Record of Decision
Operable Unit 3 – Marsh & River Sediment
Horseshoe Road and Atlantic Resources Sites
Sayreville, New Jersey

June 22, 2009

RECORD OF DECISION

Operable Unit 3 - Marsh and River Sediment

Horseshoe Road and Atlantic Resources Corporation Sites,

Sayreville Township, Middlesex County, New Jersey

United States Environmental Protection Agency

Region II

June 2009

DECLARATION STATEMENT

RECORD OF DECISION

SITE NAME AND LOCATION

Horseshoe Road Site (EPA ID# NJD980663678)
Atlantic Resources Corporation Site (EPA ID# NJD981558430)
Sayreville Township, Middlesex County, New Jersey
Operable Unit 3 - Marsh and River Sediment

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for contaminated sediment located on the Horseshoe Road site and the neighboring Atlantic Resources Corporation site, in Sayreville, Middlesex County, New Jersey. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record file for these sites.

The State of New Jersey concurs with the Selected Remedy.

ASSESSMENT OF THE SITE

The response actions selected in this Record of Decision (ROD) are necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances from the sites into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The response action described in this document represents the third and final phase of three planned remedial phases, or operable units, for the Horseshoe Road and Atlantic Resources Corporation (ARC) sites. It addresses sediment contamination at the sites. The first ROD, signed in September 2000, addressed buildings and above-ground structures at the two sites. The second ROD, signed in September 2004, addressed the contaminated on-site soil and groundwater at these sites.

The Selected Remedy described in this document involves the excavation and off-site disposal of marsh sediments, and dredging and disposal of river sediments. The major components of the selected response measure include:

- Excavation, transportation and disposal of approximately 21,000 cubic yards of contaminated sediments from the

Horseshoe Road/ARC Marsh;

- Dredging of approximately 14,000 cubic yards of contaminated sediments from the Raritan River;
- Off-site disposal of the dredged material;
- Backfilling and grading of all excavated or dredged areas with clean cover material;
- Institutional controls for the marsh sediments, such as a deed notice or covenant, to prevent exposure to residual sediment contamination that may exceed levels that would allow for unrestricted use;
- Institutional controls for the river sediments, to prevent disruption of cover in the event that materials are left at depth; and
- On-site restoration of approximately six acres of wetlands disturbed during implementation of the remedy.

DECLARATION OF STATUTORY DETERMINATIONS

Part 1: Statutory Requirements

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial actions to the extent practicable, and is cost-effective. EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the sites.

Part 2: Statutory Preference for Treatment

The Selected Remedy for sediment will not meet the statutory preference for the use of remedies that involve treatment as a principal element.

Part 3: Five-Year Review Requirements

This remedy will result in hazardous substances, pollutants, or contaminants remaining on the Horseshoe Road and Atlantic Resources Corporation sites above levels that allow for unlimited use and unrestricted exposure. Pursuant to Section 121(c) of CERCLA, a statutory review will be conducted within five years of the initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for the two sites.

- Chemicals of concern and their respective concentrations may be found in the "Site Characteristics" section.
- Baseline risk represented by the chemicals of concern may be found in the "Summary of Site Risks" section.
- A discussion of cleanup levels for chemicals of concern may be found in the "Remedial Action Objectives" section.
- A discussion of principal threat waste is contained in the "Principal Threat Waste" section of this document. None of the waste addressed in this operable unit is considered a principal threat.
- Current and reasonably-anticipated future land use assumptions are discussed in the "Current and Potential Future Site and Resource Uses" section.
- A discussion of potential land use that will be available at the sites as a result of the Selected Remedy is discussed in the "Remedial Action Objectives" section.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs are discussed in the "Description of Alternatives" section.
- Key factors that led to selecting the remedies (i.e., how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decisions) may be found in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections.

Walter E. Mugdan, Director Emergency and Remedial Response Division EPA - Region II	6/22/09 Date

Decision Summary

Operable Unit 3 - Marsh and River Sediment

Horseshoe Road and Atlantic Resources Corporation Sites,

Sayreville Township, Middlesex County, New Jersey

United States Environmental Protection Agency

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SITE NAME, LOCATION AND BRIEF DESCRIPTION

The Horseshoe Road site is a 12-acre property located in Sayreville, Middlesex County, New Jersey. The site includes three areas: (1) the Sayreville Pesticide Dump (SPD); (2) the former Atlantic Development Corporation facility (ADC); and (3) the Horseshoe Road Drum Dump (HRDD). (See Appendix I, Figures 1 and 2.)

The adjacent Atlantic Resources Corporation (ARC) site is a 4.5-acre property also located on Horseshoe Road. It was the location of a precious metals recovery facility, operated by several companies, including the Atlantic Resources Corporation.

Both sites are located on the south shore of the Raritan River, and are bordered to the east by railroad tracks belonging to Conrail, on the opposite side of which lies property owned by the Middlesex County Utilities Authority (MCUA). Property to the west of the sites, on the Raritan River, is currently undeveloped, but portions are a wetland and the remainder was previously used to dispose of dredge spoils from local shipping channels. The Marsh that is a subject of this action is bounded on the east and south by the upland portions of the two sites and on the west by remnants of the Crossman Company. The Crossman Company mined clays for brick manufacturing, and built a rail line from its clay pits in Sayreville to the Raritan River. Remnants of the rail line and the former Crossman Dock bound the western edge of the Marsh. To the southwest lies the Sayreville facility of Gerdau Ameristeel, and to the southeast, approximately one-half mile away, lies a residential neighborhood containing approximately 47 homes. The areas described above are served by municipal water; about 14,000 people obtain drinking water from public wells within four miles of the sites.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Problems on Horseshoe Road first came to EPA's attention in 1981, when a brush fire at the HRDD area exposed approximately 70 partially filled drums containing acetonitrile, silver cyanide and ethyl acetate. The HRDD area was used for disposal from approximately 1972 into the early 1980s. The SPD area was also used for disposal, from about 1957 into the early 1980s. These two dump areas do not contain any buildings or structures.

The ADC facility contained three buildings that were owned or leased by many companies from the early 1950s to the early 1980s. The various operations included, at different times, the production of roofing materials, sealants, polymers, urethane and epoxy resins, resin pigments, wetting agents, pesticide intermediates and recycled chlorinated solvents.

The ARC site contained several interconnected buildings and structures, including a series of incinerators used for precious metals recovery. The facility recovered gold and silver from fly ash, x-ray and photographic film, circuit boards, building material and other materials. The operation also accepted spent solvents, which were used to fuel the incinerators. As with ADC, all the commercial operations at the ARC facility ceased in the early 1980s.

Since 1985, when the New Jersey Department of Environmental Protection (NJDEP) requested that EPA take the lead role in the cleanup of the sites, EPA has performed 10 removal actions. These removals stabilized the sites by removing more than 3,000 drums, cleaning up dioxin and mercury spills, emptying and disposing of materials found in numerous tanks and vats on both sites, and excavating and disposing of contaminated soils and debris.

Various companies operated at the ADC and ARC facilities from the late 1930s until the mid 1980s. The available information indicates that the various operators at ADC used the SPD area as a dump site, and the operators at the ARC site used the HRDD area for dumping. In 1995, EPA notified a number of former operators that they were considered potentially responsible parties (PRPs) for the cleanup of the Horseshoe Road site. Based upon the information available, EPA subsequently concluded that neither the property owner nor any of the former operators were viable companies with the resources to perform the necessary work at the Horseshoe Road site. Therefore, EPA has been performing site work, including the remedial actions, for the SPD and ADC areas with state and federal funds.

In 1995, EPA notified a number of companies that sent waste to ARC, referred to as "generators," and Jack Kaplan, the former president of ARC, that they were considered PRPs with respect to the cleanup of the ARC site and the HRDD portion of the Horseshoe Road site.

The Horseshoe Road site was proposed for inclusion on the NPL in 1993, and formally placed on the NPL on September 29, 1995. The ARC facility was initially included in the description of the Horseshoe Road site, but it was removed from the NPL listing after the PRPs for ARC challenged the joint listing.

In the summer of 1997, EPA initiated a remedial investigation and feasibility study (RI/FS) to jointly characterize the nature and extent of contamination at the sites. An RI report was released in 1999. The RI evaluated groundwater, surface water, surface soils, subsurface soils, sediments and building material.

EPA is addressing the sites in separate phases, or operable units. In September 1999, a Focused Feasibility Study (FFS) was completed for Operable Unit 1 (OU1), the buildings and structures on the ADC and ARC facilities. A September 2000 Record of Decision (ROD) for OU1 called for demolition and off-site disposal of buildings and above-ground structures. On April 10, 2001, EPA completed the OU1 remedy for the Horseshoe Road site, removing the buildings and surface debris from the ADC facility.

Since 1995 when the Horseshoe Road site was first placed on the NPL, EPA has entered into several orders with various PRPs for the ARC site to perform various site tasks: to reimburse EPA for the costs of several removal actions; to undertake the OU1 remedy for the ARC site; and to complete the Operable Unit 3 (OU3) RI/FS. Under this last order, PRPs completed a combined OU3 RI/FS for both sites that served as the basis for this ROD.

Based on additional data gathered from the ARC site during the RI, together with previously obtained data, EPA proposed the ARC facility as a separate NPL site in September 2001. The site was formally placed on the NPL on September 5, 2002.

In May 2003, the OU1 remedy for the ARC site was completed. A PRP group for the ARC site, with EPA oversight, demolished and disposed of all on-site buildings and above-ground structures, and removed several underground storage tanks discovered during the cleanup.

In September 2004, EPA signed a ROD addressing soil and groundwater identified as Operable Unit 2 (OU2). The ROD called for excavation and disposal of contaminated soil, including deep soils that acted as groundwater contaminant source material. In February 2008, EPA began work on the OU2 Remedy for the Horseshoe Road site.

In July 2007, EPA and a PRP Group for the ARC site entered onto a judicial consent decree to perform the OU2 remedial design for both the ARC site and HRDD portion of the Horseshoe Road site, and the remedial action for the ARC site. The PRPs are currently in the design phase of those actions.

The May 1999 RI report, and the May 2006 Baseline Ecological Risk Assessment are discussed below, and formed the basis for the development of the OU3 FS report and this ROD. All these documents are included in the Administrative Record for the sites.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

Since the Horseshoe Road site's placement on the NPL, EPA has worked closely with the Edison Wetlands Association (EWA), public officials and other interested and concerned members of the community. EWA received a Technical Assistance Grant (TAG) from EPA to assist in its independent efforts to communicate information about the Horseshoe Road site to the surrounding community. Public interest in both sites has remained high.

On July 21, 2008, EPA released the Proposed Plan and supporting documentation for the sediment remedy (OU3) to the public for comment. EPA made these documents available to the public in the administrative record repositories maintained at the EPA Region II office (290 Broadway, New York, New York 10007), and the Sayreville Public Library (1050 Washington Road, Parlin, New Jersey 08859). EPA published a notice of availability involving these documents in the Suburban Newspaper, and opened a public comment period on the documents from July 21, 2008 to August 20, 2008.

On August 12, 2008, EPA held a public meeting at the Sayreville Township Municipal Building, to inform local officials and interested citizens about the Superfund process, to review the planned remedial activities at the Horseshoe Road and Atlantic Resources Sites, and to respond to any questions from area residents and other attendees.

Responses to the comments received at the public meeting and in writing during the public comment period are included in the Responsiveness Summary (see Appendix V).

SCOPE AND ROLE OF OPERABLE UNIT

As with many Superfund sites, the problems at the Horseshoe Road and ARC sites are complex and, therefore, to more effectively manage the cleanup of the sites, EPA has organized the work into three operable units (OUs):

Operable Unit 1:	Demolition of buildings and above-ground structures (Completed in 2003).
Operable Unit 2:	Contaminated soil and groundwater (Clean-up work began February 2008 for Horseshoe Road; the OU2 remedy for the ARC site is currently in remedial design).
Operable Unit 3:	Marsh and River Sediment (the subject of this ROD).

OU3 addresses sediment in the adjacent Marsh and River and is the last operable unit for these sites.

SUMMARY OF SITE CHARACTERISTICS

Horseshoe/ARC Marsh Sediments

The Horseshoe Road site includes the former ADC facility, the SPD areas (allegedly used by ADC), and the HRDD area, which was used by ARC. One drainage channel collects most of the surface water from the ADC and SPD areas (please refer to Appendix I, Figure 2). This ADC/SPD drainage channel appears to provide a majority of the fresh water flow into the Marsh, and the most distinguishable surface water channel through the Marsh can be traced back to this channel.

A second drainageway begins at a small depression that approximately divides the ADC and ARC operations, travels just south of the HRDD area, and discharges into the Marsh at the base of the HRDD mound. Both sites contribute surface water flow to this HRDD drainageway.

Surface water runoff from the HRDD mound enters into the HRDD drainageway or releases directly into the Marsh. The ARC site has its own drainage swale just north of the HRDD area, and most of the surface water runoff from ARC currently travels through this swale. Unlike the other surface water routes described above, which appear to be natural water courses, portions of this swale are man-made. Surface water travels through a culvert under the MCUA right-of-way to reach the ARC swale, and water from the swale discharges to the bay north of the Marsh.

Approximately 95 Percent of the Horseshoe/ARC Marsh is dominated by Common Reed (*Phragmites*) and is considered a freshwater emergent wetland. The remaining five percent is a fringe that is an average of 25 feet wide at the edge of the Raritan River, and dominated by salt-tolerant cordgrass (*Spartina*), indicative of an intertidal wetland environment. A natural berm formed by tidal deposition separates these two wetland zones. This berm is only breached in one location where the surface water enters the River from the Marsh. Site topography, which includes the drainage channels previously described, influenced EPA to investigate the down-gradient Marsh, which is approximately 8.2 acres in size. EPA evaluated surface and subsurface sediment samples collected from the Marsh. For its studies, EPA considered surface sediments to be within the first 12 inches of the surface within the Marsh. Subsurface samples were taken from 12 to 42 inches. Reference samples were collected in an area of marsh sediments about 400 feet south of the former Crossman Dock, and these results were one of a number of data points used to screen marsh sediments for contaminants of concern. Marsh sediments were analyzed for volatile and semivolatile organic compounds, metals, pesticides and polychlorinated biphenyls (PCBs), and three contaminants of concern were identified in the Marsh and associated drainageways: arsenic; mercury; and PCBs. The reference sample results appear in Appendix II, Table 1, along with representative Horseshoe/ARC Marsh sediment data. All mercury sampling at the sites was analyzed for total mercury.

The ADC/SPD drainage channel is the most highly contaminated portion of the Marsh. PCBs are found at highest concentrations in shallow surface sediments of the channel, and at lesser concentrations within the Marsh itself and at depth. Arsenic and mercury were also generally found at their highest concentrations within the ADC/SPD drainage channel; however, these two metals were also found throughout the Marsh and at depth at elevated concentrations. In several cases, the deepest sediment samples collected (about 30 to 42 inches below the ground surface) were at concentrations greater than the reference sample results. Some arsenic concentrations were an order of magnitude greater than that found in the reference area samples.

The presence of arsenic and mercury at depth, but not PCBs, indicates that sediment deposition and burial over time was probably not a major factor in contaminant distribution to deeper sediments. A groundwater pathway for transport of contaminants from the upland site areas into the deeper sediments of the Marsh was considered as part of the OU2 RI/FS, and the OU2 ROD concluded that a groundwater transport pathway was highly unlikely for the contaminants of concern in the Marsh (arsenic, mercury and PCBs). The rate of groundwater flow through the dense clays and silts found in upland soils is very slow, and the Marsh contaminants were found to be at very low concentrations or "non-detect" in the monitoring wells furthest downgradient (nearest the Marsh). Volatile organic compounds were the groundwater contaminants that were likely to migrate to the Marsh from upland sources. (This assessment of groundwater transport mechanisms applies to River sediments as well.) The deeper distribution pattern for arsenic and mercury suggest that these contaminants may have been discharged into the Marsh in a relatively soluble form, allowing dissolved constituents to pass deeper into the marsh sediments. Subsurface geochemistry may then have decreased arsenic and mercury solubility, resulting in deposition in these deeper sediments. After reviewing the current water quality in the Marsh, the FS concluded that these deeper sediments are "stable", that is, the Marsh contaminants are not likely to be transported in groundwater, and are bound to the deeper sediments.

Raritan River Sediments

The sites are about four miles from the mouth of the Raritan River where it meets the Atlantic Ocean, and the River is approximately 2,600 feet wide at this point. This reach of the Raritan River is a tidal estuary.

The Raritan River Estuary has been identified as an impaired water under Section 303(d) of the Clean Water Act as a result of metals (including arsenic and mercury) contamination, and New Jersey has established fishing advisories within the Raritan River as a result of PCB contamination that may be found in American Eel, White Catfish, White Perch, Striped Bass, Bluefish, and Blue Claw crab.

The U.S. Army Corps of Engineers (USACE) maintains a commercial shipping channel, the "Main Channel," along the north shore of the Raritan. For much of the 20th century, a second channel served the NL Industries/Titanium Pigments facility ("the Titanium Reach"), and a smaller extension ("the South Channel") served Crossman Dock and other brick-related businesses in Sayreville. At one time, the South Channel was dredged to a depth of 15 feet (measured at low tide) and was 150 feet wide. Now, the South Channel is mostly silted in, with an average depth of 4.2 feet. The USACE has no plans for dredging the Titanium Reach or the South Channel, neither of which serves any commercial interests at this time. It is possible that Sayreville may consider a marina as part of its waterfront development plans; however, there are no current plans for a marina.

Pilings from the Crossman Dock are still present in the River in front of the Horseshoe/ARC Marsh. A depositional area can be found in front of the Horseshoe/ARC Marsh, between the shoreline and these pilings. Because the Marsh drains directly into this depositional area, through a breach in the berm that runs along the River, EPA sampled this area and the area around it.

Reference samples were collected from near-shore sediments up-river and down-river from the sites. Other Raritan River sediment data were also consulted to provide a better picture of the current contaminant loading in river sediments. The FS compared the site-specific reference data to results from National Lead Industries (NL) sampling events (collected in 2003 at the direction of NJDEP) for arsenic. The FS also compared the site-specific reference data to results from USACE sampling of the Main Channel (2004) for arsenic, mercury and PCBs.

The reference data in Appendix II, Table 2 presents the combined (site-specific and river-wide) sediment sampling results. The river-wide results include data from the 2004 USACE survey, which is not in the FS, but is included in the Administrative Record. The near-site river sampling areas are shown on Appendix I, Figure 3.

Surface (0 to six inches) and subsurface (six inches to 42 inches below the river bottom) sediment samples were collected. Raritan River sediment contamination was characterized by arsenic and mercury in surface and subsurface sediments. PCBs were much less frequently detected relative to the marsh sediments.

The sampling results indicate that the depositional area behind the dock pilings contains elevated levels of arsenic and mercury relative to the surrounding sediments. The surrounding sediments have contaminant levels that are more consistent with background levels for the River, as indicated by both the off-site sample results and other off-site data from the NL site and Army Corps surveys.

Based on analytical results and past site practices, it appears that contamination migrated to the Marsh and Raritan River through runoff from the sites, and groundwater transport does not appear to be a contributing mechanism to sediment contamination, though the contaminated sediments appear to be a likely continuing source of contamination to the River.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Site Uses: Prior to the start of the OU1 remedy, the sites were abandoned and fenced off to the extent practicable. The sites are zoned for industrial use, similar to the current use of neighboring, occupied commercial properties. In discussions with members of the Sayreville Planning Board and Zoning Office, as well as review of the borough zoning ordinances, EPA has been advised that the properties contaminated by the two sites are zoned for economic redevelopment and light industrial usage. Both of these uses exclude residential use. Furthermore, the Borough expects that the future use of this area will be integrated into one of several long-range planning projects, either the "Main Street Bypass", which might involve some commercial land use, or as part of an open-space shoreline redevelopment that would provide access to the Raritan River for recreational and light commercial purposes. In either case, residential re-use is not contemplated. The 8.2-acre Marsh is not suitable for commercial development and, under any of these future-use scenarios EPA expects that the Marsh will remain open space/ecological habitat.

Ground and Surface Water Uses: Groundwater underlying the sites is considered by New Jersey to be Class II-A, a source of potable water; however, no current exposure pathways to contaminated groundwater are known. Based on the very low yields measured in monitoring wells, the groundwater formations would not yield enough water for a potable well. The nearest aquifers used for drinking water are stratigraphically isolated and not threatened by the groundwater contamination from the sites.

SUMMARY OF SITE RISKS

As part of the RI/FS, EPA conducted a baseline risk assessment to estimate the current and future effects of contaminants on human health and the environment. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects of releases of hazardous substances from a site in the absence of any actions or controls to mitigate such releases, under current and future land uses. The baseline risk assessment includes a human health risk assessment and an ecological risk assessment. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for the sites.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: *Hazard Identification* - uses the analytical data collected to identify the contaminants of potential concern at the sites for each medium, with consideration of a number of factors explained below; *Exposure Assessment* - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well water) by which humans are potentially exposed; *Toxicity Assessment* - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and *Risk Characterization* - summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks. The risk characterization also identifies contamination at concentrations that exceed acceptable levels, defined by the NCP as an excess lifetime cancer risk greater than 1×10^{-6} to 1×10^{-4} or a Hazard

Index greater than 1.0; contaminants at these concentrations are considered chemicals of concern (COCs) and are typically those that will require remediation at the sites. Also included in this section is a discussion of the uncertainties associated with these risks.

Hazard Identification

In this step, the chemicals of potential concern (COPCs) in each medium were identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations, mobility, persistence, and bioaccumulation. Analytical information that was collected to determine the nature and extent of contamination revealed the presence of arsenic at the sites at concentrations of potential concern. Based on this information, the risk assessment focused on surface water, sediment, and shellfish contaminants that may pose significant risk to human health.

A comprehensive list of all COPCs can be found in the BHHRA, which consists of documents entitled "Final Baseline Human Health Risk Assessment - Horseshoe Road Complex Site" (EPA , October 6, 1999) and "Final Human Health Risk Assessment Addendum Horseshoe Road Complex Site" (EPA, October 31, 2000). These documents are available in the Administrative Record file. Only the COCs, or those chemicals requiring remediation at the sites, are listed in Appendix II, Table 3 of this ROD.

Exposure Assessment

Consistent with Superfund policy and guidance, the BHHRA is a baseline human health risk assessment and, therefore, assumes no remediation or institutional controls to mitigate or remove hazardous substance releases. Cancer risks and noncancer hazard indices were calculated based on an estimate of the reasonable maximum exposure (RME) expected to occur under current and future conditions at the sites. The RME is defined as the highest exposure that is reasonably expected to occur at the sites. For those contaminants for which the risk or hazard exceeded the acceptable levels, the central tendency estimate (CTE), or the average exposure, was also evaluated.

The sites are currently zoned for commercial use, although there are residential properties in the vicinity of the sites. According to recent information from Sayreville, it is anticipated that the future land use for this area will remain consistent with its current use or be used for recreational activities. The BHHRA evaluated potential risks to populations associated with both current and potential future land uses.

Exposure pathways were identified for each potentially exposed population and each potential exposure scenario for the surface water, sediment, and shellfish. Exposure pathways assessed in the BHHRA for the surface water and sediment included ingestion and dermal contact by residents living nearby the sites, on-site workers, and recreational visitors/trespassers. In addition, ingestion of shellfish through recreational/subsistence fishing was also evaluated. A summary of the exposure pathways that were associated with elevated risks or hazards can be found in Appendix II, Table 4. Typically, exposures are evaluated using a statistical estimate of the exposure point concentration, which is usually an upper-bound estimate of the average concentration for each contaminant, but in some cases may be the maximum detected concentration. A summary of the exposure point concentrations for the COCs in each medium can be found in Appendix II, Table 3, while a comprehensive list of the exposure point concentrations for all COPCs can be found in the BHHRA.

Toxicity Assessment

Under current EPA guidelines, the likelihood of carcinogenic risks and noncancer hazards due to exposure to site chemicals are considered separately. Consistent with current EPA policy, it was assumed that the toxic effects of the site-related chemicals would be additive. Thus, cancer and noncancer risks associated with exposures to individual COPCs were summed to indicate the potential risks and hazards associated with mixtures of potential carcinogens and noncarcinogens, respectively.

Toxicity data for the human health risk assessment were provided by the Integrated Risk Information System (IRIS) database, the Provisional Peer Reviewed Toxicity Database (PPRTV), or another source that is identified as an appropriate reference for toxicity values consistent with EPA's directive on toxicity values. This information is presented in Appendix II, Table 5 (noncancer toxicity data summary) and Appendix II, Table 6 (cancer toxicity data summary). Additional toxicity information for all COPCs is presented in the BHHRA.

Risk Characterization

Noncarcinogenic risks were assessed using a hazard index (HI) approach, based on a comparison of expected contaminant intakes and benchmark comparison levels of intake (reference doses, reference concentrations). Reference doses (RfDs) and reference concentrations (RfCs) are estimates of daily exposure levels for humans (including sensitive individuals) that are thought to be safe over a lifetime of exposure. The estimated intake of chemicals identified in environmental media (*e.g.*, the amount of a chemical ingested from contaminated drinking water) is compared to the RfD or the RfC to derive the hazard quotient (HQ) for the contaminant in the particular medium. The HI is obtained by adding the hazard quotients for all compounds within a particular medium that impacts a particular receptor population.

The HQ for oral and dermal exposures is calculated as below. The HQ for inhalation exposures is calculated using a similar model that incorporates the RfC, rather than the RfD.

HQ = Intake/RfD

Where: HQ = hazard quotient
Intake = estimated intake for a chemical (mg/kg-day)
RfD = reference dose (mg/kg-day)

The intake and the RfD will represent the same exposure period (i.e., chronic, subchronic, or acute).

As previously stated, the HI is calculated by summing the HQs for all chemicals for likely exposure scenarios for a specific population. An HI greater than 1.0 indicates that the potential exists for noncarcinogenic health effects to occur as a result of site-related exposures, with the potential for health effects increasing as the HI increases. When the HI calculated for all chemicals for a specific population exceeds 1.0, separate HI values are then calculated for those chemicals which are known to act on the same target organ. These discrete HI values are then compared to the acceptable limit of 1.0 to evaluate the potential for noncancer health effects on a specific target organ. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. A summary of the noncarcinogenic risks associated with these chemicals for each exposure pathway is contained in Appendix II, Table 7.

It can be seen in Appendix II, Table 7 that the HI for noncancer effects due to potential exposure to arsenic in surface water and sediment is 2.1 for the youth resident exposed to marsh sediments and surface water and 1.1 for the youth resident exposed to Raritan River sediment and surface water. The noncancer HI is 2.6 for future adult residents exposed to arsenic in marsh sediments and surface water and is 1.5 for future adult residents exposed to Raritan River sediment, surface water and shellfish. The noncancer HI for future child residents due to exposure to marsh sediment and surface water and Raritan River sediment and surface water is 16 and 8, respectively. The noncarcinogenic hazards for these populations were attributable primarily to arsenic and all are above the acceptable EPA value of 1.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen, using the cancer slope factor (SF) for oral and dermal exposures and the inhalation unit risk (IUR) for inhalation exposures. Excess lifetime cancer risk for oral and dermal exposures is calculated from the following equation, while the equation for inhalation exposures uses the IUR, rather than the SF:

Risk = LADD x SF

Where: Risk = a unitless probability (1×10^{-6}) of an individual developing cancer
LADD = lifetime average daily dose averaged over 70 years (mg/kg-day)
SF = cancer slope factor, expressed as [1/(mg/kg-day)]

These risks are probabilities that are usually expressed in scientific notation (such as 1×10^{-4}). An excess lifetime cancer risk of 1×10^{-4} indicates that one additional incidence of cancer may occur in a population of 10,000 people who are exposed under the conditions identified in the assessment. Again, as stated in the NCP, the acceptable risk range for site-related exposure is 10^{-6} to 10^{-4}.

Results of the BHHRA presented in Appendix II, Table 8 indicate that future adult residents (3.9×10^{-4} Marsh; 2.5×10^{-4} Raritan River) and future child residents (6.1×10^{-4} Marsh; 3.1×10^{-4} Raritan River) exceed the acceptable EPA risk range due to exposure to arsenic in surface water, sediment, and shellfish.

In summary, arsenic in surface water, sediment, and shellfish contribute to unacceptable risks and hazards to receptor populations that may use the sites. The non-cancer hazards and cancer risks from all COPCs can be found in the BHHRA.

The response action selected in the ROD is necessary to protect the public health or welfare and the environment from actual or threatened releases of contaminants into the environment.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis
- environmental parameter measurement
- fate and transport modeling
- exposure parameter estimation
- toxicological data.

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper-bound estimates of the risks to populations near the sites, and is highly unlikely to underestimate actual risks related to the sites.

More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the risk assessment report.

Actual or threatened releases of hazardous substances from these sites, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare or the environment.

Ecological Risk Assessment

During the original RI (1999), a Screening Level Ecological Risk Assessment (SLERA) was prepared for the Horseshoe Road/ARC sites, to determine which contaminants and exposure pathways presented ecological risks based on conservative assumptions. The SLERA considered upland, Marsh and River ecological risks. Receptor species selected to represent the different habitats and trophic levels of the sites were the red-tailed hawk, short-tailed shrew, marsh wren, spotted sandpiper, green frog, fiddler crab, and the benthic invertebrate community. The assessment endpoint for these receptors in the SLERA was the disruption of ecological community structure by the reduction of ecological populations.

Regarding the measurement endpoints for the SLERA, food chain risks were estimated for the modeled receptors (red-tailed hawk, short-tailed shrew, marsh wren, spotted sandpiper) by comparing estimated exposure levels with ecologically-based toxicity reference values. The risks to the green frog and fiddler crab were evaluated by comparing surface water concentrations to aquatic toxicological benchmarks. The comparison of sediment and surface water contaminant concentrations to ecologically-based screening values was conducted to determine risks to benthic invertebrates. Also included in the assessment were the results of biota sampling from EPA's Environmental Response Team (ERT). ERT collected and analyzed tissue from small mammals and fiddler crabs from these sites. These data showed potential contaminant migration off site and into the food chain. Consequently, a SLERA Addendum was completed to collect additional samples in the Marsh and the Raritan River. The SLERA Addendum was completed in 2002. Forage fish samples were collected to estimate contaminant concentrations in fish tissue. Toxicity tests were conducted at five sampling locations using a 28-day chronic bioassay.

The SLERA and the SLERA Addendum identified the potential for ecological risks for all the representative receptors evaluated with exposure to contaminants in sediment, surface water, and surface soil. After reviewing the SLERA work, EPA concluded that a Baseline Ecological Risk Assessment (BERA) was warranted.

A four-step process is utilized for assessing site-related ecological risks for a reasonable maximum exposure scenario:

> **Problem Formulation** - a qualitative evaluation of contaminant release, migration, and fate; identification of COPCs, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study.

Exposure Assessment - a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations.

Ecological Effects Assessment - literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors.

Risk Characterization - measurement or estimation of both current and future adverse effects.

Problem Formulation/Exposure Assessment

As with the human health risk assessment, the BERA reviewed all potential site contaminants. The assessment endpoints in the BERA focused on the following Marsh and River ecosystems:

- **aquatic macroinvertebrate community** abundance and population production in Marsh sediment, relying upon laboratory testing of sediment toxicity using a sensitive and representative aquatic macroinvertebrate (*Lumbriculus variegatus,* blackworm) as the measurement endpoint;
- **terrestrial invertebrate community** abundance and population in the Marsh sediment, relying upon laboratory testing of sediment toxicity using a sensitive and representative terrestrial invertebrate (*Eisenia fetida*, earthworm) as the measurement endpoint;
- **estuarine fish population** abundance and community structure in the Raritan River, relying upon measured concentrations of COPCs in the water column compared with state water quality standards and measured COPCs in estuarine fishes of the Raritan compared with literature-based effect-level thresholds as measurement endpoints; and
- **wildlife population** abundance in the Marsh and the River, relying upon modeled dietary doses of COPCs based on measured concentrations of COPCs in prey organisms and Marsh and River sediments, compared with toxicity reference values.

For the wildlife population assessment, a set of indicator species were selected to represent different functional groups that might use the Marsh or River, such as mammals that eat insects, or birds of prey that rely on fish. Representative wildlife species for the Marsh were the short-tailed shrew, muskrat, marsh wren, and red-tailed hawk. The wildlife species selected for the Raritan River included the osprey and the herring gull.

Ecological Effects Assessment

The BERA relied upon both site-specific quantitative effects studies and site-specific data (where available) compared to literature-derived values to evaluate the four assessment endpoints.

Toxicity Testing. Site-specific sediment toxicity tests were the primary measurement endpoints for assessment of both the aquatic macroinvertabrate and terrestrial invertabrate communities, and in each case the toxicity testing only considered Marsh sediments. In addition to the work in the BERA, sediment toxicity testing was performed for River sediments as described in the SLERA Addendum, discussed below.

- **Blackworm and Earthworm (Marsh sediment) toxicity testing.** These toxicity tests evaluated survival and biomass reduction endpoints, evaluating lethal and sub-lethal (chronic) effects on the indicator species. Significant reduced survival and biomass were found for the blackworm and significant reduced biomass was found for the earthworm for exposure to sediments collected at several of the 10 sampling stations. The BERA compared sediment contaminant levels in each of the 10 sampling locations (and three reference locations) to the measurement endpoints to identify apparent effects threshold (AET) values for 18 different contaminants, and then used these AET values to assess the risks to invertebrates. To be conservative, the lowest AET for each target chemical was selected, including 31.6 ppm for arsenic, 3.6 ppm for mercury, and 2.2 ppm for total PCBs. AETs for other chemicals were also calculated and appear in the BERA. A strong correlation between sediment concentration and both survival and biomass reduction could be identified: higher contaminant concentrations correlated with higher mortality and greater biomass reduction. Overall, the blackworm was determined to be a substantially more sensitive species during the toxicity testing, and all these AETs derive from blackworm data.

- **SLERA (River sediment) toxicity testing.** A 28-day sediment toxicity test using the saltwater test species *Leptochirus* plumulosus (an amphipod) showed significant reduced survival (43 percent) as compared to the survival (82 percent) at a reference station at sediment sampling location RSD07, one of four locations tested. The other three locations had survival results similar to the reference location. Location RSD07, near the discharge point for the SPD/ADC channel, also had the lowest measurements for growth and reproduction (sub-lethal, or chronic) endpoints. The concentrations of arsenic and mercury at RSD07 were 194 ppm and 2.6 ppm, respectively. These findings suggest that there may be potential risk to benthic organisms from contaminated River sediment at concentrations similar to these.

Assessment of Estuarine Fishes. This work was performed during the SLERA and involved comparison of COPC concentrations in the surface water against screening benchmarks, and comparison of COPC concentrations in fish/crab tissue with whole-body residue effects levels. This screening assessment indicated that there was a very low likelihood of adverse effects to estuarine fishes from COPCs in surface water. While New Jersey has established fishing advisories within the Raritan River as a result of PCB levels that may be found in American Eel, White Catfish, White Perch, Striped Bass, Bluefish, and Blue Claw crab, locally collected crabs and forage fish have not demonstrated elevated concentrations of COPCs during several different sampling events. The most recent sampling event (crabs and killifish) was associated with the BERA supplemental investigations in 2004.

Wildlife Assessment. Food-web exposure models were developed for bird and mammal species that might frequent the site, to assess site-specific exposures that might occur. Then exposure assessments attempt to link potential contaminant exposure-point concentrations to potential adverse effect in selected receptors. Exposure assessments were performed for each of the indicator species (the short-tailed shrew, muskrat, marsh wren, and red-tailed hawk for the Marsh and the osprey and herring gull for the River). The assessments relied on site-specific inputs for assessing potential exposure (sediment concentrations and measured or extrapolated food source concentrations) and then literature values for exposure parameters (body weight, diet, home range size, etc.) for each of the indicator species.

Marsh - Food web model results for short-tail shrew (representing mammals that may feed on insects) suggest arsenic, mercury and PCBs, and possibly copper are the primary drivers of ecological risk, and that hazard quotients (a quantification of risk) were elevated above the reference areas across the Marsh. The magnitude of hazard quotient values varied across the Marsh generally in relation to contaminant concentrations. Results for muskrat, (mammalian herbivore), were averaged over the entire marsh based upon a wider home range. Arsenic and mercury appear to be the primary contaminants of concern for muskrat, with elevated hazard quotients relative to the reference area. For the marsh wren (representing insect-eating birds), mercury appeared to be the primary risk driver, along with arsenic and chromium. As with the mammalian indicator species, the magnitude of risk could be correlated to contaminant concentrations, with higher hazard quotients for stations near the ADC/SPD channel. Finally, results for the red-tailed hawk (carnivorous bird), that may prey on small mammals within the marsh, did not manifest a likely adverse ecological effect from foraging on the site.

River - The food-web modeling of the herring gull and osprey indicated little likelihood of risks associated with contaminated sediment and surface water in the Raritan River.

In summary, potential adverse effects on bird and mammal receptor species may be associated with the elevated contaminant concentrations in the Marsh sediment. The Marsh sediment was also found to pose potential adverse effects on the growth of aquatic and terrestrial invertebrates. While several other COPCs were identified by the wildlife assessment, arsenic, mercury and PCBs were the predominant COPCs for ecological receptors. Beyond a limited benthic community assessment, which indicated some toxicity in sediments probably associated with arsenic and mercury, the ecological risk assessment attributed little likelihood of a site-specific effect to receptors in the Raritan.

Uncertainties

As with the human health risk assessment, procedures and inputs used to assess risks in this ecological evaluation are subject to a wide variety of uncertainties. Uncertainties are inherent in the collection and analysis of environmental samples, and can be compounded when sampling biota.

With regard to toxicity testing, the BERA assumed that lethal and sub-lethal effects observed were derived exclusively from chemical concentrations in the sediments. A number of other factors may influence both survival and growth of the blackworm and earthworm in site sediments in a laboratory setting, such as moisture content or grain particle size distribution, or the particular site setting that might not be ideally suited to the indicator species. In addition, the data sets for toxicity testing were relatively small, particularly in the case of the

SLERA testing of River sediments using amphipods, and small data sets introduce higher levels of uncertainty into the results.

With regard to the assessment of estuarine fish tissue, a reliable assessment of this kind is hampered by several factors. The extent of sediment contamination in the Raritan that is demonstratively attributable to the sites, generally about two acres, is small, and the level of "background" contamination with site COPCs within the estuary is relatively high. The habitat ranges of estuarine fishes that have been sampled is not confined to the two-acre area. In addition, because the assessment area is small, the sample size (number of individuals collected for analysis) has generally been too small for reliable statistical analysis of the data.

Food-web modeled exposure assessments are a satisfactory method of assessing risk to wildlife receptors, but require a large and in some cases speculative set of assumptions about various life-cycle factors for targeted species, such as the size of a foraging range or the variability of body weights. The BERA identified a number of potential sources of uncertainty for the wildlife assessments, including body mass and intake rate parameters, diet composition, area use (the site size relative to the home range), measured COPC concentrations in environmental media and food sources, and COPC bioavailability. Another area of uncertainty are the literature-derived values for ecotoxicity, where toxicity thresholds for test species for particular contaminants can vary widely and need to be extrapolated to a particular local setting.

The BERA discusses several additional areas of uncertainty, including the levels of contamination found in the reference areas, and the reliability of extrapolating the responses of individuals to the level of a population.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs) and risk-based levels established in the risk assessment.

The following remedial action objectives for contaminated sediments address the human health risks and environmental concerns at the Horseshoe Road and ARC sites:

Sediments - Marsh

- Reduce human health risks from exposure, including ingestion, inhalation and dermal contact, to contaminants in the surface and sub-surface sediments to acceptable levels.

- Reduce risks to environmental receptors from exposure to contaminants in the sediments to acceptable levels.

- Minimize the migration of contaminated sediments to the Raritan River through surface water runoff or flooding.

Sediments - River

- Reduce the potential for human health risks from exposure to river sediments within the low-tide mudflat in front of the sites, through ingestion or dermal contact, to acceptable levels.

- Reduce exposure to sediments deposited in the River adjacent to the sites with highly elevated contaminant concentrations that contribute to the degradation of the Raritan River Estuary, and result in risks to ecological receptors, including benthic aquatic organisms, shellfish, fish, birds and mammals.

REMEDIATION GOALS

Sediments - Marsh

The Remediation Goals discussed below balance several factors in addressing arsenic, mercury, and PCBs. EPA has identified cleanup criteria only for arsenic and mercury, because when these criteria are met, risks from other COCs, which are co-located, would be addressed as well (see Appendix I, Figures 3 & 6). Furthermore, given the distribution of PCBs in the Marsh and River sediments, by addressing arsenic and mercury, PCBs will also be remediated (see Figures 3 & 7).

In developing Remediation Goals for marsh sediments, EPA considered sediment risk levels for each COC identified in the BHHRA and BERA, available background values, and other ecological receptor reference values such as sediment quality guidelines adopted by NJDEP.

The BHHRA presented preliminary remediation goals (PRGs) for exposure to arsenic in sediments for the three receptor populations. The values presented in Appendix F of the BHHRA were calculated for a hazard index of 1 and a cancer risk of 10^{-4}. Typically, PRGs are presented as a range of values that span the acceptable risk range. Appendix II, Table 9 presents the PRGs that are associated with the acceptable hazard index of 1 and cancer risk range, as well as calculated background values and ecologically relevant values. These values were taken into consideration when selecting the appropriate remediation goal.

Identifying a Remediation Goal for arsenic in the Marsh provides the broadest range of factors to consider. From the starting point of direct ecological effects to receptors within the Marsh, the BERA sediment toxicity testing results were used to calculate site-specific Apparent Effects Thresholds (AETs) of 32 mg/kg and 1,050 mg/kg (biomass reduction in blackworms and earthworms, respectively). In addition, data from the wildlife assessments in the BERA allowed for the derivation of Lowest Observed Apparent Effects Levels (LOAELs) for higher trophic species, calculated to result in a hazard quotient of one, ranging from 183 mg/kg (muskrat)* to 1,420 mg/kg (marsh wren). After considering screening values used by NJDEP and the recommendations of the other Natural Resource Trustees, EPA has identified 32 mg/kg as the Remediation Goal for the benthic zone of the Marsh (within the first foot of the marsh sediments). Applying this Remediation Goal to the surface sediments addresses most of the remedial action objectives, and in particular, satisfies the Agency's desire to minimize the Marsh as a continuing source of contamination to the Raritan.

The surface sediment remediation goals were selected to be protective for ecological receptors and for human exposure, and EPA expects that addressing sediment contamination within the first foot of the Marsh will be protective for most potential receptors; however, after considering several factors described below, EPA has identified a second Remediation Goal of 160 mg/kg arsenic for deeper marsh sediments (below the benthic zone).

Through biotic activity such as burrowing, animals such as muskrat can be exposed to sediments deeper than one foot and bring these sediments to the surface. The site-specific exposure assessment for muskrat identified a LOAEL concentration of 183 mg/kg for arsenic; this concentration was one of the factors considered by the Region for assessing this deep-sediment Remediation Goal. This deep sediment Remediation Goal, which is

* Different values for the Muskrat LOAEL and NOAEL were identified in the Proposed Plan. The correct values appear in the FS Report and in this document.

below the muskrat LOAEL, should also protect other higher trophic species, presuming that the remediated Marsh would develop from its current state as a degraded Phragmites monoculture to support a more robust, high quality habitat.

In addition, EPA concluded that the remedial action objectives would be very difficult to achieve over the long term by only addressing the surface sediments. The uncertainties of the setting cannot be accounted for by only addressing the surface sediments. These uncertainties include flooding and scouring from peak storm events, and the possibility that the primary ADC stream channel may meander over time, resulting in newly exposed sediments. Deeper sediments are also thought to represent a contamination reservoir, whereby surface sediments in the marsh or the river could potentially be recontaminated by these sediments. The 160 mg/kg-Remediation Goal for arsenic in the marsh is meant to address the deeper sediments that act as a potential continuing source.

EPA further concluded that sediments deeper than about 30 inches were not accessible even to phragmites roots, the predominant Marsh plant species; therefore, the maximum remediation depth to satisfy the remedial action objectives is 30 inches except for the channel areas. The remediation depth considered in stream channels is deeper (up to 42 inches) to account for higher erosion potential. The Remedial Investigation concluded that sediments in the Marsh are relatively stable, and become more stable with depth (that is, the deeper sediments themselves are unlikely to be moved without human intervention or a severe weather disturbance, and the contaminants within the deeper sediments are bound tightly to sediment particles). Addressing surface sediments and deeper sediments in the Marsh as described above is expected to leave some contamination, even contamination in excess of 160 mg/kg arsenic, at depths greater than 30 inches while still satisfying the remedial action objectives.

EPA's National Remedy Review Board, in reviewing Region 2's remedial plans for OU3, recommended that the Region further evaluate one additional contaminant migration pathway: the groundwater interaction between shallow and deep sediments within the Marsh, and whether any contaminated sediments that are left in place at depth might recontaminate newly placed sediments to levels that would not be protective, through remobilization and transport of deeper sediment contamination. Based upon the Region's current understanding, remobilization and transport of deeper sediment contamination is unlikely; however, further studies during the forthcoming remedial design for the selected Marsh remedy will further clarify this issue.

Applying a similar approach to developing a Remediation Goal for mercury, from the starting point of direct ecological effects to receptors within the Marsh, the sediment toxicity testing in the Marsh allowed for the development of site-specific AETs of 3.6 mg/kg and 15.5 mg/kg (biomass reduction in blackworms and earthworms, respectively). Data from the wildlife assessments in the BERA allowed for the derivation of LOAELs for higher trophic species, including 24 mg/kg (muskrat) and 8.7 mg/kg (marsh wren). After considering the available information, EPA identified 2.0 mg/kg total mercury as the Remediation Goal in the surface sediments, using the Severe Effects Level (SEL) adopted by NJDEP from the Ontario Ministry of the Environment, rather than the lowest of the site-specific values, because of the potential for bioaccumulation with mercury, and because of a desire to eliminate releases to the Raritan (discussed in more detail, below). Given the sensitivity of ecological receptors to mercury in the environment, EPA considered a lower value, such as NJDEP's Effects Range-Median of 0.71 mg/kg; however, since EPA's Remediation Goal is just above background levels, lower levels may not be attainable. EPA did not identify a separate Remediation Goal for deeper mercury contamination, expecting that actions to address arsenic would also address deeper mercury that might become exposed.

Sediments - Raritan River

By addressing Marsh sediments, the OU3 remedial action would address a continuing source of contamination to the River. However, because much of the lower Raritan River system sediments are contaminated with arsenic, mercury and PCBs, and the sites contribute some incremental part to that sediment contamination, a river response is also appropriate. This is particularly important for mercury and PCBs, because while the site footprint (where elevated levels in River sediments can clearly be attributable to releases from the sites) is less than three acres and is probably too small to result in quantitative food-chain level affects, the overall contribution of the sites to the lower Raritan ecosystem cannot be ignored. EPA's remedial approach for addressing both Marsh and River sediments is consistent with the New York/New Jersey Harbor Estuary Program's efforts to protect the estuary. The Harbor Estuary Program's Comprehensive Conservation and Management Plan (CCMP) recommends using available information to help set priorities for the clean closure or remediation of sites contributing contamination to the Harbor/bight. In addition, the CCMP also indicates that, even in light of elevated sediment contamination levels through the region, EPA and other responsible agencies should take appropriate steps to remediate known areas of highly contaminated sediments that are contributing to human health and ecological risks. Consistent with this approach, NJDEP has stated that it plans to evaluate other contaminated sites along the Raritan River that are also contributing incrementally to contamination in the Raritan Estuary, and Remediation Goals that EPA and the State developed together for this ROD will be considered by the State for those sites.

While PCBs can be found in sediment throughout the River from multiple sources, the site-related footprint of PCB contamination is much smaller and is within the footprint for mercury and arsenic; therefore, EPA only developed chemical-specific sediment cleanup criteria for mercury and arsenic. The criteria for mercury is 2 mg/kg, and for arsenic, 100 mg/kg. These values offer the best balance between several factors. Blue crab and estuarine fish collected near the sites do not appear to be adversely affected by the area of very high sediment contamination found in the River adjacent to the sites. The absence of affects on higher trophic species taken from the site sediment depositional area needs to be balanced against the results of the amphipod chronic sublethal bioassay study, which suggests a LOAEL of 194 mg/kg for arsenic and 2.6 mg/kg for mercury. NJDEP has identified marine/estuarine sediment quality screening guidelines, where direct toxic affects or food-chain affects can be expected to riverine receptors, and the near-shore sediments exceed these screening values (for arsenic, mercury and PCBs) by several orders of magnitude. EPA considered using NJDEP's Effects Range-Medium (70 mg/kg for arsenic, 0.71 mg/kg mercury) as Remediation Goals, but given the background levels in the Raritan River Estuary, lower levels would not be attainable.

EPA expects that any areas of the River remediated during OU3 will be recontaminated to levels similar to the reference values identified in Appendix II, Table 2.

DESCRIPTION OF ALTERNATIVES

CERCLA requires that each remedial alternative be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery technologies to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility or volume of hazardous substances. Remedial alternatives for the Horseshoe Road site and ARC site are presented below.

Upland soil contamination at the two sites could be addressed as separate problems, because the contaminants and contaminated areas are distinct and in most cases, it is possible to designate contaminants as being attributed to one site or the other. Separate remedial alternatives could not be developed for the sediments, because constituents that might be attributable to a particular facility's operation have become intermixed in the sediments. A joint remedial approach is necessary for sediments; however, because the remedial alternatives address two separate NPL sites, costs for remedial alternatives have been divided in half and attributed to each site. This is an artificial allocation for administrative reasons, and is not a basis for liability allocation between the two sites. That allocation has not been determined at this point.

EPA is required to evaluate a wide array of remedial technologies during the RI/FS and to give preference to remedies that involve treatment as a principal element, to the extent practicable. Given the conditions identified in the OU3 sediments, the FS developed range of remedial technologies; however, none of the technologies that rely on treatment to permanently and significantly reduce the volume, toxicity or mobility of the site contaminants as a principal element were considered appropriate to carry beyond the screening stage.

DESCRIPTION OF MARSH ALTERNATIVES

Common Elements

Many of these alternatives include common components. With regard to the upland portions of the two sites, the FS assumes that the OU2 remedies would eliminate these areas as ongoing sources of contamination to sediments. It is expected that OU2 remedies would be performed prior to, or at least concurrently with, implementation of the active remedial alternatives evaluated below.

As discussed previously, EPA has identified different remedial goals to address surface and subsurface sediments to satisfy the remedial action objectives for the Marsh. The FS went further, dividing the deeper zone into three zones based on contaminant levels and distance from the stream channel. The first zone is targeted for the deepest excavation and encompasses an area within 20 feet of the channel. This zone tends to be the most contaminated, and also has the greatest potential for erosion. The second is characterized by arsenic contamination above 1,050 mg/kg (which is based on the site-specific AET for biomass reduction in earthworms). The third zone is characterized by levels between 1,050 mg/kg and EPA's remediation goal of 160 mg/kg for arsenic. The alternatives presented in the FS address these zones to varying degrees with several technologies.

The remedial alternatives also address marsh sediments to varying depths, up to 42 inches below the marsh surface. EPA concluded that sediment contamination deeper than 42 inches would be inaccessible under current conditions, and would remain inaccessible in the future, assuming that post-remedy topography is similar to current conditions.

For remedial alternatives that include excavation of sediments, contaminated sediments would be dewatered on site and transported off-site for disposal at an appropriate land disposal facility. Based on current information, treatment would not be required prior to disposal of marsh sediments.

For all alternatives except M1 (No Action), some wetlands will be adversely affected. Each of these alternatives will require wetlands restoration and/or off-site mitigation of compromised wetland resources that are not restored.

Because any combination of remedial alternatives are expected to result in some contaminants remaining on the sites above levels that would allow for unrestricted use, five-year reviews will be conducted, unless determined otherwise. In addition, while the land is currently wetlands and could not be used without extensive landfilling, institutional controls such as a deed notice, would be appropriate to prevent a change of land use in the future.

Please refer to Appendix I, Figure 4 for a simplified depiction of each Marsh alternative.

Alternative M1: No Action

Estimated Capital Cost:	$0
Estimated Operation & Maintenance (O&M) Cost:	$0
Estimated Present Worth Cost:	$0

Estimated Construction Time frame:	None
Area excavated/backfilled:	0.0 acres
Area capped:	0.0 acres

Regulations governing the Superfund program expect that the "no action" alternative will be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no further action at either site to prevent exposure to contaminated sediments. Institutional controls, such as a deed notice, would not be implemented to restrict future site use. Engineering controls would not be implemented to prevent site access or exposure to site contaminants. Existing security fences would remain present in upland areas, but they would not be monitored or maintained.

Alternative M2: Channel Excavation/Armored, Thin Cover and Monitored Natural Recovery

Horseshoe Road Site Costs	
Estimated Capital Cost:	$3,550,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$3,700,000

ARC Site Costs	
Estimated Capital Cost:	$3,550,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$3,700,000

Estimated Construction Time frame:	3 months
Area excavated/backfilled:	0.3 acres
Area capped:	4.6 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor the length of the SPD/ADC drainage, a total of approximately 2,000 cubic yards of material. The channel would then be backfilled to the original contour. Because of the high levels of contaminants in these sediments, Alternative M2 includes the establishment of an embedded channel armored with stone to prevent erosion and lateral movement. The marsh area outside the stream corridor with arsenic levels above 160 mg/kg would be covered with a thin cap (approximately six inches). The cap would be constructed in such a way as to allow for the re-establishment of a wetland on top of the cap. This alternative relies on natural sedimentation processes to bury marsh sediments that have arsenic contamination above 32 mg/kg but below the 160 mg/kg, and would be monitored to assure that the reduction in surface soil concentrations eventually achieves the overall site goals.

Long-term operation and maintenance (O&M) of the cap and armored channel would be required. Institutional controls, such as a deed notice, will be required to prevent disruption of the capped area.

Alternative M3: Channel Excavation, Surficial Hot Spot Removal and Monitored Natural Recovery

Horseshoe Road Site Costs	
Estimated Capital Cost:	$3,835,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$4,000,000

ARC Site Costs	
Estimated Capital Cost:	$3,835,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$4,000,000

Estimated Construction Time frame:	3 months
Area excavated/backfilled:	2.2 acres
Area capped:	0.0 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor along the length of the SPD/ ADC drainage, and the marsh area outside the stream corridor with arsenic levels above 1,050 mg/kg would be excavated to a depth of one foot (a total excavation of approximately 4,883 cubic yards). The excavated areas would then be backfilled to the original contour. This alternative relies on natural sedimentation processes to bury marsh sediments with arsenic contamination above 32 mg/kg but below 1,050 mg/kg, and would be monitored to assure the reduction achieves the overall site goals.

Institutional controls, such as a deed notice, would be required to prevent future disruption of the recovered area.

Alternative M4: Channel Excavation, Shallow Hot Spot Removal and Thin Cover

Horseshoe Road Site Costs	
Estimated Capital Cost:	$7,355,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$7,500,000

ARC Site Costs	
Estimated Capital Cost:	$7,355,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$7,500,000

Estimated Construction Time frame:	3 months
Area excavated/backfilled:	2.2 acres

Area capped:	3.8 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor along the SPD/ADC drainage, and the marsh area outside the stream corridor containing arsenic above 1,050 mg/kg would be excavated to a depth of two feet (a total excavation of approximately 7,766 cubic yards). The excavated areas would then be backfilled to the original contour. Marsh sediments that are above 32 mg/kg of arsenic or 2 mg/kg of mercury, but below 1,050 mg/kg of arsenic would be covered with a thin cap (approximately six inches). The cap would be constructed in such a way as to allow for the re-establishment of a wetland on top of the cap.

