

2.2 SITE 09 ALLEN HARBOR LANDFILL

2.2.1 Site Introduction

Refer to Section 1.1 for description of the purpose of the five-year review.

2.2.2 Site Chronology

The following presents the chronology of site events:

- 1946-1972 – Allen Harbor Landfill was used for the disposal of waste material generated by the former NCBC Davisville facility and NAS Quonset Point.
- 1972 – After landfilling operations had ceased, the landfill was closed in accordance with standard practice at the time by placing a 2-ft soil cap over the fill materials.
- September 1984 – Completion of the Initial Site Assessment of the former NCBC Davisville facility (Hart 1984).
- February 1987 – Completion of the Verification Step - Confirmation Study of the former NCBC Davisville facility (TRC 1987).
- 1989 – EPA’s Hazard Ranking Scoring Package for the former NCBC Davisville facility.
- 21 November 1989 – NCBC Davisville facility placed on the CERCLA NPL.
- March 1992 – FFA signed by the Navy, EPA, and the State of Rhode Island.
- December 1996 – Remedial Investigation completed (EA 1996a).
- 29 September 1997 – ROD signed (EA 1997).
- 31 March 1998 – Submittal of Final Design Analysis Report For Closure of the Allen Harbor Landfill (EA 1998c) and landfill capping activity begins.
- August 1999 – Landfill capping activity completed and ESD submitted for polychlorinated biphenyls (PCB)-contaminated soil removal and extension of the soil cap and the revetment.
- 30 March 2000 – Initiation of quarterly physical inspections of the landfill.
- June 2000 – Final Remedial Action Report for Site 09 – Allen Harbor Landfill Cap (FWENC 2000b).

- November 2000 – Class I survey of Parcel 10 completed and annotated with references to the deed for ground-water use and land-use restrictions.
- 22 December 2000 – Final CLTMP which included establishment of the performance standards (NewFields 2000b).
- 14 December 2000 – FOST to transfer the property (Parcel 10) to the U.S. Department of Interior for transfer to the Town of North Kingstown, Rhode Island (U.S. Navy 2000). The FOST includes the ELUR required by the ROD and deed covenants.
- May 2001 – Final Remedial Action Operations and Long-Term Management Plan for Allen Harbor Landfill (FWENC 2001).
- July 2001 – Work Plan Addendum No. 2 and Installation of MW09-25S as agreed to in the CLTMP.
- October 2001 – Final Landscape Plan for Allen Harbor Landfill (Beckman-Weremay 2001).
- November 2001 – Final Quality Assurance Project Plan for LTM of Site 09 (EA 2001e).
- 30 November 2001 – LTMP initiated with ME 01.
- January 2002 – Final LUCIP that includes the inspection procedures for Site 09 to document compliance with the land-use controls and/or deed covenants placed by the Navy on this transferred Navy property (Parcel 10) (EA 2002g).

2.2.3 Background

2.2.3.1 Physical Characteristics

Site 09 is located in the Main Center of the former NCBC Davisville facility and within Parcel 10 (Figures 1, 4, and 5). Currently, the site is an approximately 15-acre, grassy area formerly used by the Navy as a landfill. The site is located within a 100-year floodplain and is bounded to the east by Allen Harbor, to the west by Sanford Road, and to the north and south by vegetated wetlands. Allen Harbor is used for recreational boating and is supported by two marinas. In 1984, RIDEM closed Allen Harbor to shellfishing due to suspected contamination by several sources, including Site 09.

The ground surface of the site is currently covered with grass and small shrubs. In general, the terrain at Site 09 is gently sloping with a topographic high in the middle. A revetment wall and constructed wetland are located along the southern and eastern boundary of the landfill with a stone breakwater structure separating the wetland from the harbor.

Based on water level measurements in 18 of the 20 LTM wells at the site during the mid-tide stage, ground water in the shallow overburden and fill material is interpreted to flow generally toward the nearest shoreline (south in the southern portion of the site and east in the eastern portion of the site (EA 2002c, EA 2002d, EA 2002e, and EA 2003b), while ground water in the deep overburden is interpreted to flow generally east to southeast. Additionally, based on these sets of LTMP water level measurements, it appears as though the water table in the shallow overburden and fill material has decreased approximately 0.5 ft (MW09-20I) to 3.3 ft (MW09-17I) since April 1995 (during the Phase III RI; prior to construction of the landfill cap). However, it must be noted that the water level database is very small, so it is not possible to determine if this water level decrease is due to the effect of the landfill cap mitigating rainfall infiltration and/or if it is just seasonal variations, or if the local water levels are just naturally lower during the LTMP measurement times.

