, would subsequently be encapsulated.

The following sections discuss the areas evaluated for pressure washing/vacuuming on a floor-by-floor basis. As discussed above, the fourth floor is constructed entirely of wood. The renovated portion of the fourth floor is covered with a carpet surface cover and the unrenovated portion contains exposed wood flooring, which would not be amenable to high-pressure washing. Rather a low pressure wash/manual cleaning would be performed in this area. This cleaning is discussed further in Section 9.4.2.1.7. Therefore, the fourth floor has been excluded from the following discussion.

Third Floor

As shown on Figure 9-10, pressure washing/vacuuming would be performed in the former offices located in the southwest corner of Building No. 7 and the Men's Room. The combined area to be pressure washed on the third floor is 3,100 sf.

Second Floor

As shown in Figure 9-11, the majority of the High Bay Building (Building No. 8) and Building No. 2 would require pressure washing/vacuuming. In addition, the southern portion of the Railroad Siding Platform, the Men's Room north of Building No. 2, and the northern portion of Building No. 5 require pressure washing/vacuuming. A total area of 48,650 sf would require pressure washing/vacuuming on the second floor.

First Floor

As shown on Figure 9-12, the majority of the High Bay Building (Building No. 8) requires pressure washing/vacuuming. Other areas evaluated for pressure washing/vacuuming include the Storage Room and Men's Room next to the Pipe Shop, the eastern half of the new Boiler Room in Building No. 9, and the Men's Room located in the northern part of Building No. 14. The total area to be pressure washed/vacuumed on the first floor is 52,630 sf.

In addition to the areas listed above, all of the stairwells (including stairwell walls and ceilings) throughout the Site buildings would be pressure washed/vacuumed. The estimated combined area of all of the stairwells is 38,325 sf. Columns, walls, and ceilings of each of the Site buildings would be pressure washed and vacuumed to address any prior operational impacts and dust generated from the surface preparation prior to encapsulation or the bulk building material removal activities. In areas that are not exposed to dust generated from remedial activities, confirmatory wipe sampling may be collected from the columns, walls, and ceilings in lieu of pressure washing. For cost estimating purposes, it was assumed that pressure washing of the columns, walls, and ceilings would be performed in all areas following remedial activities. The estimated surface area of columns, walls, and ceilings is 590,000 sf.

9.4.2.1.6 Task No. 6: Wood Building Material Removal and Replacement

As previously discussed, the entire fourth floor and portions of the third and second floors are constructed with wood floors. As part of the RI, wipe samples and wood bulk samples were collected from these floors (See Figures 7-13 through 7-15). Under this task, wood removal would be conducted in these unrenovated areas where PCB concentrations in excess of the bulk LTOC are encountered at depth in the wood flooring. As discussed in Task No. 3, the northern sections of the third and fourth floors (Building No. 1) have been renovated. As part of this renovation, carpet was installed either directly on the plywood sub-floor, or more often, directly on top of existing vinyl tile. These renovated areas are not located in heavily trafficked areas. The unrenovated portions of the building constructed with wood flooring are either in poor structural condition or in heavily trafficked areas and are thus, not amenable to tiling or carpeting.

Wood floor and plywood sub-floor removal would be accomplished using manual and mechanical demolition equipment. Where necessary, non-load bearing walls would also be removed to facilitate removal of the floors. All waste generated from wood removal would be contained in roll-off containers. Waste characterization samples would be collected to determine the proper disposal requirements for wood debris. Following removal, all areas would be restored with new wood flooring and plywood sub-flooring. Confirmatory samples would not be required since all wood floor material would be removed and replaced.

The areas of wood building material that have been evaluated for bulk removal are discussed below on a floor-by-floor basis. The first floor is constructed entirely of concrete and the wood flooring on the third floor is located in a renovated, non-trafficked area (See Task No. 3 for remedial actions for this area). Therefore, these floors are excluded from the discussion below.

Fourth Floor

As shown on Figure 9-9, three locations in Building No. 2 require wood floor removal. These areas are exposed wood floors and are not located in renovated areas. Although this wood flooring is not located in a heavily trafficked area, the floor in this building is not in good structural condition and therefore is not amenable to tiling and/or carpeting. The total surface area of wood floor to be removed and replaced on the fourth floor is approximately 3,020 sf.

Second Floor

As shown on Figure 9-11, portions of Building No. 1, Building No. 6, Building No. 15, and Building No. 4 would require wood floor removal.

Some of these areas are covered with steel diamond plate. With the exception of a small area located in Building No. 1, none of these wood floor areas has been previously cleaned. These areas comprise approximately 11,360 sf.

9.4.2.1.7 Task No. 7. Manual Cleaning/Vacuuming of Wood Building Material

As presented on Figure 7-13 through 7-15, exceedances of the surface LTOC for PCBs and lead are present in areas of wood construction on the second, third, and fourth floors. Wood floor cleaning was evaluated for all wood floor surfaces in unrenovated areas where bulk concentrations did not exceed the bulk LTOC for PCBs or lead and where:

- the post-clean wipe sample results are less than the surface LTOC for PCBs and lead (Note: Since these areas are represented by post-clean sampling results, manual cleaning/vacuuming is needed to attain these levels.); and
- the pre-clean wipe samples are less than the surface LTOC for lead and PCBs (see rationale below).

Cleaning of wood building surfaces, as discussed above, including those building surfaces that meet the surface and bulk LTOC, would be required since the other tasks discussed in this alternative (i.e. surface preparation for encapsulation, bulk building material removal) would be performed in adjacent buildings and may potentially generate dust containing the COPCs.

Cleaning would be completed using methods similar to the concrete pressure washing, except a low-pressure wash would be used instead of high-pressure wash. A high-pressure wash cannot be used since it would splinter the wood surface and much of the water would be absorbed by the wood flooring. Prior to the low-pressure wash, the surface would be vacuumed. The surfaces would be scrubbed with a detergent cleaner, rinsed using low-pressure equipment, and vacuumed again. All collected water would be managed along with the water generated during the Task No. 5 high-pressure washing. Confirmatory wipe samples would be collected to verify the effectiveness of the wood cleaning and compliance with the surface LTOC. Wipe samples would be collected at a frequency of one sample for every 1,500 sf of area cleaned and submitted for analysis for lead and PCBs.

The areas of wood building material that have been evaluated for wood cleaning are discussed below on a floor-by-floor basis. Since the first floor is constructed entirely of concrete, the first floor has been excluded from the discussion below. The third floor has also been excluded from the following discussion since this wood flooring is currently carpeted or tiled (see Task No. 3).

Fourth Floor

As shown on Figure 9-9, the wood flooring in Building No. 2 would be manually cleaned and vacuumed with HEPA-filter equipped vacuums. The total surface area to be washed is approximately 4,450 sf. The renovated areas in Building No. 1 would not be manually cleaned and vacuumed. As discussed previously, the existing carpeting in Building No. 1 would serve as a surface cover for exceedances of the surface LTOC for lead and PCBs.

Second Floor

As shown on Figure 9-11, portions of Building No. 1, Building No. 10 and Building No. 4 would require wood cleaning. The total surface area to be cleaned is approximately 13,650 sf.

9.4.2.1.8 *Task No. 8: Lead-Based Paint and Asbestos Abatement*

Under this task, all known lead-based paint, regardless of its condition, would be abated from all buildings by a certified contractor. This includes chipping and peeling lead-based paint, as well as lead-based paint that is in good condition. All lead-based paint would eventually deteriorate and chip off. This material would then recontaminate the encapsulant or remediated building material. As such, all lead-based paint would be abated and disposed off-Site prior to encapsulation, removal, or cleaning activities.

In addition, all known asbestos-containing material (ACM) present in the interior portions of the Site buildings would be abated by a certified contractor. Currently, the ACM within the Site buildings has been identified and labeled and is not friable. The ACM does not pose an immediate exposure risk. However, it is estimated that ACM abatement would be required in the future. Therefore, for cost estimation purposes, it has been assumed that abatement of ACM would be accomplished gradually as it deteriorates over the years. It is assumed that a percentage of the ACM would be abated every five years over the course of the next 30 years. This eventually will include all ACM with the exception of exterior asbestos-containing building material (i.e., exterior transite panels, roofing material). All removed ACM would be stockpiled separately and disposed off-Site.

9.4.2.1.9 *Task No. 9: Ambient Air Monitoring*

Several of the interior building material remedial activities would require air monitoring. These activities include: bulk concrete and wood removal, lead-based paint abatement, and ACM abatement. An air monitoring program would be developed to meet the requirements of the various SCGs that apply to these activities.

A building interior PAMP that specifies the components of this program would be developed in accordance with the New York State Department of Health Generic Community Air Monitoring Plan contained in Appendix 1A of the Draft DER-10 (NYSDEC, 2002). The air monitoring program would include real-time particulate monitoring using particulate monitoring devices and conducted continuously throughout the remedial activities. Dust action levels that relate to PCBs and lead would be developed. Air samples would be collected and submitted for lead and PCB analysis daily during the remedial activities.

Dust would be controlled by spraying a water mist over the work area if perimeter action levels established in the PAMP are exceeded. This would be generated by connecting a misting device to a hose, which would be connected to any nearby interior water source. The degree to which these measures would be used would depend on particulate levels in ambient air at the perimeter of the Site as determined through the implementation of the PAMP.

In addition, a HASP would be prepared for all remedial work to be completed at the Site. The HASP would include air monitoring for particulates, lead, and PCBs in the work and exclusion zones. This plan would identify the level of PPE required for Site work, action levels for the work and exclusion zones, and PPE upgrades and engineering controls that correspond to action level exceedances.

As requested by the NYSDEC and NYSDOH, air samples would be collected in each floor of each building following all remedial activities using PUF samplers and submitted to a laboratory for PCB analysis. For cost estimating purposes, it was assumed that approximately 50 indoor air samples would be collected. Sample results would be submitted to the NYSDEC and NYSDOH upon completion. The feasibility and need for PUF sampling, as well as the frequency needed to correlate realtime measurements, would be confirmed during the Remedial Design.

9.4.2.1.10 Task No. 10: Transportation and Off-Site Disposal

Under this task, the remediation-derived waste would be transported and disposed off-site. Remediation derived waste would include:

- Bulk concrete from building material removal (i.e. slab removal);
- Concrete dust from surface preparation activities;
- Wood from building material removal (i.e. floors and walls);
- Wash water generated from pressure washing/vacuuming and wood floor cleaning activities;
- Sludge removed from the interior stormwater system;
- ACM removed from the interior of the Site buildings;
- Lead-based paint removed during abatement activities in the interior of the Site buildings; and
- Fill and debris removed from subsurface concrete structures.

Segregation of each of the above remediation wastes would be conducted based on media (e.g. bulk concrete, concrete dust, wash water, wood, ACM), available analytical data, and field observations. All debris generated from the remedial activities would be sampled for waste characterization prior to off-Site disposal. Based on the waste characterization sampling results, each of the building material waste types would be transported to the appropriate waste disposal facility.

Non-hazardous bulk concrete building material would be transported to either a concrete recycler or a State-approved solid waste landfill facility. PCB-hazardous concrete building material would be transported to a TSCA approved landfill disposal facility. Concrete dust generated during surface preparation activities would be containerized in either roll-off containers or drums. Disposal of this material would be similar to that of the bulk concrete building material.

Wood building material would be segregated from the concrete building material debris and stockpiled separately. Non-hazardous wood debris would be transported to a State-approved solid waste landfill facility. Wood debris determined to be PCB-hazardous based on waste characterization sampling would be transported to a TSCA approved disposal facility.

It is anticipated, based on Site-related experience, that all wash water generated from pressure washing and wood floor cleaning activities would be non-hazardous waste. However, waste characterization samples would be collected to confirm its non-hazardous classification. Wash water would be stored in either drums or a temporary on-Site tank to await disposal. Wash water would be transported to a treatment facility capable of handling this liquid waste.

All ACM and lead-based paint removed from the Site buildings would be transported to a landfill facility licensed to accept and manage these wastes. Prior to transport of these materials, all ACM and lead-based paint would be sealed in leak-tight containers in an effort to prevent fiber and paint chip releases during handling and transportation.

Fill removed from the subsurface structures would be segregated, stockpiled, and sampled for waste characterization. Sludge removed from the interior stormwater system would be stabilized with a stabilizing agent (e.g. kiln dust) to reduce the moisture content of the sludge, if necessary. Based on the results of waste characterization samples, PCB-hazardous soil/fill and sludge would be transported to a TSCA approved landfill facility and non-hazardous soil/fill and sludge would be transported to a State-approved solid waste disposal facility. Lead-hazardous fill and sludge would be stabilized and disposed at a solid waste disposal facility permitted to accept hazardous waste

To estimate debris quantities, average densities of 1.5 tons per CY and 1.2 tons per CY were assumed for concrete and wood debris, respectively. Based on these density assumptions, it is estimated that a total of 1,570 tons of concrete, 200 tons of wood, and 430,400 gallons of water would be generated. The quantity of ACM and lead-based paint is not quantifiable.

An average density of 1.5 tons per CY was assumed for the fill material within the concrete subsurface structures. It is estimated that a total of 215 tons of fill and debris would be removed as part of the subsurface fill removal common action.

It was assumed that one waste characterization sample would be collected for every 22-ton truckload of concrete, wood, or soil/fill generated for disposal. It was estimated that one waste characterization sample would be collected for every 10,000 gallons of wash water generated. Waste characterization samples collected for each waste stream, with the exception of ACM and lead-based paint, would be submitted for analysis for PCBs, total lead, TCLP VOCs, TCLP SVOCs, TCLP metals, and RCRA Characteristics.

9.4.2.1.11 *Task No. 11: Infrastructure Restoration of Deteriorated Pilings, Building Floors and Roof System*

Under this alternative impacted interior building materials would remain on-Site at concentrations greater than the surface and bulk LTOC. The COPCs in these impacted building materials would be separated from direct contact by humans and prevented from being released to the surrounding environment through the use of a non-porous epoxy encapsulant. However, to ensure that the epoxy encapsulant remains intact and continues to provide protection from exposure, the encapsulant must be maintained. A necessary component of the application and maintenance of the encapsulant is restoration of the Site buildings structures. Continued deterioration of the Site buildings structures would result in expedited deterioration of the encapsulant. Additionally, the deterioration of the Site building structures poses a risk for impacted building material that remains under this alternative to collapse and contaminate the surrounding environment or the river. Therefore, this task addresses restoration of the Site building structures including restoration of the timber support piles and roof systems. The following discusses the required restoration activities associated with both the timber support piles and roofing. The bulkhead would be restored under Common Action C4, included as part of this alternative.

<u>Timber Support Piles</u>

An investigation of the building substructures (including the existing piles and concrete floor slabs) was conducted by Greenman-Pedersen, Inc. The findings of this investigation are documented in the May 2000 report entitled "*Investigation and Analysis of Existing Timber Piers and Concrete Floor Slabs Supported by Timber Piles*" (Greenman-Pedersen, May 2000) (the "Greenman-Pederson Report"). The areas investigated in this report included the West Warehouse and adjacent dock, Building No. 8 and the western dock, the peripheral dock around the EPRI Laboratory building, Building Nos. 7 and 9, and under Building Nos. 9A, 9B, and 9C.

According to the Greenman-Pedersen Report, portions of the Site require rehabilitative work to restore currently deteriorated areas, prevent further deterioration of the substructure and ensure the future integrity and stability of the Site building structures. Additional fracturing of the first floor concrete slabs would continue and subsidence of concrete floor slabs would persist without restoring the stability to the Site building structures. Continued fracturing or subsidence of concrete floor slabs that have been encapsulated would compromise the integrity of the encapsulant and result in direct exposure of the environment to the COPCs.

As part of this alternative, a pre-design structural evaluation would be conducted to determine what additional actions are required to address continued deterioration that has occurred since the Greenman-Pedersen investigation was completed in March 2000. Based on the Greenman-Pederson Report, the following work would need to be conducted at a minimum to secure the building integrity:

Dock West of Building No. 8

As a result of the deterioration of the steel sheeting bulkhead on the west side of Building No. 8 (see Figure 9-13), subsidence of underlying soil/fill has caused exposure of timber piles to tidal action of the Hudson River. Additionally, extensive deterioration of support piles for the adjacent dock has been identified. To ensure structural stability it would be necessary to conduct repairs to piles/posts and bracing below the concrete slab in these areas.

EPRI Lab Peripheral Dock and Esplanade

Significant deterioration was identified in the horizontal and diagonal timber braces for the EPRI Lab Peripheral Dock and Esplanade (see Figure 9-13). This deterioration appears to have resulted in loose and missing bracing. Concrete slab settlement was also identified. Concrete slab repair would have to be completed along the EPRI Lab Peripheral Dock and Esplanade, as well as post, pile and bracing repair below the concrete slab to secure this area.

Building Nos. 7 and 7A

Exposed reinforcement from the underside of the concrete slab and deteriorated pile caps and posts were identified during the Greenman-Pederson investigation under Building Nos. 7 and 7A (see Figure 9-13). Recent evaluation of the timber support structure has identified further deterioration since the May 2000 Greenman-Pederson investigation (GPI, 2000). Load restrictions have been implemented for the concrete slabs in these buildings. As part of the remedy for Building Nos. 7 and 7A, replacing or repairing pile caps, stringers, and posts would be required. This work would be coordinated with the concrete slab replacement of Building No. 7 as discussed in Section 9.4.2.1.4.

Building No. 9

Deteriorated posts, pile caps, and stringers were identified under Building No. 9 (see Figure 9-13). Slab settlement and cracking were observed, as well. Therefore, repairs to pile caps and stringers, and posts below the concrete slab would be required for this task.

Building Nos. 9A, 9B, and 9C and North Dock

Several pile caps were observed to be missing during this investigation. Deterioration of several piles have caused weakening of the dock adjacent to Building Nos. 9A, 9B, and 9C. Additionally, the joint between the dock and the buildings was reported by Greenman-Pederson to be in poor condition. Substantial slab settlement has been observed, as a result of the deterioration of the timber supports. To secure Building Nos. 9A, 9B, and 9C it would be necessary to repair a significant number of posts below the concrete slab. Removal and replacement of the concrete floor slabs in Building Nos. 9A, 9B, and 9C were discussed in Task No. 4.

Roof Systems

As discussed in Section 1.4.6, the existing roof system varies in age and is in differing states of repair. In a number of places the roof has deteriorated and leaks sufficiently to allow storm water to enter the Site buildings. Puddles of storm water from roof leaks have been observed on each floor of the Site buildings resulting from storm conditions. Maintenance and repair to the roof has been performed in the recent past, however, because of the deteriorated condition of the roof, storm water leaks continue. Restoration of the compromised roof systems would be required prior to installing the encapsulant. Exposure to storm water through the roof leaks would cause premature deterioration of the encapsulant.

Based on the existing condition of the roof, it has been estimated that 33% of the roof systems would require immediate restoration. The remainder of the roof systems would be restored gradually at a rate of approximately 7% per year for an additional 10 years.

9.4.2.1.12 Task No. 12: OM&M Associated With Remedial Alternative I2

Since impacted interior building materials would remain at the Site after the completion of remediation activities under this alternative, a series of OM&M tasks would be completed on a routine basis. An OM&M Plan would be prepared for these activities. The purpose of these OM&M tasks would be to ensure that the COPCs remaining in interior building materials are secure, and do not pose an exposure route to humans or the surrounding environment. For cost estimation purposes, it has been assumed that OM&M would be conducted for 30 years and that the building would be demolished at Year 30. Since the buildings would be demolished at that time, reapplication of the 30-year epoxy encapsulation is not assumed after Year 30.

The following OM&M tasks would be included in the OM&M Plan:

- Inspection of Epoxy Encapsulation (OM&M Task No. 1)
- Inspection of Carpeting and Vinyl Tile Surface Covers in the Renovated Wood Areas of the Third and Fourth Floor (OM&M Task No. 2)
- Collection and Analysis of Wipe Samples from Encapsulated Areas (OM&M Task No. 3)
- Restoration of the Roof Systems (OM&M Task No. 4)
- Inspection of Timber Support Piles (OM&M Task No. 5)
- Abatement of ACM (OM&M Task No. 6)

A brief description of each OM&M task is provided below, as well as the frequency each task would be performed.

<u>OM&M Task No. 1: Inspection of Epoxy Encapsulation</u>

All surfaces that were encapsulated as part of this alternative would be thoroughly inspected semi-annually. The inspection would focus on the identification of worn or compromised (i.e. cracks, rips, or breaks in the integrity of the surface caused by expansion and contraction in seasonal temperature cycles) or improperly adhering encapsulant. Areas that have been worn would be identified prior to any exposure or release of COPCs due to the double coat of different colored encapsulants that have been applied. Compromised areas would be repaired immediately following the semi-annual inspection to prevent potential exposure of occupants to underlying COPCs. For cost estimation purposes, it was assumed that approximately 1% of encapsulant would require replacement every year.

OM&M Task No. 2: Inspection of Carpeting and Vinyl Tile Surface Covers in the Renovated Wood Areas of the Third and Fourth Floor

All renovated wood areas on the third and fourth floors would be inspected to ensure that the carpet/tile is providing a sufficient barrier between the COPCs and the environment. All areas would be thoroughly inspected to ensure the surface covers have not been ripped or torn. If a damaged area were detected, it would be repaired immediately. This inspection would be conducted semi-annually and concurrent with OM&M Task No. 1. Although the wear of the carpet covers would be dependent upon the usage of these areas, it is anticipated that the carpeting would require replacement during the assumed OM&M period of 30 years. Therefore, it has been assumed that one-third of the carpeted areas would require replacement every 10 years. The vinyl tiling is less likely to wear or become damaged. It has been assumed that one-quarter of the vinyl tile would require replacement every ten years.

OM&M Task No. 3: Collection and Analysis of Wipe Samples from Encapsulated Areas

Wipe samples would be collected from the encapsulated surfaces to ensure that COPCs have not penetrated through the encapsulation as per previous NYSDEC requests (NYSDEC, 2002a – comment #22). Wipe samples would be collected at a ratio of one sample per 1,300 sf of encapsulant and submitted for analysis for PCBs and lead. Wipe samples would be collected on an annual basis.

