Five-Year Review Report

First Five-Year Review Report
for
Hocomonco Pond Superfund Site
Town of Westborough
Worcester County, Massachusetts

September 2004

Prepared by:

The United States Environmental Protection Agency
Region 1, New England
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EPA
New England

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for Susan Studlien, Director,
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U.S. EPA, New England

Date:

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NOTICE

The development of this first five-year review for the Hocomonco Pond Superfund Site, Westborough, Massachusetts, was funded by the U.S. Environmental Protection Agency (EPA) under Contract No. 68-W6-0045, Work Assignment No. 138-FRFE-0137, to Tetra Tech NUS, Inc. (Document No. RI041171). The report was completed in accordance with the EPA Comprehensive Five-Year Review Guidance, OSWER No. 9355.7-03B-P and was subjected to EPA and state review and comment. Tetra Tech NUS, Inc. provided technical assistance to EPA in the preparation of the five-year review. EPA provided all final decisions in the report.

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ACRONYMS

AMEC	AMEC Earth & Environmental
ARAR	Applicable or Relevant and Appropriate Requirement
BBL	Blasland, Bouck & Lee, Inc.
BTEX	benzene, toluene, ethylbenzene, and xylenes
COC	Contaminant of Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cPAH	Carcinogenic polynuclear aromatic hydrocarbons
CSF	Cancer Slope Factor
DAF	dissolved air flotation
DL	Detection Limit
DNAPL	dense non-aqueous phase liquid
DPW	Department of Public Works
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
LTM	long-term monitoring
LTMP	Long Term Monitoring Plan
MADEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MCP	Massachusetts Contingency Plan
ND	non detect
NM	not measured
NPL	National Priorities List
O&M	Operations and Maintenance
PAH	Polycyclic aromatic hydrocarbons
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfDs	EPA Risk Reference Doses
RI	Remedial Investigation
ROD	Record of Decision
SDD	Supplemental Decision Document
Site	Hocomonco Pond Superfund Site

ACRONYMS (cont.)

TI	technical impracticability
TOC	total organic carbon
TtNUS	Tetra Tech NUS, Inc.
µg/L	micrograms per liter
VOC	volatile organic compound

ES EXECUTIVE SUMMARY

This is the first five-year review for the Hocomonco Pond Superfund Site. The triggering action for this policy review was the completion of construction, marked by issuance of the Preliminary Site Close-out Report, dated September 22, 1999. The five-year review is required since hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure. EPA prepared this five-year review in accordance with the EPA Comprehensive Five-Year Review Guidance, OSWER No. 9355.7-03B-P. Tetra Tech NUS, Inc. provided technical assistance to EPA in the preparation of this document.

The approximately 23-acre Site is located in the Town of Westborough, Massachusetts. The Site is bordered to the northwest by Hocomonco Pond, a 27-acre shallow freshwater pond, to the east by Otis Street and to the south by the Smith Valve Parkway. The Site is zoned as town-owned land. The areas surrounding the Site are zoned IB (General Industry) which allows for light industrial, office, and warehouse use.

Wood treating operations were conducted at the Site between 1928 and 1946. Wastes from these operations were discharged to an unlined lagoon and two depressions, known as the Kettle Pond. After 1946 the facility was converted to an asphalt mixing plant and then to a cement plant. An open-jointed storm drainage system was installed in 1976 per order of the Westborough Conservation Commission to collect runoff from Smith Valve Parkway and contain a small watercourse that crossed the Site. Unknowingly, the storm drain was laid adjacent to the east side of the former lagoon. Rainwater passing through the drainage system transported contaminants from the lagoon through the storm drain and into the Hocomonco Pond. As a result, creosote compounds discharged through the storm drain contaminated the shoreline of Hocomonco Pond and a portion of its discharge stream. Road reconstruction on Otis Street in 1983 adjacent to Kettle Pond unearthed contaminated soil, which was then redistributed along the roadway embankments. The Site was placed on the NPL on September 8, 1983.

The remedial investigation (RI) identified four primary areas of contamination on the Site: (1) the Kettle Pond area; (2) Hocomonco Pond and its discharge stream; (3) the former lagoon area; and (4) Otis Street. In addition, the RI identified three small isolated areas. The predominant contaminants found in all the areas were creosote compounds, primarily polycyclic aromatic

hydrocarbons (PAHs), such as acenaphthene, naphthalene, acenaphthylene, fluorene, phenanthrene, dibenzofuran, and 2-methylnaphthalene.

The September 30, 1985 Record of Decision (ROD) specified a multi-component remedy to address each of the areas of contamination at the Site. The remedies selected involved excavation and dredging of contaminated soil, waste, and sediments from the Kettle Pond area, Hocomonco Pond and its discharge stream, Otis Street, and the three isolated areas, followed by disposal into the former lagoon or a double-lined landfill constructed on the Site. The former lagoon area would be capped. The remedy also included dewatering Kettle Pond and lowering the groundwater level prior to and during excavation, relocating the storm drain pipe that was laid along the eastern side of the former lagoon, and sealing the open-jointed storm drainage pipe along the east side of Otis Street.

Pre-design investigations in the Kettle Pond area identified a number of issues, including extensive DNAPL contamination at depth. EPA issued an Explanation of Significant Differences (ESD) in 1992 that modified the remedy for that area.

EPA established cleanup levels and the limits of excavation in the 1992 Supplemental Decision Document. All excavation and dredging activities were completed by 1996 and certification reports documenting completion of the remedial activities were submitted and approved by EPA. DNAPL recovery operations, required by the 1992 ESD, began in 1995. The in-situ bioremediation system required by the 1992 ESD was not successful due to iron fouling. Other treatment alternatives were evaluated; the evaluation concluded that other treatment alternatives would have limited effectiveness due to the residual and free phase DNAPL present in the Kettle Pond area.

A technical impracticability (TI) investigation was completed in 1997 which identified two TI zones where groundwater restoration was deemed not practicable. A second ESD was issued by EPA in 1999 that waived compliance with the interim groundwater cleanup levels in the two TI zones and required continuation of DNAPL recovery and implementation of a long-term monitoring program (LTMP) to ensure that the plume would be contained and contamination would not increase in concentration or extent.

Continuing O&M activities include inspections and groundwater monitoring around the landfill and former lagoon area, and performance of the elements of the LTMP. The on-site double-lined landfill and former lagoon area cap are functioning as designed. The O&M activities are continuing as required by the RCRA post-closure care regulations. The LTMP includes collection of groundwater samples from eight wells and sediment samples from four locations along the southeast shoreline of Hocomonco Pond.

The interim groundwater cleanup levels for benzene and naphthalene have been consistently exceeded at the two wells located within the Kettle Pond TI zone (M-15S, M-15D) and at MLC-2, downgradient and outside of the former lagoon area TI zone. The requirement to attain the cleanup levels within the TI zones was waived by the 1999 ESD. Polycyclic aromatic hydrocarbons (PAH) concentrations in sediments from location SED-1 have consistently exceeded the total PAH cleanup level. The PAH concentrations are comparable to the concentrations of samples which were collected in 1998 following indications that groundwater containing dissolved PAHs was discharging from the Kettle Pond area to Hocomonco Pond. Based on the data collected to date in accordance with the LTMP, the areal extent of the DNAPL plume appears contained.

The water treatment plant operated in batch mode between March 1995 and May 2003, while the DNAPL recovery system was operated in an enhanced/passive mode. Since May 2003, the treatment plant has been operated on an as needed basis. The treated effluent discharged to Hocomonco Pond has met the required effluent discharge limits.

DNAPL has been measured in 14 of the 63 monitoring wells since 2000 and is routinely recovered from 8 of the 14 wells. Between 1995 and July 2004, approximately 56,405 gallons of DNAPL have been recovered.

The ROD and 1999 ESD both require institutional controls in the form of deed restrictions. These deed restrictions, to restrict development in the area of the former lagoon, landfill, and along the embankment of Otis Street, and to prohibit extraction of the groundwater for purposes other than the remedial action unless certain conditions are met, have been prepared in draft form but have not yet been finalized and recorded. EPA expects to have the deed restrictions in place by December 2004. The fencing around the remediated areas of contamination is in good condition and appears to adequately control access to these areas.

There have been no changes in action-specific or chemical-specific ARARs that could affect the protectiveness of the remedy. State risk-based groundwater standards have been promulgated since the SDD interim groundwater cleanup levels were established. Monitoring wells outside the TI zones exceed some of the state GW-1 standards for carcinogenic PAHs (cPAHs). There have been no changes in exposure pathways. The town's plans for passive recreational use of the Site after EPA releases the Site to the town appear to be consistent with the cleanup RAOs. Should future use plans include swimming and catch and release fishing, a re-evaluation of the ingestion and dermal contact exposure pathways is recommended.

The toxicity values used in the calculation of groundwater clean-up levels (RfDs and CSFs) remain unchanged with the exception of the RfD value for naphthalene. The RfD for naphthalene has decreased by 50 percent. For this reason, if the groundwater clean-up level for naphthalene was recalculated today, it would decrease to 750 µg/L from the current cleanup level of 1,500 µg/L.

The portions of the remedy involving excavation and dredging of contaminated soils and sediments and placement in the on-site double-lined landfill or the capped former lagoon area have met the RAOs for the areas of contamination described in the ROD. The evaluation of the LTM data after 5 years as outlined in the LTMP was designed to assess trends in concentrations of individual constituents. This evaluation should occur in early 2006, following the fall 2005 semi-annual monitoring event. In the meantime, the remedy is progressing as expected.

Five-Year Review Protectiveness Statement:

The remedies for the Hocomonco Pond Site are expected to be protective of human health and the environment once the deed restrictions are in place. In the interim, exposure pathways that could result in unacceptable risks are being controlled. Continuation of post-closure care for the on-site landfill and former lagoon area cap is required to ensure the remedy remains protective. Consistent with the 1999 ESD, DNAPL recovery must continue until EPA and MADEP provide written approval stating otherwise. Long-term monitoring required by the 1999 ESD must continue consistent with the LTMP. Following the evaluation of the passive DNAPL recovery operation (expected in the 4th quarter of 2004) and the 5-year assessment of trends indicated by

the monitoring data (expected in early 2006), recommendations, such as continued monitoring, additional site work, or engineering controls, will be made to ensure the remedy remains protective of human health and the environment in the long term.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Hocomonco Pond		
EPA ID *(from WasteLAN)*: MAD980732341		
Region: 1	**State:** MA	**City/County:** Westborough/Worcester
SITE STATUS		
NPL status: Final		
Remediation status (choose all that apply): Operating		
Multiple OUs?* No	**Construction completion date:** September 22, 1999	
Has site been put into reuse? No		
REVIEW STATUS		
Lead agency: EPA		
Author name: Derrick Golden		
Author title: Remedial Project Manager	**Author affiliation:** EPA Region I	
Review period: 4/6/04 to 9/30/04		
Date(s) of site inspection: 6/9/04		
Type of review: Pre-SARA Policy Review		
Review number: 1 (first)		
Triggering action: Construction completion; issuance of Preliminary Close Out Report		
Triggering action date *(from WasteLAN)*: September 22, 1999 (PCOR date)		
Due date (five years after triggering action date): September 22, 2004		

* "OU" refers to operable unit.