During construction of the landfill cap, the ground surface of the site was regraded and increased in elevation in many areas. This resulted in the extension of most of the LTM wells to the final grade of the landfill cap. During redevelopment of the LTM wells prior to initiating the LTMP, 8 of the planned 20 LTM wells were found to be damaged, apparently during the cap construction activity (perhaps due to the weight of the heavy machinery used at the site and/or being inadvertently hit by that machinery). The damage was assumed when the pump used for the redevelopment process could not be placed to the bottom of the well or when traces of filter sand were discharged or observed on the pump when it was retrieved. Four of these wells appear to be damaged above the ground-water level (MW09-08S, MW09-20I, MW09-23S, and MW09-24S). MW09-14D may be damaged within the screened interval. MW09-23D may be damaged approximately 45 ft below grade (10 ft above the screened interval). Because the damage to these 6 wells was not anticipated to seriously impact the representativeness of water samples collected from them, they were tentatively retained in the LTMP. The remaining 2 of these LTM wells (MW09-09D and MW09-14I) are damaged such that even the intake for the peristaltic sampling pump could not be lowered to a depth within the screened interval and so can not be sampled. MW09-09D appears to be damaged just below the water table and MW09-14I is damaged above the water table (21.1 ft below the top of the riser pipe). During the 8 November 2001 BRAC Cleanup Team (BCT) Meeting, it was agreed that decisions regarding the replacement of damaged wells and/or the installation of additional monitoring wells would be delayed for two years pending the collection and assessment of monitoring data (through ME 08) during that time, including probable changes resulting from capping of the landfill. Sampling of the 18 accessible LTM wells has been by peristaltic pump (EA 2001e).

2.2.3.2 Land and Resource Use

The historic (1946 to 1972) land use of the site was as the Allen Harbor Landfill for the disposal of waste material generated by NCBC Davisville and NAS Quonset Point. Currently, the site is undeveloped property with a grass and small shrub ground surface cover over the multimedia cap of the landfill. Parcel 10, which includes Site 09, is in the process of being transferred from the Navy to the Town of North Kingstown via the U.S. Department of Interior. Site 09 will not be used for residential purposes in the future due to environmental land use restrictions required by

the remedy and because the Town's planned use of the property is as open space/conservation land.

No ground-water production wells are located on, or downgradient of, the site. Ground water at the site is classified by RIDEM as GB (i.e., presumed to be not suitable for public or private drinking water use without treatment).

In accordance with the LUCIP (EA 2002g), Parcel 10 includes the following environmental land-use restrictions:

- That the entire parcel is used only for park and recreational uses, not for residential or commercial use, as stated in the ROD.
- For the entire parcel, water supply wells shall not be installed, nor shall ground water be utilized except for sampling or other remedial purposes.
- That the contaminated site as delineated on Figure 5 (land-use restriction boundary) is used by the Grantee, its successors, and assigns, for pedestrian traffic only. Restrictions include, but are not limited to: digging, use of motorized vehicles, or other activities that may damage the remedy components (multimedia cap, gas vents, monitoring wells, stone revetment, etc.) or otherwise allow direct exposure to hazardous waste under the cap.

LUCIP inspections of Parcel 10 are performed in conjunction with each Site 09 ME, but no less frequently than annually, to document that there has been no variance from the environmental land-use restrictions stated above.

The purpose of the environmental land-use restrictions is to ensure:

- That the entire parcel shall be used for only park and recreational uses, not for residential or commercial use, as stated in the ROD.
- That ground water for the entire parcel shall not be withdrawn or utilized except for sampling or other remedial purposes.
- That the Contaminated Site as delineated on Figure 5 ('land-use restriction boundary') is used by the Grantee, its successors, and assigns, for pedestrian traffic only. Restrictions include, but are not limited to: digging, use of motorized vehicles or other activities that may damage the remedy components (multimedia cap, gas vents, monitoring wells, stone revetment, etc.) or otherwise allow direct exposure to hazardous waste under the cap.

2.2.3.3 History of Contamination

A 1939 aerial photograph of the Allen Harbor area depicts the landfill as an undeveloped open grass field rimmed with shrubs and bushes. From 1946 to 1972, the Allen Harbor

Landfill was used for the disposal of waste material generated by NCBC Davisville and NAS Quonset Point. Reportedly, a variety of waste, including municipal-type waste, construction debris, rubble, preservatives, paint thinners, degreasers (e.g., solvents), PCB, oil, asbestos, ash, sewage sludge, and waste fuel oil were disposed of in the landfill. Disposal activities usually included burning the waste and covering it with soil. In 1972, after landfilling operations had ceased, the landfill was closed in accordance with standard practice at the time by placing a 2-ft soil cap over the fill materials. Prior to construction of the cap portion of the site remedy (in 1998), the site was vegetated similar to typical upland coastal areas (i.e., grasses/perennials, shrub communities, and deciduous forest components) which provided habitat for numerous species of birds and mammals. Also, building debris and rusted metallic objects were visible at various locations across the site, including the site shoreline and harbor-side face of the landfill prior to implementation of the remedy in 1998.

2.2.3.4 Initial Response

In 1972, after landfilling operations had ceased, the landfill was closed in accordance with standard practice at the time by placing a 2-ft soil cap over the fill materials.