OM&M Task No. 4: Restoration of the Roof Systems

As discussed in Task No. 11, to ensure the longest useful life for the epoxy encapsulation it is necessary to minimize the exposure of the encapsulant to deteriorating elements, such as water or extreme temperatures. For this reason it is essential that the roof of the buildings be intact and watertight. As stated above, it is estimated that restoration of the roof systems would be completed within 10 years. However, routine inspection would be required within this duration to identify the need for immediate repairs. It would be necessary to inspect and maintain the roofing for the life of the encapsulant, or until the COPCs in exceedance of the LTOC are removed from the Site. Routine roof inspection/maintenance would be conducted annually prior to and following the restoration of the roof.

OM&M Task No. 5: Inspection of Timber Support Piles

A pre-design structural evaluation would be conducted to identify the timber piles, which are in need of restoration, in addition to those identified in the May 2000 Greenman-Pederson Report (GPI, 2000). Restoration of the timber support piles would be performed only on those support piles that exhibit deterioration at that time. Periodic evaluations of timber support piles would be required in the future to determine their condition. For cost estimation purposes, it was assumed that a structural evaluation would be performed every 5 years for the next 30 years and that repair would be conducted, as needed.

OM&M Task No. 6: Abatement of ACM

All known ACM located in the interior portion of the Site would be abated over time. As discussed in Section 9.4.2.1.8, abatement activities would be completed gradually since the asbestos is not friable and does not pose an immediate exposure risk. It was assumed that a percentage of the ACM would be abated every five years for the next 30 years. All ACM would be removed by a certified contractor, and properly disposed at a facility licensed to receive ACM.

9.4.2.1.13 Task 13: Demolition and Remediation of Site Buildings at Year 30

The encapsulation component of Remedial Alternative I2 would offer a remedy for managing the COPCs at the Site. The encapsulant would provide protection of human health and the environment and manage the COPCs on-Site. The structural repairs, along with the OM&M tasks discussed in Section 9.4.2.12, would aid in preserving the encapsulant in an effort to prolong the life of the encapsulant. It is expected that at some point in the future, the Site buildings would exceed their useful life, despite the OM&M inspections and restoration activities undertaken in Task No. 11 and Common Action C4. For this reason, the complete demolition and remediation of on-Site buildings was evaluated as a future remedial action. For cost estimating purposes it was assumed that this task would be conducted in Year 30 after the initial implementation of this alternative.

This future demolition task is similar to the demolition included in Remedial Alternative I4 (see Section 9.4.4). This demolition task would completely remove all Site buildings on grade (northern buildings). The Site buildings supported by timber piles (southern buildings) would be partially demolished, leaving only the concrete floor slab. The demolition would exclude the Warehouses and the Paint Shop, which are discussed with the soil/fill alternatives in Section 9.2. The concrete floor slab supported by timber piles would be remediated utilizing pressure washing and micro-removal technologies. All demolition and remediation derived waste would be transported off-Site and properly disposed. The demolition task would include the following sub-tasks:

- Site Preparation and Mobilization
- Demolition of Site Buildings
- Remediation of Concrete Building Material Remaining in Southern Site Buildings
- Removal of the Interior Stormwater System
- Ambient Air Monitoring
- Transportation and Off-Site Disposal of Building Debris

Additional discussion regarding these tasks is provided in Section 9.4.4.

9.4.2.1.14 Task No. 14: Access and Use Restrictions (Task No. 14)

Under this alternative, interior building materials containing chemicals at concentrations above the surface and bulk LTOC would remain in place until Year 30 and would be encapsulated. Institutional controls would therefore be implemented to address the NYSDEC's requirement to issue a notice regarding chemicals present in Site media and TSCA's requirement to provide a notice regarding PCB concentrations remaining beneath surface covers.

In accordance with 40 CFR 761.61(a)(8), a deed notice would be prepared and filed within 60 days of completion of implementation of this Alternative for the Site. This deed notice would:

- indicate that the building materials have been used for PCB remediation waste disposal;
- indicate the existence of the surface covers (i.e., encapsulation);
- identify the areas where the total PCB concentration exceeds 50 mg/kg;
- identify acceptable Site uses;
- specify the OM&M requirements identified in Task No. 12; and
- identify the locations and concentrations of COPCs in excess of their LTOC.

After this deed notice is filed, the Site owner would submit a signed certification to the EPA Administrator stating that the deed notice has been filed.

9.4.2.2 *Evaluation*

9.4.2.2.1 *Overall Protection of Human Health and the Environment*

As discussed above, under Remedial Alternative I2, COPCs would remain on and in the interior building materials that are encapsulated. This alternative would provide adequate protection of human health and the environment through:

- encapsulation of impacted interior building construction material amenable to encapsulation;
- continued OM&M of the encapsulated and carpeted/tiled areas;
- restoration of the building infrastructure through Task No. 11 and Common Action C4;

- bulk removal and washing/vacuuming of areas not amenable to encapsulation;
- removal of lead-based paint and ACM;
- removal of sludge from the interior stormwater system;
- removal of the process and fuel oil tanks;
- demolition of the Site buildings in Year 30; and
- off-Site disposal of the remediation waste generated during this alternative.

Deterioration or damage to the encapsulation and/or the carpeting/tiling could allow direct exposure of the underlying COPCs to occupants and the surrounding environment. This risk would be managed through semi-annual inspections and the deed notice. There is a minimal potential for direct contact with damaged areas between the inspection periods.

As discussed above, limited bulk removal and washing/vacuuming would be conducted. COPCs would be reduced through complete removal of building material containing COPCs, as well as through pressure washing/vacuuming of concrete surfaces and manual washing/vacuuming of wood surfaces. For these areas, there would be a reduction of the COPCs in exceedance of the surface and bulk LTOC and any risk of exposure to humans and the surrounding environment would be mitigated.

Demolition of the Site buildings and remediation of the concrete slabs supported on piles in the southern buildings would be performed thirty years after the application of the encapsulation. Following the demolition and remediation activities, there would be no risks posed by interior building materials to human health or the environment.

Provided long-term OM&M is properly conducted and all damaged and worn encapsulation is immediately detected, this alternative would provide adequate protection of human health and the environment during the 30-years of encapsulation. In addition, demolition of the Site buildings at the end of the 30-year period would provide long-term protection of human health and the environment without any continued OM&M.

9.4.2.2.2 Compliance with the SCGs

A summary of the SCGs for the interior building material is provided in Table 9-5. As shown in this table, during the first 30 years of implementation, this alternative would comply with the location specific SCGs, but would not meet all of the chemical and action specific SCGs for interior building material. Most importantly, this alternative would not fully address the SCGs related to the LTOC for the interior building material in the first 30 years of implementation.

Alternative I2 would:

- address the 6 NYCRR Part 375 goals to eliminate or mitigate all significant threats to public health and the environment through installation and OM&M of encapsulation until building demolition is conducted;

- meet the OSWER Directive 9360.3-12 by mitigating the potential for release of COPCs to the surrounding environment through implementation of Task No. 11 and Common Action C4;

- meet the surface and bulk LTOC for PCBs (i.e., 1 µg/100 cm^2 and 1 mg/kg, respectively) in encapsulated areas through application of an encapsulant in accordance with 40 CFR 761.30(p);

- meet the surface LTOC for lead (i.e., 4.3 µg/100 cm^2) in encapsulated areas;

- address the 40 CFR 745 and 40 CFR 763 requirements for lead paint and asbestos abatement, respectively;

- address the 6 NYCRR Part 613 requirement by removing the fuel oil tanks;

- address the 6 NYCRR Part 613 requirement by removing the process tanks that have been out of service for several years;

Alternative I2 would not:

- address the 6 NYCRR Part 375 goals to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law; and
- address the 6 NYCRR Part 375 requirement to remove "consequential amounts" of hazardous waste in both building material and subsurface concrete structure fill.

Washing/vacuuming of concrete and wood surfaces would reduce PCB and lead concentrations to meet the surface LTOC. Limited removal of bulk building material would eliminate wood and deteriorating concrete that are not amenable to encapsulation and that also contain COPCs at concentrations above the bulk LTOC. Remaining concrete surfaces would be covered with an epoxy encapsulant, which would provide a barrier for the COPCs in exceedance of the bulk LTOC on-Site.

Following the demolition/remediation task in Year 30, this alternative would fully meet all of the SCGs for interior building material, as well as the SCGs related to the LTOC for building material.

9.4.2.2.3 Long Term Effectiveness and Permanence

The washing/vacuuming and building material removal components of Remedial Alternative I2 would effectively remove the COPCs from the Site, and provide a permanent remedy. The application of an epoxy encapsulant on concrete surfaces is a proven method for reducing potential exposure to the COPCs when effectively applied and maintained. However, the COPCs would remain on-Site for the first 30 years of this alternative. For encapsulated surfaces to successfully provide protection against the COPCs over the long-term, regularly scheduled OM&M would be implemented. In addition, the surrounding building structure would be maintained to mitigate the exposure of the encapsulation to the elements.

For cost estimation purposes, application of a 30-year encapsulant was assumed. This life expectancy reflects the time it would take to wear down the encapsulant and does not address the potential for damage to the encapsulant through deterioration. To address these long-term concerns, semi-annual inspections would be conducted to identify damaged areas and the encapsulant would be repaired, as needed. Performance testing, including confirmatory wipe sampling, would be conducted to confirm that the encapsulation continues to provide adequate protection. Furthermore, this alternative includes infrastructure restoration and restoration of the bulkhead to prevent the release of encapsulated impacted interior building construction materials to the environment.

Removal of the fill in the subsurface concrete structure (Common Action C3), cleaning of the interior stormwater system (Common Action C5), the removal of the process and fuel oil tanks (Common Action C6), and cleaning of the lead extrusion pits (Common Action C7) would effectively remove the COPCs from the Site and provide a permanent remedy.

Following the demolition/remediation activities in Year 30, the remaining impacted building materials would be removed, thus ultimately providing a permanent remedy for the interior building materials.

9.4.2.2.4 Reduction of Toxicity, Mobility, or Volume

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility, and volume of listed hazardous waste and COPCs. At some locations within the Site buildings, concrete exhibiting bulk PCB concentrations above 50 mg/kg is present. In addition, fill contained in some of the subsurface concrete structures exhibit PCB concentrations above 50 mg/kg. These materials, which have PCB concentrations in excess of 50 mg/kg, are classified as NYS B007 PCB-listed hazardous wastes.

Under this alternative, all NYS B007 PCB listed hazardous waste located within the subsurface structures would be removed from the Site. Select areas of impacted concrete building material that are classified as a NYS B007 PCB- listed hazardous waste would be removed under this alternative since they are located in areas not amenable to encapsulation. This would reduce the toxicity, mobility, and volume of hazardous waste and COPCs at these locations. However, the majority of the impacted concrete building material that is classified as a NYS B007 PCB listed hazardous waste would not be removed under this alternative until the buildings are demolished in Year 30. The encapsulant would reduce the mobility of the hazardous wastes and COPCs; however, it would not be effective in reducing the toxicity or volume of hazardous waste or COPCs prior to building demolition. Bulk removal of impacted wood, and surface cleaning of wood and concrete areas would reduce the toxicity, mobility, and volume of COPCs in these areas.

Removal of the debris in the subsurface structures (Common Action C3), removal of the process and fuel oil tanks (Common Action C6), removal of sludge in the interior stormwater system (Common Action C5), and cleaning of the lead extrusion pits (Common Action C7) would reduce the toxicity, mobility, and volume of these impacted building materials through removal from the Site.

This alternative would be effective in reducing the toxicity, mobility, and volume of lead-based paint and asbestos through abatement of these materials.

All waste generated from the remedial activities associated with Alternative I2, including concrete and wood building material, ACM, lead-based paint, sludge, fill, and wash water would be transported off-Site for disposal. Consequently, this material would no longer present an on-Site threat as the material would be relocated to a secure land disposal facility.

9.4.2.2.5 Short-Term Effectiveness

The total time required to complete Alternative I2 is expected to be 8 to 12 months following NYSDEC approval of the Remedial Design. The demolition to be performed in Year 30 would require 6 to 8 months to complete. During building material removal, surface preparation prior to encapsulation, and cleaning activities, the remedial contractors could be exposed to COPCs through direct contact or inhalation. Exposure risks may be associated with dermal, inhalation, and/or ingestion pathways. Adverse impacts to remedial contractors would be minimized with the proper use of PPE, air monitoring, and the use of the appropriate engineering controls. These same risks would be applicable during the demolition/remediation activities performed in Year 30.

All current on-Site activities would be disrupted during the implementation of this alternative. All occupants currently at the Site, including property management, maintenance personnel, and temporary tenants would be relocated from the Site and remain off-Site for the duration of the remedial activities. All non-permanent structures within the Site buildings (i.e. machinery, tools, furniture, etc.) would be removed, as well.

There is also the potential for air-borne risks to the surrounding community during implementation of this alternative from remedial activities and disposal trucks leaving the Site. Risks would be mitigated, to the extent possible, via engineering controls, decontamination procedures prior to leaving the work zone, and proper health and safety monitoring. As discussed in Section 9.4.2.1.9, a PAMP would be implemented to monitor particulate concentrations at the Site's perimeter.

The remedial activities would cause an increase in the truck traffic in the community. Approximately 155 truckloads would leave the Site during implementation of the remedial action. Although the Site is located in a commercial/industrial setting, one narrow means of access exists into and out of the Yard. In addition, residential areas must be traversed to reach the Site. Consequently, the increased truck traffic and its associated emissions posed by this alternative would likely pose considerable concerns to the surrounding community. All disposal vehicles would be decontaminated prior to leaving the Site and all material to be disposed would be either contained in sealed containers or covered before leaving the Site. Additional increased traffic would be experienced in Year 30 during demolition activities. Over 1,800 additional truckloads would leave the Site during demolition activities.

9.4.2.2.6 Implementability

The technologies to be used in this alternative are readily available. Similarly, experienced remedial contractors are readily available to implement the remedial activities associated with this alternative. However, because of the large surface area of the Site buildings that would require encapsulation, the heterogeneous nature and condition of the concrete building material in the Site buildings and the numerous structural components (i.e., columns, pipes), installation of the encapsulant would be complex and challenging to apply effectively to all areas.

The bulk building material removal and cleaning/vacuuming activities are reasonably implementable. Similar to the encapsulation activities, fixed structural components may complicate the removal and cleaning activities. Removal of concrete building material that is supported by timber piles increases the difficulty of building material removal and replacement. Proper engineering and planning could minimize these difficulties.

Extensive OM&M would be required for 30 years to maintain the encapsulant. Continual monitoring of the encapsulant, including inspection for deterioration, immediate repair to any deteriorated areas of the encapsulant, and routine performance testing, would be required for the life of the encapsulant, until the COPCs are removed from the Site or until the buildings are demolished. As discussed in Section 9.4.2.1, the Site buildings' structures would require restoration and continual inspection to protect the encapsulant. Therefore, significant monitoring of the encapsulant, as well as the Site buildings structure, would be required to ensure the encapsulant continues to provide an adequate barrier. Administrative issues associated with this alternative would include securing an agreement with the NYSDEC regarding continued inspection and performance monitoring and implementing access and use restrictions. Additionally, an agreement and management program would need to be established with any future owners or occupants.

The demolition/remediation activities to be performed in Year 30 would be easily implementable. Demolition contractors are readily available to perform the work. The technologies associated with the remediation of the concrete slab supported on piles have been proven effective and remedial contractors are also readily available to perform this work. The proximity of the Site to the Hudson River may require additional precautions to prevent any impacts from the construction debris or runoff generated by stormwater during the demolition activities. Permits to complete the demolition and remediation of the Site buildings would be obtainable with average effort.

Common Actions C5, C6, C7, and the subsurface structure portion of Common Action C3 are readily implementable. As discussed in Section 9.2, Common Action C4 has considerable implementability concerns.

9.4.2.2.7 Cost

The summary of the estimated capital cost of Remedial Alternative I2 is provided in Table R-2 of Appendix R. As shown in Table R-2, the total estimated cost for completing Remedial Alternative I2 is $12,598,595. It is estimated that the present worth cost for completing the associated OM&M activities is $2,363,508. The present worth cost for completing the demolition/remediation activities in Year 30 are estimated to be $3,210,461. Therefore, the net present value of Remedial Alternative I2 is $18,172,564.

9.4.3 ALTERNATIVE I3: BUILDING INTERIOR REMEDIATION

9.4.3.1 Description

This alternative addresses the impacted interior building construction material identified in Section 7.2.4.3 primarily through the use of concrete micro-removal and bulk concrete and wood removal. The extent of impacted interior building construction material was presented in Figures 7-12 through 7-15 and Figures 7-12A through 7-14A.

Interior building construction materials that exhibit bulk concentrations in excess of the bulk LTOC and/or surficial concentrations above the surface LTOC would be addressed in the following manner:

- Milling of all structurally stable concrete floor slabs, with the exception of first floor concrete slabs supported by piles, that are impacted to depths less than or equal to ½-inch;
- Milling of structurally stable first floor concrete slabs supported by piles that are impacted to depths less than or equal to 1-inch (due to structural complications associated with removing concrete slabs in these areas);
- Bulk concrete removal of all non-structurally concrete first floor slabs supported by piles that are impacted to depths less than 1-inch since these floors cannot support the weight of the milling equipment;
- Bulk concrete removal of all concrete floor slabs, with the exception of first floor concrete slabs supported by piles, that are impacted to depths greater than ½-inch;
- Bulk removal of the first floor concrete slabs supported by piles that are impacted to depths greater than 1-inch;
- Shot blasting of interior building materials that exhibit residual lead surface concentrations above the surface LTOC after surface accumulation removal;
- Washing and vacuuming of interior building materials not addressed in the concrete removal activities identified above that exhibit post-clean surface concentrations below the LTOC – washing and vacuuming is needed since the post-clean sample results assume some degree of cleaning is conducted {Note: A more aggressive washing

technique would be used for the concrete building materials than the wood building materials}; and

- Washing and vacuuming of all areas that are not subject to micro-removal or bulk removal or washed/vacuumed since the remedial work in the other areas would generate dust that may contaminate these clean areas.

The maximum depths for milling noted above were defined in Section 8.1.2.4. Figures 9-14 through 9-17 show the remedial technologies proposed for the fourth, third, second and first floors, respectively, under Remedial Alternative I3.

This alternative would include the following remedial tasks and incorporate the following Common Actions discussed in Section 9.1 associated with building materials:

- Site Preparation and Mobilization Task (Task No. 1)
- Restoration of the Interior Stormwater System (Task No. 2)
- Micro-Removal of Concrete Building Material (Task No. 3)
- Concrete Building Material Removal (Task No. 4)
- Pressure Washing/Vacuuming of Concrete Building Material (Task No. 5)
- Wood Building Material Removal (Task No. 6)
- Manual Cleaning/Vacuuming of Wood Building Material (Task No. 7)
- Lead-based Paint and Asbestos Abatement (Task No. 8)
- Ambient Air Monitoring (Task No. 9)
- Transportation and Off-Site Disposal (Task No. 10)
- Removal of Debris Within Building Subsurface Structures (Common Action C3)
- Removal of The Interior Stormwater System (Common Action C5)
- Removal of Process Tanks (Common Action C6)
- Cleaning of The Lead Extrusion Pits (Common Action C7)

This alternative could be completed within 12 to 14 months of NYSDEC approval of the Remedial Design for this Site.

Descriptions of the common actions considered for this alternative (i.e., Common Actions C3 and C5 through C7) were provided in Section 9.1.1.3 and Sections 9.1.1.5 through 9.1.1.7. Evaluation of these common actions is included along with the other tasks of this alternative.

9.4.3.1.1 Task No. 1: Site Preparation and Mobilization Task

Prior to beginning any remediation activities associated with this alternative, it would be necessary to prepare the Site and mobilize all necessary equipment to the Site. Initially, all occupants currently at the Site (including property management, on-Site facility workers, and temporary tenants) would be relocated from the Site and remain off-Site for the duration of the remedial activities. All non-permanent structures within the building (i.e. machinery, tools, furniture, etc.) would be relocated from the Site to allow open access to all areas that would be remediated.

Under this alternative, bulk concrete, concrete dust, wood, wash water, lead-based paint, and asbestos waste would be generated. It would be necessary to stage roll-off containers and wash water storage containers/tanks on-Site in the North Yard. Equipment needed for concrete slab and wood building material removal and replacement, such as demolition equipment, excavators and loaders, as well as construction trailers would be mobilized to the Site and staged in the North Yard. Debris stockpile zones would also be established in the North Yard. This task would need to be coordinated with the selected soil/fill remedial action alternative since a number of the potential alternatives for this media include extensive work in the North Yard.

9.4.3.1.2 Task No. 2: Restoration of the Interior Stormwater System

As described in Section 9.1.1.5, the interior stormwater system located below the floor slab on the first floor would be cleaned and removed as a Common Action. After removal of the stormwater system, a void would remain in the location of the former trench and piping. Under this alternative, a functional stormwater management system for the northern Site buildings would be installed in the trench void. New piping would be installed where the trench formerly was located. The existing roof drains that formerly discharged to the trench system would be tied into this new piping. The pipe trench would then be filled with gravel backfill, and a reinforced concrete slab would be installed over the entire area. Cleanouts would be installed through the concrete slab throughout the length of the stormwater piping.

As shown on Figure 7-7, two areas of impacted soil/fill below the building have been identified and delineated in association with the interior stormwater system. Both of these areas are located in portions of the trench believed to have no competent bottom. The first impacted area is located near the southern portion of the Pipe Shop, and the second impacted area is located in Building No. 10. The investigation of Below Building soil/fill is discussed in detail in Section 2.2, and the evaluation for addressing these two areas was discussed in Section 9.2.