Five-Year Review Summary Form, cont'd.

Issues:

- Required deed restrictions are not yet in place.
- Interim groundwater cleanup levels and state GW-1 standards are exceeded at monitoring wells outside of the TI zones.
- Analytical reporting limit for cPAHs is higher than the applicable MCL and GW-1 standards.
- Passive DNAPL recovery evaluation must be completed.
- Evaluation of 5 years of long-term monitoring data must be completed.
- Compilation of information and data for the next five-year review.
- Potential reuse of the Site for catch-and-release fishing and swimming.

Recommendations and Follow-up Actions:

- Finalize and record deed restrictions by December 2004.
- Increase sampling frequency at MLC-2 to semi-annual to collect more data points for statistical analysis. Include GW-1 standards in all future groundwater monitoring evaluations.
- Use analytical method 8270 (SIMS) to achieve lower reporting limits beginning with the fall 2004 event.
- Complete passive DNAPL recovery evaluation by the end of 2004.
- Complete the evaluation of 5 years of long term monitoring data, including the GW-1 standards, by early 2006.
- Compile information and data by 2nd quarter 2009.
- Re-evaluate exposure pathways to ensure the future reuse is consistent with current site RAOs prior to implementation of the reuse plan.

Protectiveness Statement(s):

The remedies for the Hocomonco Pond Site are expected to be protective of human health and the environment once the deed restrictions are in place. In the interim, exposure pathways that could result in unacceptable risks are being controlled. Continuation of post-closure care for the on-site landfill and former lagoon area cap is required to ensure the remedy remains protective. Consistent with the 1999 ESD, DNAPL recovery must continue until EPA and MADEP provide written approval stating otherwise. Long-term monitoring required by the 1999 ESD must continue consistent with the LTMP. Following the evaluation of the passive DNAPL recovery operation (expected in the 4th quarter of 2004) and the 5-year assessment of trends indicated by the monitoring data (expected in early 2006), recommendations, such as continued monitoring, additional site work, or engineering controls, will be made to ensure the remedy remains protective of human health and the environment in the long term.

1.0 INTRODUCTION

The purpose of this five-year review is to determine if the remedy selected for the Hocomonco Pond Superfund Site (Site) in Westborough, Massachusetts is protective of human health and the environment. This report summarizes the five-year review process, investigations and remedial actions undertaken at the Site; evaluates the monitoring data collected; reviews, as appropriate, the Applicable or Relevant and Appropriate Requirements (ARARs) specified in the Record of Decision (ROD) for changes; discusses any issues identified during the review; and presents recommendations to address those issues.

The United States Environmental Protection Agency, Region 1 (EPA) prepared this five-year review pursuant to the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) §121 and the National Contingency Plan. CERCLA §121 states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

The EPA interpreted this requirement further in the National Contingency Plan; 40 CFR §300.430(f)(4)(ii) states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action."

The EPA conducted this five-year review of the remedial actions implemented at the Hocomonco Pond Site in Westborough, Massachusetts. Tetra Tech NUS, Inc. (TtNUS) provided technical assistance to EPA in completion of the review under EPA Contract No. 68-W6-0045, W.A. No. 138-FRFE-0137. Assistance was also provided by the Massachusetts Department of Environmental Protection (MADEP) and Beazer East, Inc., the Potentially Responsible Party (PRP). The work to prepare this review was performed between

April and September 2004. The review was completed in accordance with the EPA Comprehensive Five-Year Review Guidance, OSWER No. 9355.7-03B-P.

This is the first five-year review for the Site. The triggering action for this policy review was the completion of construction, marked by the issuance of the Preliminary Site Close-Out Report, dated September 22, 1999. The five-year review is required since hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure.

2.0 SITE CHRONOLOGY

TABLE 2-1
CHRONOLOGY OF SITE EVENTS
FIVE-YEAR REVIEW
HOCOMONCO POND SITE
WESTBOROUGH, MASSACHUSETTS

Event	Date
Montan Treating Company and American Lumber & Treating Company conducted wood-treating operations on the site.	1928-1946
Facility was converted to an asphalt mixing plant and later into a cement plant.	Late 1940's
Beazer East, Inc. (formerly Beazer Materials and Services, Inc.; formerly Koppers Company, Inc.) purchased the stock of the wood treating operating company.	1950's
Smith Valve Company purchased the property of the former operations (also operates a manufacturing plant on a separate parcel on the southwest side of Hocomonco Pond).	April 2, 1976
An open-jointed storm drain was installed crossing the site from Smith Valve Parkway to Hocomonco Pond.	1976
MA Division of Fisheries & Wildlife investigated two fish kills at Hocomonco Pond, attributed to creosote contamination.	November 1979 & April 1982
Studies and investigations were conducted to evaluate the source and extent of creosote contamination and evaluate methods to remove or contain the contamination (attributed to creosote and water leaking into the storm drain laid adjacent to the former lagoon and discharging to Hocomonco Pond).	1979-1982
Site proposed for listing on the National Priority List (NPL) due to the threat creosote contamination posed to the Otis Street municipal well and Hocomonco Pond.	Dec. 30, 1982
Excavation during reconstruction of Otis Street resulted in disturbance of contamination in the Kettle Pond area and redistribution of contaminated soil in the road embankment adjacent to the Kettle Pond area.	July 1983
Site was placed on the NPL.	Sept. 8, 1983
Information repositories were established at the Westborough Town Hall and Public Library.	January 1984
Remedial investigation / feasibility study (RI/FS) was issued.	September 1985
ROD was signed.	Sept. 30, 1985
Consent Decree entered into between EPA, the Commonwealth of Massachusetts, and the PRPs. Consent Decree entered by the U.S. District Court for the District of Massachusetts.	Jan. 10, 1988
Pre-design investigations conducted by the PRP.	1988-1992
Relocation of the storm drain (initially installed in 1976) was completed.	January 1990

TABLE 2-1 (cont.)
CHRONOLOGY OF SITE EVENTS
FIVE-YEAR REVIEW
HOCOMONCO POND SITE
WESTBOROUGH, MASSACHUSETTS
PAGE 2 OF 2

Event	Date
First Explanation of Significant Differences (ESD), changing the remedy for the Kettle Pond area, was issued by the EPA.	July 22, 1992
Supplemental Decision Document entitled "Cleanup Levels for Sediments, Soils and Groundwater and Limits of Excavation of Sediments and Soils" was issued by the EPA.	Sept. 28, 1992
Remedial design completed.	1993
Groundwater treatment plant constructed.	1993-1994
Excavation of the Kettle Pond area completed; construction of the on-site double-lined landfill for contaminated soil and sediments completed.	1994
Completed dredging of contaminated sediment from Hocomonco Pond and Brook and sealing and lining of Otis Street storm drain. DNAPL recovery begun.	1995
Soils from the former tank farm area and former storm drain excavated; covers on landfill and former lagoon completed.	1996
EPA issued a letter to the PRP indicating that remediating groundwater to drinking water quality may not be achievable at the entire Site.	May 20, 1997
Technical Impracticability (TI) Work Plan submitted.	June 30, 1997
Field work was conducted to investigate the practicability of groundwater remediation.	Sept. – Nov. 1997
"Report Demonstrating the Technical Impracticability of Restoring Groundwater at the Hocomonco Pond Site" submitted by the PRP.	April 1998
EPA and MADEP conducted a pre-final Site inspection and determined construction activities were completed.	Sept. 10, 1999
Second ESD and associated TI waiver implemented.	Sept. 21, 1999
"Preliminary Close-Out Report" issued by EPA.	Sept. 22, 1999
"Interim Remedial Action Report" issued by EPA.	Sept. 28, 2000
"Revised Long-Term Monitoring Plan" (LTMP) submitted by the PRP.	September 2001
Baseline biological monitoring conducted, per the LTMP.	May 2002
"Long Term Monitoring Report" submitted by the PRP.	June 2002
"Long Term Monitoring Report" submitted by the PRP.	July 30, 2004
First Five-Year Review completed.	Sept. 22, 2004

3.0 BACKGROUND

This section contains information pertaining to the Site's physical characteristics, current and prior land use at the property, as well as waste identification and characterization information. This information has been obtained through a review of historical information, previous investigations, zoning and flood maps, and a site visit.

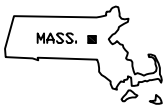
3.1 Physical Characteristics

The approximately 23-acre Site is located in Worcester County, in the town of Westborough, Massachusetts (Figure 3-1). The Site is bordered to the northwest by Hocomonco Pond, a 27-acre shallow freshwater pond, to the east by Otis Street, and to the south by the Smith Valve Parkway. The Site lies approximately 3,500 feet south of Massachusetts Route 9.

The Site is comprised of unconsolidated sediments, characterized as glacial drift deposits and tills, overlying consolidated bedrock (Fluor Daniel GTI, 1998). The glacial drift deposits vary in thickness, with the greatest thickness west of the Kettle Pond. Glacial drift deposits are absent in the southeast portion of the Site. Till is found in most of the Site, but is absent in western and southeastern areas. A sand and gravel layer exists within the till in areas where DNAPL is routinely found. The regional bedrock consists of Precambrian to Ordovician metamorphic rock, primarily schists, gneisses, and granites, which dips westward while striking northeast (EPA, 1985). A dominant geological feature of the Site is a bedrock valley that extends from the northeast to the southwest, with the eastern wall sloping towards the west from the area near Kettle Pond (Fluor Daniel GTI, 1998). Based on geologic investigations conducted during the 1997 TI study, the "differential weathering and erosion of the bedrock surface" indicates that the bedrock valley appears to have been formed by a fault line (Fluor Daniel GTI, 1998).