2.2.3.5 Basis for Taking Action

Ground-water data from the RI indicated the presence of elevated concentrations of VOC and low concentrations of PAH, pesticides, and metals. Elevated concentrations of PAH, pesticides, PCB, and metals were detected in surface and subsurface soil samples. Semi-volatile organic compounds (SVOC), pesticides, PCB, and metals were detected in sediment samples throughout the Harbor.

Contaminants (cancer risk $> 10^{-4}$ and/or HI >1)

Ground Water

Arsenic

Manganese

Bis(2-chloroethyl)ether

1,2-Dichloroethane

1,2-Dichloroethene (total)

1,2-Dichloropropane

TCE

Vinyl chloride

Sediment

Heavy metals

PAH

PCB

Shellfish

Arsenic

Copper

Zinc

Aroclor 1254

Aroclor 1260

The identified human health risks at Site 09 are associated with the potential ingestion of deep ground water by future residents, the use of site ground water for showering in a potential recreational facility, dermal contact with or incidental ingestion of site surface soil by recreational users of the site, incidental ingestion of shoreline sediment by recreational users of the site, and consumption of shellfish from the site shoreline. Potential health risks to site workers during remedial activities are associated with the incidental ingestion of soil. Ecological risks to marine organisms in Allen Harbor were reported to be "moderate" to "slight." Moderate risk to marine organisms was reported to be limited to the narrow intertidal zone to the north and south of the site. Risks to terrestrial ecological receptors were reported to be moderate to high within the Allen Harbor Watershed (an area in which the Allen Harbor Landfill was one of the contributors to elevated risk).

The use of site ground water for drinking or showering is not considered to be a viable exposure scenario based on the planned use as open space/conservation land by the Town of North Kingstown. The Rhode Island ban on shellfishing in Allen Harbor addresses the reported human health risk for ingestion of shellfish from the shoreline of the Allen Harbor Landfill. Construction of an impermeable, multimedia and soil cap at Site 09, as summarized below, prevents human and terrestrial animal contact with site surface soil/fill material, reduces runoff and erosion of fill material, and reduces the potential leaching of COC from fill materials caused by precipitation infiltration.

2.2.4 Remedial Actions

The ROD for Site 09 was signed 29 September 1997 and presents the selected whole-site remedy for Site 09 (EA 1997) including the construction of a multimedia cap (including a gas venting system), stone shoreline revetment, an offshore breakwater, and the construction of intertidal wetlands, along with LTM and land-use controls. The Navy concluded that the selected remedial action would protect human health and the environment.

As stated in the ROD, the Remedial Action Objectives (RAO) for Site 09 are as follows:

- Surface Soil
 - Prevent human and terrestrial animal exposure to COC in surface soil
 - Prevent offsite migration of surface soil and surface soil constituents through overland runoff

- Subsurface Soil
 - Reduce leachate generation

- Reduce or eliminate surface erosion and exposure of fill materials along landfill shoreline
- Ground Water
 - Prevent human exposure to COC in deep ground water
- Sediment
 - Minimize risks from marine ecological exposure to COC in sediment
 - Control potential future sediment contamination from landfill constituents
- Wetlands
 - Control potential future contamination of wetlands from landfill constituents
 - Improve quality of existing wetlands and create new wetlands onsite along the shoreline
- Shellfish
 - Control potential future contamination of shellfish from landfill constituents
 - Prevent or minimize human ingestion of shellfish from the landfill shoreline containing COC above health advisory concentrations.

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS), and the community response to the Proposed Plan, the selected remedy for Site 09 was Alternative 3 – Multimedia Cap. A complete description of the selected alternative is presented in Section VIII of the ROD (EA 1997) and in the ESD of August 1999. The selected remedial alternative is a whole-site remedy, which was planned to be protective of human health and the environment.

The EPA's Presumptive Remedy for CERCLA Municipal Landfill Sites directive (OSWER Directive 9355.0-49FS) states that containment technologies are the preferred remedies for municipal-type landfill waste. Accordingly, cleanup goals (i.e., treatment goals) were not developed as part of the Site 09 remedy. The components of the selected alternative address the identified risk pathways and RAO identified for Site 09. The LTM program established as part of the selected alternative will ensure the protection of human health and the environment over time. The selected remedial alternative includes the following components:

- Construction of a Multimedia Cap above the 14-ft MSL 100-year storm elevation, that consists of multiple soil layers and two impermeable layers, and a soil cap in the area below 14 ft MSL to comply with current federal and state laws. This addressed the RAO for surface and subsurface soil.