9.4.3.1.3 Task No. 3: Micro-Removal of Concrete Building Material

As discussed in Section 7.2.4.3 and shown in Figures 7-12 through 7-15, PCBs and lead are present in and on concrete building materials at concentrations above the bulk and surface LTOC.

The following rationale has been used to select the appropriate remedial technologies for the various locations of lead and PCB exceedances of the LTOC for interior building material. This selection has been based upon the distribution of lead and PCBs in and on the concrete building materials and physical Site conditions.

Exceedance of the surface LTOC for lead only

In areas where lead is persistent in the post-clean concrete wipe samples at concentrations above the surface LTOC, the concrete would be shotblasted to remove the residual lead. As discussed in Section 8.1.2.4, shot blasting has been proven effective in addressing residual surficial concentrations of lead in concrete at the Site.

Exceedance of the surface and bulk LTOC for PCBs

In areas where PCBs have permeated into the concrete:

- Milling would be conducted for all structurally competent concrete floor slabs, that are impacted to depths less than or equal to ½-inch with the exception of first floor concrete slabs supported by piles;
- Milling would be conducted for structurally competent first floor concrete slabs supported by piles or in isolated areas that are impacted to depths less than or equal to 1-inch (due to structural complications associated with removing concrete slabs in these areas);
- Bulk concrete removal of structurally unstable concrete first floor slabs supported by piles that are impacted to depths less than 1-inch since these floors cannot support the weight of the milling equipment;
- Bulk concrete removal would be conducted for all concrete floor slabs, with the exception of first floor concrete slabs supported by piles that are impacted to depths greater than ½-inch; and
- Bulk removal would be conducted for the first floor concrete slabs supported by piles that are impacted to depths greater than 1-inch.

The maximum depths for milling noted above were defined in Section 8.1.2.4.

As discussed in Section 8.2.1.4, prior to beginning any concrete micro-removal activities, areas would be prepared by first removing any surface accumulation. Removal of surface accumulation would be accomplished by scraping the concrete surface, either manually or using a power scraper. Additional discussion regarding shot blasting and milling is provided in Section 8.2.1.4. Subsequent to completing milling activities, the newly exposed concrete would be vacuumed to remove any residual dust left behind from the concrete removal process. Areas that have been shot blasted would be pressure washed to ensure that all loose particles and shot are removed, and then vacuumed to ensure that all remaining dust is removed.

All solid and liquid waste generated from micro-removal technologies would be temporarily stored on-Site in the appropriate containers (i.e. 55-gallon drums, roll-off containers, temporary on-Site storage tanks) during remediation activities. Containers would then be sampled for waste characterization and transported off-Site to the appropriate disposal facility. During remediation activities dust collection systems equipped with HEPA filters would be utilized to minimize the level of airborne particulates. Air monitoring would also be conducted to ensure the appropriate PPE is being utilized.

After the concrete micro-removal activities are completed, confirmatory wipe and/or concrete core samples would be collected to verify the effectiveness of these technologies and compliance with the surface and bulk LTOC. Confirmatory samples would be collected at a frequency of one sample for every 1,500 sf of area cleaned. This sampling frequency is based on the approximate frequency of the current dataset collected during the RI activities. Three, $^{1}/_{2}$-inch thick concrete samples would be submitted for analysis for PCBs for every core collected. Wipe samples would be collected and submitted for analysis for PCBs and lead only if a cover, such as a concrete topping material, is not applied during remediation (i.e., over shot blasted areas).

Epoxy sealant for concrete would then be applied to fill in any remaining cracks in the floor slab, then a concrete topping material would be added to seal the concrete surface and bring it up to grade with the surrounding floor slab.

Figures 7-12 through 7-15 and 7-12A through 7-14A depict the extent of impacted interior building construction material on each of the four floors. Impacted bulk concrete is present on the first, second and third floors. The fourth floor is constructed entirely of wood and therefore not amenable to concrete micro-removal technologies. A portion of the third floor is constructed of wood and the remainder is constructed of concrete. Although the analytical data indicates less removal would be required, as requested by NYSDEC, concrete removal will be conducted for the entire concrete portion of the third floor. Therefore, with the exception of the fourth and third floors, the following sections discuss the proposed micro-removal concrete remedial technologies on a floor-by-floor basis. Concrete and wood building material removal is discussed in Section 9.4.3.1.4 and 9.4.3.1.6, respectively.

Second Floor

As shown in Figure 9-16, the following micro-removal technologies would be employed on the second floor: shot blasting to $^{1}/_{16}$-inch, milling to ½-inch, and milling to 1-inch.

Shot blasting would be completed in a portion of the High Bay building (Building No. 8), the southern portion of the Railroad Siding at track level, and the center portion of Building No. 2. The total area to be shot blasted on the second floor is approximately 9,300 sf.

A portion of the room north of the Railroad Siding, located in Building No. 5 and the elevated loft in Building No. 4 would be milled to a depth of ½-inch. The surface area of these locations is approximately 3,500 sf.

PCBs are present at concentrations above the bulk LTOC to a depth of 1-inch at one sample location in the second floor High Bay, a localized area of approximately 1,370 sf. Since this is an isolated exceedance to a depth of 1- inch in this area, the area would be milled to 1-inch rather than removed and replaced.

<u>First Floor</u>

As shown in Figure 9-17, concrete micro-removal on the first floor would entail shot blasting to $^{1}/_{16}$-inch, milling to ½- inch, and milling to 1-inch.

Shot blasting would be completed in the Drying Ovens Area (Building No. 10, 1,515 SF), and in the High Bay (Building No. 8, 1,780 SF). The combined surface area to be shot blasted on the first floor is 3,295 sf.

Milling to a depth of $^{1}/_{2}$-inch is required in the following areas:

- Carpenter and Electrical Shops (Buildings 9A, 9B, and 9C; 2,340 sf);
- Building No. 10A (2,360 sf);
- Building No. 9 (6,970 sf);
- Building No. 3, Building No. 15, the northern portion of Building No. 1 (8,920 sf);
- Building No. 10 (south of the Drying Ovens; 1,010 sf);
- Buildings No. 2 (14,490 sf);
- the High Bay Building (Building No. 8; 2,240 sf):

- Building No. 5 and Building No. 2A (4,625 sf);
- Building No. 11 (1,350 sf); and
- Building No. 12A (2,370 sf).

The total surface area of locations on the first floor requiring milling to ½- inch is 46,675 sf.

Two areas on the first floor have been identified for milling to 1-inch. One area is located in Building No. 9 (400 sf) and one area is in the High Bay Building (Building No. 8; 1,070 sf) for a total of 1,470 sf. These areas are to be milled as opposed to removed and replaced because these exceedances are isolated to small areas and are located in areas of the Site that are supported by piles and extend over the River.

9.4.3.1.4 *Task No. 4: Concrete Building Material Removal*

As discussed above, bulk concrete removal would be conducted on the first, second and third floors where PCBs above the bulk LTOC are present at depths greater than ½ -inch below the top of concrete. Some of these areas on the first floor are concrete slabs supported by piles and lie over water. In these areas, concrete building material removal was evaluated for areas where PCBs above the LTOC were present at depths greater than 1-inch, unless the floor was structurally unstable. In most cases, it is neither structurally feasible due to the presence of steel reinforcement nor cost effective to remove more than 1-inch from the top of the slab using the concrete micro-removal technologies. When contamination exists at depths greater than 1-inch, it is more feasible and cost-effective to remove the contaminated concrete slab and replace it with a new, reinforced concrete slab, with the exception of the localized areas discussed in Section 9.4.3.1.3.

The concrete areas to be removed were delineated based on the analytical data collected during the RI activities. Several removal areas are located in portions of the Site that are supported on piles (as opposed to concrete slab on grade) or on second or third floor levels. Subsequently, a structural analysis of these areas was performed to evaluate the necessary precautions required during removal, including shoring and stabilizing the surrounding concrete slab to remain in place. As a result of this analysis, some of the removal areas were expanded to the nearest support column to allow for continued stabilization of the structure. In most cases, the removal areas were expanded based on column spacing within the building.

Concrete slab removal would also be performed in areas that would be suitable for micro-removal technologies based on the analytical data, yet are not structurally stable to support micro-removal equipment (i.e., Building No. 7). Timber support structure restoration would be required as part of the slab replacement activities.

In areas where concrete removal would be applicable, the existing slab to be removed would be cut around the perimeter using either a handheld gas-powered concrete saw or a large walk-behind, gas-powered concrete saw, depending on the size of the area to be cut. The slab would then be broken up into small, manageable pieces using a jackhammer. For second and third floor slab removals, bracing and shoring of the surrounding floor slab would be constructed to stabilize the floor. The concrete would then be removed and placed in roll-off containers, sampled for waste characterization, and transported off-Site for proper disposal. Each area of concrete slab removal would be replaced with reinforced concrete. In locations where the new slab would be installed on grade, backfill would be added, if necessary, to level the ground and repair any erosion of the soil/fill prior to pouring the new slab.

Figures 7-12 through 7-15 depict the extent of impacted interior building construction material on each of the four floors. Impacted bulk concrete is present on the first, second and third floors. The portions of the concrete slab on-Site that would be removed and disposed off-Site as part of this alternative are shown on Figures 9-15 through 9-17, and are discussed below. No concrete removal is proposed for the fourth floor since the fourth floor is constructed entirely of wood.

Third Floor

A portion of the third floor is constructed of concrete, while the remainder is constructed of wood. The concrete portion of the third floor is located in Building Nos. 2 and 7. To address the NYSDEC's concern regarding elevated concentrations of PCBs in the upper 0.5-inch of concrete, all concrete flooring material would be removed from Building Nos. 2 and 7. As shown in Figure 9-15, the total area to be removed is approximately 20,040 sf.

Second Floor

As shown in Figure 9-16, the concrete slab would be removed from three separate locations on the second floor. Two locations in the High Bay (Building No. 8), and one location from the northern portion of the Railroad Siding Platform (Building No. 5) would be removed. For structural purposes, the areas to be removed from the High Bay are larger than required to address impacted media in order to maintain the concrete slab's stability. The total area of concrete to be removed from the second floor is 14,100 sf.

In addition, under Alternatives E3 or E4, a portion of the Railroad Siding track level would be removed to facilitate the excavation of PCB-impacted below building soil/fill (see Sections 9.2.3.1.6 and 9.2.4.1.5).

First Floor

As shown in Figure 9-17, several portions of the first floor require concrete removal and off-Site disposal. The majority of the concrete requiring removal is located in the northern Site buildings. Areas to be removed on the first floor include the Annealing Line Transformer area and the Transformer No. 14 area located in the High Bay building (Building No. 8), Building No. 7, the High Voltage Testing Lab (Building No. 7A), the Pipe Shop (Building No. 1), and the storage room immediately to the north of the Pipe Shop, Building Nos. 6, 13, and a portion of Building No. 10, the Compressor Room (Building No. 11), the Machine Shop (Building No. 14 and 17), portions of the Maintenance Shop (Building 12, 12A, and part of 12B), and Building No. 4. The total surface area of concrete slab to be removed on the first floor is approximately 71,100 sf.

Additionally, approximately 6,375 sf of the concrete slab on the first floor would be removed to facilitate excavation of PCB-impacted below building soil/fill under Alternative E3 and E4 (see Sections 9.2.3.1.6 and 9.2.4.1.5).

9.4.3.1.5 Task No. 5: Pressure Washing/Vacuuming of Concrete Building Material

Pressure washing/vacuuming would be conducted for all concrete floor surfaces where concrete micro-removal or full removal is not being conducted. These areas include:

- areas where the post-clean wipe sample results are less than the surface LTOC for lead and PCBs {Note: Since these areas are represented by post-clean results, pressure washing/vacuuming is needed to attain these levels.}; and

- areas where the pre-clean wipe samples are less than the surface LTOC for lead and PCBs (see rationale below).

It is necessary to clean building surfaces as discussed above, including those meeting the LTOC, because the micro-removal technologies and bulk concrete removal activities would generate dust containing the COPCs. Dust control measures are discussed in Section 9.4.3.1.9. The adequacy of cleaning in these areas would be confirmed through post-clean sampling (see discussion below).

All liquid waste generated from the pressure washing/vacuuming activities would be temporarily stored on-Site in the appropriate containers (i.e. 55-gallon drums, temporary on-Site storage tanks) during remediation activities. The wash water would then be sampled for waste characterization, and transported off-Site to the appropriate disposal facility. During pressure washing/vacuuming activities, dust collection systems equipped with HEPA filters would be utilized to minimize the level of airborne particulates. Air monitoring would also be conducted to ensure the appropriate PPE is being utilized.

After the pressure washing/vacuuming activities are completed, confirmatory wipe and/or concrete core samples would be collected to verify the effectiveness of these technologies, and compliance with the surface and bulk LTOC. Confirmatory samples would be collected at a ratio of one sample for every 1,500 sf of area cleaned. This sampling frequency is based on the approximate frequency of the current dataset collected during the RI activities. Three, $^{1}/_{2}$-inch depth concrete samples, collected sequentially to total 1½ inches, would be submitted for analysis for PCBs for every core collected. Wipe samples would be collected and submitted for analysis for PCBs and lead.

Figures 7-12 through 7-15 depict the extent of impacted interior building construction material on each of the four floors. Surficially impacted concrete is present on the first, second and third floors. The areas proposed for pressure washing are shown in Figures 9-15 through 9-17. The fourth floor is constructed entirely of wood and therefore not amenable to pressure washing/vacuuming. Cleaning of the fourth floor wood areas is discussed in Section 9.4.3.1.7. Therefore, with the exception of the fourth floor, the following sections discuss the proposed pressure washing locations on a floor-by-floor basis.

Third Floor

Pressure washing would be conducted in the Men's Room on the third floor. The total area to be pressure washed on the third floor is approximately 285 sf.

Second Floor

Pressure washing would be completed in the northern portion of Building No. 5, the southern Railroad Siding Platform Area, and the majority of Building No. 2 and the High Bay (Building No. 8). The total area to be pressure washed on the second floor is approximately 48,650 sf.

First Floor

Pressure washing would be completed in the Men's Room and Office areas in Building No. 14, the Boiler Room, the Men's Room and Store Room to the west of the Pipe Shop, the southern portion of Building No. 7, and the High Bay (Building No. 8). The total surface area to be pressure washed on the first floor is 44,460 sf.

In addition to the areas listed above, all of the stairwells (including stairwell walls and ceilings) throughout the Site buildings would be pressure washed/vacuumed. The estimated combined area of all of the stairwells is approximately 38,325 sf. Columns, walls, and ceilings of each of the Site buildings would be pressure washed to address any prior operational impacts and dust generated from the micro-removal and slab removal activities. In areas that are not exposed to dust generated from remedial activities, confirmatory wipe sampling may be collected from the columns, walls, and ceilings in lieu of pressure washing. For cost estimating purposes, it was assumed that pressure washing of the columns, walls, and ceilings would be performed in all areas following remedial activities. The estimated surface area of columns, walls, and ceilings is 590,000 sf.

9.4.3.1.6 Task No. 6: Wood Building Material Removal

The entire fourth floor and portions of the third and second floors are constructed with wood floors and wood supports. As noted in Figures 7-13 through 7-15, bulk concentrations above the LTOC were observed in these wood floors. Under this task, wood flooring exceeding the bulk LTOC for PCBs would be removed.

Wood floor and plywood sub-floor removal would be accomplished using manual and mechanical demolition equipment. Where necessary, walls would also be removed to facilitate removal of the floors. All waste generated from wood removal would be contained in roll-off containers. Waste characterization samples would be collected in order to determine the proper disposal requirements for wood debris. Following removal, all areas would be restored with new wood flooring and plywood sub-flooring. Confirmatory samples would not be required since all wood floor material would be removed and replaced.

Fourth Floor

As shown on Figure 9-14, three locations in Building No. 2, and one location in Building No. 1 require wood floor removal. The location in Building No. 1 is in the renovated part of the fourth floor, and is located under carpeting. The three larger removal areas in Building No. 2 are exposed wood floors and are not under carpeting. The total surface area of wood floor to be removed and replaced on the fourth floor is approximately 4,170 sf. Following removal and restoration of the wood flooring, the carpeting would be restored.

Third Floor

As presented on Figure 9-15, the wood floor in one area located in Building No. 1 would be removed and replaced. This area is located in the northeast part of the renovated portion of the third floor. This entire area is located under carpeting and comprises a total of 2,105 sf. Following removal and restoration of the wood flooring, the carpeting would be restored.

Second Floor

As shown on Figure 9-16, portions of Building No. 1, Building No. 6, Building No. 15, and Building No. 4 would require wood floor removal. Some of these areas are covered with steel diamond plate. With the exception of a small area located in Building No. 1, none of these wood floor areas have been previously cleaned. These areas comprise a total of approximately 11,360 sf.

9.4.3.1.7 Task No. 7: Manual Cleaning/Vacuuming of Wood Building Material

As stated above, the entire fourth floor and portions of the third and second floors are constructed with wood floors and supports. Manual cleaning and vacuuming of wood flooring that exceeds only the surface LTOC for PCBs and/or lead has been evaluated based on the results of the RI wipe sampling.

Cleaning would be completed using methods similar to the concrete pressure washing, except a low-pressure wash would be used instead of high-pressure wash. A high-pressure wash cannot be used since it would splinter the wood surface and much of the water would be absorbed by the wood flooring. Prior to the low-pressure wash, the surface would be vacuumed. Following the low-pressure wash, the surfaces would be scrubbed with a detergent cleaner, low pressure rinsed, and vacuumed again. Confirmatory wipe samples would be collected to verify the effectiveness of the wood cleaning and compliance with the surface LTOC. Wipe samples would be collected at a frequency of one sample for every 1,500 sf of area cleaned and submitted for analysis for lead and PCBs. All carpeting and vinyl tiling removed from the renovated areas would be restored after cleaning activities.

The following wood flooring locations would be manually cleaned/vacuumed:

<u>Fourth Floor</u>

As shown on Figure 9-14, the wood flooring in the unrenovated portion of Building No. 2 with exceedances of the surface LTOC would be cleaned and vacuumed with HEPA-filter equipped vacuums (4,450 sf). Similarly, the wood flooring in the renovated area would be cleaned and vacuumed. All carpeting would be removed and the wood floor would be cleaned (6,900 sf).

Third Floor

As shown on Figure 9-15, the wood flooring located in renovated area of Building No. 1 would be cleaned and vacuumed following carpet or vinyl tile removal. The total surface area to be washed on the third floor is approximately 7,600 sf

Second Floor

As shown on Figure 9-16, wood flooring located in Building Nos. 1, 4 and 10 would be cleaned and vacuumed. The wood flooring in these areas is exposed and not covered by carpeting or vinyl tile. The total surface area to be cleaned is approximately 13,650 sf.

9.4.3.1.8 Task No. 8: Lead-Based Paint and Asbestos Abatement

Under this task, all known lead-based paint, regardless of its condition would be abated from all buildings by a certified contractor. This includes chipping and peeling lead-based paint, as well as lead-based paint that is in good condition. All removed lead-based paint would be containerized separately and disposed off-Site.

In addition, all known asbestos-containing material (ACM) present in the interior portions of the Site buildings would be abated by a certified contractor. This includes all ACM with the exception of exterior asbestos-containing building material (i.e., exterior transite panels, roofing material). All removed ACM would be stockpiled separately and disposed off-Site.

9.4.3.1.9 *Task No. 9: Ambient Air Monitoring*

Several of interior building material remedial activities would require air monitoring. These activities include: concrete micro-removal, bulk concrete and wood removal, lead-based paint abatement, and ACM abatement. An air monitoring program would be developed to meet the requirements of the various SCGs that apply to these activities.

A building interior PAMP that specifies the components of this program would be developed in accordance with the New York State Department of Health Generic Community Air Monitoring Plan contained in Appendix 1A of the Draft DER-10 (NYSDEC, 2002). The air monitoring program would include real-time particulate monitoring using particulate monitoring devices and be conducted continuously throughout the remedial activities. Dust action levels that relate to PCBs and lead would be developed. Air samples would be collected and submitted for lead and PCBs analysis daily during the remedial activities.

Dust would be controlled by spraying a water mist over the work area if perimeter action levels established in the PAMP are exceeded. The water mist would be generated by connecting a misting device to a hose, which would be connected to any nearby interior water source. The degree to which these measures would be used would depend on particulate levels in ambient air at the perimeter of the Site as determined through the implementation of the PAMP.

In addition, a HASP would be prepared for Site work. The HASP would include air monitoring for particulates, lead, and PCBs in the work and exclusion zones. This plan would identify the level of PPE required for Site work, action levels for the work and exclusion zones, and PPE upgrades and engineering controls that correspond to action level exceedances.

As requested by the NYSDEC and NYSDOH, air samples would be collected using a PUF sampler in each building following all remedial activities and submitted to a laboratory for PCB analysis. For cost estimation purposes, it was assumed that approximately 50 indoor air samples would be collected. Sample results would be submitted to the NYSDEC and NYSDOH upon completion.

9.2.4.1.10 Task No. 10: Transportation and Off-site Disposal

Under this task, the remediation-derived waste would be transported and disposed off-site. Remediation derived waste would include:

- Bulk concrete from building material removal (i.e. slab removal);
- Wood from building material removal (i.e. floors and walls);
- Concrete dust from micro-removal activities;
- Wash water generated from pressure washing and wood floor cleaning activities;
- Sludge removed from the interior stormwater system;
- Scrap metal from the process tanks and fuel oil tanks;
- ACM removed from the interior of the Site buildings;
- Lead-based paint removed during abatement activities in the interior of the Site buildings; and
- Soil/fill removed from subsurface structures.

Segregation of each of the above remediation wastes would be conducted based on media (e.g. bulk concrete, concrete dust, wood, ACM), available analytical data, and field observations. All debris generated from the remedial activities would be sampled for waste characterization prior to off-Site disposal. Based on the waste characterization sampling results, each of the building material waste types would be transported to the appropriate waste disposal facility.