The Site is generally well-drained due to its topography and the relatively permeable soils, which overlie the sandy stratified drift deposits. Most of the Site contains coarse-grained, poorly-sorted glacial drift deposits, which are comprised primarily of sand, silt, and gravel. These materials are underlain by dense clay and gravel till. Some locations, such as Kettle Pond and the surrounding area, contain permeable materials increasing the potential for downward vertical migration of contaminants. Other areas, such as the area surrounding

BASE MAP FROM USGS QUADRANGLE SHEET: MARLBOROUGH, MASS., 1983



QUADRANGLE LOCATION

GRAPHIC SCALE
0 0.5 MILE 1 MILE

SITE LOCUS		FIGURE 3-1	
HOCOMONCO POND SITE – FIVE-YEAR REVIEW			
WESTBOROUGH, MASSACHUSETTS			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	P. CALL	DATE:	JULY 15, 2004
SCALE:	AS SHOWN	ACAD NAME:	DWG\1845\0600\FIG_1.DWG

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

the former lagoon, are underlain by weathered bedrock/saprolite, that prevents downward migration of contaminants (EPA, 1992a; Fluor Daniel GTI, 1998).

Groundwater flows northward towards Hocomonco Pond and discharges into the pond. In the extreme north of the Site, data suggest that groundwater may be flowing northward following a general drainage pattern from Hocomonco Pond to more low-lying swamps northeast of Otis Street (BBL, 2002a). The hydrogeologic conditions present at the Site indicate that Hocomonco Pond provides a constant head boundary, thus preventing any site contaminants from migrating toward the Otis Street municipal well, northwest of the pond, or toward the Smith Valve process well located west of the pond (EPA, 1985). Site contaminants were not found in either of these wells during the remedial investigation or during subsequent routine testing of the Otis Street well.

The Federal Emergency Management Agency flood insurance rate map for the area shows that Hocomonco Pond, its wetlands at both the inlet and discharge from the pond, and the wetlands east of Otis Street, lie within the 100-year floodplain (FIRM, 2002). The Kettle Pond wetland, located between Kettle Pond and Hocomonco Pond, is a 0.1-acre wooded swampy area that is occasionally inundated during major storm events. Hocomonco Pond discharges from its northeast end and flows under Otis Street into wetlands and the Assabet River (see Figure 3-1). The Assabet River wetland is a 70-acre wooded wetland located northeast of Hocomonco Pond (EPA, 1985). An unnamed 8-acre wetland, located northwest of Hocomonco Pond, is primarily wooded and is also contiguous to an inlet stream to the pond (see Figure 3-1).

3.2 Land and Resource Use

The current Town of Westborough zoning map shows the Site and properties to the northwest of Hocomonco Pond as town-owned land. The Westborough Master Plan identifies the properties to the northwest as municipal protected and municipal unprotected open space (Daylor, 2003). The areas surrounding the Site and the town-owned parcels northwest of the pond are zoned IB (General Industry). This zoning category allows for light industrial, office, and warehouse use (Daylor, 2003). Currently, and in the past, the surrounding lots were used for light industrial, commercial, and/or residential purposes. Although there are no private residences that directly border the Site, there are approximately 40 residential homes within a ½ mile radius, most of which are located along Fisher Street, to the south.

The Site lies within a Zone II aquifer, which is a direct recharge area of a public water supply (Westborough, 2001). The Otis Street municipal well is located approximately 2,000 feet northwest and upgradient of Hocomonco Pond. The well is operated at a pumping rate that limits the radius of influence from intersecting Hocomonco Pond (EPA, 1985). Routine testing of the Otis Street well by the town has never detected any site contaminants (McNulty, 2004). According to town officials, a second municipal well planned for the Otis Street location was not installed due to concerns of the impact of two wells pumping in this area (McNulty, 2004).

There are no estimated habitats of rare wetland wildlife or priority habitats for state-listed rare species within one mile of the Site. There are a number of potential vernal pools located in the Assabet River wetlands east of the Site and Otis Street (Daylor, 2003).

EPA's September 2004 Draft Preliminary Reuse Assessment for Hocomonco Pond and the Westborough Master Plan include maps that show the major land uses, resources, and zoning discussed above.

Appendix D, "Summary of 2003 Open Space and Recreation Plan," of the Westborough Master Plan includes a plan to transfer the Hocomonco Pond Site to the care and custody of the Conservation Commission when the cleanup is completed and the Site is released to the town by EPA (Daylor, 2003). Town officials have indicated plans for passive recreational use of the Site and have proposed the creation of a walking trail along the Smith Valve Parkway, south of the Site (McNulty, 2004). An aerial photograph of the Site showing the proposed walking trail is included in Appendix D.

3.3 History of Contamination

Wood treating operations were conducted on-site between 1928 and 1946. These activities consisted of saturating wood products with creosote to preserve them (EPA, 1985). Waste produced during these operations was discharged into the 1.7 acre unlined (former) lagoon, located south of Hocomonco Pond. When the lagoon was filled with waste creosote, sludge, and water, its contents were pumped into two depressed areas, approximately 1 acre in size, referred to as the Kettle Pond area. The Kettle Pond area was located east of the operations and near the west side of Otis Street (EPA, 1985). Public information indicates that creosote was not used or stored on the Site after March 26, 1946 (EPA, 1985).

After 1946 the facility was converted to an asphalt mixing plant. Aggregate and asphalt wastes associated with this operation were discarded on the Site. The facility was later converted into a cement plant where dry cement was sold in bulk (EPA, 1985).

An open-jointed storm drainage system was installed in 1976 per order of the Westborough Conservation Commission to collect runoff from Smith Valve Parkway and contain a small watercourse that crossed the Site. Unknowingly, the storm drain was constructed adjacent to the east side of the former lagoon. Rainwater passing through the drainage system transported contaminants from the former lagoon into Hocomonco Pond and a portion of its discharge stream. Between 1979 and the mid 1980s an oil boom was placed in Hocomonco Pond at the drain channel discharge during heavy rains. The boom was used to collect creosote that discharged to the pond (EPA, 1985). The Massachusetts Division of Fish and Wildlife investigated two fish kills, in 1979 and 1982. The fish kills were attributed to creosote leaching from the former lagoon into the storm drain and discharging into and contaminating the pond.

Road reconstruction on Otis Street in 1983 adjacent to Kettle Pond unearthed contaminated soil, which was then redistributed along the roadway embankments (EPA, 1985). Given the historical operations in the area, EPA collected water, soil, and sludge samples along the Otis Street construction area for risk assessment purposes. Contaminants detected in the sludge samples were consistent with creosote and its by-products.

3.4 Initial Response

In the early 1980s Hocomonco Pond was closed for recreational uses, and signs were posted prohibiting fishing, boating, and swimming (EPA, 1985). Access to the Site was restricted by placement of large boulders across the access road. Based on the extent of creosote contamination detected in the Hocomonco Pond area and the potential threat of contamination to the Otis Street municipal well, EPA evaluated the Site and proposed it for inclusion on the National Priority List (NPL) in 1982. The Site was officially placed on the NPL on September 8, 1983 (EPA, 1992). A remedial investigation (RI) was initiated in 1984.

3.5 Basis for Taking Action

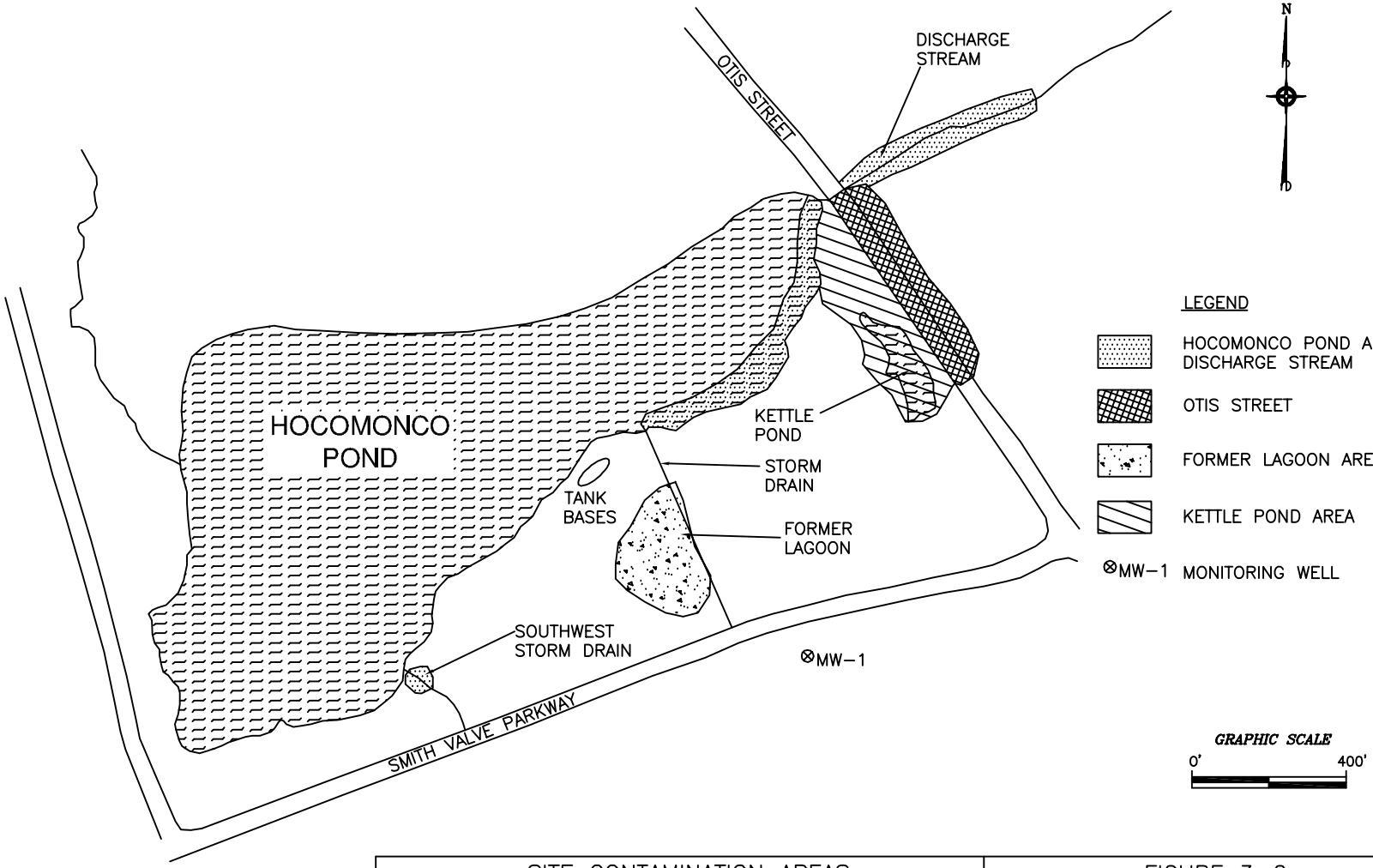
The RI identified four primary areas of contamination on the Site: (1) the Kettle Pond area; (2) Hocomonco Pond and its discharge stream; (3) the former lagoon area; and (4) Otis Street. In addition, the RI identified three small isolated areas: contaminated soil near MW-1; tank bases adjacent to the former lagoon; and sediments in the southwest drainage channel. The predominant contaminants found in all of these areas of contamination were creosote compounds, primarily polycyclic aromatic hydrocarbons (PAHs) such as acenaphthene, naphthalene, acenaphthylene, fluorene, phenanthrene, dibenzofuran, and 2-methylnaphthalene (EPA, 1985). The extent of the contamination identified in each of these areas is shown on Figure 3-2. A brief description of each of the areas of contamination identified in the RI is provided below, followed by a summary of the endangerment assessment that was performed to address public health and environmental concerns at the Site.