Long-term O&M of the cap would be required. Institutional controls, such as a deed notice, would be required to prevent future disruption and to prevent disruption of the capped/covered area.

Alternative M5: Channel Excavation/Armored, Extended Shallow Removal, and Thin Cover

Horseshoe Road Site Costs	
Estimated Capital Cost:	$8,300,000
Estimated O&M Cost:	$225,850
Estimated Present Worth Cost:	$8,450,000

ARC Site Costs	
Estimated Capital Cost:	$8,300,000
Estimated O&M Cost:	$225,850
Estimated Present Worth Cost:	$8,450,000

Estimated Construction Time frame:	6 months
Area excavated/backfilled:	4.6 acres
Area capped:	3.8 acres

Under this alternative, the stream channel and all areas with arsenic contamination greater than 1,050 mg/kg would be excavated and backfilled to two feet. Marsh area with arsenic levels above 160 mg/kg, but less than 1,050 mg/kg would be excavated to a depth of one foot and backfilled to 1.5 feet (a total excavation of approximately 10,970 cubic yards). This alternative also armors the channel with stone to prevent erosion and lateral movement. Marsh sediments that are above 32 mg/kg of arsenic or 2 mg/kg of mercury, but below 160 mg/kg arsenic would be covered with a thin cap (approximately six inches). The cap would be constructed in such a way as to allow for the re-establishment of a wetland on top of the cap.

Long-term O&M of the cap and armored channel would be required. Institutional controls, such as a deed notice, would be required to prevent disruption of the capped/covered area.

Alternative M6: Channel Excavation, Extended Deep Removal and Thin Cover

Horseshoe Road Site Costs	
Estimated Capital Cost:	$9,230,000
Estimated O&M Cost:	$225,850
Estimated Present Worth Cost:	$9,300,000

ARC Site Costs	
Estimated Capital Cost:	$9,230,000
Estimated O&M Cost:	$225,850
Estimated Present Worth Cost:	$9,300,000

Estimated Construction Time frame:	6 months
Area excavated/backfilled:	4.6 acres
Area capped:	1.4 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor, along the SPD/ADC drainage, and areas outside the channel with arsenic contamination greater than 1,050 mg/kg would be dredged to a depth of 2.5 feet. Marsh areas with arsenic levels above 160 mg/kg but less than 1,050 mg/kg would be excavated to a depth of 1.5 foot (a total excavation of approximately 15,015 cubic yards). The channel would then be backfilled to the original contours. Marsh sediments that are above 32 mg/kg of arsenic or 2 mg/kg of mercury, but below 160 mg/kg arsenic would be covered with a thin cap (approximately six inches). The cap would be constructed in such a way as to allow for the re-establishment of a wetland on top of the cap.

Long-term O&M of the cap would be required. Institutional controls, such as a deed notice, would be required to prevent future disruption of the capped/covered area.

Alternative M7: Full Excavation, Restoration

Horseshoe Road Site Costs	
Estimated Capital Cost:	$10,265,000
Estimated O&M Cost:	$125,850
Estimated Present Worth Cost:	$10,350,000

ARC Site Costs
Estimated Capital Cost: $10,265,000
Estimated O&M Cost: $125,850
Estimated Present Worth Cost: $10,350,000

Estimated Construction Time frame: 6 months
Area excavated/backfilled: 6.0 acres
Area capped: 0.0 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor along the SPD/ADC drainage, and areas outside the channel with arsenic contamination greater than 160 mg/kg would be dredged to a depth of 2.5 feet. Marsh areas with arsenic levels above 32 mg/kg of arsenic or 2 mg/kg of mercury, but less than 160 mg/kg, would be excavated to a depth of one foot (a total excavation of approximately 21,145 cubic yards). The Marsh would then be backfilled to its original contour.

Institutional controls, such as a deed notice, would be required for this remedy to prevent disruption of the covered area.

COMPARATIVE ANALYSIS OF MARSH ALTERNATIVES

In selecting a remedy, EPA considered the factors set out in CERCLA §121, 42 U.S.C. §9621, by conducting a detailed analysis of the viable remedial response measures pursuant to the NCP, 40 CFR §300.430(e)(9) and OSWER Directive 9355.3-01. The detailed analysis consisted of an assessment of the individual response measure against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each response measure against the criteria.

Threshold Criteria *- The first two criteria are known as "threshold criteria" because they are the minimum requirements that each response measure must meet in order to be eligible for selection as a remedy.*

1. Overall Protection of Human Health and the Environment
Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

All alternatives except the "no action" alternative would provide adequate protection of human health and the environment by eliminating or controlling risk through removal of contaminants or engineering or institutional controls. Alternative M7 (Full Excavation) would be the most protective over the long-term because it removes the most contaminated sediments from the Marsh that could result in exposure or off-site migration of contaminants to the River.

Alternative M4 (Shallow Hot Spot Removal and Thin Cover), M5 (Extended Shallow Removal and Thin Cover), and M6 (Extended Deep Removal and Thin Cover), provide levels of protection through a combination of excavation and capping. The main difference between these three alternatives is the amount of contaminated sediment being excavated and, therefore, eliminated as a source for off-site migration. These alternatives also rely on caps or backfill to cover contaminated sediment that is left in place.

Alternatives M4, M5 and, to a lesser degree M6, rely on thin caps over the top of existing sediment. A thin cap would act through dilution by adding the clean cap material to the surface sediment to dilute the surface concentration. For alternatives that rely on thin caps to cover areas of contaminated sediment, resulting surface concentrations would be slightly higher, and the potential for disruption of the surface cover materials reduces the level of protection.

Alternatives M2 (Channel Excavation, Thin Cover and Monitored Natural Recovery) and M3 (Surficial Hot Spot Removal and Monitored Natural Recovery) rely on Monitored Natural Recovery (MNR), which depends on natural processes (burial/dilution by cleaner sediments) to address contaminants. The FS considered a range of factors in evaluating how long it might take MNR to achieve the remediation goals, and concluded that at it would take a minimum of five years (under favorable conditions), but as many as 45 years before the remediation goals would be reached in surface sediments. During this period, exposure scenarios and off-site migration of contaminants would continue much as they are today. Based on the current distribution of sediment at the sites, there is little evidence that MNR is occurring, or that implementation of the OU2 upland remedies would help the performance of MNR.

Because M1, the "No Action" alternative, is not protective of human health and the environment, it was eliminated from consideration under the remaining eight criteria.

All the remaining alternatives would require institutional controls to some degree because some contamination will be left behind. Alternatives M2 and M3 will require long-term monitoring to assure the remediation goals are achieved through MNR. Alternatives M2 through M7 would require O&M to ensure that the cover material remains protective.

2. Compliance with applicable or relevant and appropriate requirements (ARARs)

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4).

<u>Applicable requirements</u> are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. <u>Relevant and appropriate requirements</u> are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for an invoking waiver.

EPA has developed site-specific remediation goals. Alternative M7 would achieve remediation goals through excavation and backfilling. All the other alternatives would achieve the remediation goals through a combination of excavation, capping and/or MNR.

Alternatives M2 through M7 are expected to satisfy the action- and location-specific ARARs that have been identified, though compliance with ARARs that affect wetlands requires further clarification. Wetlands perform a variety of important functions, such as providing ecological habitats, spawning grounds, and assisting in flood control. The Federal Clean Water Act, Section 404, and Federal Executive Order No. 11990 protect existing wetlands, and portions of these laws are ARARs for the sites. Generally these laws seek to prevent the disruption of existing wetlands when possible; however, because preserving the existing wetland would have precluded most of the remedial technologies available for cleanup, preservation of the existing wetland was not a remedial action objective.

All the active remedial alternatives result in the disturbance of the existing wetland, to varying degrees. The whole marsh drainage area is approximately 8.2 acres, and the area that is contaminated, as defined by arsenic concentrations greater than 32 mg/kg, is 6.0 acres. Alternative M3 disturbs the smallest area within the wetland, (2.2 acres) followed by Alternative M2 (4.6 acres). The remaining four alternatives disturb 6.0 acres of wetland. While each alternative assumes that any disturbed wetlands would be restored, from the point-of-view of wetlands disruption alone, Alternative M3 is preferable because it leaves the majority of the Marsh untouched.

Several of the remedial alternatives result in altering the land surface or surface water flows within the Marsh in subtle but potentially important ways. Alternatives M4, M5 and M6 all rely on thin layer capping, which would raise the land surface over portions of the Marsh to limit access to contaminated sediments below the cap. Raising the land surface can result in increasing surface water flows through the Marsh, or in creating areas that are wetter or drier than pre-remedy conditions; these changes can result in adverse affects in the wetland.

Alternatives M2 and M5 rely on an "armored channel" to prevent the movement of the ADC/SPD drainage channel from its current position. This drainage channel is a slightly deeper preferential pathway for water-flow through the Marsh, and it is the area of highest sediment contamination. Because the meandering channel could expose contaminated sediments that are currently buried, armoring (lining the channel with stone) prevents the channel from meandering in the future. An armored channel has a potential adverse affect on the wetland, because during low flow periods, when the much of the surface water would be found in the channel itself, the armored channel has the potential to "hurry" surface water out of the Marsh, further drying it out.

Capping and armoring the channel cause relatively small changes in how the Marsh functions, and engineering techniques are available that minimize adverse affects from these changes. But even small changes may warrant a "mitigation" under the Clean Water Act, in the form of some kind of further restoration elsewhere to compensate for a localized disruption of wetland function. Of the six active alternatives, only Alternatives M3 and M7 leave the contours of the Marsh unchanged, and are, therefore, neutral with regard to affects on the wetland.

Based upon the available documentation regarding the source of contamination, and sediment testing, EPA has concluded that the marsh sediments are neither listed hazardous waste or exhibit hazardous characteristics, and therefore do not require treatment to meet RCRA Land Disposal Restrictions.

Primary Balancing Criteria *- The next five criteria, criteria 3 through 7, are known as "primary balancing criteria". These criteria are factors with which tradeoffs between response measures are assessed so that the best option will be chosen, given site-specific data and conditions.*

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3. Long-term effectiveness and permanence

A similar degree of long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls.

Long-term effectiveness and permanence would be achieved by all the active alternatives to varying degrees. Alternative M7 (complete removal) would achieve the highest level of long-term effectiveness and permanence because the most contaminated sediments would be permanently removed from the Marsh. The remaining Alternatives (M2 through M6) would leave behind contaminated sediment that would need to be managed in place. With these alternatives there is the possibility that the cover could be breached by a large storm event, dredging, or some other disruption. Alternatives M6 through M4 would rely entirely on clean cover material to prevent exposures to the contaminated sediment that remains, M6 excavating the most contaminated sediment and consequently providing the most cover to the remaining contamination. M5 and M4 leave behind progressively more contaminated sediment, and therefore, achieve a slightly lower level of permanence. Alternatives M3 and M2 each rely to some degree on MNR to address the lower level contamination, which assumes that with time the contaminated surface sediments would eventually be covered with clean sediments through the natural sedimentation processes. Monitoring would be required to determine if these processes are achieving the remediation goals in a reasonable timeframe. EPA would consider M3 and M2 less reliable when considering long-term effectiveness and permanence.

Alternatives M2 and M5 armor the channel to prevent the channel from migrating and eroding out the deeper sediments in adjacent areas. The armored channel minimizes the potential for the channel to meander and expose currently buried contaminants, and so would add to the long-term permanence of these alternatives.

4. Reduction of toxicity, mobility, or volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

None of the alternatives treat contaminated sediments. Alternative M7 would provide the greatest reduction of contaminant mass at the sites, but does not rely on treatment.

5. Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

All the active alternatives involve at least some excavation and thus present a potential for minor short-term challenges. Alternative M2 requires the least excavation and presents the lowest short-term difficulties to the community or site workers, with M3 only slightly more difficult. Alternatives M4, M5, M6 and M7 would pose greater challenges in the short term compared to Alternatives M2 and M3 because larger and deeper excavations would pose an increased risk of short term exposure as well as increased materials handling. However, proper health and safety measures can mitigate these risks.

The risk of release during remedy implementation is principally limited to wind-blown transport or surface water runoff. This is expected to be minimal based on the high moisture content of the sediments. Any potential environmental impacts associated with dust and runoff would be minimized with proper installation and implementation of dust and erosion control measures. In the event of a catastrophic storm that occurred during the implementation phase of one of the active alternatives, the risk of additional sediment releases would increase over the current conditions, because vegetation that currently minimizes sediment movement would be removed; however, there is little difference in the implementation time from the shortest (three months) to the longest (six months), so no alternative is substantially more favorable from this standpoint.

Implementation times of the remedial alternatives are as follows: M2 and M3 would require three months to construct and a minimum of five years, but as many as 45 years, to reach the remediation goals for surface sediments; M4 would require three months, and M5/M6/M7, six months to implement, and the remediation goals would be achieved at that time.

6. Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Although all of the alternatives are technically and administratively implementable, because they all utilize standard construction equipment and services, and require similar permit equivalencies, it is unclear whether natural recovery would be effective in achieving the remediation goals in a reasonable timeframe, if at all. Natural recovery is a type of remedy that EPA can consider if natural processes appear likely to achieve goals for a site, or part of a site, in a timeframe that is similar to other active remedies. Using favorable assumptions about sediment rates, the FS report predicts the MNR portion of Alternatives M2 and M3 could achieve remediation goals within five years. All of the other remedial alternatives achieve the remediation goals for the Marsh within the first year after implementation and while these implementation times are not similar, a five-year implementation time is still considered reasonable. The FS also considered less favorable sedimentation rates and calculated timeframes as long as 45 years to reach remediation goals, a timeframe that is clearly unacceptable. This broad range (five years to 45 years) suggests a level of uncertainty about whether MNR can be relied upon to achieve the remediation goals.

EPA considers Alternatives M2 and M3 to be questionable for overall implementability.

7. Cost

Includes estimated capital and O&M costs, and net present worth value of capital and O&M costs.

As discussed above, cost estimates were developed jointly for the two sites without regard to the relative cost contribution of each site and, therefore, costs are divided equally between the sites. EPA has not attempted to assess the actual contribution of each site to marsh contamination. Actual allocations will be done at a future date when more information is available. Summing the per-site costs for each alternative provides the total cost for each alternative.

For the Horseshoe Road site, the estimated present worth costs of Alternatives M2, M3, M4, M5, M6 and M7 are $3.7 million, $4.0 million, $7.5 million, $8.45 million, $9.3 million and $10.35 million, respectively.

For the Atlantic Resources site, the estimated present worth costs of Alternatives M2, M3, M4, M5, M6 and M7 are $3.7 million, $4.0 million, $7.5 million, $8.45 million, $9.3 million and $10.35 million respectively.

Excavation and off-site disposal of contaminated sediments is the primary cost variable across the remedial alternatives, M2 (1,291 cubic yards) excavating the smallest quantity and M7 (21,145 cubic yards) the largest. The difference in cost between M2 or M3 and the remaining alternatives is substantial, whereas the costs of Alternative M4 through M7 are generally comparable.

O&M costs for Alternatives M2, M3 and M4 are the highest, because they rely primarily on capping or MNR, and require additional on-site management to assure protectiveness or, in the case of MNR, monitoring to assure that the remedy is reaching the remedial goals for the Marsh. Alternative M7 has the lowest O&M cost, because it leaves only inaccessible deeper sediments in place at the conclusion of the remedial action, and monitoring for that alternative focuses primarily on assuring that the wetland is restored.

The potential for remedy failure (e.g., a substantial disruption of a cap following a catastrophic storm event) to a degree that would require a second cleanup effort to restore damage to a remedy is not accounted for in the estimated costs of any of the alternatives.

When comparing the cost of each of these alternatives, it is apparent that what is achieved by the increase in cost from M2 to M7 is a decreased potential for remedy failure. For the Marsh, one must consider that a failure here may compromise the down-gradient river remedy. Alternatives M2 and M3 are unproven, and may require implementation of another alternative should they fail to perform as expected. Alternatives M4 through M7 progressively depend on more excavation and less thin capping. The result is a more robust remedy. M7 leaves very little contaminated sediment on site and covers it with a very thick layer of backfill, and even a major storm event would have very little chance of exposing buried contamination. At the other end of the spectrum is M4, which relies completely on a thin-layer cap to address arsenic contamination at concentrations up to 1,050 mg/kg. In the case of Alternative M4, the potential for failure during a storm or disruption from human activity is much greater.

Modifying Criteria - *The final two evaluation criteria, criteria 8 and 9, are called "modifying criteria" because new information or comments from the state or the community on the Proposed Plan may modify the preferred response measure or cause another response measure to be considered.*

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8. State acceptance

Indicates whether based on its review of the RI/FS reports and the Proposed Plan, the state supports, opposes, and/or has identified any reservations with the selected response measure.

The State of New Jersey concurs with EPA's preferred alternative in this Record of Decision; however, it should be noted that the selected remedy does not address primary and compensatory restoration of natural resources.

9. Community acceptance

Summarizes the public's general response to the response measures described in the Proposed Plan and the RI/FS reports. This assessment includes determining which of the response measures the community supports, opposes, and/or has reservations about.

EPA solicited input from the community on the remedial response measures proposed for the sites. Oral comments were recorded from attendees of the public meeting. Written comments were received from the EWA, and a group of Potentially Responsible Parties (PRPs). The primary areas of concern for both EWA and the PRPs were the remediation goals for contaminated sediments and whether the depths of the sediment excavations considered in the Proposed Plan were appropriate to the sites. EWA expressed concerns that EPA had not been sufficiently protective in selecting remediation goals and that the depths of removal were insufficient, and the PRPs indicated that EPA had been overly conservative in assessing the ecological risks and potential for off-site transport of contaminated sediments, such that the preferred remedial alternative was unnecessarily conservative and expensive. Appendix V, The Responsiveness Summary, addresses all the comments received both oral and written.

DESCRIPTION OF RIVER ALTERNATIVES

Using the Remediation Goals of 100 mg/kg for arsenic and 2.0 mg/kg for mercury in river sediments, the FS targeted an area (marked on Appendix I, Figure 3) for remediation. Given the difficulties of collecting reproducible data in river sediments and the potential for multiple point sources for the COCs in the River, EPA expects to limit its River response to the mudflat areas identified in Appendix I, Figure 3, a depositional zone that is clearly affected by the sites.

As with the marsh sediments, the FS used zones defined by the Remediation Goals but divides the river sediments into additional zones, to assess a wider variety of response actions. In addition to areas defined by the Remediation Goals, river sediments were further divided into an area that exceeds 194 mg/kg for arsenic and 2.6 mg/kg for mercury. These values are based on the amphipod bioassay performed as part of the BERA. This area is considered more critical, and contains most of the contaminant mass. The second zone is characterized by sediments that are less than 194 mg/kg of arsenic but exceed the Remediation Goals. As with the Marsh alternatives, the river alternatives presented in the FS address these zones to varying degrees as described in the summary of remedial alternatives below.

Common Elements

Many of the alternatives include common components. The FS assumes that the OU2 remedies and Marsh remedies will eliminate these areas as ongoing sources of contamination to river sediments. It is expected that these other remedies would be performed before, or at least concurrently with the active remedial alternatives evaluated below.

Because the COCs (arsenic, mercury and PCBs) are commonly found in sediments of the Raritan River Estuary, and because only a small portion of the sediment contamination in the Estuary can be reasonably attributed to the sites, the remedial actions contemplated for the River are limited to addressing a hotspot that is clearly attributable to the sites. EPA expects that the area targeted for remediation will be recontaminated to at least the background levels found throughout the Estuary. Post-remedy sediment monitoring in the River would be needed to assess whether actions taken to address this hotspot have been effective, and whether the Marsh remedy was effective at eliminating the Marsh as a continuing source to the River.

Five-year reviews will be conducted. In addition, EPA will identify institutional controls to prevent disruption of the remedy. Institutional controls may include a Restricted Navigation Area or other similar control that would limit activities in the River that could disturb subaqueous capped areas.

Please refer to Appendix I, Figure 5 for a simplified depiction of each river alternative.

Alternative R1: No Action

Estimated Capital Cost:	$0
Estimated (O&M) Cost:	$0
Estimated Present Worth Cost:	$0

Estimated Construction Time frame:	None
Area dredged:	0.0 acres
Area Backfilled :	0.0 acres
Area capped:	0.0 acres

Regulations governing the Superfund program expect that the "no action" alternative will be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no further action in the River to prevent exposure to sediment contamination, or to prevent the further migration of site contamination from the hotspot area. Institutional controls, such as a deed notice, would not be implemented to limit access to this area. Engineering controls would not be implemented to prevent site access or exposure to site contaminants.

Alternative R2: Monitored Natural Recovery

Horseshoe Road Site Costs

Estimated Capital Cost:	$120,000
Estimated O&M Cost:	$410,000
Estimated Present Worth Cost:	$335,000

ARC Site Costs

Estimated Capital Cost:	$120,000
Estimated O&M Cost:	$410,000

Estimated Present Worth Cost: $335,000

Estimated Construction Time frame: 0 months
Area dredged: 0.0 acres
Area requiring cover: 0.0 acres

This alternative relies on natural processes in the River, such as dilution and deposition of cleaner sediments at the surface, to reduce exposures to human and ecological receptors. This alternative is similar to Alternative R1 with the exception that there would be monitoring performed to determine the rate of recovery.

Institutional controls would be required to prevent disruption of the recovered area.

Alternative R3: Shallow Dredge and Thin Cover

Horseshoe Road Costs
Estimated Capital Cost: $1,310,000
Estimated O&M Cost: $410,000
Estimated Present Worth Cost: $1,400,000

ARC Costs
Estimated Capital Cost: $1,310,000
Estimated O&M Cost: $410,000
Estimated Present Worth Cost: $1,400,000

Estimated Construction Time frame: 1-2 months
Area dredged: 0.8 acre
Area requiring cover: 2.5 acres

Under this alternative, approximately 1,290 cubic yards of sediment in the River that exceed 194 mg/kg arsenic and 2.6 mg/kg mercury would be dredged to a depth of approximately one foot, and clean material would be used as backfill to restore the dredged area to the original contour. The remaining sediments within the area targeted for remediation would be covered with a thin sand layer (approximately six inches) that would both dilute contaminant concentrations at the surface and act as a cap on the more contaminated sediment below.

This alternative would require monitoring to ensure that the cover material remains in place and is functioning as expected. Institutional controls would be required to prevent disruption of the capped sediments.

Alternative R4: Extended Shallow Dredge and Cover

Horseshoe Road Site Costs

Estimated Capital Cost:	$2,745,000
Estimated O&M Cost:	$410,000
Estimated Present Worth Cost:	$2,800,000

ARC Site Costs

Estimated Capital Cost:	$2,745,000
Estimated O&M Cost:	$410,000
Estimated Present Worth Cost:	$2,800,000

Estimated Construction Time frame:	1-2 Months
Area dredged:	2.5 acres
Area requiring cover:	2.5 acres

Under this alternative, approximately 4,030 cubic yards of sediment within the area targeted for remediation (arsenic greater than 100 mg/kg or mercury greater than 2mg/kg) would be dredged to a depth of approximately one foot, and clean material would be used to restore the dredged area to the original contour.

This alternative would require monitoring to ensure that the cover material remains in place and is functioning as expected. Institutional controls would be required to prevent disruption of the capped sediments.

Alternative R5: Deep Dredge and Natural Resedimentation

Horseshoe Road Site Costs

Estimated Capital Cost:	$5,335,000
Estimated O&M Cost:	$410,000
Estimated Present Worth Cost:	$5,450,000

ARC Site Costs

Estimated Capital Cost:	$5,335,000
Estimated O&M Cost:	$410,000
Estimated Present Worth Cost:	$5,450,000

Estimated Construction Time frame:	3-4 months
Area dredged:	2.5 acres
Area requiring cover:	0.0 acres

Under this alternative, approximately 14,120 cubic yards of sediment within the area targeted for remediation (arsenic greater than 100 mg/kg or mercury greater than 2 mg/kg) would be dredged to a depth of approximately 3.5 feet, but no cover material would be placed in the dredged area. The depth of dredging would be determined by the extent of contaminated sediments in excess of the Remediation Goals, but would not be deeper than 3.5 feet. Based upon the available sampling data, this dredging effort would be expected to remove most, but possibly not all the sediments in the target area that exceed the remediation goals; additional sediment sampling would be required to determine if this is the case. Natural sedimentation would be expected to fill in the dredged area over time, providing a layer of cover over any residual sediment contamination that might exist beneath the area dredged.

This alternative may require monitoring if contaminated sediment is left behind to ensure that natural sedimentation covers any remaining contaminated sediment in order to achieve the Remediation Goals. Under this alternative, if contamination will be left behind at depth, institutional controls would be required to prevent disruption of the sediments buried by natural sedimentation.

Alternative R6: Deep Dredge and Cover

Horseshoe Road Site Costs	
Estimated Capital Cost:	$6,710,000
Estimated O&M Cost:	$45,000
Estimated Present Worth Cost:	$6,750,000
ARC Site Costs	
Estimated Capital Cost:	$6,710,000
Estimated O&M Cost:	$45,000
Estimated Present Worth Cost:	$6,750,000
Estimated Construction Time frame:	3-4 months
Area dredged:	2.5 acres
Area requiring cover:	2.5 acres

Under this alternative, approximately 14,120 cubic yards of sediment within the area targeted for remediation (arsenic greater than 100 mg/kg or mercury greater than 2 mg/kg) would be dredged to a depth of approximately 3.5 feet, and 3.5 feet of clean material would be used to restore the dredged area to its original contour. The depth of dredging would be determined by the extent of contaminated sediments in excess of the Remediation Goals, but would not be deeper than 3.5 feet.

This alternative would require monitoring so that the cover material is not disturbed, though variations in the thickness of the cover as a result of natural events (severe weather, ice scour) is expected, and would not affect the protectiveness of the cover. Under this alternative, EPA will need to evaluate whether contamination will be left behind, in order to determine if institutional controls would be required to prevent disruption of the covered sediments.

COMPARATIVE ANALYSIS OF RIVER ALTERNATIVES

1. Overall Protection of Human Health and the Environment

Alternatives R3, R4, R5 and R6 provide varying levels of protection of human health and the environment through combinations of dredging, covering, institutional controls, and monitoring. The "no action" alternative and Alternative R2 (Monitored Natural Recovery) take no action to reduce the potential for direct contact exposure or the potential for the hotspot area to be a continuing source of contamination to the River, and neither of these alternatives appear to satisfy the remedial action objectives for river sediments. While natural sedimentation and dilution may eventually reduce the surface sediment concentrations somewhat, the timeframes for this recovery may be quite long. In the FS, MNR was modeled to take as little as three years and as long as 65 years; however, there is only marginal evidence of natural recovery to date. The site sources that would have provided a continuing source of contaminated sediments during facility operations appear to have substantially diminished, and the facilities have not operated for over 20 years; yet, this diminished sediment loading has not appeared in the surface sediment concentrations as "recovery" (a clear pattern of reduced concentrations). In addition, because most of the area targeted for remediation is in a depositional zone of the River and is currently a mudflat at low tide, it is very difficult for new, cleaner sediment to deposit on the surface, unless the more highly contaminated sediments are first removed, and if the highly contaminated sediments are removed through the natural redistribution of sediments throughout the River, it would not satisfy the remedial action objectives.

Alternatives R6 (Deep Dredge and Cover) and R5 (Deep Dredge and MNR) provide the largest mass reduction, one method of evaluating environmental protection. Alternatives R3 (Shallow Dredge and Thin Cover) and R4 (Extended Shallow Dredge and Cover) also remove a portion of the most highly contaminated and accessible sediments (those at the surface) but rely more heavily on cover material to manage deeper sediments. Alternatives R3 through R6 rely on covering contaminated sediments left in place, to varying degrees. Alternative R3 may offer a slightly lesser degree of protectiveness than the others, because a thin-layer cover is expected to mix and dilute with contaminated bottom sediments, and the resulting surface sediment concentrations may be slightly higher than for the other active alternatives.

Long-term maintenance and monitoring would be required to ensure that cover material remains in place, and efforts made to assure that the cover material is not disturbed, through the designation of a Restricted Navigation Area, (RNA) or similar control.

Because Alternative R1, the "No Action" alternative, and Alternative R2 (MNR) do not satisfy the remedial action objectives for the river sediments, they were eliminated from consideration under the remaining eight criteria.

2. **Compliance with ARARs**

Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements of federal and state law or provide grounds for invoking a waiver of those requirements. There are no chemical-specific ARARs for the contaminated river sediments. The Remediation Goals are risk-based. Alternative R6 would address the Remediation Goals through dredging and backfilling, and the other alternatives would achieve the Remediation Goals by dredging and capping. The active remedial alternatives would comply with action-specific ARARs and location-specific ARARs that regulate dredging, filling, and discharge into wetlands and floodplains. A complete list of ARARs/TBCs may be found in the FFS and in Appendix II, Table 10 of this ROD.

Based upon the available documentation regarding the source of contamination and sediment testing, EPA has concluded that the river sediments are neither listed hazardous waste or exhibit hazardous characteristics, and therefore do not require treatment to meet RCRA Land Disposal Restrictions prior to disposal in a RCRA-compliant unit.

3. **Long-term Effectiveness and Permanence**

Long-term effectiveness and permanence would be achieved by Alternatives R3, R4, R5, and R6, to varying degrees. Alternatives R6 (Deep Dredge and Cover) would achieve the highest level of long-term effectiveness and permanence because the largest mass of contaminated sediment would be permanently removed from the River and the thickest layer of cover material would be put in place. Alternative R5 could be considered slightly less effective because it relies on natural processes to cover any residual contamination that may remain; however, after sediment dredging to 3.5 feet, the dredged area would be expected to create a local depositional environment that would accumulate sediment at a higher rate than the surrounding areas, providing cover material relatively rapidly.

Alternatives R3 (Shallow Dredge and Thin Cover) and R4 (Extended Shallow Dredge and Cover) provide long-term effectiveness and permanence by dredging the most highly contaminated and accessible sediments at the surface, and placing a sediment cap over residual contaminated sediment; these sediment caps need to be monitored to assure that they will remain in place. Alternative R4 would be considered more reliable over the long-term compared to Alternative R3, because the thin sand cover of Alternative R3 is placed on top of existing sediments and is more prone to the natural redistribution of river-bottom sediments (some portion of the cap material would be washed away), whereas cover material for Alternative R4 is placed after dredging, and the river bottom is essentially unchanged. In addition, the one foot of cover material in Alternative R4 would have little mixing and dilution of surface sediments, whereas the six-inch sand cover in Alternative R3 relies, at least partially, on mixing and dilution of the surface sediment concentrations, and the resulting surface sediment concentrations would be higher.

Alternatives R3 and R4 are more at risk of failure from sediment disturbance than are Alternatives R5 or R6, which incorporate a thicker cover layer. The most likely causes of sediment disturbance would be human activities (such as boating or dredging) or ice scour during the winter months. The capped area in the River would be designated as a Restricted Navigation Area (RNA) where anchoring would not be allowed, and access would be restricted. The RNA would also be marked on navigational charts. Alternatives R3 and R4 rely heavily on an RNA, and on the limited accessibility of this area to larger water craft to prevent damage to a capped area, while alternatives R5 and R6 would rely more on deeper contamination removal and cover to prevent failure. While preventative measures can be put in place to prevent human disturbance of this area, the only measure to address ice scour would be deeper removal and cover as provided in alternatives R5 and R6. In the case of R5 however, the time required for the natural sedimentary processes to fill in the excavated area is uncertain and, therefore, it is unclear when the remedy would become fully protective.

For any of the remedial alternatives considered, background sediment contamination present throughout the Raritan River Estuary will result in the some recontamination of surface sediments over the long term.

4. **Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment**

None of the alternatives involve treatment of the contaminated sediments. Alternatives R6 and R5 remove the most contaminated mass from the River, and therefore do reduce the most volume. However, treatment is not involved and these alternatives do not do more than the other alternatives to satisfy EPA's preference for treatment of wastes.

5. **Short-term Effectiveness**

All of the alternatives would be effective over the short term. Alternatives R3 through R6 involve at least some dredging and thus present minor short-term challenges. The risk of release during remedy implementation is principally limited to resuspension of sediments in the River, and to wind-blown transport or surface water runoff from stock piles. All potential environmental impacts associated with resuspension, dust and runoff can be minimized with proper engineering controls.

Risk to workers posed by normal dredging and materials-handling should be minimal and proper health and safety measures should mitigate this risk.

For the remaining alternatives with the exception of Alternative R5 (Deep Dredge and Natural Resedimentation), once the construction phase is complete, the remedy will be fully effective. The implementation time for Alternatives R3 and R4 is about two months, while Alternative R6 would require four months. Alternative R5 would require about four months to construct and at least 30 months before sedimentation would cover the sediments to a depth that is protective, resulting in an implementation time of about three years.

6. **Implementability**

Alternatives R3 through R6 are technically and administratively implementable, because they all utilize standard construction equipment and services, and require similar permit equivalencies.

7. **Cost**

As discussed above, cost estimates were developed jointly for the two sites without regard to the relative cost contribution of each site and, therefore, costs are divided equally between the sites. EPA has not attempted to assess the actual contribution of each site to river contamination. Actual allocations will be done at a future date when more information is available.

For the Horseshoe Road site, the estimated present worth costs of Alternatives R2, R3, R4, R5, and R6 are $0.34 million, $1.4 million, $2.8 million, $5.45 million, and $6.75 million, respectively.

For the ARC site, the estimated present worth costs of Alternatives R2, R3, R4, R5, and R6 are $0.34 million, $1.4 million, $2.8 million, $5.45 million, and $6.75 million, respectively.

Dredging and off-site disposal of contaminated sediments is the primary cost variable across the remedial alternatives, with Alternative R3 dredging the least (1,290 cubic yards) and Alternatives R5 and R6 dredging the most (14,117 cubic yards). The long-term monitoring costs for alternatives R2 through R5 are higher, because they rely primarily on covering or MNR, and require additional on-site management to assure protectiveness or, in the case of MNR, monitoring to assure that the remedy is reaching the remedial goals for the River. Alternative R6 has the lowest long term monitoring cost, because it leaves only inaccessible deeper sediments in place at the conclusion of the remedial action. The potential for remedy failure (e.g., a substantial disruption of a cap following a catastrophic storm event) to a degree that would require a second cleanup effort to restore damage to a remedy is not accounted for in the estimated costs.

8. State acceptance

The State of New Jersey concurs with EPA's preferred alternatives in this Record of Decision; however, it should be noted that the Selected Remedy does not address primary and compensatory restoration of natural resources, which is normally addressed by the state and federal natural resource trustees and not subject to CERCLA.

9. Community acceptance

EPA solicited input from the community on the remedial response measures proposed for the sites. Oral comments were recorded from attendees of the public meeting. Written comments were received from the EWA, and a group of PRPs. As with the marsh sediments, the primary areas of concern for both EWA and the PRPs were the remediation goals for contaminated sediments and whether the depths of the sediment dredging considered in the Proposed Plan were appropriate to the sites. As with the marsh sediments, EWA was concerned that EPA had not been sufficiently protective for the River, and the PRPs indicated that EPA had been overly conservative. Appendix V, The Responsiveness Summary, addresses all the comments received both oral and written.

PRINCIPAL THREAT WASTE

Contaminants in surface soils on both the Horseshoe Road and ARC sites have been identified as "principal threat wastes" because these contaminants have demonstrated a potential for migrating to the groundwater; no principal threat wastes have been identified in the sediments in the Marsh or the River.

SELECTED REMEDY

Based upon consideration of the results of the site investigation, the requirements of CERCLA, the detailed analysis of the response measures, and public comments, EPA has determined that Marsh Alternative M7, Full Excavation, Restoration, and River Alternative R6, Deep Dredge and Cover, satisfy the requirements of CERCLA §121 and the NCP's nine evaluation criteria for remedial alternatives, 40 CFR §300.430(e)(9). Alternatives M7 and R6 are comprised of the following components.

- Excavation, transportation and disposal of approximately 21,000 cubic yards of contaminated sediments from the Horseshoe/ARC Marsh;
- Dredging an estimated 14,000 cubic yards of contaminated sediments from the Raritan River;
- Dewatering and off-site disposal of excavated/dredged sediments in an appropriate land disposal facility;
- Backfilling and grading of all excavated marsh areas with clean cover material to allow for reestablishment of wetland habitat;
- Filling of the dredged river area with clean cover material that will support the reestablishment of a benthic community in surface sediments;
- Institutional controls in the Marsh, such as a deed notice or covenant, to prevent exposure to residual soils that may

exceed levels that would allow for unrestricted use that may remain at the completion of the remedial action;

- Institutional controls for the river sediments such as a restricted navigation area, to prevent disruption of cover in the event contaminated sediments are left at depth;

- On-site restoration of approximately six acres of wetlands disturbed during implementation of the remedy.

The selected sediment alternative for the Marsh was selected over other alternatives because it is expected to achieve substantial and long-term risk reduction through off-site disposal, and is expected to allow the property to be used for the reasonably anticipated future land use, which is open space/wetland. The selected Marsh remedy reduces the risk within a reasonable time frame, at a cost comparable to other alternatives and is reliable over the long term. Although M7 and M6 are very similar in most respects, M7 was chosen because it removes a higher mass of contaminants at only slightly higher cost than M6. Since the selected remedy would achieve the remediation goals that are protective for the current expected human exposure scenarios (recreational land use), but are not expected to achieve levels that would allow for unrestricted use, institutional controls, such as a deed notice or covenant, may be needed to prevent a change in land use.

As described under "Summary of Site Characteristics," above, EPA concluded that groundwater transport of contaminants from upland soils was highly unlikely, and that deeper sediments are "stable." EPA's National Remedy Review Board recommended that the Region further evaluate whether the groundwater interaction between shallow and deep sediments within the Marsh is adequately understood, and whether any contaminated sediments that are left in place at depth might recontaminate newly placed fill to levels that would not be protective, through remobilization and transport of deeper sediment contamination. Studies during the remedial design for the selected Marsh remedy will further clarify this issue.

The River portion of the selected remedy was selected over the other alternatives because it is expected to achieve substantial and long-term risk reduction through off-site disposal of dredged sediments, reducing contaminant levels in the River, and reducing the mudflat area as a source of contamination to the River. The selected remedy reduces the risk within a reasonable timeframe, at a reasonable value for the money spent, and provides for long-term reliability of the remedy.

The depth of River dredging required by the Selected Remedy will be determined by the extent of contaminated sediments in excess of the Remediation Goals, but will not be deeper than 3.5 feet. Based upon available sampling data, this dredging action will remove most, but possibly not all the sediments that exceed the Remediation Goals; however, additional sediment sampling will be required to determine if this is the case. If contaminated sediments are left behind, the 3.5 feet of cover material will provide a sufficient barrier to natural events, such as severe storms or ice scour, and natural variations in the thickness of this cover are not expected to compromise the protectiveness of the cover. To the degree that institutional controls are required, it is to prevent human disruption of the cover. Although Alternative R4 and, to a lesser amount Alternative R3 would provide protectiveness at the surface to a degree that would be similar to R6, EPA believes that the additional long-term effectiveness and permanence in a river setting, where conditions cannot be as easily controlled as on land, justifies the additional cost of removing a larger quantity of contaminated sediments.

EPA expects that at least some sediments deeper than 42 inches are contaminated at concentrations greater than the remediation goals, and these sediments will be left in place; therefore, EPA also believes that the placement of cover over the dredged area, as called for in Alternative R6 but not in Alternative R5, provides a more reliable and effective remediation approach that reaches the remedial action objectives sooner, with no uncertainty about the when, or to what the degree the Remediation Goals are met at the surface. EPA's National Remedy Review Board, in reviewing Region 2's remedial plans for OU3, recommended that the Region consider a middle path between Alternatives R5 and R6. The Board recommended that some minimal backfilling of the dredged area might take place in the River to assure the isolation of deeper sediments, but natural sedimentary processes in the River might be relied upon to fill in the remainder. EPA expects that this approach would eliminate the short term exposure concerns that might be posed by Alternative R5, thus providing a cost savings while achieving an equivalent level of protectiveness to the original Alternative R6. EPA will evaluate the amount of backfill needed during the remedial design for OU3.

With regard to the long-term surface sediment conditions, EPA expects that areas of the River remediated during OU3 will be recontaminated to levels similar to the reference values identified in Appendix II, Table 2.

STATUTORY DETERMINATIONS

As was previously noted, CERCLA § 121(b)(1) mandates that a remedial action must be protective of human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity or mobility of the hazardous substances, pollutants, or contaminants at a site. CERCLA § 121(d) further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA § 121(d)(4).

Protection of Human Health and the Environment

The Selected Remedies, Marsh Alternative M7 coupled with River Alternative R6, will be protective of human health and the environment through the removal of contaminated sediments from the sites that are both contact hazards and contribute to environmental impacts both in the Marsh and River. In addition, the implementation of institutional controls will prevent future exposure to contaminated sediment. Monitoring will further ensure that contaminated sediments that remain on site will not impact human health and the environment.

Compliance with ARARs

The Marsh sediment and River sediment remedial actions will comply with all federal and state requirements that are applicable or relevant and appropriate (ARAR) to their implementation. A comprehensive ARAR discussion is included in the FFS and a complete listing of ARARs is included in Table 10 of this ROD.

Chemical-Specific ARARs There are no chemical-specific ARARs for the contaminated Marsh or River sediments.

Action-Specific ARARs Based upon the available documentation regarding the source of contamination and sediment testing, EPA has concluded that the Marsh and River sediments are neither listed hazardous waste or exhibit hazardous characteristics, and therefore do not require treatment to meet RCRA Land Disposal Restrictions prior to disposal in a RCRA-compliant unit.

EPA has not identified PCB contamination within OU3 at levels high enough to trigger the PCB management requirements of the Toxic Substances Control Act (TSCA). In the event that PCB contamination is found during design sampling at levels high enough to trigger such requirements, EPA will delineate the wastes in place and manage them in accordance with 40 CFR Part 761.

Action-specific ARARs will be achieved by conducting remedial action activities in accordance with OSHA, RCRA, New Jersey hazardous waste regulations, New Jersey Soil Erosion and Sediment Control Act regulations,

Federal Surface Water Quality Criteria and State Water Surface Water Quality Standards will be included in the design specifications to ensure compliance with the Clean Water Act (CWA) and State Water Pollution Control Act during the implementation of the River remedial action. In assessing the affects of sediment dredging on water quality, EPA has concluded that there will be no long-term exceedences of the Federal criteria or State standards resulting from the remedy and, given the small size of the dredging action relative to size of the River, the short-term affects will be inconsequential. In performing the remedial action, EPA will comply with the substantive requirements of New Jersey regulations that govern the management and regulation of dredging activities, which require best practices to minimize the release of sediment contamination into the water column..

Location-Specific ARARs Location-specific ARARs will be achieved by conducting remedial action activities in accordance with the National Environmental Policy Act, specifically with regard to carrying out Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands), and New Jersey statutes governing floodplains and protection of wetlands.

River remedial actions involving the management of contaminated sediments will be conducted in accordance with the Rivers and Harbors Act, Section 10 regulations, and NJDEP sediment dredging regulations.

Endangered Species Act (16 U.S.C. 1531) requirements for the protection of federally listed threatened and endangered species and their habitat will be met.

Since the Raritan Estuary is located within a coastal management zone, and since the Marsh and River remedial actions may affect a coastal use or resource, the federal Coastal Zone Management Act requires that the remedy be undertaken in a manner consistent, to the maximum extent practicable, with New Jersey's Coastal Management Program. It is expected that the requirement will be satisfied by the Selected Remedy for the sites.

Cost Effectiveness

In the lead agency's judgment, the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)). EPA evaluated the "overall effectiveness" of those alternatives that satisfied the threshold criteria (*i.e.*, were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. EPA considered whether the overall effectiveness of Alternatives M7 and R6 were substantially greater than the remedial alternatives that rely more heavily on containment, with estimated present worth costs for each site in the range of $7.5 million to $8.5 million for Marsh alternatives and $1.4 million to $2.8 million for River alternatives. The relationship of the overall effectiveness of these remedial alternatives were determined to be proportional to their costs and hence, these alternatives represent a reasonable value for the money to be spent.

For the Horseshoe Road site: The estimated present worth cost of Alternative M7 (Full Excavation, Restoration) is $10.4 million and Alternative R6 (Deep Dredge and Cover) is $6.8 million.

For the ARC site: The estimated present worth cost of Alternative M7 (Full Excavation, Restoration) is $10.4 million and Alternative R6 (Deep Dredge and Cover) is $6.8 million.

For a detailed cost summary of Alternatives M7 and R6, see Appendix II, Table 11, of this document.

Utilization of Permanent Solutions and Alternative Treatment Technologies

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the sites. Of those alternatives that are protective of human health and the environment and comply with ARARs to the extent practicable, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element, the bias against off-site treatment and disposal, and State and community acceptance.

The Selected Remedy will provide adequate long-term control of risks to human health and the environment through excavation and off-site disposal of contaminated marsh sediments, dredging, dewatering and off-site disposal of river sediments, and institutional controls. The Selected Remedy does not present short-term risks different from the other alternatives. There are no special implementability issues since the remedy employs standard technologies.

Preference for Treatment as a Principal Element

The Selected Remedy will not meet the statutory preference for the use of remedies that involve treatment as a principal element. The FS did not identify viable technologies for addressing the media of concern that included treatment.

Five-Year Review Requirements

This remedy is expected to result in hazardous substances, pollutants, or contaminants remaining on the Horseshoe Road and ARC sites above levels that may allow for unlimited use and unrestricted exposure. Pursuant to Section 121(c) of CERCLA, a statutory review will be conducted within five years of the initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Horseshoe Road and ARC sites was released for public comment on July 21, 2008. The comment period closed on August 20, 2008.

The Proposed Plan identified Alternative M7, Full Excavation, Restoration, and Alternative R6 Deep Dredge and Cover as EPA's selected alternatives. EPA reviewed all written and verbal comments submitted during the public comment period. The comments received were documented in the Responsiveness Summary.

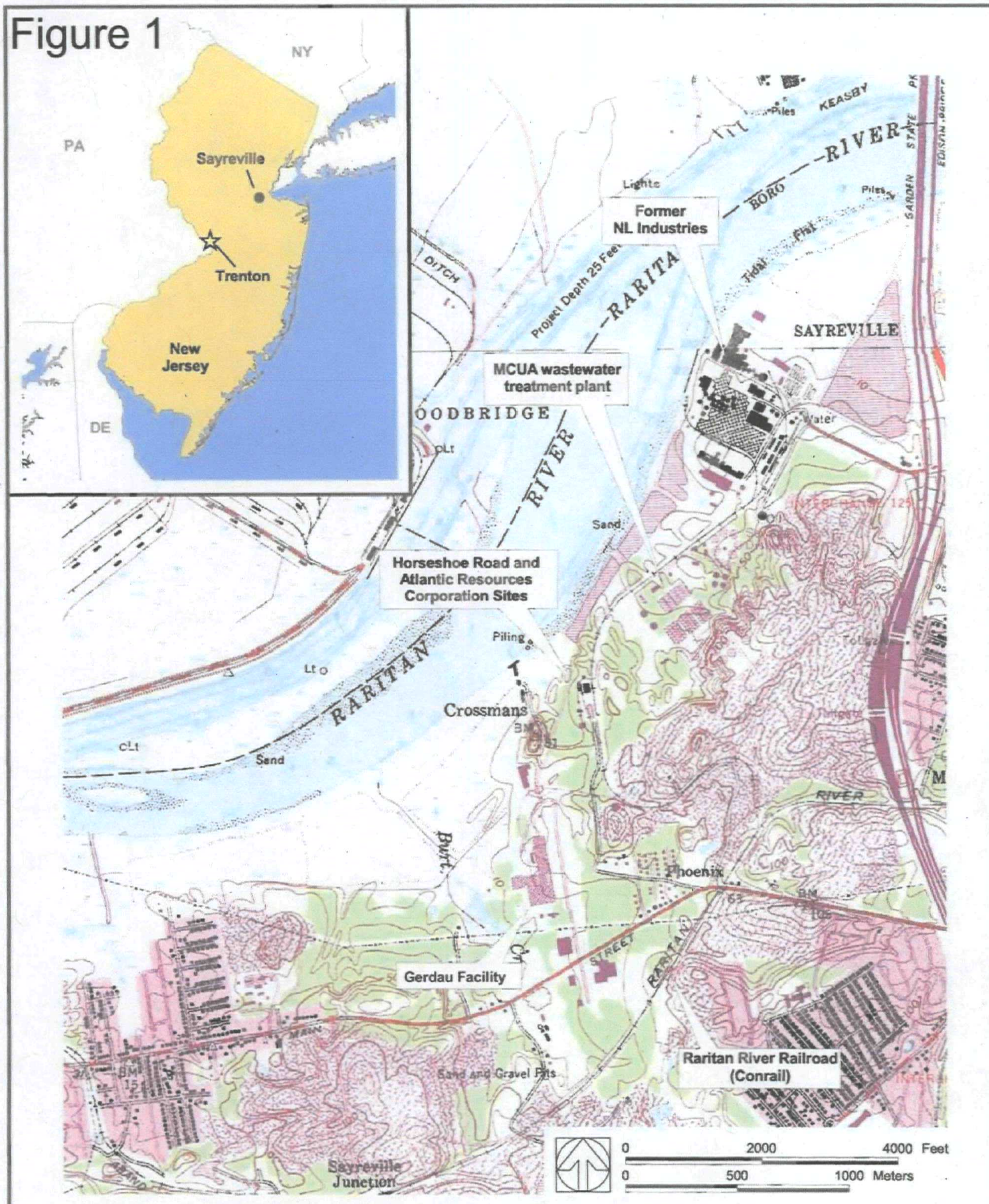
In response to a request from a reviewer of the Proposed Plan, the Region presented EPA's proposed remedy to EPA's National Remedy Review Board on November 19, 2008. Prior to the November meeting, the Region extended an invitation to all stakeholders who had provided written comments on the Proposed Plan to also submit a written position to the Board, and most of the commenters did so. These stakeholder statements are included in the Administrative Record for the sites. The comments that were received from the Board, and the Region's responses, are included in the

Administrative Record. The Board's comments resulted in a number of modifications and clarifications to this decision, and in response the Region has made the following two modifications to the remedy that was originally identified in the Proposed Plan:

- For Alternative M7, EPA will further evaluate, during remedial design, the groundwater interaction between shallow and deep sediments within the Marsh, to ensure that any contaminated sediments that are left in place at depth would not recontaminate newly placed sediments to levels that would not be protective; and
- For Alternative R6, EPA will evaluate during remedial design whether after dredging it is equally protective and cost-effective to place a thinner cap in the dredged area and allow natural sedimentary processes in the River to fill in the remainder.

APPENDIX I
FIGURES

Figure 1

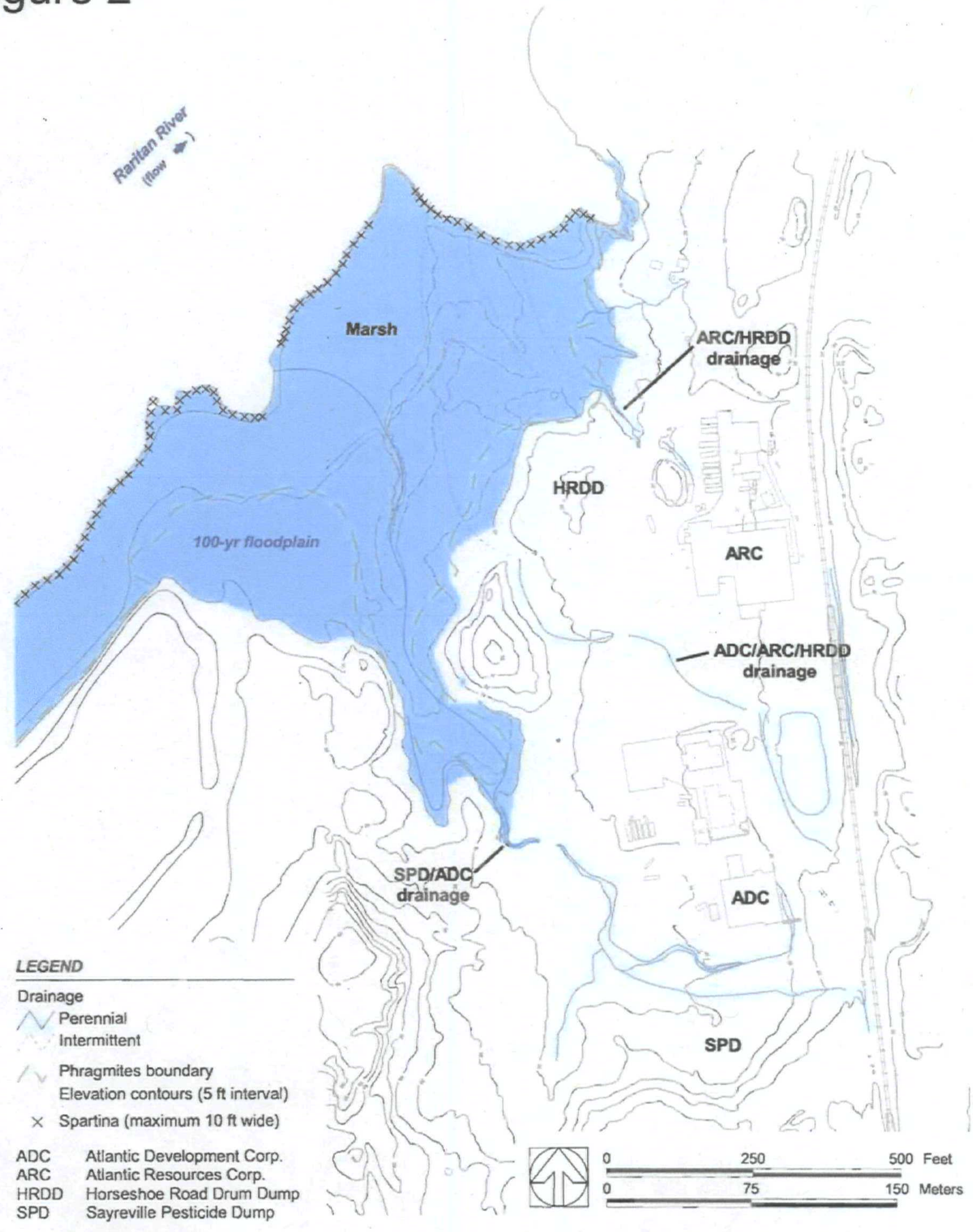


Source: Base map from USGS topographic map South Amboy (1981) and Perth Amboy (1981).