- Landfill gases collected within the gas vent layer passively vented to the atmosphere via five vents at Site 09. The points of discharge (vents) were fenced in order to protect potential site visitors.
- Removal and/or covering of landfill debris from the site shoreline. This addressed the RAO for surface soil and sediment.
- Construction of a stone revetment along the shoreline of Site 09 to protect the landfill face from wave action (e.g., tidal forces and storm events). This stabilization of the landfill face addressed the RAO for surface soil and sediment.
- The ESD extended the remedial action under the selected remedy as follows (addressing the RAO for surface and subsurface soil, and sediment in the north portion of the site):
 - Excavation of soil with detected PCB concentrations greater than the cleanup objectives
 - Disposal of soil offsite
 - Placement of a soil cover over areas with soil contamination below cleanup objectives
 - Extension of the shoreline protection (revetment) further north and adjacent to this area.
- Construction of a breakwater structure just east of a majority of the revetment wall, along with construction of a wetland area between the revetment wall and breakwater structure, which together act to trip waves and reduce energy reaching the revetment. Construction of this wetland area along the shoreline of the site also serves as a natural resources/habitat improvement and used material dredged from the entrance channel to Allen Harbor. The progression of wetland development is being monitored over time to determine the feasibility of sustainability. This addressed the RAO for sediment and wetlands.
- Establishment of institutional controls as follows (addressing the RAO for ground water):
 - Implementation of land-use restrictions that include deed restrictions regarding site and ground-water use
 - Implementation of appropriate land-use restrictions (no use of motorized vehicles, no digging, no deep-rooted vegetation) to protect human health and the environment through limiting site development to maintain the integrity of the cap
 - Prevention of the installation or use of ground-water wells, which would be used for drinking water or showering purposes.

- Conduct LTM of landfill gas, ground water, sediment, and shellfish quality to evaluate the effectiveness of the remedy.
- Five-year reviews of the decision for the site by the Navy, EPA, and RIDEM.

2.2.4.1 Remedy Implementation

On 31 March 1998, the Final Design Analysis Report for Closure of the Allen Harbor Landfill (EA 1998c) was submitted and the capping activity begun. FWENC completed the remedial action in August 1999 (FWENC 2000b). In addition to the remediation activities outlined in the ROD, a removal action was performed by FWENC in the Spring of 1999 when the presence of PCB-contaminated soil was discovered in an area just beyond the northern end of the landfill. Due to the PCB removal conducted as part of the remedy for this site, an ESD was submitted as part of the ROD in August 1999. The ESD did not fundamentally alter the remedy at the site. The ESD included the PCB-contaminated soil removal and a northerly extension of the soil cap and the revetment. On 30 March 2000, quarterly physical inspection of the landfill was initiated. On 30 November 2001, LTMP and LUCIP inspections were initiated with ME 01.

2.2.4.2 System Operation/Operation and Maintenance

Operation and maintenance activities at the Allen Harbor Landfill are performed quarterly for the first two years and then semi-annually for the next 28 years in accordance with the Final Remedial Action Operations and Long-Term Management Plan (FWENC 2001). Operation and maintenance, or post-closure care, at the Allen Harbor Landfill must be performed for 30 years after the landfill closure in accordance with Resource Conservation and Recovery Act (RCRA) requirements in 40 CFR Parts F, G, and N, Section 2.1.09(c) of the RIDEM Office of Waste Management Solid Waste Regulation No. 2 – Solid Waste Landfills, and the ROD. The LTMP is performed in accordance with the Final QAPP (EA 2001e). A copy of the template for the site physical inspection report (checklist) is provided as Table 6-2 in the Final QAPP (EA 2001e). A copy of the Institutional Control Inspection Checklist for this site is provided in the Final LUCIP (EA 2002g).

The primary activities associated with operation and maintenance of the site include:

- Visual inspection of the landfill cap with regard to vegetative cover, settlement, erosion, and need for corrective action.
- Inspection of the storm drainage system for sediment accumulation, erosion, vegetative growth, ponding, and obstructions.
- Inspection of the condition of the gas vents and monitoring wells.
- Inspection of the revetment slope and breakwater structure for areas of sliding or stone displacement.

- Inspection of the constructed wetland, the planted wetland in the former barge area just north of the capped area, and the wetland enhancement area located along the northwest corner of Allen Harbor for plant percent survivability, physical appearance, density of growth, and presence of invasive wetland plant species.
- Inspection of shellfish in the constructed wetland regarding presence (establishment of a population), general location, extent, and abundance of ribbed mussels, hard or soft-shell clams, and oysters.

Based on the Institutional Control Inspections during ME 01 (30 November 2001), ME 02 (25 February 2002), ME 03 (3 June 2002), and ME 04 (3 September 2002) there was compliance with the institutional controls stated in the LUCIP (EA 2002g) for this parcel. Copies of the related institutional control inspection checklist are included in each of the related monitoring event reports (EA 2002c, EA 2002d, EA 2002e, and EA 2003a), and the LUCIP 2001 and 2002 Annual Letter Reports (EA 2002i and EA 2003a).