3.5.1 Kettle Pond Area

Creosote contamination was detected in soils at concentrations up to 483 mg/kg at a depth of 0 to 2 feet; a concentration of up to 55 mg/kg was detected at a depth of 20 feet below ground surface (bgs). The contamination extended below the water table, which was located at approximately 8 feet bgs, and was visible in soil borings to a depth of 17 feet bgs (EPA, 1992a). The RI estimated the volume of contaminated soil to be approximately 24,000 cubic yards with an aerial extent of approximately one acre (EPA, 1992a). Contamination extended to the western bank of Otis Street and north to Hocomonco Pond (EPA, 1985). Downgradient of Kettle Pond, groundwater was contaminated with creosote compounds and phenolic compounds at parts per million concentrations. Iron and manganese were detected at concentrations which exceeded secondary drinking water standards (EPA, 1985). Surface soil adjacent to Hocomonco Pond also contained creosote compounds (EPA, 1992).

3.5.2 Hocomonco Pond and Discharge Stream

The RI determined that creosote-contaminated leachate migrated from the former lagoon into the open-jointed storm drain adjacent to the former lagoon, and discharged into Hocomonco Pond (EPA, 1992a). The creosote compounds contaminated the sediments in the discharge stream and along the shoreline of the pond. Most of the metals detected exceeded background



SOURCE:
HOCOMONCO POND SUPERFUND SITE,
"SUMMARY OF SITE CONTAMINATION AREAS",
CDM FEDEREAL PROGRAMS CORPORATION.

SITE CONTAMINATION AREAS			
HOCOMONCO POND SITE – FIVE-YEAR REVIEW			
WESTBOROUGH, MASSACHUSETTS			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	P. CALL	DATE:	AUGUST 3, 2004
SCALE:	AS SHOWN	FILE NO.:	DWG\1845\0600\FIG_3-2.DWG

FIGURE 3-2

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levels in both pond and stream sediments. Migration via the storm drain was noted as the primary source of contamination in Hocomonco Pond and the discharge stream. Contaminated surface water was found in the pond only within the oil boom area at the storm drain discharge. Contamination was not found in surface water beyond the oil boom or in the discharge stream exiting the pond near Otis Street (EPA, 1985).

3.5.3 Former Lagoon Area

Creosote contamination was detected in the soil near the surface and at depths ranging from 5 to 20 feet bgs. Creosote product was observed in the upper 15 feet of the soil, above the groundwater table (EPA, 1985). The RI estimated the volume of contaminated soil in the former lagoon area to be approximately 18,000 cubic yards with an estimated aerial extent of approximately 1.7 acres (EPA, 1992). Groundwater contamination was not found in wells located downgradient of the former lagoon. Observations made during test pit and soil boring operations suggested that downward migration of contaminants was apparently impeded by impervious layers of sludge and fines in the bottom of the lagoon. The RI concluded that hydrogeologic conditions in the area would prevent migration of contaminants deep into the aquifer and that seepage from the lagoon into the groundwater would likely flow laterally and discharge into Hocomonco Pond (EPA, 1985).

3.5.4 Otis Street

Creosote contamination was not detected in soils or groundwater along the eastern embankment of Otis Street; metals above background levels were found in both soil and groundwater. Manganese was the only compound detected in the groundwater east of Otis Street that exceeded secondary drinking water standards (EPA, 1985). Stream sediments containing creosote contamination were detected 300 feet downstream of Otis Street (see Section 3.5.2).

3.5.5 Isolated Areas

The RI reported that limited creosote contamination was found in the three isolated areas. Shallow soils near MW-1 contained creosote contamination ranging from 2.5 to 9 mg/kg (EPA, 1985). Creosote contaminants were detected in sediments in the southwest drainage channel

at concentrations ranging from 6 to 39 mg/kg (EPA, 1985) (see Figure 3-2). Oily creosote compounds were found in the bottom of the tank bases (Golden, 2004).

3.5.6 Endangerment Assessment

The ROD summarized the endangerment assessment that was performed to address public health and environmental concerns at the Site. The assessment included hazard identification, exposure assessment, and risk characterization. Critical contaminants were identified based on the data collected during the RI from each of the areas of contamination described above in Sections 3.5.1 to 3.5.5. The list of compounds posing the greatest health risks included known carcinogens, noncarcinogens with known health effects, and compounds with unknown health effects. This list of critical contaminants for the Site is shown in Table 3-1.

Critical contaminants were found in high concentrations in soil and sediments in the former lagoon area, Kettle Pond area, and Hocomonco Pond and its discharge stream. Lower concentrations were found in groundwater in the Kettle Pond and Otis Street areas and in surface water within the oil boom at the storm drain discharge to Hocomonco Pond. The exposure assessment identified inhalation, ingestion, and direct contact as potential routes of exposure. Risks were calculated based on exposures to the identified critical contaminants via ingestion and dermal contact (EPA, 1985).

TABLE 3-1
CRITICAL CONTAMINANTS
FIVE-YEAR REVIEW
HOCOMONCO POND SITE
WESTBOROUGH, MASSACHUSETTS

ORGANICS	
Carcinogens	Benzo(a)pyrene
	Benzene
Non-carcinogens	Naphthalene
	Fluoranthene
Unknowns	Phenanthrene
	Anthracene
	2-methylnaphthalene
	Pyrene
	Fluorene
	Acenaphthene
	Benzo(a)anthracene
	Chrysene
	Dibenzofuran
	2-chlorophenol
	4-methylphenol
	2,4-dimethylphenol
	2-methylphenol
	Benzo(g,h,i)pyrene
INORGANICS	
Carcinogens	Arsenic
	Chromium

Source: EPA, 1985

4.0 REMEDIAL ACTION

This section describes the remedial actions selected for and implemented at the Site in accordance with the ROD and the modifications to the ROD.

4.1 Remedy Selection

The September 30, 1985 ROD specified a multi-component remedy to address each of the areas of contamination at the Site. Based on the conclusions of the RI, remedial action objectives (RAOs) were identified that would mitigate or eliminate impacts to human health and the environment due to exposure to site contaminants. The individual RAOs described in the ROD for each area of contamination are summarized in the table below.

Remedial Action Objectives (per ROD)	Areas of Contamination				
	Former Lagoon	Kettle Pond	Hocomonco Pond & Discharge Stream	Otis Street	Isolated Areas
Eliminate inhalation, direct contact and/or ingestion exposure pathways	X	X	X	X	X
Eliminate the contaminant migration potential to downstream areas and to surface waters	X		X	X	X
Ensure no future groundwater contamination	X				
Eliminate impacts on wetlands	X	X		X	X
Eliminate groundwater contamination in this area and east of Otis Street		X			
Eliminate future potential impacts to wetlands and fisheries (e.g. the ingestion exposure pathway)			X		
Enhance future recreational usage of Hocomonco Pond			X		

Source: EPA, 1985

Since remedial alternatives for each area were evaluated separately, the ROD selected separate remedial actions that addressed the specific issues identified for each area. The remedial alternatives selected by the EPA needed to ensure that “the best practical measures were used and the most cost effective alternatives that are technologically feasible and reliable were chosen to effectively mitigate potential harm and provide adequate protection for public health, welfare, and the environment” (EPA, 1985). Therefore as part of the ROD, the EPA

issued a separate Statement of Findings for each of the four areas to ensure compliance with EPA policy, Executive Orders 11988 (Floodplains Management) and 11990 (Protection of Wetlands), and consistency with Massachusetts state law and local standards. The Statements of Findings were required since some of the proposed remedial actions were in or might potentially affect a 100-year floodplain and/or a wetland. The remedies selected for each area of contamination are briefly described below.

Kettle Pond Area. The remedy selected for the Kettle Pond area involved excavation of contaminated soil/waste and on-site disposal into a double-lined landfill. The remedy also included dewatering Kettle Pond to lower the groundwater level prior to and during excavation. A groundwater pumping and treatment system would be installed to lower the groundwater level and also to extract and treat contaminated groundwater (EPA, 1985). This alternative was selected since it would remove the soil/waste source of contamination to groundwater. This would be achieved by excavating all visible contamination and approximately 2 to 3 feet of additional soil below the visible contamination and consolidating it into an on-site double-lined landfill (EPA, 1985).

Hocomonco Pond and Discharge Stream. The remedy selected for Hocomonco Pond and its discharge stream involved mechanical dredging of contaminated sediments with on-site disposal either into the former lagoon area prior to construction of the cap and/or at an approved landfill facility. This alternative was selected since it would remove the contamination and essentially restore Hocomonco Pond to a condition suitable for recreational purposes (EPA, 1985).

Former Lagoon Area. The remedy selected for the former lagoon area involved site grading, construction of a cap, and removal/disposal and relocation of the storm drain pipe that had been installed along the eastern side of the former lagoon. This alternative was selected since all soil contamination was located above the water table; therefore containment of the waste material under the cap would prevent migration to Hocomonco Pond and groundwater (EPA, 1985). A deed restriction was also required for the area of the cap to prevent future development (EPA, 1985).