Non-hazardous bulk concrete building material would be transported to either a concrete recycler or a State-approved solid waste landfill facility. PCB-hazardous concrete building material would be transported to a TSCA approved landfill disposal facility. Concrete dust generated during micro-removal activities would be containerized in either roll-off containers or drums. Disposal of this material would be similar to that of the bulk concrete building material.

Wood building material would be segregated from the concrete building material debris and stockpiled separately. Non-hazardous wood debris would be transported to a State-approved solid waste landfill facility. Wood debris determined to be PCB-hazardous based on waste characterization sampling would be transported to a TSCA approved disposal facility.

It is anticipated, based on Site-related experience, that all wash water generated from pressure washing and wood floor cleaning activities would be non-hazardous waste. However, waste characterization samples would be collected to confirm the non-hazardous classification. Non-hazardous water would be stored in either drums or a temporary on-Site tank to await disposal. Wash water would be transported to a treatment facility capable of handling this liquid waste.

All ACM and lead-based paint removed from the building would be transported to a landfill facility licensed to handle these wastes. Prior to transport of these materials, all ACM and lead-based paint would be sealed in lead-tight containers in an effort to prevent fiber and paint chip releases during handling and transportation.

Soil/fill removed from the subsurface structures would be segregated, stockpiled, and sampled. Sludge removed from the interior stormwater system would be stabilized with a stabilizing agent (e.g. kiln dust) to reduce the moisture content of the sludge, if needed. The stabilized sludge would then be disposed similar to the soil/fill. Based on results of waste characterization samples, PCB-hazardous soil/fill and sludge would be transported to a TSCA approved landfill facility and non-hazardous soil/fill and sludge would be transported to a State-approved solid waste disposal facility. Lead-hazardous soil/fill and sludge would be stabilized and disposed at a solid waste disposal facility permitted to accept hazardous waste. If either Remedial Alternative E3 or E4 are selected, this soil/fill and sludge may be disposed with the North Yard, South Yard and Below Building impacted soil/fill.

To estimate debris quantities, average densities of 1.5 tons per CY and 1.2 tons per CY were assumed for concrete and wood debris, respectively. Based on these density assumptions, it is estimated that a total of 3,500 tons of non-hazardous concrete, 900 tons of hazardous concrete, 245 tons of wood, and 385,196 gallons of water would be generated. The quantity of ACM and lead-based paint cannot be estimated at this time.

An average density of 1.5 tons per CY was assumed for the fill material within the concrete subsurface structures. It is estimated that a total of 214 tons of fill would be removed as part of the subsurface fill removal common action.

It was assumed that one waste characterization sample would be collected for every 22-ton truckload of concrete, wood, or soil generated for disposal. It was estimated that one waste characterization sample would be collected for every 10,000 gallons of wash water generated. Waste characterization samples collected for each waste stream, with the exception of ACM and lead-based paint, would be submitted for analysis for PCBs, total lead, TCLP VOCs, TCLP SVOCs, TCLP metals, and RCRA Characteristics.

9.4.3.2 *Evaluation*

9.4.3.2.1 *Overall Protection of Human Health and the Environment*

Alternative I3 would provide adequate protection of human health and the environment. This would be accomplished through:

- removal of surficially impacted interior building construction material via pressure washing/vacuuming or shot blasting;
- removal of the impacted interior building construction material at depth via milling, bulk concrete removal and bulk wood removal;
- removal of lead-based paint and ACM;
- removal of sludge from the interior stormwater system;
- removal of the process and fuel oil tanks; and
- off-Site disposal of the remediation waste generated during this alternative.

By removing COPCs in exceedance of the LTOC from the impacted interior building construction materials, and by removing other impacted interior building materials, the possibility of current and future human exposure and exposure to the surrounding environment from impacted interior building materials would be eliminated.

9.4.3.2.2 Compliance with the SCGs

A summary of the SCGs for the building interiors is provided in Table 9-5. As shown in this table, this alternative would meet all of the SCGs for interior building material. Most importantly, this alternative would address the SCGs related to the LTOC for the interior building material and would address the directive related to preventing releases to the environment (i.e., OSWER Directive 9360.3-12, *Response Actions at Sites with Contamination Inside Buildings* (USEPA, 1993)).

Alternative I3 would:

- address the 6 NYCRR Part 375 goals to eliminate or mitigate all significant threats to public health and the environment and restore the Site buildings to pre-disposal/pre-release conditions, to the extent feasible and authorized by law;
- address the 6 NYCRR Part 375 requirement to remove "consequential" amounts of hazardous waste in both building material and subsurface concrete structure fill;
- meet the OSWER Directive 9360.3-12 by mitigating the potential for release of COPCs to the surrounding environment;
- address the 40 CFR 745 and 40 CFR 763 requirements for lead paint and asbestos abatement, respectively;
- meet the surface and bulk LTOC for PCBs (i.e., 1 $\mu g/100\ cm^2$ and 1 mg/kg, respectively) through micro and bulk removal and cleaning;
- meet the surface LTOC for lead (i.e., 4.3 $\mu g/100\ cm^2$) through micro-removal;
- address the 6 NYCRR Part 613 requirement by removing the fuel oil tanks;
- address the 6 NYCRR Part 613 requirement by removing the process tanks that have been out of service for several years;

Concrete micro-removal, bulk concrete removal, and wood removal would remove concrete and wood that contains COPCs at concentrations above the applicable SCGs (i.e., bulk LTOC). The remaining interior building surfaces would be cleaned to comply with the applicable SCGs (i.e., surface LTOC). Following the implementation of remedial tasks (i.e., washing, concrete micro-removal, slab removal, etc.), confirmatory wipe and/or bulk samples would be collected and submitted for analysis for the appropriate COPCs to assure compliance with the SCGs.

9.4.3.2.3 *Long-Term Effectiveness and Permanence*

Remedial Alternative I3 would effectively remove the COPCs from the interior building material and provide a permanent remedy. Concrete micro-removal and bulk concrete and wood building material removal would eliminate contaminated portions of building material from the Site and mitigate the long term potential for "wicking", or recontamination of the Site. Cleaning of the remaining building material would remove surface accumulations or surficial impacts on building materials. This alternative would also permanently eliminate the potential for COPCs to migrate from the Site buildings' interior to the surrounding environment, thus satisfying the RAOs.

Removal of debris from the interior stormwater, removal of the fill in the subsurface concrete structure (Common Action C3), cleaning of the interior stormwater system (Common Action C5) and the removal of the process and fuel oil tanks (Common Action C6), and cleaning of the lead extrusion pits (Common Action C7) would effectively remove the COPCs from the Site and provide a permanent remedy.

9.4.3.2.4 *Reduction of Toxicity, Mobility, or Volume*

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility, and volume of listed hazardous waste and COPCs. Concrete exhibiting bulk PCB concentrations above 50 mg/kg is present at some locations within the Site buildings. In addition, fill contained in some of the subsurface concrete structures exhibit PCB concentrations above 50 mg/kg. These materials, which have PCB concentrations in excess of 50 mg/kg, are classified as NYS B007 PCB- listed hazardous wastes.

Under this alternative, all NYS B007 PCB-listed hazardous waste located within the subsurface structures and within the Site buildings would be removed from the Site. This would reduce the toxicity, mobility and volume of hazardous waste and COPCs at these locations.

This alternative would also remove COPCs in excess of their SCGs (i.e. surface and bulk LTOC) from the Site. This would eliminate the toxicity, mobility, and volume of COPCs in excess of the SCGs associated with the interior building material at the Site.

All waste generated from remediation activities, including the concrete and wood material, ACM and lead-based paint removed from the Site buildings, and wash water generated from cleaning activities, would be transported off-Site for disposal. Consequently, this material would no longer present an on-Site threat, as the material would be relocated to a secure land disposal facility.

Removal of the debris in the subsurface structures (Common Action C3), removal of the process and fuel oil tanks (Common Action C6), removal of sludge in the interior stormwater system (Common Action C5), and cleaning of the lead extrusion pits (Common Action C7) would reduce the toxicity, mobility, and volume of these impacted building materials through removal from the Site.

9.4.3.2.5 Short-Term Effectiveness

The total time required to complete Remedial Alternative I3 is expected to be 4 to 6 months following NYSDEC approval of the Remedial Design. During building material removal or cleaning activities workers could be exposed to COPCs through direct contact or inhalation. Exposure risks may be associated with dermal, inhalation, and/or ingestion pathways. Adverse impacts to remedial contractors would be minimized with the proper use of PPE, monitoring, and use of the appropriate engineering controls.

There is the potential for air-borne risks to the surrounding community from remedial activities and disposal trucks leaving the Site. Risks would be mitigated, to the extent possible, via engineering controls, decontamination procedures prior to leaving the work zone, and proper health and safety monitoring. As discussed in Section 9.4.2.1, a PAMP would be implemented to monitor particulate concentrations at the Site's perimeter.

The remedial activities would cause an increase in the truck traffic in the community. Approximately 260 truckloads would leave the Site during implementation of the remedial action. Although the Site is located in a commercial/industrial setting, one narrow means of egress exists into and out of the Yard. In addition, residential areas must be traversed to reach the Site. Consequently, the increased truck traffic and its associated emissions posed by this alternative would likely pose considerable concerns to the surrounding community.

Proper controls and precautions would be taken regarding transporting material through the surrounding community, such as covering the material and decontaminating the trucks prior to leaving the Site. Additionally, air monitoring would be performed at the perimeter of the Site to ensure there are no impacts to the surrounding community resulting from the remedial activities.

During implementation of this alternative, all current on-Site activities would be disrupted. It would be necessary for any on-Site facility workers and tenants to vacate the Site and remove all equipment and items stored on-Site during implementation.

9.4.3.2.6 Implementability

The technologies to be used in this alternative are proven, and readily available. Site-specific conditions, such as the large number of columns, walls, and fixed objects will complicate removal and cleaning operations. In addition, the fact that portions of the Site are constructed on piles (particularly some of uncertain stability), and are not directly on grade, increases the difficulty of building material removal and replacement. These Site-specific conditions pose technical challenges and some potential unforeseen problems due to piling instability and structural issues created by removal of concrete from around support columns, but with the proper engineering and planning, this alternative is technically implementable. In addition, with the proper health and safety monitoring this alternative can be safely implemented. All permits and the appropriate approvals to complete this work would be obtainable with average effort.

Common Actions C5, C6, C7, and the subsurface structure portion of Common Action C3 are readily implementable.

9.4.3.2.7 *Cost*

The summary of the estimated capital cost of Remedial Alternative I3 is provided in Table R-3 of Appendix R. As shown in Table R-3, the total estimated capital costs for completing Remedial Alternative I3 is $15,175,048. There are no OM&M costs associated with this alternative.

9.4.4 ALTERNATIVE I4: BUILDING DEMOLITION

9.4.4.1 Description

This alternative addresses the impacted interior building construction material identified in Section 7.2.4.3 primarily through demolition. The extent of impacted interior building construction material was presented in Figures 7-12 through 7-15.

Interior building construction materials that exhibit bulk concentrations in excess of the bulk LTOC and/or surficial concentrations above the surface LTOC and are located:

- in the northern buildings (i.e., buildings constructed on concrete slabs on soil/fill) and
- on the second, third and fourth floors of the southern buildings (i.e., Buildings Nos. 7, 8, and 9)

would be addressed through building demolition (including slab removal) and off-Site disposal. Figure 9-18 identifies the building areas that would be demolished under this alternative.

The first floor concrete slab of the southern buildings (i.e., Buildings Nos. 7, 8, and 9), which is supported by piles, cannot be removed without replacement since it would eliminate access to the EPRI Laboratory. As discussed in Section 1.0, EPRI Laboratory is not part of the Registry Site and therefore is not subject to this remedial action.

The first floor concrete slab of the southern buildings (i.e., Buildings Nos. 7, 8, and 9) that would remain following demolition activities and would now be an exterior surface would be treated to meet the bulk LTOC. This treatment would eliminate NYS B007 listed PCB hazardous waste and prevent future recontamination of the slab from residual PCBs at depth. Because the first floor slab in Building Nos. 7, 8 and 9 would be an exterior concrete slab after the demolition activities, it would no longer pose the same level of potential risk of exposure as an interior concrete slab. Consequently, the slab would not be treated to meet the surface LTOC. If this slab were used in the future as an interior floor slab, the slab would be remediated or removed to meet the surface LTOC at that time. Figure 9-18 shows the remedial activities that would be conducted for the remaining first floor slab.

In conjunction with the demolition of the Site buildings, the abatement of lead-based paint and ACM would be performed.

This alternative would include the following tasks and incorporate the following Common Actions, discussed in Section 9.1, associated with building materials:

- Site Preparation and Mobilization (Task No. 1)
- Demolition of Site Buildings and Installation and OM&M of an Asphalt Cover over Soil/Fill (Task No. 2)
- Remediation of Concrete Building Material Remaining in Southern Site Buildings (Task No. 3)
- Closure of the Interior Stormwater System (Task No. 4)

- Lead-Based Paint and Asbestos Containing Material Abatement (Task No. 5)
- Ambient Air Monitoring (Task No. 6)
- Transportation and Off-Site Disposal (Task No. 7)
- Removal of Debris Within Building Subsurface Structures (Common Action C3)
- Removal of The Interior Stormwater System (Common Action C5)
- Removal of Process Tanks and Fuel Oil Tanks (Common Action C6)
- Cleaning of The Lead Extrusion Pits (Common Action C7)

This alternative could be completed within 8 to 12 months of NYSDEC approval of the Remedial Design for this Site.

Descriptions of the common actions considered for this alternative (i.e., Common Actions C3 and C5 through C7) were provided in Sections 9.1.1.3 and 9.1.1.5 through 9.1.1.7. Evaluation of these common actions is included along with the other tasks of this alternative and is provided below.

9.4.4.1.1 Task No. 1: Site Mobilization and Preparation

Prior to beginning any demolition activities associated with this alternative, it would be necessary to prepare the Site and mobilize all necessary equipment to the Site. Initially, all occupants currently at the Site (including property management, on-Site facility workers, and temporary tenants) would be relocated from the Site and remain off-Site for the duration of the remedial activities.

Utilities (e.g., fuel lines, sewer lines) would be disconnected and capped or dismantled. Water and electricity would be maintained for operation of the demolition equipment. In addition, during construction, electricity would be maintained for the cathodic protection system used for the piles supporting the EPRI laboratory, as well as the heat and water supply for this building. Large utility equipment (i.e., boilers, fire suppression pumps, transformers) would be dismantled and removed. Excavators, loaders, and roll-off trucks and containers, and construction trailers would be mobilized to the Site and staged in the North Yard. Debris stockpile zones would also be established in the North Yard. This task would need to be coordinated with the selected soil/fill remedial action alternative since three of the potential alternatives for this media include extensive work in the North Yard. Runoff control measures would be implemented to prevent impacts to the Hudson River during demolition activities.

The concrete micro-removal equipment would be mobilized to the remaining concrete slabs after the demolition activities. Limited Site preparation would be required for the remediation of these concrete slabs supported on piles.

9.4.4.1.2 Task No. 2: Demolition of the Site Buildings and Installation and O&M of an Asphalt Cover Over Soil/Fill

As shown in Figure 9-18, this task would include the demolition of all Site buildings including the first floor concrete slab with the exception of the first floor slab of the southern buildings (i.e., Building Nos. 7, 7A, 8 and 9). Remediation of the first floor slab of the southern buildings is discussed in the following task.

The demolition of the northern buildings would also include removal of the first floor concrete slab on grade in these buildings. The existing concrete slab, which is constructed on top of soil/fill, would require replacement since it is currently deteriorating in areas and would not provide an adequate cover for the Below Building historic fill. It is also anticipated that the demolition activities would damage, to some extent, the older, existing first floor concrete slab in the northern buildings. Following building demolition, the northern building concrete slab would be replaced with an asphalt cover. This would provide a surface cover for the Below Building historic fill that remains under the soil/fill alternatives. This asphalt cover would be similar to the asphalt cover discussed in Section 9.2.2.1.3 for the exterior environmental media. Routine inspection and maintenance of this surface cover would be required. For cost estimating purposes, it was estimated that approximately one-third of the asphalt cover would require replacement every 10 years for the 30 year OM&M period.

Access to the northern buildings would be limited for the demolition equipment by the current configuration of the southern buildings and the fact that the access gate for the Site is located in the southern portion of the Site. For this reason, demolition of the Site buildings would commence at the southern buildings and progress to the northern buildings. Demolition debris would be stockpiled in the North Yard and segregated based on building material type, as discussed further in Task No. 7 (Section 9.4.4.1.7).

The first floor of the Site buildings is situated at a lower elevation than the adjacent railroad property to the east. The east foundation wall of the High Bay Building on the first floor currently serves as a retaining wall for the soil/fill under the Railroad Siding tracks (at the second floor level) and for the soil under the adjacent property's railroad tracks. This foundation wall would be removed down to the existing floor slab as part of the demolition activities. Therefore, engineering measures are required to stabilize this soil and prevent undermining of the adjacent property's railroad tracks following the demolition activities. The soil stabilization would be accomplished by re-grading the soil that is currently under the

Railroad Siding tracks to slope down to the first floor elevation. The slope would be stabilized with filter fabric and vegetated to prevent erosion. A drainage swale would be constructed at the toe of the slope to divert stormwater. As discussed in Section 7.2.1.3, PCB-impacted soil/fill is located under the Railroad Siding tracks. This soil/fill would be removed under soil/fill Alternatives E3 and E4. Consequently, if Alternatives E3 or E4 were implemented, the regrading would need to take into consideration the removal of some of this soil and the need for backfilling, if any.

The majority of the utilities for the Site buildings (i.e. water, electricity, sewer) enter the buildings in Building No. 5. These utilities also service the former EPRI Laboratory building, which was delisted from the Site in 2000. Removal of these utilities, due to the demolition activities, would discontinue service to the EPRI Laboratory. For this reason, restoration and relocation of the domestic and fire suppression water, sewer, electrical, and HVAC services would be required to maintain services to the EPRI Laboratory. In addition, a temporary electrical system would need to be provided to the EPRI Laboratory during the remedial activities to power the cathodic protection system for the pilings under this building.

9.4.4.1.3 *Task No. 3: Remediation of Concrete Building Material Remaining in Southern Site Buildings*

As discussed above and shown in Figure 9-18, following the demolition activities, the first floor concrete slab supported by piles in Building Nos. 7, 8 and 9 would remain in place. This remaining slab, which would now be exposed to the environment, would be remediated to meet the bulk LTOC. Micro-removal and building material removal would be utilized to address the bulk LTOC exceedances in the first floor slab for the southern buildings. Concrete slab removal would be conducted in areas exhibiting PCB concentrations above the bulk concrete LTOC at depths greater than 1-inch and in areas that are structurally unstable to support micro-removal equipment (i.e., Building No. 7). Milling would be conducted in areas exhibiting PCB concentrations above the bulk concrete LTOC at depths less than or equal to 1-inch.

The concrete areas to be removed were delineated based on the analytical data collecting during the RI activities. A structural analysis of the concrete removal areas was performed to evaluate the necessary precautions required during removal including shoring and stabilizing the surrounding concrete slab to remain in place. Based on this structural analysis, some of the removal areas were expanded to the nearest support column to allow for continued stabilization of the remaining slab. In most cases, the removal areas were expanded based on column spacing within the building.

PCB concentrations in excess of the bulk LTOC are present at depths greater than 1-inch in the Annealing Line Area and Transformer No. 14 Area (both located in Building No. 8) and in the former High Voltage Testing Laboratory (Building 7A). The entire concrete floor slab in these areas would therefore be removed. As stated above, the structural stability of Building No. 7 and load restrictions preclude the use of micro-removal technologies on this slab. For this reason, Building No. 7 would be addressed through concrete slab removal. As discussed above, the area of removal had to be enlarged in some areas due to structural concerns associated with slab removal. The total surface area of concrete to be removed would be approximately 20,730 sf.

The majority of Building Nos. 2 and 9 and a portion of Building No. 8 contain PCB concentrations in excess of the bulk LTOC in the top $^{1}/_{2}$-inch of the concrete slab. Milling to a depth of $^1/_2$-inch would be conducted in these areas. Heavy surface accumulation would first be removed by manual or mechanical scraping. The surface area to be milled in these areas would be approximately 5,140 sf in Building No. 2, approximately 3,200 sf in Building No. 9, and approximately 2,240 sf in Building No. 8. Each area would be vacuumed to collect any residual dust generated following the milling activities. Confirmatory core samples would be collected every 1,500 sf of the treated area. Each core would be completed to a depth of 6-inches. Three, $^1/_2$-inch depth core samples, collected from the top of each core, would be submitted for PCB analysis from each concrete core collected. After receipt of sampling results and confirmation that sufficient concrete has been removed, epoxy sealant would be applied to fill any cracks (greater than $^1/_8$-inch) in the concrete slab and a concrete topping material would be applied on the milled areas to restore the grade of the milled concrete to the surrounding concrete.

Two localized areas in Building Nos. 8 and 9 contain PCB concentrations in excess of the bulk LTOC to a depth of 1-inch. These concrete slabs are supported by piles. Because of the construction in these areas, bulk removal of the impacted concrete material would require overextending the delineated areas to the nearest support column to maintain the structural integrity of the surrounding floor slab and to avoid the level of complexity of replacing these slabs supported by piles. In lieu of removing the concrete slab for these small areas, these areas would be milled to the 1-inch depth. Approximately 1,070 sf and 400 sf of concrete building material would be milled to 1-inch depth in Building Nos. 8 and 9, respectively, using the procedure described above.

9.4.4.1.4 *Task No. 4: Closure of the Interior Stormwater System*

The interior stormwater system is located below the concrete floor slab of the northern Site buildings. As discussed in Section 9.1.1.5, this stormwater system would be cleaned and removed as a Common Action to the remedial alternatives. Since the northern Site buildings would be removed under this alternative, there would be no need to reroute the roof drainage and replace the stormwater system. Therefore, the removal of the interior stormwater system would be performed following the demolition of the northern Site buildings. The former trench would be backfilled with clean fill material and covered by asphalt to be constructed for the purpose of providing a cover for the historic fill.