Based upon the landfill inspections during 2000, 2001, and 2002, it appears that overall the site remedy was in good condition and functioning according to design, including the cap, revetment slope, and breakwater structure. Based on survey results, there has been minor subsidence in a few areas, but this has not exceeded the acceptable range of 6 in. over any 100 linear ft area of the landfill cap. A summary of these findings is provided in the annual summary letter reports of the Site 09 inspections for 2000 and 2001 (EA 2002h and EA 2002j). The wetland vegetation appears to be growing well in the barge removal area, the wetland enhancement area (located just north of the site), and in the northern portion of the constructed wetland. However, the southern portion of the constructed wetland is characterized by less than 1 percent vegetative cover. A shellfish population has not yet been established in the created wetland area. A few of the monitoring wells were identified as needing minor surficial repairs that were completed during October 2002. Additionally, two monitoring wells (MW09-14I and MW09-09D) need to be evaluated regarding potential abandonment and replacement (refer to the last paragraph of Section 2.2.3.1 for related detail). No conditions have been observed that would indicate negative impact on the integrity of the remedy. Identified minor maintenance needs that do not impact the integrity of the remedy will be addressed by the Navy in Summer 2003 including:

- Repair of rutting in the LTMP dirt access roads
- Removal of vegetation from drainage pipe outlets and the southern drainage swale
- Re-seeding of bare spots on the cap surface
- Installation of additional geotextile over the area east of piezometer P09-03 where there appears to be some channeling of tidal waters through the breakwater structure
- Repair of the small sections of exposed geotextile fabric along the top and toe of the revetment and the breakwater structure

- Removal of two large shrubs in the vicinity of gas vent GV09-05 as a precaution so their roots do not impact the multimedia cap
- Assess whether or not replanting of the southern portion of the constructed wetland is appropriate.
- Assess whether or not to replace damaged monitoring wells and/or consider adding wells to the monitoring network (after evaluation of the ME 08 sample results by 31 December 2004).

2.2.5 Progress Since the Last Five-Year Review

This is the first five-year review for the site.

2.2.6 Five-Year Review Process

2.2.6.1 Administrative Components

Refer to Section 1.1.

2.2.6.2 Community Involvement

Refer to Section 1.1.

2.2.6.3 Document Review

Documents reviewed are referenced in this Section 2.2 and the citations are included in the List of References.

2.2.6.4 Data Review

Only four sets of LTM sample data are available since the site investigations, including ME 01 (December 2001-January 2002), ME 02 (March 2002), ME 03 (June 2002), and ME 04 (September 2002) ground-water samples from monitoring wells and piezometers and sediment samples as reported in the related reports of ME 01 (EA 2002c), ME 02 (EA 2002d), ME 03 (EA 2002e) and ME 04 (EA 2003b). This database is too small to determine and evaluate trends in the detected concentrations. As per Section 6.3.1 of the QAPP (EA 2001a), statistical trend analysis of available time series of the site COC, including an evaluation of observed 95 percent statistically significant increasing and/or decreasing trends will be evaluated, once at least eight rounds of data become available.

Based on the landfill gas vent samples and gas flow rate measurements collected during ME 04, none of the VOC detected in the samples would exceed the PAL. SVOC were not detected in the gas vent samples. Field measurements for methane were up to 100 parts per million (ppm) approximately 1 ft below grade at some of the gas probe locations around the edge of the

multimedia capped area and 0.0 ppm along the perimeter of the landfill, well below the PAL of 500 ppm. The locations of the gas vents are shown on Figure 4.

Except for an approximately tenfold higher concentration detected in seven CVOC in the MW09-20I sample from ME 03, the ME 01 through ME 04 results of the ground-water samples collected from monitoring wells generally confirmed the nature and presence of the contamination identified during the Phase II and III RIs, including the probable presence of residual dense non-aqueous phase liquid (DNAPL) sorbed to soil or as ganglia between soil grains in the vicinity of MW09-20I (TRC 1994 and EA 1996a, respectively); i.e., the main analytes detected are CVOC. A summary of the constituents detected at concentrations exceeding the PAL is provided in Table 1. The 4 sets of LTMP data do not indicate the presence of obvious trends, except an apparent decrease in the chlorobenzene at MW09-11S and an apparent decrease in the trichloroethene and *cis*-1,2-DCE at MW09-21D, although there are insufficient sets of data available to statistically confirm this. Although the concentration of total CVOC detected in samples from MW09-20I during these four monitoring events ranges from 622,555 µg/L to 675,404 µg/L (922,200 µg/L at ME 03) versus 380,500 µg/L in the 1995 sample for the Phase III RI, there is an insufficient database for 1995 to know if that result was typical or anomalously low or high. These LTM sample data indicate that the ground water continues to pose unacceptable risk to human health if used for drinking (ingested) or if used for showering (inhalation and dermal contact). The ground-water use restriction on the entire Parcel 10 precludes such exposures.