Location of Horseshoe Road and Atlantic Resources Corporation Sites

Exponent

Figure 2



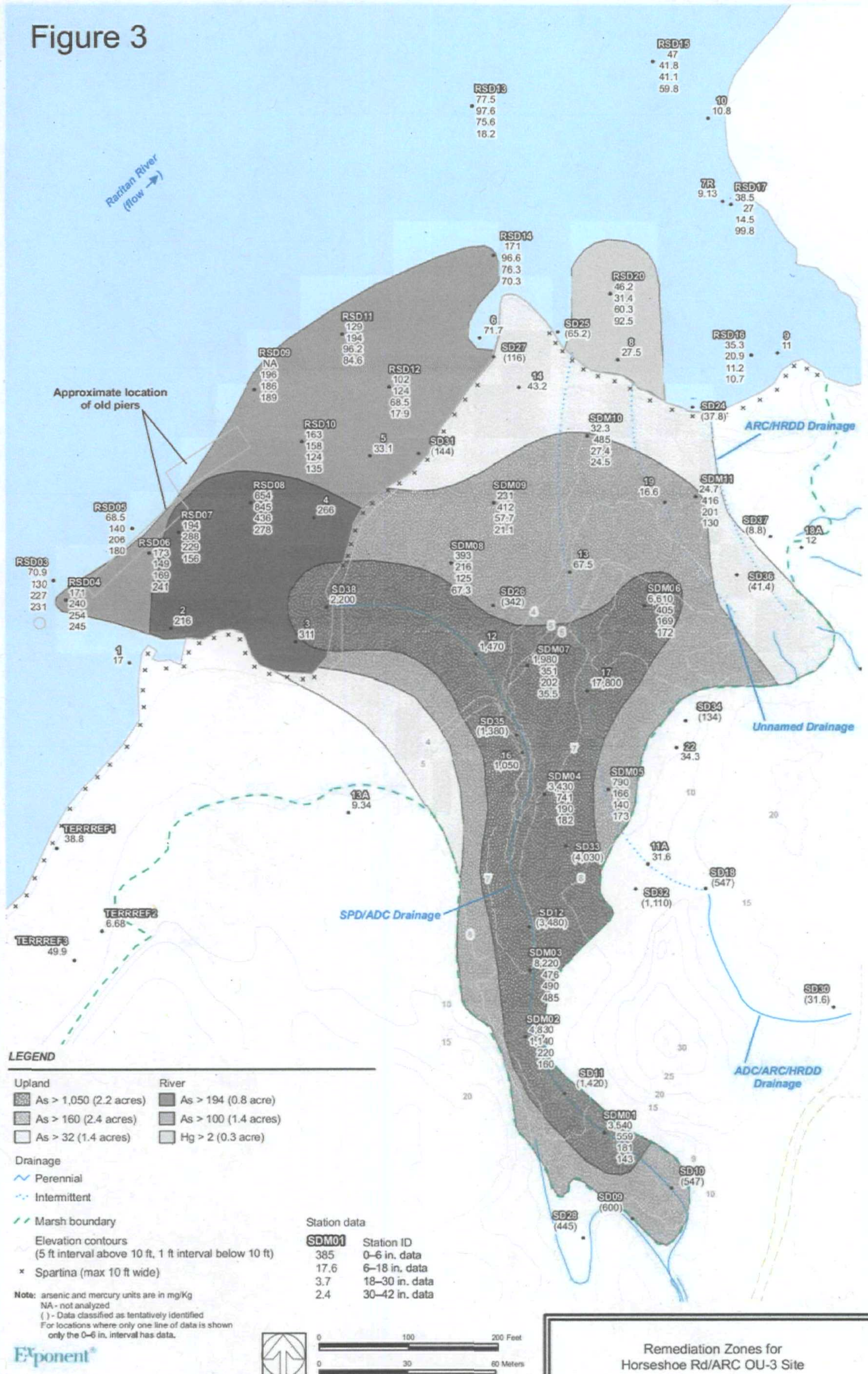
Source: Elevations from CDM (1997).

Note: All buildings have been demolished. Figure shows former locations.

Extent of Marsh

Exponent

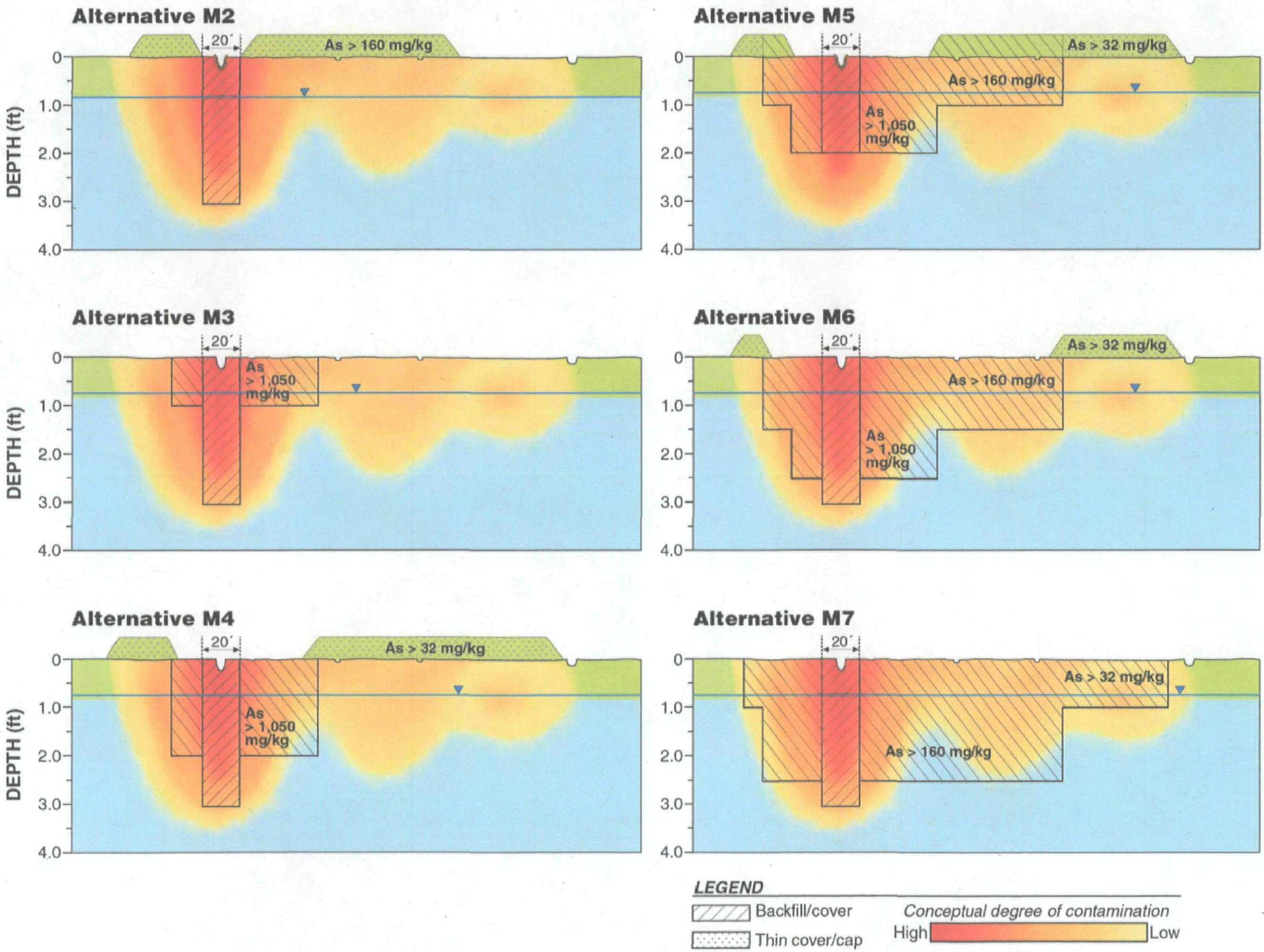
BE02758.001 | Feb 27, 2008 | Figure 1-3 view | Figure 1-3 layout | M:\BE02578_Sayreville\projects\sayreville_report_figs_200707.apr



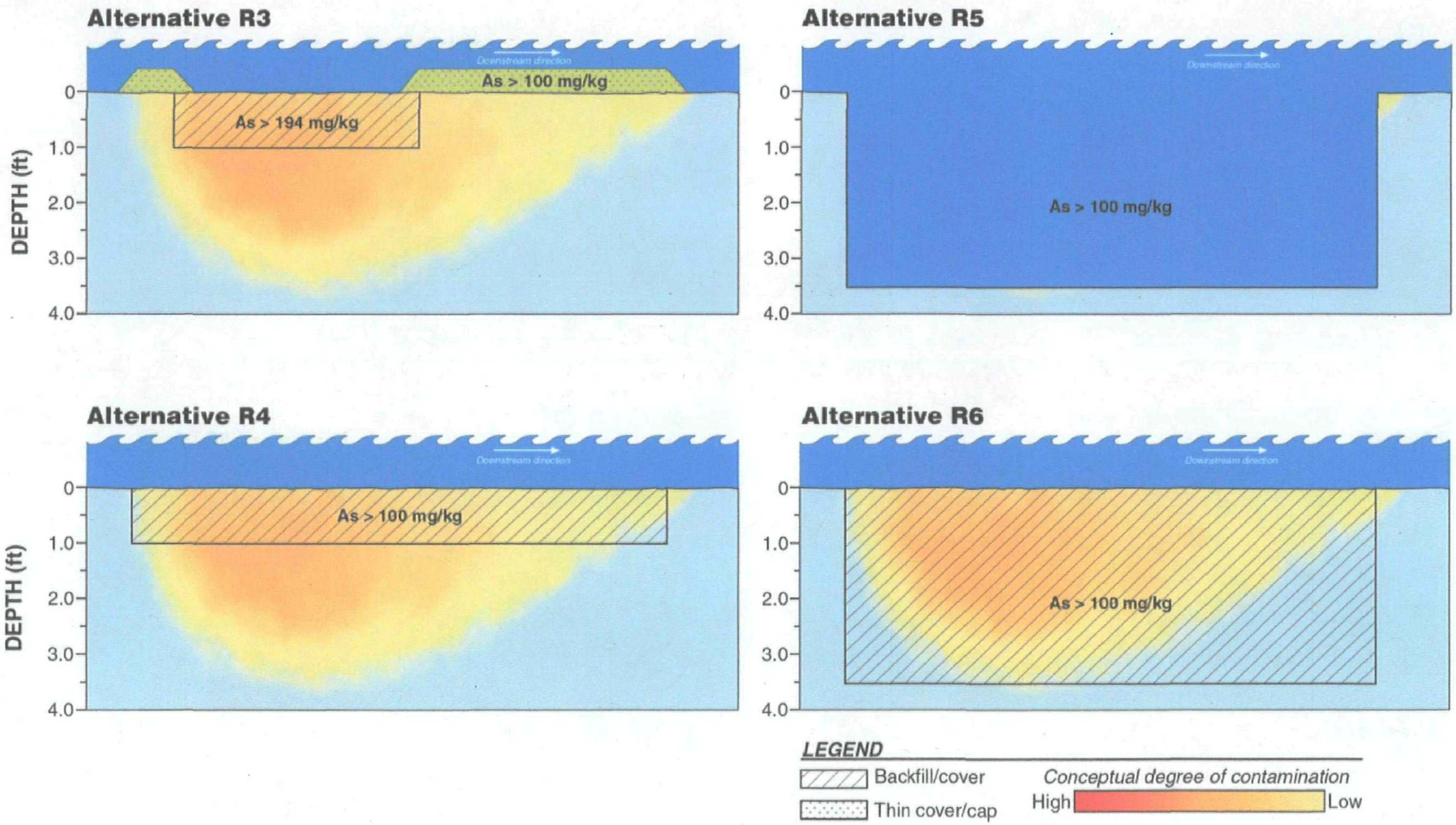
Remediation Zones for Horseshoe Rd/ARC OU-3 Site

BE02578 | May 8, 2008 | M:\BE02578_Sayreville\projects\remed zones.mxd

Marsh Alternatives - Figure 4



River Alternatives - Figure 5



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APPENDIX II
TABLES

TABLE 1

Horseshoe/ARC Marsh Surface Sediment Data (2006 Sampling Only)

COC (mg/kg)	Reference[1] Samples (range)	Marsh Sediments (range)
Arsenic	6.7-49.9 mg/kg	16.6-17,800 mg/kg
Mercury	0.18-1.4 mg/kg	0.36-385 mg/kg
PCBs	0.01-0.77 mg/kg	0.08-32 mg/kg

[1]Reference Samples were taken during the BERA investigation in areas considered background to the site.

TABLE 2

Horseshoe/ARC Raritan River Sediment Data

COC (mg/kg)	Reference[1] Samples (range)	Near-site River Sediments (range)
Arsenic	6 - 47 mg/kg	9.1 - 2,200 mg/kg
Mercury	0.08 -1.3 mg/kg	0.062 - 7 mg/kg
PCBs	0.06 - 0.89 mg/kg	0.021- 9.5 mg/kg

[1]Reference Samples were taken during the BERA investigation in areas considered background to the site. Sample AQUAREF2 was eliminated from the reference sample group due to obvious site related contamination.

TABLE 3
Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Surface Water - Marsh	Arsenic	535	569	µg/l	2/2	569	µg/l	Maximum
Surface Water - Raritan River	Arsenic	5.9	20.3	µg/l	3/3	20	µg/l	Maximum

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Sediment - Marsh	Arsenic	342	4030	mg/kg	3/3	4030	mg/kg	Maximum
Sediment - Raritan River	Arsenic	37.8	2200	mg/kg	7/7	2200	mg/kg	Maximum

Scenario Timeframe: Current/Future
Medium: Shellfish
Exposure Medium: Shellfish

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Shellfish - Raritan River	Arsenic	0.48	1	mg/kg	9/9	1	mg/kg	Maximum

Maximum: Maximum Detected Concentration

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

This table presents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in surface water, sediment, and shellfish (i.e., the concentration that will be used to estimate the exposure and risk from each COC). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC and how it was derived.

TABLE 4
SELECTION OF EXPOSURE PATHWAYS

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/ Future	Surface Water	Surface Water	Marsh	Trespasser	Youth	Dermal/ Ingestion	On./Off -site	Quant	Potential exposure to sediments in the Marsh Area by adolescents.
				Residents	Adult	Dermal/ Ingestion	On/Off-Site	Quant	Potential exposure to surface water in the Marsh Area by future residents.
					Child	Ingestion	On/Off-site	Quant	Potential exposure to surface water in the Marsh Area by future residents.
			Raritan River	Trespasser	Youth	Dermal/ Ingestion	On-site	Quant	Potential exposure to sediments in the Raritan River by adolescents.
				Residents	Adult	Dermal/ Ingestion	On/Off-Site	Quant	Potential exposure to surface water in the Raritan River by future residents.
					Child	Ingestion	On/Off-site	Quant	Potential exposure to surface water in the Raritan River by future residents.
	Sediment	Sediment	Marsh	Trespasser	Youth	Dermal/Ingestion	On-site	Quant.	Potential exposure to sediments in the Marsh Area by adolescents.
				Residents	Adult	Dermal/ Ingestion	On/Off-Site	Quant	Potential exposure to sediments in the Marsh Area by future residents.
					Child	Ingestion	On/Off-site	Quant	Potential exposure to sediments in the Marsh Area by future residents.
			Raritan River	Trespasser	Youth	Dermal/ Ingestion	On-site	Quant	Potential exposure to sediments in the Raritan River by adolescents.
				Residents	Adult	Dermal/ Ingestion	On/Off-Site	Quant	Potential exposure to sediment in the Raritan River by future residents.
					Child	Ingestion	On/Off-site	Quant	Potential exposure to sediment in the Raritan River by future residents.
	Shellfish	Shellfish	Raritan River	Resident	Adult	Ingestion	On/Off-site	Quant.	Potential exposure to shellfish from the Raritan River by future residents.

Quant = Quantitative risk analysis performed.

Summary of Selection of Exposure Pathways

The table describes the exposure pathways associated with the surface water, sediments, and shellfish that were evaluated for the risk assessment, and the rationale for the inclusion of each pathway. Exposure media, exposure points, and characteristics of receptor populations are included.

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TABLE 5

Non-Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Absorp. Efficiency (Dermal)	Adjusted RfD (Dermal)	Adj. Dermal RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates of RfD:
Arsenic	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Skin	3	IRIS	08/24/00

Key

NA: No information available
IRIS: Integrated Risk Information System, U.S. EPA
NCEA: National Center for Environmental Assessment
HEAST: Health Effects Assessment Summary Tables
R3 RBC: EPA Region 3 Risk-Based Concentration Table
CNS: Central Nervous System

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in surface water, sediment, and shellfish. When available, the chronic toxicity data have been used to develop oral reference doses (RfDs) and inhalation reference doses (RfDi).

TABLE 6

Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Oral Cancer Slope Factor	Units	Adjusted Cancer Slope Factor (for Dermal)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	-----	$(mg/kg/day)^{-1}$	A	IRIS	08/24/00

Key:

IRIS: Integrated Risk Information System. U.S. EPA

NA: No information available

EPA Weight of Evidence:

A - Human carcinogen

B1 - Probable Human Carcinogen-Indicates that limited human data are available

B2 - Probable Human Carcinogen-Indicates sufficient evidence in animals associated with the site and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E- Evidence of noncarcinogenicity

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern in surface water, sediment, and shellfish. Toxicity data are provided for both the oral and inhalation routes of exposure.

TABLE 7

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Youth (12-17 years)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface water	Surface water	Marsh	Arsenic	Skin	5.7E-02	-----	1.0E-03	5.8E-02
Sediment	Sediment	Marsh	Arsenic	Skin	1.6E+00	-----	4.4E-01	2.0E+00
							Hazard Index Total	2.1E+00

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Youth (12-17 years)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface water	Surface water	Raritan River	Arsenic	Skin	2.0E-03	-----	3.7E-05	2.0E-03
Sediment	Sediment	Raritan River	Arsenic	Skin	8.8E-01	-----	2.4E-01	1.1E+00
							Hazard Index To	1.1E+00

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface water	Surface water	Marsh	Arsenic	Skin	2.3E-01	-----	1.1E-01	3.4E-01
Sediment	Sediment	Marsh	Arsenic	Skin	1.3E+00	-----	9.7E-01	2.2E+00
							Hazard Index Total	2.6E+00

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Ingestion	Ingestion	Exposure Routes Total
Surface water	Surface water	Raritan River	Arsenic	Skin	8.0E-03	-----	3.7E-03	1.2E-02
Sediment	Sediment	Raritan River	Arsenic	Skin	6.9E-01	-----	5.3E-01	1.2E+00
Shellfish	Shellfish	Raritan River	Arsenic	Skin	3.0E-01	-----	-----	3.0E-01

							Hazard Index Total	1.5E+00

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface water	Surface water	Marsh	Arsenic	Skin	1.1E+00	-----	1.7E-01	1.3E+00
Sediment	Sediment	Marsh	Arsenic	Skin	1.2E+01	-----	2.8E+00	15E+01
							Hazard Index Total	16E+00

Scenario Timeframe: Future
Receptor Population: Resident

Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Ingestion	Exposure Routes Total
Surface water	Surface water	Raritan River	Arsenic	Skin	8.0E-03	-----	3.7E-03	1.2E-02
Sediment	Sediment	Raritan River	Arsenic	Skin	6.5E+00	-----	1.5E+00	8E+00
							Hazard Index Total	8.0E+00

Summary of Risk Characterization - Non-Carcinogens

The table presents hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-cancer effects.

TABLE 8

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface water	Surface water	Marsh	Arsenic	3.5E-05	-----	1.6E-05	5.1E-05
Sediment	Sediment	Marsh	Arsenic	1.9E-04	-----	1.5E-04	3.4E-04
						Total Risk =	3.9E-04

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface water	Surface water	Raritan River	Arsenic	1.2E-06	-----	1.8E-06	1.8E-06
Sediment	Sediment	Raritan River	Arsenic	1.1E-04	-----	8.0E-05	1.9E-04
Shellfish	Shellfish	Raritan River	Arsenic	4.6E-05	-----	-----	4.6E-05
						Total Risk =	2.5E-04

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface water	Surface water	Marsh	Arsenic	4.2E-05	-----	6.7-E06	4.8E-05
Sediment	Sediment	Marsh	Arsenic	4.5E-04	-----	1.1E-04	5.6E-04
						Total Risk =	6.1E-04

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface water	Surface water	Raritan River	Arsenic	1.2E-06	-----	5.7E-07	1.8E-06
Sediment	Sediment	Raritan River	Arsenic	2.5E-04	-----	5.9E-05	3.1E-04
						Total Risk =	3.1E-04

Summary of Risk Characterization - Carcinogens

The table presents cancer risks for each route of exposure and for all routes of exposure combined. As stated in the National Contingency Plan, the acceptable risk range for site-related exposure is 10^{-6} to 10^{-4}.

Table 9

Preliminary Remediation Goals Identified in the Proposed Plan and the Final Remediation Goals

(See Page 18 of Decision Summary)

Site-Specific Receptor	Hazard /Risk	Arsenic (mg/kg)	Mercury (mg/kg)
Human Health Receptors			
Adolescent trespasser	10^{-6}	44	n/a
	10^{-4}	4,400	n/a
	HI = 1	2,000	n/a
Adult resident	10^{-6}	12	n/a
	10^{-4}	1,200	n/a
	HI = 1	1,850	n/a
Child Resident	10^{-6}	7.5	n/a
	10^{-4}	750	n/a
	HI = 1	285	n/a
Ecological Receptors			
Blackworm (biomass)	HI = 1	32	3.6
Earthworm (biomass)	HI = 1	1,050	15.5
Blackworm (survival)	HI = 1	17,800	68
Earthworm (survival)	HI = 1	17,800	68
Muskrat	HI = 1	183	24
Marsh Wren	HI = 1	1,470	8.86
Burrowing animals	HI = 1	160	n/a
Benthic organisms	HI = 1	n/a	2
Soil Background	n/a	14.7	0.14

Remediation Goals

Media	Arsenic (mg/kg)	Mercury (mg/kg)
River Sediments	100	2
Marsh Surface Sediments	32	2
Marsh Sediments (below 1')	160	n/a

*n/a - not applicable

Table 10 Potential applicable or relevant and appropriate requirements (ARARs) and To-Be-Considered (TBC) Criteria

Action/Application	Authority	Act	Criteria/Issues	Citation	Description
Chemical-Specific					
Soil	State of New Jersey		Direct Contact Soil Cleanup Criteria	N.J.A.C. 7:26D	Proposed remediation standards for soil and groundwater.
Action-Specific					
Upland Disposal	Federal	RCRA	Identification and Listing of Hazardous Waste	40 CFR 261	Identifies solid wastes that are subject to regulation as hazardous wastes.
Upland Disposal	Federal	RCRA	Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Establishes requirements (e.g., EPA ID numbers and manifests) for generators of hazardous waste.
Upland Disposal	Federal	RCRA	Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Establishes standards that apply to persons transporting manifested hazardous waste within the United States.
Upland Disposal	Federal	RCRA	Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities	40 CFR 264	Establishes the minimum national standards that define acceptable management of hazardous waste.
Upland Disposal	Federal	RCRA	Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR 265	Establishes minimum national standards that define the periods of interim status and until certification of final closure or if the facility is subject to post-closure requirements, until post-closure responsibilities are fulfilled.
Upland Disposal	Federal	RCRA	Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR 267	Establishes minimum standards that define acceptable management of hazardous wastes for new land disposal activities.
Upland Disposal	Federal	RCRA	Land Disposal Restrictions	40 CFR 268	Identifies hazardous wastes that are restricted from land disposal. All listed and characteristic hazardous waste, soil, or debris contaminated by a RCRA hazardous waste and removed from a CERCLA site may not be land disposed until treated as required by LDRs.
Upland Disposal	Federal	RCRA	Hazardous Waste Permit Program	40 CFR 270	Establishes provisions covering basic EPA permitting requirements.

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Table 10 (cont.)

Action/Application	Authority	Act	Criteria/Issues	Citation	Description
Upland Disposal	State of New Jersey	Statutes and Rules	Hazardous Waste	N.J.A.C. 7:26C	Establishes rules for the operation of hazardous waste facilities in the state of New Jersey. Establishes cleanup authority and objectives.
Upland Disposal	State of New Jersey	Hazardous Waste Regulations	Hazardous waste disposal regulations	N.J.A.C. 7:26G	Federally authorized state of New Jersey hazardous waste identification and management program that operates in lieu of the base federal program.
Upland Disposal	State of New Jersey	State Solid Waste Management Act	Statutory framework for solid waste disposal activities.	N.J.S.A. 13:1E-1	Establishes a statutory framework for solid waste collection, disposal, and utilization activities.
General Remediation	Federal	CERCLA	National Contingency Plan	40 CFR 300, Subpart E	Outlines procedures for remedial actions and for planning and implementing off-site removal actions.
General Remediation	Federal	OSHA	Worker Protection	29 CFR 1904	Requirements for recording and reporting occupational injuries and illnesses.
General Remediation	State of New Jersey	Soil Erosion and Sediment Control Act	Approval Requirements.	N.J.S.A. 4:24-1	Requirement for approval from the local soil conservation district (Freehold Soil Conservation District, Middlesex County) for projects that disturb more than 5,000 ft^2 of surface area of land.
General Remediation	State of New Jersey	Statutes and Rules	Technical Requirements for Site Remediation	N.J.A.C. 7:26E	Establishes minimum regulatory requirements for investigation and remediation of contaminated sites in New Jersey.
General Remediation	State of New Jersey	Technical Manual	The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters	New Jersey Department of Environmental Protection Technical Manual (1997)	NJDEP technical manual to make the permitting process for dredging activities and the management of dredged material clearer, less complicated, and more efficient. Includes best management practices.
General Remediation	Federal	Quality Criteria for Water 1976, 1980, and 1986	Clean Water Act, Ambient Water Quality Criteria	40 CFR 131	Sets criteria for water quality based on protection of human health and protection of aquatic life.

Table 10 (cont.)

Action/Application	Authority	Act	Criteria/Issues	Citation	Description
General Remediation	State of New Jersey		Surface Water Quality Standards	N.J.A.C. 7:9B	Establishes classification of surface waters of the state, procedures for establishing water quality-based effluent limitations, and modification of water quality-based effluent limitations.
General Remediation	State of New Jersey	State Water Pollution Control Act	Surface Water Quality Standards	N.J.S.A. 58:10A	Establishes water quality standards for waters of the state and criteria to protect beneficial uses.
General Remediation	State of New Jersey		State Air Quality Law and Noise Control	N.J.S.A. 26:2C. N.J.S.A. 13:1G	Provides general emission standards for fugitive emissions of air contaminants and requires the highest and best practicable treatment of control of such emissions. Prohibits any handling, transporting, or storage of materials, or use of a road, or any equipment to be operated, without taking reasonable precautions to prevent particulate matter from becoming airborne. Sets noise standards for equipment, facilities, operations, or activities employed in the production, storage, handling, sale purchase, exchange, or maintenance of a product, commodity, or service, including the storage or disposal of waste products.
Location-Specific					
Within 100-Year Floodplain	Federal	NEPA	Statement of Procedures on Floodplain Management and Wetlands Protection	40 CFR 6, Appendix A	Establishes EPA policy and guidance for carrying out Executive Order 11988—Floodplain Management. Action must avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values of the floodplain.
Within 100-Year Floodplain	State of New Jersey	Flood Hazard Control Act	Floodplain Use and Limitations	N.J.A.C. 7:13	State standards for activities within flood plains.

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Table 10 (cont.)

Action/Application	Authority	Act	Criteria/Issues	Citation	Description
Wetlands	Federal	NEPA	Statement of Procedures on Floodplain Management and Wetlands Protection	40 CFR 6, Appendix A	Executive Order 11990—Protection of Wetlands—defines wetlands. Action must avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands.
Wetlands	State of New Jersey	Freshwater Protection Act	Permitting requirements	N.J.S.A. 13:9B-1; N.J.A.C. 7:7A	Require permits for regulated activity disturbing wetlands.
Wetlands	State of New Jersey	Wetlands Permit	Statement of Procedures for Work in wetlands	N.J.S.A. 13:9A-1	Restricts work type and mitigative measures necessary within a wetland.
Tidelands Conveyances	State of New Jersey	Riparian Grants, Leases and/or Licenses	Requirements for granting of conveyances		Tidelands grants, leases, and/or licenses are required for the use of state-owned riparian lands. These conveyances are granted by the Tidelands Resources Council.
Coastal Areas	Federal	Coastal Zone Management Act (1972) and Coastal Zone Act Reauthorization Amendments (1990)	Impacts to coastal resources	16 USC 1451 et seq; 16 USC 6217	Encourages states to develop coastal management plans to manage competing uses of and impacts to coastal resources, and to manage sources of nonpoint pollution in coastal waters.
Coastal Areas	State of New Jersey	Coastal Zone Management Program	Impacts to coastal resources	N.J.A.C. 7:7E	Standards for use and development of coastal resources in coastal waters to the limit of tidal influence (including the Raritan River).
Area Affecting Stream or River	Federal	Clean Water Act	Section 401(b)(1) Guidelines for Specification of Disposal Sites for Dredge or Fill Material; Section 404(c) Procedures; 404 Program Definitions; 404 State Program Regulations	40 CFR 230–233	Restricts discharge of dredged or fill material to wetlands or waters of the United States. Provides permitting program for situations with no other practical alternative.
Area Affecting Stream or River	Federal	Endangered Species Act	Protection of Threatened and Endangered Species	16 USC 1531 et seq.; 40 CFR 400	Standards for the protection of threatened and endangered species.

Table 10 (cont.)

Action/Application	Authority	Act	Criteria/Issues	Citation	Description
Area Affecting Stream or River	Federal	Fish and Wildlife Conservation Act	Statement of Procedures for Non-game Fish and Wildlife Protection	16 USC 2901 et seq.	Establishes EPA policy and guidance for promoting the conservation of non-game fish and wildlife and their habitats. Action must protect fish or wildlife.
Area Affecting Stream or River	Federal	Rivers and Harbors Act	Regulates activity that may obstruct or alter a navigable waterway	33 USC 403 33 CFR 320-330	Regulations for filling, altering or modifying the course, location, condition, or capacity of a navigable waterway.
Area Affecting Stream or River	Federal	Migratory Bird Treaty Act	Protection of Migratory Birds	16 USC 703-702 50 CFR 10.12	Makes it unlawful to take, import, export, possess, buy, sell, purchase, or barter any migratory bird. "Take" is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, trapping, and collecting.
Area Affecting Stream or River	State of New Jersey	Coastal Area Facility Review Act Permit	Statement of Procedures for Work Within Coastal Areas	N.J.S.A. 13:19-1 et seq.	Establishes that coastal areas should be dedicated to land uses that protect public health and are consistent with laws governing the environment.
Area Affecting Stream or River	State of New Jersey	Waterfront Development Upland Waterfront Permit	Statement of Procedures for Work Within Waterfront	N.J.S.A. 12:5-3	Establishes the need for permitting when constructing or developing in coastal area between mean high tide. Waterfront development activities include, but are not limited to, the construction or addition of docks, wharves, piers, bridges, pipelines, dolphins, permanent buildings, and removal or deposition of subaqueous materials (dredging or filling).
Area Affecting Stream or River	State of New Jersey	Endangered and Non-Game Species Act	Protection of Threatened and Endangered Species	N.J.S.A. 23:2A-1	Standards for the protection of threatened and endangered species.
Area Affecting Stream or River	State of New Jersey	Flood Control Facilities Act	Statement of procedures for construction, operation, planning, or acquiring flood control facilities	N.J.S.A. 58:16A-50 et seq.; N.J.A.C. 7:8-3.15	Standards to construct, operate, or acquire a flood control device.

Table 10 (cont.)

Action/Application	Authority	Act	Criteria/Issues	Citation	Description
General Remediation	Federal	National Historic Preservation Act	Procedures for preservation of historical and archaeological data	16 USC 469 et seq.; 40 CFR 6301(c)	Establishes procedures to provide for preservation of historical and archaeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.

Note:

CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act of 1980
N.J.A.C.	-	New Jersey Administrative Code
N.J.S.A.	-	New Jersey Statutes Annotated
NEPA	-	National Environmental Policy Act
OSHA	-	Occupational Safety and Health Administration
RCRA	-	Resource Conservation and Recovery Act
USC	-	United States Code

Table 11

Alternative M7—Complete Removal

Capital Costs

COST COMPONENT	UNIT	QUANTITY	UNIT COST	TOTAL COST
Excavation Costs				
Clearing the Site	Acre	6.00	$1,217	$7,302
Load, Haul, and Disposal of Debris	CY	19,360	$24	$467,157
Excavate Contaminated Soil	CY	31,182	$47	$1,465,573
Load, Haul and Disposal at Subtitle D Landfill	CY	18,005	$105	$1,890,504
Load, Haul and Disposal at Subtitle C Landfill	CY	19,766	$220	$4,348,608
Sheet pile	SF	4,500	$18	$83,018
Dewatering and disposal	days	60	$650	$39,000
Treatment of pumped water	days	60	$1,593	$95,590
			Subtotal:	$8,396,752
Site Restoration				
Obtain, Haul and Place Backfill	CY	24,856	$54	$1,342,224
First Year Maintenance	MO	12	$20,000	$240,000
Re-establish Marsh Vegetation	AC	6.00	$3,480	$20,880
			Subtotal:	$1,603,104
Mobilization/Demobilization +Staging area+dewatering area	LS	1	$1,479,215	$1,479,215
Site preparation (15 feet wide approach road)	LF	3,000	$82	$247,275
15 feet wide berm construction	LF	100	$75	$7,500
Pre-design investigation	LS	1	$50,000	$50,000
			Subtotal	$1,733,990
			Total Direct Capital Costs:	$11,733,846
Indirect Capital Costs				
Engineering[A]	% of Direct Costs	20%		$2,346,769
Project Management[A]	% of Direct Costs	10%		$1,173,385
Construction Oversight[A]	% of Direct Costs	15%		$1,760,077
Scope & Bid Contingency (15% Each)[A]	% of Direct Costs	30%		$3,520,154
			Total Indirect Capital Costs:	$8,800,384
Total Capital Costs				**$20,534,230**

Operating Costs

COST COMPONENT	UNIT	QUANTITY	UNIT COST	TOTAL COST
Annual Direct Costs				
Site Maintenance	per Visit	4	$300	$1,200
			Total Annual Direct Costs:	$1,200
Annual Indirect Costs				
Project Management[A]	% of Direct Costs	5%	$1,200	$60
Technical Support[A]	% of Direct Costs	10%	$1,200	$120
Contingency[A]	% of Direct Costs	30%	$1,200	$360
			Total Annual Indirect Costs:	$540
			Total Annual Costs:	$1,740

Periodic Costs

Five Year Site Inspections and Reviews	each	1	$50,000	$50,000
Annual monitoring for 4 years	each	4	$50,000	$200,000
			Total Periodic Costs:	$250,000

Net Present Value Analysis

Project Duration (period)	30	
Discount Factor	7.0%	
NPV of Capital Costs		$20,534,230
NPV of Annual O&M Costs		$21,592
NPV of Periodic Costs		$169,361
Total Estimated Costs (NPV)		**$20,725,183**

Notes:

[A] *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* , EPA 540-R-00-002

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Table 11 – Continued

Alternative R6—Deep Dredge and Cover

Capital Costs

COST COMPONENT	UNIT	QUANTITY	UNIT COST	TOTAL COST
Dredging Costs				
Dredge from Barge	CY	19,360	$150	$2,904,000
Load, Haul and Disposal at Subtitle D Landfill	CY	19,360	$105	$2,032,800
Dewatering of dredged materials in a separate barge	days	56	$500	$28,000
Dredge Depth Measurement/Confirmation	LS	1	$40,000	$40,000
			Subtotal:	$5,006,100
Capping Costs				
Obtain, Haul and Place Backfill/Cap	CY	16,133	$100	$1,613,333
Final Elevation Confirmation Survey	LS	1	$100,000	$100,000
Baseline Coring and Analysis	days	-	$10,000	$0
			Subtotal:	$1,713,333
Mobilization/Demobilization				
Site preparation	LS	1	$937,733	$937,733
Silt curtain for dredging	LF	2,000	$5	$10,000
			Subtotal	$947,733
		Total Direct Capital Costs:		$7,667,166
Indirect Capital Costs				
Engineering[A]	% of Direct Costs	20%		$1,533,433
Project Management[A]	% of Direct Costs	10%		$766,717
Construction Oversight[A]	% of Direct Costs	15%		$1,150,075
Scope & Bid Contingency (15% Each)[A]	% of Direct Costs	30%		$2,300,150
		Total Indirect Capital Costs:		$5,750,374
Total Capital Costs				**$13,417,540**

Operating Costs

COST COMPONENT	UNIT	QUANTITY	UNIT COST	TOTAL COST
Annual Operation & Maintenance (Included as Periodic Costs)				
		Total Annual Costs:		$0

Periodic Costs

Five Year Monitoring and Reporting	each	1	$90,000	$90,000
				$90,000

Net Present Value Analysis

Project Duration (period)	30	
Discount Factor	7.0%	
NPV of Capital Costs		$13,417,540
NPV of Annual O&M Costs		$0
NPV of Periodic Costs		$64,169
Total Estimated Costs (NPV)		**$13,481,709**

Notes:
[A] *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, EPA 540-R-00-002

APPENDIX III
ADMINISTRATIVE RECORD
INDEX

HORSESHOE ROAD SITE
OPERABLE UNIT 3
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS

3.0 REMEDIAL INVESTIGATION

3.2 Sampling and Analysis Data/Chain of Custody Forms

P. 300001 - 300012 Facsimile to Mr. John Osolin, U.S. Environmental Protection Agency, Region 2, from Ms. Kelly Naito, U.S. Army Corps of Engineers, New York District, re: Data from Raritan River, March 12, 2007.

3.4 Remedial Investigation Reports

P. 300013 - 300647 Report: Baseline Ecological Risk Assessment, Operable Unit 3, Horseshoe Road and Atlantic Resources Corporation Sites, Sayreville, New Jersey, prepared by Exponent, Inc., prepared for ARC OU-3 Cooperating Group, c/o Robertson, Freilich, Bruno & Cohen LLC, May 2006.

3.5 Correspondence

P. 300648 - 300648 Email message to Mr. John Osolin, U.S. Environmental Protection Agency, Region 2, from Mr. Charles Nace, U.S. Environmental Protection Agency, Region 2, re: Arsenic in Sediment for Human Health, January 31, 2007.

P. 300649 - 300652 External Memorandum to Mr. John Osolin, U.S. Environmental Protection Agency, Region 2, from Ms. Betsy Henry, Exponent, Inc., re: Calculation of Ecological PRGs for the Horseshoe Rd/ARC OU-3 Site, Project: BE02578.001, April 17, 2007.

4.0 FEASIBILITY STUDY

4.3 Feasibility Study Reports

P. 400001 - 400001 Report: Feasibility Study, Operable Unit 3, Horseshoe Road and Atlantic Resources Corporation Sites, Sayreville, New Jersey, prepared by Exponent, Inc., prepared for ARC OU-3 Cooperating Group, c/o Robertson, Freilich, Bruno & Cohen LLC, July 2008.

4.6 Correspondence

P. 400002 - 400010 Letter to Irv Freilich, Esq., Robertson, Freilich, Bruno & Cohen, LLC, from Mr. John Prince, Chief, Central New Jersey Remediation Section, U.S. Environmental Protection Agency, re: Identification of Remedial Action Objectives and Remediation Goals for the Operable Unit 3 Combined Feasibility Study, Horseshoe Road and Atlantic Resources Corporation Sites, Sayreville, New Jersey, (Data Attached), June 11, 2007.

P. 400011 - 400024 Letter to Mr. John Prince, Central New Jersey Remediation Section, U.S. Environmental Protection Agency, Region 2, from Betsy Henry, Ph.D., Managing Scientist, Exponent, Inc., re: Comments on the June 11, 2007, Letter on Remedial Action Objectives and Remedial Goals for the Horseshoe Rd/ARC OU-3 Sites, Project No. BE02578.001, August 7, 2007.

P. 400025 - 400053 Letter to Irv Freilich, Esq., Robertson, Freilich, Bruno & Cohen, LLC, from Mr. John Prince, Chief, Central New Jersey Remediation Section, U.S. Environmental Protection Agency, Region 2, re: EPA Comments to the Draft Operable Unit 3 Feasibility Study, dated August 10, 2007, and Exponent's August 7, 2007 Comment Letter for the Horseshoe Road and Atlantic Resources Corporation Sites, Sayreville, New Jersey, December 21, 2007.

P. 400054 - Data: Table 1, River Sediments and Marsh
400054 Sediments, undated.

7.0 ENFORCEMENT

7.3 Administrative Orders

P. 700001 - Administrative Order on Consent for
700077 Supplemental Field Investigation, Baseline Ecological Risk Assessment and Feasibility Study, Operable Unit 3, U.S. EPA Index No. CERCLA-02-2003-2033, In the Matter of: The Atlantic Resources and Horseshoe Road Superfund Sites, General Motors Corporation, et al., Respondents, October 6, 2003.

10.0 PUBLIC PARTICIPATION

10.3 Public Notices

P. 10.00001-Public Notice: Maintenance Dredging of
10.00006 Raritan River, NJ Federal Navigation Channel, Public Notice No. Raritan River, NJ - Mile 2.0-4.0/05, prepared by U.S. Army Corps of Engineers, New York District, Published: December 16, 2004, Expires: January 16, 2005.

11.0 TECHNICAL SOURCES AND GUIDANCE DOCUMENTS

11.2 EPA Regional Guidance

P. 11.00001-Report: Ecological Screening Levels, prepared
11.00013 by U.S. Environmental Protection Agency, Region 5, RCRA, August 22, 2003.

11.3 State Guidance

P. 11.00014-Letter to Mr. Terry S. Casey, Efficasey
11.00020 Environmental, from Mr. Murdo Morrison, Case Manager, and Mr. Joseph J. Nowak, Supervisor, Bureau of Northern Case Management, State of New Jersey, Department Of Environmental Protection, re: N.L.

Industries, Inc., Sayreville Boro., Middlesex County, ISRA Case #E88768; Remedial Investigation Report, Supplemental Raritan River Sediment Sampling Results Dated July 2003; Class 3 Final Status Survey Supplement to the Radiological Soil Sampling Results Investigation Report: Chloride and Research Areas dated November 2002, June 24, 2004.

11.4 Technical Sources

P. 11.00021- 11.00031 Report: Calculation and Uses of Mean Sediment Quality Guideline Quotients: A Critical Review, prepared by Mr. Edward R. Long, ERL Environmental; Mr. Christopher G. Ingersoll, Columbia Environmental Research Center, U.S. Geological Survey, and Mr. Donald D. MacDonald, MacDonald Environmental Science Ltd., February 7, 2006.

P. 11.00032- 11.00032 Map: Raritan River Sediment Sample Locations Exceeding Ecological Benchmarks, July to September 2005, Project Name: Former Raritan Arsenal Baseline Ecological Risk Assessment, prepared by U.S. Army Corps of Engineers, New England & New York Districts, June 12, 2006.

P. 11.00033- 11.00034 Report: Report of Channel Conditions 100 to 400 Feet Wide (ER 1130-2-3165), Raritan River, New Jersey, prepared by U.S. Army Corps of Engineers, New York District, December 8, 2006.

P. 11.00035- 11.00036 Facsimile to Mr. John Osolin, U.S. Environmental Protection Agency, Region 2, from Mr. N. Hamill, re: SDRR 01-13, Raritan River, Table 4-12 (continued) Target Analyte List Metals in Estuarine Sediment, Baseline Ecological Risk Assessment, Former Raritan Arsenal, Edison, New Jersey, May 24, 2007.

P. 11.00037- 11.00037 Report: Waterbody Specific Fish Consumption Advisories, Estuarine & Marine Waters, undated.

P. 11.00038- 11.00041 Report: <u>Distribution of Arsenic in the Environment in New Jersey</u>, prepared by E.F. Vowinkel, A.E. Grosz, J.L. Barringer, Z. Szabo, P.E. Stackelberg, J.A. Hopple, J.N. Grossman, E.A. Murphy, M. Serfes, and S. Spayd, U.S. Geological Survey, West Trenton, N.J., U.S. Geological Survey, Reston, Va., New Jersey Department of Environmental Protection, Trenton, N.J., undated.

P. 11.00042- 11.00042 Map: New Jersey Area, Features: Cooling Pond, Pond Area, Pesticide Dump, Atlantic Dev, Atlantic Resources, Horseshoe Rd. Dump, Marsh, Marsh Pond, undated.

Note: The Administrative Records for Horseshoe Road OU1 and OU2 are incorporated into this Administrative Record by reference.

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10.0 PUBLIC PARTICIPATION

10.1 Comments and Responses

P. 10.00041 - 10.00064 — Letter (with attachments) to Mr. John Osolin, Remedial Project Manager, U.S. Environmental Protection Agency, Region 2, from Betsy Henry, Ph.D., Senior Managing Scientist, Exponent, re: Comments on the Proposed Plan for Horseshoe Road and Atlantic Resources Corporation Sites, Project No. BE02578.001, August 19, 2008.

P. 10.00065 - 10.00067 — Email message to Mr. John Osolin, U.S. Environmental Protection Agency, Region 2, from Mr. Geoffrey K. Clark, P.G., Associate, and Mr. Kevin E. Koch, P.E., Vice President, Hatch Mott MacDonald, re: Attached comments regarding proposed plan for OU 3 at the Horseshoe Road and Atlantic Resources Sites offered by Hatch Mott MacDonald on behalf of Gerdau Ameristeel, August 20, 2008.

P. 10.00068 - 10.00072 — Email message to Ms. Pat Seppi and Mr. John Osolin, U.S. Environmental Protection Agency, Region 2, from Mr. Richard W. Chapin, M.S., P.E., President, Chapin Engineering, re: Attached comments on the Proposed Cleanup Plan for OU3 at the Horseshoe Road and Atlantic Resources Superfund Sites, submitted on behalf of Edison Wetlands Association, August 20, 2008.

10.4 Public Meeting Transcripts

P. 10.00073 - 10.00192 Transcript: United States Environmental Protection Agency, Region II, The Proposed Plan for Sediment Cleanup in the Marsh and River, Horseshoe Road and Atlantic Resources Superfund Sites, Sayreville, New Jersey, August 12, 2008.

10.8 Late Comments

P. 10.00193 - 10.00193 Letter to Mr. Alan Steinberg, Regional Administrator, U.S. Environmental Protection Agency, Region 2, from Honorable Frank R. Lautenberg, New Jersey Senator, United States Senate, re: Proposed cleanup plan for remediating Operable Unit 3 at the Horseshoe Road and Atlantic Resources Superfund Sites in Sayreville, New Jersey, September 4, 2008.

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OPERABLE UNIT 3
ADMINISTRATIVE RECORD UPDATE #3
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10.0 PUBLIC PARTICIPATION

10.1 Comments and Responses

P. 10.00194 - 10.00203 - Letter to Mr. John Osolin, Remedial Project Manager, U.S. Environmental Protection Agency, Region 2, from Betsy Henry, Ph.D., Senior Managing Scientist, Exponent, re: Comments to the National Remedy Review Board on the Proposed Plan for Horseshoe Road and Atlantic Resources Corporation Sites, Project No. BE02578.001, November 7, 2008.

P. 10.00204 - 10.00209 - Letter (with attachment) to Mr. John Prince, Chief, Central New Jersey Remediation Section, Emergency and Remedial Response Division, U.S. Environmental Protection Agency, Region 2, from Mr. Robert Spiegel, Executive Director, Edison Wetlands Association, Inc., re: Comments for NRRB re: Horseshoe Road and Atlantic Resource Superfund Sites, November 12, 2008.

P. 10.00210 - 10.00213 - Report: New Jersey Department of Environmental Protection Comments For the National Remedy Review Board Regarding the Horseshoe Road and Atlantic Resources Corporation Sites, Record of Decision Operable Unit 3 - Marsh and River Sediments, prepared on behalf of NJDEP by Mr. Edward Putnam, Assistant Director, Site Remediation Program, New Jersey Department of Environmental Protection, November 17, 2008.

P. 10.00214 - 10.00214 - Letter to Mr. Alan Steinberg, Regional Administrator, U.S. Environmental Protection Agency, Region 2, from Honorable Robert Menendez, New Jersey Senator, United States

Senate, re: Proposed Cleanup Plan for Remediating Operable Unit 3 at the Horseshoe Road and Atlantic Resources Superfund Sites in Sayreville, New Jersey, November 18, 2008.

P. 10.00215 - 10.00218 Memorandum to Mr. Walter Mugdan, Director, Emergency and Remedial Response Division, U.S. Environmental Protection Agency, Region 2, from Ms. Amy R. Legare, Acting Chair, National Remedy Review Board, U.S. Environmental Protection Agency, re: National Remedy Review Board Recommendations for the Horseshoe Road and Atlantic Resources Corporation Superfund Sites, January 26, 2009.

P. 10.00219 - 10.00224 Memorandum to Ms. Amy R. Legare, Acting Chair, National Remedy Review Board, U.S. Environmental Protection Agency, from Mr. John S. Frisco, Manager, Superfund Remedial Program, U.S. Environmental Protection Agency, Region 2, re: National Remedy Review Board Recommendations - Horseshoe Road and Atlantic Resources Corporation Superfund Sites, February 25, 2009.

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11.0 TECHNICAL SOURCES AND GUIDANCE DOCUMENTS

11.4 Technical Sources

P. 11.00043 - 11.00066 Memo to File from Mr. John Osolin, Remedial Project Manager, U.S. Environmental Protection Agency, Region 2, re: Assessment of Sediment Reference Values for the Horseshoe Road and Atlantic Resource Corporation Sites, Operable Unit 3, May 18, 2009. (Attachments: (1) Letter to Mr. Terry S. Casey, Efficasey Environmental, from Mr. Joseph J. Nowak, Supervisor, and Mr. Murdo Morrison, Case Manager, Bureau of Northern Case Management, New Jersey Department of Environmental Protection, re: N.L. Industries, Inc., Sayreville Boro, Middlesex County, ISRA Case #E88768, Remedial Investigation Report, Supplemental Raritan River Sediment, Sampling Results Dated July 2003, Class 3 Final Status Survey Supplement to the Radiological Soil Sampling Results Investigation Report: Chloride and Research Areas dated November 2002, June 24, 2004; (2) Facsimile to Mr. John Osolin, U.S. Environmental Protection Agency, Region 2, from Ms. Kelly Naito, U.S. Army Corps of Engineers, New York District, re: Data from Raritan River, March 12, 2007; (3) Drawing: Figure 3-3. Surface Sediment (0-6 in.) Data from 2004 Investigation (Reference Stations), prepared by Exponent, Inc., May 11, 2006; (4) Drawing: Raritan River Sediment, Sample Locations Exceeding Ecological Benchmarks July to September 2005, Former Raritan Arsenal Baseline Ecological Risk Assessment, prepared by Weston Solutions, Inc., prepared for U.S. Army Corps of Engineers, New England & New York Districts, June 2006.)

HORSESHOE ROAD SITE
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10.0 PUBLIC PARTICIPATION

10.3 Public Notices

P. 10.00007 - 10.00007 Public Notice: EPA Invites Public Comment on the Proposed Plan for the Horseshoe Road and Atlantic Resources Superfund Sites, Sayreville, Middlesex County, New Jersey, prepared by U.S. Environmental Protection Agency, Region 2, undated.

10.9 Proposed Plan

P. 10.00008 - 10.00040 Superfund Program Proposed Plan, Horseshoe Road and Atlantic Resources Corporation Sites, prepared by U.S. Environmental Protection Agency, Region 2, May 2008.

APPENDIX IV
STATE LETTER

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

SEP 3 0 2008

Mr. George Pavlou, Acting Director
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
Region II
290 Broadway
New York, NY 10007-1866

Re: Horseshoe Road Superfund Site
Record of Decision

Dear Mr. Pavlou:

The New Jersey Department of Environmental Protection (NJDEP) completed its review of the "Record of Decision, Operable Unit 3 – Marsh and River Sediment, Horseshoe Road and Atlantic Resources Corporation Sites, Sayreville Township, Middlesex County, New Jersey" prepared by the U.S. Environmental Protection Agency (USEPA) Region II in September 2008 and concurs with its selected remedy to address sediment contamination.

The response action described in this document represents the third and final phase of three Operable Units, for the Horseshoe Road and Atlantic Resources Corporation sites. It addresses sediment contamination at the sites. The first ROD, signed in September 2000, addressed buildings and above-ground structures at the two sites. The second ROD, signed in September 2004, addressed the contaminated on-site soil.

The Selected Remedy described in this document involves the excavation and off-site disposal of marsh sediments, and dredging and disposal of river sediments. The major components of the selected response measure include:

- excavation, transportation and disposal of approximately 21,000 cubic yards of contaminated sediments from the Horseshoe/ARC marsh;
- dredging approximately 14,000 cubic yards of contaminated sediments from the Raritan River;

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- off-site disposal;

- backfilling and grading of all excavated or dredged areas with clean cover material;

- institutional controls for the marsh sediments, such as a deed notice or covenant, to prevent exposure to residual sediment contamination that may exceed levels that would allow for unrestricted use;

- institutional controls for the river sediments, to prevent disruption of cover in the event that materials are left at depth; and,

- on-site restoration of approximately six acres of wetlands disturbed during implementation of the remedy.

While the State of New Jersey concurs with EPA's selected remedy, the Record of Decision does not address primary and compensatory restoration of natural resources.

DEP appreciates the opportunity to participate in the decision making process to select an appropriate remedy and is looking forward to future cooperation with EPA in further remedial work at this site.

If you have any questions, please call me at 609-984-3074.

Sincerely,

Edward Putnam, Assistant Director
Publicly Funded Remediation Element
Site Remediation Program

C: Irene Kropp, Assistant Commissioner, Site Remediation, DEP
Joe Maher, Site Manager, Publicly Funded Remediation Element, DEP
Carole Petersen, Chief, New Jersey Remediation Branch, USEPA

APPENDIX V

RESPONSIVENESS SUMMARY
Operable Unit 3 - Sediments in the Marsh and River
Horseshoe Road and Atlantic Resources Corporation Sites,
Sayreville Township, Middlesex County, New Jersey

INTRODUCTION

This Responsiveness Summary provides a summary of the public's comments and concerns regarding the Proposed Plan for the Horseshoe Road and Atlantic Resources Corporation (ARC) sites, and EPA's responses to those comments. At the time of the public comment period, EPA proposed a preferred alternative for remediation of sediments in the marsh and river, which has been designated Operable Unit 3 (OU3). All comments summarized in this document have been considered in EPA's final decision for the selection of a remedial alternative for OU3.

This Responsiveness Summary is divided into the following sections:

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS: This section provides the history of community involvement and interests regarding the Horseshoe Road and ARC sites.

II. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES: This section contains summaries of oral comments received by EPA at the public meeting, EPA's responses to these comments, as well as responses to written comments received during the public comment period.

The last section of this Responsiveness Summary includes attachments, which document public participation in the remedy selection process for these sites. They are as follows:

Attachment A: the Proposed Plan that was distributed to the public for review and comment;

Attachment B: the public notices that appeared in the Suburban News.

Attachment C: the transcripts of the public meeting; and

Attachment D: the written comments received by EPA during the public comment period.

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

EPA encouraged the formation of a Community Advisory Group (CAG) in March 1999, in an effort to keep the community informed of EPA's efforts and to solicit comments and information from the affected community. The CAG has met up to several times per year to discuss EPA findings or site activities. The CAG last met on March 11, 2008, to discuss the kick-off of the Operable Unit 2 (OU2) remedial action. EPA expects the CAG to continue advising EPA of community concerns during remedial design and remedial action for the OU3 Remedy.

EPA has also met Sayreville Town officials on several occasions to discuss the Horseshoe Road and ARC sites. One of the issues discussed was the town's plans for future land use of the sites and surrounding area. EPA plans to coordinate closely with the town to determine how best to fit EPA's cleanup plans for the sites with the town's future use plans.

EPA has also worked closely with the Edison Wetlands Association (EWA). EWA received a Technical Assistance Grant (TAG) from EPA for the Horseshoe Road site, to assist in its independent efforts to communicate information about that site to the surrounding community. EWA chose to discontinue use of the TAG grant for the site, but still participates in the CAG.

In December 1999, the Proposed Plan and supporting documentation for OU1, which addressed the on-site buildings and above-ground structures at the Horseshoe Road and ARC sites, were made available to the public. After evaluating comments received during the public comment period, EPA selected a remedy for OU1, which has since been implemented. During the OU1 public comment period, community interest was moderate, with a smaller group that showed deep concern over site issues.

In June 2004, the Proposed Plan and supporting documentation for OU2, which addressed the soil and groundwater remedies at the Horseshoe Road and ARC sites, were made available to the public. After evaluating comments received during the public comment period, EPA selected a remedy for OU2. Again community interest was moderate, with a smaller group that showed concern over site issues.

The implementation of the Horseshoe Road site portion of the OU2 Remedy began in February 2008. On March 14, 2008, EPA held a meeting to kick-off the excavation work. The purpose of the meeting was to let the community know what to expect, and to hear their concerns. Turnout for the meeting was moderate. The community concerns were mostly about truck and train traffic, and precautions taken to prevent off-site contamination. The remedial design for the ARC portion of the OU2 remedy is ongoing.