Otis Street. The remedy selected for Otis Street involved sealing the open-jointed storm drainage pipe along the east side of the street. This alternative was selected since it would

prevent the migration of contamination from the drainage pipe into Hocomonco Pond, the discharge stream, and adjacent wetlands. A deed restriction would be required for the road embankment area (EPA, 1985).

Isolated Areas. The remedy selected involved removal of the tank bases, contaminated soil near MW-1, and contaminated sediment from the southwest storm drain channel, and consolidation of the materials either on-site into the former lagoon area prior to construction of the cap and/or at an approved landfill facility. This option was selected to eliminate the potential exposure risk to humans and animals from contaminants in these isolated areas (EPA, 1985).

On January 10, 1988, a Consent Decree was entered into between the EPA, the Commonwealth of Massachusetts, and the following parties: Beazer East, Inc. (Beazer), Chicago Bridge & Iron Co., Smith Valve Corp., Massachusetts Department of Public Works (DPW), and the Town of Westborough (EPA, 1992). The Consent Decree set forth activities that Beazer would be required to carry out in order to implement the remedies specified in the ROD. The other PRPs agreed to make settlement payments to Beazer (EPA, 1992). These activities, specified in the Remedial Design/Action Plan (RD/RA Plan), attached as Appendix I to the Consent Decree, included pre-design, remedial design, remedial action, and long term operation and maintenance (O&M) for the remedies selected in the ROD.

As part of the selected remedy for the former lagoon area, the storm drain along the east side of the lagoon area was relocated between November 1989 and January 1990. The contaminated portions of the former storm drain were then excavated as part of the activities described in Section 4.3.1.

4.2 Additional Investigations

Along with the remedial alternatives selected for each area of contamination, the ROD listed future actions to support the design process and on-going monitoring. These actions included:

- Soil sampling and analysis during the design process to determine the extent of excavation required at the Kettle Pond area, the former tank farm, the southwest storm drain area, and the MW-1 area;

- A sediment investigation during the design process to determine the extent of dredging that would be required to remediate Hocomonco Pond;

- Water treatability studies for the Kettle Pond area, as necessary, to adequately design a water treatment system for dewatering the area prior to excavation;

- Monitoring of the former lagoon area cap and double-lined landfill to ensure their effectiveness;

- Establishing final groundwater cleanup levels after soil and groundwater remedial actions were completed in the Kettle Pond area; and

- Installing fencing during design and prior to the start of construction activities to prevent direct exposure of the public to contaminants and to the construction activities on the Site (EPA, 1985).

4.2.1 Pre-Design Investigations

The PRP conducted pre-design investigations in the early 1990s, including sediment, soil, groundwater, and fish tissue sampling, to further refine the extent of contamination in the different areas of the Site. During the remedial design the results of these sampling activities were used to supplement the previous investigations of the Site to define the extent of excavation and dredging activities that would be required in each area.

Sediment sampling was conducted at Hocomonco Pond, the discharge stream, and a marshy area and abandoned stream associated with Hocomonco Pond. Soil sampling was conducted at the former wood treating building located to the north of the former lagoon, at the former tank farm area, in the southwest storm drain, around MW-1, Kettle Pond, and the area between Kettle and Hocomonco Ponds. Groundwater sampling was conducted across the Site to confirm the location of the bedrock valley and determine the migration path for the creosote contamination. Five fish tissue samples were collected from Hocomonco Pond (EPA, 1992a).

4.2.2 1992 Explanation of Significant Differences

The PRP also conducted additional investigations at Kettle Pond as part of the pre-design activities specified in the Consent Decree. These investigations resulted in new information which questioned the effectiveness and implementability of the remedy specified in the ROD for the Kettle Pond area.

During pre-design investigations in the Kettle Pond area, boulders were encountered in the glacial drift during drilling activities. The investigation also determined that the aquifer in the Kettle Pond area was more transmissive than estimated in the RI. The sheet piling would need to be installed to a depth of 60 to 80 feet to control groundwater inflow from the deep permeable aquifer. The PRP determined that the boulders and overhead utility wires would impede the installation of sheet piles, as required in the ROD to support the excavation sidewalls and prevent water from entering the excavation, since the sheeting could bend and separate and therefore compromise the hydraulic and structural integrity of the remedy (EPA, 1992).

The investigations also determined that the vertical extent of visible contamination extended to a depth of approximately 45 feet bgs into the saturated soils, rather than 20 feet bgs as reported in the RI. The investigations concluded that lowering the groundwater level in the Kettle Pond to facilitate “dry” excavation, as specified in the ROD, could cause subsidence of Otis Street, a heavily traveled road (EPA, 1992).

A deep overburden and shallow bedrock investigation was conducted to investigate the December 1988 discovery of creosote product in deeper soils west of Kettle Pond. During this investigation, creosote was observed as a dense non-aqueous phase liquid (DNAPL) at a depth of approximately 140 feet bgs west of Kettle Pond (EPA, 1992; EPA, 1992a). The DNAPL was found above dense clay soil and/or weathered bedrock, which appeared to have acted as a barrier to further downward migration (EPA, 1992).

In response to this new information, on July 22, 1992, the EPA issued the first Explanation of Significant Differences (ESD) for the Site which modified the remedy originally selected for the Kettle Pond area. The remedies selected for the other areas of the Site were not modified, as they were not impacted by the new information. To ensure that the Kettle Pond remedy

remained protective of human health, welfare, and the environment, the 1992 ESD set forth the following changes:

- The ROD requirement for sheet piling and the dry excavation of sediments and soils was replaced with a requirement for wet excavation of shallow contaminated material to a maximum depth of 5 feet;

- The ROD requirement for excavating, dewatering, and landfilling the deeper contaminated soil was replaced with a requirement for in-situ bioremediation and soil flushing; and

- Since DNAPL in the deep overburden can be a continuous source of dissolved contaminants, the ESD required product recovery prior to and/or during in-situ bioremediation and either on- or off-site treatment or product reuse offsite.

The EPA concluded that "these changes do not fundamentally alter the remedy selected in the ROD" (EPA, 1992).

4.2.3 Cleanup Levels and Limits of Excavation

The Consent Decree and RD/RA Plan included a requirement that EPA would establish the horizontal and vertical limits of excavation in the Kettle Pond area, Hocomonco Pond, and its discharge stream in a supplemental decision document. On September 28, 1992, EPA issued a final supplemental decision document (SDD) entitled "Cleanup Levels for Sediments, Soils and Groundwater and Limits of Excavation of Sediments and Soil." The document established the vertical and horizontal extent of excavation for the Site and also established cleanup levels for soils, sediments, and groundwater across the Site (EPA, 1992a). Based on the pre-design investigation results, and other studies, EPA identified contaminants of concern (COCs) for the Site. The COCs identified included benzene, toluene, ethylbenzene, and xylenes (BTEX), noncarcinogenic and carcinogenic PAHs, arsenic, and chromium (EPA, 1992a).

The groundwater cleanup levels established by EPA in the SDD are the Maximum Concentration Limits (MCLs) and non-zero MCL goals (MCLGs) for the COCs. However, since MCLs had not been established for non-carcinogenic PAHs and some carcinogenic PAHs

(cPAHs), risk-based criteria were used to establish interim groundwater cleanup levels. The interim cleanup levels and the criteria upon which they were based, are shown in Table 4-1.

TABLE 4-1
INTERIM GROUNDWATER CLEANUP LEVELS
FIVE-YEAR REVIEW
HOCOMONCO POND SITE
WESTBOROUGH, MASSACHUSETTS

Constituent	Interim Cleanup Level (µg/l)	Reference (criteria)
PAH – carcinogenic		
Benzo(a)anthracene	None	-
Benzo(a)pyrene	0.2	final MCL
Benzo(b)fluoranthene	None	-
Benzo(k)fluoranthene	None	-
Chrysene	None	-
Dibenzo(a,h)anthracene	None	-
Indeno(1,2,3-cd)pyrene	None	-
PAH – noncarcinogenic		
Acenaphthene	2,200	risk-based
Acenaphthylene	None	-
Anthracene	11,000	risk-based
Benzo(g,h,i)perylene	None	-
Fluoranthene	1,500	risk-based
Fluorene	1,500	risk-based
Naphthalene	1,500	risk-based
Phenanthrene	None	-
Pyrene	1,100	risk-based
VOCs		
Benzene	5	final MCL
Ethylbenzene	700	final MCLG
Toluene	1,000	final MCLG
Xylenes (total)	10,000	final MCLG
Inorganics		
Arsenic	50	final MCL
Chromium (total)	100	final MCLG

None = no interim cleanup level established
Source: EPA, 1992

The SDD stated that these interim levels, which were applied to groundwater within the saturated zone beneath the entire Site, could be reassessed during implementation of the remedy and at the completion of the remedial action to ensure its protectiveness. The SDD allowed for periodic assessments and a possible re-evaluation of performance standards associated with the groundwater treatment remedy. The SDD required a risk assessment to evaluate the potential risk of consumption of site groundwater once the groundwater ARARs were achieved (EPA, 1992a).

Based on the soil and sediment data collected during the pre-design investigations, EPA established cleanup standards for Hocomonco Pond, the discharge stream, Kettle Pond area, and the isolated areas. Cleanup levels were established based on risks to human health from potential exposure via dermal contact and ingestion as well as risks to aquatic life. No cleanup levels were established for surface water or fish since the risks calculated were less than 10^{-6} (EPA, 1992a). The volumes of sediment and soil in each area that exceeded the respective cleanup standard, and thus required excavation, were then estimated by EPA. The soil and sediment cleanup standards and estimated volumes are summarized below for each area.

Kettle Pond Area. A human health based cleanup level of 4 mg/kg cPAHs was established for surface soils (less than 2 feet) in the Kettle Pond area. To meet this standard, EPA determined that removal of the top 4 feet of soil, totaling approximately 4,200 cubic yards, was required (EPA, 1992a). Excavating this volume of soil would result in the removal of a considerable volume of contaminated material before the in-situ bioremediation activities were implemented.

Hocomonco Pond. A human health based cleanup level of 4 mg/kg cPAHs was established for shallow sediments in Hocomonco Pond. In the shallow sediment of the eastern portion of the pond, a cleanup level of 35 mg/kg total PAHs and 4 mg/kg phenanthrene was established for protection of aquatic life (EPA, 1992a). EPA determined that dredging pond sediments along approximately 4,000 feet of shoreline at depths ranging from 0.5 to 1.5 feet bgs was required to meet the cleanup standard. The total volume of sediments required to be removed was approximately 1,840 cubic yards (EPA, 1992a).