9.4.4.1.5 *Task 5: Lead-Based Paint and Asbestos Containing Material Abatement*

Peeling and chipping lead-based paint on building surfaces in the Site buildings to be demolished would be removed. The deteriorated paint would be removed and disposed separately in an effort to reduce the quantity of hazardous waste generated. The remaining lead-based paint that is not peeling or chipping at the time of building demolition would be disposed along with the demolished building material. ACM in the Site buildings would be removed and disposed prior to demolition activities. All ACM removed from the Site buildings would be segregated from the demolition debris and containerized separately in leak-tight containers in compliance with 40 CFR 763.

After the partial demolition of the southern buildings, there would be no ACM or lead-based paint associated with the concrete slabs to remain.

9.4.4.1.6 Task No. 6: Ambient Air Monitoring

Several of the interior building material remedial activities would require air monitoring. These include: demolition, micro- and bulk concrete removal, lead-based paint abatement and ACM abatement. An air monitoring program would be developed to meet the requirements of the various SCGs that apply to these activities.

A PAMP that specifies the components of this program would be developed in accordance with the New York State Department of Health Generic Community Air Monitoring Plan contained in Appendix 1A of the Draft DER-10 (NYSDEC, 2002). The air monitoring, including real-time particulate monitoring, would be performed using a particulate monitoring device and conducted continuously throughout the remedial activities. Dust action levels that relate to PCBs and lead would be developed. Air samples would be collected and submitted for lead and PCB analysis daily during the remedial activities.

Dust would be controlled by spraying a water mist over the work area if perimeter action levels established in the PAMP are exceeded. The water mist would be generated by connecting a misting device to a hose, which would be connected to any nearby interior water source. The degree to which these measures would be used would depend on particulate levels in ambient air at the perimeter of the Site as determined through the implementation of the PAMP.

In addition, a HASP would be prepared for site work. The HASP would include air monitoring for particulates, lead, and PCBs in the work and exclusion zones. This plan would identify the level of PPE required for site work, action levels for the particulates and contaminants in the work and exclusion zones, and PPE upgrades and engineering controls that correspond to action level exceedances.

Post-remediation indoor air sampling would not be required for this alternative since all buildings would be demolished.

9.4.4.1. 7 Task No. 7: Transportation and Off-Site Disposal

Under this task, the remediation-derived waste would be transported and disposed off-site. Demolition and remediation derived waste would include:

- Bulk concrete, wood and steel waste from building demolition activities;
- Concrete dust generated from concrete micro-removal activities;
- Wash water from pressure washing activities and tank cleaning;
- Sludge removed from the interior stormwater system;
- Soil/fill and debris removed from the concrete subsurface structures;
- Scrap metal from the process tanks and fuel oil tanks;
- ACM removed from the interior and exterior of the Site buildings; and
- Lead-based paint generated from abatement activities.

The concrete removal and demolition debris would be segregated and stockpiled, to the extent possible, based on media (i.e. concrete or wood), available analytical data, and field observations. All debris generated from the concrete removal and demolition activities would be sampled for waste characterization prior to off-Site disposal. Based on the waste characterization sampling results, each of the building material waste types would be transported to the appropriate waste disposal facility.

Non-hazardous bulk concrete building material would be transported to either a concrete recycler or a State-approved solid waste landfill facility.

PCB-hazardous concrete building material would be transported to a TSCA-approved landfill facility. Concrete dust generated during micro-removal activities would be containerized in either roll-off containers or drums. Disposal of this material would be similar to that of the bulk concrete building material. Construction debris (e.g. steel and concrete) would be recycled when possible

Wood building material would be segregated from the concrete building material debris and stockpiled separately. Based on the analytical data from wood bulk sampling, it is anticipated that the wood debris would be characterized as non-hazardous. However, waste characterization sampling would be performed during the demolition activities. Non-hazardous wood debris would be transported to a State-approved solid waste landfill facility. Wood debris determined to be PCB-hazardous based on the waste characterization sampling would be transported to a TSCA-approved disposal facility.

It is anticipated, based on Site-related experience, that the wash water generated from pressure washing activities would be non-hazardous waste. However, waste characterization samples would be collected to confirm non-hazardous classification. Wash water would be stored in either drums or a temporary on-Site tank while awaiting disposal. Wash water would be transported to a treatment facility capable of treating and managing this liquid waste.

All ACM and lead-based paint would be transported to landfill facilities licensed to accept and manage these waste streams. Prior to transport of these materials, all ACM and lead-based paint would be sealed in leak-tight containers in an effort to prevent fiber and paint chip releases during handling and transportation.

Soil/fill removed from the subsurface concrete structures would be stockpiled and sampled for waste characterization. Sludge removed from the interior stormwater system would be stabilized with a stabilizing agent (e.g. kiln dust) to reduce the moisture content of the sludge. The stabilized sludge would then be disposed similar to the soil/fill. Based on the results of the waste characterization samples, PCB-hazardous soil/fill and sludge would be transported to a TSCA-approved landfill facility and non-hazardous soil/fill and sludge would be transported to a State-approved solid waste disposal facility. Lead-hazardous soil/fill and sludge would be stabilized and disposed at a solid waste disposal facility permitted to accept hazardous waste. If either Remedial Alternative E3 or E4 are selected, this soil/fill and sludge may be disposed with the North Yard, South Yard and Below Building impacted soil/fill.

In estimating debris quantities, average densities of 1.5 tons/CY and 1.2 tons/CY were assumed for concrete and wood debris, respectively. It is estimated that approximately 4,750 tons of concrete, 1,500 tons of wood, and 68,590 gallons of water would be generated during the demolition and limited remediation activities. The amount of construction debris, ACM, and lead-based paint is not yet quantified.

An average density of 1.5 tons/CY for soil/fill was assumed for the soil/fill within the concrete subsurface structures. It is estimated that a total of 214 tons of soil/fill would be removed from these structures.

It was assumed that one waste characterization sample would be collected for every 22-ton load of concrete, wood, or soil generated for disposal. It was estimated that one waste characterization sample would be collected for every 10,000 gallons of wash water. Waste characterization samples, collected for each waste stream with the exception of ACM and lead-based paint, would be submitted for analysis for PCBs, total lead, TCLP VOCs, TCLP SVOCs, TCLP metals, and RCRA characteristics.

9.4.4.2 *Evaluation*

9.4.4.2.1 *Overall Protection of Human Health and the Environment*

Alternative I4 would provide adequate protection of human health and the environment. This would be accomplished through:

- removal of impacted interior building construction material via demolition of all Site buildings with the exception of the first floor slab supported by piles;
- removal of impacted interior building material via micro-removal and bulk removal of the first floor of the southern buildings;
- removal of lead-based paint and ACM;
- removal of sludge from the interior stormwater system;
- removal of the process and fuel oil tanks;
- off-Site disposal of the remediation waste generated during this alternative; and
- installation and OM&M of an asphalt cover over the remaining Below Building soil/fill.

By removing COPCs from the impacted interior building construction materials and by removing the other impacted interior building materials, the possibility of current and future human exposure and exposure to the surrounding environment would be eliminated.

9.4.4.2.2 *Compliance with SCGs*

A summary of the SCGs for the interior building material is provided in Table 9-5. As shown in this table, this alternative would meet all of the SCGs for interior building material. Most importantly, this alternative would address the SCGs related to the LTOC for the interior building material and would address the directive related to preventing releases to the surrounding environment (i.e., OSWER Directive 9360.3-12, *Response Actions at Sites with Contamination Inside Buildings* (USEPA, 1993)).

Alternative I4 would:

- address the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to the public health and the environment and restore the Site buildings to pre-disposal/pre-release conditions, to the extent feasible and authorized by law;

- remove "consequential" amounts" of hazardous waste in accordance with 6 NYCRR Part 375 in both building material and subsurface concrete structure fill;

- meet the OSWER Directive 9360.3-12 by mitigating the potential for release of COPCs to the surrounding environment;

- meet the surface and bulk LTOC for PCBs (i.e., 1 µg/100 cm2, 1 mg/kg, respectively) in the northern buildings and the second, third and fourth floors in the southern buildings through building demolition;

- meet the bulk LTOC for PCBs (i.e., 1 mg/kg) in the southern buildings through micro-removal of concrete building material {Note: the surface LTOC for PCBs is not applicable for the now exterior concrete slab);

- meet the surface LTOC for lead (i.e., 4.3 µg/100 cm^2) for the northern buildings and the second, third and fourth floors in the southern buildings through building demolition {Note: the surface LTOC for lead is not applicable for the now exterior concrete slab);

- address the 40 CFR 745 and 40 CFR 763 requirements for lead paint and asbestos abatement, respectively;

- address the 6 NYCRR Part 613 requirement by removing the fuel oil tanks; and

- address the 6 NYCRR Part 613 requirement by removing the process tanks that have been out of service for several years.

Following the implementation of remedial tasks for the first floor concrete slab for the southern buildings (i.e., concrete micro-removal, slab removal), confirmatory bulk samples would be collected and submitted for analysis for the appropriate COPCs to assure compliance with the bulk LTOC. This cleaning would eliminate the potential for future recontamination of the slab from PCBs at depth and thus address the requirements of OSWER Directive 9360.3-12.

9.4.4.2.3 *Long-term Effectiveness and Permanence*

The demolition of the Site buildings would remove the COPCs from the Site and provide a permanent remedy. Similarly, the remediation of the concrete slab supported on piles would permanently remove the COPCs that exceed the bulk LTOC from the Site and mitigate the long term potential for "wicking", or recontamination of the Site buildings. Complete abatement of lead-based paint and ACM from the Site buildings would provide a permanent remedy, as well.

Removal of the fill in the subsurface concrete structure (Common Action C3), cleaning of the interior stormwater system (Common Action C5) and the removal of the process and fuel oil tanks (Common Action C6), and cleaning of the lead extrusion pits (Common Action C7) would effectively remove the COPCs from the Site buildings and provide a permanent remedy.

9.4.4.2.4 *Reduction of Toxicity, Mobility, or Volume*

As discussed in Section 9.0, this criterion will evaluate changes in the toxicity, mobility, and volume of listed hazardous waste and COPCs. Concrete exhibiting bulk PCB concentrations above 50 mg/kg is present at some locations within the Site buildings. In addition, fill contained in some of the subsurface concrete structures exhibit PCB concentrations above 50 mg/kg. These materials, which have PCB concentrations in excess of 50 mg/kg, are classified as NYS B007 PCB- listed hazardous wastes.

Under this alternative, all NYS B007 PCB- listed hazardous waste located within the subsurface structures and within the Site buildings would be removed from the Site. This would reduce the toxicity, mobility, and volume of hazardous waste and COPCs at these locations.

This alternative would also remove COPCs in excess of their SCGs (i.e. surface and bulk LTOC) from the Site. This would eliminate the toxicity, mobility, and volume of COPCs in the interior building material at the Site.

All waste generated from remediation activities, including the concrete and wood material, ACM and lead-based paint removed from the Site buildings, and wash water generated from cleaning activities, would be transported off-Site for disposal. Consequently, this material would no longer present an on-Site threat, as the material would be relocated to a secure land disposal facility.

Removal of the debris in the subsurface structures (Common Action C3), removal of the process and fuel oil tanks (Common Action C6), sludge in the interior stormwater system (Common Action C5), and cleaning of the lead extrusion pits (Common Action C7) would reduce the toxicity, mobility, and volume of the COPCs related to these material through removal from the Site.

9.4.4.2.5 Short-Term Effectiveness

The total time required to complete Remedial Alternative I3 is expected to be 8 to 12 months following NYSDEC approval of the Remedial Design.

Risk of exposure to the COPCs in the building material exists for remedial contractors during the demolition and remediation activities. Remedial contractors would be in direct contact with concrete dust generated from the remediation activities and bulk material during the demolition activities, thereby presenting dermal, ingestion and inhalation pathways. The risk of exposure would be minimized through the use of appropriate PPE, continual air monitoring, and implementing engineering controls. Particulate monitoring would be performed at work zones and at the Site perimeter. Air sampling for PCBs and lead would be performed periodically during all demolition and remediation activities.

There is the potential for air-borne risks to the surrounding community from remedial activities and disposal trucks leaving the Site. Risks would be mitigated, to the extent possible, via engineering controls, decontamination procedures prior to leaving the work zone, and proper health and safety monitoring. As discussed in Section 9.4.2.1, a PAMP would be implemented to monitor particulate concentrations at the Site's perimeter.

The remedial activities would cause a considerable increase in the truck traffic in the community. Approximately 1,830 truckloads would leave the Site during implementation of the remedial action. Although the Site is located in a commercial/industrial setting, one narrow means of access exists into and out of the Yard. In addition, residential areas must be traversed to reach the Site. Given the large number of trucks that would be needed under this alternative, the increased truck traffic and its associated emissions would likely pose considerable concerns to the surrounding community. Barging of materials may be considered during the RD in lieu of truck transport.

9.4.4.2.6 Implementability

Although demolition contractors are readily available to perform the work and demolition methods are well-proven, , demolition of the Site buildings would present some technical challenges given the location of the Site. As discussed above, a number of trucks would be needed to transport remediation waste from the facility. Since there is only one means of egress to the Yard and the trucks would need to traverse narrow, congested city streets to get to the Site, off-Site transportation of this quantity of materials would be challenging. Alternative transportation methods may be evaluated during the RD to address these concerns. Rail transport is not possible since the adjacent lines are used by the commuter railroad.

The technologies associated with the remediation of the concrete slab supported on piles have been proven effective and remedial contractors are also readily available to perform this type of work. The proximity of the Site to the Hudson River may require additional precautions to prevent any impacts from the construction debris or runoff generated by stormwater during the demolition activities. Disposal tracking and waste characterization sampling would require a significant effort due to the quantity of waste to be disposed off-Site. Permits to complete the demolition and remediation of the Site buildings would be obtainable with average effort.

Common Actions C5, C6, C7, and the subsurface structure portion of Common Action C3 are readily implementable.

9.4.4.2.7 Cost

A summary of the demolition and remedial costs associated with Remedial Alternative I4 is provided in Table R-4, Appendix R. The estimated capital cost to implement Remedial Alternative I4 is $10,610,383. The estimated present worth cost for OM&M tasks associated with inspection and maintenance of the asphalt cover is $139,142. Therefore, the total net present value of Remedial Alternative I4 is $10,747,525.

9.5 *COMPARISON OF REMEDIAL ACTION ALTERNATIVES*

This section provides a comparison of the remedial action alternatives that were developed for the Site media of interest (i.e., soil/fill, sediment and interior building material). As discussed in Sections 9.2 through 9.4, the following remedial action alternatives were developed for these media:

<u>Soil/fill</u>

Alternative E1:	No Action (Section 9.2.1)
Alternative E2:	Surface Cover (Section 9.2.2)
Alternative E3:	Excavation and Off-Site Disposal with Surface Cover (Section 9.2.3)
Alternative E4:	Excavation and Off-Site Disposal to Pre-Disposal Conditions with Surface Cover (Section 9.2.4)

<u>Sediment</u>

Alternative S1:	No Action (Section 9.3.1)
Alternative S2:	Monitored Natural Recovery (Section 9.3.2)
Alternative S3:	Sediment Removal (Section 9.3.3)
Alternative S4:	Sediment Capping (Section 9.3.4)

<u>Interior building materials</u>

Alternative I1:	No Action (Section 9.4.1)
Alternative I2:	Encapsulation (Section 9.4.2)
Alternative I3:	Building Interior Remediation (Section 9.4.3)
Alternative I4:	Building Demolition and Off-Site Disposal (Section 9.4.4)

The NCP (40 CFR 300.430) and the NYSDEC guidance on the selection of remedial actions at inactive hazardous waste disposal sites (NYSDEC, 1990 and NYSDEC, 2002) require that alternatives be developed that protect human health and the environment by eliminating, reducing and controlling potential risks posed through each pathway at a site.

With respect to developing remedial alternatives, the NCP provides for a review of remedial alternatives that: (1) require no action {40 CFR 300.430(e)(6)}; (2) involve little or no treatment but protect human health and the environment by preventing or controlling potential exposures to hazardous substances through engineering or institutional controls {40 CFR 300.430(e)(3)(ii)}; and (3) reduce the toxicity, mobility or volume of hazardous substances through treatment {40 CFR 300.430(e)(3)(i)}.

The No Action approaches evaluated in this Feasibility Study in Alternatives E1, S1 A, S1B and I1 comply with the NCP requirement to evaluate the applicability of not implementing additional remedial actions at the Site for soil/fill, sediment and interior building materials, respectively. The remaining alternatives (i.e., E2, E3, E4, S2A, S3A, S4A, S2B, S3B, S4B, I2, I3 and I4) comply with the NCP requirement to evaluate, where applicable, alternatives that protect human health and the environment through engineering or institutional controls or by reducing the toxicity or volume of hazardous substances.

Each alternative was evaluated for the seven items identified in the NCP {40 CFR 300.430(e)(9)} and in NYSDEC guidance for the selection of remedial actions (NYSDEC, 1990; NYSDEC, 2002) including performance criteria to be considered during the preparation of a feasibility study. The NCP and the NYSDEC guidance (NYSDEC, 1990; NYSDEC, 2002) also require that alternatives be evaluated for community acceptance. Alternatives are to be evaluated for community acceptance after the NYSDEC has distributed the RI/FS and a proposed remedial action plan (PRAP) for review and comment by the public.

In accordance with the NCP (40 CFR 300.430(f)(1)(i)) and NYSDEC guidance (NYSDEC, 1990; NYSDEC, 2002), the first two performance criteria (i.e., protect human health and the environment and compliance with SCGs) are considered threshold criteria. Standards and criteria represent promulgated standards while engineering judgement may be used in the application of guidance. Remedial action alternatives must achieve these two threshold criteria, unless a waiver is justified. The remaining five criteria (identified below) are considered primary balancing criteria. These balancing criteria address the following issues:

1. How will the remedial actions perform in the future (long-term effectiveness and permanence)?
2. Does the alternative reduce the toxicity, mobility or volume of hazardous substances?
3. Does the implementation of the alternative create adverse impacts (short-term effectiveness)?
4. Can the alternative be implemented (implementability)?
5. What is the total cost of the alternative?

Addressing these criteria for each alternative provides the comparative analysis by which a preferred remedial action alternative can be selected. The comparative analysis or evaluation highlights the particular advantages, disadvantages and/or similarities of each alternative for the specific criteria. This comparative analysis is discussed below for soil/fill, sediment and interior building materials.

9.5.1 *Soil/Fill Remedial Action Alternatives*

9.5.1.1 *Overall Protection of Human Health and the Environment*

Protection of human health and the environment is measured by the ability of an alternative to address the remedial action objectives for the media of interest. As previously discussed, protection of human health and the environment and compliance with SCGs are threshold criteria. That is, an alternative must adequately protect human health and the environment and comply with SCGs to be considered for selection as a preferred remedial action alternative for a site.

The RAOs for Site soil/fill and ground water are:

- Prevent ingestion, direct contact, and/or inhalation of/with soil/fill that exceeds applicable SCGs;
- Prevent migration of soil/fill that would result in surface water impacts that exceed applicable SCGs or result in fish advisories;
- Prevent inhalation of or exposure from COPCs volatilizing from soil that exceed applicable SCGs;
- Prevent contact with VOCs in ground water; and
- Prevent inhalation of VOC vapors from ground water.

With the exception of Alternative E1 (No Action), all of the soil/fill alternatives would provide adequate protection of human health and the environment by eliminating, reducing or controlling risks through:

- engineering and institutional controls;
- covering impacted Site soil/fill; and/or
- excavation and off-Site disposal of impacted Site soil/fill.

Since Alternative E1 would not eliminate, reduce or control the potential exposure pathways for impacted Site soil/fill and ground water and would not address any of the soil/fill or ground water RAOs, it would not provide adequate protection of human health and the environment.

Alternatives E2 (Surface Cover), E3 (Excavation and Off-Site Disposal with Surface Cover), E4 (Excavation and Off-Site Disposal to Pre-Disposal Conditions with Surface Cover) would all rely on a variety of institutional and engineering controls to address the soil/fill and ground water RAOs. These include:

- access and use restrictions for all remaining Site soil/fill areas that contain COPCs at concentrations in excess of the SCGs;
- installation and maintenance of a surface cover over remaining Site soil/fill areas that contain COPCs at concentrations in excess of the SCGs;
- implementation of a Soil Management Plan (SMP) to address future risks posed by direct contact with Site soil/fill areas that contain COPCs at concentrations in excess of the SCGs and VOCs in ground water; and
- restoration of the bulkhead to prevent erosion of soil/fill into the Hudson River.

Alternative E2 would rely on a surface cover to prevent direct contact with all PCB and VOC-impacted Site soil/fill, including soil/fill located in the upper 8 feet of soil/fill. As discussed in Section 4.2.1, because of the shallow ground water table at the Site and any future buildings would need to be constructed on top of pilings (i.e., basement construction is not feasible), the upper 8 feet of soil/fill is considered to be the construction worker accessible soil zone. Under Alternative E2, PCBs at concentrations up to 97,600 mg/kg would remain in Site soil/fill. As discussed in Section 9.2 and below, the majority of the PCB mass and the mass of NYS B007 listed hazardous PCB waste is located in the zone most accessible to construction workers. A properly maintained surface cover could effectively manage direct contact with this impacted Site soil/fill. However, any future construction work in these areas would require health and safety provisions for construction workers and have to be conducted by personnel trained to work with hazardous waste. These provisions would be specified in the SMP along with the provisions to address direct contact with deeper soil outside of the construction worker soil zone during piling installation and historic fill in the remainder of the Site.