On July 18, 2008, EPA released the Proposed Plan and supporting documentation for the sediment remedy (OU3) to the public for comment. EPA made these documents available to the public in the administrative record repositories maintained at the EPA Region II office (290 Broadway, New York, New York), and the Sayreville Public Library (1050 Washington Road, Parlin, New Jersey). EPA published a notice of availability involving these documents in the Suburban News newspaper, and opened a public comment period on the documents from July 21 to August 20, 2008.

On August 12, 2008, EPA held a public meeting at the Sayreville Township Town hall to inform local officials and interested residents about the Superfund process, to present the preferred remedial alternative for OU3, solicit oral comment, and respond to any questions.

In response to a written request from a reviewer of the Proposed Plan, the Region presented EPA's proposed remedy to EPA's National Remedy Review Board (NRRB) on November 19, 2008. Prior to the November meeting, the Region extended an invitation to all stakeholders who had provided written comments on the Proposed Plan to also submit a written position to the Board, and most of the commenters did so. These stakeholder statements are included in the Administrative Record for the sites. The comments that were received from the Board, and the Region's responses, are included in the Administrative Record.

II. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS, AND RESPONSES

PART 1: Verbal Comments

This section summarizes comments received from the public during the public comment period, and EPA's responses.

A. SUMMARY OF QUESTIONS AND EPA's RESPONSES FROM THE PUBLIC MEETING CONCERNING OU3 OF THE HORSESHOE ROAD AND ATLANTIC RESOURCES SITES - August 12, 2008

A public meeting was held August 12, 2008, at 7:00 p.m. at the Sayreville Town Hall, 167 Main Street, Sayreville, New Jersey. Following a brief presentation of the investigation findings, EPA presented the Proposed Plan and preferred alternative for OU3 of the Horseshoe Road and ARC sites, received comments from interested citizens, and responded to questions regarding the remedial alternatives under consideration.

Although the purpose of the public meeting was to take public comments on EPA's preferred remedy for OU3, there were also questions/comments about OU2, such as the cost of the clean-up.

Comment #1: *A representative of Edison Wetlands Association asked if EPA would be restoring wetlands in place immediately after the excavation work was complete.*

EPA Response - EPA plans to restore wetlands in place to the extent possible. How restoration is implemented has not been determined at this point, and will depend on several factors including the impact of previous operable unit remediation work, as well as Town and State input. There is the potential that EPA may have to restore in-kind elsewhere along the river or we could restore a different type of wetland vegetation. That would be part of the remedial design process.

Comment #2: *A representative of Edison Wetlands Association asked if the wetland restoration plans could be commented on by the public, and when it would be available to the public.*

EPA Response - All design documents would be available to the public in the site repository shortly after they are approved. Although public comment on the design is not normally part of the process, EPA could provide the wetlands restoration plans to interested parties if there was interest in doing so. The Community Advisory Group (CAG) meetings would probably be the best way to allow interested parties to learn about wetlands restoration plans and have a dialog about them with EPA.

As for the timing, EPA expects the wetlands restoration plans, along with the other remedial design documents, could be available between 18-24 months after the ROD is signed.

Comment #3: *A representative of Edison Wetlands Association asked if the wetland restoration plans would take the proposed Main Street Bypass into consideration, and whether EPA has seen such plans.*

EPA Response - EPA has been made aware of the Town's intentions to build a Main Street bypass that might pass through the Horseshoe Road and ARC sites. EPA has not seen any specific plans and does not know that it will indeed pass through the sites. EPA will move forward with plans that are neutral with regard to the Town's plans. At such time that Sayreville has plans it can share with EPA, we will make every effort to work with the Town and State to ensure that the efforts to restore the wetlands are not compromised by development of this area.

Comment #4: *A representative of Edison Wetlands Association asked what the source of background information was that EPA used for the Marsh and River in the Proposed Plan.*

EPA Response - The background numbers in Table 4 of the Proposed Plan(Arsenic 14.7 mg/kg and Mercury 0.14 mg/kg) come from the 2002 Final Revised Feasibility Study for Soil and Groundwater. These values were based on site-specific surface soil data collected during the remedial investigation and was used to calculate the human health risk in accordance with EPA's human health risk guidance, and were primarily derived from upland sampling locations. Reference range numbers found in Tables 1 and 2 of the Proposed Plan were taken from near-site sediment sampling during the Ecological Investigation done in 2004. In the case of the river reference locations, reference location # 2 was omitted as not representative of background conditions.

With regard to OU3, EPA also looked at data collected throughout the Raritan River Estuary for the New Jersey Department of Environmental Protection (NJDEP) and the Army Corps of Engineers to get an idea what the regional background levels were in the area of the Lower Raritan. These numbers were used as a reference to determine what a remedy could reasonably expect to achieve in the River.

The comparison to background data was only used in the River to determine what was realistically attainable, and to assess the degree to which the remediation of a portion of River sediments would be recontaminated by regional conditions.

Comment #5: *A representative of Edison Wetlands Association asked whether the numbers EPA is cleaning up to in the River are protective of benthic organisms and other animals in the area.*

EPA Response - The clean-up numbers EPA chose for the River are based on a balance between site-specific values from the human health and ecological risk assessments, NJDEP's Effects Range-Medium screening numbers, and consideration for what is achievable in the River based on the regional level of sediment contamination. EPA believes that using these Remediation Goals will be both protective to benthic organisms and other animals, and increase the overall health of the Raritan Estuary by removing a source of contamination.

Comment #6: *A representative of Edison Wetlands Association asked whether EPA planned to cap the dredged areas in the river, and will clay be used.*

EPA Response - EPA's proposed remedy calls for placing backfill in the dredged areas. The cover material in the proposed remedy would be as much as three and a half feet thick and is expected to have permeability similar to the surrounding materials. The advantage of this alternative over a more traditional cap is threefold: (1) more contaminated sediment will be removed from the sites; (2) the thicker cap will provide more protection against erosion by river ice or boat motors; and (3) the more permeable material will allow the River biota to re-establish.

It is unclear how much contaminated sediment will remain after dredging. While this alternative does not specify the material that will be used as backfill, it is not EPA's intent to backfill with three and a half feet of impermeable clay. The design of this remedy will take into account many factors including permanence and re-establishment of the ecological habitat. While EPA does not intend to make this a completely clay cap, some clay may be incorporated into the design. As discussed in the Decision Summary, during remedial design, EPA will evaluate alternative capping methods that may be equally protective but at lower cost, such as placing a thinner cover layer and allowing natural resedimentation to return the area to current depths.

Comment #7: *A representative of Edison Wetlands Association asked whether EPA planned to leave the old dock pilings in the river that are currently used for nesting by osprey, and would EPA time the clean-up to minimize disturbance of the osprey.*

EPA Response - It is EPA's intent to leave the pilings in place. EPA also intends to plan the dredge work near the pilings during the fall when the birds are not nesting to minimize the affect of the clean-up on ospreys.

Comment #8: *The Raritan River Keeper asked if there is a difference between backfill and capping in the river, and does EPA intend to monitor these remedies.*

EPA Response - It is EPA's intent to monitor these remedies to ensure they remain protective. See EPA's response to Comment #6 regarding backfill and capping.

Comment #9: *The Raritan River Keeper asked if EPA intends to place restrictions on these areas after the remedies are in place.*

EPA Response - The Proposed Plan includes land use restrictions as part of the proposed remedies for both the Marsh and River as necessary to prevent disturbance of any contaminated materials that may be left in place.

Comment #10: *The Raritan River Keeper asked what dredging methods EPA proposes to use, and will the plans need to go through the State Office of Dredging. In addition, will* *the dredging method prevent re-suspension of contaminated sediment.*

EPA Response - The chosen remedy does not specify the dredging method, though a variety of dredging methods were evaluated, and considered appropriate for the sites, in the FS. The dredging method will be determined during design, and will be coordinated with both the Army Corps of Engineers and the State of New Jersey. The design will be required to minimize suspension of contaminated sediment, to the extent practicable.

Comment #11: *The Raritan River Keeper asked if there will be an opportunity to comment on EPA's dredging plans in the design phase.*

EPA Response - All documents will be available in the site file. The best venue for commenting will be through the Community Advisory Group, of which the River Keeper is an active member. Other members of the community are welcome to join this group or send questions or concerns about remedy implementation separately to EPA.

Comment #12: *A representative of Edison Wetlands Association asked about the schedule for this remedy, and would the wetlands restoration be part of the Remedial Design.*

EPA Response - EPA plans to begin the remedial design once the Record of Decision is finalized. The wetlands restoration plans would be part of this Design. There will be some time required to negotiate an order with the potentially responsible parties (PRPs), and hire a contractor, but the design should be completed within two years. EPA would like to have the design ready to implement when the OU2 remedy for both sites is completed. The Horseshoe Road site OU2 remedy started in February 2008 and is expected to be completed in 30 months. The ARC site portion of the OU2 remedy should be ready to start when the Horseshoe Road portion is completed, and will probably require the same amount of time. Due to transportation and space issues, the clean-ups cannot be implemented concurrently.

Comment #13: *A representative of Edison Wetlands Association asked if there were any viable responsible parties for these sites.*

EPA Response - There is a PRP group working with EPA to clean up the ARC site. At this time, EPA has not identified any viable parties for the Horseshoe Road site.

Comment #14: *A representative of Edison Wetlands Association pointed out on the map, the area in the river being addressed for mercury only, and asked where in the Proposed Plan it says that this area will be excavated.*

EPA Response - On page 12 of the Proposed Plan, where EPA describes the Remediation Goals, mercury is included. On page 21, where the Remediation Goals are repeated the goal of two mg/kg is included. On Figure 3, where the remediation zones are outlined the mercury only area is included. EPA also intends to perform additional delineation sampling during the remedial design phase, which will include arsenic, mercury, and PCB sampling.

Comment #15: *A representative of Edison Wetlands Association asked why there isn't any horizontal scale to the cross-sectional views (figures 4 and 5), and why there is no trace line on the map view to indicate where the cross-sectional view is from.*

EPA Response - Figures 4 and 5 are conceptual models depicting how the contamination would be addressed in each alternative. These views do not accurately depict any one cross-section of the site but instead illustrate the various zones and how the alternatives will address them in a simplified format to make it readable. The horizontal scale is not relevant because it would differ depending on the area of the site you looked at, and likewise drawing a trace on the map would indicate that this is a detailed accurate representation of the cross-section defined by that line, which these figures are not.

Comment #16: *A representative of Edison Wetlands Association asked what the nature of the sediments were in the river and what type of backfill EPA intended to place there.*

EPA Response - Sediment in the River varies from sandy silt to silt and clay, with silt being the most common constituent. See EPA's response to Comment #6 for backfill information.

Comment #17 *A representative of Edison Wetlands Association wanted to know if the marsh restoration method will be documented in the Record of Decision.*

EPA Response - The ROD will document the fact that wetlands restoration will be required for these sites, but the exact method of restoration will be determined during the remedial design.

Comment #18: *A representative of Edison Wetlands Association asked whether the Horseshoe Road Drum Dump will be converted back to tidal or upland wetlands.*

EPA Response - Consistent with the OU2 ROD addressing that area, the area of the Horseshoe Road Drum Dump, which is currently a mound, will be returned to a grade similar to the neighboring land, and some of it is likely to be wetlands.

Comment #19 *A representative of Edison Wetlands Association asked where EPA got the 14.7 mg/kg background number for arsenic in Table 4 of the Proposed Plan, and how cleaning up to 32 mg/kg prevents the site from being a continuing source.*

EPA Response - The response to Comment #4 explains how background numbers in Table 4 of the Proposed Plan were derived. The Remediation Goal of 32 mg/kg of arsenic in the Marsh is the lowest of the numbers derived in the ecological risk assessment, and is derived from a study of the affects of site sediments on indicator species that are meant to represent conditions in the marsh for various communities (in this case, blackworm, representing aquatic macroinvertebrates in Marsh sediments) in a lab study of toxicity. To set the 32 mg/kg clean-up goal, EPA conferred with the Biological Technical Assessment Group, which includes representatives EPA, NJDEP, NOAA, and the U.S. Fish and Wildlife. EPA relied upon the expertise within this group to identify appropriate ecologically derived Remediation Goal for the sites. EPA's goal is to eliminate the site as a source of arsenic that is a risk to the environment. Arsenic can be found in the marsh sediments as high as 20,000 mg/kg, so reducing arsenic levels to below the risk-based number of 32 mg/kg is removing a significant source of arsenic that is a risk to the environment.

Comment #20: *A resident living on Horseshoe Road asked how the Horseshoe Road Site compares in size to other Superfund Sites in the Nation and New Jersey.*

EPA Response - The Horseshoe Road site and ARC site areas would be dwarfed by some of the Superfund mega-sites around the nation. In New Jersey, the two sites would not rank as one of the largest by area; they would probably fall nearer to the middle. They are some of the larger sites currently being cleaned up in New Jersey.

Comment #21: *A resident living on Horseshoe Road asked where the arsenic found on the site is coming from.*

EPA Response - EPA cannot pinpoint the exact origin of the arsenic found at the sites. Although it is plausible that some arsenic originated from the metals reclamation at the ARC facility, it appears that the larger input to the Marsh came from the runoff channel that drains the Horseshoe Road site. The were many businesses that operated out of the Atlantic Development Corporation facility as well as midnight dumping that occurred in the Sayreville Pesticide Dump. Arsenic could be part of a pesticide production or numerous other operations. EPA can only speculate as to the sources at this point.

Comment #22: *A representative from Exponent (The potentially responsible party group's contractor) asked if the total cost of the remedy being $34.4 million would trigger a review by the National Remedy Review Board.*

EPA Response - The National Remedy Review Board (NRRB) reviews proposed Superfund cleanup decisions that meet cost-based review criteria to assure they are consistent with Superfund law, regulations, and guidance. Given the number of remedial decisions that are made each year, the NRRB reserves its reviews to site remedies of a certain magnitude, that is, planned remedies greater than $25 million. Further information about the NRRB can be found at:

http://www.epa.gov/superfund/programs/nrrb/index.htm

Prior to releasing the Proposed Plan, EPA Region 2 concluded that, because the proposed remedy addressed two sites, neither of which individually met the threshold of $25 million, the sites would not be eligible for NRRB review. After considering Exponent's comment, EPA consulted with the Board, and the Board accepted the site for review. EPA then solicited comments from major stakeholders and other interested parties. Written statements from stakeholders along with a presentation package from Region 2 were provided to the NRRB members.

The NRRB met on November 20, 2008 to discuss the OU3 remedy for sites. The Board's written recommendations were provided to Region 2 on January 29, 2009 and Region 2 provided written responses to the NRRB on February 25, 2009.

EPA has placed the stakeholder's comments, along with the NRRB's recommendations memorandum, and Region 2's response to the Board, in the administrative record for the sites.

Comment #23: *A representative of Edison Wetlands Association asked if the reason that there were no viable PRPs for the Horseshoe Road Site was because one of the owners killed his partner, and asked whether he was still in jail.*

EPA Response - While this did occur, and the man is still in jail, he is not the reason that there are no viable parties identified for this site. To date, EPA's investigation into former owner-operators has been unable to identify viable companies or individuals that can take responsibility for the cleanup at the Horseshoe Road site.

Comment #24: *A representative of Edison Wetlands Association asked whether the ARC PRPs will be paying for the clean-up at the ARC site and the Horseshoe Road Drum Dump portion of the Horseshoe Road site.*

EPA Response - A group of PRPs for the ARC site are currently performing the remedial design for the OU2 remedy of the ARC site and for the HRDD portion of the Horseshoe Road site. An agreement is in place whereby the ARC parties will also perform the remedial action work for the ARC site. It is not yet determined how the clean up of the HRDD area will take place. EPA has an agreement in place with the ARC PRPs to perform the RI/FS for the marsh and river (Operable Unit 3 - this action), which addresses both sites. Once the ROD is issued, EPA expects to enter into negotiations with the PRPs for the remedial design and remedial action for the ARC site, or to reach some other appropriate settlement.

Comment #25: *A representative of Edison Wetlands Association asked whether EPA would use its authority provided in the superfund law to recover treble damages from recalcitrant parties to persuade the PRPs to do the remediation work.*

EPA Response - EPA will evaluate its enforcement options at the appropriate time. EPA has several enforcement routes available when it comes to cleaning up sites, including reaching settlements with PRPs that require the PRPs to perform the cleanup work with EPA oversight, or reaching a cash settlement with PRPs and performing the work itself. If EPA is unable to negotiate a settlement with PRPs, EPA may choose to issue an order to compel PRPs to do cleanup work. The referenced "treble damages" provision of CERCLA is reserved for recalcitrant parties that decline to perform work pursuant to an order, whereas EPA has had a productive working relationship with the viable parties identified for the ARC site for a number of years.

Comment #26: *A representative of Edison Wetlands Association asked if the area in the River that is being addressed for mercury alone is the only area with mercury or the only area with mercury that arsenic is not found. He also asked if the mercury in this area is related to the ARC site and would the ARC PRPs pay for that cleanup.*

EPA Response - Based on the location of this mercury-contaminated area, it is more likely to be related to the operations on the ARC site. Generally, arsenic and mercury were found co-located; this area was an exception. EPA has not fully evaluated the available information in an effort to determine the origin of all the contamination in the Marsh and River, and cannot say what portion of the clean-up will be attributed to the PRPs for ARC.

Comment #27: *A representative of Edison Wetlands Association asked at what point EPA will determine the contribution of the PRP group for ARC.*

EPA Response - After the ROD is issued, EPA typically discusses with viable PRPs about performing remedial design and remedial action work, and EPA and the PRPs may come to an agreement on what the PRP contribution to the cleanup should be. If EPA and the private parties cannot reach an agreement on a fair division of the cleanup costs, EPA may fund the cleanup work and later seek reimbursement from the PRPs.

Comment #28: *A representative of Edison Wetlands Association asked if the negotiated settlement would need to be addressed in an ESD (Explanation of Significant Difference).*

EPA Response - The settlement or court decision regarding the PRP contribution is not relevant to the Record of Decision. The Record of Decision documents what needs to be done, not who will do it. If PRPs do not fund it, EPA and New Jersey will.

Comment #29: *A representative of Edison Wetlands Association asked if EPA had determined the cause of the bare spot in the marsh along the ARC drainage.*

EPA Response - The cause of the lack of vegetation in the ARC drainage is still unknown. Sampling in that area does not point to a contaminant-derived cause.

Comment #30: *A representative of Edison Wetlands Association asked if EPA had looked at the chemical processes that the companies were using to see if there was some specialty chemical that was being used that may be the cause of the bare area on ARC.*

EPA Response - EPA and CDM (EPA's contractor) looked into the possibility that one of the PRPs disposed of a "specialty chemical" that might not be detected within the normal suite of pollutants that EPA tests for. EPA evaluated "tentatively identified compounds", but did not find any patterns that suggested an unidentified constituent outside EPA's normal range of testing. ARC did metal reclamation and it seems unlikely that there is anything they used that EPA does not already test for, though EPA does not rule out that possibility.

Comment #31: *A representative of Edison Wetlands Association asked what money EPA has received for the Operable Unit 2 clean-up currently going on, and what EPA expects to get in Fiscal Year (FY) 2009.*

EPA Response - As of the date of the Proposed Plan, EPA Region 2 had received approximately $17 million for the OU2 cleanup work. At the time of the public meeting, the Region had expected that this project would be fully funded from the fiscal year 2008 (FY08), FY09 and FY10 budgets.

Comment #32: *A representative of Edison Wetlands Association asked if EPA expected to get money to do the Marsh and River when EPA is ready for the cleanup.*

EPA Response - While there is no guarantee that funds will be available when EPA starts the OU3 cleanup, the Region has been able to obtain the funds needed to do all the work up to now, and EPA is confident that there will be funding to address this Operable Unit when the time comes.

Comment #33: *A representative of Edison Wetlands Association commented that he would like the pond that was filled in for the OU2 work to be considered open water (presumably to be restored as such).*

EPA Response - Comment noted. This pond was constructed by one of the local businesses, presumably to provide a water source by collecting surface water run-off in earlier years before municipal water was brought to the area. A reconstructed pond probably does not fit in with the long-term plans of Sayreville, and is not currently in EPA's site restoration plans.

PART 2: Written Comments

Comment #34: A representative for the consulting firm Hatch Mott MacDonald (HMM), on behalf of Gerdau Ameristeel, writes, "*Based upon a review of the cited documents, it is not apparent how the background concentration of arsenic was derived.*"

EPA Response - See response to Comment #4 and the discussions regarding reference samples in the "Summary of Site Characteristics" section of the ROD Decision Summary.

Comment #35: A representative of HMM writes, "*Soils at and adjacent to the Site include New Jersey Coastal Plain sediments, historic fill, and fluvial sediments deposited by the Raritan River or its former and present tributaries. These soils may have different concentrations of arsenic based on their texture, mineralogy, and/or depositional* *history (for the native soils and sediments) or source (for the fill), among other factors. HMM is concerned that our review of the documents did not indicate that EPA adequately took soil texture, mineralogy, and depositional history into account when determining the appropriate background concentration of arsenic."*

EPA Response - EPA agrees with the commenter with regard to the difficulty in determining background concentrations for upland soils in developed areas. The background values and reference ranges were used to determine if the clean-up goals were attainable in the Marsh and River settings, not to set clean-up numbers for the sites. The Remediation Goals for the Marsh and River were derived from site-specific risk and ecologic assessment information, reference location sampling, and ecological risk guidance.

Comment #36: A representative of HMM writes, *"The historic filling of former marshlands and general historic industrial land use on both sides of the Raritan River indicate numerous potential non-point sources for arsenic. Distinguishing background concentrations in this environment is difficult. HMM believes considering background concentrations to encompass both naturally-occurring and anthropogenic arsenic to be appropriate given the site setting."*

EPA Response - The Commenter makes a general observation about regional conditions; whereas a site-specific evaluation was performed by EPA for these sites.

EPA in its evaluation of the Horseshoe Road and ARC sites took into consideration regional site conditions; however, these sites (particularly Horseshoe Road) are clearly a local source of arsenic contamination. The Marsh area that is a primary focus of this Operable Unit is clearly the drainage area for surface water runoff from the sites, and there is no evidence in the Marsh of the types of anthropogenic activities identified in the comment.

Comment #37: *A representative of HMM writes, "HMM notes that the concentration of naturally-occurring arsenic and anthropogenic arsenic deposited from non-point sources may vary spatially, even over short distances. Therefore, background samples collected along the property boundaries of the Sites or adjacent to the Sites may not be* *representative of background concentrations throughout the Sites."*

EPA Response - Comment noted.

Comment #38: A representative from Exponent (The potentially responsible party group's contractor) writes, ***"First, the site contains no principal threat wastes yet EPA's preferred alternatives rely primarily on removal, as though the sediments are highly toxic or mobile or pose significant risk and cannot be reliably contained.*** *The Proposed Plan correctly acknowledges that OU-3 marsh and river sediments (the subject of this Proposed Plan) are* not *considered to be principal threat wastes. In contrast, surface soils at the Horseshoe Road Complex and Atlantic Resources Sites under Operable Unit 2 have been identified and are being handled as such. The remedy for principal threat wastes at OU-2 relies primarily on removal of contaminated soil that has the potential to contaminate groundwater. EPA has selected the same remedy (i.e., removal) for a large volume of OU-3 sediments yet the majority of these sediments are not highly toxic or mobile, do not pose significant risk, and are or can be reliably contained. All marsh alternatives include excavation of the SPD/ADC drainage, the area with the highest contaminant concentrations, most significant risk to human health and the environment, and greatest potential to contaminate the marsh and river.*

"The National Contingency Plan (NCP) makes clear that "EPA expects to use engineering controls, such as containment, for waste that poses a relatively low long-term threat or where treatment is impracticable" (NCP Section 300.430(a)(1)(iii)(B)). This approach is also reflected in EPA guidance for remediating metals at soil sites (EPA 540-F-98-054) where containment is identified as the presumptive remedy for low-level threat wastes, and for remediating contaminated sediment (EPA-540-R-05-012) where monitored natural recovery and capping are both recognized as viable approaches that should be evaluated at every sediment site. Given the standards in the NCP that govern remedy selection and the conditions at OU-3, the most appropriate approach is to remove the areas of highest contamination and potential risk (i.e., the SPD/ADC drainage) and contain other areas that present only a relatively low long-term threat. All alternatives, with the exception of No Action,

include excavation of the SPD/ADC drainage and associated areas with elevated contaminant concentrations."

EPA Response - The section quoted from the NCP over-simplifies the role that designating principal and low-level threats plays in remedy selection. EPA's "A Guide to Principal Threat and Low-level Threat Wastes" (9380.3-06FS, November 1991), further clarifies EPA's expectations regarding these designations, which are made primarily to aid in streamlining remedy selection. That guidance document states:

> "The identification of principal and low level threats is made on a site-specific basis. In some situations site wastes will not be readily classifiable as either a principal or low level threat waste, and thus no general expectations on how best to manage these source materials of moderate toxicity and mobility necessarily apply."

While principal threat wastes were not identified in the Marsh and River sediments, EPA has identified that contaminated Marsh sediments may be a continuing source to the river, and that the River sediments to be addressed by this action are a potential source to other River sediments. The NCP expects EPA to consider a range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants is a principal element, an approach that the PRP Group supports; therefore, to a large degree, this comment is not focused on the need to consider treatment or other permanent remedies for principal threat wastes (the guiding principle behind this aspect of the NCP) but about the Remediation Goals selected by EPA to address different aspects of the sediment contamination.

The comment suggests a level of agreement with EPA's approach to the more highly contaminated sediments, though the comment does not suggest which contamination in either the Marsh or the River needs to be addressed, and which is "low-level", or which alternative the commenter felt best met the RAOs. Be that as it may, the FS considered a wide array of remedial alternatives that use a mixture of remedial technologies, including all the technologies identified in the comment. To understand EPA's rationale for not selecting an alternative that relies primarily on capping or monitored natural recovery for sediments with lower contaminant concentrations, please refer to the Decision Summary for EPA's nine-criteria assessment of the remedial alternatives.

Comment #39: A representative from Exponent writes, ***"Second, the total cost for EPA's preferred alternatives ($34.2 million) is out of proportion to any of the potential risks associated with the site.*** *The total cost makes OU-3 one of the largest sediment remediation projects in New Jersey; however, the risks, particularly in the river, are relatively minor. With regard to human health, the 6-acre marsh is covered by Phragmites, virtually impenetrable by humans, and there are no conceivable plans for residential development. The only area identified in the feasibility study as posing risk to human health is the SPD/ADC drainage, which will be excavated under all marsh alternatives with the exception of No Action. In the river, there are no unacceptable risks to human health with the exception of a small area at the mouth of the SPD/ADC drainage that is included for removal in all marsh alternatives, with the exception of No Action. Reliance on full scale removal and dredging, which dramatically increases total costs, is thus unwarranted.*

"The total cost of $34.2 million is also unwarranted given the limited threat to the ecosystem of the marsh and river. The BERA found that acute risks to aquatic and terrestrial invertebrates and adverse effects on individuals of avian and mammalian invertivore receptor species were limited to discrete areas (primarily associated with the SPD/ADC drainage) where contaminant concentrations are elevated, risks were calculated to be relatively low for mammalian herbivore receptors assumed to forage over the entire marsh, and risks were calculated to be negligible for avian carnivores with home ranges larger than the area of the marsh. Yet, the preferred marsh alternative involves excavating the entire marsh to various depths at a cost of $20.7 million based on this minimal risk to ecological receptors.

"The BERA found that the river portion of the site presents no risks to fish or birds, minimal risk to benthic macroinvertebrates, and as stated by EPA in their June 25, 2007, comment letter on the draft Feasibility Study report, "…the site footprint…is probably too small to result in quantitative food-chain level effects…" and "…the incremental improvement that would result from taking

action in the River would be difficult to quantify…" Yet, EPA's preferred river alternative is expected to cost $13.5 million and the area would be quickly recontaminated by sediment from the lower Raritan River.

"In a similar situation at the NL Industries site just downstream of OU-3 on the Raritan River, NJDEP decided in 2004 on no action in the river, even though NL Industries had contributed to sediment contamination adjacent to the site, because recontamination would occur within a relatively short time. Given that recontamination was an important concern at NL Industries, it should also be one here, regardless of other distinctions between the sites. Finally, it should be noted that the total cost of the OU-3 remedy is obscured in the Proposed Plan by the separation of marsh and river costs, and by EPA's 50-50 attribution of costs to the Horseshoe Road Complex and Atlantic Resources Corporation sites. EPA has stated that this cost attribution is necessary for administrative reasons. The Group has not been advised of the administrative rationale for EPA's cost splitting presented in the Proposed Plan. There is concern, however, that an unintended result of such cost splitting would lead EPA to ignore the obligation to seek review of this remedy by the National Remedy Review Board (NRRB). OU-3 is a single operable unit and the total cost of addressing that operable unit exceeds the $25 million threshold for review by the NRRB. Thus, the Group believes that review by the NRRB is mandated under the circumstances. At the recent public meeting, EPA stated that OU-3 is one of the largest sediment remediation projects in New Jersey. Thus, even if not mandated, review by the NRRB is warranted and the Group specifically requests such a review.

"Regardless of administrative accounting, EPA's 50-50 attribution between the Horseshoe Road Complex and ARC Sites has no basis in fact or science. The Horseshoe Road Complex consists of three separate sites (the Horseshoe Road Drum Dump site or "HRDD", the Atlantic Development Corporation site or "ADC" and the Sayreville Pesticide Dump or "SPD"). Any "administrative" attribution must acknowledge the existence of all four sites (i.e., a 25-25-25-25 attribution). Fundamentally, however, the data provide clear and convincing factual and technical evidence that a much larger portion of the total costs is associated with the SPD/ADC sites, including the SPD/ADC drainage. This is significant because these sites along with the HRDD

are "orphan" sites (i.e., no financially viable potentially responsible parties have been identified) whose cleanup must be paid for out of public funds. The NCP offers guidance on situations such as this (note that the cleanup levels in this Proposed Plan are not technically applicable or relevant and appropriate requirements (ARARs); however, the line of reasoning is instructive):
(C) An alternative that does not meet an ARAR under federal environmental or state environmental or facility siting laws may be selected under the following circumstances: …
(6) For Fund-financed response actions only, an alternative that attains the ARAR will not provide a balance between the need for protection of human health and the environment at the site and the availability of Fund monies to respond to other sites that may present a threat to human health and the environment ((NCP Section 300.430(f)(1)(ii)(C)(6)). The guidance here is that scarce public funds should not be expended to address low level risks (such as in OU-3) when there are other, higher-risk sites in need of those funds."

EPA Response - During the development of the FS, EPA acknowledged the challenges of assessing the ecological risks posed by the sediment contamination, accounting for the variability of the wetlands setting when coming up with permanent remedies, and the difficulty of identifying an appropriate set of Remediation Goals that will be protective for human health and the environment in this setting. Please refer to the Decision Summary for EPA's discussion of the factors considered in developing the Remediation Goals. In its first comment (Comment #38, above), Exponent acknowledges that contaminated sediments above some unnamed threshold should be remediated, even excavated or dredged and removed from the sites. In this comment, Exponent presents its own interpretation of the assessments of human health and ecological risk, stating that the overall site risks are minor. As discussed in the Decision Summary, Exponent, while developing the FS, proposed a number of different interpretations of the BERA and BHHRA results to come up with different clean-up endpoints. EPA evaluated Exponent's work along with input from NJDEP and other federal agencies participating in the Biological Technical Assistance Group, an advisory group in environmental risk assessment within EPA. As discussed in the Decision Summary, EPA weighed not only risk assessment information, but the sites as an ongoing source of contamination to the Raritan in developing its Remediation Goals.

One of the key factors regarding selection of the remedies was the natural sedimentation rate (i.e., if left alone, how fast would cleaner sediment accumulate on top of contaminated sediment, providing a clean barrier to exposure, and would it effectively cover the contaminated areas). The type of remedial alternatives preferred by the PRP Group rely on an assumption that the sedimentation rate is a significant remedial factor here, providing protective cover material to the contaminated areas in a reasonable period of time. EPA's review of the data indicated that sedimentation is at a fairly steady state, neither depositing or eroding significantly, under the current conditions. EPA's selected remedies do not rely on natural sedimentation as capping, and offer a robust cover in the event of significant weather events, or greater-than-normal ice scouring in the River. The PRP Group is proposing to accept a much higher level of uncertainty with regard to the effectiveness and permanence of a sediment remedy, and does not appear to fully consider that the contaminated sediments are a continuing source of contamination to the Raritan. If one of the other alternatives offered the same or similar protection, at a lesser cost, EPA would have chosen it instead.

With regard to the Raritan River, Exponent refers to NJDEP's assessment for the NL Industries site, which is nearby the sites and also has caused River sediment contamination with metals, including arsenic. EPA evaluated NJDEP's conclusions about that site while developing this remedy (summarized in its June 24, 2004 letter regarding NL Industries, included in the Administrative Record), and it is important to note two issues: NJDEP identified the nearby Horseshoe Road sediment contamination as one factor impeding a sediment remedy for NL Industries; and NJDEP believed that any remedial actions conducted in this area of the River should be part of a regional approach. As described in the ROD, EPA's approach to addressing the Raritan River is in keeping with NJDEP's expectations, and will complement actions at other local sources of sediment contamination in the lower Raritan. EPA's remedial approach for addressing both Marsh and River sediments is consistent with the New York/New Jersey Harbor Estuary Program's efforts to protect the estuary. The Harbor Estuary Program's Comprehensive Conservation and Management Plan (CCMP) recommends using available information to help set priorities for the clean closure or remediation of sites contributing contamination to the Harbor/bight. In addition, the CCMP also indicates that, even in light of elevated sediment contamination levels through the region, EPA and other responsible agencies should take appropriate steps to remediate known areas of highly contaminated sediments that are contributing to human health and ecological risks. Consistent with this approach, NJDEP has stated that it plans to evaluate other contaminated sites along the Raritan River that are also contributing incrementally to contamination in the Raritan Estuary, and Remediation Goals EPA and the State developed together for this ROD will be considered by the State for those sites.

With regard to EPA's assessment of need for a consultation with the NRRB, see EPA's response to Comment #22. The discussion of cost attribution among different site segments are rendered moot by the Region's subsequent consultation with the Board.

With regard to the suggestion that any "administrative" attribution must acknowledge the existence of four separate sites (i.e., a 25-25-25-25 attribution), EPA believes that the history of the sites are well known on this matter; that SPD was a dumping area for ADC, and HRDD was a dumping area for ARC. In the FS, the Agency has not attempted to attribute the sediment contamination to one site or the other and is not doing so in the ROD, but neither does EPA accept the idea that a 50/50 split is an inappropriate method of dividing costs in the ROD.

Please note that at the public meeting EPA did not identify the sites as "one of the largest sediment remediation projects in New Jersey." Please refer to the response to Comment #20, above.

With regard to the reference to NCP Section 300.430(f)(1)(ii)(C)(6), EPA does not believe that this is germane to the issues raised by the comment. A more appropriate citation would be the section that immediately follows, Section 300.430(f)(1)(ii)(D), which discusses the basis for assessing cost effectiveness during remedy selection. Cost-effectiveness is meant to be assessed as one factor among the nine criteria, and only after the threshold criteria are satisfied.

Comment #40: A representative from Exponent writes, ***"Third,***

EPA's preferred alternatives are significantly more expensive than other alternatives but are at best only marginally more protective, such that additional costs are not justified. *Regarding risks, each of the marsh and river alternatives with the exception of No Action addresses unacceptable risks to human health. Each of the marsh and river alternatives, with the exception of No Action, addresses acute risks to benthic and terrestrial invertebrates. Each of the marsh alternatives, with the exception of No Action and Alternative M3, addresses chronic risks to terrestrial invertebrates and risks to birds and mammals. In addition, each of the marsh alternatives, with the exception of No Action, addresses the primary area with elevated contaminant concentrations that is mostly likely to release contamination to the marsh and river (i.e., the SPD/ADC drainage). The SPD/ADC drainage was identified in the Proposed Plan as "clearly the most highly contaminated portion of the marsh (page 6)." Remediation of the SPD/ADC drainage in combination with the substantial work completed for OU-1 and in process for OU-2 (to address principal threat wastes) will reduce the potential for the upland sites and the SPD/ADC drainage to contaminate the OU-3 marsh and river.*

Marsh Alternatives M6 and M7 provide an example of a significant increase in cost for a marginal increase in protectiveness. The cost difference between Alternatives M6 and M7 is $2.1 million (note that the cost of Alternative M7 is characterized by EPA on page 28 of the Proposed Plan as "only slightly higher" than M6). The substantive difference between the two is that Alternative M7 removes an additional foot of sediment (to 1.5 feet below the water table, in fact) to the burrowing animal/transport arsenic value of 160 mg/kg and removes an extra 1.2 acres of marsh to one foot to prevent chronic effects (i.e., the potential for biomass reduction) in the blackworm (and other aquatic macroinvertebrates), which, as stated in our August 8, 2007, Response to Comments (see attached), are highly unlikely to be resident in this area. The deeper removal in the marsh is excessive given the long-term stability of this marsh and the lack of burrowing below the water table. The Proposed Plan states on page 19 that Alternative M7 provides the greatest reduction in contaminant mass; however, the reduction in risk is incalculable. In all alternatives, contamination will be removed to appropriate risk-based levels. Considering the cost of EPA's preferred alternative, and the low potential for remedy failure, application of a thin layer cover as *proposed in Alternatives M2 and M4-M6, even though it would result in a slight increase in marsh elevation, should be more carefully considered.*

"In the river, the cost difference between Alternatives R5 and R6 is $2.6 million. The only substantive difference between the two is that Alternative R5 relies on natural deposition (estimated in the Proposed Plan to be at least 30 months) rather than backfill to fill in the dredged area. Furthermore, Alternative R4, which costs $5.3 million less than R5 and $7.9 million less than Alternative R6, achieves the same effect (i.e., protectiveness in the biological zone) but faster than Alternatives R5 and R6. Alternative R4 would result in uncontaminated sediment to a depth of 1 ft (twice as deep as the 6-in. biological zone). Concern over the potential for disturbance of the foot of clean sediment used for backfill is ameliorated by the fact that this area of the river is not susceptible to disturbance, as evidenced by the accumulation of sediment in this area over time. Considering the cost of EPA's preferred alternative, the feasibility/utility of establishing a restricted navigation area should be more carefully considered.

"In conclusion, the remediation should focus on removal for areas with the highest concentrations of contaminants that pose the greatest risk to human health and ecological receptors and that are potentially available for transport to the river and the Raritan River Estuary. With the exception of No Action, all alternatives will

- *Eliminate human health risk*
- *Remove the primary source of ongoing contamination to the marsh and river*
- *Protect ecological resources by*
  - *Eliminating acute and chronic risks to aquatic and terrestrial invertebrates*
  - *Mitigating chronic risks to wildlife*
  - *Avoiding large-scale disruption of a functioning ecosystem.*

"Ultimately, EPA has to resolve how to address uncertainty in the remedy selection process (e.g., the risk of remedy failure). Given the high cost of EPA's preferred

alternatives and the likelihood that a majority of the costs will be paid from public monies that could be spent on sites with obvious threats to human health and the environment, significantly greater attention should be paid to reducing the uncertainty of overly conservative assumptions used in selection of the remedy."

EPA Response - For the reasons given in EPA's response to Comment #39, EPA believes the issue is not so much that the preferred alternatives offer an increased level of protection over the other alternatives, but that they will be far more reliable in achieving EPA's remedial action objectives (RAOs) within a reasonable time frame, and then will perform better at maintaining protectiveness over the long term. All the remedial alternatives were devised to achieve the RAOs eventually; however, Exponent relies on the assumption that sedimentation can provide a protective cover in alternatives M2, M3, R2, R4 and R5, and that a thin cap or relatively thin backfill material can remain stable in the event of a large storm or ice scour event. An additional area of uncertainty weighed by EPA, but not acknowledged by Exponent, is the adequacy of a number of the remedial alternatives for the Marsh in providing sufficient wetland restoration. Ultimately, EPA needs to weigh the risk of remedy failure, and decide which remedy is appropriate to the sites.

Comment #41: A representative from Exponent writes, *"finally, please note that the Group rejects the cost attribution presented in the Proposed Plan even though EPA has stated that the cost attribution is for "administrative purposes" only. The Group fully reserves all rights regarding this issue and nothing herein should be deemed an admission or waiver of any kind."*

EPA Response - Comment noted.

Comment #42: A consultant to Edison Wetlands Association writes, *"EPA's PP is based on removal of contamination above specific numeric limits; however, the basis for these limits is not clearly defined in the PP.*

"According to the Feasibility Study for OU3, there were "reference locations" sampled and that data was "...one of a number of data points..." used to identify the contaminants of concern in OU3 marsh soils. For marsh sediments, the "reference location" was identified as an area 400 feet

south of the Crossman's Dock. The "other data points" used by EPA are not presented in the PP. Their location and magnitude of contamination are not provided. All data used to establish the PRGs for arsenic and mercury must be provided with the PP. A summary table would serve that purpose.

"The PP uses the terms "reference data" and "background levels". Neither term is clearly defined, and these terms appear to be interchanged at several points in the PP. Reference data and background levels are combined in Table 2 under a column titled "Reference Data". The Raritan River has well known sediment contamination issues. EPA is clearly committed to cleanup only that sediment contamination attributable to the HR and ARC Sites. The level of cleanup for OU3 hinges, to a large degree, on an accurate determination of background levels. The PP must include to EPAs basis for establishing background. The current PP is confusing on this point and requires correction."

EPA Response - See response to Comment #4 with regard to a discussion of background/reference values, and their use in assessing remedial alternatives. Studies of the Horseshoe Road and ARC sites have been performed over a number of years, by different consultants, resulting in slight variations of terminology, though EPA disagrees that the Proposed Plan is not clear on this point. EPA would also disagree that the Remediation Goals identified in the Proposed Plan rely to a large degree on background levels. The comparison to background data was only used to determine what was realistically attainable, and to assess the degree to which the remediation of a portion of river sediments would be recontaminated by regional conditions.

Consistent with CERCLA and the NCP, EPA assessed the regional sediment conditions in the lower Raritan Estuary and identified an appropriate site-specific response action that fits into the larger regional issues within the waterbody. Please refer to the Decision Summary for further discussion of the relationship between this remedy and the Raritan.

Comment #43: A consultant to Edison Wetlands Association writes, *"The arsenic PRG for the upper 1 ft of marsh sediments is 32 mg/kg. Various arsenic levels form the Human Health and Ecological Risk Assessments are provided* *in Table 4 of the PP. As a rationale for selecting 32 mg/kg, the PP states "After considering screening values used by NJDEP and the recommendations of the other Natural Resource Trustees, EPA has identified 32 mg/kg as the Remediation Goal for the benthic zone of the marsh... Applying this Remediation Goal addresses most of the RAOs (Remedial Action Objectives), and in particular, satisfies the Agency's desire to minimize the marsh as a continuing source to the Raritan."*

"The NJDEP's "Guidance for Sediment Quality Evaluations" defines two freshwater sediment screening criteria for arsenic: the LEL (lowest effects level, or the least concentration where adverse impact to benthic organisms occurs) is 6 mg/kg, while the SEL (severe effects level, or the concentration where adverse impacts occur 95% of the time) is 33 mg/kg. EPA's selected arsenic PRG is, essentially, a concentration where adverse benthic impacts occur most of the time.

"Table 4 of the PP identifies the "background" arsenic concentration as 14.7 mg/kg. The selected PRG is more than twice this background concentration. If the concentration of arsenic in marsh sediments are greater than a background level those sediments, when eroded will cause a net release of arsenic to the Raritan River, making the marsh sediments a continuing source. The EPA's selected arsenic value does not reduce marsh sediment arsenic levels to background, leaving those sediments as a continuing source. The "other Natural Resource Trustees" the EPA consulted are not identified. These "others" must be identified and the basis of their concurrence must be provided. As noted above, having the basis for establishment of background concentrations is key to understanding and evaluating the selected PRGs and must be provided. "

EPA Response - EPA chose the remediation goal of 32 mg/kg arsenic, a value derived from site-specific sediment toxicity testing, after reviewing a wide variety of ecological assessment endpoints and other ecological risk assessment guidance. The SEL is a screening guideline, which means it is used to determine whether any further evaluation is required. The SEL was considered, along with other guidance, in developing remediation goals, in a "line of evidence" approach, where a number of relevant pieces of information are considered. In general, site-specific values are given more consideration than more generically derived values like SELs. (See also response to Comment #19 and refer to the full analysis of EPA's use of the reference values found in the Decision Summary.)

EPA's Response to Comment #19 also addresses the commenter's concern that remediating to 32 mg/kg will leave a continuing source if the background were 14.7 mg/kg. This 14.7 mg/kg value was used in the human health risk assessment and was derived from upland soil samples, not sediments. The range of Marsh reference values is more representative for the Marsh sediments.

EPA has a long-standing relationship with the Natural Resource Trustees, which include NJDEP and other federal agencies (in this case the National Oceanic Atmospheric Administration, part of the Commerce Department and the Fish and Wildlife Service, part of the Department of Interior) that participate in the Biological Technical Assistance Group (BTAG). BTAG is an advisory group in environmental risk assessment within EPA. The BTAG has participated throughout the development of the BERA and FS for this action. NJDEP concurs with the selected remedy.

Comment #44: A consultant to Edison Wetlands Association writes, *"EPA's PRG for arsenic in deep soils (below 1 ft) is 160 mg/kg, and is based on an ecological risk of exposure to deeper soils due to burrowing animals and erosion bringing deeper soils to the surface. As it is presently proposed, above 32 mg/kg in the upper 1 ft must be removed, but after cleanup, erosion (or a burrowing animal) can expose sediments with 160 mg/kg of arsenic at the surface and that is acceptable.*

"There is a fundamental flaw in these PRGs. If 32 mg/kg is the surface soil criteria it should be the criteria independent of time. What makes 160 mg/kg acceptable at some future date? EPA must address this dichotomy. One arsenic PRG, independent of depth, is more appropriate."

EPA Response - While EPA realizes the potential for burrowing animals (the muskrat in this case) to bring up contaminated sediment from below one foot while burrowing, the impact on the average surface sediment concentration would be negligible. After implementation of the remedial action, the amount of Marsh surface area that would actually be covered with only one foot of clean fill, with up to 159 mg/kg arsenic immediately below, is expected to be very small. Using the current data set, there are currently no areas within the marsh where this is the case, although arsenic concentrations in a few small areas do range from 50 to 80 mg/kg. The more common situation is where the proposed remedy would require an excavation to 30 or more inches to address the combined surface contamination (above 32 mg/kg arsenic, etc.) and deeper "source area" contamination (above 160 mg/kg arsenic). In addition, EPA believes that common disturbances which could theoretically drag deeper sediments to the surface (e.g., muskrat borrowing) would not cause substantial changes in surface sediment concentrations or otherwise compromise the protectiveness of the surface sediment cleanup.

Burrowing by invertebrate species in the benthic zone (mostly 0-6 inches) is much more pervasive and effective at mixing sediments. The FS addresses this issue in Section 2.3.1, "Marsh Sediment Preliminary Remediation Goals". Since invertebrate burrowing is limited to the top of the first foot, it will not affect deeper sediments.

Within the nine-criteria evaluation of the remedial alternatives for the Marsh, EPA evaluated long-term permanence, the issue raised by this comment. Much of the analysis of the Marsh found in the FS, and summarized in the Proposed Plan, is precisely on this issue of the stability of deeper marsh sediments over the long term.

Comment #45: A consultant to Edison Wetlands Association writes, *"The marsh sediment PRG for mercury is 2 mg/kg, independent of depth. Again, the EPA uses the NJDEP SEL as a basis. The SEL is a value where impacts to benthic organisms occurs 95% of the time. The EPA goes on to state "... since EPA's remediation goal is just above background levels, lower levels may not be attainable". Table 4 gives the background level for mercury as 0.14 mg/kg, which is an order of magnitude below the EPA's PRG. This discussion makes very little sense and requires a detailed explanation by EPA. The statement concerning lower levels not attainable indicates the EPA knows of a continuing source of mercury will re-contaminate the marsh sediments. An explanation of this is also required."*

EPA Response - EPA chose the Remediation Goal of 2 mg/kg mercury based a variety of factors as discussed in the Decision Summary, including the SEL. The SEL is a screening value that can be used as a comparison, but it is not intended to be used as a clean-up goal without site-specific risk data. Please refer to the following NJDEP web address on the use of SELs:

http://www.state.nj.us/dep/srp/regs/sediment/03_screen.htm#ref1

The background numbers cited in Table 4 were taken from the 2002 Soil FS; please refer to Comments #4 and #19 regarding the use of background values. EPA's discussion on the comparison to the background level for mercury in the Marsh refers to the samples Exponent took in the marsh area upriver of the site in 2006. The range of values for these upgradient samples was between 0.18 and 1.4 mg/kg of mercury which is just below EPA's Remediation Goal.

As discussed throughout the Proposed Plan, the FS and the Administrative Record, there is no evidence of a "continuing source of mercury" in this area, as alleged in the comment; rather, as acknowledged elsewhere in the commenter's correspondence, the Raritan River has known sediment contamination, including mercury. EPA's efforts to balance a site-specific response with the knowledge of these regional conditions is clearly discussed throughout these documents.

Comment #46: A consultant to Edison Wetlands Association writes, "*In river sediments, the PRG for arsenic is 100 mg/kg and the PRG for mercury is 2 mg/kg. The PP states EPA considered lower levels, but concluded "…given background levels in the Raritan River Estuary, lower levels would not be attainable." Again, neither the data utilized nor the EPA's method for defining background levels is provided. In order for the public to understand the PP, this information on the background must be provided in the PP.*

"The current PP does not clearly communicate the Agency's basis for the PRGs it selected. A clear understanding of that basis is key to acceptance of the PP."

EPA Response - See response to Comments #4, #5, #19 and #43.

Comment #47: *U.S. Senator Frank R. Lautenberg expressed concern that EPA's proposed clean-up levels for arsenic and mercury exceeded the New Jersey Department of Environmental*

Protection's recommendations for sediment, as well as background levels for the site established by EPA.

EPA Response - Please refer to EPA's responses to Comments #44 and #45. The Remediation Goals for the site sediments are based on a site-specific risk assessment for human health and for ecological receptors and a number of other factors. NJDEP's Sediment Screening Guidelines are the only sediment criteria that have been identified by NJDEP, and are not clean-up goals, as discussed in the response to Comment #45. NJDEP has participated in the development of these Remediation Goals and supports them.

The Raritan River has elevated levels of mercury and arsenic in the sediments from many sources, not just the Horseshoe Road and ARC sites. The comparison to background data was only used in the River to determine what was realistically attainable, and to assess the degree to which the remediation of a portion of river sediments would be recontaminated by regional conditions.

Comment #48: *U.S. Senator Frank R. Lautenberg urged EPA to ensure that wetlands impacted by the site be restored.*

EPA Response - EPA's selected remedy calls for wetland restoration of areas affected by the remedy. EPA strongly values wetlands preservation and restoration, and this issue was an important factor in the comparison of the remedial alternatives for the Marsh (in the Decision Summary, please refer to the Comparative Analysis of Marsh Alternatives Section, regarding the compliance with ARARs). During the remedial design, EPA, with input from NJDEP, will develop and assure the implementation of a wetlands restoration plan.

Comment #49: *U.S. Senator Frank R. Lautenberg also urged EPA to make funding for cleanup of the Horseshoe Road and Atlantic Resources sites a top priority.*

EPA Response - Comment noted.

Attachment A

The Proposed Plan

Superfund Program
Proposed Plan

U.S. Environmental Protection Agency, Region II

HORSESHOE ROAD AND ATLANTIC RESOURCES CORPORATION SITES

May 2008

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the preferred alternative for addressing sediment contamination at two Superfund sites, the Horseshoe Road site and the adjoining Atlantic Resources Corporation (ARC) site, and provides the rationale for that preference. The Horseshoe Road site was placed on the National Priorities List (NPL) of Superfund sites in 1995 and the ARC site was placed on the NPL in 2002. While they are considered two separate sites on the basis of past disposal activities, their proximity and commingled wastes have led the U.S. Environmental Protection Agency (EPA) to address the sites jointly. Both sites are contaminated with a variety of chemicals, which have entered drainage channels that run off into an 8-acre marsh adjacent to the Raritan River. EPA's proposed alternative addresses marsh and river sediments through excavation/dredging, off-site disposal and backfilling.

EPA is issuing this Proposed Plan as part of its community relations program under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, or Superfund). This Proposed Plan summarizes information that can be found in greater detail in the May 1999 Remedial Investigation and Feasibility Study (RI/FS) report, the February 2008 OU3 Focused Feasibility Study, and other documents contained in the Administrative Record file for these sites. EPA and the New Jersey Department of Environmental Protection (NJDEP) encourage the public to review these documents to gain a more comprehensive understanding of the sites and the Superfund activities that have been conducted.

This Proposed Plan includes summaries of all the cleanup alternatives evaluated for use at these sites. This document is issued by the EPA, the lead agency for site activities, and NJDEP, the support agency. EPA, in consultation with NJDEP, will select the final remedy for the sites after reviewing and considering all information submitted during the 30-day public comment period. EPA, in consultation with NJDEP, may modify the preferred alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all

MARK YOUR CALENDAR:

PUBLIC COMMENT PERIOD:
July 21 – August 20, 2007
U.S. EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING:
August 12, 2008, 7:00pm
U.S. EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Council Chamber in the Sayreville Town Hall 167 Main Street, Sayreville, New Jersey.

For more information, see the Administrative Record at the following locations:

U.S. EPA Records Center, Region II
290 Broadway, 18th Floor.
New York, New York 10007-1866
(212)-637-3261
Hours: Monday - Friday 9 am to 5 pm

Sayreville Public Library
1050 Washington Road
Parlin, New Jersey 08859
(732)727-0212

the alternatives presented in this Proposed Plan.

SITE HISTORY

The Horseshoe Road site is a 12-acre property located in Sayreville, Middlesex County, New Jersey. The site includes three areas: (1) the Sayreville Pesticide Dump (SPD); (2) the former Atlantic Development Corporation facility (ADC); and (3) the Horseshoe Road Drum Dump (HRDD). (See Figures 1 and 2.)

The adjacent ARC site is a 4.5-five acre property also located on Horseshoe Road. It was the location of a precious metals recovery facility which was operated by several companies, including the Atlantic Resources Corporation.

East of the sites is a railroad right-of-way belonging to Conrail, on the opposite side of which lies the Middlesex County Utilities Authority (MCUA) property. To the southwest of the site lies the Gerdau Ameristeel facility.

A residential neighborhood with approximately 50 homes is located approximately one-half mile to the southeast of the site. The areas described above are served by municipal water; about 14,000 people obtain drinking water from public wells within four miles of the sites.

Both sites are located on the south shore of the Raritan River. Surface water from them drains into a fresh water marsh area of approximately 8.2 acres, and this wetland then drains to the Raritan. (See Figure 1) The shoreline up-river (southwest) of the sites is undeveloped, but portions are wetland and the remainder was at one time used to dispose of dredge spoils from local shipping channels. The southern edge of the Horseshoe/ARC marsh is partly bounded by the remnants of the Crossman Company. Crossman, a producer of sand, clay and other aggregates, operated Crossman Dock just off the Horseshoe/ARC marsh, and pilings from the dock are found in the Raritan in front of the sites. Surface water drainage from the ARC site also discharges into a small bay just north of the sites. Just north of this bay is the first of a series of man-made ponds associated with the former NL/Titanium Pigments facility, which is down-river (northeast) of the sites.