Discharge Stream. A human health based cleanup level of 7 mg/kg cPAHs was established for the contaminated sediment in the upper portion of the stream, from Otis Street east

approximately 440 feet. A cleanup level of 35 mg/kg total PAHs and 4 mg/kg for phenanthrene, in shallow sediments for the entire stream and adjacent soils, was established for the protection of aquatic life (EPA, 1992a). EPA determined that excavation of approximately 500 cubic yards of sediments in the upper portion of the discharge stream was required. Excavation of approximately 50 cubic yards of contaminated sediment in the lower portion of the discharge stream was also required (EPA, 1992a).

Isolated Areas. The human health based cleanup level for soils in the former tank farm area, southwest storm drain, and around MW-1 was 4 mg/kg cPAHs (EPA, 1992a). Since the tank base and the soil adjacent to the tank base were contaminated, EPA determined that excavation of approximately 940 cubic yards of soil to a depth of 2 feet bgs was required. Approximately 730 cubic yards was required to be excavated near MW-1 (EPA, 1992a).

4.3 Remedy Implementation

This section describes the completion of the tasks required to implement the remedies for each area of contamination on the Site in accordance with the ROD, 1992 ESD, and SDD. At the time the ROD was issued, the Site was not fenced and pedestrian access was not restricted. Fencing was installed around the areas of contamination by the PRP prior to implementation of the remedial action. Implementation of the remedies began in 1994 as described in Sections 4.3.1 through 4.3.6 below. By 1996 all soil and sediment remedial activities had been completed on the Site. Certification reports were submitted in 1997, documenting that the excavation and dredging activities, and the construction of the on-site double-lined landfill, former lagoon area cap, water treatment plant, and in-situ bioremediation system, were completed in accordance with EPA-approved plans.

4.3.1 Dredging and Excavation Activities

Dredging and excavation of soils and sediments from the various areas of contamination on the Site were conducted between 1994 and 1996. These activities are described below based on the portions of the certification reports attached to EPA's Interim Remedial Action Report (EPA, 2000). The approximate extent of the dredging and excavation activities is shown on Figure 4-1.

Kettle Pond Area. Excavation activities were conducted in and around Kettle Pond from October to November 1994. A total of approximately 4,500 cubic yards of sediments and soils were removed from an area within the 286-foot contour line of Kettle Pond and to the east of Kettle Pond. Confirmatory samples collected outside this footprint indicated that soils and sediments did not exceed the cleanup levels. Due to the lack of contamination along the western perimeter, and with the concurrence of EPA, the limits of excavation were reduced to minimize disturbance to the environment. Once excavation was completed, saturated sediments were de-watered in drying beds (temporary lined structures located in the area of the former lagoon) and then placed into the on-site double-lined landfill. The water collected during dewatering the Kettle Pond excavation was pumped to the drying beds and then to the on-site water treatment plant (Fluor Daniel GTI, 1997).

Hocomonco Pond. Dredging activities at Hocomonco Pond occurred from September through December 1994 and June through November 1995. Six inches of sediment were dredged from an approximately 20-foot wide area along the shoreline from the pond discharge point at the Otis Street culvert west to the former boat ramp. Approximately 2,300 cubic yards of sediment were dredged from this area. Prior to disposal into the on-site double-lined landfill, the saturated sediments were dewatered in the drying beds. Water collected in the drying beds was then treated at the on-site water treatment plant. Additional excavation was required where post-remedial sediment samples exceeded the cleanup standards. All excavated areas were then backfilled with clean material (Fluor Daniel GTI, 1997).

Discharge Stream. Sediments were excavated from the discharge stream located downstream from Hocomonco Pond and the culvert beneath Otis Street, and along a small unnamed tributary located south of the discharge stream. The excavation activities took place in May 1995. Following excavation of approximately 500 cubic yards of sediments, the stream and tributary were backfilled to the approximate original grade. Prior to disposal into the on-site double-lined landfill saturated sediments were dewatered in the drying beds. (Fluor Daniel GTI, 1997).

Former Storm Drain. The storm drain was relocated and the new storm drain was constructed in January 1990. At that time the former storm drain located on the eastern side of the former lagoon was left in place. Excavation and removal of the former storm drain was completed in August 1996. Approximately 1,400 cubic yards of soils and reinforced concrete pipe were

excavated and visually segregated. Stained and saturated materials, totaling approximately 140 cubic yards, were directly transferred to the on-site double-lined landfill. The remaining 1,260 cubic yards were used as unclassified fill for the cap of the former lagoon area. The excavated area was then backfilled with clean low permeability off-site soils. (Fluor Daniel GTI, 1997).

Tank Farm Area. From August to September 1996 approximately 2,700 cubic yards of soil were excavated from the area extending from the tank farm to the adjacent site chain-link fence line. Of the 2,700 cubic yards excavated, approximately 300 cubic yards were used as unclassified fill in the on-site double-lined landfill while the remaining 2,400 cubic yards were used as unclassified fill under the former lagoon area cap. Tank bottoms and bases were excavated, cut up, and incorporated into the unclassified fill placed in the on-site landfill. The sludge that was encountered was solidified and also used as unclassified fill in the on-site landfill. (Fluor Daniel GTI, 1997).

4.3.2 Landfill Construction

The on-site landfill, located midway between the former lagoon area and the water treatment plant (see Figure 4-1), was constructed between June and July 1994. The double-lined landfill cell, approximately 160 feet long and 160 feet wide, was designed to meet the ROD-specified technical standards of the Resource Conservation and Recovery Act (RCRA). The landfill was designed as a containment area for contaminated soils and sediments that were excavated from the various areas of contamination across the Site (see Section 4.3.1). Approximately 8,500 cubic yards of fill, the majority from the excavated areas of the Site, were placed into the double-lined landfill cell (Fluor Daniel GTI, 1997).

A leachate collection system consisting of a submersible pump with automatic sensing controls and associated piping was constructed at the southern side of the landfill due to its proximity to the water treatment plant. The leachate system piping extended from the pump at the base of the landfill to the treatment plant, where the collected leachate was treated (Fluor Daniel GTI, 1997). All construction activities, including installation and testing of the liners and leachate collection system, placement of the soils and dewatered sediments excavated from the various areas of the Site, and construction of the landfill cap followed the EPA-approved design specifications and construction quality assurance plan. The landfill cap was seeded and mulched in November 1996 (Fluor Daniel GTI, 1997).

Four groundwater monitoring wells (LF-1 through LF-4) were installed around the perimeter of the landfill cell in June 1993 to assess the effectiveness of the double-lined landfill. Monitoring well LF-1 was installed south of the landfill to assess groundwater quality upgradient of the landfill, while monitoring wells LF-2 through LF-4 were installed north, or downgradient, of the landfill (Fluor Daniel GTI, 1997). Following semi-annual baseline sampling of the wells in 1993 and 1994, the monitoring frequency was reduced to an annual event. The results of the annual monitoring events are discussed in Section 6.4.1.

4.3.3 Former Lagoon Area Cap Construction

The former lagoon area, located southeast of Hocomonco Pond and west of the landfill (see Figure 4-1), was capped in October 1996. Temporary drying beds had been constructed at this location for dewatering the saturated dredged and excavated sediments from the contaminated areas on the Site (see Section 4.3.1). Approximately 3,660 cubic yards of unclassified fill, obtained from the former storm drain and tank farm excavations, was placed in the former lagoon area. In addition, approximately 1,200 cubic yards of unclassified fill was imported from two off-site borrow sources to achieve the minimum elevations required by the design specifications. (Fluor Daniel GTI, 1997a).

During excavation of a portion of the anchor trench for the cap liner system a concrete structure, thought to be a retaining wall, was encountered. Due to its size, the concrete was left in place and the cap was extended to include this subsurface structure. All construction activities, including installation and testing of the liner, placement of the fill materials, and construction of the geomembrane cap, followed the EPA-approved design specifications and construction quality assurance plan (Fluor Daniel GTI, 1997a). Once all the required cover materials were in place, 6 inches of stone was placed around the perimeter slopes of the cap to prevent erosion. Seeding and mulching of the cover and associated drainage channels of the former lagoon occurred in November 1996, concurrent with the seeding of the landfill cap (Fluor Daniel GTI, 1997a).

Four groundwater monitoring wells (MLC-1 through MLC-4) were installed in June 1993 to establish baseline conditions prior to installation of the cap on the former lagoon area. Monitoring well MLC-1 was installed south, hydraulically upgradient, of the former lagoon, while MLC-2, MLC-3, and MLC-4 were installed north, or downgradient, of the lagoon (Fluor Daniel

GTI, 1997a). Following semi-annual baseline sampling of the wells in 1993 and 1994, the monitoring frequency was reduced to an annual event. The results of the annual monitoring event are discussed in Section 6.4.1.

In addition, six of the monitoring wells installed during previous investigations (TRC-6S, TRC-6D, TRC-7S, TRC-7D, TRC-B1, and TRC-C2) were abandoned according to MADEP guidelines in order to construct the cap (Fluor Daniel GTI, 1997a).

4.3.4 Storm Drain Sealing

The storm drain located along Otis Street (see Figure 4-1) was cleaned and inspected in November 1994. A total of 1,032 linear feet of storm drain was inspected and cleaned, as were manholes and catch basins located along Otis Street. During this operation approximately 10,000 gallons of water were generated and approximately 1.5 cubic yards of debris were collected. The water and debris was initially pumped to the drying beds; after dewatering, the debris was then placed in the double-lined landfill and the water was treated in the treatment plant. No cracks or structural deficiencies were detected during the inspection of the storm drain. In September 1995, joints in the storm drain were sealed and two manholes and four catch basins were grouted (Fluor Daniel GTI, 1997b).

The Otis Street culvert is approximately 113 feet long and 3.5 feet in diameter and drains from Hocomonco Pond. The culvert was cleaned in September 1996. Approximately 4 cubic yards of sediments were excavated and placed as unclassified fill beneath the former lagoon cap. Approximately 5,800 gallons of water generated during the cleaning were transferred to the water treatment plant (Fluor Daniel GTI, 1997b).