The ME 01, ME 02, ME 03, and ME 04 results of the ground-water samples collected from piezometers (screened 2–3 ft bgs) located in the constructed wetland and along the shoreline indicate exceedance of some of the PALs as summarized in Table 2. The locations of the piezometers are shown on Figure 4. However, because of the very poor yields from these piezometers and their location in an inter-tidal zone, sample volumes could not be collected for all aliquots needed for the planned analytical program. Based upon the field-measured salinity of water from the piezometers and the results of a few samples that were laboratory analyzed for salinity (Table 3), it appears that the water collected from at least piezometers P09-02 through P09-08 (located within the constructed wetland) may be mostly harbor water (i.e., salinity greater than 20 parts per thousand [ppt]) draining out through the wetland after the previous high tide stage and, therefore, not representative of ground water from the site. Additionally, the wide variability in the data between monitoring events shown in Table 2 may better support variations from mostly recycled harbor water than a more consistent concentration that could be expected from slowly discharging ground water. However, the VOC results of the samples from P09-08B (new location selected for P09-08 downgradient of MW09-20I during ME 04) and P09-10 suggest that at least a portion of the water collected from at least these two locations is ground water from the site, although there is not a sufficient database to statistically confirm this. Because the sample aliquot types collected from the piezometer locations has varied both from location to location and between monitoring events, these data are currently inconclusive regarding the potential site discharge to this area. The Navy plans to add additional piezometers to each of these 10 locations. Additionally, although dissolved metals are often detected at concentrations above the PAL in ground-water samples from the piezometers (Table 2), they are not typically detected at concentrations above the MCL in ground-water samples from

monitoring wells within the site (Table 1); i.e., the detected dissolved metals concentrations are higher at the piezometer locations than just upgradient in the landfill. The possibility that much of the water collected from the piezometers may be recycled harbor water from the previous high tide stage will be assessed after collection of 8 monitoring events of data.

The ME 01 through ME 04 results of the sediment samples indicated inconsistent exceedance of PAL for only a few constituents in a few locations (Table 4):

- 4,4'-DDE (ME 03, SED09-09 at 9.5 micrograms per kilogram ($\mu\text{g}/\text{kg}$) versus 7.65 $\mu\text{g}/\text{kg}$ for the PAL)
- 4,4'-DDT (ME 01, SED09-01 at 62J $\mu\text{g}/\text{kg}$ versus 6 $\mu\text{g}/\text{kg}$ for the PAL)
- Alpha-chlordane (ME 03, SED09-01 at 21 $\mu\text{g}/\text{kg}$ versus 6 $\mu\text{g}/\text{kg}$ for the PAL)
- Total PCB (ME 01, ME 02, and ME 04 for SED09-01 at 1,600 $\mu\text{g}/\text{kg}$, 220 $\mu\text{g}/\text{kg}$, and 910 $\mu\text{g}/\text{kg}$, respectively, versus 215 $\mu\text{g}/\text{kg}$ for the PAL)
- Eight PAH (ME 04, SED09-10 overall 77,260 $\mu\text{g}/\text{kg}$ versus the 44,792 $\mu\text{g}/\text{kg}$ PAL for total PAH).

The small number of compounds detected and the inconsistent detections of these analytes across the area sampled do not support a protectiveness problem in sediment at this time. Only three pesticides have been detected in sediment at concentrations above their PAL (4,4'-DDE; 4,4'-DDT; and alpha chlordane) once each and during only one ME. In comparison, only trace amounts of one of these pesticides (4,4'-DDT) has been detected in ground-water samples from monitoring wells located upgradient within the landfill (MW09-14D at 0.0075 $\mu\text{g}/\text{kg}$ and MW09-20D at 0.071J $\mu\text{g}/\text{kg}$) both of which are screened in the deep zone near the base of the silt unit and neither of which is close to the SED09-01 location where 4,4'-DDT was detected once above the PAL. The site data indicate that ground water from the landfill does not appear to be negatively impacting the sediment. However, continued assessment of the P09-01 and P09-10 locations (outside the constructed wetland area) and ground-water flowpaths are appropriate to build a database from which statistical analysis could be performed if necessary to determine if there is unacceptable risk to the environment. The presence of PCB at the P09-01 location is not unexpected, because it is in the vicinity of the PCB soil removal action of Spring 1999 and the concentrations detected at P09-01 (220 $\mu\text{g}/\text{kg}$ –1,600 $\mu\text{g}/\text{kg}$) except for one sample have been below the removal action goal of 1,000 $\mu\text{g}/\text{kg}$. The elevated concentration of 8 PAH detected in the SED09-10 sample from ME 04 is the first PAH exceedance in a sediment sample during the first four monitoring events and suggests the presence of a localized remnant (approximately 2–3 ft bgs) of the historical activity at the site.

Areas of Non-Compliance

These LTM data indicate that the ground water continues to pose unacceptable risk to human health if used for drinking (ingested) or for showering (inhalation and dermal contact). The ground-water use restriction on the entire Parcel 9 precludes such exposures.

Except for the VOC detected at P09-10 and P09-08B, the results of the water sample from piezometers are inconclusive regarding the amount of their representativeness of discharge from the landfill verses recycled harbor water from a previous high tide stage.

The PAH and PCB exceedances in sediment (SED09-10 and SED09-01, respectively) may be localized remnants of the historical activity at the site. However, the PCB detections are in the vicinity of the soil removal action of Spring 1999 and the concentrations detected at P09-01 (220 µg/kg–1,600 µg/kg) except for one sample have been below the removal action goal of 1,000 µg/kg.