DESCRIPTIONS OF THE SITES(See Figure 1)

HORSESHOE ROAD SITE AREAS

Sayreville Pesticide Dump (SPD): Covers approximately 3 acres. Test pit and soil boring samples from this former dump area shows buried refuse and soil contamination as deep as 10 feet below the ground surface.

Atlantic Development Corporation (ADC): Covers approximately 6.0 acres. Test pit and soil boring samples from this former process area shows soil contamination and buried refuse 3 to 14 feet below the ground surface in source areas.

Horseshoe Road Drum Dump (HRDD): Covers approximately 1.2 acres. Test pit and soil boring samples from this former dump area shows buried refuse down to 12 feet

ATLANTIC RESOURCES CORPORATION SITE (ARC)

ARC covers approximately 3.7 acres. Test pit and soil boring samples from this former precious metals recovery facility shows soil contamination covering much of the lot. Subsurface soil contaminants were found as deep as 10 feet below the ground surface in source areas.

DOWN-STREAM MARSH

The marsh covers approximately 6.0 acres and has been impacted by stream run-off from the site. Arsenic and mercury contamination have been found as deep as 42 inches below the sediment surface.

THE RARITAN RIVER

EPA has defined an area of elevated sediment contamination in the river bordering the marsh that is approximately 2.5 acres in area. As with the marsh, arsenic and mercury contamination have been found as deep as 42 inches below the sediment surface.

Problems on Horseshoe Road first came to EPA's attention in 1981, when a brush fire at the HRDD area exposed approximately 70 partially filled drums containing acetonitrile, silver cyanide and ethyl acetate. The HRDD area was used for disposal until the early 1980s. The SPD area was also used for disposal, from about 1957 into the early 1980s. These two dump areas do not contain any buildings or structures.

The ADC facility contained three buildings that were owned or leased by many companies from the early 1950s to the early 1980s. The various operations over time included the production of roofing materials, sealants, polymers, urethane and epoxy resins, resin pigments, wetting agents, pesticide intermediates and recycled chlorinated solvents.

The ARC site contained several inter-connected buildings and structures, including a series of incinerators used for precious metals recovery. The facility recovered gold and silver from fly ash, x-ray and photographic film, circuit boards, building material and other materials. The operation also accepted spent solvents, which were used to fuel the incinerators. The ARC facility, like ADC, ceased all commercial operations in the early 1980s.

Since 1985, when NJDEP requested that EPA take the lead role in the cleanup of the sites, EPA has performed 10 removal actions. These removals stabilized the sites by removing more than 3,000 drums, cleaning up dioxin and mercury spills, emptying and disposing of materials found in numerous tanks and vats on both sites, and excavating and disposing of contaminated soils and debris.

The Horseshoe Road site was proposed for inclusion on the NPL in 1993, and formally placed on the NPL on September 29, 1995. The ARC site was initially included in the description of the Horseshoe Road site, but it was removed from the NPL listing after the potentially responsible parties (PRPs) for ARC challenged the joint listing.

In the summer of 1997, EPA initiated a remedial investigation and feasibility study (RI/FS) to jointly characterize the nature and extent of contamination at the sites. An RI report was released in 1999. The RI evaluated groundwater, surface water, surface soils, subsurface soils, sediments and building material.

EPA is addressing these sites in separate phases, or operable units. In September 1999, a Focused Feasibility Study was completed for Operable Unit 1 (OU1), the buildings and structures on the ADC and ARC facilities. A September 2000 Record of Decision (ROD) for OU1 called for demolition and off-site disposal of buildings and above-ground structures. On April 10, 2001, EPA completed the OU1 remedy for the Horseshoe Road site, removing the buildings and surface debris from the ADC facility.

Based on additional data gathered from the ARC site during the RI, together with previously obtained data, EPA proposed the ARC facility as a separate NPL site in September 2001. The site was formally placed on the NPL on September 5, 2002.

In May 2003, the OU1 remedy for the ARC site was completed. A PRP group for the ARC site, with EPA oversight, demolished and disposed of all on-site buildings and above-ground structures, and removed several under-ground storage tanks discovered during the cleanup.

EPA completed the Operable Unit 2 (OU2) FS report in 2004, using the results of the 1999 RI pertaining to soils and groundwater. A September 2004 ROD for OU2 selected soil and groundwater remedies for the two sites. A group of PRPs has agreed to perform the OU2 remedial action for the ARC site, and is also performing the remedial design activities for the HRDD portion of the Horseshoe Road site. The ARC RD is in the work plan stage. EPA began the OU2 remedial action earlier this year, and it is expected to take 30 months to complete.

In 2004, the ARC PRP group also agreed to complete an FS for the remainder of both sites, to address sediments in the marsh and river. This phase is known as Operable Unit 3 (OU3). This FS is the basis for the development of this Proposed Plan. The FS and other relevant documents are included in the Administrative Record for the sites.

SITE CHARACTERISTICS

Horseshoe/ARC Marsh Sediments

The Horseshoe Road site includes the former ADC facility, the SPD areas (allegedly used by ADC), and the HRDD area, which was used by ARC. One drainage channel collects most of the surface water from the ADC and SPD areas (please refer to Figure 2). This ADC/SPD drainage channel appears to provide a majority of the fresh water flow into the marsh, and the most distinguishable surface water flow through the marsh can be traced back to this channel.

A second drainageway begins at a small depression that approximately divides the ADC and ARC operations, travels just south of the HRDD area, and discharges into the marsh at the base of the HRDD mound. Both sites contribute surface water flow to this HRDD drainageway.

Surface water runoff from the HRDD mound enters into the HRDD drainageway or releases directly into the marsh. The ARC site has its own drainage swale just north of the HRDD area, and most of the surface water runoff from ARC currently travels through this swale. Unlike the other surface water routes described above, which appear to be natural water courses, portions of this swale are man-made. Surface water travels through a culvert under the MCUA right-of-way to reach the ARC swale, and water from the swale discharges to the bay north of the marsh.

Approximately 95 Percent of the Horseshoe/ARC marsh is dominated by Common Reed (Phragmites) and is considered a freshwater emergent wetland. The remaining 5 percent is a fringe that is an average of 25 feet wide at the edge of the Raritan River, and dominated by salt-tolerant cordgrass (Spartina), indicative of an intertidal wetland environment. A natural berm formed by tidal deposition separates these two wetland zones. This berm is only breached in one location where the surface water enters the river from the marsh.

WHAT ARE THE "CONTAMINANTS OF CONCERN"?

The primary contaminants are those which pose the greatest potential risk to human health and the environment. Although the primary contaminants vary from area to area on the sites, the following are the major risk contributors; Arsenic, mercury and PCBs are primary contaminants that drive the risk in sediments in the marsh and in the Raritan River.

Arsenic - Arsenic is a naturally occurring element in the earth's crust. It is a known carcinogen and can also cause adverse health effects that are not related to cancer.

Mercury - Mercury is a naturally occurring element in the earth's crust. It is a known carcinogen and can also cause adverse health effects that are not related to cancer.

PCBs (Polychlorinated Biphenyls) - PCBs are not naturally occurring compounds. They are very persistent in the environment and tend to accumulate in animal tissues. EPA has classified PCBs as "Probable Human Carcinogens."

Site topography, which includes the drainage channels previously described, influenced EPA to investigate the down-gradient marsh which is approximately 8.2 acres in size. EPA evaluated surface and subsurface sediment samples collected from the marsh. For its studies, EPA considered surface sediments to be within the first 12 inches of the surface within the marsh. Subsurface samples were taken from 12 to 42 inches. Reference samples were collected in an area of marsh sediments about 400 feet south of the former Crossman Dock, and these results were one of a number of data points used to screen marsh sediments for contaminants of concern. Three contaminants of concern were identified in the marsh and associated drainageways: arsenic; mercury; and polychlorinated biphenyls (PCBs). The reference sample results appear in Table 1, along with representative Horseshoe/ARC marsh sediment data. All mercury sampling at the sites was analyzed for total mercury.

The ADC/SPD drainage channel is clearly the most highly contaminated portion of the marsh. PCBs are found at highest concentrations in shallow surface sediments of the stream channel,

TABLE 1
Horseshoe/ARC Marsh Surface Sediment Data (2006 Sampling Only)

COC (mg/kg)	Reference Samples (range)	Marsh Sediments (range)
Arsenic	6.7-49.9 mg/kg	16.6-17,800 mg/kg
Mercury	0.18-1.4 mg/kg	0.36-385 mg/kg
PCBs	0.01-0.77 mg/kg	0.08-32 mg/kg

and at lesser concentrations within the marsh itself and at depth. Arsenic and mercury were also generally found at their highest concentrations within the ADC/SPD drainage channel; however, these two metals were also found throughout the marsh and at depth at elevated concentrations. In several cases, the deepest sediment samples collected (about 30 to 42 inches below the ground surface) were at concentrations greater than the reference sample results. Some arsenic concentrations were an order of magnitude greater than that found in the reference area samples.

The distribution pattern for arsenic and mercury suggest that these contaminants were discharged into the marsh in a relatively soluble form, allowing dissolved constituents to pass deeper into the marsh sediments before the subsurface geochemistry forced the arsenic and mercury to precipitate.

Raritan River Sediments

The sites are about four miles from the mouth of the Raritan River where it meets the Atlantic Ocean, and the river is approximately 2,600 feet wide at this point. This reach of the Raritan River is a tidal estuary.

The Raritan River Estuary has been identified as an impaired water under section 303(d) of the Clean Water Act as a result of metals (including arsenic and mercury) contamination, and New Jersey has established fishing advisories within the Raritan River as a result of PCB contamination found in American Eel, White Catfish, White Perch, Striped Bass, Bluefish, and Blue Claw crab.

The U.S. Army Corps of Engineers (USACE) maintains a commercial shipping channel, the "Main Channel," along the north shore of the Raritan. For much of the 20th century, a second channel served the NL Industries/Titanium Pigments facility ("the Titanium Reach"), and a smaller extension ("the South Channel") served Crossman Dock and other brick-related businesses in Sayreville. At one time, the South Channel was dredged to a depth of 15 feet (measured at low tide) and was 150 feet wide. Now, the South Channel is mostly silted in, with an average depth of 4.2 feet. The USACE has no plans for dredging the Titanium Reach or the South Channel, neither of which serves any commercial interests at this time. It is possible that Sayreville may consider a marina as part of its waterfront development plans, however there are no current plans for a marina at this location, and furthermore, the area is too shallow. In order to locate a marina at this location, the river would need to be dredged much deeper than any of these alternatives would require.

Pilings from the Crossman Dock are still present in the river in front of the Horseshoe/ARC marsh. A depositional area can be found in front of the Horseshoe/ARC marsh, between the shoreline and these pilings. Because the marsh drains directly into this depositional area, through a breach in the berm that runs along the river, EPA sampled this area and the area around it.

Reference samples were collected from near-shore sediments up-river and down-river from the sites. Other Raritan River sediment data were also consulted to provide a better picture of the current contaminant loading in river sediments. The FS compared the site-specific reference data to results from NL Industries sampling events (collected in 2003 at the direction of NJDEP) for arsenic. The FS also compared the site-specific reference data to results from USACE sampling of the Main Channel (2004) for arsenic, mercury and PCBs.

The reference data in Table 2 presents the combined (site-specific and river-wide) sediment sampling results. The river-wide results include data from the 2004 USACE survey which is not in the FS, but is included in the Administrative Record. The near-site river sampling areas are shown on Figure 3.

TABLE 2
Horseshoe/ARC Raritan River Sediment Data

COC (mg/kg)	Reference data	Near-site River Sediments (range)
Arsenic	6 - 47 mg/kg	9.1 - 2,200 mg/kg
Mercury	0.09 -1.3 mg/kg	0.062 - 7 mg/kg
PCBs	6 - 0.89 mg/kg	0.021- 9.5 mg/kg

Surface (0 to six inches) and subsurface (six inches to 42 inches below the river bottom) sediment samples were collected. Raritan River sediment contamination was characterized by arsenic and mercury in surface and subsurface sediments. PCBs were much less frequently detected relative to the marsh sediments.

The sampling results indicate that the depositional area behind the dock pilings contains elevated levels of arsenic and mercury relative to the surrounding sediments. The surrounding sediments have contaminant levels that are more consistent with background levels for the river, as indicated by both the off-site sample results and other off-site data from the NL Industries site and Army Corps surveys.

Based on analytical results and past site practices, it appears that contamination migrated to the marsh and Raritan River through runoff from the sites, and groundwater transport does not appear to be a contributing mechanism to sediment contamination, though the contaminated sediments appear to be a likely continuing source to the river.

Contaminants in surface soils on both the Horseshoe Road and ARC sites have been identified as "principal threat wastes" because these contaminants have demonstrated a potential for migrating to the groundwater; no principal threat wastes have been identified in the sediments.

WHAT IS A "PRINCIPAL THREAT"?

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

ENFORCEMENT

Various companies operated at the ADC and ARC facilities from the late 1930s until the mid 1980s. The available information indicates that the various operators at ADC used the SPD area as a dump site, and the operators at the ARC site used the HRDD area for dumping. In 1995, EPA notified a number of former operators that they were considered potentially responsible parties (PRPs) for the cleanup of the Horseshoe Road site. Based upon the information available at this time, EPA has concluded that neither the property owner nor any of the former operators are viable companies that have the resources to perform the necessary work at the site. Therefore, EPA is performing the OU2 remedial action for the SPD and ADC areas with state and federal funds.

In 1995, EPA notified a number of companies that sent waste to ARC, referred to as "generators," and Jack Kaplan, the former president of ARC, that they were considered PRPs with respect to the cleanup of the ARC site and the HRDD portion of the Horseshoe Road site.

In 2001, EPA entered into an order with a group of PRPs to undertake the OU1 remedy for the ARC site.

In 2003, EPA entered into a second order with certain PRPs to complete the OU3 RI/FS, and this work served as the basis for this Proposed Plan.

In July 2007, EPA and the PRP Group entered into a judicial consent decree to perform the OU2 remedial design for both the ARC site and HRDD portion of the Horseshoe Road site, and the remedial action for the ARC site. The PRPs are currently in the design phase of that action.

SCOPE AND ROLE OF THE ACTION

EPA is addressing these sites in operable units. During OU1, buildings and above-ground structures were demolished. OU1 is complete for both sites. OU2 addresses the final remediation of soils and groundwater, and is currently in progress. OU3, the subject of this Proposed Plan, addresses sediments in the adjacent marsh and Raritan River, and is the final action planned for the sites.

SUMMARY OF SITE RISKS

As part of the RI/FS, a human health risk assessment (BHHRA) and a baseline ecological (BERA) risk assessment were performed to determine the current and future effects of contaminants on human health and the environment. The current use of the neighboring properties is industrial (the MCUA sewage treatment plant, and a steel mill) or residential. EPA has consulted with Sayreville with regard to its plans for the upland (OU2) portions of the sites, and its interest in re-use of the area. The town's plans may include a new roadway and the

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern at the site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines exposure information and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For non-cancer health effects, a "hazard index" (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which non-cancer health effects development of the waterfront between the former NL facility to the east and Sayreville's public boat launch to the west for a variety of commercial, recreational or parkland uses. Residential re-use is not contemplated. The baseline human health risk assessment for OU3 focused on health effects to trespassers in the marsh, and the ecological risk assessment focused on ecological receptors that inhabit fresh water marshes.

The Horseshoe/ARC marsh, has not been discussed in the context of any redevelopment plans, but EPA assumes that future development plans would not substantially change the size or character of the marsh, and that the existing human health risk assumptions with regard to trespassers will be pertinent in the future as well, and that the current wetland habitat will be maintained.

Human Health Risks

The BHHRA identifies contaminants of potential concern (COPCs) that are representative of Site risks. The BHHRA identified the following COPCs in the sediments in the marsh and Raritan River: polycyclic aromatic hydrocarbons (PAHs) (specifically, benzo[a]pyrene, benzo[b]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene), polychlorinated biphenyls (i.e., Aroclor 1254), arsenic, and copper. In addition, manganese, aluminum, antimony, thallium, and vanadium were identified as COPCs in the surface water.

Next, the BHHRA calculates the potential non-cancer hazards and carcinogenic risks from exposure to OU3 sediments and surface water. The health hazards of non-carcinogens are assessed by comparing the chronic daily intake (CDI) of a contaminant to its reference dose (RfD); the RfD being a benchmark for safety by virtue of its being based on the contaminant's threshold for causing adverse health effects, to which multiple safety factors are added. The ratio of the chronic daily intake to the reference dose (CDI/RfD) is referred to as the Hazard Quotient (HQ). A HQ greater than 1 may be associated with adverse health effects. To assess the overall potential for non-carcinogenic effects posed by simultaneous exposure to multiple contaminants, EPA has developed the Hazard Index (HI), which is the sum of all HQs within a particular exposure pathway. In the event that the addition of multiple sub-threshold HQs (i.e., HQ less than 1) exceeds an HI = 1, adverse health effects may result if the individual contaminants are believed to share a similar mechanism-of-action or toxic endpoint.

Carcinogenic risk is expressed as a probability of developing cancer over the course of a lifetime as a result of a given exposure level. To assess overall cancer risk, risks from various COPCs are assumed to be additive and are summed. EPA uses a range of cancer risks of 1×10^{-4} to 1×10^{-6} as an acceptable risk range and the Agency strives to ensure that risks are within or below this range as part of a Superfund cleanup.

The receptors that were evaluated included current and future adolescent trespassers and future adult and child residents. The results of the BHHRA indicate that non-cancer hazards and carcinogenic risk exceed EPA target levels (i.e., hazard index of 1; risk range of 1×10^{-6} to 1×10^{-4}) for all three receptor groups, with the exception of the cancer risk for adolescent trespassers, which were within the acceptable cancer risk range (Table 3). The estimated cancer risk for the adolescent trespasser increases to 1.2×10^{-4}, which exceeds the USEPA target level when the exposures from the two areas of concern are summed.

Table 3 summarizes hazards and risks associated with sediment, surface water, and shellfish exposure for the marsh and Raritan River sediments, and is taken from Tables 10.1 and 10.2b of the BHHRA.

Table 3

Area	Receptor	Hazard Index	Cancer Risk
Down-stream Marsh	Area Residents ages 12-17	2.1 (arsenic)	7.9×10^{-5} (arsenic)
	Adult Residents	2.6 (arsenic)	3.9×10^{-4} (arsenic)
	Child Residents	1.5 (arsenic)	5.6×10^{-4} (arsenic)
Raritan River	Area Residents ages 12-17	1.1 (arsenic)	4.2×10^{-5}
	Adult Residents	1.2 (arsenic)	1.9×10^{-4} (arsenic)
Sum of both Areas	Area Residents ages 12-17	3.2 (arsenic)	1.2×10^{-4} (arsenic)
	Adult Residents	3.8 (arsenic)	6.8×10^{-4} (arsenic)
	Child Residents	1.5 (arsenic)	5.6×10^{-4} (arsenic)

* Note that the shellfish consumption for the river was reevaluated in an addendum to the risk assessment, which resulted in the hazard index increasing to 1.8 and the cancer risk increasing to 2.5×10^{-4}.

The non-cancer hazards and carcinogenic risks for all three receptor populations include exposure to sediment, surface water and consumption of contaminated shellfish; however, it is exposure to sediments in the marsh and Raritan River that is responsible for the non-cancer hazards and carcinogenic risk exceeding the EPA acceptable target value and range. Arsenic is the main driver of non-cancer hazards and carcinogenic risk for OU3. Arsenic, therefore, has been identified as the primary contaminant of concern ("COC").

PAHs, PCBs, and other metals identified as COPCs in the sediment and surface water did not contribute significantly to the non-cancer hazards or carcinogenic risk.

Ecological Risks

A four-step process is utilized for assessing site-related ecological risks for a reasonable maximum exposure scenario:
Problem Formulation - a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study.
Exposure Assessment - a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations.
Ecological Effects Assessment - literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors.
Risk Characterization -measurement or estimation of both current and future adverse effects.

A Screening Level Ecological Risk Assessment (SLERA) was conducted for the Horseshoe Road site to determine which contaminants and exposure pathways presented ecological risks based on conservative assumptions. Receptor species selected to represent the different habitat and trophic levels of the site were the red-tailed hawk, short-tailed shrew, marsh wren, spotted sandpiper, green frog, fiddler crab, and the benthic invertebrate community. The assessment endpoint for the SLERA was the disruption of ecological community structure by the reduction of ecological populations.

Food chain risks were estimated for the modeled receptors (red-tailed hawk, short-tailed shrew, marsh wren, spotted sandpiper) by comparing estimated exposure levels with ecologically-based toxicity reference values. The risks to the green frog and fiddler crab were evaluated by comparing surface water concentrations to aquatic toxicological benchmarks. The comparison of sediment and surface water contaminant concentrations to ecologically-based screening values was conducted to determine risks to benthic invertebrates.
Consequently, a SLERA Addendum was completed to collect additional samples in the marsh and the Raritan River. Forage fish samples were collected to estimate contaminant

concentrations in fish tissue. Toxicity tests were conducted at five sampling locations with Leptochirus Plumulosus using a 28-day chronic bioassay.

The SLERA and the SLERA Addendum identified the potential for ecological risks for all the receptors evaluated with exposure to contaminants in sediment, surface water, and surface soil. Therefore, it was concluded a Baseline Ecological Risk Assessment (BERA) was warranted.

The assessment endpoints in the BERA focused on aquatic macroinvertebrate and terrestrial invertebrate community abundance and population in the marsh sediment, estuarine fish population abundance and community structure in the Raritan River, and wildlife population abundance in the marsh and the river. Representative species for the marsh were the short-tailed shrew, muskrat, marsh wren, and red-tailed hawk. The species selected for the Raritan River included the osprey and the herring gull.

The BERA used oligochaete and earthworm sediment toxicity tests to assess risks to benthic and terrestrial invertebrate communities. Risks to estuarine fish were analyzed by comparing contaminant concentrations in fish tissue to effects based literature values. Additionally, food web modeling was utilized to evaluate risks to bird and mammal populations.

The BERA indicated that there may be potential risk to benthic organisms from contaminated Raritan River sediment in the area immediately adjacent to where the main channel from the marsh enters the river. The marsh sediment was also found to pose potential adverse effects on the growth of aquatic and terrestrial invertebrates. Additionally, potential adverse effects on bird and mammal receptor species may be associated with the elevated contaminant concentrations in the marsh sediment. The risk drivers for these ecological receptors were identified as arsenic, mercury, and PCBs.

REMEDIAL ACTION OBJECTIVES

EPA developed the following Remedial Action Objectives (RAOs) to mitigate current and/or potential future risks associated with contamination at the sites:

Sediments - Marsh

Reduce human health risks from exposure, including ingestion, inhalation and dermal contact, to contaminants in the surface and sub-surface sediments to acceptable levels.

Reduce risks to environmental receptors from exposure to contaminants in the sediments to acceptable levels.

Minimize the migration of contaminated sediments to the Raritan River through surface water runoff or flooding.

Sediments - River

Reduce the potential for human health risks from exposure to river sediments within the low-tide mudflat in front of the site, through ingestion or dermal contact, to acceptable levels.

Reduce exposure to sediments deposited in the river adjacent to the site with highly elevated contaminant concentrations that contribute to the degradation of the Raritan River Estuary, and result in risks to ecological receptors, including benthic aquatic organisms, shellfish, fish, birds and mammals.

Remediation Goals

Sediments - Marsh

The Remediation Goals discussed below balance several factors in addressing arsenic, mercury, and PCBs. EPA has identified criteria only for these contaminants, because when these criteria are met, risks from other COCs, which are co-located, would be addressed as well. Furthermore, given the distribution of PCBs in the marsh sediments and river, by addressing arsenic and mercury, PCBs will also be remediated.

In developing Remediation Goals for marsh sediments, EPA considered sediment risk levels for each COC identified in the BHHRA and BERA, available background values, and other ecological receptor reference values such as sediment quality guidelines adopted by NJDEP.

The BHHRA presented preliminary remediation goals (PRGs) for exposure to arsenic in sediments for the three receptor populations. The values presented in Appendix F of the BHHRA were calculated for a hazard index of 1 and a cancer risk of 10^{-4}. Typically, PRGs are presented as a range of values that span the acceptable risk range. Table 4 presents the PRGs that are associated with the acceptable hazard index of 1 and cancer risk range, as well as calculated background values and ecologically relevant values. All of these values were taken into consideration when selecting the appropriate remediation goal.

Identifying a Remediation Goal for arsenic in the marsh provides the broadest range of factors to consider. From the starting point of direct ecological effects to receptors within the marsh, the BERA results were used to calculate site-specific Apparent Effects Thresholds (AETs) of 32 mg/kg and 1,050 mg/kg (biomass reduction in blackworms and earthworms, respectively), and BERA-derived Lowest Observed Apparent Effects Levels (LOAELs) for higher trophic species ranging from 339 mg/kg (muskrat) and 1,420 mg/kg (marsh wren). After considering screening values used by NJDEP and the recommendations of the other Natural Resource Trustees, EPA has identified 32 mg/kg as the Remediation Goal for the benthic zone of the marsh (within the first foot of the marsh sediments). Applying this Remediation Goal to the surface sediments addresses most of the RAOs, and in particular, satisfies the Agency's desire to minimize the marsh as a continuing source to the Raritan.

Table 4

Site-Specific Receptor	Hazard /Risk	Arsenic (mg/kg)	Mercury (mg/kg)
Human Health Receptors			
Adolescent trespasser	10^{-6}	44	n/a
	10^{-4}	4,400	n/a
	HI = 1	2,000	n/a
Adult resident	10^{-6}	12	n/a
	10^{-4}	1,200	n/a
	HI = 1	1,850	n/a
Child Resident	10^{-6}	7.5	n/a
	10^{-4}	750	n/a
	HI = 1	285	n/a
Ecological Receptors			
Blackworm (biomass)	HI = 1	32	3.6
Earthworm (biomass)	HI = 1	1,050	15.5
Blackworm (survival)	HI = 1	17,800	68
Earthworm (survival)	HI = 1	17,800	68
Muskrat	HI = 1	183	24
Marsh Wren	HI = 1	1,470	8.86
Burrowing animals	HI = 1	160	n/a
Benthic organisms	HI = 1	n/a	2
Background	n/a	14.7	0.14

*n/a – not applicable

EPA has identified 160 mg/kg arsenic as the Remediation Goal for deeper marsh sediments (below the benthic zone). EPA concluded that the RAOs would be very difficult to achieve by only addressing the surface sediments for several reasons. Through biotic activity, such as burrowing, animals can expose themselves to the deeper sediments and bring them to the surface.

In addition, the uncertainties of the setting cannot be accounted for by only addressing the surface sediments. These uncertainties include flooding and scouring from peak storm events, and the likelihood that the primary ADC stream channel may meander over time, resulting in newly exposed sediments.

This deep sediment Remediation Goal is considered sufficiently below the muskrat LOAEL to conservatively protect a variety of higher trophic species, presuming that the remediated marsh would develop from its current state as a degraded Phragmites monoculture to support a more robust, high quality habitat.

Applying a similar approach to mercury, from the starting point of direct ecological effects to receptors within the marsh, Exponent (the RI/FS contractor) identified site-specific AETs of 3.6 mg/kg and 15.5 mg/kg (biomass reduction in blackworms and earthworms, respectively), and BERA-derived LOAELs for higher trophic species range from 7.5 mg/kg (muskrat) and 8.7 mg/kg (marsh wren). EPA has identified 2.0 mg/kg total mercury as the Remediation Goal in the surface sediments, using the Severe Effects Level (SEL) adopted by NJDEP from the Ontario Ministry of the Environment, rather than the lowest of the site-specific values, because the potential for bioaccumulation with mercury, and because of a desire to eliminate releases to the Raritan (discussed in more detail, below). Given the sensitivity of ecological receptors to mercury in the environment, EPA considered a lower Remediation Goal, such as NJDEP's Effects Range-Median of 0.71 mg/kg; however, since EPA's Remediation Goal is just above background levels, lower levels may not be attainable. EPA did not identify a separate Remediation Goal for deeper mercury contamination, expecting that actions to address arsenic would also address deeper mercury that might become exposed.

Sediments - Raritan River

By addressing marsh sediments, the OU3 remedial action would address a continuing source of contamination to the river. However, because much of the lower Raritan River system sediments are contaminated with arsenic, mercury and PCBs, and the sites contribute some incremental part to that sediment contamination, a river response is also appropriate. This is particularly important for mercury and PCBs, because while the site footprint (where elevated levels can clearly be attributable to site releases) is less than six acres and is probably too small to result in quantitative food-chain level affects, the overall contribution of the sites to the lower Raritan ecosystem cannot be ignored.

While PCBs can be found in sediment throughout the river from multiple sources, the site-related footprint of PCB contamination is much smaller and is within the footprint for mercury and arsenic; therefore, EPA only developed chemical-specific sediment cleanup criteria for mercury and arsenic. The criteria for mercury is 2 mg/kg, and for arsenic, 100 mg/kg. These values offer the best balance between several factors. Blue crab and estuarine fish collected near the site do not appear to be adversely affected by the area of very high sediment contamination found in the river adjacent to the site. The absence of affects on higher trophic species taken from the site sediment depositional area needs to be balanced against the amphipod chronic sublethal bioassay study, which suggests a LOAEL of 194 mg/kg for arsenic and 2.6 mg/kg for mercury. NJDEP has identified marine/estuarine sediment quality screening guidelines, where direct toxic affects or food-chain affects can be expected to riverine receptors, and the near-shore sediments exceed these screening values (for arsenic, mercury and PCBs) by several orders of magnitude. EPA considered using NJDEP's Effects Range-Medium (70 mg/kg for arsenic, 0.71 mg/kg mercury) as Remediation Goals, but given the background levels in the Raritan River Estuary, lower levels would not be attainable. EPA expects that any areas of the river remediated during OU3 will be recontaminated to levels similar to the reference values identified in Table 2.

SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives for the Horseshoe Road site and ARC site are presented below. The numbering of the alternatives corresponds to the numbering in the FS report.

Upland soil contamination at the two sites could be addressed as separate problems, because the contaminants and contaminated areas are distinct and in most cases, it is possible to designate contaminants as being attributed to one site or the other. Separate remedial alternatives could not be developed for the sediments, because constituents that might be attributable to a particular facility's operation have become intermixed in the sediments. A joint remedial approach is necessary for sediments; however, because the remedial alternatives address two separate NPL sites, costs for remedial alternatives have been divided in half and attributed to each site. This is an artificial allocation for administrative reasons, and is not a basis for liability allocation between the two sites. That allocation has not been determined at this point.

MARSH ALTERNATIVES

Common Elements

Many of these alternatives include common components. With regard to the upland portions of the two sites, the FS assumes that the OU2 remedies would eliminate these areas as ongoing sources of contamination to sediments. It is expected that OU2 remedies would be performed prior to, or at least concurrently with, implementation of the active remedial alternatives evaluated below.

As discussed already, EPA has identified different remedial goals to address surface and subsurface sediments to satisfy the RAOs for the marsh. The FS went further, dividing the deeper zone into three zones based on contaminant levels and distance from the stream channel. The first zone is targeted for the deepest excavation and encompasses an area within 20 feet of the channel. This zone tends to be the most contaminated, and also has the greatest potential for erosion.

The second is characterized by arsenic contamination above 1,050 mg/kg (which is based on the biomass reduction in earthworms).

The third zone is characterized by levels between 1050mg/kg and EPA's remediation goal of 160 mg/kg for arsenic.

The alternatives presented in the FS address these zones to varying degrees with several technologies.

The remedial alternatives also address marsh sediments to varying depths, up to 42 inches. EPA concluded that sediment contamination deeper than 42 inches would be inaccessible under current conditions, and would remain inaccessible in the future, assuming that post-remedy topography is similar to current conditions.

For remedial alternatives that include excavation of sediments, contaminated sediments would be dewatered on site and transported off site for disposal at an appropriate land facility. Based on current information, treatment would not be required prior to disposal of marsh sediments.

For all alternatives except M1 (No Action), some wetlands will be adversely affected. Each of these alternatives will require wetlands restoration and/or off-site mitigation.

Because any combination of remedial alternatives will result in some contaminants remaining on the site above levels that would allow for unrestricted use, five-year reviews will be conducted, unless determined otherwise. In addition, while the land is currently open space and could not be used without extensive landfilling, institutional controls such as a deed notice, would be appropriate to prevent a change of land use in the future.

Alternative M1: No Action

Estimated Capital Cost:	$0
Estimated Operation & Maintenance (O&M) Cost:	$0
Estimated Present Worth Cost:	$0

Estimated Construction Time frame: None
Area excavated/backfilled: 0.0 acres
Area capped: 0.0 acres

Regulations governing the Superfund program expect that the "no action" alternative will be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no further action at either site to prevent exposure to contaminated sediments. Institutional controls, such as a deed notice, would not be implemented to restrict future site use. Engineering controls would not be implemented to prevent site access or exposure to site contaminants. Existing security fences would remain present in upland areas, but they would not be monitored or maintained.

Alternative M2: Channel Excavation/Armored, Thin Cover and Monitored Natural Recovery

Horseshoe Road Site Costs

Estimated Capital Cost:	$3,550,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$3,700,000

ARC Site Costs

Estimated Capital Cost:	$3,550,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$3,700,000

Estimated Construction Time frame: 3 months
Area excavated/backfilled: 0.3 acres
Area capped: 4.6 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor the length of the SPD/ADC drainage, a total of approximately 2,000 cubic yards of material. The channel would then be backfilled to the original contour. Because of the high levels of contaminants in these sediments the Alternative M2 includes the establishment of an embedded channel armored with stone to prevent erosion and lateral movement. The marsh area outside the stream corridor with arsenic levels above 160 mg/kg would be covered with a thin cap (approximately six inches). The cap would be constructed in such a way as to allow for the re-establishment of a wetland on top of the cap. This alternative relies on natural sedimentation processes to bury marsh sediments that have arsenic contamination above 32 mg/kg but below the 160 mg/kg, and would be monitored to assure the reduction achieves the overall site goals.

Long-term operation and maintenance (O&M) of the cap and armored channel would be required. Institutional controls, such as a deed notice, will be required to prevent disruption of the capped area.

Alternative M3: Channel Excavation, Surficial Hot Spot Removal and Monitored Natural Recovery

Horseshoe Road Costs

Estimated Capital Cost:	$ 3,835,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$4,000,000

ARC Costs

Estimated Capital Cost:	$ 3,835,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$4,000,000

Estimated Construction Time frame: 3 months
Area excavated/backfilled: 2.2 acres
Area capped: 0.0 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor along the length of the SPD/ ADC drainage, and the marsh area outside the stream corridor with arsenic levels above 1,050 mg/kg would be excavated to a depth of 1 foot (a total of approximately 4,883 cubic yards). The excavated areas would then be backfilled to the original contour. This alternative relies on natural sedimentation processes to bury marsh sediments with arsenic contamination above 32 mg/kg but below 1,050 mg/kg, and would be monitored to assure the reduction achieves the overall site goals.

Institutional controls, such as a deed notice, would be required to prevent future disruption of the recovered area.

Alternative M4: Channel Excavation, Shallow Hot Spot Removal and Thin Cover

Horseshoe Road Site Costs

Estimated Capital Cost:	$7,355,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$7,500,000

ARC Site Costs

Estimated Capital Cost:	$7,355,000
Estimated O&M Cost:	$275,850
Estimated Present Worth Cost:	$7,500,000

Estimated Construction Time frame: 3 months
Area excavated/backfilled: 2.2 acres
Area capped: 3.8 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor along the SPD/ADC drainage, and the marsh area outside the stream corridor containing arsenic above 1,050 mg/kg would be excavated to a depth of two feet (a total of approximately 7,766 cubic yards). The excavated areas would then be backfilled to the original contour. Marsh sediments that are above 32 mg/kg but below the 1,050 mg/kg level would be covered with a thin cap (approximately six inches). The cap would be constructed in such a way as to allow for the re-establishment of a wetland on top of the cap.

Long-term O&M of the cap would be required. Institutional controls, such as a deed notice, would be required to prevent future disruption and to prevent disruption of the capped/covered area.

Alternative M5: Channel Excavation/Armored, Extended Shallow Removal, and Thin Cover

Horseshoe Road Site Costs

Estimated Capital Cost:	$8,300,000
Estimated O&M Cost:	$225,850
Estimated Present Worth Cost:	$8,450,000

ARC Site Costs

Estimated Capital Cost:	$8,300,000
Estimated O&M Cost:	$225,850
Estimated Present Worth Cost:	$8,450,000

Estimated Construction Time frame: 6 months
Area excavated/backfilled: 4.6 acres
Area capped: 3.8 acres

Under this alternative, the stream channel and all areas with arsenic contamination greater then 1,050 mg/kg would be excavated and backfilled to two feet. Marsh area with arsenic levels above 160 mg/kg, but less than 1,050 mg/kg would be excavated to a depth of one foot and backfilled to 1.5 feet (a total of approximately 10,970 cubic yards). This alternative also armors the channel with stone to prevent erosion and lateral movement. Marsh sediments that are above 32 mg/kg but below 160 mg/kg arsenic would be covered with a thin cap (approximately six inches). The cap would be constructed in such a way as to allow for the re-establishment of a wetland on top of the cap.

Long-term O&M of the cap and armored channel would be required. Institutional controls, such as a deed notice, would be required to prevent disruption of the capped/covered area.

Alternative M6: Channel Excavation, Extended Deep Removal and Thin Cover

Horseshoe Road Site Costs	
Estimated Capital Cost:	$9,230,000
Estimated O&M Cost:	$225,850
Estimated Present Worth Cost:	$9,300,000

ARC Site Costs	
Estimated Capital Cost:	$9,230,000
Estimated O&M Cost:	$225,850
Estimated Present Worth Cost:	$9,300,000

Estimated Construction Time frame: 6 months
Area excavated/backfilled: 4.6 acres
Area capped: 1.4 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor, along the SPD/ADC drainage, and areas outside the channel with arsenic contamination greater than 1,050mg/kg would be dredged to a depth of 2.5 feet. Marsh areas with arsenic levels above 160 mg/kg but less than 1,050 mg/kg would be excavated to a depth of 1.5 foot (a total of approximately 15,015 cubic yards). The channel would then be backfilled to the original contours. Marsh sediments that are above 32 mg/kg but below 160 mg/kg arsenic would be covered with a thin cap (approximately six inches). The cap would be constructed in such a way as to allow for the re-establishment of a wetland on top of the cap.

Long-term O&M of the cap would be required. Institutional controls, such as a deed notice, would be required to prevent future disruption of the capped/covered area.

Alternative M7: Full Excavation, Restoration

Horseshoe Road Site Costs	
Estimated Capital Cost:	$10,265,000
Estimated O&M Cost:	$125,850
Estimated Present Worth Cost:	$10,350,000

ARC Site Costs	
Estimated Capital Cost:	$10,265,000
Estimated O&M Cost:	$125,850
Estimated Present Worth Cost:	$10,350,000

Estimated Construction Time frame: 6 months
Area excavated/backfilled: 6.0 acres
Area capped: 0.0 acres

Under this alternative, the stream channel would be dredged to a depth of three feet within a 20 foot-wide corridor along the SPD/ADC drainage, and areas outside the channel with arsenic contamination greater than 160 mg/kg would be dredged to a depth of 2.5 feet. Marsh areas with arsenic levels above 32 mg/kg, but less than 160 mg/kg, would be excavated to a depth of one foot (a total of approximately 21,145 cubic yards). The marsh would then be backfilled to its original contour.

Institutional controls, such as a deed notice, would be required for this remedy to prevent disruption of the covered area.

EVALUATION OF MARSH ALTERNATIVES

Nine criteria are used to evaluate the different remedial alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment evaluates whether and how an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that are legally applicable, or relevant and appropriate to the site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, the community, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

criteria are discussed below. The "Detailed Analysis of Alternatives" can be found in the FS.

1. Overall Protection of Human Health and the Environment

All alternatives except the "no action" alternative would provide adequate protection of human health and the environment by eliminating or controlling risk through removal of contaminants or engineering or institutional controls. Alternative M7 (Full Excavation) would be the most protective over the long-term because it removes the most contaminated sediments from the marsh that could result in exposure or off-site migration of contaminants to the river.

Alternative M4 (Shallow Hot Spot Removal and Thin Cover), M5 (Extended Shallow Removal and Thin Cover), and M6 (Extended Deep Removal and Thin Cover), provide levels of protection through a combination of excavation and capping. The main difference between these three alternatives is the amount of contaminated sediment being excavated and, therefore, eliminated as a source for off-site migration. These alternatives also rely on caps or backfill to cover contaminated sediment that is left in place.

Alternatives M4, M5 and, to a lesser degree, M6 rely on thin caps over the top of existing sediment. A thin cap would act through dilution by adding the clean cap material to the surface sediment to dilute the surface concentration. For alternatives that rely on thin caps to cover areas of contaminated sediment, resulting surface concentrations would be slightly higher, and the potential for disruption of the surface cover materials reduces the level of protection.

Alternatives M2 (Channel Excavation, Thin Cover and Monitored Natural Recovery) and M3 (Surficial Hot Spot Removal and Monitored Natural Recovery) rely on Monitored Natural Recovery (MNR), which depends on natural processes (burial/dilution by cleaner sediments) to address contaminants. The FS considered a range of factors in evaluating how long it might take MNR to achieve the remediation goals, and concluded that at it would take a minimum of five years (under favorable conditions), but as many as 45 years before the remediation goals would be reached. During this period, exposure scenarios and off-site migration of contaminants would to continue much as they are today. Based on the current distribution of sediment at the site, there is little evidence that MNR is occurring, or that implementation of the OU2 upland remedies would help the performance of MNR. Therefore, M2 and M3 are considered minimally protective at best, and unproven.

Because M1, the "No Action" alternative, is not protective of human health and the environment, it was eliminated from consideration under the remaining eight criteria.

All the remaining alternatives would require institutional controls to some degree because some contamination will be left behind. Alternatives M2 and M3 will require long-term monitoring to assure the cleanup goals are achieved through MNR. Alternatives M2 through M7 would require O&M to ensure that the cover material remains protective.

2. **Compliance with ARARs**

Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements (ARARs) of federal state law or provide grounds for invoking a waiver of those requirements. See Appendix A of the FS for a complete listing of ARARs for this action. There are no chemical-specific ARARs for contaminated sediments, so EPA has developed site-specific remediation goals. Alternative M7 will achieve cleanup goals through excavation and backfilling. All the other alternatives would achieve the cleanup goals through a combination of excavation, capping and/or MNR.

Wetlands perform a variety of important functions such as, providing ecological habitats, spawning grounds, and assisting in flood control. The Federal Clean Water Act, Section 404, and Federal Executive Order No. 11990 protect existing wetlands, and portions of these laws are ARARs for the site. Generally these laws seek to prevent the disruption of existing wetlands when possible; however, because preserving the existing wetland would have precluded most of the remedial technologies available for cleanup, preservation of the existing wetland was not a remedial action objective.

All the active remedial alternatives result in the disturbance of the existing wetland, to varying degrees. The whole marsh drainage area is approximately 8.2 acres, and the area that is contaminated, as defined by arsenic concentrations greater than 32 mg/kg, is 6.0 acres. Alternative M3 disturbs the smallest area within the wetland, (2.2 acres) followed by Alternative M2 (4.6 acres). The remaining four alternatives disturb 6.0 acres of wetland. While each alternative assumes that any disturbed wetlands would be restored, from the point-of-view of wetlands disruption alone, Alternative M3 is preferable because it leaves the majority of the marsh untouched.

Several of the remedial alternatives result in altering the land surface or surface water flows within the marsh in subtle but potentially important ways. Alternatives M4, M5 and M6 all rely on thin layer capping, which would raise the land surface over portions of the marsh to limit access to contaminated sediments below the cap. Raising the land surface can result in increasing surface water flows through the marsh, or in creating areas that are wetter or drier than pre-remedy conditions; these changes can result in adverse affects in the wetland.

Alternatives M2 and M5 rely on an "armored channel" to prevent the movement of the ADC/SPD drainage channel from its current position. This drainage channel is a slightly deeper preferential pathway for water-flow through the marsh, and it is the area of highest sediment contamination. Because the meandering channel could expose contaminated sediments that are currently buried, armoring (lining the channel with stone) prevents the channel from meandering in the future. An armored channel has a potential adverse affect on the wetland, because during low flow periods, when the much of the surface water would be found in the channel itself, the armored channel has the potential to "hurry" surface water out of the marsh, further drying it out.

Capping and armoring the channel cause relatively small changes in how the marsh functions, and engineering techniques are available that minimize adverse affects from these changes. But even small changes may warrant a "mitigation" under the Clean Water Act, in the form of some kind of further restoration elsewhere to compensate for a localized disruption of wetland function. Of the six active alternatives, only Alternatives M3 and M7 leave the contours of the marsh unchanged, and are, therefore, neutral with regard to affects on the wetland.

Based upon the available documentation regarding the source of contamination, and sediment testing, EPA has concluded that the marsh sediments are neither listed hazardous waste or exhibit hazardous characteristics, and therefore do not require treatment to meet RCRA Land Disposal Restrictions.

3. Long-term Effectiveness and Permanence

Long-term effectiveness and permanence would be achieved by all the active alternatives to varying degrees. Alternative M7 (complete removal) would achieve the highest level of long-term effectiveness and permanence because the most contaminated sediments would be permanently removed from the marsh. The remaining Alternatives (M2 through M6) would leave behind contaminated sediment that would need to be managed in place. With these alternatives there is the possibility that the cover could be breached by a large storm event, dredging, or some other disruption. Alternatives M6 through M4 would rely entirely on clean cover material to prevent exposures to the contaminated sediment that remains, M6 excavating the most contaminated sediment and consequently providing the most cover to the remaining contamination. M5 and M4 leave behind progressively more contaminated sediment, and therefore, achieve a slightly lower level of permanence. Alternatives M3 and M2 each rely to some degree on MNR to address the lower level contamination, which assumes that with time these materials would eventually be covered with clean sediments through the natural sedimentation processes. Monitoring would be required to determine if these processes are achieving the remediation goals in a reasonable timeframe. Therefore, EPA would consider M3 and M2 less reliable when considering long-term effectiveness and permanence.

Alternatives M2 and M5 armor the channel to prevent the channel from migrating and eroding out the deeper sediments in adjacent areas. The armored channel minimizes the potential for the channel to meander and expose currently buried contaminants, and so would add to the long-term permanence of these alternatives.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment

None of the alternatives treat contaminated sediments. Alternative M7 would provide the greatest reduction of contaminant mass at the sites, but does not rely on treatment.

5. Short-term Effectiveness

All the active alternatives involve at least some excavation and thus present a potential for minor short-term challenges. Alternative M2 requires the least excavation and presents the lowest short-term difficulties to the community or site workers, with M3 only slightly more difficult. Alternatives M4, M5, M6 and M7 would pose greater challenges in the short term compared to Alternatives M2 and M3 because larger and deeper excavations would pose an increased risk of short term exposure as well as increased materials handling. However, proper health and safety measures can mitigate these risks.

The risk of release during remedy implementation is principally limited to wind-blown transport or surface water runoff. This is expected to be minimal based on the high moisture content of the sediments. Any potential environmental impacts associated with dust and runoff would be minimized with proper installation and implementation of dust and erosion control measures. In the event of a catastrophic storm that occurred during the implementation phase of one of the active alternatives, the risk of additional sediment releases would increase over the current conditions, because vegetation that currently minimizes sediment movement would be removed; however, there is little difference in the implementation time from the shortest (three months) to the longest (six months), so no alternative is substantially more favorable from this standpoint.

Implementation times of the remedial alternatives are as follows: M2 and M3 would require three months to construct and a minimum of five years, but as many as 45 years, to reach the remediation goals for surface sediments; M4--three months; and M5/M6/M7--six months.

6. Implementability

Although all of the alternatives are technically and administratively implementable, because they all utilize standard construction equipment and services, and require similar permit equivalencies, it is unclear whether natural recovery would be effective in achieving the remediation goals in a reasonable timeframe, if at all. Natural recovery is a type of remedy that EPA can consider if natural processes appear likely to achieve goals for a site, or part of a site, in a timeframe that is similar to other active remedies. Using favorable assumptions about sediment rates, the FS report predicts the MNR portion of Alternatives M2 and M3 could achieve remediation goals within five years. All of the other remedial alternatives achieve the remediation goals for the marsh within the first year after implementation and while these implementation times are not similar, a five-year implementation time is still considered reasonable. The FS also considered unfavorable sedimentation rates and calculated timeframes as long as 45 years to reach remediation goals, a timeframe that is clearly unacceptable. This broad range (5 years to 45 years) suggests a level of uncertainty about whether MNR can be relied upon to achieve the remediation goals.

EPA considers Alternatives M2 and M3 to be questionable for overall implementability.

7. Cost

As discussed above, cost estimates were developed jointly for the two sites without regard to the relative cost contribution of each site and, therefore, costs are divided equally between the Sites. EPA has not attempted to assess the actual contribution of each Site to marsh contamination. Actual allocations will be done at a future date when more information is available. Summing the per-site costs for each alternative provides the total cost for each alternative.

Horseshoe Road Site

The estimated present worth costs of Alternatives M2, M3, M4, M5, M6 and M7 are $3.7 million, $4.0 million, $7.5 million, $8.45 million, $9.3 million and $10.35 million, respectively.

Atlantic Resources Site

The estimated present worth costs of Alternatives M2, M3, M4, M5, M6 and M7 are $3.7 million, $4.0 million, $7.5 million, $8.45 million, $9.3 million and $10.35 million respectively.

Excavation and off-site disposal of contaminated sediments is the primary cost variable across the remedial alternatives, M2 (1,291 cubic yards) excavating the smallest quantity and M7 (21,145 cubic yards) the largest. The difference in cost between M2 or M3 and the remaining alternatives is substantial, whereas the costs of Alternative M4 through M7 are generally comparable.

O&M costs for Alternatives M2, M3 and M4 are the highest, because they rely primarily on capping or MNR, and require additional on-site management to assure protectiveness or, in the case of MNR, monitoring to assure that the remedy is reaching the remedial goals for the marsh. Alternative M7 has the lowest O&M cost, because it leaves only inaccessible deeper sediments in place at the conclusion of the remedial action, and monitoring for that alternative focuses primarily on assuring that the wetland is restored.

The potential for remedy failure (e.g., a substantial disruption of a cap following a catastrophic storm event) to a degree that would require a second cleanup effort to restore damage to a remedy is not accounted for in the estimated costs of any of the alternatives.

When comparing the cost of each of these alternatives, it is apparent that what is achieved by the increase in cost from M2 to M7 is a decreased potential for remedy failure. For the marsh, one must consider that a failure here may compromise the down-gradient river remedy. Alternatives M2 and M3 are unproven, and may require implementation of another alternative should they fail to perform as expected. Alternatives M4 through M7 progressively depend on more excavation and less thin capping. The result is a more robust remedy. M7 leaves very little contaminated sediment on site and covers it with a very thick layer of backfill, and even a major storm event would have very little chance of exposing buried contamination. At the other end of the spectrum is M4, which relies completely on a thin-layer cap to address arsenic contamination at concentrations up to 1,050 mg/kg. The potential for failure during a storm or disruption from human activity is much greater.

8. **State/Support Agency Acceptance**

The State of New Jersey concurs with EPA's preferred alternative in this Proposed Plan.

9. **Community Acceptance**

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the site.

RIVER ALTERNATIVES

Using the Remediation Goals of 100 mg/kg for arsenic and two mg/kg for mercury in river sediments, the FS targeted an area (marked on Figure 3) for remediation. Given the difficulties of collecting reproducible data in surface sediments and the potential for multiple point sources for the COCs in the river, EPA expects to limit its river response to the mudflat areas identified in Figure 3, a depositional zone that is clearly affected by the sites.

As with the marsh sediments, the FS uses zones defined by the Remediation Goals but divides the river sediments into additional zones, to assess a wider variety of response actions. In addition to areas defined by the Remediation Goals, river sediments were further divided into an area that exceeds 194 mg/kg for arsenic and 2.6 mg/kg for mercury. These values are based on the amphipod bioassay performed as part of the BERA. This area is considered more critical, and contains most of the contaminant mass. The second zone is characterized by sediments that are less than 194 mg/kg of arsenic but exceed the Remediation Goals. As with the marsh alternatives, the river alternatives presented in the FS address these zones to varying degrees as described in the summary of remedial alternatives below.

Common Elements

Many of the alternatives include common components. The FS assumes that the OU2 remedies and marsh remedies will eliminate these areas as ongoing sources of contamination to river sediments. It is expected that these other remedies would be performed before, or at least concurrently with the active remedial alternatives evaluated below.

Because the COCs (arsenic, mercury and PCBs) are commonly found in sediments of the Raritan River Estuary, and because only a small portion of the sediment contamination in the Estuary can be reasonably attributed to the sites, the remedial actions contemplated for the river are limited to addressing a hotspot that is clearly attributable to the sites. EPA expects that the area targeted for remediation will be recontaminated to at least the background levels found throughout the Estuary. Post-remedy sediment monitoring in the river would be needed to assess whether actions taken to address this hotspot have been effective, and whether the marsh remedy was effective at eliminating the marsh as a continuing source to the river. Five-year reviews will be conducted. In addition, EPA will identify institutional controls to prevent disruption of the remedy. Institutional controls may include a Restricted Navigation Area or other similar control that would limit activities in the river that could disturb subaqueous capped areas.

Alternative R1: No Action

Estimated Capital Cost:	$0
Estimated (O&M) Cost:	$0
Estimated Present Worth Cost:	$0

Estimated Construction Time frame: None

Area dredged: 0.0 acres
Area Backfilled : 0.0 acres
Area capped: 0.0 acres

Regulations governing the Superfund program expect that the "no action" alternative will be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no further action in the river to prevent exposure to sediment contamination, or to prevent the further migration of site contamination from the hotspot area. Institutional controls, such as a deed notice, would not be implemented to limit access to this area. Engineering controls would not be implemented to prevent site access or exposure to site contaminants.

Alternative R2: Monitored Natural Recovery

Horseshoe Road Site Costs	
Estimated Capital Cost:	$120,000
Estimated O&M Cost:	$410,000
Estimated Present Worth Cost:	$335,000

ARC Site Costs	
Estimated Capital Cost:	$120,000
Estimated O&M Cost:	$410,000
Estimated Present Worth Cost:	$335,000

Estimated Construction Time frame: 0 months
Area dredged: 0.0 acres
Area requiring cover: 0.0 acres

This alternative relies on natural processes in the river to reduce exposures to human and ecological receptors. This alternative is similar to Alternative R1 with the exception that there would be monitoring performed to determine the rate of recovery.

Institutional controls, such as a deed notice, would be required to prevent disruption of the recovered area.

Alternative R3: Shallow Dredge and Thin Cover

Horseshoe Road Costs
Estimated Capital Cost: $ 1,310,000
Estimated O&M Cost: $410,000
Estimated Present Worth Cost: $1,400,000

ARC Costs
Estimated Capital Cost: $ 1,310,000
Estimated O&M Cost: $410,000
Estimated Present Worth Cost: $1,400,000

Estimated Construction Time frame: 1-2 months
Area dredged: 0.8 acre
Area requiring cover: 2.5 acres

Under this alternative, approximately 1,290 cubic yards of sediment in the river that exceed 194 mg/kg arsenic and 2.6 mg/kg mercury would be dredged to a depth of one foot, and clean material would be used as backfill to restore the dredged area to the original contour. The remaining sediments within the area targeted for remediation would be covered with a thin sand layer (approximately six inches) that would both dilute contaminant concentrations at the surface and act as a cap on the more contaminated sediment below.

This alternative would require monitoring to ensure that the cover material remains in place and is functioning as expected. Institutional controls, such as a deed notice, would be required to prevent disruption of the capped sediments.