Excavation and off-Site disposal of impacted Site soil/fill under Alternatives E3 and E4, combined with the institutional and engineering controls discussed above, would provide more certainty with respect to protection to human health and the environment than Alternative E2 by reducing the aforementioned health and safety requirements when performing future intrusive work. Under Alternative E4 and all Alternative E3 excavation scenarios, except E3: 0-4 feet, all PCB and VOC-impacted soil/fill in the construction worker accessible soil zone would be removed. Direct contact with the remaining soil/fill would be provided through installation and maintenance of a surface cover and implementation of the SMP. Although Alternatives E3: 0-12, E3: 0-16 feet and E3: 0-20 feet and E4 would remove additional PCB and VOC-impacted soil/fill, exposure to this impacted media would be limited to installation of pilings. Risks posed during piling installation, which would be minimal, could be adequately managed through implementation of the SMP. Therefore, the increased protection to human health and the environment afforded by these deeper excavation scenarios (i.e., E3: 0-12, E3: 0-16 feet and E3: 0-20 feet) over Alternative E3: 0-8 feet would be minimal.

Under Alternative E4, additional historic fill that is not impacted by PCBs or VOCs, but lies within the post-1940s fill line, would be removed. Since a surface cover is being used under Alternative E4 to prevent exposure to the remaining historic fill (i.e., pre-1940s historic fill) and this exposure barrier has been effectively used at other historic fill sites, Alternative E4 would provide minimal additional protection to human health and the environment over Alternative E3 by further removal of this non-PCB and VOC-impacted historic fill.

Ground water monitoring, which is included as a Common Action, would be conducted to confirm that upgradient ground water flowing onto the Site does not pose an unacceptable potential for exposure. Alternatives

E3: 0-12 feet, E3: 0-16 feet and E3: 0-20 feet and Alternative E4 would remove VOC- impacted Site soil/fill, which would in turn eliminate the potential for future leaching of these COPCs to groundwater. However, as discussed in previous sections, the COPCs in Site soil/fill are not causing unacceptable ground water impacts. As such, the removal of this soil/fill would not substantively improve protection to human health and the environment

In conclusion, provided adequate long-term OM&M is conducted, all soil/fill alternatives, with the exception of Alternative E1 would provide adequate protection of human health and the environment. All three alternatives, besides E1 would rely to some degree on long-term OM&M of surface covers and implementation of an SMP to ensure continued protection of human health and the environment. All alternatives besides E1 would include bulkhead restoration to prevent erosion of soil/fill to the river. Alternatives E3 and E4 would also include soil/fill excavation and off-Site disposal. Through removal of the impacted Site soil/fill, Alternatives E3 and E4 would reduce the potential for future exposure to impacted Site soil/fill by construction workers. As discussed above, adequate long-term direct contact protection can be achieved by limiting removal of the PCB and VOC-impacted Site soil/fill to the construction worker accessible soil zone (i.e., upper 8 feet) and implementation of an SMP for direct contact with the remaining soils.

9.5.1.2 Compliance with SCGs

Compliance with SCGs is also a threshold criterion. Table 7-1 contains a list of potential SCGs and TBCs for the Site media of interest and Table 9-5 presents a summary of each alternative's compliance with these SCGs.

Compliance with SCGs determines whether an alternative satisfies regulatory and risk management requirements. As discussed in Section 7.0, SCGs incorporate both the CERCLA concepts of ARARs and TBCs. They include promulgated requirements and non-promulgated guidance, which govern activities that may affect the environment. The standards and criteria (SCs) are those cleanup standards, standards of control and other substantive requirements, criteria or limitations that are officially promulgated under federal or state law. Though guidance does not represent a legal requirement, it should be considered based on professional judgment when applicable to site conditions (NYSDEC, 2002).

As discussed in the previous sections and in Tables 7-1 and 9-5, the SCGs can be chemical specific, action specific and/or location specific. The following comparison takes into consideration the type of SCG and whether or not it is a standard, a criteria or guidance.

As shown in Table 9-5, Alternative E1 would not comply with any of the applicable chemical- specific SCGs. The chemical- specific SCGs include both standards and criteria (i.e., the TSCA standards) and guidance (i.e., the TAGM 4046 RSCOs). In addition, Alternative E1 would not address the 6 NYCRR Part 375 goals to: eliminate or mitigate all significant risk to the public health and the environment; restore the Site to pre-disposal/ pre-release conditions, to the extent feasible and authorized by law; and remove "consequential" amounts of listed hazardous waste. Since Alternative E1 does not include any remedial activities, none of the action-specific SCGs would apply to this alternative.

As shown in Table 9-5, with the exception of 6 NYCRR Part 375, Alternatives E2, E3 and E4 would meet all of the applicable action and location- specific standards and criteria and guidance. With regard to 6

NYCRR Part 375, Alternatives E2, E3 and E4 would meet the goal of this regulation to eliminate or mitigate all significant threats to the public health through either installation of a surface cover and/or soil excavation and off-Site disposal. In addition, Alternatives E3 and E4 would meet the goal to remove "consequential" amounts of listed hazardous waste. However, only Alternative E4 would address the goal to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law.

With regard to the chemical specific SCGs, Alternatives E2, E3 and E4 would all address the TAGM 4046 RSCOs (guidance) for historic fill parameters (i.e., inorganic constituents and SVOCs) through installation of a surface cover. Alternative E4 would also address the historic fill parameters (i.e., inorganic constituents and SVOCs) through excavation and off-Site disposal of the post-1940s historic fill not located within the PCB and VOC-impacted soil/fill footprint.

For non-historic fill parameters (i.e., PCBs and VOCs), the TAGM 4046 RSCOs (guidance) and the TSCA PCB standards would be addressed in:

- Alternative E2 through installation of a surface cover,
- Alternative E3 through soil excavation and off-Site disposal plus installation of surface cover for underlying soil for all scenarios except E3: 0-20 feet; and
- Alternative E4 through soil excavation and off-Site disposal (post-1940 placement only).

Alternative E2 and E3: 0-4 feet would leave PCBs in the construction worker accessible soil zone (i.e., upper 8 feet) at concentrations in excess of both the high and low occupancy TSCA standards and the TAGM 4046 RSCOs. In contrast, all of the remaining Alternative E3 and Alternative E4 excavation scenarios would remove soil/fill from the construction workers- accessible soil zone that exceeds these SCGs. Under Alternatives

E3: 0-8 feet, E3: 0-12 feet and E3: 0-16 feet, soil containing PCBs at concentrations above the maximum TSCA low occupancy standard of 100 mg/kg (see Table 7-2) would remain at depths greater than 8 feet, 12 feet and 16 feet, respectively. These are all depths beyond the construction worker accessible soil zone. Although the TSCA low occupancy standard would not be met for the Alternative E3 excavation scenarios that remove less than 20 feet of soil/fill, a waiver of this standard would be likely since this remaining soil/fill has limited accessibility and similar concentrations have been left at other sites with the Department's approval. For example, at Harbor at Hastings' site, the NYSDEC proposed remedial action allows PCBs to remain in Site soil/fill at concentrations well above 100 mg/kg (NYSDEC, 2003d).

The SCGs for the interior building materials are comprised of both standards and guidance. These SCGs would be met for the Warehouses, Guard House and Paint Shop via either building surface cleaning (Alternative E2) or building demolition (Alternative E3 and E4).

Alternatives E2, E3 and E4 would comply with applicable chemical specific SCGs that relate to protection of surface water bodies through bulkhead restoration and its subsequent maintenance (Common Action C4). As noted in Table 9-5, these SCGs are standards. Finally, Alternatives E2, E3 and E4 would comply with applicable TBCs identified in Table 7-1 and 9-5.

9.5.1.3 *Long-Term Effectiveness and Permanence*

Long-term effectiveness and permanence is measured by the magnitude of the residual risk and the adequacy and reliability of controls. As discussed in Section 2.6, Site soil/fill poses direct contact risks and there is the potential for erosion of soil/fill into the Hudson River from areas that are not adequately bulkheaded. Protection to human health and the environment would be provided by preventing direct contact with impacted soil/fill, removing impacted soil/fill and preventing erosion of soil/fill into the Hudson River.

Alternative E1 would not provide any long-term effectiveness or permanence. Site soil/fill would continue to erode from behind the degraded bulkhead into the river and the potential for continued direct contact with impacted Site soil/fill would continue.

Under Alternative E2, a surface cover would be installed over the PCB and VOC-impacted soil/fill, as well as the historic fill that does contain PCBs or VOCs. With proper maintenance, a surface cover would be effective in the long-term in preventing direct contact with this material. In addition, an SMP would be implemented to address any potential risks posed during construction activities. This SMP would require that construction work in the areas with soil exhibiting PCB concentrations greater than 50 mg/kg be conducted by personnel trained to work with hazardous waste.

Under Alternative E4 and all of the Alternative E3 excavation scenarios, with the exception of Alternative E3: 0-4 feet, all of the PCB and VOC-impacted soil/fill in the construction worker accessible soil zone (i.e., upper 8 feet) would be removed. This would provide more certainty in the long-term effectiveness and permanence of the remedy in comparison to Alternative E2 and Alternative E3: 0-4 feet. Similar to Alternative E2, Alternatives E3 and E4 would also rely on properly maintained surface covers to prevent long-term exposure to the remaining impacted Site soil/fill. All three alternatives would rely on a properly maintained bulkhead to prevent erosion of soil/fill into the river.

Neither Alternative E1 nor E2 would be a permanent remedy. Alternatives E3 and E4 would classify as a permanent remedy in the areas where soil/fill excavation and removal are conducted. In conclusion:

- Alternatives E3: 0-8 feet, E3: 0-12 feet, E3: 0-16 feet and E3: 0-20 feet and Alternative E4 would have greater long term permanence than Alternative E3: 0-4 feet;
- Alternative E3: 0-4 feet would, in turn, have greater long term permanence than Alternative E2; and
- Alternative E2 would, in turn, have greater long-term permanence than Alternative E1.

9.5.1.4 Reduction of Toxicity, Mobility or Volume

As discussed in Section 9.0, this criterion evaluates changes in the toxicity, mobility and volume of listed hazardous waste and COPCs. As previously discussed, NYS B007 listed PCB hazardous waste is present in North Yard and Below Building soil/fill.

Alternative E1 would have no effect on the current toxicity, mobility or volume of impacted Site soil/fill or listed hazardous waste. Alternative E2 would reduce the mobility of the COPCs in Site soil/fill and listed hazardous waste, to some degree, through installation of new surface covers, maintenance of the new and existing surface covers and bulkhead restoration. However, Alternative E2 would not reduce the toxicity or volume of listed hazardous waste or COPCs.

Alternatives E3 and E4 would result in the reduction in the mobility and volume of listed hazardous waste and COPCs in the impacted Site soil/fill. Following is a summary of the reduction in North Yard total PCB mass and listed hazardous waste PCB mass that would be achieved:

North Yard

	Estimated PCB Mass Removed (kg)	Estimated% Reduction of Total PCB Mass	Estimated Mass of PCB Listed Hazardous Waste (kg)	Estimated % Reduction of PCB Listed Hazardous Waste
E3: 0-4 feet	35,930	86%	35,873	87%
E3: 0-8 feet	39,465	94%	39,356	95%
E3: 0-12 feet	41,455	99%	41,028	99%
E3: 0-16 feet	41,720	99.7%	41,303	99.7%
E3: 0-20 feet	41,829	100%	41,412	100%
E4	41,829	100%	41,412	100%

In addition to the North Yard PCB mass, Alternative E3 and E4 would also remove an additional 8 kg of PCB mass from the South Yard and Below Building soil/fill and all of the NYS B007 listed PCB listed hazardous waste from the Below Building soil/fill. Alternatives E3 and E4 would also reduce the mobility of VOCs from soil/fill to ground water, though as discussed in Section 7.2.1.1 and 7.2.2.1, this fate and transport mechanism did not pose a risk.

Excavated soil/fill that exhibits hazardous waste characteristics for lead would be stabilized. This treatment would reduce the mobility of lead in excavated soil/fill prior to its placement in an off-Site landfill. The volume of the excavated material would increase slightly due to the addition of stabilization agent. Any removed stabilized soil/fill would be relocated from the Site to a secure land disposal facility. Under Alternative E4, additional Site soil/fill would be stabilized to remove its hazardous waste characteristic. Under Alternative E4, non-PCB and/or VOC-impacted post-1940s soil/fill would also be removed. This removal would result in a reduction in the volume and mobility of COPCs in this additionally excavated Site soil/fill. It should be noted, even under Alternative E4, chemicals would remain at concentrations above their TAGM 4046 RSCOs. However these chemicals, the majority of which are present at concentrations consistent their historic fill values would be addressed through surface covers and deed restrictions.

As shown above, Alternative E3 (all excavation scenarios) would result in substantial reduction in the total PCB mass and the mass of NYS B007 listed PCB hazardous waste from the Site, as does Alternative E4. However, Alternative E4 would result in a somewhat greater reduction in toxicity, mobility and volume of inorganic constituents and SVOCs in Site soil/fill than Alternative E3: 0 to 8 feet. Alternatives E1 would provide the least reduction in toxicity, mobility and volume followed by Alternative E2.

9.5.1.5 *Short-Term Effectiveness*

Short-term effectiveness refers to the potential effects and related risks associated with the implementation of the remedy. Potential short-term effects would occur during construction and operation of the remedial action alternatives. Since Alternative E1 does not include any remedial activities, it would not have any short-term impacts.

Potential short-term effects from implementation of the Exterior alternatives can be summarized as follows:

- air emissions at the Site;
- transportation risks (i.e., accidents, spills, increased air emissions);
- discharge of treated construction liquids; and
- remedial contractor worker safety.

Intrusive activities can generate air emissions at the Site if soil particles and other materials (e.g., dust, VOCs) are released into ambient air. Alternative E2 entails installation of a surface cover. This activity, which would include some amount of regrading, would have the lowest potential for short-term air emissions impacts. Alternative E3, and more significantly, Alternative E4, have higher potentials for generation of air emissions during soil excavation activities. Under Alternative E3 between 7,000 and 17,000 cy of soil/fill would be excavated. Under Alternative E4 approximately 75,000 cy of soil/fill would be excavated. Consequently, Alternative E4, which would take longer to implement and require considerably more materials handling, would have a higher potential for short-term Site air emissions impacts than Alternatives E3 and E2.

Transportation risks, such as accidents, spills and increased air emissions from vehicles, are also related to the amount of material to be transported on-Site for the remedial action (e.g., backfill) and off-Site for disposal. Alternative E4 includes the transportation of the greatest amount of material to the Site for the remedial action and from the Site to an off-site disposal facility. The potential short-term risks posed by the Alternative E4 transportation activities are considerably greater than the potential short-term transportation risks posed by Alternatives E2 or E3. In addition to trucks required to transport backfill and other materials to the Site, Alternative E3 would require 400 to 950 truckloads for off-Site disposal of excavated materials, and Alternative E4 would require 4,000 truckloads for off-Site disposal of excavated materials. This truck traffic, which would need to navigate through residential areas to and from the Site, would pose considerable short-term risks and create community concerns. Alternative E2 would have the least transportation related short-term concerns.

Excavation to depths greater than 2.3 feet (depending on the area) would require dewatering and treatment and discharge of dewatering fluids. Short-term impacts would be posed to the Hudson River through discharge of construction liquids. However, these impacts could be mitigated via treatment prior to discharge.

In conclusion, Alternative E1 would pose the least potential for short-term impacts followed by Alternative E2. Alternative E3 would have short-term impacts (progressively increasing with increasing volumes of removed soil/fill). The greatest potential for short-term impacts resides with Alternative E4.

9.5.1.6 Implementability

Implementability concerns are related to potential technical and institutional problems associated with a remedial action alternative. Since Alternative E1 does not include the implementation of any remedial actions, there are no implementability concerns associated with this alternative.

No special technologies or materials would be required to complete the work proposed under Alternatives E2, E3 and E4. Under Alternatives E2, E3 and E4, bulkhead restoration would be conducted. There are considerable implementability concerns associated with bulkhead restoration beneath the Site buildings.

In addition, there are potential implementability concerns associated with Alternatives E3 and E4. They are:

- potential limitations to the maximum depth of excavation that can be conducted at the Site {Note: studies at the Harbor at Hastings site have demonstrated that the maximum depth of soil/fill excavation may be limited};
- increased dewatering and construction fluids treatment with excavation depth;
- increased slope stabilization with excavation depth;
- increased materials handling with excavation depth; and
- extensive permitting requirements associated with bulkhead restoration and discharge of treated construction fluids.

In conclusion, Alternative E1 would be the most implementable followed by Alternative E2. The implementability concerns would increase with increasing excavation depths conducted under Alternative E3. Alternative E4 would have the highest implementability concerns.

9.5.1.7 *Cost*

Following is a summary of the estimated costs for the soil/fill remedial action alternatives. The detailed cost estimates are provided in Appendix P.

		Capital/ Construction	O&M NPV	Capital Cost Contingency	Other Indirect Costs	Total NPV
E1	No Action	$0	$0	$0	$0	$0
E2	Surface Cover	$2,034,472	$867,745	$508,618	$788,358	$4,313,382
E3	Excavation and Off-Site Disposal					
	4 ft	$4,958,945	$803,515	$1,239,736	$1,487,684	$8,489,879
	8 ft	$7,801,107	$803,515	$1,950,716	$2,340,332	$12,895,231
	12 ft	$9,588,252	$796,358	$2,397,063	$2,876,476	$15,658,149
	16 ft	$11,575,198	$796,358	$2,893,799	$3,472,559	$18,737,914
	20 ft	$12,747,086	$796,358	$3,186,772	$3,505,449	$20,235,665
E4	Excavation and Off-Site Disposal to Pre-Disposal Conditions					
		$28,189,328	$657,399	$7,047,332	$7,752,065	$43,646,124

As noted above, Alternative E1 has no associated costs. Alternatives E2, E3 and E4 have similar OM&M net present value (NPV) costs; however, the capital/construction costs and total NPV of these alternatives varies considerably. Alternative E4 has the highest costs followed by the deeper E3 excavation scenarios.

As discussed above, Alternative E3: 0-8 feet would remove the vast majority of PCBs in Site soil/fill (i.e., 94% of the PCB mass and 95% of the NYS B007 listed PCB hazardous waste) at an estimated cost of $12.7 million dollars. Comparison of the total remedial costs for the soil/fill removal remedial action alternatives (see Figure 9-19) demonstrates that little additional PCB mass and NYS B007 listed PCB hazardous waste is removed for considerable additional monies. For example, it would cost:

- an additional $2.7 million dollars over Alternative E3: 0-8 feet to remove an additional 5% of the PCB mass and 4% of the PCB listed hazardous waste under Alternative E3: 0-12 feet;
- an additional $3.1 million dollars over the Alternative E3: 0-8 feet remedial cost to remove an additional 5.7% of the PCB mass and 4.7% of the PCB listed hazardous waste under Alternative E3: 0-16 feet;
- an additional $4.6 million dollars over the Alternative E3: 0-8 feet remedial cost to remove an additional 6% of the PCB mass and 5% of the PCB listed hazardous waste under Alternative E3: 0-20 feet; and
- an additional $30 million dollars over the Alternative E3: 0-8 feet remedial cost to remove an additional 6% of the PCB mass and 5% of the PCB listed hazardous waste and additional historic fill related constituents under Alternative E4.

It should be noted that under the deeper Alternative E3 excavation scenarios (i.e., E3: 0-12 feet, E3: 0-16 feet and E3: 0-20 feet), as well as Alternative E4, chemicals would be remain in the Site soil/fill at concentrations above the TAGM 4046 RSCOs. Similar to Alternative E3: 0-8 feet, these chemicals, the majority of which are present at concentrations consistent historic fill values, would be addressed through surface covers and deed restrictions.

9.5.2 *Sediment Remedial Action Alternatives*

9.5.2.1 *Overall Protection of Human Health and the Environment*

Protection of human health and the environment is measured by the ability of an alternative to address the remedial action objectives for the media of interest. As previously discussed, protection of human health and the environment and compliance with SCGs are threshold criteria. That is, an alternative must adequately protect human health and the environment and comply with SCGs to be considered for selection as a preferred remedial action alternative for a site.

The RAOs for Site-related impacted sediment are:

- Prevent direct contact with sediment where concentrations of COPCs exceed upriver sediment values and applicable SCGs;
- Prevent releases of chemicals in excess of upriver values to or from sediment that would result in surface water concentrations of COPCs in excess of ambient water quality criteria and/or result in fish advisories; and
- Prevent Site-related impacts to biota from ingestion/direct contact with sediment causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain to the extent practicable, by taking upriver sediment quality and applicable SCGs into consideration.

With the exception of Alternative S1A (No Action), all of the Site-related impacted sediment alternatives would provide adequate protection of human health and the environment by eliminating, reducing or controlling risks through:

- engineering and institutional controls;
- covering Site-related impacted sediment via MNR or capping; and/or
- sediment removal and off-Site disposal.

Since Alternative S1A would not eliminate, reduce or control the potential exposure pathways for Site-related impacted sediment and would not address any of the sediment RAOs, it would not provide adequate protection of human health and the environment.

Alternatives S2A (Monitored Natural Recovery), S3A (Sediment Removal) and S4A (Sediment Capping) would all rely on both engineering and institutional controls to address the sediment RAOs. These include:

- access and use restrictions for all remaining Site-related impacted sediment;

- implementation of a Soil Management Plan (SMP) to address potential future risks posed by direct contact with remaining Site-related impacted sediment; and
- restoration of the bulkhead to prevent erosion of soil/fill into the Hudson River and to separate the majority of the intertidal sediment from the river environment.

Alternative S2A would rely on monitored natural recovery (MNR), in conjunction with removal of debris piles, hot spots and residual sludge in the interior stormwater system to meet the sediment RAOs and provide protection to human health and the environment. Alternative S3A would rely on removal of the Site-related impacted sediment, debris, hot spots and residual sludge in the interior stormwater system to meet the RAOs and provide protection to human health and the environment. Alternative S4A would rely on a combination of sediment removal and capping, debris, hot spots and residual sludge in the interior stormwater system to address the sediment RAOs and provide protection to human health and the environment.