2.2.6.5 Site Inspections

Refer to Section 2.2.4.2.

2.2.6.6 Interviews

No interviews were conducted. However, during the January, March, and June 2002 Restoration Advisory Board (RAB) meetings, the community was informed of the five-year review process for the former NCBC Davisville facility, and copies of a related EPA handout were provided by EPA entitled "Focus on Five-Year Reviews and Involving the Community, Checking Up on Superfund Sites" (U.S. EPA 2001). Persons with related comments and/or information were asked to contact the EPA RPM and/or the Navy RPM. Notes of each RAB meeting are prepared and sent out to approximately 150 addressees on the NCBC Davisville community mailing list. A copy of the EPA handout was included with the notes of the January 2002 RAB meeting.

2.2.7 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARAR, risk assumptions, and the results of site inspections do not indicate that the remedy is not functioning as intended by the ROD. Assessment of the ARAR is provided in Appendix C (using the ARAR tables from the ROD modified with the first five-year findings) and indicates that although there have been some minor changes since the ROD was signed, they do not have a significant impact on the site remedy. A change in the MCL for arsenic is noted below, but only results in a change to the related PAL in the Final QAPP (EA 2001e) and will be added in Revision No. 01 to the QAPP. Detections above this revised PAL for ground water have been few (Table 1) and so the related impact on the remedy is negligible. As stated in Section 2.1.6.4 (Data Review), an area of noncompliance regarding the quality of the ground water does not pose an unacceptable risk to human health because of the

effective implementation of institutional controls which have prevented exposure to, or ingestion of, contaminated ground water as planned. Additionally, the landfill gas sample results indicate that that portion of the remedy is being protective as planned.

Except for the VOC detected at P09-10 and P09-08B, the results of the water samples from piezometers are inconclusive regarding the amount of their representativeness of discharge from the landfill versus recycled harbor water from a previous high tide stage.

The PAH and PCB exceedances in sediment (SED09-10 and SED09-01, respectively) may be localized remnants of the historical activity at the site. However, the PCB detections are in the vicinity of the soil removal action of Spring 1999 and the concentrations detected at P09-01 (220 $\mu\text{g}/\text{kg}$ –1,600 $\mu\text{g}/\text{kg}$) except for one sample have been below the removal action goal of 1,000 $\mu\text{g}/\text{kg}$. The elevated PAH detections at SED09-10 are located 2–3 ft bgs, and therefore, there is not a risk of direct contact with the material.

Monitoring of ground water beneath the site and ground-water discharge near the harbor shoreline, plus sediment and landfill gas, will continue to provide data to assess the condition of the site regarding risk to human health and the environment. Remedy-required institutional controls are currently being implemented through the LUCIP and in the future through the LUCIP and the ELUR.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and remedial action objectives (RAO) used at the time of the remedy selection still valid?

Changes in Standards and To-Be-Considereds

Table 8-2A of the QAPP for the LTM of Site 09 (EA 2001e), NCBC Davisville, presents ground-water standards as PAL for ground water in monitoring wells at the site. These standards correspond to federal drinking water standards, MCL, or state drinking water standards, whichever is more stringent. All values presented in that Table 8-2A were reviewed for changes. Only one MCL has undergone revision since the Final QAPP was issued. The MCL for arsenic has been lowered from 50 $\mu\text{g}/\text{L}$ to 10 $\mu\text{g}/\text{L}$ with a compliance date effective in 2006. Therefore, the PAL for arsenic in ground water has been revised, and will be provided as a revised Table 8-2A in Revision No. 01 of the Final QAPP.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

Some of the exposure pathways have been mitigated by the landfill capping activity; i.e., contact with site surface and subsurface soil via the landfill cap and revetment, and contact with a large portion of the original shoreline sediment that is now beneath the revetment slope, the constructed wetland, and the breakwater structure.

Review of Toxicity and Other Contaminant Characteristics

A review of *Final Preliminary Remediation Goals (PRG) for Allen Harbor Landfill (Site 09)* (Appendix D of EA 1998c) reveals that no significant changes have been issued in toxicity values, exposure factors, or exposure scenarios since the PRG were developed for COC in shellfish in Allen Harbor. From the PRG document, Table 10 presents exposure assumptions; Table 13 presents toxicity values; and Table 14 presents PRG for COC at the site. There have been no changes to toxicity values or exposure assumptions. Therefore, the PRG values presented are still valid.

There have been no changes for Site 09 with respect to ecological receptors. Terrestrial PRG for the protection of ecological receptors were established for arsenic and zinc, and aquatic PRG for the protection of aquatic receptors were established for copper, mercury, and nickel. Finally, an aquatic PRG for 4,4'-DDE for the protection of aquatic organisms was established for sediment. None of the exposure assumptions or toxicity values used to derive these PRG have changed since production of the CLTMP (NewFields 2000b). Therefore, there have been no risk and exposure changes that would impact PRGs established to protect ecological receptors over the last five years.