Alternative R4: Extended Shallow Dredge and Cover

Horseshoe Road Site Costs
Estimated Capital Cost: $2,745,000
Estimated O&M Cost: $410,000
Estimated Present Worth Cost: $2,800,000

ARC Site Costs
Estimated Capital Cost: $2,745,000
Estimated O&M Cost: $410,000
Estimated Present Worth Cost: $2,800,000

Estimated Construction Time frame: 1-2 Months
Area dredged: 2.5 acres
Area requiring cover: 2.5 acres

Under this alternative, approximately 4,030 cubic yards of sediment within the area targeted for remediation (Arsenic >100 mg/kg) would be dredged to a depth of approximately one foot, and clean material would be used to restore the dredged area to the original contour.

This alternative would require monitoring to ensure that the cover material remains in place and is functioning as expected. This alternative will require Institutional Controls to prevent disruption of the remediated area.

Alternative R5: Deep Dredge and Natural Resedimentation

Horseshoe Road Site Costs
Estimated Capital Cost: $5,335,000
Estimated O&M Cost: $410,000
Estimated Present Worth Cost: $5,450,000

ARC Site Costs
Estimated Capital Cost: $5,335,000
Estimated O&M Cost: $410,000
Estimated Present Worth Cost: $5,450,000

Estimated Construction Time frame: 3-4 months
Area dredged: 2.5 acres
Area requiring cover: 0.0 acres

Under this alternative, approximately 14,120 cubic yards of sediment within the area targeted for remediation (Arsenic >100 mg/kg) will be dredged to a depth of approximately 3.5 feet, but no cover material would be placed in the dredged area. Natural sedimentation would be expected to fill in the dredged area over time, providing a layer of cover over any residual sediment contamination that might exist beneath the area dredged.

This dredging effort would be expected to remove most of, but possibly not all the sediments in the area that exceed the remediation goals; however, post-dredging sampling would be required to determine if this is the case. This alternative may require monitoring if contaminated sediment is left behind to ensure that natural sedimentation would be covering any remaining contaminated sediment in order to achieve the remediation goals.

Alternative R6: Deep Dredge and Cover

Horseshoe Road Site Costs	
Estimated Capital Cost:	$6,710,000
Estimated O&M Cost:	$45,000
Estimated Present Worth Cost:	$6,750,000

ARC Site Costs	
Estimated Capital Cost:	$6,710,000
Estimated O&M Cost:	$45,000
Estimated Present Worth Cost:	$6,750,000

Estimated Construction Time frame: 3-4 months
Area dredged: 2.5 acres
Area requiring cover: 2.5 acres

Under this alternative, approximately 14,120 cubic yards of sediment within the area targeted for remediation (Arsenic >100 mg/kg) would be dredged to a depth of approximately 3.5 feet, and 3.5 feet of clean material would be used to restore the dredged area to the original contour.

This alternative is not expected to require monitoring except to assure that the cover material is not disturbed. (River sediment sampling may still be needed to monitor the performance of the marsh remedy.) This alternative will require institutional controls to prevent disruption of the dredged and covered area.

EVALUATION OF RIVER ALTERNATIVES

1. **Overall Protection of Human Health and the Environment**

Alternatives R3, R4, R5 and R6 provide varying levels of protection of human health and the environment through combinations of dredging, covering, institutional controls, and monitoring. The "no action" alternative and Alternative R2 (Monitored Natural Recovery) take no action to reduce the potential for direct contact exposure or the potential for the hotspot area to be a continuing source of contamination to the river, and neither of these alternatives appear to satisfy the Remedial Action Objectives for river sediments. While natural sedimentation and dilution may eventually reduce the surface sediment concentrations somewhat, the timeframes for this recovery may be quite long. In the FS, MNR was modeled to take as little as three years and as long as 65 years; however, there is only marginal evidence of natural recovery to date. The site sources that would have provided a continuing source of contaminated sediments during facility operations appear to have substantially diminished, and the facilities have not operated for over 20 years; yet, this diminished sediment loading has not appeared in the surface sediment concentrations as "recovery" (a clear pattern of reduced concentrations). In addition, because most of the area targeted for remediation is in a depositional zone of the river and is currently a mudflat at low tide, it is very difficult for new, cleaner sediment to deposit on the surface, unless the more highly contaminated sediments are first removed, and if the highly contaminated sediments are removed through the natural redistribution of sediments throughout the river, it would not satisfy the remedial action objectives.

Alternatives R6 (Deep Dredge and Cover) and R5 (Deep Dredge and MNR) provide the largest mass reduction, one method of evaluating environmental protection. Alternatives R3 (Shallow Dredge and Thin Cover) and R4 (Extended Shallow Dredge and Cover) also remove a portion of the most highly contaminated and accessible sediments (those at the surface) but rely more heavily on cover material to manage deeper sediments. Alternatives R3 through R6 rely on covering contaminated sediments left in place, to varying degrees. Alternative R3 may offer a slightly lesser degree of protectiveness than the others, because a thin-layer cover is expected to mix and dilute with contaminated bottom sediments, and the resulting surface sediment concentrations may be slightly higher than for the other active alternatives.

Long-term maintenance and monitoring would be required to ensure that cover material remains in place, and efforts made to assure that the cover material is not disturbed, through the designation of a Restricted Navigation Area, (RNA) or similar control.

Because Alternative R1, the "No Action" alternative, and Alternative R2 (MNR) do not satisfy the Remedial Action Objectives for the river sediments, they were eliminated from consideration under the remaining eight criteria.

2. Compliance with ARARs

Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements of federal and state law or provide grounds for invoking a waiver of those requirements. There are no chemical-specific ARARs for the contaminated river sediments. The cleanup goals are risk-based. Alternative R6 would address the cleanup goals through dredging and backfilling, and the other alternatives would achieve the cleanup goals by dredging, and capping.

Based upon the available documentation regarding the source of contamination and sediment testing, EPA has concluded that the river sediments are neither listed hazardous waste or exhibit hazardous characteristics, and therefore do not require treatment to meet RCRA Land Disposal Restrictions prior to disposal in a RCRA-compliant unit.

3. Long-term Effectiveness and Permanence

Long-term effectiveness and permanence would be achieved by Alternatives R3, R4, R5, and R6, to varying degrees. Alternatives R6 (Deep Dredge and Cover) would achieve the highest level of long-term effectiveness and permanence because the largest mass of contaminated sediment would be permanently removed from the river and the thickest layer of cover material would be put in place. Alternative R5 could be considered slightly less effective because it relies on natural processes to cover any residual contamination that may remain; however, after sediment dredging to 3.5 feet, the dredged area would be expected to create a local depositional environment that would accumulate sediment at a higher rate than the surrounding areas, providing cover material relatively rapidly.

Alternatives R3 (Shallow Dredge and Thin Cover) and R4 (Extended Shallow Dredge and Cover) provide long-term effectiveness and permanence by dredging the most highly contaminated and accessible sediments at the surface, and placing a sediment cap over residual contaminated sediment; these sediment caps need to be monitored to assure that they will remain in place. Alternative R4 would be considered more reliable over the long-term compared to Alternative R3, because the thin sand cover of Alternative R3 is placed on top of existing sediments and is more prone to the natural redistribution of river-bottom sediments (some portion of the cap material would be washed away), whereas cover material for Alternative R4 is placed after dredging, and the river bottom is essentially unchanged. In addition, the one foot of cover material in Alternative R4 would have little mixing and dilution of surface sediments, whereas the six-inch sand cover in Alternative R3 relies, at least partially, on mixing and dilution of the surface sediment concentrations, and the resulting surface sediment concentrations would be higher.

Alternatives R3 and R4 are more at risk of failure from sediment disturbance than are Alternatives R5 or R6, which incorporate a thicker cover layer. The most likely causes of sediment disturbance would be human activities (such as boating or dredging) or ice scour during the winter months. The capped area in the river would be designated as a Restricted Navigation Area (RNA) where anchoring would not be allowed, and access would be restricted. The RNA would also be marked on navigational charts. Alternatives R3 and R4 rely heavily on an RNA, and on the limited accessibility of this area to larger water craft to prevent damage to a capped area, while alternatives R5 and R6 would rely more on deeper contamination removal and cover to prevent failure. While preventative measures can be put in place to prevent human disturbance of this area, the only measure to address ice scour would be deeper removal and cover as provided in alternatives R5 and R6. In the case of R5 however, the time required for the natural sedimentary processes to fill in the excavated area is uncertain, and therefore we can not definitively say when the remedy will become fully protective.

For any of the remedial alternatives considered, background sediment contamination present throughout the Raritan River Estuary will result in the some recontamination of surface sediments over the long-term.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment

None of the alternatives involve treatment of the contaminated sediments. Alternatives R6 and R5 remove the most contaminated mass from the river, and therefore do reduce the most volume. However, treatment is not involved and these alternatives do not do more than the other alternatives to satisfy EPA's preference for treatment of wastes.

5. Short-term Effectiveness

All of the alternatives would be effective over the short term. Alternatives R3 through R6 involve at least some dredging and thus present minor short-term challenges. The risk of release during remedy implementation is principally limited to resuspension of sediments in the river, and to wind-blown transport or surface water runoff from stock piles. All potential environmental impacts associated with resuspension, dust and runoff can be minimized with proper engineering controls.

Risk to workers posed by normal dredging and materials-handling should be minimal and proper health and safety measures should mitigate this risk.

For the remaining alternatives with the exception of Alternative R5 (Deep Dredge and Natural Resedimentation), once the construction phase is complete, the remedy will be fully effective. The implementation time for Alternatives R3 and R4 is about two months, while Alternative R6 would require four months. Alternative R5 would require about four months to construct and at least 30 months before sedimentation would cover the sediments to a depth that is protective, resulting in an implementation time of about three years.

6. Implementability

Alternatives R3 through R6 are technically and administratively implementable, because they all utilize standard construction equipment and services, and require similar permit equivalencies.

7. **Cost**

As discussed above, cost estimates were developed jointly for the two sites without regard to the relative cost contribution of each site and, therefore, costs are divided equally between the Sites. EPA has not attempted to assess the actual contribution of each Site to river contamination. Actual allocations will be done at a future date when more information is available. Summing the per-site costs for each alternative provides the total cost for each alternative.

Horseshoe Road Site

The estimated present worth costs of Alternatives R2, R3, R4, R5, and R6 are $0.34 million, $1.4 million, $2.8 million, $5.45 million, and $6.75 million, respectively.

Atlantic Resources Site

The estimated present worth costs of Alternatives R2, R3, R4, R5, and R6 are $0.34 million, $1.4 million, $2.8 million, $5.45 million, and $6.75 million, respectively.

Dredging and off-site disposal of contaminated sediments is the primary cost variable across the remedial alternatives, with Alternative R3 dredging the least (1,290 cubic yards) and Alternatives R5 and R6 dredging the most (14,117 cubic yards).

The long-term monitoring costs for alternatives R2 through R5 are the highest, because they rely primarily on covering or MNR, and require additional on-site management to assure protectiveness or, in the case of MNR, monitoring to assure that the remedy is reaching the remedial goals for the river. Alternative R6 has the lowest long term monitoring cost, because it leaves only inaccessible deeper sediments in place at the conclusion of the remedial action. The potential for remedy failure (e.g., a substantial disruption of a cap following a catastrophic storm event) to a degree that would require a second cleanup effort to restore damage to a remedy is not accounted for in the estimated costs.

8. **State/Support Agency Acceptance**

The State of New Jersey concurs with EPA's preferred alternative in this Proposed Plan.

9. **Community Acceptance**

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the sites.

SUMMARY OF THE PREFERRED ALTERNATIVES

The Preferred Alternatives for the cleanup of OU3 marsh and river sediments are Alternative M7, Complete Removal, and Alternative R6, Extended Deep Dredge and Cover, hereafter referred to as the Preferred Sediment Alternatives. These alternatives include excavation, transportation and disposal of approximately 21,000 cubic yards of contaminated sediments from the Horseshoe/ARC marsh, and dredging approximately 14,120 cubic yards of contaminated sediments from the Raritan River. The excavated/dredged areas would be restored to approximately the current grades. Residual contaminated sediments remaining at depth would be capped in place. The accessible contaminated sediments would be removed in the marsh, and the cover layer would provide a substantial barrier to any residual deeper contaminants that might remain. A breach to the cover material appears highly unlikely under current and potential future scenarios. Because some contaminated material will be left on site, deed restrictions will be needed to manage the isolated sediments over the long term. This Remedy will require on-site restoration of approximately six acres of wetlands disturbed during implementation of the remedy.

The Preferred Sediment Alternative for the marsh was selected over other alternatives because it is expected to achieve substantial and long-term risk reduction through off-site disposal, and is expected to allow the property to be used for the reasonably anticipated future land use, which is open space/wetland. The Preferred Marsh Sediment Alternative reduces the risk within a reasonable time frame, at a cost comparable to other alternatives and is reliable over the long-term. Although M7 and M6 are very similar in most respects, M7 was chosen because it removes a higher mass of contaminants at only slightly higher cost than M6. Since the preferred alternative would achieve the remediation goals that are protective for the current expected human exposure scenarios (recreational land use), but are not expected to achieve levels that would allow for unrestricted use, institutional controls, such as a deed notice or covenant, may be needed to prevent a change in land use.

The river portion of the Preferred Sediment Alternatives was selected over the other alternatives because it is expected to achieve substantial and long-term risk reduction through off-site disposal of dredged sediments, reducing contaminant levels in the river, and reducing the mudflat area as a source of contamination to the river. The Preferred River Sediment Alternative reduces the risk within a reasonable timeframe, at a cost comparable to the other alternatives and provides for long-term reliability of the remedy. Although Alternative R4 would provide protectiveness at the surface to a degree that would be similar to R6, EPA believes that the additional long-term effectiveness and permanence in a river setting, where conditions cannot be as easily controlled as on land, justifies the additional cost of removing a larger quantity of contaminated sediments.

The Preferred Sediment Alternatives are believed to provide the best balance of tradeoffs among the alternatives based on the information available to EPA at this time. EPA believes that the Preferred Sediment Alternatives would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The selected alternative can change in response to public comment or new information.

COMMUNITY PARTICIPATION

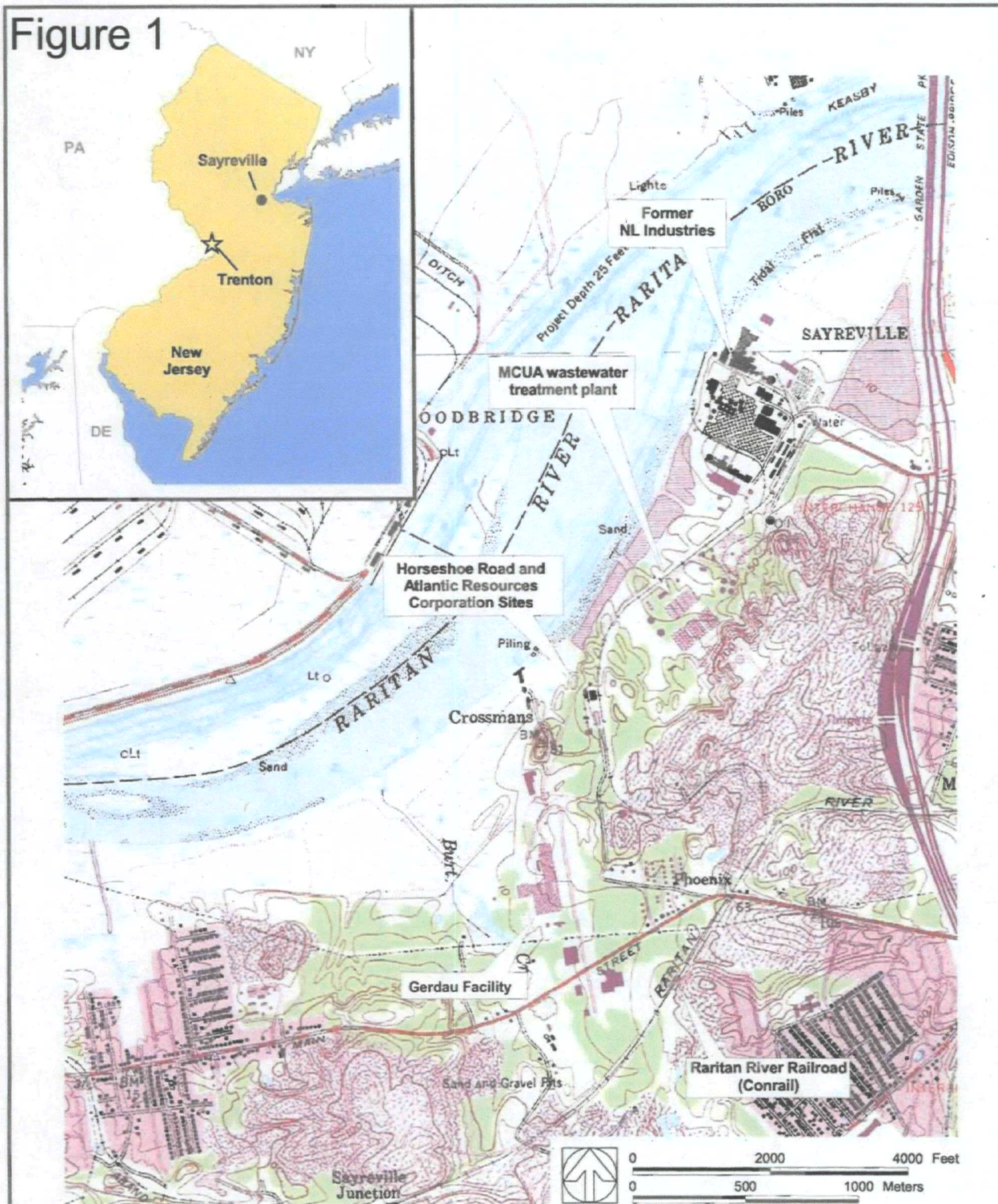
EPA provided information regarding the cleanup of the Horseshoe Road and Atlantic Resources Corporation sites to the public through public meetings, the Administrative Record file for the sites, and announcements published in the Suburban News. EPA encourages the public to gain a more comprehensive understanding of the sites and the Superfund activities that have been conducted there.

For further information on the Horseshoe Road and Atlantic Resources sites, please contact:

John Osolin	Pat Seppi
Remedial Project Manager	Community Relations Coordinator
(212) 637-4412	(212) 637-3679

U.S. EPA
290 Broadway 19th Floor.
New York, New York 10007-1866

The dates for the public comment period, the date, location and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan.

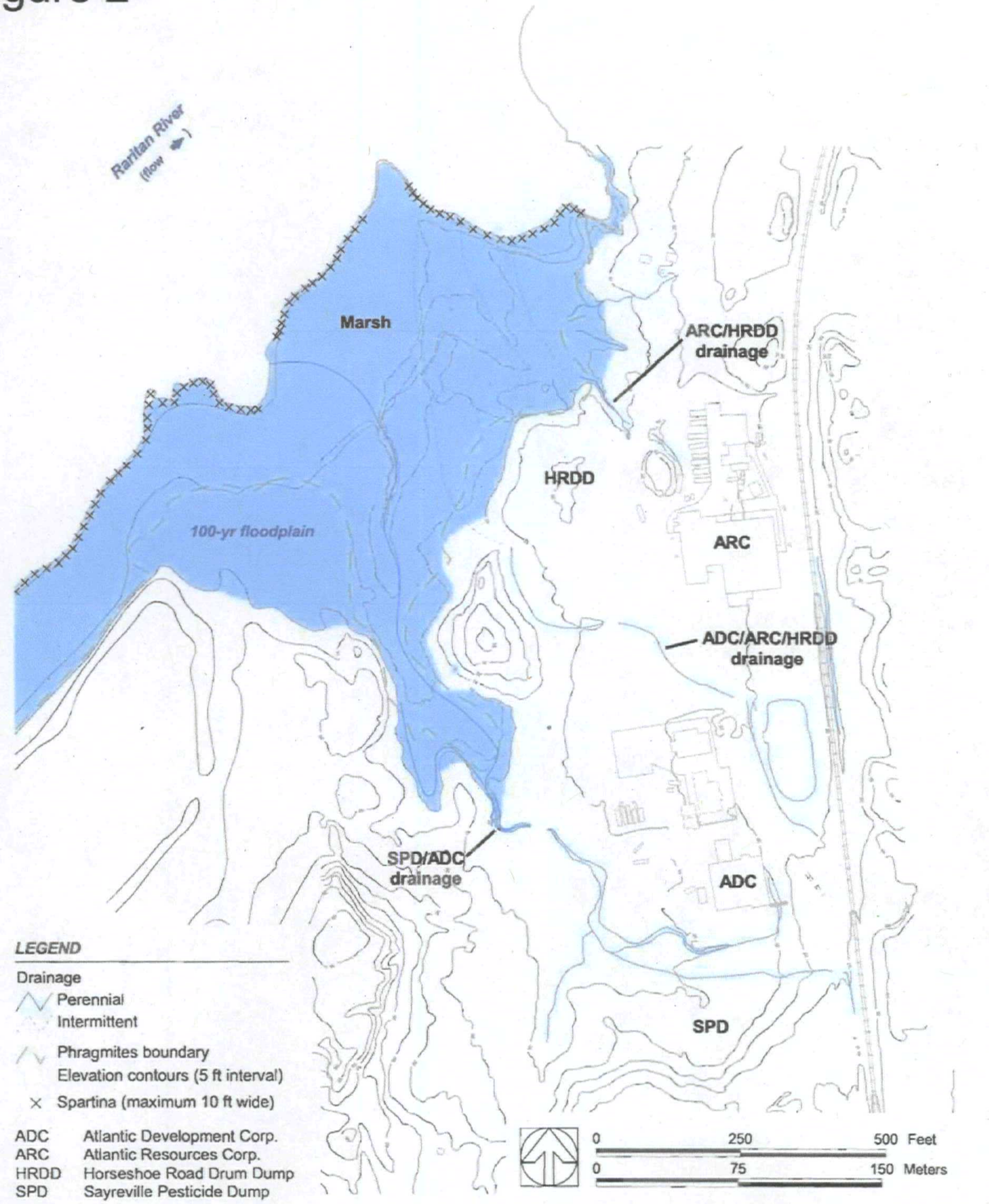


Source: Base map from USGS topographic map South Amboy (1981) and Perth Amboy (1981).

Location of Horseshoe Road and Atlantic Resources Corporation Sites

Exponent

Figure 2



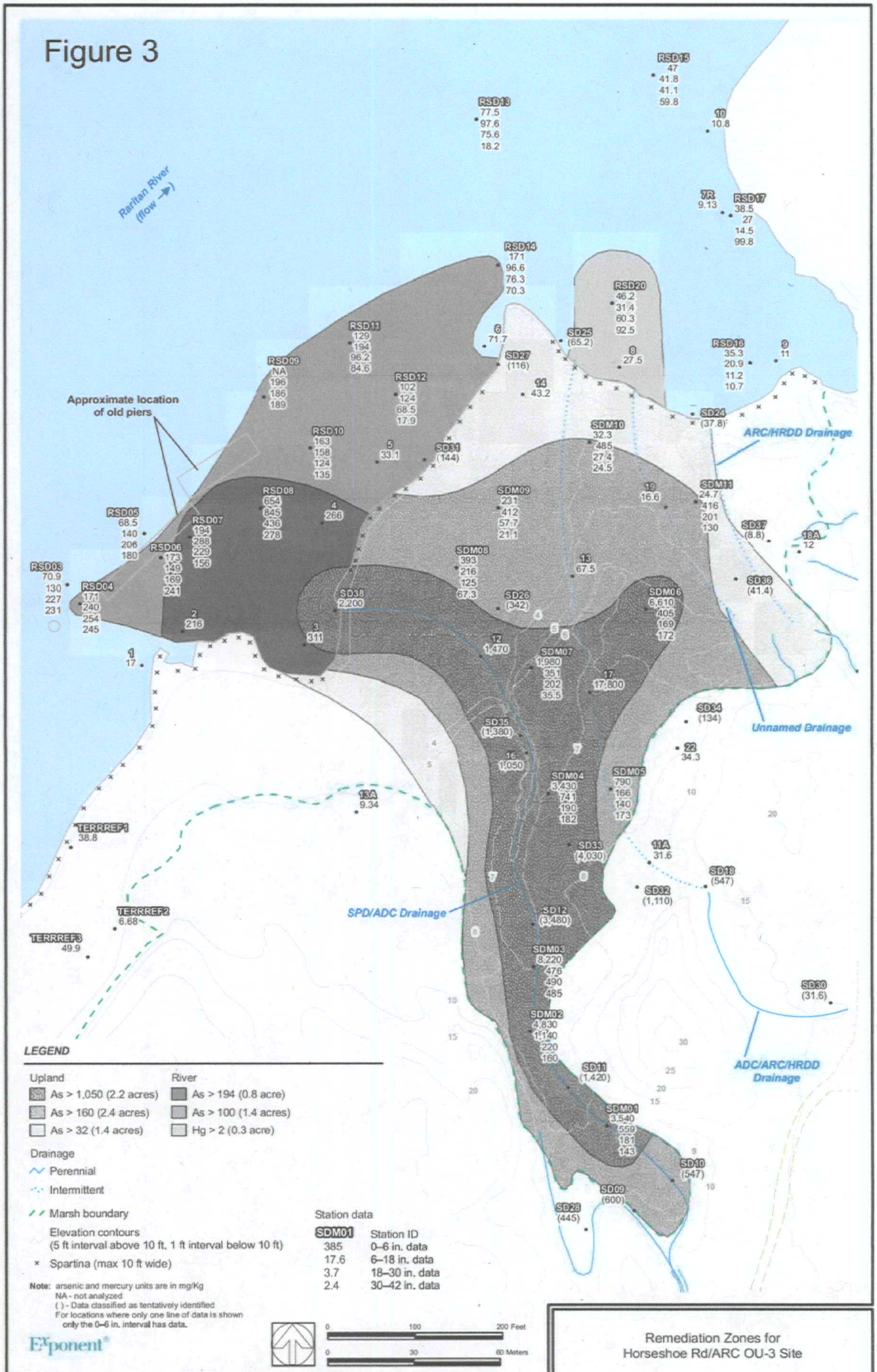
Source: Elevations from CDM (1997).

Note: All buildings have been demolished. Figure shows former locations.

Extent of Marsh

Exponent

BE02758.001 | Feb 27, 2008 | Figure 1-3 view | Figure 1-3 layout | M:\BE02578_Sayreville\projects\sayreville_report_figs_200707.apr



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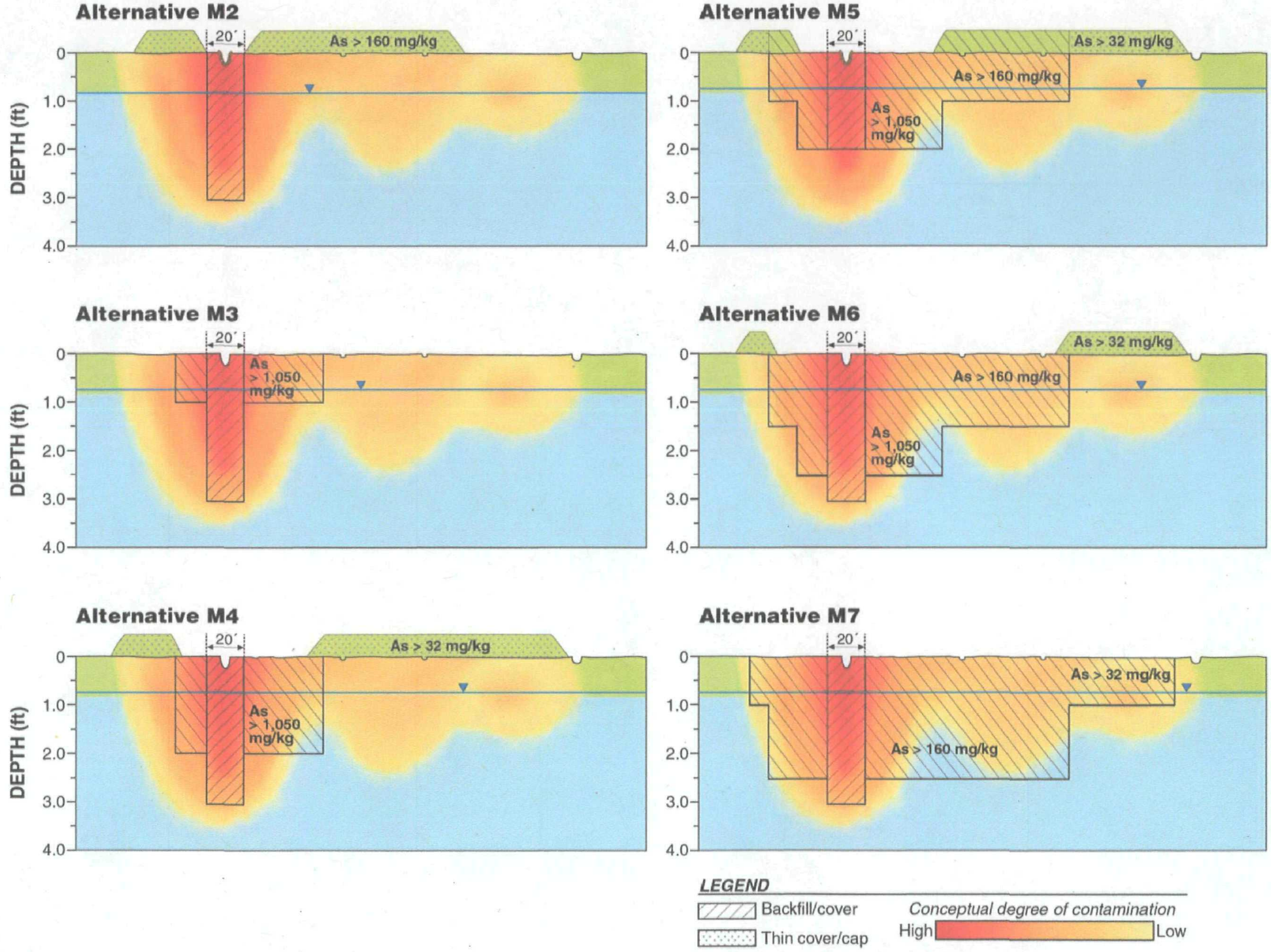
Marsh Alternatives - Figure 4



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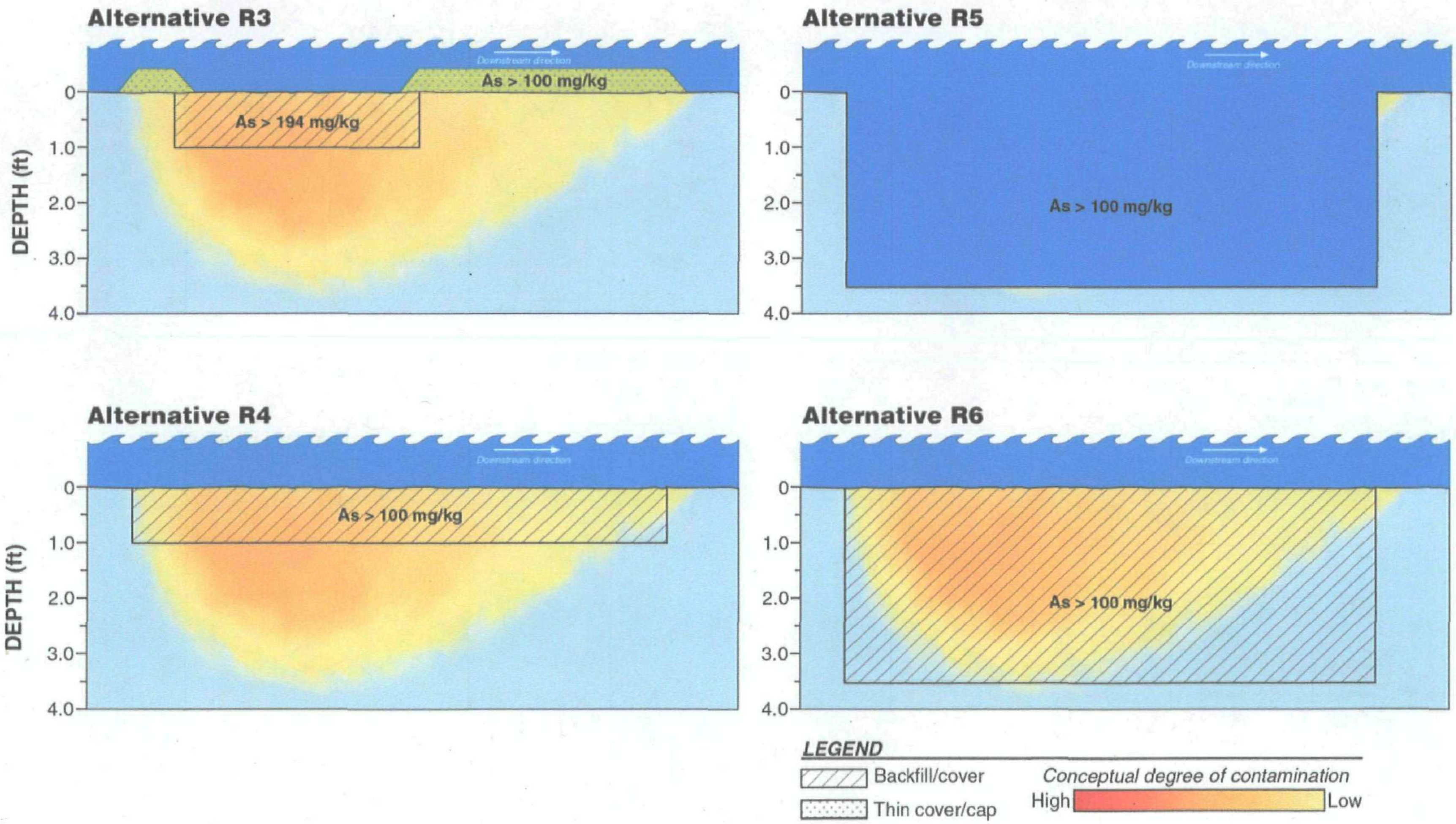
River Alternatives - Figure 5



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Attachment B

The Public Notice from the *Suburban News*

EPA INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE HORSESHOE ROAD AND ATLANTIC RESOURCES SUPERFUND SITES SAYREVILLE, MIDDLESEX COUNTY, NEW JERSEY

The U.S. Environmental Protection Agency (EPA) announces the opening of a **30-day comment period** on the Proposed Plan and preferred cleanup alternative to address contamination at the Horseshoe Road and Atlantic Resources Superfund sites in Sayreville, Middlesex County, New Jersey. The comment period **begins on July 21, 2008 and ends on August 20, 2008.** As part of the public comment period, EPA will hold a **Public Meeting on August 12, 2008 at 7:00 PM at the Municipal Building Council Chambers, 167 Main Street, Sayreville, New Jersey.** To learn more about the meeting you can contact Ms. Pat Seppi, EPAís Community Involvement Coordinator, at 212-637-3679 or visit our website at www.epa.gov/region2/superfund/npl/horseshoe.

The Horseshoe Road and Atlantic Resources sites are listed on the Superfund National Priorities List. EPA recently concluded a remedial investigation/feasibility study (RI/FS) for the sites to assess the nature and extent of contamination in the sediment found in the adjacent marsh and the Raritan River. Based upon the results of the RI/FS, EPA has prepared a Proposed Plan which describes the findings of the remedial investigation and the feasibility study and which provides the rationale for recommending the preferred cleanup alternative.

Institutional controls, monitoring, and periodic reviews will also be part of the remedy to ensure that the remedy remains protective of public health and the environment. During the **August 12 Public Meeting,** EPA representatives will be available to address all the alternatives considered and the reasons for recommending the preferred cleanup alternative. Public comments will be received.

The RI Report, FS Report, Risk Assessment, Proposed Plan and other site-related documents are available for public review at the information repositories established for the sites at the following locations:

Sayreville Library: 1050 Washington Road, Parlin, New Jersey, (732) 727-0212
Hours: Mon. ñ Thurs., 9:30 AM ñ 7:45 PM; Fri. ñ Sat., 9:30 AM ñ 4:45 PM; Sun., 1 PM ñ 4:45 PM

USEPA Region 2: Superfund Records Center, 290 Broadway, 18th Floor, New York, NY 10007-1866, (212) 637-4308
Hours: Mon. - Fri., 9 AM - 5 PM

EPA relies on public input to ensure that the selected remedy for each Superfund site meets the needs and concerns of the local community. It is important to note that although EPA has identified a preferred cleanup alternative for the sites, no final decision will be made until EPA has considered all public comments received during the public comment period. EPA will summarize these comments along with responses in a Responsiveness Summary, which will be included in the Administrative Record file as part of the Record of Decision. **Written comments and questions regarding the Horseshoe Road and Atlantic Resources Superfund sites, postmarked no later than August 20, may be sent to:**

Mr. John Osolin, Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, New York 10007-1866
Fax: (212) 637-4412
email: osolin.john@epa.gov

Attachment C

The Transcripts of the Public Meeting

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

- x

The Proposed Plan for Sediment
Cleanup in the Marsh and River
HORSESHOE ROAD AND ATLANTIC RESOURCES
SUPERFUND SITES
Sayreville, New Jersey

- x

A p p e a r a n c e s:

PAT SEPPI, EPA, Community Involvement Coordinator

JOHN OSOLIN, EPA, Project

CHUCK NACE, EPA, Risk Assessor

GENE URBANIK, New Jersey Area Engineer for the Corps of Engineers

NEIL KOLB, Residential Engineer for the Corps of Engineers

August 12, 2008

7:05 p.m.

Public Meeting held in the above-entitled matter at the Municipal Building, 167 Main Street, Sayreville, New Jersey before Leah Allbee, Registered Professional Reporter and Notary Public within and for the State of New Jersey.

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MS. SEPPI: My name is Pat Seppi. I am the Community Involvement Coordinator for the Horseshoe Road and Atlantic Resources site. We are here tonight to talk cleanup of the river and marsh. It's called Operable Unit 3.

John Osolin is going to give a short presentation. Before that, just a couple of things. I would like the people here from EPA, the other agencies who are involved in the site, to stand up and introduce themselves and tell you their relationship to the site. We will start with John.

MR. OSOLIN: John Osolin project manager for EPA.

MR. NACE: Hi. Chuck Nace, Human Health Resources for the site for EPA.

MR. URBANIK: Gene Urbanik, I am the New Jersey Area Engineer for the Corps.

MR. KOLB: Neil Kolb. I am

the Residential Engineer for the Corps.

MS. SEPPI: If you are not aware, I am think most of you are, most of you look familiar, Conti is the company that is our remedial contractor and the Corps of Engineers, they are at the site every day and they do the oversight at the EPA.

MS. HENRY: My name is Betsy Henry. I work for Exponent, the baseline ecological risk assessment and feasibility study for the site.

MS. SEPPI: Thank you, Betsy. Is that better?

MR. MEYER: Joe Mayer with New Jersey DEP.

MS. SEPPI: Hi, Joe. How are you? Welcome.

Now, Leah is our court reporter/stenographer. Because it's a public meeting, we will be having a transcript of tonight's meeting. And it's also important for us to have a

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stenographer, because any of the questions that you ask after John's presentation will become part of the public record. And we will issue what is called a responsiveness summary as part of our final documents to the cleanup of the sites.

So what I am going to ask and just to remind you again before we start the question-and-answer session is, will you please you come up and use the mic when you have a question and state your name first, so we have it for the record.

I will remind you again at the end. The comment period starts on July 21st and runs until August 20th. All of the comments that we receive here tonight will become part of that. And also if you think of anything after tonight's meeting, you can send them to John. John's address is on page 28, I believe, of the proposal.

And as far as the Proposed

Plan is concerned, we sent it out to everyone on our mailing list. If someone didn't receive it, I do have a couple of extra copies. Please, it's very exciting reading, I am sure, right, John?

MR. OSOLIN: Oh, yes.

MS. SEPPI: The next step after this is to issue what we call a Record of Decision. That's our legally binding document that sets out what we are going to do to clean up the site. That will be issued after the comment period, a little bit after the comment period, once John has a chance to write it.

Also, we have a Web site that has a Web page just for the Horseshoe Road site. And what -- if anybody is interested in that, the Proposed Plan is up on that site as well as notification of meetings, other documents that are available. They are also available at the library.

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But let me turn this over now to John for his presentation. He promised me 20 minutes. That's, if you don't mind waiting until the end for questions. We will really appreciate that. Thank you.

MR. OSOLIN: Thank you, Pat. I don't know if you can hear me. Again, John Osolin, Project Manager for EPA.

Tonight I am going to go over a little bit of the history of the Horseshoe Road site and then a little history background of the site, background of the investigations that have gone on before, background to some of the cleanups that have been done and that has already been started.

And then we are going to look at the Proposed Plan for Operable Unit 3, the marsh and river sediments.

The Horseshoe Road site is in Sayreville, New Jersey.

I don't know if I am in the way here.

In Sayreville, New Jersey, along the Raritan River. In this slide you can see the Atlantic Resources site, which is outlined in blue. The Atlantic Resources facility is right along the -- let me go back.

The Atlantic Resources facility is right over here and the polygon also represents areas that are down gradient and affected by sediments from the site. The Horseshoe Road site is outlined in red. You can see the Raritan River up here, the Gerdau Steel facility, Middlesex County Utility Authority, sewerage treatment plant. And this is the closest neighborhood to the site, the Horseshoe Road houses. There are about 64 houses in that area.

This close-up of the site, again, Atlantic Resources outlined in blue and the affected area. This is

Atlantic Resource facility. You can see the marsh area down here. The Horseshoe Road site is actually made up of three separate areas. The Sayreville pesticide dump down here, the Atlantic Development facility and the Horseshoe Road drum dump.

I would like to give you a little site history. The Horseshoe Road complex site is made up of three areas, as you saw in the last slide. The Atlantic Development facility was operated from the early 1950's to 1980's. This was leased by Atlantic Development Corporation. The various entities -- these entities manufactured roofing tars, epoxies, epoxy resins, epoxy pigments, and various other products on that facility.

Next to it is the Sayreville dump area. It was used for disposal from 1957 to the 1980's. This determined by aerial photography that

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we have, historical aerial photography. The name Sayreville Pesticide Dump comes from pesticide bottles that were actually found at the surface of the dump when it was first discovered. And it turns out to be a misnomer. They seem to be a very small part and were probably left there by midnight dumping by somebody in the area. The majority of the material seems to be associated with the Atlantic Development facility and those operations that occurred there.

The fourth area in the Horseshoe Road complex site is the Horseshoe Road dump area. This area was used for disposals from 1972 to the mid '80's. This also was determined by aerial photography. This seems to be associated with the Atlantic Resources facility.

The Atlantic Resources site was operated from the late '30's to the early 1980's. The facility that operated toward the end of those years was a metals recycling Facility. They recycled precious metals from various materials. Circuit boards were sent to the site. They were put in acid baths and the metal etched off and metal recovered from the acid.

There was also film that was burned in incinerators. There were incinerators out in the back that were -- the film was put in and they used spent solvents that they received from companies that were disposing of them and these spent solvents were put in and used as fuel. Many of the problems that we have at this facility are associated with these spent solvents. These spent solvents were not stored properly and some of the tanks that they were in leaked and there are solvents in the ground associated with this site.

The two sites where -- EPA became aware of the two sites in 1981 when a fire exposed approximately 70 drums out at the site. The drums contained acetonitrile, silver cyanide, ethyl acetate. And these were at the Horseshoe Road dump area. The state referred the site to EPA and the EPA took lead of the site in 1985.

This is a picture of -- actually, a police photograph that was taken right after the fire. You can see the burned area behind the drums where the fire had gone through and exposed a lot of these drums that were out in the back of the dump. The drums have since been removed.

At this time I would like to talk to you a little bit about the National Priorities List. The National Priorities List is a list ranking of the sites in the nation. And the higher ranking sites that are placed on this list are eligible for federal monies for cleanups. And, therefore, it is advantageous to get a site, a big site on the NPL list to get federal funding for them.

The Horseshoe Road complex site as well as the ARC site were both listed or proposed to be listed in May of 1993. And were listed together. Originally they were listed September 29, 1995. Shortly before and during the listing some of the responsible parties for the Atlantic Resources site contested the listing and brought a suit against -- brought action against EPA. And it was decided to separate out the Atlantic Resources area. So it was removed from the listing of the Horseshoe Road complex site. EPA proposed it as its own separate site based on investigation data in September 2001. And on September 5, 2002, it was listed as its own separate site.

So the information we are giving you here tonight is actually addressing two Superfund sites: the

Horseshoe Road and Atlantic Resources site. And they are both NPL list sites.

The Superfund process, I can't really go into the sites without discussing the Superfund process. So I will give you a brief history, brief introduction to the Superfund process. And those of you who know it already, bear with me.

Initially when a site is brought to EPA's attention, we send a crew out that does a site investigation. A site investigation basically looks at the site for drums, for any materials that are laying on the surface, stuff that might be shallowly buried. It's a very preliminary investigation basically looking for something that is out at the site characterizing what contaminants are there and looking to see if anything can be done right away about it.

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The results of a site investigation are two fold: one, the site may be listed on the National Priorities List or proposed for the list and then listed. The second thing that will happen is anything that is out there in the way of drums or pure product will be taken out in what we call removal action.

After the removal action is complete and gross contaminants are removed, like drums and materials that are found there, we start a remedial investigation. And this addresses the residual contamination that is left after these larger sources are removed.

For example, a site like the Horseshoe Road site, after the removal action is complete, I would estimate that about 90 percent or more of the pure product or the material that was on-site originally when the site was found was removed at that point. All of the pure product materials and stuff and drums were taken off at that point. But the remedial investigation would look into the material that is left behind. So as part of the remedial investigation EPA goes out and tests the ground water, tests surface water. We will look at soils, both surface and subsurface. We look at sediments. We look at any buildings that might be on-site. We look at the river, effects on the river. We look at effects on wild life in the area. Based on this investigation, which involves hundreds and actually thousands of samples, we get a very good idea of where the contamination is and what levels are to be found at the site.

And then we go into the next stage, which is risk assessment. The risk assessment takes these chemicals and looks at them and decides, A, are they hazardous. If they are hazardous, are they in large enough amounts to cause an effect on the receptor, such as human health or the environment. And third thing, is there a pathway from the contamination itself to the receptors. And it quantifies that pathway and quantifies the amount. And at the end of the risk assessment, you should have a pretty good idea whether there is an effect from these chemicals. And at what level you would have to clean it up to address the contamination, clean it up so the site is safe.

At that point we do a feasibility study. The feasibility study looks at the contaminants that we have out there. And we look at all of the technologies that are out there that could address these chemicals.

Then we put them together in what we call alternatives, where we put a bunch of technologies, one or more technologies together, that will address these things and make the site safe. And we compare them to the nine criteria that are laid out in the Superfund law, which are -- which include things like effectiveness; short-term and long-term, community acceptance, which is what public meeting is for, state acceptance, cost. And there are other alternatives. I mean, there are other criteria that we use.

Once we compare these criteria to the various alternatives, we pick an alternative and we propose that to the public in what we call a Proposed Plan, which is the stage we are at right now. And we present that to the public and accept comments on it. The Record of Decision comes after we receive comments from state and the public. The state at this point has concurred with this remedy. We accept the comments and we consider them and we respond to them and we make a final decision and that is memorialized in the Record of Decision. Once that is signed, it becomes law and that is what we have to do to clean up the site.

Once the Record of Decision is complete, we go into what we call remedial design. The remedial design takes the concept that is in the Record of Decision and turns it into blueprints. So that a contractor can go out and actually do the cleanup. It quantifies things that will have to be removed, figures out the cost, and basically provides a blueprint in which they can work.

Once remedial design is completed, we take remedial action, which is the final cleanup for the site. And that's basically the Superfund process.

On this site, for example, removal actions that were done at this site since 1985, we performed numerous removal actions at the Horseshoe Road site and Atlantic Resources site. And those removals have removed over 3,000 drums, cleaned up dioxin and mercury spills. Contaminated soil and debris were removed from the site. And areas that were considered contact areas, contact hazards, were fenced.

The next phase, the remedial cleanup, was broken up into three-phases for ease of taking an action. And these phases are called Operable Units. Operable Unit 1 was demolition of the buildings. We completed that in July of 2003. Operable Unit 2 is the soil and ground water. That cleanup began in February of this year and is currently ongoing. Operable Unit 3 is the marsh and river sediment. And that is the subject of this discussion tonight.

To give you a brief history of each of the Operable Units, OU1, the buildings and structures, you see the

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demolition in the pictures. Remedial investigation was initiated in October of 1997. Focused feasibility was completed in 1999. Record of Decision was written in August of 2000. And the building demolition was completed in July of 2003 on both sites.

Operable Unit 2, soil and ground water, a feasibility study was completed in September of 2002. We ran into some difficulties and we had to do addendums to the feasibility study that were done in July 2003 and January 2004. And these addressed things like the technical and practicability of cleaning up ground water and clay.

A Record of Decision was signed in September of 2004. A design was completed in September of 2007. The cleanup began February of this year. And as you can see, it's well underway. This picture is an actual picture from the work going on right now.

Operable Unit 3, the marsh and river sediments, the ecological risk assessment was completed in May of 2006. Feasibility study was completed in July of this year. And the Proposed Plan went to public July 21, 2008. And we are currently in the comment period. And this is the point where we are at right now with the site.

To give you a little background into what we have accomplished as far as the remedial investigation for Operable Unit 3: We collected a lot of samples out there. Sampling data included sediment sampling of both the marsh and river. We did sediment toxicity sampling of blackworms and earthworms. Toxicity tests are done by taking sediment from the site and putting it in a lab and placing worms, in this case blackworms and earthworms, into the sediments.

And they are monitored to see their progress or how they are affected by the sediments. And then the body burden of those animals is checked to see what contaminants they uptook and what we could expect to find in their system and what might be taken up by birds or anything that might eat them. Fish tissue is collected in the river. Fiddler crab tissue is collected at the fringe of the marsh. Blue Crab tissue was -- Blue Craw Crab tissue was collected in the river. Small mammals were collected in the marsh and phragmites were sampled also in the marsh.

From the data that we got here, we were able to determine what levels these animals and plants received. And we were able to model up to things -- to larger animals that might be in the marsh, might frequent the marsh.

The data was then put into an

ecological risk assessment and the risk assessment came up with several findings. The first is that there was a potential risk to benthic organisms in the river, sediments immediately adjacent to the site. Benthic organisms are organisms that live on or near the bottom of the river in the muds.

There was also a potential risk to aquatic and terrestrial invertebrates in the marsh. And potential adverse effects to birds and mammal receptors in the marsh. We found that the chemicals that caused these risks, that drove these risks were arsenic, mercury and PCBs. These were the chemicals that we needed to address to eliminate these risks.

Just to give you an idea here, this is a map that, unfortunately, it's not as clear as I would like it to be. But it gives you an idea of what the configuration of the marsh is

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in the darker blue. The river is out over here (indicating).

To give you orientation, the Atlantic Resources site is here, Horseshoe Road drum dump, Atlantic Development and Sayreville Pesticide (indicating).

What I wanted to show here is the contamination that we are finding in the marsh has entered into the marsh through these stream channels that we find here. There are four stream channels that come off the site. And the contamination was -- traveled into there mostly during the operation of these facilities through sediment wash down those channels (indicating).

This picture depicts the contamination. When we went out to the site, we determined that arsenic was the most pervasive of the three chemicals that we were looking at. And almost all of the cases where they were PCBs and mercury, you also found arsenic at levels that warranted a cleanup. So this picture mostly is looking at arsenic. The areas that you see here are the darker areas are the higher contamination with the middle grade areas being mid-level contamination and lower contamination on the edges.

This area out here is actually in the river. It's more solid color. But you see the darker areas, the higher contamination in the river. And this area over here is the lesser contaminated area (indicating).

This area right here is only one of the areas where arsenic and the contaminants were not co-located. That area is a mercury contaminated area and will have to be addressed for mercury found there (indicating).

MR. SPIEGEL: Is that wetlands?

MR. OSOLIN: Excuse me?

MR. SPIEGEL: Is that wetlands?

MR. OSOLIN: That's in the river. This is not as clear as I would like it to be. Where the edge of the marsh is actually this dotted line that goes along here. And everything in the blue is the river (indicating).

The EPA looked at seven alternatives to address the marsh. And this is a cross section that will give you an idea what those alternatives are. Alternative one is the no-action alternative, so it's not listed higher. But alternative M2 and M7 are all listed here.

The alternatives are basically addressed. Each one of them is a combination of three technologies. One is capping technology. That's represented by this green area on the top here, cap.

The other is excavation and

backfill, which is represented by the crosshatched area. Anywhere you see crosshatched area, that's backfill and that's excavation backfill.

And some areas are being -- are going to be addressed by natural remediation, which is the natural covering by sediments after the up gradient source areas are removed. And in areas like this that are not addressed by either a cap or the excavation, we would be depending on natural remediation to address those areas. And in those cases, it's not like no action. In those cases we monitor it to make sure that the cover is actually covering those areas.

If you look at all of the alternatives, we go from -- an alternative depends mostly on capping and natural remediation all the way to the other extreme where we depend completely, in this case, on excavation.

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And EPA preferred alternative is M7, which is complete excavation.

For the river we have very similar alternatives. Again, we have six alternatives for the river. The first two are not listed here. The first one is no action and the second one would be natural remediation and monitoring. Neither one of those are listed here because there isn't really much to see.

In the river also we are depending on capping. The dotted area is in green and the hatched areas are again excavation. Alternative R3 depends on a combination of capping and excavating the more contaminated areas. Alternative R4 will address -- will dig up one foot all across the contaminated area and backfill across the whole thing with the backfill acting as somewhat of a cap to the contaminants that are left behind.

Alternative R5 and R6, both

involve excavation to three and a half feet across the whole site, essentially removing most of the contamination that we find above the hundred milligram per kilogram level of arsenic. And in the alternative 5, we rely on natural re-sedimentation to fill in that gap. And for R6, we backfill. Again, R6 is EPA's preferred alternative.

The closer look at the preferred alternative for the marsh, M7. M7 involves excavation, it is stepped, stepped excavation where we will be digging down to one foot in areas between 32 milligrams per kilogram of arsenic and 160 milligrams per kilogram of arsenic. And those areas above 160 milligrams, we are going to be digging down 30 inches. And except in the area of the drainage channel within ten feet on either side of the drainage channel, we are going to be going down to three feet.

The estimated volume for this alternative of material removed will be 21,000 cubic yards and will affect approximately six acres. If you look at this picture, you can see the area that will be affected by the removal. The drainage channel that we are addressing, the main drainage channel where most of the contamination is, this one channel right here and these are the other contaminated areas that will be addressed (indicating).

The preferred river alternative is deep dredge. And in this case anything above a thousand milligrams per kilogram of arsenic will be dug out to three feet. I mean, three and a half feet. I am sorry. And with the exception of this area up in the corner which will be addressed for mercury, this alternative will affect -- will affect two and a half acres of area and will involve about 14,000 cubic yards of material removed and replaced. This is an overview of that removal.

And as you can see, this is the area characterized by arsenic contamination and this is the mercury contamination (indicating).

We have piers here, those of you that are familiar with the site, the Crossman Docks that came out to the site. There are piers left behind from those docks and they are the proximate limit out into the river of the excavation that would go on there.

At this point I would like to open the floor to questions. I am going to leave contact information up here for anybody who would like to copy this down. It's also in the Proposed Plan. Anybody who is interested who doesn't have a copy of the Proposed Plan, feel free to come up and we will give you one. I am going to bring a mic forward, so that it's easier access here.

MS. SEPPI: Just as a reminder, if you have a question, would you please state your name first and we will have that for the record.

And Leah, if you don't get it, just say, would you give me your name again, please.

Anybody who has any questions please step up.

MR. SPIEGEL: Robert Spiegel, executive director Edison Wetlands Association.

The area that you show where the wetlands are going to be excavated, are those areas going to be restored in places as you are doing the actual -- after you get done with the removal work in the wetlands, are you going to immediately do a restoration of those areas?