4.3.5 Construction of the Water Treatment Plant

The water treatment plant was designed to treat groundwater containing dissolved and suspended oils and solids to achieve the interim cleanup levels established in the SDD. The design of the water treatment plant was integrated with the DNAPL recovery system and in-situ bioremediation system described in Section 4.3.6 below. No specific discharge limits were set for PAHs and BTEX, identified as “constituents of interest” in the Consent Decree. The plant

thus was designed to meet EPA “Gold Book” effluent discharge criteria shown in the table below and also to pass the acute toxicity screening test (Orbital, 1997).

“GOLD BOOK” CRITERIA		
Compound	**Maximum Concentration (µg/l)**	**Continuous Concentration (µg/l)**
Arsenic	360	190
Chromium III	1700	210
Chromium VI	16	11

Source: Orbital, 1997

The water treatment plant was constructed between November 1993 and July 1994 to treat groundwater containing dissolved and suspended oil and/or solids pumped from several recovery wells located on-site, as well as the water collected in the drying beds during dewatering of excavations and saturated sediments. The plant was located off the site access road from Otis Street and approximately 350 feet southeast of the eastern perimeter of Hocomonco Pond (see Figure 4-1). The plant was designed to operate at a total flow of about 150 gallons per minute (gpm); approximately 135 gpm would be from groundwater, while 15 gpm would be from other sources. Startup of the plant began on August 9, 1994 (Orbital, 1997).

The main unit processes in the treatment plant include pH adjustment, polymer addition, dissolved air flotation (DAF), multimedia filtration, and carbon absorption. The treated water was discharged to Hocomonco Pond, recycled, or diverted to the in-situ bioremediation system where nutrients and oxygen were added and the water injected into the aquifer to enhance bioremediation. Treated effluent was discharged to Hocomonco Pond via an outfall located in the vicinity of sediment station SED-2 (see Figure 4-2) (Bollinger, 2004b). The solids were skimmed off the DAF unit. The heavier solids removed from the DAF unit were stored outside the plant until they were ultimately disposed of off site (Orbital, 1997).

Effluent monitoring was performed during start up and normal plant operations. The certification report documenting that construction and operation of the plant were completed in substantial conformance with the design documents also confirmed that the discharge from the plant was in compliance with the “Gold Book” criteria during start up and normal operation (Orbital, 1997).

4.3.6 DNAPL Recovery/In-Situ Bioremediation

The primary objective of the groundwater pump and treat system was to remove DNAPL from a series of DNAPL recovery wells and treat the associated contaminated groundwater; and to recover and treat contaminated groundwater from Kettle Pond, add nutrients to enhance bioremediation, and then reinject the treated water through a series of reinjection wells. The DNAPL recovery wells and bioremediation recovery and reinjection wells were installed concurrent with construction of the water treatment plant. The recovery wells were piped to a DNAPL storage tank located behind the water treatment plant. The four DNAPL recovery wells (DRW-1 through DRW-3, A-10) were fitted with automatic groundwater and DNAPL pumps (BBL, 2003a). The five biological recovery wells (BRW-1 through BRW-5) installed in the Kettle Pond area as part of the in-situ bioremediation system were fitted with manually-operated DNAPL recovery pumps (BBL, 2003a). These wells are shown on Figure 4-2.

The in-situ bioremediation system began operation on March 4, 1996. Operation of the system was suspended on March 18, 1996 due to problems with dissolved, naturally-occurring iron in the groundwater. The 1992 ESD stated that if the combination of DNAPL recovery and in-situ bioremediation could not remediate the creosote contamination "to cleanup goals within a reasonable time period as determined by EPA, then other technologies, such as in-situ soil flushing, will be implemented" (EPA, 1992). Following additional groundwater sampling in the Kettle Pond area, two other treatment alternatives, air sparging and natural attenuation, were evaluated. The evaluation concluded that the effectiveness of both technologies was limited due to the presence of residual and free phase DNAPL (Fluor Daniel GTI, 1998). Based on experience with other sites contaminated with creosote at DNAPL concentrations, EPA then recommended that a technical impracticability demonstration be completed for certain areas of the Site (see Section 4.3.7). The BRW wells continue to be checked for the presence of DNAPL. DNAPL is regularly found only in BRW-5; when present the pump is manually activated to remove the accumulated DNAPL.

The DNAPL recovery wells were operated in an enhanced/passive mode beginning in March 1995. After 2 years of adjustments to the timing and pumping rates, the system was set to run at 10 gpm at DRW-1 and 5 gpm at DRW-2 over a 6-week cycle as described below (BBL, 2003). During each 6-week cycle, two wells, DRW-1 and DRW-2, were operated in an enhanced mode for 4 weeks and passive mode for 2 weeks. Wells DRW-3 and A-10 were

operated in a continuous passive mode. During operation in the passive mode, the DNAPL pumps were set to automatically switch on and remove DNAPL at the rate that it enters each well. In the enhanced mode, both the groundwater and the DNAPL pumps were active; groundwater was pumped to create a hydraulic gradient toward the wells, increasing the rate that the DNAPL enters the well, thus increasing the volume of DNAPL recovered (BBL, 2003). The DNAPL is collected in the DNAPL storage tank located behind the water treatment plant; the groundwater is treated in the water treatment plant.

The PRP completed an evaluation of the DNAPL recovery program during 2002 which concluded that the enhanced system had "reached a point of diminishing returns" and that the monitoring data indicated that the DNAPL area appeared to be stable in extent (BBL, 2003a). The DNAPL recovery evaluation also showed that during enhanced recovery operations, there was a direct relationship between DNAPL recovery rates and groundwater pumping rates. The report noted that "within the range of pumping rates tested, at higher groundwater pumping rates, a greater volume of DNAPL was recovered" (BBL, 2003).

In early 2003, EPA and the PRP discussed the PRP's recommendation to switch to a wholly passive system, operate the system and monitor the results for 1 year, and based on the results, recommend modifications for future passive recovery activities. The PRP submitted an "Operation and Monitoring Plan Modification for DNAPL Recovery" to the agencies that proposed modifications to the DNAPL recovery system based on the above recommendations (BBL, 2003a). An objective of the plan modification was to collect additional information to modify the system to operate in a passive mode after decommissioning of the water treatment plant (BBL, 2003a).

In May 2003, the PRP began operating the DNAPL recovery system in passive mode and collecting data for the system evaluation. On July 21, 2003, EPA agreed to allow passive recovery to continue (BBL, 2004). Following the 1 year evaluation period, the PRP planned to summarize all data and information in a report that would include recommendations for long-term changes to the DNAPL recovery system operations (BBL, 2003a). The volumes of DNAPL recovered, and other relevant recovery system data are discussed in Section 6.4.2.

4.3.7 Technical Impracticability of Groundwater Restoration

During 1997, the PRP conducted investigations to establish site-wide groundwater quality conditions and determine whether it would be practical to restore groundwater at the Site to drinking water standards. The investigations involved drilling one soil boring downgradient of Kettle Pond, installing 24 pore water sample points in Hocomonco Pond, conducting a site-wide groundwater level and DNAPL measurement event, and performing a groundwater and pore water sampling and analysis round at 55 locations on-site (Fluor Daniel GTI, 1998). Groundwater and pore water samples were collected and analyzed for PAHs, BTEX, and filtered and unfiltered (total) arsenic and chromium.

While the interim cleanup levels established in the SDD were exceeded in some locations for total, or unfiltered, arsenic and chromium samples, the filtered results showed chromium and arsenic concentrations below the cleanup levels, with the exception of one arsenic exceedance. The exceedance of the cleanup level for total arsenic was attributed to reducing conditions found in the Kettle Pond area. Benzene and naphthalene were the most frequently detected contaminants exceeding the interim groundwater cleanup levels (Fluor Daniel GTI, 1998). Since benzene and naphthalene had historically exceeded the cleanup levels, the technical impracticability (TI) evaluation focused on these compounds as the primary constituents of concern. The results and conclusions of this investigation were presented in a "Report Demonstrating the Technical Impracticability of Restoring Groundwater at the Hocomonco Pond Site," dated April 1998.

During this time frame, sediment data from samples collected along the southeast side of Hocomonco Pond showed increasing concentrations of PAHs. These results suggested that groundwater from the Kettle Pond area containing dissolved PAHs, primarily naphthalene, was discharging through remediated sediments into the southern portion of the pond. A sediment sampling plan was developed in 1998 using guidance provided by EPA and was used to collect a round of sediment samples from three locations in December 1998 (BBL, 2001).

The TI report concluded that there were two primary DNAPL entry locations on the Site, the Kettle Pond area and the former lagoon area. Soil samples collected from borings in the Kettle Pond area confirmed that DNAPL was present in both shallow and deep soil samples; test pits in the former lagoon area encountered DNAPL in the unsaturated soils (Fluor Daniel GTI, 1998).

The investigations determined that remedial actions at these two areas were able to mitigate the presence and/or migration of DNAPL, even though DNAPL might be present at other locations on the Site.

The TI investigations determined that the till layer located beneath the glacial drift aquifer not only acted as a barrier to vertical migration of DNAPL, but also enhanced the horizontal migration of DNAPL (Fluor Daniel GTI, 1998). The lateral extent of DNAPL contamination at the former lagoon area was estimated to be approximately 125 feet from north to south and approximately 100 feet from west to east. The lateral extent of DNAPL contamination at the Kettle Pond area was estimated to be 375 feet from northeast to southwest and approximately 250 feet from southeast to northwest (Fluor Daniel GTI, 1998). The residual and free phase DNAPL had migrated downward through the glacial drift deposits in areas across the Site. In the area west of Kettle Pond, DNAPL was found to a maximum depth of 170 feet bgs (Fluor Daniel GTI, 1998). At the former lagoon area, DNAPL was found in the unsaturated zone, extending to the water table surface, as the downward migration of DNAPL was limited.

Due to the lack of DNAPL at depth around the former lagoon area, DNAPL recovery efforts were focused to the area west of Kettle Pond. By September 1999 approximately 31,000 gallons of creosote DNAPL had been recovered. Given the extent of DNAPL contamination present at the Site, the TI report concluded that: “The presence of residual phase DNAPL represents a long-term source for impacts to groundwater since this phase of DNAPL is difficult to remove. Locating all free phase DNAPL sources and the inability to remediate residual phase DNAPL makes groundwater restoration technically impracticable” (Fluor Daniel GTI, 1998).