It must be noted that the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (Buchman 1999) were used as the source for the Aquatic Water Quality Criteria (AWQC) for Table 8-2a in the Final QAPP (EA 2001e) for the PAL to screen piezometer water samples from the landfill. The EPA has subsequently released a new AWQC listing (U.S. EPA 2002); however, no changes in AWQC occurred for analytes listed in Table 8-2a of the Final QAPP. During this review, it was discovered that many of the values listed as AWQC in Buchman (1999) were not truly formal AWQC, but rather proposed or Lowest Observed Effect Concentrations (LOEC). Consequently, Table 8-2a has been modified to reflect: 1) updating and correction of the AWQC values to those provided in EPA (2002), 2) removal of the LOEC and proposed AWQC listed in Buchman (1999), and, 3) retaining the copper, mercury, and nickel site-specific screening values from the CLTMP (NewFields 2000b). None of these changes have a significant effect on the ability to detect exceedances, with the exception of pesticides and PCB, laboratory reporting limits are adequate to allow for a meaningful comparison. The preparation method for the sample aliquots for PCB analyses will be modified to decrease the detection limit by a factor of 10 for ME 05 (January 2003). Table 8-2a will be revised to reflect these revisions and will be included in Revision No. 01 of the Final QAPP. Pesticides have AWQC that are orders of magnitude lower than standard analytical methods. It is not practical to reduce the laboratory reporting limits below those shown for the pesticides listed in Table 8-2a.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

Based on the data reviewed and site inspections, the remedy is functioning as intended by the ROD, as modified by the ESD, for ground water (from monitoring wells) beneath the site, for landfill gas, and for preventing contact with the site soil and waste material. However, except for the VOC detected at P09-10 and P09-08B, the results of the water samples from piezometers are inconclusive regarding the amount of their representativeness of discharge from the landfill versus recycled harbor water from a previous high tide stage. Lastly, the sediment sample results do not appear to indicate negative impact from ground water from the site, but the PAH and PCB exceedances in sediment (SED09-10 and SED09-01, respectively) may be localized remnants of the historical activity at the site. However, the PCB detections are in the vicinity of the soil removal action of Spring 1999 and the concentrations detected at P09-01 (220 µg/kg–1,600 µg/kg) have been below the removal action goal of 2,000 µg/kg.

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. The ARAR related to implementation of the remedy were met. The toxicity values, exposure assumptions, PRG values, and RAO used at the time of the remedy selection are still valid. Although there was one change in standards, the MCL for arsenic, it is not expected to have a negative impact on the remedy. Lastly, some of the exposure pathways have been mitigated by the landfill capping activity. There is no other information that calls into question the protectiveness of the remedy.

2.2.8 Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Additional monitoring data required to assess ground-water discharge to the shoreline.	N	Y
Identified minor maintenance needs to the landfill cap that do not impact the integrity of the remedy.	N	N
Sustainability of the plants in the southern portion of the constructed wetland.	N	N
Deed and ELUR have not yet been recorded.	N	Y
Completeness of the monitoring well network.	N	Y

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? Y/N	
					Current	Future
Monitoring well network completeness	Assess whether or not to replace damaged monitoring wells and/or consider adding wells to the monitoring network	Navy	EPA / RIDEM	12/31/04	N	Y

2.2.10 Protectiveness Statement

A protectiveness determination of the remedy at Site 09 cannot be made at this time until further information is obtained. Site 09 LTM plan states that 8 rounds of sampling will be completed prior to determining the protectiveness of the cap. As of this date 3 rounds of sampling have been completed. It is estimated that the 8 rounds of sampling will be completed by May 2004, at which time a protectiveness statement will be made. The remedy is expected to be protective of human health and the environment as long as the cap and institutional controls remain in place. Remedy of the site has been addressed through stabilization and capping of the waste and contaminated soil, gas vents, covering of most of the shoreline sediment with the constructed wetland, the installation of fencing and warning signs, and the implementation of institutional controls through the LUCIP to prevent exposure to, or ingestion of, contaminated ground water and to prevent ground surface activities (e.g., building, motorized vehicles except for LTM activities, digging) that could negatively impact the integrity of the landfill cap. The outstanding issue is the inconclusiveness of the available shoreline piezometer sample data to confirm the quality of ground water discharging from the site to the nearshore. Additional piezometers will be installed at each of the 10 locations to attempt to obtain all planned sample aliquots for analysis starting with ME 05 or ME 06. The results of the future complete analyses are hoped to aid in the determination of the representativeness of this sampled area. In addition, the Navy is considering conducting additional studies and/or other evaluations in the shoreline environment in order to better identify areas where plume discharge has the potential to occur, and to optimize long-term monitoring locations accordingly.

2.2.11 Next Review

The next five-year review for the former NCBC Davisville facility that includes Site 09 is required by March 2008, five years from the date of this review