MR. OSOLIN: That's the plan, yes. We plan to restore in place. How exactly that restoration occurs is somewhat open. We -- I mean, there is certain -- we could restore in kind or we could restore a different type of wetlands. And I don't -- I think that would be part of the remedial design process.

MR. SPIEGEL: Will it be a wetlands approved plan that the public can comment on at some point?

MR. OSOLIN: Yes. All of the plans that we put together for these things are put out in the administrative record. From time to time we will have -- we have a CAG group that we meet with. As you well know, you are part of. We will meet any time that the public feels is necessary. We will come down and discuss site plans, site wetlands, restoration. Those documents will be made available to you. The public record is there for anybody to review.

MR. SPIEGEL: When do you anticipate that a wetland restoration plan will be available for public comment now that you are putting forth this Proposed Plan?

MR. OSOLIN: Well, that would be part of the remedial design process. Once the Proposed Plan goes out to the public and once we get a Record of Decision, which we expect to have in September, we start the remedial design process. And I would assume that that process would take about a year. And at the end of the year, we would hope to have a wetlands restoration or at least we would expect to have a design for wetlands restoration that could be commented on.

MR. SPIEGEL: As part of that wetlands restoration project, are you going to be looking at the proposed Main Street bypass that you had at one point said might go through this restored wetlands area?

MR. OSOLIN: If the town comes to us with -- if a plan comes forward to us that involves Main Street bypass or there is some development ideas that they have on the table, we will certainly consider them. There is the possibility that if some of their plans for the area involve going through the site as it is, we might have to replace some of the wetlands in kind somewhere else along the river or maybe in that area move them around to accommodate the plans that the town has. Or you know, we would work with the town on that if they came forward with a plan that we needed -- that they wanted to address.

MR. SPIEGEL: Are you aware of any such plans at this point in time as far as the road going through any of these areas that EPA is planning on working on? Is there any type of alignment that you have been made aware of?

MR. OSOLIN: At this point there is no solid plans. I have not

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seen anything that shows any location where a road might go through or any development plans with any specificity at this point. And I am not aware of any. But we are -- we will be working with the town and we will ask that that will certainly be part of our planning process to make sure of, if they had any plans.

I mean, the idea is that this is town land and we obviously don't want to go out there and spend, you know, thousands, millions of dollars replacing wetlands and then have the town run a road through it or some sort of development project through it. When, if we work with the town, we can work in concert and get something that is mutually beneficial.

So, yes, we would have to work with the town. But that would also involve working with the state. The state would also have to approve any wetlands plans. And, obviously, the state and EPA would not consider any plans that didn't involve restoration of wetlands.

MR. SPIEGEL: I would like to put it on the record that I would oppose and my organization would oppose any attempt to not restore wetlands in a place where they are going to be disturbed for the purposes of facilitating a road. The EPA should be looking to restore the wetlands in place.

And if the town is proposing to impact wetlands, let them go through the process of applying for permits and not be assisted by the EPA's willingness to disturb wetlands there and then relocate them elsewhere. Our organization would be strongly opposed to that process, because these wetlands have been impacted. They serve a function while they are impacted. And you see lots of Osprey, there are Bald eagles down in the Raritan. These areas are very valuable, even areas that are impacted that are scheduled to be remediated.

So our organization and myself, we are opposed to any plan that did not involve restoring the wetlands in place where these impact wetlands are being cleaned up now.

MR. OSOLIN: Duly noted.

MR. SPIEGEL: Okay. The second point that I wanted to raise is the issue of the background. Because I wasn't privy to the conversation you had had with our technical adviser. But where did these background numbers come from that EPA is using to determine their cleanup numbers in the sediment and in the Raritan River?

MR. OSOLIN: The numbers came from various sources. And you can see them in the documents that we have in the library, the Parlin library and administrative record. Also in the administrative record in New York.

Numbers are gathered from various sources on the river. One being Army Corps dredge sampling that was done out in the channel on the north side of the river. We also got data from the state that included areas off NL Industries, areas across the river and nearby areas.

We also collected data during our investigation and a lot of what is in the FS site specific data that was gathered from the Raritan River up and downstream from the site. And you can see that -- you can certainly see that in the risk assessment. It might be in the FS also. That's where the data is gathered, where the data was gathered from.

MR. SPIEGEL: So you said there was data gathered by the EPA by the NL Industry property?

MR. OSOLIN: No. We took data that was part of the NL Industries, their gathering effort in the river.

So we looked at data from other sites on the river, we looked at data from the dredging projects. Any source of data that we could find in that area we looked at to see what levels are found out in the river that are in the local area to get an idea what the backgrounds for the river was.

MR. SPIEGEL: While -- so if the data was gathered at an adjacent site that also had an arsenic problem, that was used as a source of background data that EPA used in their determination?

MR. OSOLIN: I wouldn't use the word background. That wouldn't be considered a background data. But that would be a reference of the river. I mean, the river has -- it's not a pristine river. We're not -- the Horseshoe Road site and Atlantic Resources sites are not the only sources on the river. And to address this site, to go after -- to look

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at -- what we did was we looked at the contamination in the river. We saw a footprint.

I don't know if you can go back -- that was actually good. We saw a footprint in the river of levels that were higher than anything we are seeing in nearby rivers. And there was actually much higher levels -- there were some very high levels at NL Industry that were not used as background. I think they were up to 300 milligrams per kilogram right off the NL Industry site. That wouldn't be considered background. But we are seeing a lot of sampling in the river that were in the hundreds and were in the seventies, 99, the nineties. There were actually some in the hundreds. But they were usually associated with sites. And to expect that we can go out and start cleaning up based on the standard that was, say, 50, we would be out in the ocean cleaning up from the site on sources that were not of the site.

So the idea was the main contaminant area on the site was the marsh. We were looking at that as the source. And then we were looking to clean up the footprint of the site in the river and address that to get it back to what the local area around the river is, so that it was more in line with what was in the area.

MR. SPIEGEL: Are those numbers that you are cleaning up to according to EPA standards going to be protective of benthic organisms in the Raritan and also in the wetlands? You are cleaning up to a standard that you are saying is equivalent to background standard and that's certainly a topic of discussion. Are those standards according to EPA's guidelines going to be protective of the organisms and the fish and the other animals that use this area?

MR. OSOLIN: I believe so. To say -- I mean, they are not pristine numbers, they are not ideal numbers. If this was a site on a river in Alaska, we might be talking about different numbers. But we are bringing it to levels below what is in the river. We have fish in the river that are being impacted by the river and other sites.

We did our risk assessment. And the numbers -- even the numbers that we found showed very little impact on -- even the numbers that we found out here, except for areas very close to the site, our risk assessment showed very little impact to most of the receptors on the river. What we did have some impacts on some of the heavier contaminated areas, there was low impact further down. And I mean, at the levels that we were seeing there, we weren't seeing a lot of impact.

MR. SPIEGEL: After you are done with the cleanup in the Raritan, did I see that you are also going to be capping some of those areas, some of the sediment areas?

MR. OSOLIN: Yes. More backfill which would act as a cap. We are putting in three and a half feet in the river. We are putting in three and a half feet of fill, light fill, similar fill to what we find in the river. So that would act as a cap. Although if there was any contamination down say three and a half feet, we wouldn't expect there to be much. It could migrate up. But you would expect it to dilute. And as it comes up through the sediments, then we would have very little effect. So basically we replace it with clean fill. And we might expect some rebound. But certainly nothing to the degree that we took out of there. And certainly it would basically come to background by influence of the surrounding sediments in the river.

MR. SPIEGEL: Is there going to be any clay cap used in any of that?

MR. OSOLIN: No. Not yet.

MR. SPIEGEL: Just using the backfill. And then use the theory of solution to solution in case anything comes up through those sediments?

MR. OSOLIN: No. You are looking at three feet of fill over the top of these sediments. And at the bottom of that, the contamination is nowhere near what we are finding at the surface. In some cases we are finding levels at depth, but they are nowhere near what we have here. And the natural material that we are putting back there would act as a cap, three feet of material certainly you -- the contamination that you are going to find in those surface areas is going to be more a result of surrounding sediments moving in from neighboring areas than anything coming up through that fill.

MR. SPIEGEL: And the last question, you have -- currently you have Osprey nests on those old piers. Are those piers going to be disturbed as part of that cleanup process?

MR. OSOLIN: We are cleaning up, right up pretty much to the area of those pilings. My understanding is these pilings are going to be left in place. I would assume that would be the case. I don't know what design considerations -- there may be some other issue. But we are certainly aware that there are Osprey out there and we don't want to disturb that, that as a nesting area.

In fact, today we were out there and we saw Osprey on a nest right out on those pilings. We certainly don't want to impact that. As of now, I think we are going to leave them and if we do affect them, it will certainly be some sort of --

MR. SPIEGEL: Compensation?

MR. OSOLIN: I assume we would replace them. I am not exactly sure how we would address that.

There are issues of how you go about dredging materials out from behind those pilings and what methods we would use. And those considerations would come into play here on how that would be addressed.

MR. SPIEGEL: Would that also come into the timing of the cleanups? You would do it around this -- the nesting season for the Osprey or the migratory fish seasons that occur? Because I know there are blackout periods for work in the Raritan. That would also apply to this, I would assume?

MR. OSOLIN: Yes. My understanding from Chuck, our risk assessor, is that Osprey nest during the summer or early summer and leave in fall? Tell me if I am wrong. But they leave in the fall, migrate elsewhere. And certainly any effects that we would -- anything we would do out there, we would try to avoid any disturbing of the Osprey nests out there.

MR. SPIEGEL: So the work could be done between the time they leave in the fall and the spring?

MR. OSOLIN: I would hope so. I would think so.

MR. SPIEGEL: Thank you, John.

MS. SEPPI: Yes.

MR. SCHULTZ: Bill Schultz, Raritan River Keeper.

You seem to alternate between backfill and capping in the river. Will there be ongoing monitoring of the backfill area since that's not a real cap?

MR. OSOLIN: In any of these alternatives, there will be some monitoring that will go on to make sure that the cap is safe.

MR. SCHULTZ: There are different material, capping and backfilling; is that correct? Or am I getting confused.

MR. OSOLIN: Well, it's basically a backfill. It's basically a backfill. But when you put three feet of anything over something else it essentially is capping the material.

MR. SCHULTZ: Okay. And in regards to the wetlands, will there be -- when you are completed, will there be any restrictions on the properties?

MR. OSOLIN: Yes.

MR. SCHULTZ: I guess my final question is, in regard to the dredging, what methods of -- well, will dredging methods have to be run through the state office of dredging and sediment technology for levels of expertise? Or what type of dredging will be done? How will you keep these toxins from being suspended and spread?

MR. OSOLIN: Offhand, what we are presenting here tonight does not present the method of dredging. But certainly, yes, you are right. The state would have to approve any dredging method that we choose. Dredging in the river certainly would involve some type of curtain or something to prevent sediment from being resuspended and put back into the river. So, yes, that would be part of the dredging operation. What exact method we are going to have to use, I don't know. And how, would we be using silk curtains or would we be putting down sheet piling, I couldn't tell you at this point. That would be part of the design process. But we certainly wouldn't want to dig this stuff up and introduce it to the water column.

So that would have to be part of the consideration and all of that would have to be -- the design has to be approved by the state and by other entities.

MR. SCHULTZ: We have had some dredging issues in the Raritan in the past couple of years. That's why I bring it up. There will be public meetings prior to the actual start of the work, so there can be additional comments?

MR. OSOLIN: There certainly will --

MR. SCHULTZ: Can we have a method of commenting on your final decisions as far as what type of dredging is going to be done?

MR. OSOLIN: We have a CAG group for this site, as you are well aware. You are also a member of it. That is probably the best method of interchange of information between the public and EPA. Certainly letters, we can -- we will make available all of the documents that are pertinent to the site. So that all of these documents can be reviewed. And certainly would consider any comments that are brought in on this on the public's behalf. So, you know, yes.

Do we have a formal public meeting at this end of the remedial design stage, no. That's not normally part of the process. But if there is a demand for it, I don't see why we can't do that. I would be more than happy to come and meet with the public and discuss our plans.

As we did at the start of the Operable Unit 2 work, we came out and explained what was going on out at the site and what we were doing. We can set something up for when the design is complete. Once the design is at the stage where we feel we are ready to go out, to put it out for bid, we can get comment on it.

MR. SCHULTZ: Okay. Thank you.

MR. WHEELER: David Wheeler, Edison Wetlands.

First off, I guess if you could just walk me through the timetable for the cleanup process from this point on. Once the alternative is chosen, once you have all of the comments and make your final decision, what is the timetable at that point?

MR. OSOLIN: Timetable for this Operable Unit is a very relative term. Right now we are doing Operable Unit 2 work out on the Horseshoe Road complex site. That we are expecting to take about 30 months starting February.

Once that is completed, we hope to have a design in place to do the Atlantic Resources portion of the Operable Unit 2 work. I would expect that would be of a similar time frame, maybe 30 months also. With a similar -- they are using similar methods of removing the materials from the site.

MR. WHEELER: Is that overlapping?

MR. OSOLIN: No, they are not overlapping.

MR. WHEELER: Or you wait until the first one is done?

MR. OSOLIN: I believe -- the issue becomes getting material on and off the site. Right now we have trucks coming into the site to bring in backfill. And material that is being excavated is being taken off by rail. The problem being is, it's a very limited area and getting -- we have trucks coming down the Crossman Road down near Gerdau Steel to avoid the neighborhood. And we have about reached capacity there in how much we can get in and out in a day with the truck traffic that is already on that road.

So introducing the responsible, the cleanup at ARC, which is the responsible party side of the cleanup, at the same time would be difficult. We would certainly in their design entertain any ideas that they have. But the one thing that we would not discuss is bringing soil out through the neighborhood or bringing any material out. The method of removing material is by train, by rail spur. The method of -- right now we are using trucks to bring in backfill. If they could propose some other way of doing overlapping work, we would certainly consider that. But I don't anticipate that. I think it's going to have to be a step fashion. And then after their work is done, then the marsh can be addressed. We wouldn't want to start cleaning up down gradient without the up gradient source areas being removed.

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MR. WHEELER: So you don't recontaminate it?

MR. OSOLIN: Right. So to a certain extent, we have to stagger this. So we are looking at a time frame. We are setting up these operable units. And we are hoping to have them set, so when we are done with OU2 on the Atlantic Development -- I mean, Horseshoe Road site, we start OU2 remedy for Atlantic Resource. Once that's complete, we start the OU3 remedy. We want to have them all set, so we can do them and there is no lag time in between them. And that's our plan.

MR. WHEELER: And NL's portion, which it sounds like is five years away, obviously an estimate?

MR. OSOLIN: That's fair.

MR. WHEELER: Are you planning on having all of the wetlands restorations that you mentioned before, are you planning on having the decisions made on that prior to starting the actual cleanup work? I would imagine that would make sense.

MR. OSOLIN: That would be part of the design, yes.

MR. WHEELER: That would all come and be factored in at some point prior to that?

MR. OSOLIN: Yes. That should be all ready to go, plans ready to go. So when the Atlantic Resources OU2, when the Operable Unit 2 remedy is completed, then we would kick off the next stage.

MR. WHEELER: One last unrelated question, are there any viable responsible parties still among the RPs here? Is Atlantic Resources --

MR. OSOLIN: Atlantic Resources has a large group of responsible parties that sent waste out to Atlantic Resources. Also sent solvents out to Atlantic Resources.

We have not really found any viable responsible parties for the Horseshoe Road complex site. And that's being handled through EPA funds.

The cleanups that have taken place so far, that's another thing I should mention, the cleanup, the building demolition that was done, OU1 was done by a responsible party cleanup that was funded and taken care of with our oversight. This whole investigation for the marsh was done with responsible party money and oversight from the EPA. And so they are very much part of this process and they will be doing Operable Unit 2, they will be cleaning up the Operable Unit 2 portion of the site. Definitely the Atlantic Resources site. We hope to have them also do the Horseshoe Road drum portion. That would be included with cleanup for the Atlantic Resources site.

MR. WHEELER: When you say

"they," that's Atlantic Resources?

MR. OSOLIN: Responsible parties for the Atlantic Resources site.

MR. WHEELER: Thank you.

MR. OSOLIN: Okay.

MR. CHAPIN: Rich Chapin, Chapin Engineering, technical adviser to EWA, on this project.

If you could flip back to your map that shows the sediment trucks with your little finger, please. I may jump around. I am sorry.

MR. OSOLIN: That one?

MR. CHAPIN: Yes.

You discussed the little finger sticking up there as mercury?

MR. OSOLIN: Yes.

MR. CHAPIN: Mercury contaminated. Where in the Proposed Plan does it say that's going to be excavated in this proposal? I couldn't find it. If it's not addressed specifically as a spot, you need to add that in there. There is no place that it says this area of mercury will be --

MR. OSOLIN: I would have to look. I believe it is. It's certainly, I believe that's part of the maps. But --

MR. CHAPIN: It's not in the text. I can't find it.

MR. OSOLIN: Well taken. That will certainly be in the record decision.

MR. CHAPIN: Flip forward to the cross sectional views, please.

MR. OSOLIN: Which one? The marsh?

MR. CHAPIN: It doesn't matter. It's all the same. There is no horizontal scale on any of these maps. And none of these things show a cross section as to where you are going across any of what is contaminated in the plan. It's very difficult, if not impossible, to get an orientation as to where this is actually going to take place. I understand this is going to represent the whole thing. But typically there is a cross section drawn on the plan maps, so you can orient yourselves. I think you should have that in your proposal plan.

MR. OSOLIN: This is a planned view.

MR. CHAPIN: I understand. Flip back --

MR. OSOLIN: Let me explain. If you go back to -- I am sorry -- for the interest of this presentation, I didn't want to go into all the details. Because, obviously, that would take a lot longer. But if you go back to the map that you were just looking at with the contamination, you will find that these numbers, the 32 milligrams, 160 milligrams --

MR. CHAPIN: Right.

MR. OSOLIN: And the center,

are represented on that map. This -- okay, that map right there. If you look at the legend in here and this is also in the Proposed Plan, those areas are represented on the map there.

MR. CHAPIN: I suggest that you draw a straight line across your plan to show where that cross section comes from.

MR. OSOLIN: That's a conceptual model. It's not really a true cross section. It's a conceptual model.

MR. CHAPIN: And as currently planned, for a technical person looking at it, it doesn't make any sense. That's going to engender comments like I am making now, where a simple line would facilitate the understanding. I suggest the revision.

MR. OSOLIN: Okay.

MR. CHAPIN: The materials that you are going to backfill the river with -- first of all, backing up. The sediments that you are removing now, what is the nature and characteristics of the sediments? Are they organic muck mixed with sand? Are they sand? And what are you going to backfill with?

MR. OSOLIN: A like material. A material similar to what we are taking out.

MR. CHAPIN: If you are taking out sand, which is a highly erodable substance, are you going to put back sand that is highly erodable?

MR. NACE: What we have in the marsh is --

MR. CHAPIN: Not in the marsh. I am talking about the river now.

MR. OSOLIN: Oh, in the river?

MR. CHAPIN: In the river. You are going to take out in the river, you are going to make a box and fill the box back in with something. And you are saying that something is going to function as a cap basically keeping whatever is down there in place. Well, what you put back is just as erodable as what you are taking out, aren't you going to have a problem with it eroding away?

MR. OSOLIN: Well, two points. That's part of the remedial design. That's part of the engineering design.

The second point is if you are putting what is there already, I don't see why that would be more erodable than -- if this material is not eroding out as it stands now, why would similar material erode out any further?

MR. CHAPIN: If you put back the same cohesiveness that you --

MR. OSOLIN: Certainly that would have to be a design consideration when this material is put back. It's possible that we may for the purposes of this -- the idea is we want to -- we do not want to put in something that is impermeable to benthic organisms. We want the organisms that are there now to come back. And if you go out and put something there -- we could put a cement cap in that will never erode. And you will also never have any worms or organisms in the bottom. So we have to design a material there that will support the same organisms that were there before. And I would assume it would be something similar to what we already have there.

MR. CHAPIN: Will the method of marsh restoration be documented in the Record of Decision and will that be a specific part of the Record of Decision that you are going to restore the marshes this way?

MR. NACE: I am not sure I understand. If you are asking, are we going to do wetlands restoration and are we going to have a restoration plan, the answer is yes. If you are asking, are we going to put Spartina or phragmites or we are going to draw the line here, and this is where sediment is going to be, the answer is no. We will not have that specificity.

MR. CHAPIN: The Record of Decision will say these areas will be restored, you will define in the Record of Decision the areas to be restored, but you will not define the specific restoration method? Is that what you are saying?

MR. OSOLIN: I believe that's correct.

MR. CHAPIN: Thank you.

MR. OSOLIN: One other thing as part of the OU2, this marsh as it stands is going -- is considerably smaller than it will be at the end of this. The OU2 operation involved the removal of material from the Horseshoe Road dump. That material will be removed and that area which was backfilled wetlands area will be restored as wetlands. So the Horseshoe Road dump, the area that is now the Horseshoe Road dump as part of the Operable Unit 2, this raised area right over here once was wetlands before these sites backfilled over that area (indicating). As part of this restoration plan for OU2, that area will be removed and restored to wetlands. So there is probably about ten feet of material there that is going to be removed and now brought down to wetlands grade and restored as wetlands.

MR. CHAPIN: Tidal wetlands or upland wetlands?

MR. OSOLIN: I do not believe any of this is tidal. Correct me if I am wrong. But there is a berm over here and in cases of floods, we do get some influx into the marsh. But it is not tide. The tide isn't coming in to most of this area on a regular basis.

That's correct. It's fresh water.

MR. CHAPIN: Without a berm. Who put the berm in?

MR. OSOLIN: It's naturally created.

MR. CHAPIN: Natural berm?

MR. OSOLIN: Raised area, yes.

MR. CHAPIN: Fascinating.

The rest of this has to do with the discussion a little bit earlier about background. I understand that you looked at a whole lot of data and you decided what the background numbers were. But there is no place in the Proposed Plan where that -- those numbers documented the process of how you did it.

I am going to read you an example here. For arsenic in the near upper marsh, the upper foot of soil, this plan says after considering screening values used by the NJ EPA and reclamations of the other natural resource trustees -- and I would like to know who they are, but that's a side point. The EPA has identified 32 milligrams per kilogram as a remediation goal for the benthic zone in the upper foot of the marsh lands, referring to arsenic here.

Applying this remediation goal to the surface sediments addressed by the remedial action addresses most of the remedial action route to alternatives. And in particular, satisfies the Agency's desire to minimize the marsh as a continuing source through the Raritan.

Now, that 32 milligrams per kilogram is twice the number in table four that you identified as background, 14.7. So how is leaving twice what is background preventing it from being a continuing source? If I am reading your document --

MR. OSOLIN: Which table are you referring to?

MR. CHAPIN: Table four says

background arsenic is 14.7. You are only going down to 32. You are leaving twice what is background. How is it not a continuing source? The issue here is really where you got the background numbers for this whole document, as any cleanup depends on background.

MR. OSOLIN: We are talking two different areas. When you are talking the river --

MR. CHAPIN: I am talking about your document. I am not finished. We are talking about your document. I am reading only about marsh sediments. Not the river. So table four is sediments 14.7. Am I reading table four wrong?

MR. OSOLIN: Absolutely correct.

MR. CHAPIN: You are saying that the marsh sediments in cleanup is 32.

MR. OSOLIN: Does it say

anywhere in there that we used background for determining the marsh sediment?

MR. CHAPIN: No, it didn't.

MR. OSOLIN: We didn't.

MR. CHAPIN: You didn't. You are saying twice background is protective. That's the sum of the question. How is twice background protective?

MR. OSOLIN: Okay. The marsh -- the numbers for marsh sediments is based on state numbers. We have the ecological, the numbers that we came up in the risk assessment. The blackworm, the 32 is based on the blackworm number, which is one of the lowest numbers that we came out of the risk assessment with. We also compared that with the numbers -- the state's numbers, the -- what do they call them? The ERLs for the marsh?

The blackworm is the number

that we used. But the number was picked when we compared it with all of the risk data that we had for the other receptors that were in the risk assessment, the site specific risk assessment. And also numbers that the state has for looking at contamination in the river.

MR. CHAPIN: The LELs and the SELs?

MR. OSOLIN: The LELs and the SELs. I keep getting the numbers for the salt water and the fresh water, I get them mixed up. We used them in consideration.

The background numbers, I believe, are New Jersey background numbers and that's just listed there as a number.

MR. CHAPIN: 14.7 isn't a New Jersey background number. There are many arsenic background numbers in the state of New Jersey depending on where you are.

MR. OSOLIN: Okay. I don't know. I have to look to see where the specific background came from. I believe that it might be -- it's either background for the area or background -- a site specific background from neighboring properties.

However, the background came into a very large consideration when we looked at the river sediments. It's not really a driver for the marsh sediments.

MR. CHAPIN: My point I made earlier, I think it's very important. Background is talked about many times in your proposed plan. This number is greater than background. We're not going to clean up to a number that is less than background. And to understand those numbers, why the decisions you made were made, I think it's very important that a background summary, some sort of little attachment document, a page or two or whatever it takes, be in this Proposed Plan. So that someone who reads it can understand the situation of the river and background in the river and the surrounding grounds.

I understand that the Raritan is not a pristine river. I understand there are sediment numbers all over the river. And I understand someone picking up this doesn't understand the difference between what background is. There is also some confusion when I read the document, there are reference numbers which really refer to near site sediment sampling that should be made.

MR. OSOLIN: Right.

MR. CHAPIN: And then there are background numbers. And it's not clear that they are not the same. I figured that out, but it's not clear. So to make your document here clear as to why you are doing it, I think it should have something in there that discusses or presents what you think or what you decided was the background and how you decided that.

MR. OSOLIN: I understand your point. I take your point. I don't know that we are going to revise this document.

MR. NACE: Since you asked the question here, it's part of the public record, it's in the responsiveness summary. It will be answered in the responsiveness summary for the ROD.

MR. OSOLIN: There's an answer in the responsiveness summary for the ROD and we can address it in the ROD when we write the ROD.

MR. CHAPIN: That's fine.

MR. OSOLIN: I can't tell you that we are going to go out and revise the Proposed Plan.

MR. CHAPIN: I can also tell you an acceptable plan is not go to the administrative record and wade

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through all of these documents. That's something that I would do as a technical adviser. But for a document that is for the public, the public shouldn't have that burden.

So some sort of summary of what you did, how you decided this was background belongs in this document, in ROD, someplace.

MR. OSOLIN: Oh, it will. Definitely.

MR. CHAPIN: Thank you.

MR. OSOLIN: Do you have any other questions? Concerns?

MR. SZATKOWSKI: Hello. My name is Bruno Szatkowski. I am a life resident of Horseshoe Road.

And when you talk about from the very beginning, my question is, is Horseshoe Road -- is that a very large toxic waste site compared to some of the other toxic waste sites in the United States or that EPA has handled?

MR. OSOLIN: I think I

understand the question as, how does this site compare to sites elsewhere in the United States?

MR. SZATKOWSKI: Yes.

MR. OSOLIN: And New Jersey, I guess.

MR. SZATKOWSKI: Yes.

MR. OSOLIN: As far as New Jersey is concerned, it's not the biggest site in New Jersey. It's one of the biggest cleanups that we are doing in New Jersey. But if you compare it to sites out west, some of the creosote sites, some of the mine tailing sites that are just mega sites, this is small by comparison.

MR. SZATKOWSKI: As compared.

And you were talking about the Horseshoe site, that red line, at the end of the red line.

MR. OSOLIN: Right in here, yes (indicating).

MR. SZATKOWSKI: You mean that up there?

MR. OSOLIN: Not the red line. Let's see if I have a better -- I am not sure we have a better shot. Except -- actually, the map that we have shows the dot a little better. It may have little areas here. But the line of cleanup, which is this line of contamination here, approximates in that area, approximates the area of the dot pilings.

MR. SZATKOWSKI: So that last piece back there?

MR. OSOLIN: Right.

MR. SZATKOWSKI: I just wanted to know. And I tried to go on the computer, I am trying to know. But my question is, why is so much arsenic found here? The other people brought in the arsenic?

MR. OSOLIN: That's a good question. I think the metal, the arsenic certainly is associated with the metals reclamation facility.

It seems to be associated, if you look at the main channel here, the discharge that comes out of the Atlantic Development facility area and the Sayreville Pesticide area, there seems to be a large amount of arsenic that comes down there. As you can see by this kind of a plume map. It seems to be coming down from that area. So they must have had a source. I don't know whether it was part of the pigments. But that was one of the contaminants that were found coming out of that facility.

MR. SZATKOWSKI: I would like to say on public record, I just want to ask of my own curiosity, what was arsenic used for or what was it intended to be used for?

MR. OSOLIN: Betsy, maybe Betsy or Chuck, do you have any idea in the industries that were there what arsenic would have been part of?

There were so many -- the

things that we found in Horseshoe Road, looking back at the history, the companies that rented out that property and disposal practices that went on there, it's really hard to trace one specific thing. Offhand, I don't know. I know they did have some limited pesticide. There was some limited pesticide stuff that they did there. And it's possible that arsenic was introduced during that. I couldn't tell you. Offhand, I couldn't tell you the process that occurred there that put arsenic in the ground. It's there. I know that.

MR. SZATKOWSKI: Okay. Because now to me, I am laughing about it, because all of the time that I heard about arsenic, was like ten years ago when they thought that -- or when they thought that snapping turtles could get killed from arsenic. Something like that. I didn't know about arsenic --

MR. OSOLIN: The snapping turtle -- I am sorry.

MR. SZATKOWSKI: About ten years somebody proposed that the president of the United States --

MR. OSOLIN: Okay.

MR. SZATKOWSKI: -- was killed by arsenic.

MR. OSOLIN: Arsenic.

MR. SZATKOWSKI: I don't know.

MR. OSOLIN: I think there have been several assassinations using arsenic. I think that's a popular poison over history. It is obviously a poison.

MR. SZATKOWSKI: Yes. Thank you very much.

MR. OSOLIN: Thank you.

MR. SZATKOWSKI: Thank you.

MR. OSOLIN: Thank you for coming.

MS. SEPPI: Any other questions?

MS. HENRY: Hi. My name is

Betsy Henry. I am with Exponent.

John, I just had a question with the total cost of the remedy at about 34.4 million. Does this need to go in front of the remedy review board?

MR. OSOLIN: That is a very good question. I believe it's going to be broken up into two sites. So I don't know if the remedy review board would know that cost is broken up between the two sites. And I don't know whether it would be brought before the remedy review board. But that is a consideration. I don't know that I can answer that right now.

MR. SPIEGEL: Bob Spiegel, Edison Wetlands.

Actually, two questions. One was a follow-up to his question about the arsenic. It's unlikely that the main sources of arsenic would have come from the Atlantic Development site. Because they did the reclamation, I believe, at the Atlantic Resources Superfund site. And the channel itself, the one that comes from the Atlantic Development site were -- we sampled and I know the EPA sampled, that was in tens of thousands of ppb of arsenic.

The question remains, if they weren't handling large amounts of arsenical pesticides at the Atlantic Development portion of the site, where did that arsenic actually come from? It could not have come from -- the Atlantic Resources Superfund site drains out of a different stream. That drains out at a different area around the back of the site.

So where would that high concentration of arsenic, which had to have occurred over many years. It wasn't a one-time event, it wasn't one company that went in there and dumped a little bit of arsenic. You are talking about a significant concentration over a relatively long period of time.

MR. OSOLIN: I don't know that I could make that same assumption that it was over a long period of time. I don't see why it couldn't have been dumped in large quantity at one single time. But certainly it is a large quantity of arsenic there. What the exact source of it is, I cannot tell you.

There was midnight dumping done in the Sayreville pesticide area. There is also numerous operators that operated out of the Atlantic Development facility. There are three buildings there and over time those buildings were rented out to various operators who did many operations, the intricacies of which and the chemicals of which they used, I do not know. All I know is that we do find large -- high levels of arsenic out in the back of that facility. We do find it in the channel. And it certainly is not a background issue. It's coming from the site. We do know that. What the source of that is, I cannot tell you.

MR. SPIEGEL: You said there is no viable party as far as the PRPs for the Horseshoe Road site. Is that because one guy killed his partner and dumped the body in the Barnegat Bay where they were crabbing? Isn't that guy still around or did he die in jail?

MR. OSOLIN: He is still in jail. He is serving a life sentence. He is the only Atlantic Development facility, he certainly was one of the operators out there. He is still out there. I really don't think we are going to get anything from somebody who is in jail for life, spending his life in jail.

The property, the value of the property is minimal with the liens that are going to be on it. So the

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other entities, there were many entities that moved through there. There were a lot of fly-by-night operations. There were some larger corporations that had subsidiaries that were sold off and closed. We have looked into a lot of these leads, trying to find a lead to see who might be out there, who might be responsible that might still be able to pay for this. And certainly that investigation, RP investigation is not something that we would stop. If we found a lead, we would follow it. But at this point we have found nothing.

MR. SPIEGEL: So is the Atlantic Resources Superfund site, they are going to pay for Atlantic Resources, they are going to pay for the drum dump removal?

MR. OSOLIN: We currently have a consent decree that involves doing the remedial design, doing the feasibility study for a remedial investigation and doing the cleanup on -- Operable Unit 2 cleanup of the Atlantic Resources facility alone. It's still undecided and we do not have under consent order the Horseshoe Road dump portion done on it.

Now, we will either at the end of the investigation, at the end of all this work enter into a consent decree with the responsible parties to do that work. Or we will go and do that work publicly funded and seek to recover the money for that in the future from whatever parties are out there.

MR. SPIEGEL: Either they are going to do the work, they will step up to do the work or you will do the work and bill them. Would you use the treble damages thing, where you bill for triple the damages or triple the cost of the work?

MR. OSOLIN: I couldn't tell you that. I am not an attorney. I'm more on the technical end of it. So I really couldn't tell you the damage end of it. I know there is a treble damages claim, if the responsible party is not cooperative with EPA, does not do the work in a timely fashion, if ordered there may be treble damages.

But I don't really think that would be -- if we decided -- if they decided not to sign a consent decree, I am not sure that would be what we would be going after. I am not even sure that would apply. That would be something the attorneys would have to figure out.

MR. SPIEGEL: What makes that apply and what makes that not apply?

MR. OSOLIN: I am not an attorney. That's the reason I am afraid to answer that. I know that when you sign a consent order, you very often put treble damages in and I know there are treble damages in

Superfund law. How that is applied, I cannot tell you. So I couldn't tell you that would be applied here.

MR. SPIEGEL: I would suggest that if the threat was there that you were going to do the work in a building for three times the cost, they may be more amenable to stepping up and doing that work on the drum dump.

MR. OSOLIN: Well, up until now, the responsible parties have been very cooperative. They have stepped up to do the work. They have stepped up to do this investigation, which to a large part is not on their site. If you look at some of the areas over here, these are not areas associated with the Atlantic Resources sites. And they have stepped up to do that work. They have stepped up to do the building demolition. They have stepped up to do the OU2 cleanup of the Atlantic Resources area.

I think it's an issue of some of the responsible parties deciding whether they feel that they are libel for that dump area or not. And that's something that they have to decide and come to us.

But so far, they have been very cooperative and to say that you really need a hammer to get them to do work, I think is kind of unfair. Because they have been doing quite a bit of work and have been very cooperative with EPA in doing all of this cleanup work.

MR. SPIEGEL: But the drum dump portion is from them, it's from Atlantic Resources?

MR. OSOLIN: EPA believes and has strong evidence to indicate that the material that we are finding in the Horseshoe Road dump came from Atlantic Resources.

MR. SPIEGEL: So what you actually, you should have done was when they pressured you to delist that site and EPA backed down and took that off the Horseshoe Road site, you should have made the Horseshoe Road drum dump part of the Atlantic Resources Corporation's Superfund site, so that as part of their cleanup that would have just been done.

MR. OSOLIN: Also subject to attorneys.

MR. SPIEGEL: Well, subject to attorneys. I understand that.

MR. OSOLIN: That's something that -- a decision that was made that is not in my --

MR. SPIEGEL: I understand that.

MR. OSOLIN: It would have certainly been neater to deal with that as part of Atlantic Resources. It would have been easier to explain. But that's not the way it happened.

MR. SPIEGEL: Also, don't paint the RPs as doing this out of the kindness of their heart. It's clear why they did the sediment river study or worked on it. Because they were trying to prove that there was no impact from their site operation in the sediments in the Raritan River. And at the end of the day, they want to be named as a co-plaintiff, so to speak, in doing that cleanup. So I don't think they did it out of the kindness of their heart because they are good PRPs. They wanted to show it wasn't related to their operations.

MR. OSOLIN: I can't discount that they certainly had a motive to look at it more carefully. If the EPA had done it, we may have spent a little less effort in determining this belongs to them, this belonged to them, or what have you.

But at the end of the day the same investigation would have to have been done. The investigation was done. I think it was a good investigation. It was overseen by EPA. And certainly it doesn't have any -- it certainly isn't tainted by the fact that it was done by the responsible party. I think if you look at the record, it was a good investigation. And you know, I don't want to paint it either way. I mean, certainly there are certain incentives for the responsible parties to work with EPA, to get this work done and have a hand in it. Because they get to help make the decisions and help look at what is going on, suggest ideas. Certainly if they were not involved, they would have very little or no say in it or they can point out things. But ultimately the decision is made by EPA and the state.

MR. SPIEGEL: Now, where is the location of that mercury figure in relation to the Atlantic Resources Superfund site? Can you point it out?

MR. OSOLIN: In the river, you

are speaking?

MR. SPIEGEL: Yes.

MR. OSOLIN: It's right over here (indicating).

MR. SPIEGEL: Besides that, there really wasn't really much mercury in that general area, except for that little? Or that was just an area that was didn't have arsenic, but did have mercury?

MR. OSOLIN: Yes. That's the case. I mean, mercury, we did find mercury in the marsh down gradient. Down gradient from the sites. It was found in spotty areas around the marsh, we did find mercury. In most cases it was co-located with arsenic and in that particular case, it wasn't. And we didn't want to leave it, obviously.

MR. SPIEGEL: Is that related to the Atlantic Resources site?

MR. OSOLIN: I couldn't tell you. It certainly seems like it's over in that area. It could very well be associated with Atlantic Resources. But, you know, it's kind of hard to tell, unfortunately.

MR. SPIEGEL: Are they going to pay for the cleanup of the sediments in the Raritan?

MR. OSOLIN: At this point that's to be decided. I think there is a portion of the damage to the marsh that would be associated with Atlantic Resources. What portion that is, I couldn't tell you.

MR. SPIEGEL: Now, at what point would that be determined -- I mean, obviously, you would go to the Record of Decision next. That's going to lay out the final details.

And then at what point is EPA going to turn around and say, okay, Mr. PRP, we are assessing 25, 30 percent, whatever percentage of the cost of the cleanup to you and you work out whatever they are going to be putting up? At what point does that take place?

MR. OSOLIN: There are two points that could happen. One, if the responsible parties sign onto a consent decree with EPA, there would be some apportionment that would be agreed to by both parties. If that agreement couldn't take place and the EPA decided to do the work, that would probably be decided in court or some negotiation afterwards.

MR. SPIEGEL: The EPA would do the work either way and then just bill the RP for a percentage of that? Or would you give the RP the opportunity to do their portion of the cleanup, separate from the cleanup that you are doing?

MR. OSOLIN: It's hard to tell. I mean, at this point we haven't entered into negotiations to discuss all of this for the marsh. So, I mean, it's -- there's many ways it could play out.

MR. SPIEGEL: Wouldn't that be done before a Record of Decision would be issued?

MR. OSOLIN: No.

MR. SPIEGEL: Or you would say, we are going to do this portion of it, the RP is going to do that portion of it? Or is the EPA just going to do the entire thing and go after a percentage of the cost from the responsible parties for the Atlantic Resources site?

It's a pretty important thing to know because you might have to, at the end of the day, have to issue an ESD or change the Record of Decision based on what the RP would be willing to do. If they wanted to do the work themselves --

MR. OSOLIN: No. The remedy is laid out in the Record of Decision. The remedy is the remedy.

MR. SPIEGEL: Right.

MR. OSOLIN: At the end of the day that remedy is going to be done. Whether it's done through EPA funds and are recovered later in part or in full or whether it's going to be done by responsible party action, that remedy will be done. The scope of the remedy is not hinged on any negotiations that occur. The negotiations would involve how much the responsible parties would have to chip in for that cleanup at the end of the day.

So no. It absolutely does not have to be done before the Record of Decision. Once the Record of Decision is in place, the remedy is the remedy. And that will be what we put on.

MR. SPIEGEL: Then you would go into the design phase. And isn't it critical to know if the RP wants to be part of that cleanup as you are going into the remedial design phase? Don't have you to know that before you design the remedy? Or is it your contention again that EPA is doing the entire remedy and it's just a cost component that you are dealing with the responsible parties for the Atlantic Resources Corporation?

MR. OSOLIN: I would assume that the -- we are going to have discussions with the responsible parties shortly after the Record of Decision is in place. The Record of Decision is a milepost in deciding what the remedy is.

I wouldn't imagine if I were a responsible party that I would be willing to sign a document that said whatever EPA decides at the end of the day, I am going to put in place. I think that that would be -- would probably be foolish on their part to do that.

So once the decision is made and the responsible parties know what the cleanup is and can get an idea of what that cost is going to be, they can come to the table and discuss their involvement. And I expect that's what will happen.

MR. SPIEGEL: Last question: Did you ever figure out what is killing all of that vegetation and phragmites from the drainage from the Atlantic Resources Superfund site? Because every time we have ever asked EPA, you tell us it doesn't appear as those areas are heavily contaminated. But yet clearly you can see that drainage has killed and stressed the vegetation in there to the point where it looks like a moonscape.

And according to the data that you have shown us, you haven't been able to find any real high levels of contaminants there.

MR. OSOLIN: I agree. We have looked at the data. That question has been asked many times of the EPA. I asked Betsy, I have asked -- I have talked to Chuck about it, I have talked to many people. I have talked to our removals program. We talked to CDM. We have talked to a lot of people, why is there no vegetation growing there.

The only explanation that I have heard that may make some sense, although I am not sure I totally am comfortable with it, is that the amount of sedimentation, sediment coming down that stream is sort of overwhelming the phragmites and they are not growing in it. Or it is too sandy for it do grow in. Although phragmites seem to grow anywhere. So I am a little uncomfortable with that explanation.

But if you look at the data we have collected and we have collected a lot of data in that area, there doesn't seem to be any contaminant or anything that would indicate that this area is dying off for some contaminant reason. And I can't --

MR. SPIEGEL: Is there a possibility that there might be contaminants there that are specific to the site operations that you -- that fall outside of what you normally test for?

MR. OSOLIN: Well, is that a possibility? I guess. I can't rule that out.

MR. SPIEGEL: Did you look at the chemicals that that company had handled to see if there was any type of specialty chemicals, dyes, materials, acid, precious metals, or anything that you might not have in your normal parameter of analyticals? So that -- because it seems very suspicious that you are going to -- that this area is not going to be cleaned up and is still going to look like a moonscape when you are done at the end of the day.

Clearly, it's the runoff.

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It's all of the runoff that was channeled from the Atlantic Resources site, because there's an actual drainage channel on the whole entire site and goes right to that area where there is no vegetation.

MR. OSOLIN: I agree with you. Had that been the drainage coming out of the Atlantic Development facility, operations which were so numerous and I couldn't tell you every single operation that went through those plants. Some of them are cropped up and went on for months and then disappeared. I would say, okay, maybe there is some specialty chemical that we're not testing for there. But I would find it less likely --

MR. SPIEGEL: Even the phragmites are growing in that drainage. Even the one from the development which is a real witch's brew of the chemicals from the various site operations, even phragmites are growing there. Why aren't they growing at Atlantic Resources? So what went through there, what kind of chemical or process went through there that killed all of that vegetation?

MR. OSOLIN: You are assuming there is a chemical that killed them. That was my first assumption. I think your question -- I haven't finished really answering your question. Your question as to whether there is a specialty chemical, that is something that we thought of. Atlantic Resources was a metals reclamation operation. Metals reclamation operation is pretty straightforward. They are pretty -- we see them all over New Jersey. There are few ways they reclaim things. They are not creating specialty chemicals. They are using chemicals that are specific to metals reclamation and we test for those. We test for the various things.

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If somebody has a suggestion of what might have been used in those areas, I certainly wasn't out at the site when these operations were going on. If there is somebody who has some historical knowledge that might have a suggestion what might be causing that, we are open to suggestion.

But of all of the chemicals that we have tested for, and we tested hundreds of them, we have not come up with a chemical that is found there that would seem to indicate why those phragmites are not growing there. And it's one of those things which I just can't answer really at this point.

Suffice it to say that that area is going to be part of the remediation. And we will be taking out a lot of that material and putting in backfill. And hopefully, that will --

MR. SPIEGEL: You are going to address it in some form?

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MR. OSOLIN: Yes.

MR. SPIEGEL: Just on the chance there is something there that is not --

MR. OSOLIN: Well, there are other contaminants there that we are addressing, arsenic and that area is part of the area that will be addressed. That is within the area that we are addressing.

MR. SPIEGEL: Thank you, John.

MR. OSOLIN: Right?

MS. HENRY: Well, it's not on the red line you have drawn there.

MR. OSOLIN: No, no.

Just for clarification purposes, the red line and the blue line are not legal lines. They are not -- these lines were drawn in actually separate for both sites at a time when we were asked for aerial -- what do they call it? For GIS purposes. We had information that was put in Geographic Information System.

And they -- the question was asked of us, can you locate the site on the map and can you put a polygon around it approximating the site?

MR. SPIEGEL: Is that the site?

MR. OSOLIN: Split Rock Falls.

Affecting the site and the affected area of the site. Before we had the information from the remedial investigation in, before we had any data back, these polygons were drawn. So these are not -- these polygons are not lines that are scientifically based. They are approximations of what the site and the sites affected areas are.

MS. HENRY: John, I would just say that the delineation for remediation is chemical based.

MR. OSOLIN: Right.

MS. HENRY: So those are not triggering delineation, arsenic, mercury, PCBs, then technically they

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are not --

MR. OSOLIN: Can you go to the delineation, that one that we were looking at before with the chemical concentration?

There. It appears that those areas are within --

MS. HENRY: They might be.

MR. OSOLIN: Yes. I think that's right in here. Certainly on the edge. It's close.

MR. SPIEGEL: And the work that you are doing currently on the site, the OU2 work, I believe you said you received an initial $7 million to begin that work?

MR. OSOLIN: We have got more funding -- what was the last funding that we received for that?

15.2 million we received additionally.

MR. SPIEGEL: So you received the additional seven, that was used up. And now you got an additional 15 to continue for what, the fiscal year '09?

MR. OSOLIN: That should get us through, I think, February. Is it that far out? That should get us through February.

MR. SPIEGEL: That's 17 million?

MR. OSOLIN: Yes.

MR. SPIEGEL: That will get you four, five, six months? Four or five months?

MR. OSOLIN: I think our burn rate is pretty high right now. We are going through a lot of funding. We are putting out, we put in a new -- if you go out to the site now, we put in a railroad spur. That's completed. We finished the load out area. We are expecting to have a -- we have -- the load out area can accommodate ten railroad cars that are coming in. And we will be starting to load out material by rail, hopefully at the end of this week, maybe next week, something like that. God willing. We are hoping that --

MR. SPIEGEL: Are you going to get additional money for fiscal year '09? Do you feel confident that once you get done with burning through the 17 million in February --

MR. OSOLIN: Yes. I feel confident that this will be funded in full. I can't tell you that in 100 percent certainty. But usually once a site starts, it becomes a priority and the funding stream continues.

MR. SPIEGEL: How much money would you need in '09 besides the 17?

MR. OSOLIN: The whole job is about 45 million, I think.

MR. SPIEGEL: You said that was for 33 months of work, right?

MR. OSOLIN: 30 months. So we will need -- I think with the next payment is something like 17 also.

MR. SPIEGEL: Then you feel

confident then once this is done and you move to the marsh and river sediments, that that funding will be available?

MR. OSOLIN: Yes. I feel -- so far when we have needed the funding, we have gotten it.

MR. SPIEGEL: Besides the railroad car that you found underground buried when you first started digging, any other surprises at the site that you have found so far?

MR. OSOLIN: You are talking about the railroad car we found in Operable Unit 2 or Operable Unit 1?

MR. SPIEGEL: I didn't know you found one in 1.

MR. OSOLIN: We found a railroad car in building demolition in Operable Unit 1.

Now we found an additional railroad car in excavating Operable Unit 2.

MR. SPIEGEL: Is that a tanker car?

MR. CHAPIN: Half inch steel?

MR. OSOLIN: What was left of it. Yes. In the first case it was completely rusted out. It was actually used as an underground storage tank beneath the Atlantic Resources facility. They had piping going to it.

The second one seems to have been dumped off the railroad and buried in a ditch on the side of the railroad spur. It did not contain any chemicals or anything. It was just basically filled with ground water and just dumped there. So that's been put aside and will be cleaned. And the metal will be recycled.

MR. SPIEGEL: Any other surprises that you found besides this?

MR. OSOLIN: We found a motorcycle in the pond. We found a few drums here and there. We kind of

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expected it, that wasn't a surprise. We found -- offhand, I can't think of anything -- no big surprises. We still have the main excavation to do. So I am sure we are in for some more interesting discoveries.

MR. SPIEGEL: Last comment is, I would like you to consider that pond that you had to fill as open water, not as just wetlands when you go to do your restoration. Because that did serve a function as open waters. And I don't think that that should be considered as wetlands.

And I would like that reflected in the Record of Decision as well as a specific point.

MR. OSOLIN: That will be noted and a response will be made to that. I can't tell you how we will respond to that. But certainly that will be noted.

MR. SPIEGEL: Thank you.

MR. OSOLIN: Any other

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questions?

MR. CHAPIN: One last question. Could you run your finger along that map and show me where the ship channel used to be on that dock? Are the areas that you are talking about taken out, were they all inland of that ship channel?

MR. OSOLIN: Yes. The ship channel is on the outside, in the river of the dock. So that the old titanium, they are called the Titanic Titanium Reach, came along here. And then joined up with the main channel, which is mostly on the north side of the river.

MR. CHAPIN: So we have no reason to believe that these areas were historically dredged as part of the maintenance of that channel?

MR. OSOLIN: No. This doesn't look like -- this is in back of the dock, in areas that were dredged historically would be outward of that.

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MR. CHAPIN: Thank you.

MR. SZATKOWSKI: Just to clarify my -- just to clarify. What you were saying, are you saying that there is one area that there is no -- nothing growing on? Because you said -- I understand you said that the one particular spot there is nothing growing?

MR. OSOLIN: Yes.

MR. SZATKOWSKI: Can I talk to you a minute? Can you go back to that? Two more back, two back --

MR. NACE: This one (indicating)?

MR. SZATKOWSKI: Yes. That's good. Can you point where --

MR. OSOLIN: You see the white area in there? That area is the drainage channel coming out of Atlantic Resources. It receives a large portion of the drainage. All of Atlantic Resources drains through that channel. So there is a -- when it rains, there is quite a bit of material that comes down there and it drains out into the marsh over there. And for whatever reasons, the phragmites is not overgrowing that. It seems to be a pretty sandy, clean -- I wouldn't say sandy. But it doesn't --

MR. SZATKOWSKI: Do you think that could be like a natural area, maybe --

MR. OSOLIN: No. I appreciate it. That's one area I know. Betsy and I have spent many times on the phone discussing that. I have discussed that with our BTAG folks. I have had them on site visits, they looked out there. That's one of the areas of discussion that we have always had.

My understanding was that phragmites will grow almost anywhere. And this site for whatever reason, this little area does not seem to grow phragmites and there does not seem to be, based on all of the chemical work out there, there does not seem to be a chemical reason.

MR. SZATKOWSKI: May I go back to the geological map?

MR. OSOLIN: I don't think we have a geological map.

MR. SZATKOWSKI: Not that. The very first map you have.

That geological map. Yes. That geological map.

MR. OSOLIN: Okay.

MR. SZATKOWSKI: The reason I am saying that is that I know places in my neighborhood around here, where I put my houses up here, there were a lot of not white scanned area.

MR. OSOLIN: Right. Those are -- those would not be marsh areas. There are a lot of areas where the clay, clay pits were dug out in that neighborhood for the Sayre & Fisher Brick Operations. And some of that

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material has not overgrown since then. A lot of sandy soil. It takes a while for some of the stuff to take root. But that is somewhat different than what we are seeing in the marsh where you are looking at a marshy, very wet soil, which you might expect to see phragmites in.

MR. SZATKOWSKI: Very interesting. Thank you very much.

MR. OSOLIN: Thank you.

MS. SEPPI: Are there any other questions?

If not, just two things I would like to remind you. If you would like a copy of the Proposed Plan and you don't have one, you can get one. I have some up here.

If you have any additional comments that you think of after tonight's meeting, please write them down and send them to John. His address is in the Proposed Plan on page 28. They just need to be indicated by close of business August 20th.

Thank you very much. We really appreciate you coming and your attention.

MR. OSOLIN: Any comment that is sent in will be addressed in the response to the summary. So it will be addressed. It's not something that will just be sent in and ignored. You will see a response to it in the response to the summary.

Thank you very much. I appreciate you all coming.

(Time noted: 8:56 p.m.)

CERTIFICATE

STATE OF NEW YORK)
) ss.
COUNTY OF NEW YORK)

I, Leah Allbee, a Registered Professional Reporter and Notary Public of the State of New York, do hereby certify that the foregoing Public Meeting, taken at the time and place aforesaid, is a true and correct transcription of my shorthand notes.

I further certify that I am neither counsel for nor related to any party to said action, nor in any way interested in the result or outcome thereof.

IN WITNESS WHEREOF, I have hereunto set my hand this 3rd day of September, 2008.

Leah Allbee

Leah Allbee, RPR

Attachment D

The Written Comments

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August 19, 2008

Mr. John Osolin
Remedial Project Manager
U.S. Environmental Protection Agency, Region 2
290 Broadway, 19th Floor
New York, New York 10007-1866

Subject: Comments on the Proposed Plan for Horseshoe Road and Atlantic Resources Corporation Sites
Project No. BE02578.001

Dear John:

On behalf of the ARC OU-3 Cooperating Group (the Group), Exponent submits for consideration by the U.S. Environmental Protection Agency (EPA) the following comments on the Proposed Plan for the Operable Unit 3 marsh and river areas (OU-3) adjacent to the Horseshoe Road Superfund Complex and Atlantic Resources Corporation Sites. The Proposed Plan was issued by EPA following completion of the Horseshoe Rd/ARC OU-3 baseline ecological risk assessment (BERA) report and the feasibility study report that we submitted on behalf of the ARC OU-3 Cooperating Group. EPA ultimately approved these reports. During the course of completing the BERA and Feasibility Study, EPA, NJDEP and the Group engaged in a productive dialog but, as you are aware, did not reach agreement on all issues relating to development and/or use of the BERA or Feasibility Study. A number of the Group's concerns are reflected in prior communications and although we focus this comment letter on three primary areas of concern, this comment letter incorporates by reference all documents and communications between EPA and the Group, including but not limited to Exponent responses to EPA comments on two drafts of the Feasibility Study report dated August 8, 2007, and February 28, 2008, copies of which are attached.

As you are aware, the Proposed Plan proposes the selection of Alternative M7 (Full Excavation and Restoration) for the Marsh and Alternative R6 (Deep Dredge and Cover) for the River, to the exclusion of alternatives that would combine more targeted remediation in those areas. We have three major comments on the Proposed Plan as follows:

1. The Proposed Plan acknowledges that OU-3 contains no principal threat wastes[1] yet EPA's preferred alternatives rely heavily on removal, as though the sediments are highly toxic or mobile or pose significant risk, and cannot be reliably contained.
2. The total cost for EPA's preferred alternatives ($34.2 million) is out of proportion to any of the potential risks associated with OU-3.
3. EPA's preferred alternatives are significantly more expensive than other alternatives but are at best only marginally more protective, such that the additional costs are not justified.