The level of protection afforded by Alternative S3A would have less uncertainty than the level of protection than Alternatives S2A and S4A because the Site-related impacted sediment would be removed and clean fill would be installed in its place. Alternative S2A would likely provide a higher level of certainty regarding protection than Alternative S4A because of the marginal capability to apply capping materials beneath the Site buildings uniformly and effectively.

Because the Area V sediment does not exhibit Site-related impacts, all of the Area V sediment alternatives, including S1B: No Action would provide adequate protection of human health and the environment.

Since Area V does not exhibit Site-related ecological impacts, the implementation of an active remedial alternative (e.g., Alternatives S2B, S3B and S4B) is not needed to provide protection of human health and the environment. As noted above, the chemical concentrations in the Area V sediment are consistent with upriver, background sediment quality.

9.5.2.2 *Compliance with SCGs*

Compliance with SCGs is also a threshold criterion. Table 7-1 contains a list of potential SCGs and TBCs for the Site media of interest and Table 9-5 presents a summary of each alternative's compliance with these SCGs.

Compliance with SCGs determines whether an alternative satisfies regulatory and risk management requirements. As discussed in Section 7.0, SCGs incorporate both the CERCLA concepts of ARARs and TBCs. They include promulgated requirements and non-promulgated guidance that govern activities that may affect the environment. The standards and criteria (SCs) are those cleanup standards, standards of control and other substantive requirements, criteria or limitations that are officially promulgated under federal or state law. Though guidance does not represent a legal requirement, it should be considered based on professional judgment when applicable to site conditions (NYSDEC, 2002).

As discussed in the previous sections and in Tables 7-1 and 9-5, the SCGs can be chemical- specific, action- specific and/or location- specific. The following comparison takes into consideration the classification of the SCG and whether or not it is a standard or criteria or guidance.

As shown in Table 9-5, Alternative S1A would not comply with any of the applicable chemical- specific SCGs. These include both standards and criteria (i.e., the TSCA PCB standards) and guidance (i.e., the NYSDEC sediment screening criteria). In addition, Alternative S1A would not address the Part 375 goals to eliminate or mitigate all significant risk to the public health and the environment and restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law. Since Alternatives S1A and S1B do not include any remedial activities, none of the action specific SCGs would apply to these alternatives.

As shown in Table 9-5, with the exception of 6 NYCRR Part 375, Alternatives S2A, S3A and S4A would meet all of the applicable action and location specific standards and criteria and guidance. With regard to 6 NYCRR Part 375, Alternatives S2A, S3A and S4A would meet the goal of this statute to eliminate or mitigate all significant threats to the public health posed by Site-related sediment through either MNR, sediment removal and off-site disposal or sediment removal in conjunction with capping. However, only Alternative S3A would constitute an attempt to restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law. Under Alternative S2A and S4A, Site-related impacted sediment would remain at depth, though beyond the biologically active zone. As shown in Table 9-5, Alternatives S2B, S3B, and S4B would meet all of the applicable action and location specific standards and criteria and guidance.

With regard to the chemical specific SCGs, Alternatives S2A, S3A, S4A, S1B, S2B, S3B and S4B would all address the NYSDEC sediment screening criteria (guidance) for the Site-related impacted sediment located beyond the bulkhead to the extent practicable. A large number of the upriver sediment samples exhibit COPCs that exceed the NYSDEC sediment screening criteria. Therefore, the remedial goal for the Site-related impacted sediment would not be higher than concentrations observed in upriver sediment area. For PCBs, the technically achievable level identified by NYSDEC (i.e., 1 mg/kg) would be the remedial goal. This goal (i.e., 1 mg/kg) is consistent with the TSCA high occupancy standard for surface material. Provided the baseline studies demonstrate that MNR is occurring to a sufficient extent, Alternative S2A would meet the higher of the upriver concentration or the sediment screening criteria and the PCB remedial goal of 1 mg/kg. Alternatives S3A and S4A would all meet the higher of the upriver concentration or the sediment screening criteria and the PCB remedial goal (and TSCA high occupancy standard) of 1 mg/kg. Under Alternatives S1B through S4B, Area V sediment is already consistent with upriver sediment quality.

Alternatives S2A, S3A, S4A, S1B, S2B, S3B and S4B would comply with applicable chemical specific SCGs that relate to protection of surface water bodies (standard) through bulkhead restoration and subsequent maintenance (Common Action C4).

Finally, Alternatives S2A, S3A, S4A, S1B, S2B, S3B and S4B would comply with applicable TBCs identified in Table 7-1 and 9-5.

9.5.2.3 *Long-Term Effectiveness and Permanence*

Long-term effectiveness and permanence is measured by the magnitude of the residual risk and the adequacy and reliability of controls. As discussed in Section 2.6, Site-related impacted sediment poses direct contact risks and ecological risks. Protection to human health and the environment would be provided by preventing direct contact with Site-related impacted sediment and mitigating ecological impacts through MNR, sediment removal or capping.

Alternative S1A would not provide any confirmation of long-term effectiveness or permanence. Since no action is performed (including confirmation of sediment deposition, removal of debris piles and cleaning of the interior stormwater system), this alternative would not provide any long-term effectiveness or permanence.

Alternatives S2A, S3A, S4A, S1B, S2B, S3B and S4B would provide long term permanence and effectiveness for the Site-related sediment and Area V sediment. Alternative S2A would provide a means to evaluate and confirm long-term permanence and effectiveness for Site-related impacted sediment through MNR. As discussed in Section 9.3.2.2.3, sediment deposition is occurring at the Site and is expected to improve with implementation of the source removal components included in this alternative. During MNR, access to the Site-related impacted sediment would be controlled. The Site-related impacted sediment is currently hydraulically stable. The long-term trends regarding sediment stability, deposition, biota concentrations and sediment would be monitored during baseline studies and OM&M monitoring.

Alternative S3A offers more certainty of long-term effectiveness for Site-related impacted sediment in a shorter period of time through removal of this sediment. Similarly, Alternative S4A would offer more certainty of long-term effectiveness in a shorter period of time through a combination of capping and removal of the Site-related impacted sediment. The portion of the Site-related sediment that is capped (i.e., the Site-related impacted subtidal sediment) would be subject to long-term OM&M to confirm that the cap is not eroded or damaged.

Because the Area V sediment quality is consistent with upriver sediment quality, Alternative S1B, S2B, S3B and S4B would all provide equivalent long-term effectiveness or permanence.

9.5.2.4 *Reduction of Toxicity, Mobility or Volume*

As discussed in Section 9.0, this criterion evaluates changes in the toxicity, mobility and volume of listed hazardous waste and COPCs. As discussed above, the Site-related impacted sediment is not a listed hazardous waste. The debris piles scattered among intertidal sediment could only be classified as a characteristic hazardous waste upon removal.

Alternative S1 would have no effect on the current toxicity, mobility or volume of Site-related impacted sediment.

The Common Actions associated with Alternatives S2A, S3A and S4A would reduce the toxicity, mobility and volume of listed hazardous waste through the removal of debris piles and would result in a reduction in toxicity, mobility and volume of COPCs through removal of debris, hot spots and sludge from the interior stormwater system. In addition, Site-related impacted intertidal sediment within the bulkhead and its COPCs would be separated from the river environment. Once separated, the Site-related impacted sediment areas inside the restored bulkhead would meet the soil/fill excavation RAOs (see Section 9.2 for Below Building soil/fill excavation requirements).

Alternative S2A would reduce the mobility of COPCs in Site-related impacted subtidal sediment and Site-related intertidal sediment in contact with the river environment through burial with cleaner sediment in the bioavailable zone. However, because MNR depends upon maintenance of the uncontaminated sediment layer, anthropogenic processes (such as turbulence from nearby water crafts), severe storms and potentially tidal action may erode and scour the sediments locally and redistribute the contaminants over wide areas, even when burial is achieved. The potential for this activity would be evaluated during the baseline studies and the MNR monitoring.

Alternative S3A would reduce the volume and mobility of COPCs in the Site-related impacted subtidal sediment and intertidal sediment beneath Building Nos. 7, 9 and the West Warehouse (Building No. 19W). Alternative S4A would reduce the mobility of COPCs in the Site-related impacted subtidal sediment and reduce the mobility and volume of Site-related impacted intertidal sediment beneath Building Nos. 7, 9 and the West Warehouse (Building No. 19W).

Removed sediment that exhibits hazardous waste characteristics for lead could be stabilized. This treatment would reduce the mobility of lead in removed sediment prior to its placement in an off-Site landfill. The volume of the excavated material would increase slightly due to the addition of a stabilization agent. Any removed stabilized sediment would be relocated from the Site to a secure land disposal facility.

In summary, Alternative S3A achieves the most reduction in mobility and volume of COPCs in Site-related impacted sediment simply because it removes sediment volume. Alternative S2A is capable of achieving a proportional reduction in mobility as Alternatives S3A and S4A via sediment deposition but no sediment volume is removed. Alternative S4A contains elements of both, reducing mobility through capping or removal and volume through removal.

None of the Area V alternatives would have any impact on reducing the mobility, toxicity or volume of hazardous waste or COPCs in Site-related impacted sediment because Area V does not include Site-related impacted sediment or hazardous waste. Alternatives S3B and S4B would cause a short-term reduction in the mobility and volume of non-Site related COPCs in the Area V sediment. However, upriver sediment of similar quality to the removed or capped Area V sediment would deposit over these areas returning them to their pre-remedial condition.

9.5.2.5 *Short-Term Effectiveness*

Short-term effectiveness refers to the potential effects and related risks associated with the implementation of the remedy. Potential short-term effects would occur during construction and operation of the remedial action alternatives. Since Alternative S1A does not include any activities, it would not have any short-term impacts.

Potential short-term effects from implementation of the action alternatives can be summarized as follows:

- air emissions at the Site;
- transportation risks (i.e., accidents, spills, increased air emissions);
- remedial contractor worker safety.

The addition of sediment dewatering agents would likely produce particulate air emissions. Since Alternatives S3A and S3B would involve management of the largest amount of removed sediment (approximately 3,942 cy and 1,593 cy, respectively), these alternatives would have the highest potential for air emissions during the remedial actions. Because Alternatives S2A and S2B would not entail any sediment handling, these alternatives would not have air emissions impacts. Alternative S4, which entails some sediment removal, would also have potential for air emission impacts, but to a lesser degree than Alternatives S3A and S3B. These would be associated with management of removed sediment and handling of the capping materials.

Transportation risks, such as accidents, spills and increased air emissions from vehicles, are also related to the amount of material to be transported off-Site for disposal. Alternatives S3A and S3B includes the transportation of the greatest amount of material from the Site to an off-Site disposal facility (approximately 173 and 70 truckloads, respectively), followed by Alternative S4 (approximately 132 and 62 truckloads, respectively). The potential short-term transportation risk posed by Alternatives S3A, S3B, S4A and S4B are greater than the potential short-term risk posed by Alternative S2A and S2B (which does not entail any off-Site disposal or transport of cover material to the Site).

Short-term risks to remedial contractors would be managed for all alternatives through implementation of the HASP.

In conclusion, Alternatives S3A and S3B would pose the most potential short-term impacts, followed by Alternatives S4A and S4B. The short-term risks associated with Alternatives S2A and S2B would be limited to contractor safety and could be managed via the HASP. Alternative S1A and S1B would pose the least potential for short-term impacts.

9.5.2.6 Implementability

Implementability concerns are related to potential technical and institutional problems associated with a remedial action alternative. Since Alternatives S1A and S1B do not include the implementation of any remedial actions, there would be no implementability concerns associated with this alternative.

Alternatives S2A and S2B would not require any special technologies, materials, or labor. The implementability concerns associated with Alternative S2A are limited to those involved with the Common Actions. They are: access to the debris piles and hot spots beneath the buildings and restoration of the bulkhead at below building locations with limited accessibility.

In contrast, there are considerable implementability concerns associated with Alternatives S3A, S3B, S4A and S4B. Alternatives S3A and S3B would also have the implementability concerns associated with the Common Actions noted above for Alternative S2A. In addition, Alternatives S3A, S3B, S4A and S4B, which include removal of Site-related impacted sediment, would have the following implementability concerns:

- Complex coordination with the selected soil/fill and interior building materials alternatives(to a lesser degree for Alternatives S3B and S4B);
- The need to conduct removal of sediment from under the buildings and decking with limited overhead access (S3A and S4A only);
- Extensive permitting for dredging and discharge of treated dewatering fluids;
- Installation of silt curtains in rapid river currents;
- Installation and operation of dewatering equipment; and
- Manual measurements beneath buildings and decking leading to imprecise dredging (S3A and S4A only).

In addition, Alternative S4A and S4B would have the following implementability concerns associated with sediment capping:

- The need to install capping material under the buildings and decking with limited overhead access (S4A only);
- Installation of the capping materials around numerous unstable pilings and below deck structures (S4A only); and

- Extensive permitting for capping sediment.

Because the majority of the Site-related impacted sediment is located beneath buildings and decking and, thus, access to this sediment is severely limited, sediment removal and/or capping would require specially designed equipment. Selection of the final equipment would be dependent on collection of more Site-specific information in the areas subject to sediment removal and capping. This implementability concern would persist regardless of the interior building material remedial action alternative selected. As discussed in Section 9.3, under Alternative I2, I3 and I4, the northern buildings are demolished and the concrete slabs in Building Nos. 7 and 7A are removed. Demolition of the northern buildings would provide increased access to a portion of the Area II impacted sediment underlying the north dock decking; however, access to the Area II impacted sediment beneath the EPRI lab and its decking would still be complicated. Although removal of the Building Nos. 7 and 7A slab would increase the accessibility to the Area IV impacted sediment located beneath Building No. 7 and 9, there would still be some accessibility concerns for this impacted sediment.

In conclusion, Alternatives S3A, S3B, S4A and S4B would have considerable implementability concerns regardless of the interior building material remedial action alternative selected. Alternatives S2A and S2B would have minimal, if any, implementability concerns.

9.5.2.7 Cost

Following is a summary of the estimated costs for the sediment remedial action alternatives. The detailed cost estimates are provided in Appendix Q.

		Capital/ Construction	OM&M NPV	Capital Contingency	Other Indirect Costs	Total NPV
S1A	No Action	$0	$0	$0	$0	$0
S2A	Monitored Natural Recovery	$225,000	$785,166	$56,250	$65,250	$1,131,666
S3A	Sediment Removal	$1,838,522	$0	$459,630	$666,464	$2,964,617
S4A	Sediment Capping	$1,773,291	$961,791	$443,323	$642,624	$3,821,223

		Capital/ Construction	OM&M NPV	Capital Contingency	Other Indirect Costs	Total NPV
S1B	No Action	$0	$0	$0	$0	$0
S2B	Monitored Natural Recovery	$90,000	$557,121	$22,500	$26,100	$695,721
S3B	Sediment Removal	$531,854	$0	$132,964	$192,797	$857,615
S4B	Sediment Capping	$891,789	$907,443	$222,947	$323,274	$2,345,452

As noted above, Alternatives S1A and S1B have no associated costs. The capital/construction costs and total NPV of Alternatives S3 and S4 are the highest. for the Site-related impacted sediment. Similarly, the capital/construction costs and total NPV of Alternatives S3B and S4B are the highest for the Area V sediment.

9.5.3 *Interior Building Material Remedial Action Alternatives*

9.5.3.1 *Overall Protection of Human Health and the Environment*

Protection of human health and the environment is measured by the ability of an alternative to address the remedial action objectives for the media of interest. As previously discussed, protection of human health and the environment and compliance with SCGs are threshold criteria. That is, an alternative must adequately protect human health and the environment and comply with SCGs to be considered for selection as a preferred remedial action alternative for a site.

The RAOs for interior building materials are:

- Prevent direct contact, ingestion and inhalation of COPCs in the building, including PCBs and lead, where concentrations exceed applicable SCGs;
- Prevent migration of COPCs within the buildings that would result in concentrations exceeding applicable SCGs; and
- Prevent migration of COPCs outside the Site buildings.

With the exception of Alternative I1 (No Action), all of the interior building material alternatives would provide adequate protection of human health and the environment by eliminating, reducing or controlling risks through:

- engineering and institutional controls;
- encapsulating impacted interior building materials;
- removal of impacted interior building materials; or
- demolition of Site buildings.

Alternative I1 offers the least certainty in ensuring protection of human health and the environment. This alternative would not implement any measures to remove the COPCs from the Site buildings. The only means of protecting human health would be through deterring direct contact to COPCs using perimeter fencing around the Site and fencing within Site buildings. In addition, this alternative would not address the repair of the building infrastructure. Over time it is likely that continued building deterioration would contribute to the migration of COPCs to the surrounding environment. Therefore, this alternative would not offer a sufficient level of protection to human health and the environment.

Alternative I2 would offer a higher level of protection of human health and the environment than Remedial Alternative I1. Under Remedial Alternative I2, barriers are relied upon to separate COPCs from the surrounding environment if they can be properly implemented. Alternative I2 entails a combination of encapsulation and limited bulk removal to reduce the potential for exposure to the COPCs. Properly maintained, these barriers would achieve the objective of this criterion. Therefore, maintenance of the engineering components of Alternative I2 is essential to factor into the evaluation over a thirty-year period. At the conclusion of thirty years (or some prior period if building deterioration accelerates), the building will undoubtedly have to be demolished. Since the COPCs would still be present in the building materials, appropriate remediation would need to be performed. However, prior to the demolition and remediation activities, a potential risk for exposure to the COPCs would exist within Site buildings for 30 years.

As discussed in Section 9.4.3.1, Alternative I3 would use various building material removal and cleaning technologies to effectively remove COPCs that exceed the LTOC. Through the reduction of COPCs in Site buildings this alternative would provide a high level of protection to human health and the environment. Furthermore, by removing the COPCs there is less reliance on maintenance of engineering controls (i.e. barriers) over the remaining life of the building.

Remedial Alternative I4 achieves a similar level of protection to human health and the environment as Alternative I3. This level of protection would be reached via demolition of the Site buildings and would remove all COPCs associated with that building material. The northern concrete slab on grade would be removed as well. The remaining, southern concrete slab supported by timber piles would be remediated using concrete removal technologies to be compliant with the bulk LTOC. Removal of building material would eliminate the potential risk of direct human exposure to COPCs. Furthermore, due to the removal of COPCs from the Site buildings, the potential for contamination migrating to the surrounding environment would be eliminated.

As discussed above, Alternatives I2, I3 and I4 would all provide adequate overall protection of human health and the environment. Alternatives I3 and I4 would provide the most protection to human health and the environment. Remedial Alternative I1 would provide the least protection of human health and the environment.

9.5.3.2 *Compliance with SCGs*

As previously discussed, compliance with SCGs and protection of human health and the environment (discussed in Section 8.2.1) are threshold criteria that an alternative must satisfy to be considered for implementation at a site. Table 7-1 contains a list of potential SCGs and TBCs for the Site media of interest and Table 9-5 presents a summary of each alternative's compliance with these SCGs.

Compliance with SCGs determines whether an alternative satisfies regulatory and risk management requirements. As discussed in Section 7.0, SCGs incorporate both the CERCLA concepts of ARARs and TBCs. They include promulgated requirements and non-promulgated guidance, which govern activities that may affect the environment. The standards and criteria (SCs) are those cleanup standards, standards of control and other substantive requirements, criteria or limitations that are officially promulgated under federal or state law. Though guidance does not represent a legal requirement, it should be considered based on professional judgment when applicable to site conditions (NYSDEC, 2002).

As discussed in the previous sections and in Tables 7-1 and 9-5, the SCGs can be chemical- specific, action- specific and/or location- specific. The following comparison takes into consideration the type of SCG and whether or not it is a standard, a criteria, or guidance.

As shown in Table 9-5, Alternative I1 would not comply with any of the applicable chemical- specific SCGs in certain parts of the buildings. The chemical- specific SCGs include both standards and criteria (i.e., the TSCA bulk LTOC for PCBs and the EPA surface LTOC for lead) and guidance [i.e., the NYSDEC surface LTOC for PCBs and the bulk LTOC for lead (the TAGM 4046 RSCO)]. In addition, Alternative I1 would not address the 6 NYCRR Part 375 goals to: eliminate or mitigate all significant risk to the public health and the environment; restore the Site to pre-disposal/ pre-release conditions, to the extent feasible and authorized by law; and remove "consequential" amounts of listed hazardous waste. Since Alternative I1 does not include any remedial activities, none of the action-specific SCGs would apply to this alternative.

As shown in Table 9-5, with the exception of 6 NYCRR Part 375, Alternatives I2, I3 and I4 would meet all of the applicable action and location specific standards and criteria and guidance. With regard to 6 NYCRR Part 375, Alternatives I2, I3 and I4 would meet the goal of this statute to eliminate or mitigate all significant threats to the public health through removal, remediation, and/or encapsulation. In addition, Alternatives I3 and I4 would meet the goal to remove "consequential" amounts of listed hazardous waste and restore the Site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law.

With regard to the chemical- specific SCGs, Alternatives I2, I3 and I4 would address the surface and bulk LTOC through encapsulation, building material remediation and building demolition, respectively. Under Alternative I2, COPCs would be managed on-site in the interior building materials for 30 years after implementation. Consequently, future potential for exposures would be directly linked to the adequacy and completeness of maintenance of the barriers. After the demolition and remediation tasks are performed in Year 30, this potential risk would be eliminated.

Finally, Alternatives I2, I3 and I4 would comply with applicable TBCs identified in Table 7-1 and 9-5.

9.5.3.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is measured by the magnitude of the residual risk and the adequacy and reliability of controls. Remedial Alternative I1 would not provide any long-term effectiveness or permanence in the reduction of the COPCs in the Site buildings. Although fencing would act as a deterrent to exposure, COPCs would still remain in the buildings at concentrations above the LTOC.

Provided adequate OM&M is conducted, the barriers (encapsulant) installed under Alternative I2 would be effective in the long-term in preventing direct contact with impacted interior building materials that are not removed under this alternative. Continual OM&M and performance monitoring would be required to ensure adequate protection is being provided by the encapsulant.