First, the site contains no principal threat wastes yet EPA's preferred alternatives rely primarily on removal, as though the sediments are highly toxic or mobile or pose significant risk and cannot be reliably contained. The Proposed Plan correctly acknowledges that OU-3 marsh and river sediments (the subject of this Proposed Plan) are <u>not</u> considered to be principal threat wastes. In contrast, surface soils at the Horseshoe Road Complex and Atlantic Resources Sites under Operable Unit 2 have been identified and are being handled as such. The remedy for principal threat wastes at OU-2 relies primarily on removal of contaminated soil that has the potential to contaminate groundwater. EPA has selected the same remedy (i.e., removal) for a large volume of OU-3 sediments yet the majority of these sediments are not highly toxic or mobile, do not pose significant risk, and are or can be reliably contained. All marsh alternatives include excavation of the SPD/ADC drainage, the area with the highest contaminant concentrations, most significant risk to human health and the environment, and greatest potential to contaminate the marsh and river.

The National Contingency Plan (NCP) makes clear that "EPA expects to use engineering controls, such as containment, for waste that poses a relatively low long-term threat or where treatment is impracticable" (NCP Section 300.430(a)(1)(iii)(B)). This approach is also reflected in EPA guidance for remediating metals at soil sites (EPA 540-F-98-054) where containment is identified as the presumptive remedy for low-level threat wastes, and for remediating contaminated sediment (EPA-540-R-05-012) where monitored natural recovery and capping are both recognized as viable approaches that should be evaluated at every sediment site.

Given the standards in the NCP that govern remedy selection and the conditions at OU-3, the most appropriate approach is to remove the areas of highest contamination and potential risk (i.e., the SPD/ADC drainage) and contain other areas that present only a relatively low long-

[1] "Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur." (Page 6 of Proposed Plan)

term threat. All alternatives, with the exception of No Action, include excavation of the SPD/ADC drainage and associated areas with elevated contaminant concentrations.

Second, the total cost for EPA's preferred alternatives ($34.2 million) is out of proportion to any of the potential risks associated with the site. The total cost makes OU-3 one of the largest sediment remediation projects in New Jersey; however, the risks, particularly in the river, are relatively minor. With regard to human health, the 6-acre marsh is covered by *Phragmites*, virtually impenetrable by humans, and there are no conceivable plans for residential development.[2] The only area identified in the feasibility study as posing risk to human health is the SPD/ADC drainage, which will be excavated under all marsh alternatives with the exception of No Action. In the river, there are no unacceptable risks to human health with the exception of a small area at the mouth of the SPD/ADC drainage that is included for removal in all marsh alternatives, with the exception of No Action. Reliance on full scale removal and dredging, which dramatically increases total costs, is thus unwarranted.

The total cost of $34.2 million is also unwarranted given the limited threat to the ecosystem of the marsh and river. The BERA found that acute risks to aquatic and terrestrial invertebrates and adverse effects on individuals of avian and mammalian invertivore receptor species were limited to discrete areas (primarily associated with the SPD/ADC drainage) where contaminant concentrations are elevated, risks were calculated to be relatively low for mammalian herbivore receptors assumed to forage over the entire marsh, and risks were calculated to be negligible for avian carnivores with home ranges larger than the area of the marsh. Yet, the preferred marsh alternative involves excavating the entire marsh to various depths at a cost of $20.7 million based on this minimal risk to ecological receptors.

The BERA found that the river portion of the site presents no risks to fish or birds, minimal risk to benthic macroinvertebrates, and as stated by EPA in their June 25, 2007, comment letter on the draft Feasibility Study report, "...the site footprint...is probably too small to result in quantitative food-chain level effects..." and "...the incremental improvement that would result from taking action in the River would be difficult to quantify..." Yet, EPA's preferred river alternative is expected to cost $13.5 million and the area would be quickly recontaminated by sediment from the lower Raritan River.

In a similar situation at the NL Industries site just downstream of OU-3 on the Raritan River, NJDEP decided in 2004 on no action in the river, even though NL Industries had contributed to sediment contamination adjacent to the site, because recontamination would occur within a relatively short time. Given that recontamination was an important concern at NL Industries, it should also be one here, regardless of other distinctions between the sites.

[2] Thus, the only relevant human receptor, as explained in the feasibility study, is an adolescent trespasser (termed Area Residents Ages 12–17 in Table 2 and Adolescent Trespassers in Table 4 of the Proposed Plan). The adult and child residents included in Tables 2 and 4 of the Proposed Plan are irrelevant because the site is not and will not be a residential area.

Finally, it should be noted that the total cost of the OU-3 remedy is obscured in the Proposed Plan by the separation of marsh and river costs, and by EPA's 50-50 attribution of costs to the Horseshoe Road Complex and Atlantic Resources Corporation sites. EPA has stated that this cost attribution is necessary for administrative reasons. The Group has not been advised of the administrative rationale for EPA's cost splitting presented in the Proposed Plan. There is concern, however, that an unintended result of such cost splitting would lead EPA to ignore the obligation to seek review of this remedy by the National Remedy Review Board (NRRB). OU-3 is a single operable unit and the total cost of addressing that operable unit exceeds the $25 million threshold for review by the NRRB. Thus, the Group believes that review by the NRRB is mandated under the circumstances. At the recent public meeting, EPA stated that OU-3 is one of the largest sediment remediation projects in New Jersey. Thus, even if not mandated, review by the NRRB is warranted and the Group specifically requests such a review.

Regardless of administrative accounting, EPA's 50-50 attribution between the Horseshoe Road Complex and ARC Sites has no basis in fact or science. The Horseshoe Road Complex consists of three separate sites (the Horseshoe Road Drum Dump site or "HRDD", the Atlantic Development Corporation site or "ADC" and the Sayreville Pesticide Dump or "SPD"). Any "administrative" attribution must acknowledge the existence of all four sites (i.e., a 25-25-25-25 attribution). Fundamentally, however, the data provide clear and convincing factual and technical evidence that a much larger portion of the total costs is associated with the SPD/ADC sites, including the SPD/ADC drainage. This is significant because these sites along with the HRDD are "orphan" sites (i.e., no financially viable potentially responsible parties have been identified) whose cleanup must be paid for out of public funds.[3] The NCP offers guidance on situations such as this (note that the cleanup levels in this Proposed Plan are not technically applicable or relevant and appropriate requirements (ARARs); however, the line of reasoning is instructive):

> (C) An alternative that does not meet an ARAR under federal environmental or state environmental or facility siting laws may be selected under the following circumstances: ... (*6*) For Fund-financed response actions only, an alternative that attains the ARAR will not provide a balance between the need for protection of human health and the environment at the site and the availability of Fund monies to respond to other sites that may present a threat to human health and the environment ((NCP Section 300.430(f)(1)(ii)(C)(6)).

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[3] It is the Group's position that although the ARC Site and the HRDD component of the Horseshoe Road Site have been consolidated for certain purposes under OU-2, and EPA has suggested that ARC's principal, Jack Kaplan, made use of the HRDD site, the Group denies any nexus between HRDD and the ARC Customers. In other words, even if there are data to link ARC to HRDD, those data do not link HRDD to the ARC Cooperating Parties Group, whose nexus to the ARC Site, individually and collectively, is believed to be divisible. In any event, it is not legally sufficient, as against the members of the Cooperating Party Group (as distinguished from the ARC owner and operator) to consolidate HRDD and ARC as one site. Indeed, even assuming that the ARC owner and operator did make some use of HRDD, HRDD too qualifies as an orphan site on that basis.

The guidance here is that scarce public funds should not be expended to address low level risks (such as in OU-3) when there are other, higher-risk sites in need of those funds.

Third, EPA's preferred alternatives are significantly more expensive than other alternatives but are at best only marginally more protective, such that additional costs are not justified. Regarding risks, each of the marsh and river alternatives with the exception of No Action addresses unacceptable risks to human health.[4] Each of the marsh and river alternatives, with the exception of No Action, addresses acute risks to benthic and terrestrial invertebrates. Each of the marsh alternatives, with the exception of No Action and Alternative M3, addresses chronic risks to terrestrial invertebrates and risks to birds and mammals. In addition, each of the marsh alternatives, with the exception of No Action, addresses the primary area with elevated contaminant concentrations that is mostly likely to release contamination to the marsh and river (i.e., the SPD/ADC drainage). The SPD/ADC drainage was identified in the Proposed Plan as "clearly the most highly contaminated portion of the marsh (page 6)." Remediation of the SPD/ADC drainage in combination with the substantial work completed for OU-1 and in process for OU-2 (to address principal threat wastes) will reduce the potential for the upland sites and the SPD/ADC drainage to contaminate the OU-3 marsh and river.

Marsh Alternatives M6 and M7 provide an example of a significant increase in cost for a marginal increase in protectiveness. The cost difference between Alternatives M6 and M7 is $2.1 million (note that the cost of Alternative M7 is characterized by EPA on page 28 of the Proposed Plan as "only slightly higher" than M6). The substantive difference between the two is that Alternative M7 removes an additional foot of sediment (to 1.5 feet below the water table, in fact) to the burrowing animal/transport arsenic value of 160 mg/kg and removes an extra 1.2 acres of marsh to one foot to prevent chronic effects (i.e., the potential for biomass reduction) in the blackworm (and other aquatic macroinvertebrates), which, as stated in our August 8, 2007, Response to Comments (see attached), are highly unlikely to be resident in this area. The deeper removal in the marsh is excessive given the long-term stability of this marsh and the lack of burrowing below the water table. The Proposed Plan states on page 19 that Alternative M7 provides the greatest reduction in contaminant mass; however, the reduction in risk is incalculable. In all alternatives, contamination will be removed to appropriate risk-based levels. Considering the cost of EPA's preferred alternative, and the low potential for remedy failure, application of a thin layer cover as proposed in Alternatives M2 and M4–M6, even though it would result in a slight increase in marsh elevation, should be more carefully considered.

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[4] The HHRA for OU-3 calculated risks for trespassers separately for the marsh and river portions of OU-3. Using this approach, cancer risk estimates do not exceed 1×10^{-4}, the noncancer hazard index exceeds 1, and the only remediation goal established in the HHRA and used in the feasibility study was 2,000 mg/kg. Combining the marsh and river portions of the site, as was done in the Proposed Plan, increases the cancer risk estimates for trespassers to slightly above 1×10^{-4}. All alternatives except No Action and Alternative M3 address even the lowest arsenic remediation goal for protection of trespassers.

In the river, the cost difference between Alternatives R5 and R6 is $2.6 million. The only substantive difference between the two is that Alternative R5 relies on natural deposition (estimated in the Proposed Plan to be at least 30 months) rather than backfill to fill in the dredged area. Furthermore, Alternative R4, which costs $5.3 million less than R5 and $7.9 million less than Alternative R6, achieves the same effect (i.e., protectiveness in the biological zone) but faster than Alternatives R5 and R6. Alternative R4 would result in uncontaminated sediment to a depth of 1 ft (twice as deep as the 6-in. biological zone). Concern over the potential for disturbance of the foot of clean sediment used for backfill is ameliorated by the fact that this area of the river is not susceptible to disturbance, as evidenced by the accumulation of sediment in this area over time. Considering the cost of EPA's preferred alternative, the feasibility/utility of establishing a restricted navigation area should be more carefully considered.

In conclusion, the remediation should focus on removal for areas with the highest concentrations of contaminants that pose the greatest risk to human health and ecological receptors and that are potentially available for transport to the river and the Raritan River Estuary. With the exception of No Action, all alternatives will

- Eliminate human health risk
- Remove the primary source of ongoing contamination to the marsh and river
- Protect ecological resources by
    - Eliminating acute and chronic risks to aquatic and terrestrial invertebrates
    - Mitigating chronic risks to wildlife
    - Avoiding large-scale disruption of a functioning ecosystem.

Ultimately, EPA has to resolve how to address uncertainty in the remedy selection process (e.g., the risk of remedy failure). Given the high cost of EPA's preferred alternatives and the likelihood that a majority of the costs will be paid from public monies that could be spent on sites with obvious threats to human health and the environment, significantly greater attention should be paid to reducing the uncertainty of overly conservative assumptions used in selection of the remedy.

Finally, please note that the Group rejects the cost attribution presented in the Proposed Plan even though EPA has stated that the cost attribution is for "administrative purposes" only. The Group fully reserves all rights regarding this issue and nothing herein should be deemed an admission or waiver of any kind.

Sincerely,

Betsy Henry

Betsy Henry, Ph.D.
Senior Managing Scientist

Enclosures

cc: ARC OU-3 Cooperating Group

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August 7, 2007

Mr. John Prince
Central New Jersey Remediation Section
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Subject: Comments on the June 11, 2007, Letter on Remedial Action Objectives and Remedial Goals for the Horseshoe Rd/ARC OU-3 Sites
Project No. BE02578.001

Dear John:

We have reviewed your letter dated June 11, 2007, and received June 14, 2007, on the subject of *Identification of Remedial Action Objectives and Remedial Goals for Operable Unit 3 Combined Feasibility Study, Horseshoe Road and Atlantic Resources Corporation Sites, Sayreville, New Jersey* (the RAO letter). The remedial goals and other remedial considerations discussed in the RAO letter will be addressed by some of the remedial alternatives presented in the feasibility study. As the purpose of the feasibility study is to present a range of alternatives that appropriately addresses the remedial action objectives (RAOs) and to meet preliminary remediation goals (PRGs), additional alternatives that address the RAOs and PRGs, and that are consistent with U.S. Environmental Protection Agency (EPA) guidance, will be presented in the feasibility study. In this letter, we provide comments on the key issues raised in your letter, as well as the approach that will be taken in the feasibility study to address these issues.

General Comments

In the RAO letter, there is considerable emphasis on taking action at the site because of its potential contribution to degradation of the Raritan River Estuary. For example, the letter states that the "overall contribution of the sites to the lower Raritan ecosystem cannot be ignored." While conceptually, one could argue the relative impact of multiple low level sources of contaminants to the estuary, the lack of significant risks even in the site footprint in the river indicates that this site has no measurable adverse impact on the lower Raritan ecosystem. This lack of measurable impact is acknowledged in the RAO letter where EPA says "...the site footprint...is probably too small to result in quantitative food-chain level effects..." and "...the incremental improvement that would result from taking action in the River would be difficult to quantify..." While there is reason for active remediation at the site (e.g., to eliminate risk to human health, to remove ongoing sources of contamination to the marsh and river), there is no evidence of degradation of the lower Raritan River ecosystem because of the site.

A second general comment is that most of the remediation goals presented in the RAO letter do not make full use of the site-specific risk assessment and thus are inconsistent with established guidance on contaminated sediments. For example, EPA provides guidance on the use of a risk-based framework remedy evaluation at contaminated sediment sites in a February 12, 2002 memorandum regarding *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites* (OSWER Directive 9285.6-08) (U.S. EPA 2002). In this memorandum, EPA acknowledges that risk assessment should play a critical role in evaluating options for sediment remediation, and recommends a flexible risk-based approach to selecting response actions appropriate for the site. In addition, the memorandum recommends that site managers consider the benefits of a phased remedial approach at complex sediment sites. The memorandum also discusses the selection of site-specific and sediment-specific risk management approaches that will achieve risk-based goals, and ensure that sediment cleanup levels are clearly tied to risk management goals. These risk management principles are also presented in Section 1.3 of EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (U.S. EPA 2005).

EPA provides final guidance on ecological risk assessment and risk management principles for Superfund sites in OSWER Directive 9285.7-28 (U.S. EPA 2004). In the background section, EPA indicates protective exposure levels (i.e., remediation goals) are best established on a site-specific basis because of the large variations in the kinds and numbers of receptor species present at sites, the differences in their susceptibility to contaminants, their recuperative potential following exposure, and the tremendous variation in environmental bioavailability of many contaminants in different media. This Directive also indicates the following:

- Superfund remedial actions generally should not be designed to protect organisms on an individual basis, but to protect local populations and communities of biota
- A lines-of-evidence approach can be used to estimate levels that are expected to protect local populations and communities by extrapolating from effects on individuals or groups of individuals
- Site-specific data should be collected and used to determine whether or not site releases present unacceptable risks and to develop quantitative cleanup levels that are protective
- Site ecological risks should be assessed and characterized in terms of magnitude, severity, distribution, and the potential for recovery of affected receptors

- Superfund's goal is to eliminate unacceptable risks resulting from any release. Contamination that significantly reduces diversity, increases mortality, or diminishes reproductive capacity should be remediated to acceptable levels
- When evaluating remedial alternatives, the National Contingency Plan identifies the importance of considering both the short-term and long-term effects of the various alternatives. Even though an ecological risk assessment may indicate that adverse ecological effects have occurred, it may not be in the best interest of the overall environment to actively remediate the site.

As presented in the approved baseline ecological risk assessment (BERA; Exponent 2006), site-specific data indicate an absence of acute toxicity to invertebrates at the majority of tested sampling locations and, as a result, an absence of unacceptable effects to the populations/communities associated with this trophic level. The site-specific BERA also presents results indicating an absence of unacceptable risk to higher trophic levels (i.e., fish and birds) in the river. Based on this information and the regulatory guidance presented above, a balance is warranted between reduction of limited adverse effects to local biota and short-term/long-term ecological impacts associated with implementation of potential remedial actions. These factors are considered below and will be evaluated in the feasibility study as part of the remedial alternatives analysis.

Feasibility Study Approach—Impact on Estuary and Consistency with EPA Guidance

The feasibility study will mention the negligible impact of the site on the Raritan River Estuary, consistent with the RAO Letter and the results of the BERA. Nevertheless, the RAO related to impacts to the estuary will be included, as recommended in the RAO letter.

Regarding EPA guidance, the feasibility study will be consistent with guidance, including the protection of biological communities, the use of site-specific risk assessment, and an evaluation of short-term and long-term effects of the various alternatives.

Remedial Action Objectives

The marsh RAOs detailed in the RAO letter include 1) reduction of human risks from exposure to contaminants in surface and subsurface sediments, 2) reduction of risks to environmental receptors from exposure to contaminated sediments, and 3) minimization of migration of contaminated sediments to the river. Because humans are not exposed to subsurface sediments in the marsh, we presume that remedies to address this first objective could include maintenance of some sort of cover (e.g., surface sediment) that prevents exposure to subsurface sediment. Regarding the third marsh RAO, remediation of the SPD/ADC drainage, the single largest ongoing source of contaminants to the river, will be included in several remedial alternatives specifically to address this issue.

The river RAOs include reduction in exposure to sediments in front of the site that 1) result in risks to human health, 2) contribute to the degradation of the Raritan River Estuary, and 3) result in risks to ecological receptors, including benthic aquatic organisms, shellfish, fish, birds, and mammals. With the exception of localized risk to human health, this RAO is arguably already achieved under current conditions. The human health PRG of 2,000 mg/kg arsenic is only exceeded in sediment at the mouth of the SPD/ADC drainage and this area would be addressed by remedies for the SPD/ADC drainage. Second, there is no evidence that the site currently contributes to the degradation of the estuary. Elevated contaminant concentrations are localized to the mouth of the SPD/ADC drainage. Arsenic concentrations drop by over an order of magnitude within 200 ft of the mouth of the drainage and mercury concentrations in the river adjacent to the site are similar to regional and site-specific background concentrations. Furthermore, the RAO letter confirms that it would be difficult to quantify incremental improvements from taking action in the River. One could also presume that it is difficult to quantify detriment to the estuary resulting from current conditions at the site.

Third, the BERA (Exponent 2006) concluded that river sediments adjacent to (i.e., in front of) the site posed no significant risks to fish and birds. For aquatic benthic organisms, the screening level ecological risk assessment (SLERA) addendum (CDM 2002) reported significant adverse effects at only one of the four stations tested. Mammals and shellfish were not previously identified as relevant receptors for the BERA, risk to these organisms is unlikely, and it is rather late in the process to be considering them into an RAO.

Feasibility Study Approach—Remedial Action Objectives

The feasibility study will use the RAOs presented by EPA in the RAO letter.

Remediation Goals

Sediments—Marsh

For arsenic in the marsh, EPA has defined two remediation goals: 32 mg/kg for the top foot and 160 mg/kg for the top 30 in. The 32 mg/kg value is the lowest site-specific risk-based value and was developed in the BERA as protective of chronic effects in the blackworm. The basis for the 160 mg/kg arsenic value is not provided in the RAO letter. As shown in the table below, these values are considerably lower than those developed for human health, chronic effects in the earthworm, acute effects in the blackworm and earthworm, the muskrat, and the marsh wren.

Site-Specific Receptor	Arsenic (mg/kg)	Mercury (mg/kg)
Human health	2,000	NA
Blackworm (biomass reduction)	32	3.6
Earthworm (biomass reduction)	1,050	15.5
Blackworm (survival)	17,800	68
Earthworm (survival)	17,800	68
Muskrat	183	24
Marsh wren	1,470	8.86

Note: Values for the muskrat and marsh wren were recalculated during revision of the April 17, 2007, ecological PRGs memo. The revised memo will be included as an appendix to the feasibility study report.

The 32 mg/kg value for arsenic is protective of a single effect in one species of benthic organism and does not reflect the absence of effects in other benthic species and higher trophic level organisms at these concentrations. Under the regulatory guidance presented above, remedial actions should be protective of local populations and communities of biota, not individual organisms.

Another important consideration in the use of blackworm toxicity test results for identifying remediation goals in marsh sediments is the aquatic habitat requirements of the blackworm (or other aquatic oligochaetes). Blackworms are typically found in muddy sediments, especially in shallow water along the edges of marshes and ponds. They feed on submerged leaves and decaying matter and breathe through their skin (i.e., respire dissolved oxygen from the water) (Drewes 2004). Based on the aquatic nature of this organism, it is expected to be found only in areas of the marsh where water and saturated sediments are present. The only area of the marsh with water present on a perennial basis is the SPD/ADC drainage. The blackworm is not expected to inhabit the vast majority of the marsh, where inundation is infrequent and standing water is typically absent. These higher elevation areas of the marsh are considered terrestrial environments, in terms of invertebrate habitat, and would favor terrestrial invertebrates such as the earthworm. As a result, the earthworm toxicity test results are more representative of potential effects in soil/sediments located in the higher elevation areas on the marsh. This natural history information will be considered in establishing remediation goals for the marsh area as described below.

In terms of depth of application, invertebrates are generally most active in surface sediment. Core samples to a depth of 4 cm (approximately 2 in.) are typically used to evaluate marsh invertebrate communities because most infaunal organisms are contained in the upper few centimeters of marsh sediments (Wieser and Kanwisher 1961; Coull and Bell 1979; Angradi et al. 2001). NJDEP's *Guidance for Sediment Quality Evaluations* indicates that sediment samples must be collected from the 0- to 6-in. interval because this is generally considered the biotic zone in sediments (NJDEP 1998). Thus, addressing the top foot of sediment is considered more than protective.

The EPA focus on deeper sediment is to address exposure for burrowing animals and the potential for deeper sediment to be brought to the surface as a result of burrowing. It should be noted that the marsh itself has a high water table, which will preclude burrowing. According to Natural Resources Conservation Service mapping (http://websoilsurvey.nrcs.usda.gov/app/), the depth to water table in the marsh is approximately 0 to 25 cm (i.e., within 1 ft of the sediment surface). This is consistent with site-specific groundwater elevation data, which indicate a depth to groundwater of approximately 2 ft in an upgradient area adjacent to the marsh. Furthermore, potential contaminant exposure to mammals is primarily through ingestion of food items such as invertebrates and plant roots. As discussed above, invertebrates are primarily active in the top 6 in. of sediment so contaminant exposure in this zone is most relevant.

For arsenic, EPA also assumes that removal is required within 50 ft of the stream channel (i.e., the SPD/ADC drainage) to a depth of 42 in. to accommodate potential burrowing, Raritan River flooding and scouring, and channel meandering. Other than being the maximum depth sampled during the remedial investigation, there is no technical basis for a depth of 42 in. Likewise, no technical basis is presented for a 100-ft wide removal in the stream channel.

For mercury in the marsh, EPA has selected a remediation goal of 2 mg/kg. This value is lower than site-specific values developed to address toxicity to aquatic and terrestrial invertebrates as well as bioaccumulation. The 2 mg/kg value (the severe effects level of Persaud et al. [1993] and NJDEP [1998]) and other values cited by EPA (the effects range-low and the effects range-median) are screening values based on sediment toxicity tests in a wide variety of sites, many of which are dissimilar to this site. Exceedance of screening values does not mean that risk exists at the site. Rather, exceedances identify the need for additional investigation such as the supplemental field investigation conducted in 2004, on which the BERA is based. Data from the supplemental field investigation were used to develop site-specific, risk-based goals as described in the April 17, 2007, memorandum on ecological PRGs prepared by Exponent, and revised for the feasibility study.

Feasibility Study Approach–Marsh Sediment PRGs

The marsh sediment PRGs in the feasibility study will include those described by EPA as well as others developed from the BERA, as tabulated above. The primary arsenic PRGs addressed by the remedial alternatives will be 2,000 mg/kg arsenic (the human health PRG) for sediment to which humans may be exposed, 183 mg/kg arsenic (the muskrat PRG) for sediment to which muskrat may be exposed via ingestion of plants, and 32 mg/kg arsenic (the blackworm chronic PRG) for sediment to which blackworms may be exposed (i.e., saturated sediment with overlying water as in the SPD/ADC drainage). For mercury, the primary PRG addressed by the alternatives will be 8.86 mg/kg mercury (the marsh wren PRG range) for sediment to which marsh wrens may be exposed via ingestion of invertebrates, and 3.6 mg/kg mercury for sediment to which blackworms may be exposed (i.e., the SPD/ADC drainage).

Regarding depth of application of the PRGs in the marsh, exposure of receptors to subsurface sediment is limited by the high water table in the marsh. While one alternative will use EPA's depths as presented in the RAO letter, other remedial alternatives will focus on the top 1 ft of sediment, with the exception of the drainage channels where sediment will be removed to 24 in. Rather then excavate a 100-ft wide swath around the SPD/ADC drainage, these alternatives will construct the excavated drainage as an engineered channel to prevent erosion and meandering of the drainage. This approach will address EPA's concerns regarding the potential for flooding, scouring, and channel migration.

This remedial approach for marsh sediments is consistent with regulatory guidance, which recommends the selection of site-specific and sediment-specific risk management approaches that will achieve risk-based goals and be protective of local populations and communities of biota on a site-specific basis. Removal of sediment exceeding 2,000 mg/kg arsenic that is accessible to humans and subject to transport to the rest of the marsh and river would remove an ongoing source of contamination to the marsh and river.

Sediments—River

In the RAO letter, EPA identified remediation goals of 100 mg/kg arsenic and 2 mg/kg mercury in river sediment based on local river reference conditions (arsenic) and the severe effects level (mercury) of NJDEP (1998) and Persaud et al. (1993). These remediation goals are assumed to address PCBs as well. It should again be noted that the BERA concluded that there were **no food-chain level** effects in the river. The SLERA addendum found sediment toxicity at only one of the four stations tested. Despite the available risk-based, site-specific information, EPA has chosen reference conditions and a screening value as remediation goals.

The fact that near-shore sediments exceed the NJDEP screening values is cause neither for remediation nor for adoption of screening levels as remediation goals. According to NJDEP guidance, "An exceedence indicates a **potential** risk (adverse impact) to the benthic community and need for further investigations, which would reduce uncertainty and better characterize risk and natural resource injury." In the case of Horseshoe Rd/ARC Operable Unit 3 (OU-3), these further investigations were conducted (i.e., the SLERA addendum field work) and the SLERA addendum (CDM 2002) identified sediment toxicity at one station tested.

Regarding bioaccumulation, the NJDEP guidance states "The ER-L and LEL screens were developed based on benthic community studies and do not directly address **biomagnification (food chain toxicity)** to water column species (fishes), birds, and mammals. However, values found to be protective of the food chain are generally similar (within an order of magnitude) to ER-L/LEL values. When **PCBs, organochlorine pesticides and mercury (Hg)** are found in sediments at or above these screens, potential wildlife risks exist and case-by-case evaluation is warranted." Again, although the screening values were exceeded, the BERA provided a site-specific risk assessment that demonstrated no significant risks to fish and birds under current conditions. Therefore, there is no need to establish a remediation goal that addresses bioaccumulation.

This absence of mercury bioaccumulation effects is supported by the similarity of average mercury concentrations adjacent to the site and average concentrations at the reference locations and for Raritan River background conditions. The average mercury concentration for the 23 surficial river sediment samples collected adjacent to the site is approximately 1.6 mg/kg. This concentration is statistically similar to the average concentration for the five site-specific reference locations (i.e., 1.3 mg/kg). The standard deviations associated with these data sets are 1.03 and 1.52, respectively. In addition, the average mercury concentration of 1.6 mg/kg for river sediment adjacent to the site is comparable to the average background sediment concentration of 1.4 mg/kg obtained by EPA from the U.S. Army Corps of Engineers for the Raritan River. In other words, average concentrations of mercury in the river sediment adjacent to the site are similar to background concentrations in the river.

As a result, for mercury, incremental ecological risks greater than background are absent from surficial sediments in the river adjacent to the site. The comparison of average concentrations is critical because bioaccumulation is based on exposure to a wider area than single sediment locations, and ecological receptors, in effect, integrate exposure over this wider area.

Feasibility Study Approach—River Sediment PRGs

While the feasibility study will include an alternative that uses the remedial goals presented by EPA, the study will focus on site-specific, risk-based PRGs, particularly the 194 mg/kg arsenic and 2.6 mg/kg mercury developed by CDM based on the results of sediment toxicity testing (Osolin 2007, pers. comm.). The BERA found no significant risk based on bioaccumulation into fish or birds, thus no bioaccumulation-based sediment PRG is required. Furthermore, average concentrations of mercury in the river sediment adjacent to the site are similar to background concentrations in the river and thus incremental ecological risks greater than background are absent from surficial sediments in the river adjacent to the site.

River sediment near the mouth of the SPD/ADC drainage exceeds the site-specific PRG of 194 mg/kg for arsenic. Remediation in this area (e.g., monitored natural recovery, capping, dredging) would address the highest concentrations of arsenic (and mercury coincidentally) in river sediments adjacent to the site.

Again, this remedial approach for river sediments is consistent with regulatory guidance, which recommends the selection of site-specific and sediment-specific risk management approaches that will achieve risk-based goals and be protective of local populations and communities of biota on a site-specific basis. The combination of remedial action for sediments in the ditches within the marsh area and in the river at the mouth of the SPD/ADC drainage would address the remaining potential site-related source of contaminants to the river and would remove a significant mass of contaminants from the site.

Other Remedial Considerations

Natural Recovery

The discussion of natural recovery in the RAO letter ignores the fact that the SPD/ADC drainage is an ongoing source of contaminants to the marsh and river so the current observations of natural recovery rates are not representative of what one would expect following source removal. According to U.S. EPA (2005), natural recovery is one of three sediment remedial alternatives (capping and dredging being the other two) to be considered at contaminated sediment sites. While specific rates of recovery have not been estimated for the site, the current data show evidence of natural recovery (i.e., burial with less contaminated sediment) at some site locations. Additional data collection could provide the information necessary to predict rates of natural recovery and will be recommended in the feasibility study report. Collection of additional data and refinement of the selected remedy is consistent with the U.S. EPA (2005) recommendation to consider phased or adaptive management approaches.

Feasibility Study Approach—Natural Recovery

The feasibility study will include source removal and monitored natural recovery as a remedial alternative for all or for portions of the marsh and river sediment. Source removal (primarily the SPD/ADC drainage) is a critical component of several of the remedial alternatives to be presented in the feasibility study. This action will address the most contaminated portions of the marsh (i.e., the areas with greatest risk) and will minimize the migration of contaminated sediments to the Raritan River through surface water runoff and flooding, which is one of the marsh RAOs. Furthermore, source removal will then allow mechanisms of natural recovery (e.g., burial with cleaner sediment) to proceed. Existing data indicate that this process is already occurring in the marsh and river, and it is likely that the process will continue at a greater pace following source removal. The feasibility study will recommend additional data collection to better predict natural recovery rates in marsh and river sediment. Finally, when natural recovery is proposed as a component of a remedial alternative, it will always be backed up by monitoring and by contingency actions, if monitoring indicates that recovery is not proceeding as anticipated.

Active Sediment Remediation Area—Raritan River

In the RAO letter, EPA defined an active sediment remediation area (i.e., an area bounded by sample locations RSD04, RSD14, and the shoreline, as well as sample location 8) based on remediation goals of 100 mg/kg arsenic and 2 mg/kg mercury. As discussed previously, these goals are not risk-based (in the case of arsenic) or site-specific (in the case of mercury). Regarding depth of active sediment remediation, the ARC OU-3 Cooperating Group (the Group) agrees that the depth of sediment remediation in the river is technology-dependent.

Feasibility Study Approach—Active Sediment Remediation Area in River

The feasibility study will include an alternative based on EPA's definition of the active sediment remediation area in the river. However, the report will also include alternatives that define the area slated for active remediation using site-specific, risk-based PRGs as described earlier. Technically feasible approaches to capping and dredging will also be presented. In particular, an analysis of scour velocity will prescribe the depth required for active remediation and the types of capping material.

Feasibility Study Cost Estimates

EPA's suggestion that feasibility study cost estimates be broken down on a 50 percent basis between the ARC and Horseshoe Road sites appears to the Group to be inappropriate. The cost of remediating OU-3 is best segregated between costs to address the marsh and costs to address the river sediments, (i.e., the area constituting OU-3). Inasmuch as the RAO letter acknowledges that the feasibility study has no place in allocation, allocating the marsh and river sediment costs arbitrarily between the ARC site and the three sites comprising the Horseshoe Road site serves no purpose for the feasibility study. Discussions as to how the collective OU-3 costs should be allocated ought to be kept outside the feasibility study report.

Summary

In addition to the PRGs/remedial approaches described in the RAO letter, the feasibility study will present remedial alternatives that address site-specific, risk-based PRGs and RAOs as described in this letter. These alternatives will be based on the following information and approach:

- Site-specific information/data indicate an absence of toxicity or unacceptable effects to ecological populations/communities at the majority of sampling locations. As a result, a balance is warranted between reduction of limited adverse effects to local biota and short-term/long-term ecological impacts associated with implementation of potential remedial actions.

- In the marsh, active remediation in the form of excavation or dredging will be applied to the SPD/ADC drainage to address concentrations of arsenic greater than the human health PRG for arsenic (2,000 mg/kg) and the earthworm biomass reduction PRG (1,050 mg/kg). This remedial action will also address the arsenic and mercury aquatic sediment PRGs (32 mg/kg arsenic and 3.6 mg/kg mercury) and remove the remaining primary source area of contaminants to the river. Following excavation, the drainage will be constructed as an engineered channel to prevent future erosion and meandering. This approach will address EPA's concerns regarding the potential for flooding, scouring, and channel migration.

- In the remainder of the marsh, remedial alternatives will include monitored natural recovery, capping, and surface sediment removal to address areas that exceed the muskrat PRG for arsenic (183 mg/kg) and the marsh wren PRG for mercury (8.86 mg/kg).

- For the river, PRGs of 194 mg/kg arsenic and 2.6 mg/kg mercury will be used based on site-specific toxicity data summarized by CDM in their memo to EPA (Osolin 2007 pers. comm.). A bioaccumulation-based PRG for mercury in river sediments is not necessary because average mercury concentrations in the river are similar to average site-specific reference and Raritan River background concentrations and mercury bioaccumulation was not identified as a significant risk for fish and birds at the site.

- Based on the site-specific PRGs of 194 mg/kg for arsenic and 2.6 mg/kg for mercury, the area in the river requiring remediation would be limited to the mouth of the SPD/ADC drainage and a small area in the embayment north of the marsh. Remediation of this area by monitored natural recovery, capping, or dredging would address the highest concentrations of arsenic and mercury in river sediments adjacent to the site.

- For the marsh and the river, monitored natural recovery will be included in the remedial alternatives, both in conjunction with more active measures and as a stand-alone approach (in the river only). Additional data collection to predict rates of natural recovery and to monitor progress will be recommended in the feasibility study report. Collection of additional data and refinement of the selected remedy is consistent with the U.S. EPA (2005) recommendation to consider phased or adaptive management approaches.

The remedial approaches for site sediments described above are consistent with regulatory guidance and constitute site-specific and sediment-specific risk management approaches that will achieve risk-based goals and be protective of local populations and communities of biota on a site-specific basis. The combination of remedial action for sediments in the drainages within the marsh area and in the river at the mouth of the SPD/ADC drainage will address the remaining potential site-related source of contaminants to the river and will remove a significant portion of the contaminant mass from the site. As a result, the RAOs of reducing human health risks, reducing risks to environmental receptors, and minimizing the migration of contaminated sediments to the Raritan River will be met.

In summary, the remedial alternatives recommended in the feasibility study will:

- Eliminate human health risk
- Remove the primary source of ongoing contamination to the marsh and river
- Protect ecological resources by
  - Eliminating acute and chronic risks to aquatic and terrestrial invertebrates
  - Mitigating chronic risks to wildlife and
  - Avoiding large-scale disruption of a functioning ecosystem.

Remedy effectiveness will be monitored with periodic data collection and contingency plans will be executed if natural recovery is not effective in the desired timeframe.

We look forward to discussing the feasibility study with you. In the meantime, please feel free to call me at (518) 370-5132 if you have any questions regarding this letter.

Sincerely,

Betsy Henry

Betsy Henry, Ph.D.
Managing Scientist

cc: ARC OU-3 Cooperating Group (by e-mail)

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February 28, 2008

Mr. John Prince
Central New Jersey Remediation Section
U.S. Environmental Protection Agency Region 2
290 Broadway
New York, NY 10007-1866

Subject: Submittal of Final Feasibility Study Report for the Horseshoe Rd/ARC OU-3 Sites
Project No. BE02578.001

Dear John:

Enclosed you will find seven copies (six bound and one unbound) of the Feasibility Study Report for Operable Unit 3 (OU-3) of the Horseshoe Road and Atlantic Resources Corporation (Horseshoe Rd/ARC OU-3) Sites.

In addition, we have reviewed your technical review comments on our August 2007 draft feasibility study report for the Horseshoe Rd/ARC OU-3 Sites and your responses to our August 7, 2007, comment letter that we received on January 2, 2008. We appreciate your input and have revised the remedial alternatives consistent with our discussions in January. In this letter, we provide comments on the key issues raised in your comments, as well as the approach we have taken in the feasibility study to address these issues.

RAOs/PRGs

We have retained the remedial action objectives (RAOs) and preliminary remedial goals (PRGs) presented in your June 11, 2007, letter and in our draft feasibility study report. We have slightly revised your RAO5 so that it is consistent with the other RAOs and includes the concern regarding contaminant migration to the Raritan River Estuary. RAO5 is now stated as follows:

> Reduce to acceptable levels risks to environmental receptors from exposure to contaminants in river sediments and, thereby, minimize migration of contaminated sediments to the Raritan River Estuary.

Although we continue to maintain that the blackworm is a surrogate for aquatic species (as stated in your comments), which are only resident in perennial drainage features such as the SPD/ADC drainage, we have applied the lowest blackworm PRG (32 mg/kg arsenic) to the entire marsh as requested. The alternatives all have the end goal of achieving the lowest PRGs

(32 mg/kg arsenic and 2 mg/kg mercury); however, the rate at which these PRGs are reached and the volume of material removed or contained varies significantly amongst the alternatives.

Monitored Natural Recovery

Monitored natural recovery (MNR) is included in several of the marsh and river alternatives. We continue to believe that the marsh and river are subject to natural deposition of sediment, which will result in reduced contaminant concentrations over time. While the data are not currently available to estimate the rate of recovery, data collection is included in the MNR approach to evaluate rates of recovery and determine if rates are sufficiently rapid for site remediation. In accordance with our discussions, we have also included several marsh and river alternatives that do not rely on MNR to achieve PRGs.

Channel Excavation

After much review and discussion, we have proposed an SPD/ADC channel excavation width of 20 ft and an excavation depth of 36 in. This width is considered sufficiently wider than the current 2- to 5-ft channel width to allow for the possibility of future meandering, although the channel will be armored for alternatives where contaminated sediment is left in place so meandering will be minimized. The depth of 36 in. extends well below the depth that could possibly be subject to scour during high flow events and thus provides a sufficient measure of protection.

Flood Scour Analysis

The flood scour analysis in Appendix C has been revised to include an analysis of scour potential within the SPD/ADC drainage channel. This analysis concluded that the channel is subject to some scour in the upper reaches (greater than 4 ft elevation) at the higher flow rates anticipated for major storm events. The marsh alternatives therefore include armoring of the channel to limit meandering and scour when contaminated sediment remains in the vicinity of the SPD/ADC channel following remediation.

Geochemical Modeling

The geochemical model described in Appendix D concluded that arsenic can be mobilized under reduced conditions and that upward diffusion of arsenic and contamination of clean backfill/cover material under saturated conditions caused by flooding is unlikely. Arsenic dissolution under reduced conditions may also explain why we find elevated arsenic concentrations at depth. The draft feasibility study states that, "While sediment deposition can account for some burial, the depth of this contamination suggests that another mechanism such as downward migration of soluble arsenic species is or was operative." Because of low hydraulic conductivity of the marsh sediments and relatively flat groundwater gradients, it is unlikely that there is much horizontal migration of dissolved arsenic species. We have revised the discussion of the conceptual site model in Section 1 to clarify this point.

We look forward to discussing the feasibility study with you. In the meantime, please feel free to call me at (518) 370-5132 if you have any questions regarding this submittal.

Sincerely,

Betsy Henry

Betsy Henry, Ph.D.
Managing Scientist

cc: Joe Maher, NJDEP
Joe Mayo, CDM
ARC OU-3 Cooperating Group (by e-mail)

"R CHAPIN"
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08/20/2008 03:32 PM

To Pat Seppi/R2/USEPA/US@EPA, John Osolin/R2/USEPA/US@EPA
cc "EWA David Wheeler" <dwheeler@edisonwetlands.org>, "EWA BOB SPIEGEL" <Rspiegel@edisonwetlands.org>
bcc
Subject Horseshoe Rd & ARC Proposed Plan for OU3

John,

On behalf of Edison Wetlands Association we are submitting the attached comments on the Proposed Cleanup Plan for OU3 at the Horseshoe Road & Atlantic Resources Superfund sites.

Please call/e-mail if questions.

Rich

Richard W. Chapin, M.S., P.E.
President
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CE Memo EPA Proposed Plan Comments 8-20-08.doc

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A PROFESSIONAL CORPORATION
"EXCELLENCE IN ENVIRONMENTAL ENGINEERING"
R.W. Chapin, P.E.
President

MEMO

TO: Bob Spiegel, Executive Director, Edison Wetlands Association
FROM: R.W. Chapin, P.E.
DATE: August 19, 2008
RE: Horseshoe Road (HR) & Atlantic Resources (ARC) Superfund Sites, Sayreville, NJ
Comments on USEPA's Proposed Plan for Cleanup of OU3

Horseshoe Road & Atlantic Resources are adjacent Superfund sites located on the south shore of the Raritan River approximately four miles from the Raritan's confluence with the Atlantic Ocean. This reach of the Raritan is a tidal estuary. The United States Environmental Protection Agency (EPA) defined contaminated marsh and river sediments as Operable Unit #3 (OU3) at the referenced Superfund sites. EPA has issued its "Proposed Plan" (PP) to clean up contaminated sediments in OU3. Per your request, an evaluation of the PP plan for cleanup of marsh and river sediments was conducted. Comments on the PP are provided below after a summary of the PP and its basis. A copy of the EPA's PP is attached and should be referred to as needed.

The Proposed Plan & its Basis:

There is a wetlands area down-gradient of these Superfund sites. This is an 8.2 acre area that is 95% freshwater and dominated by *Phragmites*. The balance of the wetland is a 25 ft wide, intertidal strip along the Raritan River which is dominated by *Spartina*. A berm separates these two wetland zones and the EPA reports this is a natural berm formed by tidal fluctuations. Investigations of the marsh sediments identified arsenic, mercury and PCBs as the contaminants of concern. Both surface (upper 12") and subsurface (12" to 42" below grade) contamination exists.

River sediments where drainage from these Superfund sites enters the Raritan are contaminated with arsenic, mercury and PCBs. These sediments occupy approximately 2.5 acres and are located, based on maps provided in the PP, within approximately 200 feet of the shore line. The remnants (the piles) of an old pier called the Crossman Dock are present in the Raritan in front of the contaminated marsh and the river sediments appear to be in a depositional area between this dock and the marsh. Surface (upper 6") and subsurface (6" to 42" below the river bottom) sediments are both contaminated.

The PP presents discussion of the remedial objectives to "...mitigate current and/or future risks..." associated with OU3, including selection of "...preliminary remediation goals (PRGs)" for arsenic and mercury, i.e., numerical cleanup for each metal. PCBs are indicated to be co-located with these metals and by addressing those two metals, EPA indicated the PCBs will also be remediated: consequently, no numeric limit for PCBs is specified.

EPA's PRGs for marsh sediments are summarized by the following table:

Marsh Sediment PRGs

	0-12" below grade	12-42" below grade
Arsenic	32 mg/kg	160 mg/kg
Mercury	2 mg/kg	none specified

27 QUINCY ROAD, BASKING RIDGE, NJ 07920 908 647 8407 (fax) 908 647 6959 (email) rwc27q@verizon.net

MEMO

To: R. Spiegel, EWA
RE: OU3 Proposed Plan Comments

The PRGs were developed considering both the Human Health Risk Assessment and the Ecological Risk Assessment for the site. The PRGs selected are all based on ecological risk, which is lower than the human health based criteria developed by this site's Human Health Risk Assessment.

EPA's PRGs for the River Sediments are summarized by the following table. Like the marsh sediment PRGs, these are based on ecological risk.

River Sediment PRGs

	0-12" below grade	12-42" below grade
Arsenic	100 mg/kg	100 mg/kg
Mercury	2 mg/kg	2 mg/kg

The Feasibility Study for OU3 evaluated seven alternatives for the marsh sediments (designated M1 thru M7) and six alternatives (designated R1 thru R6) for the River sediments. EPA selected Alternative M7: "Full Excavation, Restoration" for marsh sediments and Alternative R6: "Deep dredge and Cover" for the River sediments. (Refer to the attached PP copy for a description of all alternatives.) The selected alternatives will remove the largest mass of contaminated sediments (when compared to any alternate). The marsh alternative is deemed protective for the expected use of the site (recreation) but will not allow for future unrestricted use; consequently, a deed notice "...may be needed to prevent a change in land use." The total present worth cost for the marsh sediment cleanup is $20,700,000, while the total present worth cost for the river sediment cleanup is $13,500,000. The total present worth of the EPA's PP is $34,200,000.

Comments:

The EPA's PP is based on removal of contamination above specific numeric limits; however, the basis for these limits is not clearly defined in the PP.

According to the Feasibility Study for OU3, there were "reference locations" sampled and that data was "...one of a number of data points..." used to identify the contaminants of concern in OU3 marsh soils. For marsh sediments, the "reference location" was identified as an area 400 feet south of the Crossman's Dock. The "other data points" used by EPA are not presented in the PP. Their location and magnitude of contamination are not provided. All data used to establish the PRGs for arsenic and mercury must be provided with the PP. A summary table would serve that purpose.

The PP uses the terms "reference data" and "background levels". Neither term is clearly defined, and these terms appear to be interchanged at several points in the PP. Reference data and background levels are combined in Table 2 under a column titled "Reference Data". The Raritan River has well known sediment contamination issues. EPA is clearly committed to cleanup only that sediment contamination attributable to the HR and ARC Sites. The level of cleanup for OU3 hinges, to a large degree, on an accurate determination of background levels. The PP must include to EPAs basis for establishing background. The current PP is confusing on this point and requires correction.

MEMO

To: R. Spiegel, EWA
RE: OU3 Proposed Plan Comments

The arsenic PRG for the upper 1 ft of marsh sediments is 32 mg/kg. Various arsenic levels form the Human Health and Ecological Risk Assessments are provided in Table 4 of the PP. As a rationale for selecting 32 mg/kg, the PP states "After considering screening values used by NJDEP and the recommendations of the other Natural Resource Trustees, EPA has identified 32 mg/kg as the Remediation Goal for the benthic zone of the marsh... Applying this Remediation Goal addresses most of the RAOs (Remedial Action Objectives), and in particular, satisfies the Agency's desire to minimize the marsh as a continuing source to the Raritan."

The NJDEP's *"Guidance for Sediment Quality Evaluations"* defines two freshwater sediment screening criteria for arsenic: the LEL (lowest effects level, or the least concentration where adverse impact to benthic organisms occurs) is 6 mg/kg, while the SEL (severe effects level, or the concentration where adverse impacts occur 95% of the time) is 33 mg/kg. EPA's selected arsenic PRG is, essentially, a concentration where adverse benthic impacts occur most of the time.

Table 4 of the PP identifies the "background" arsenic concentration as 14.7 mg/kg. The selected PRG is more than twice this background concentration. If the concentration of arsenic in marsh sediments are greater than a background level those sediments, when eroded will cause a net release of arsenic to the Raritan River, making the marsh sediments a continuing source. The EPA's selected arsenic value does not reduce marsh sediment arsenic levels to background, leaving those sediments as a continuing source. The "other Natural Resource Trustees" the EPA consulted are not identified. These "others" must be identified and the basis of their concurrence must be provided. As noted above, having the basis for establishment of background concentrations is key to understanding and evaluating the selected PRGs and must be provided.

EPA's PRG for arsenic in deep soils (below 1 ft) is 160 mg/kg, and is based on an ecological risk of exposure to deeper soils due to burrowing animals and erosion bringing deeper soils to the surface. As it is presently proposed, above 32 mg/kg in the upper 1 ft must be removed, but after cleanup, erosion (or a burrowing animal) can expose sediments with 160 mg/kg of arsenic at the surface and that is acceptable.

There is a fundamental flaw in these PRGs. If 32 mg/kg is the surface soil criteria it should be the criteria independent of time. What makes 160 mg/kg acceptable at some future date? EPA must address this dichotomy. One arsenic PRG, independent of depth, is more appropriate.

The marsh sediment PRG for mercury is 2 mg/kg, independent of depth. Again, the EPA uses the NJDEP SEL as a basis. The SEL is a value where impacts to benthic organisms occurs 95% of the time. The EPA goes on to state "... since EPA's remediation goal is just above background levels, lower levels may not be attainable". Table 4 gives the background level for mercury as 0.14 mg/kg, which is an order of magnitude below the EPA's PRG. This discussion makes very little sense and requires a detailed explanation by EPA. The statement concerning lower levels not attainable indicates the EPA knows of a continuing source of mercury will re-contaminate the marsh sediments. An explanation of this is also required.

MEMO

To: R. Spiegel, EWA
RE: OU3 Proposed Plan Comments

In river sediments, the PRG for arsenic is 100 mg/kg and the PRG for mercury is 2 mg/kg. The PP states EPA considered lower levels, but concluded "...given background levels in the Raritan River Estuary, lower levels would not be attainable." Again, neither the data utilized nor the EPA's method for defining background levels is provided. In order for the public to understand the PP, this information on the background must be provided in the PP.

The current PP does not clearly communicate the Agency's basis for the PRGs it selected. A clear understanding of that basis is key to acceptance of the PP.

"Clark, Geoffrey K" <Geoffrey.Clark@hatchmott.com>

08/20/2008 04:57 PM

To John Osolin/R2/USEPA/US@EPA

cc <lnieves@gerdauameristeel.com>, "Koch, Kevin E" <Kevin.Koch@hatchmott.com>

bcc

Subject Comments regarding proposed plan for OU 3 at the Horseshoe Road and Atlantic Resources Sites

Mr. Osolin:

Please find attached comments offered by Hatch Mott MacDonald on behalf of Gerdau Ameristeel. The comments address the background concentrations of metals identified by the U.S. Environmental Protection Agency (EPA). In particular, the background concentrations for arsenic and mercury are referenced in Table 4 of the *Superfund Program Proposed Plan Horseshoe Road and Atlantic Resoureces Coporation Sites* dated May 2008. In researching how the EPA determined these background cocnentrations, Hatch Mott MacDonald reviewed the *Record of Decision for Operable Unit 2* dated September 2004, which also referenced background concentrations for other metals. Both listed documents are referenced in our comments.

Hatch Mott MacDonald appreciates the EPA's acceptance of these comments and looks forward to receiving the EPA's responses. In the meantime, please feel free to contact us should you have any questions about the comments.

Regards,
Hatch Mott MacDonald

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<<Final Comment to USEPA.doc>>

Final Comment to USEPA.doc

Hatch Mott MacDonald (hereinafter "HMM") offers the following comments on behalf of Gerdau Ameristeel. In its *Superfund Program Proposed Plan Horseshoe Road and Atlantic Resources Corporation Sites* dated May 2008 and the *Record of Decision for Operable Unit 2* dated September 2004, the United States Environmental Protection Agency (hereinafter "EPA") cites background concentrations for certain metals in soil. Our comments are related to the background concentration of metals at the Horseshoe Road and Atlantic Resources Sites (hereinafter collectively "Sites"). For the sake of brevity, HMM refers below to the background concentration of arsenic, but these comments should be read as referring to background concentrations of arsenic and other metals.

1) Based upon a review of the cited documents, it is not apparent how the background concentration of arsenic was derived.

2) Soils at and adjacent to the Site include New Jersey Coastal Plain sediments, historic fill, and fluvial sediments deposited by the Raritan River or its former and present tributaries. These soils may have different concentrations of arsenic based on their texture, mineralogy, and/or depositional history (for the native soils and sediments) or source (for the fill), among other factors. HMM is concerned that our review of the documents did not indicate that EPA adequately took soil texture, mineralogy, and depositional history into account when determining the appropriate background concentration of arsenic.

3) The historic filling of former marshlands and general historic industrial land use on both sides of the Raritan River indicate numerous potential non-point sources for arsenic. Distinguishing background concentrations in this environment is difficult. HMM believes considering background concentrations to encompass both naturally-occurring and anthropogenic arsenic to be appropriate given the site setting.

4) HMM notes that the concentration of naturally-occurring arsenic and anthropogenic arsenic deposited from non-point sources may vary spatially, even over short distances. Therefore, background samples collected along the property boundaries of the Sites or adjacent to the Sites may not be representative of background concentrations throughout the Sites.

FRANK R. LAUTENBERG
NEW JERSEY

COMMITTEES:
APPROPRIATIONS
BUDGET
COMMERCE, SCIENCE, AND TRANSPORTATION
ENVIRONMENT AND PUBLIC WORKS

United States Senate

WASHINGTON, DC 20510

September 4, 2008

Mr. Alan Steinberg
Regional Administrator
United States Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Dear Regional Administrator Steinberg,

I am writing regarding the proposed cleanup plan for remediating Operable Unit 3 at the Horseshoe Road and Atlantic Resources Superfund Sites in Sayreville, New Jersey.

Specifically, I understand that the proposed cleanup levels for arsenic and mercury in both marsh and river sediments exceed NJ Department of Environmental Protection recommendations for sediments. Additionally, I understand that EPA's proposed cleanup levels for both metals exceed your agency's defined background levels for this site. Therefore, I have serious concerns that the current proposal will result in ongoing contamination from these Superfund sites into the Raritan River.

I also urge you in your long-term plans to restore all of the wetlands associated with these sites. The marshlands on these Superfund sites offer some of the last remaining wetlands complexes along the Lower Raritan River.

Finally, I urge you to make funding the cleanup of the Horseshoe Road and Atlantic Resources site a top priority. With the continuing impacts from these sites to the Raritan River, it is of the utmost importance to expedite their cleanup.

Thank you for your consideration. I look forward to your response.

Sincerely,

Frank R. Lautenberg

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