The removal of impacted interior building materials under Alternative I3 and I4 would increase the certainty of the long-term effectiveness and permanence of the remedy in comparison to Alternative I2, by relying less on monitoring and maintenance of the encapsulated surfaces into the future. Removal of COPCs from the impacted building materials or removing the impacted interior building materials in their entirety eliminates the potential for exposure or release to the surrounding environment.

In summary, Remedial Alternative I1 would provide no long-term effectiveness and permanence. Alternative I2 would provide adequate long-term effectiveness and permanence provided long-term OM&M of the encapsulants are observed and the encapsulant can be effectively applied. Remedial Alternative I3 and I4 would offer the greatest certainty in long-term effectiveness and permanence through removal of COPCs from the Site.

9.5.3.4 *Reduction of Toxicity, Mobility or Volume*

As discussed in Section 9.0, this criterion evaluates changes in the toxicity, mobility and volume of listed hazardous waste and COPCs. As previously discussed, NYS B007 listed PCB hazardous waste is present in the Site building construction material (i.e., concrete exhibiting PCB bulk concentrations greater than 50 mg/kg).

Remedial Alternative I1 would provide no reduction of the toxicity, mobility or volume of the COPCs or hazardous waste on-Site. It is likely that over time COPCs would migrate from the Site buildings to the surrounding environment. Furthermore, the rate of migration of the COPCs to the surrounding environment may be accelerated without proper maintenance of the Site buildings.

The Common Actions associated with Alternatives I2, I3 and I4 would reduce the toxicity, mobility and volume of listed hazardous waste through the removal of debris piles and would result in a reduction in toxicity, mobility and volume of COPCs through removal of sludge from the interior stormwater system, removal of the process and fuel oil tanks and cleaning of the lead extrusion pits.

Under Alternative I2, encapsulation of the interior building materials and structural restoration would reduce the mobility of COPCs and listed hazardous wastes associated with the interior building materials. There would be no reduction in the volume of listed hazardous wastes in the interior building materials. After the building demolition and remediation at Year 30 the volume of the remaining COPCs and listed hazardous waste in the interior building materials would be reduced.

Alternative I3 would provide a reduction in the toxicity, mobility and volume of COPCs at the Site. Alternative I3 would provide a greater reduction in the toxicity, mobility and volume of COPCs and listed hazardous waste than Alternative I2 through their removal. Alternative I4 would perform similar to Alternative I3 with respect to reducing toxicity, mobility and volume, since all COPC associated with the interior building materials (including those present at concentrations below the LTOC) would be removed during building demolition.

In summary, Alternatives I3 and I4 would provide the most reduction in toxicity, mobility and volume of COPCs. Alternative I2 would provide substantially less reduction, specifically as it relates to the volume of COPCs. Alternative I1 would provide the least reduction in this category.

9.5.3.5 Short-Term Effectiveness

Short-term effectiveness refers to the potential effects and related risks associated with the implementation of the remedy. Potential short-term effects would occur during construction and operation of the remedial action alternatives. Since Alternative I1 does not include any remedial activities, it would not have any short-term impacts.

Potential short-term effects from implementation of these alternatives can be summarized as follows:

- air emissions at the Site;
- transportation risks (i.e., traffic accidents, spills, increased vehicle air emissions); and
- remedial contractor worker safety.

Intrusive activities, such as shotblasting, concrete removal and demolition, can generate air emissions at the Site. The short-term impact related to air emissions would be greatest for Alternatives I3 and I4 and to a lesser extent Alternative I2 (i.e., encapsulation preparation via shotblasting). Alternative I2 would also have similar short-term impacts, as does Alternative I4 after Year 30. These potential short-term risks can be greatly reduced with the use of monitoring, proper PPE and the implementation of the proper engineering controls.

Transportation risks, such as accidents, spills and increased air emissions from vehicles, are also related to the amount of material to be transported off-Site for disposal.

Alternative I2 would require 155 truckloads during the immediate remedial action and 1,800 truckloads during the building demolition in Year 30. Alternative I3 would require 260 truckloads and Alternative I4 would require 1,800 truckloads. Under all of the alternatives, this truck traffic, which would need to navigate through residential areas to reach the Site, would pose considerable short-term risks and create community concerns. Because Alternative I3 would require fewer truckloads, it would have less transportation related short-term concerns than Alternatives I2 and I4. Mitigative measures to address these short-term risks would be evaluated during the Remedial Design. As an option barge transport of materials may be considered.

Building material removal and cleaning activities associated with Remedial Alternative I2 would create some level of risk to remediation contractors and workers. Risk to workers would increase during implementation of demolition activities at Year 30. Remedial Alternatives I3 and I4 would result in the most potential immediate short-term exposure risks to remedial contractors, when implemented. (Similar short-term risks would be associated with Alternative I2 during future building demolition at Year 30). Workers would be in direct contact with dust and bulk material during remediation or demolition activities. In addition, due to the large-scale demolition activities associated with Remedial Alternative I4, there is a greater chance of physical hazards (i.e. trip hazards, fall hazards, etc.) typical of a construction site and a similar higher risk of short-term impacts to the surrounding environment, including the Hudson River, during construction activities.

Based on this comparative evaluation, Remedial Alternative I1 would have the least short-term effects to remedial contractors, the surrounding community, and environment. Moderate short-term effects would be present during the surface preparation component of Remedial Alternative I2. Remedial Alternatives I3 and I4 would have the greatest potential immediate short-term effects, when implemented. However, the short-term risks associated with Remedial Alternatives I2 (both immediate and Year 30), I3, and I4 can be managed and reduced through the use of the proper controls, equipment and logistical planning.

9.5.3.6 Implementability

Remedial Alternative I1 can be implemented with relative ease. No construction activities would be performed on-Site. This alternative would not provide any reliability in reducing exposure risks to the COPCs. The performance of this alternative is dependent on the maintenance of perimeter and interior fencing, as well as maintaining locks and access restriction controls, making this alternative potentially unreliable.

Remedial Alternative I2 could also be implemented. Materials and experienced personnel are readily available, although difficulties would be encountered due to the heterogeneous nature and condition of the concrete at the Site and numerous structural components (i.e. columns and pipes).

The technologies, materials and personnel required for the implementation of Remedial Alternative I3 are readily available. Alternative I3 would present some similar implementability issues as Alternative I2 (e.g. constraints with removal of COPCs in difficult to access areas). Disposal facilities are readily available to accept the various types of waste that would be generated during implementation of Alternatives I2 and I3.

Remedial Alternative I4 would pose difficulties due to Site access constraints, but would still be implementable. Contractors and equipment required to perform demolition work are readily available. Agency coordination and permits to complete the demolition and remediation of the Site buildings would be obtainable with average effort.

Overall, Remedial Alternative I1 would be the most implementable. Alternative I2 and I3 would involve similar effort in the initial implementation, though Alternative I2 would pose more implementability concerns during application and into the future given the need to maintain the encapsulants. The implementability concerns of Alternative I3 would be related to maintaining building stability during bulk removal of the building material. Implementability issues associated with

Alternative I4 are typical of demolition projects, though the Site location would pose challenges for materials transport. Nevertheless, the implementability concerns of Alternative I4 can be handled through common construction management practices and planning.

9.5.3.7 *Cost*

Following is a summary of the estimated costs for the interior remedial action alternatives. The detailed cost estimates are provided in Appendix R.

		Capital/ Construction	OM&M NPV	Contingency	Other Indirect Costs	Total NPV	Future Capital Cost, NPV	Total NPV Including Future Costs
I1	No Action	$9,850	$37,900	$6,253	$6,252	$60,255		$60,255
I2	Encapsulation	$ 8,261,374	$2,105,567	$ 2,065,344	$ 2,529,819	$ 14,962,103	$3,210,461	$ 18,172,564
I3	Building Remediation	$ 9,950,851	$0	$ 2,487,713	$ 2,736,484	$ 15,175,048		$ 15,175,048
I4	Building Demolition	$ 7,073,589	$0	$ 1,768,397	$ 1,768,397	$ 10,610,383	$139,142	$ 10,749,525

As noted above, Alternative I1 has minimal associated costs. Alternatives I2, I3 and I4 have similar capital costs. Alternative I2 has significant OM&M costs while Alternatives I3 and I4 do not. The future costs are associated with environmental costs related maintaining to the remaining interior building materials. As a result, the NPV total cost of Alternatives I2 and I3 are greater than Alternative I4.

9.6 *RECOMMENDED REMEDIAL ACTION ALTERNATIVES*

In accordance with Section 4.3(b)(9) of NYSDEC draft DER-10 (NYSDEC, 2002), the FS report must include the recommended remedy and a discussion as to why the remedy has been recommended. The recommended remedial action alternatives for soil/fill, Site-related impacted sediment, Area V sediment and interior building materials are:

Soil/Fill	Alternative E3: Excavation and Off-Site Disposal with Surface Cover, Excavation Scenario E3: 0-8 feet
Site-Related Impacted Sediment (Areas I through IV)	Alternative S2A: Monitored Natural Recovery
Area V Sediment	Alternative S1B: No Action
Interior Building Materials	Alternatives I3 or I4: Building Remediation or Building Demolition

<u>Soil/Fill</u>

Alternative E3: 0-8 feet removes all of the PCB and VOC-impacted soil/fill in the construction worker accessible soil zone and manages exposures to the remaining non-accessible subsurface PCB and VOC-impacted soil/fill and the historic fill. Consequently, this excavation scenario would provide comparable protection of human health and the environment as the deeper Alternative E3 excavation scenarios and Alternative E4.

Alternative E3: 0-8 feet would comply with the action and location-specific SCGs and the majority of the chemical- specific SCG. The only SCG that this alternative would not comply with would be the TSCA low occupancy standard for the underlying soil/fill. However, waiver of this standard would be consistent with Departmental practice at a nearby site (NYSDEC, 2003d). Alternative E3: 0-8 feet would not restore the Site to pre-disposal conditions (a Part 375 goal); however, only Alternative E4 that would cost approximately $32 million dollars more than Alternative E3: 0-8 feet would achieve this goal for the soil/fill alternatives. Since Alternative E3: 0-8 feet would provide adequate protection of human health and the environment, expenditure of the additional $32 million dollars is not warranted. In conclusion, Alternative E3: 0-8 feet would address both of the threshold criteria (i.e., protection of human health and the environment and compliance with SCGs).

Alternative E3: 0-8 feet would provide equivalent long-term permanence and effectiveness as the deeper Alternative E3 excavation scenarios and Alternative E4. Alternative E3: 0-8 feet would also provide similar reduction in toxicity, mobility and volume as the deeper excavation scenarios and Alternative E4. As discussed above, Alternative E3: 0-8 feet would remove 94% of the PCB mass and 95% of the PCB listed waste mass. The advantages of the additional reduction in toxicity, mobility and volume afforded by the deeper excavation scenarios and Alternative E4 would be minimal in comparison to the increased implementability concerns posed by these deeper excavation options. In addition, under all Alternative E3 excavation scenarios and Alternative E4, chemicals in the remaining soil/fill would be present at concentrations above the TAGM 4046 RSCOs. These residual exceedances are being addressed with surface covers and deed restrictions under all Alternative E3 excavation scenarios and under Alternative E4. Alternative E3: 0-8 feet would pose less short-term impacts and implementability concerns than other excavation scenarios that provide equivalent levels of protection. As discussed above, both the short-term impacts and implementability concerns increase with an increase in the depth of excavation. Finally, given the above evaluation, Alternative E3: 0-8 feet is the most cost effective remedial alternative for the Site soil/fill.

In addition to soil excavation, Alternative E3: 0-8 feet also includes installation of a surface cover in the North and the South Yard (see Figure 9-4). The FS report envisions installation and maintenance of an asphalt cover in these areas. If during the period prior to completion of the RD, a future use were identified for the Yard, the RD would take this future use into consideration. As such, the surface cover may be changed in certain areas to be consistent with a future use of the Yard (e.g., 6-inches of concrete in areas of building slabs, asphalt pavement in roadways and 2 feet of soil in vegetated areas).

Sediment

The criterion that governs the selection of the recommended remedial action alternative for Site-related impacted sediment is implementability. Alternative S2 has been selected as the recommended sediment remedial action alternative since it is readily implementable, would meet the sediment RAOs, would provide comparable protection of human health and the environment as Alternatives S3A and S4A and would comply with all of the SCGs with the exception of the Part 375 goal to restore the Site to pre-disposal conditions. Thus, Alternative S2A would adequately address both of the threshold criteria (i.e., protection of human health and the environment and compliance with SCGs).

Because the majority of the Site-related impacted sediment is located beneath Site buildings or decking, both Alternatives S3A and S4A have considerable implementability concerns. These implementability concerns outweigh the increased certainty in protection of human health and the environment and the reduction in the volume of COPCs provided by Alternative S3. Adequate testing is included in Alternative S2A to confirm long-term permanence and effectiveness of this remedial action alternative. In addition, Alternative S2A has less potential short-term impacts than Alternatives S3A and S4A.

The implementability concerns associated with S3 and S4 question whether these alternatives can be successfully carried out and completed for the costs estimated or at all. Given the above evaluation, Alternative

S2A is the most cost-effective remedial alternative for the Site-related impacted sediment.

Alternative S1B is the recommended alternative for the Area V sediment. As discussed previously, comparison of the sediment quality adjacent to the Yard with the upriver, background sediment concentrations using commonly applied and acceptable sediment evaluation techniques indicates that the Area V sediment is comparable to upriver sediment. Consequently, this sediment area has not been impacted by the Site. In addition, if an active remediation of Area V were conducted (e.g., Alternatives S2B, S3B or S4B), upriver sediment of similar quality to the Area V sediment would resettle over Area V in the future. In conclusion, remedial action of this sediment area is not warranted.

Interior Building Materials

Both Alternatives I3 and I4 would provide a permanent remedy for the impacted interior building materials and would fulfill the RAOs for this media of interest. These alternatives would provide adequate protection of human health and the environment and would be effective in the long-term. This protection is afforded by removing the COPCs associated with impacted building material and eliminating the possibility of human exposure and exposure to the surrounding environment. Although both Alternatives I3 and I4 present some technical challenges , either of these alternatives can be implemented with the proper remedial design and engineering. Both Alternatives I3 and I4 would pose potential short-term risks to remedial contractors working on-Site and the surrounding community; however, highly qualified contractors would use monitoring and engineering controls to mitigate these short-term risks. Options to mitigate the potential short-term impacts to surrounding communities due to truck traffic would be evaluated during the RD. Finally, Remedial

Alternative I4 is the most cost-effective interior remedial alternative that would satisfy the RAOs.

In conclusion, Alternatives I3 and I4 would address protection of human health and the environment, compliance with SCGs, long-term effectiveness and permanence, reduction of toxicity, mobility and volume and implementability to the same degree. Alternative I4 would have higher potential short-term risks than Alternative I3; however, Alternative I4 would be less costly than Alternative I3. As discussed above, mitigative measures to address these short-term risks for Alternatives I3 and I4 would be evaluated during the RD.

Because both alternatives equally address the FS criteria, both Alternatives I3 and I4 have been identified at this time as recommended alternatives. If during the period prior to completion of the RD, a future use is identified that would make it economically practical to retain the Site buildings, Alternative I3 would be included in the final RD and be implemented at the Site. In the absence of any such future use, the RD would address Alternative I4 as the selected remedial action alternative. The decision will be made by the Site owner and will consider if there are economic benefits to building re-use that would offset the increased cost of building remediation (Alternative I3).

Conclusion

In conclusion, the recommended remedial action alternatives for the Site are:

Soil/Fill	Alternative E3: Excavation and Off-Site Disposal with Surface Cover, Excavation Scenario E3: 0-8 feet
Site-Related Impacted Sediment (Areas I through IV)	Alternative S2A: Monitored Natural Recovery
Area V Sediment	Alternative S1B: No Action
Interior Building Materials	Alternatives I3 or I4: Building Remediation or Building Demolition

As discussed above, there will need to be considerable coordination during the implementation of the final selected remedial action alternatives for all three media. Under the recommended soil/fill, sediment and interior building materials remedial action alternatives, waste will be generated that requires staging, storage and ultimate transport and off-Site disposal. These materials will include excavated soil, debris piles removed from beneath buildings and removed or demolished interior building materials. The RD will consider the logistical concerns associated with: 1) scheduling of the remedial actions; 2) providing adequate space for materials storage and handling; and 3) coordination for on-Site transport of remedial materials (e.g., backfill) and off-Site transport and disposal of excavated soil/fill, debris piles and removed building materials and provide mitigative measures to address these concerns, to the extent practicable.

REFERENCES (VOLUME II ONLY)

ERM, 2004. Letter to NYSDEC Re: Additional Information Pertaining to Bulkhead Restoration, 13 May 2004.

ERM, 2003a. Telephone Discussions with J. Harrington of DEC and C. Weinpahl of ERM and D. Greenlaw of EPA and C. Weinpahl of ERM, March 2003.

ERM, 2003b. Interim Deliverable No. 11, Proposed Remedial Action Objectives, Remedial Goals and Considered Remedial Alternatives, May 7, 2003.

ERM, 2003c. Interim Deliverable No. 12, Additional Sediment Sampling Results and Proposed RAOs for Site Related Sediment, June 24, 2003.

ERM, 2003d. Telephone conversation between C. Weinpahl of ERM and C. Neider of NYSDEC, 5 November 2003.

ERM, 2003e. Letter to NYSDEC Re: NYSDEC Comments on Interim Deliverable Nos. 11 and 12 and Summary of Sediment Discussions, 29 December 2003.

NYSDEC, 1990. Selection of Remedial Actions at Inactive Hazardous Waste Sites, Technical Administrative Guidance Memorandum #4030 (HWR-90-4030), Division of Environmental remediation, May 15, 1990.

NYSDEC, 1999. "Technical Guidance for Screening Contaminated Sediments," Division of Fish, Wildlife and Marine Resources. January.

NYSDEC, 2002. DER-10, Draft Technical Guidance for Site Investigation and Remediation, Division of Environmental Remediation, December 2002.

NYSDEC, 2002a. Letter to C. Weinpahl of ERM from Ms. Sally W.W. Dewes, NYSDEC, regarding NYSDEC comments on Draft Remedial Investigation Report, dated September 6, 2002.

NYSDEC, 2003a. Letter to E. Rossano of ERM from Ms. Sally W.W. Dewes, NYSDEC, regarding NYSDEC comments on ID#11, dated June 9, 2003.

NYSDEC, 2003b. Letter dated August 11, 2003 to E. Rossano of ERM from Ms. Sally W.W. Dewes, NYSDEC, regarding NYSDEC comments on ID#12.

NYSDEC, 2003c. E-mail from Ms. Sally W.W. Dewes, NYSDEC to Carla Weinpahl, ERM, regarding NYSDEC/NYSDOH approval of the bulk PCB level proposed in ID#11.

NYSDEC, 2003d. Proposed Remedial Action Plan. Harbor at Hastings, Village of Hastings-on-Hudson, Westchester County, New York, Site No. 3-60-022, October 2003.

NYSDEC, 2004. NYSDEC 28 July 2004 comment letter on the Remedial Investigation/Feasibility Study Report Volume II Binder 4 (Feasibility Study) dated December 2003.

NYSDOH, 2000. Letter from W. Gilday, P.E. of NYSDOH to S. Dewes, P.E. of NYSDEC, August 25, 2000.

Rast, 2003. Rast, Richard R. RS Means Environmental Remediation Estimating Methods 2nd Edition, Construction Publishers & Consultants, MA, 2003.

Roux, 2001. Interim Deliverable No. 1, Interior Drain System, dated 16 August 2001, prepared by Roux.

Roux, 2002a. Interim Deliverable No. 7, Revision 1, Investigation of Subsurface structures Below First Floor, dated 9 May 2002, prepared by Roux.

Roux, 2003a. Interim Deliverable No. 7 Summary Report, dated 28 February 2003, prepared by Roux.

Roux, 2003b. Supplement No. 1 to Interim Deliverable No. 10, Scope of Work for the Pilot Study for Shallow Concrete Remedial Technologies Selection, dated 2 May 2003, prepared by Roux.

Roux, 2003c. Proposed Scope of Work for the Investigation of Potential Subsurface Structures Below the First Floor Slab, dated 10 June 2003.

Shaw, 2002. Feasibility Study Report, Harbor-at-Hastings Site, Hastings-on-Hudson, New York, prepared for Atlantic Richfield Company, prepared by Shaw Environmental and Infrastructure, Inc. and Haley and Aldrich, dated September 18, 2002.

USEPA, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA,* EPA/540/6-89/004, October 1988.

USEPA, 1989. "Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part A," USEPA, December.

USEPA, 1990. Guidance on Remedial Actions for Superfund Sites with PCB Contamination, Office of Emergency and Remedial Response, United States Environmental Protection Agency, EPA/540/G-90/007, August 1990.

USEPA,1991. Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, February 1991.

USEPA, 1998. Solvent Extraction Technology Terra-Kleen Response Group, Inc. Innovative Technology Evaluation Report, EPA/540-R-94/521, September 1998.

USEPA, 2001. Revisions to PCB Question and Answer Manual, US Environmental Protection Agency, www.epa.gov/pcb, September 2001 (§761.30(u), Use of Decontaminated Materials, #7)

USEPA, 2002. *Draft* Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, November 2002.

USEPA, 1993. *Response Actions at Sites with Contamination Inside Buildings.* OSWER Directive 9360.3-12.

Windom et al, 1989. Windom, H.L., S.J. Schropp, F.D. Calder, J.D. Ryan, R.G. Smith, Jr., L.C. Burney, F.G. Lewis, and C.H. Rawlinson. 1989. Natural trace metal concentrations in estuarine and coastal marine sediments of the southeastern United States. Environmental Science and Technology 23:314-320.

TABLES

FIGURES

APPENDIX P
Soil/Fill Remedial Action Alternatives
Cost Estimation Tables

APPENDIX Q
Sediment Remedial Action Alternatives
Cost Estimation Tables

APPENDIX R
Interior Building Materials Remedial Action Alternatives Cost Estimation Tables