The report also stated that there was no significant risk to human health or the environment posed by the presence of free phase or residual phase DNAPL at the Site, and suggested implementing institutional controls to mitigate potential future risk. Based on these conclusions, the EPA “Guidance for Evaluating the Technical Impracticability of Groundwater Restoration,” and other relevant documents, the PRP requested a waiver of interim groundwater cleanup levels for the areas within the defined TI zone. The horizontal extent of the TI zone is shown in Figure 4-2. The vertical extent of the TI zone was defined as follows: Kettle Pond area (286 feet to 202 feet above mean sea level), area west of Kettle Pond (279 feet to 155 feet above mean

sea level), and the former lagoon area (306 feet to 282 feet above mean sea level) (Fluor Daniel GTI, 1998).

4.3.8 1999 Explanation of Significant Differences

Based on the PRP's TI Report, EPA determined that "remediating groundwater to drinking water quality may not be achievable in certain areas of the Hocomonco Pond Site" (EPA, 1999). The 1992 SDD allowed for the re-evaluation of the interim cleanup levels during implementation of the selected remedy. The interim groundwater cleanup levels established in the SDD assumed that groundwater restoration was an achievable goal. On September 21, 1999, EPA issued a second ESD that waived the groundwater ARARs and cleanup levels in the two TI zones identified in the PRP's TI report. The 1999 ESD changed the remedial objective from groundwater restoration to plume containment since the presence of DNAPL makes groundwater restoration technically impracticable in certain areas of the Site.

EPA and MADEP concluded that this modified remedy was adequately protective of human health and the environment because institutional controls, long-term monitoring, and continuing DNAPL recovery activities were required as part of the TI waiver (EPA, 1999). The 1999 ESD allowed the in-situ bioremediation system to be discontinued but required DNAPL recovery to "continue until the EPA and MADEP give a written approval stating otherwise" (EPA, 1999). The 1999 ESD also required groundwater monitoring and surface water and sediment sampling to ensure that the groundwater is hydraulically contained and contaminant levels do not increase in concentration or extent. Should levels increase, the ESD stated that additional site work or engineering controls may be required. Finally, the 1999 ESD required that a deed restriction be placed on the Hocomonco Pond property to prohibit groundwater extraction, as discussed in Section 4.3.9 below. The PRP prepared a long term monitoring plan (LTMP), as required by EPA in the 1999 ESD. The LTMP, revised September 2001, is discussed in Section 4.5.

4.3.9 Institutional Controls

The ROD and various decision documents state that deed restrictions are required for specific areas of the Site. The ROD required placement of deed restrictions on the area of the former lagoon cap, to prohibit development in the area, and also along the embankment of Otis Street

(EPA, 1985). The ROD also required land use restrictions on the on-site landfill to prohibit any future development, similar to that required for the former lagoon area (EPA, 1985). The 1999 ESD included a requirement for another deed restriction to "prohibit extraction of the groundwater for purposes other than the remedial action unless the extracted groundwater meets or is treated to appropriate water use and/or disposal standards in effect at the time of extraction and the extraction of the groundwater does not adversely affect the remedial action" (EPA, 1999).

4.4 Operations and Maintenance

The ROD specified the following O&M activities for the former lagoon area: long-term groundwater monitoring, cap maintenance, and mowing to maintain the cover and prevent tree growth (EPA, 1985). In addition, institutional controls in the form of deed restrictions were required, as described in Section 4.3.9. The O&M activities are required by the ROD for an indefinite period of time "since in-situ physical, chemical or biodegradation mechanisms are not expected to reduce the material to a non-hazardous classification for many years" (EPA, 1985). Monitoring wells were installed around the perimeter of the former lagoon (see Section 4.3.3). Following baseline monitoring, annual groundwater monitoring was initiated in 1995. The annual monitoring results are discussed in Section 6.4.1.

The ROD specified the following O&M activities for the on-site RCRA double-lined landfill: groundwater monitoring, facility inspection and maintenance, and leachate collection and treatment. In addition, land use restrictions were required, as described in Section 4.3.9. The O&M requirements for the landfill are consistent with the RCRA post-closure care and groundwater protection requirements. The landfill and former lagoon area are visually inspected on a monthly basis and the four monitoring wells around each area are sampled annually. The results of the O&M activities for the on-site landfill are discussed in Section 6.4.1.

The remedy for the Otis Street area specified periodic surface water monitoring at the Hocomonco Pond discharge stream as the only O&M requirement. This monitoring requirement has been fulfilled (Anderson, 2004). As noted in Section 4.3.9, the ROD also required a deed restriction for the Otis Street embankment (EPA, 1985).

The remedies for the isolated areas, Hocomonco Pond and discharge stream, and the Kettle Pond area all involved placement of dredged or excavated materials in either the former lagoon area or in the on-site landfill designed to meet RCRA technical standards. Therefore there are no separate O&M activities specified in the ROD for these areas beyond those described above.

4.5 Long Term Monitoring Plan

As mentioned in Section 4.3.8, consistent with the terms of the 1999 ESD and the TI waiver, the PRP developed a long term monitoring plan (LTMP) to ensure that the groundwater is hydraulically contained and contaminant levels do not increase in concentration or extent. The first phase of the long term monitoring program included performance of baseline biological monitoring in May 2002. The objective of this monitoring was to characterize the conditions prior to commencement of routine long-term monitoring and collect baseline data to be used to confirm that the TI waiver remains a protective remedy. The baseline monitoring included analysis of sediment samples for PAHs, total organic carbon (TOC), grain size, and percent solids, sediment bioassay testing, and a benthic invertebrate community survey. The benthic survey included locations within the TI zone as well as reference locations elsewhere in Hocomonco Pond.

The LTMP required semi-annual sampling events for a period of 5 years. The 5 years of data would then be used to identify any notable trends according to the criteria in the LTMP (e.g. increasing, decreasing, or no trend). This evaluation, following the decision tree outlined in the LTMP, would be the basis for decisions regarding continued monitoring at the Site, or other actions.

The LTMP was implemented in late 2000, with the first semi-annual event conducted in November. The elements of the LTMP include: water level measurements in 63 wells (semi-annually); groundwater sampling of 6 wells (semi-annually) and 2 wells (annually); measurement of DNAPL thickness (annually); and sediment sampling at 4 locations (semi-annually). Groundwater samples are analyzed for PAHs and BTEX. Sediment samples are analyzed for PAHs, TOC, percent solids, and grain size. Analysis for arsenic and chromium is not included as part of the LTMP based on the results and conclusions of the 1997 investigation which supported the TI waiver and 1999 ESD.

In addition, the 1999 ESD also required collection of sediment samples. Each sample was a composite collected from the upper 6 inches of sediment. All sediment samples were analyzed for PAHs, TOC, and grain size. A Sediment Sampling Plan, initially developed in 1998, was included as Appendix A of the LTMP. This Plan states that the sediment sample results will be compared to the criteria established in the SDD. A cleanup level of 35 mg/kg total PAHs was established for the protection of aquatic life; a cleanup level of 4 mg/kg phenanthrene was established for shallow sediments (e.g. less than 2 feet). If the sediment monitoring data indicate that cleanup levels are exceeded, the Plan states that the agencies and PRP will "discuss and agree upon appropriate additional investigative activities" (BBL, 2001).

The locations and frequency of sampling outlined in the LTMP for groundwater and sediments are summarized in the table below. The long-term monitoring data are discussed in Section 6.4.4.

LONG-TERM MONITORING SAMPLING LOCATIONS/FREQUENCY		
Groundwater Monitoring Well	**Location (see Figure 4-2)**	**Sampling Frequency**
BMW-3	Upgradient of Kettle Pond TI zone	Spring and Fall
M-15S	Within Kettle Pond TI zone	Spring and Fall
M-15D		Spring and Fall
A-9	Downgradient of the Kettle Pond TI zone	Spring and Fall
TRC-3S	Between northeastern end of Kettle Pond TI zone and Hocomonco Pond discharge stream	Spring and Fall
TRC-3D		Spring and Fall
MLC-1	Upgradient of former lagoon TI zone	Fall
MLC-2	Downgradient of former lagoon TI zone	Fall
Sediment Sample	**Location**	**Sampling Frequency**
SED-1 / T1	Within Kettle Pond TI zone, where groundwater is expected to discharge to the pond	Spring and Fall
SED-2 / T2		Spring and Fall
SED-3 / DSREF1	Between T3 and T4, not likely influenced by groundwater from Kettle Pond TI zone	Spring and Fall
SED-HP / DS-HP	Northern edge of Kettle Pond TI zone, not likely influenced by groundwater from Kettle Pond TI zone	Spring and Fall

Source: BBL, 2001

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the first five-year review for the Hocomonco Pond Site.

6.0 FIVE-YEAR REVIEW PROCESS

This section provides a summary of the five-year review process and the actions taken by the EPA to complete the review.

6.1 Administrative Components

EPA is the lead agency for this five-year review. EPA issued a scope of work, WAF No. 138-FRFE-0137, to TtNUS, under EPA Contract No. 68-W6-0045, on March 26, 2004 to provide assistance to EPA in performing the five-year review. The EPA Work Assignment Manager was Derrick Golden. Jay Naparstek, MADEP, and Bart Hoskins, EPA risk assessor, were also part of the review team.

The schedule established by EPA included completion of the five-year review by September 22, 2004.

6.2 Community Notification and Involvement

TtNUS prepared a public notice and request for public participation. After EPA approval, the information was sent to a number of local newspapers. An article was published in the Metrowest Daily News on June 7, 2004 describing EPA's five-year review of the Hocomonco Pond Site remedy. The newspaper article encouraged public participation. In response to interest from the local newspaper, EPA, MADEP, and PRP representatives conducted a site visit on July 19, 2004 with a staff writer from the Westborough News. An article summarizing site activities was published in the Westborough News on July 23, 2004. According to personnel at the Westborough Public Library, interest in the Site has been limited mostly to school children researching documents for book reports and local legend.

The ROD noted that, while community interest dated back to 1976, when an oily discharge from the storm sewer drainage pipe was noticed by a local resident, in general community interest had not been high. Several specific concerns raised by the community were noted in the ROD, including water quality, the expansion of the water supply at the Otis Street municipal well, and restoration of Hocomonco Pond as a recreational area (EPA, 1985). Although not specifically required, EPA provided public comment periods on the proposed 1992 ESD for the Kettle Pond

area and on the proposed 1999 ESD for modification of the groundwater remedy, to ensure full community involvement (EPA, 1992; EPA, 1999).

During a visit to the Westborough Town Hall on June 9, 2004, representatives from TtNUS briefly described the five-year review process to the town officials and asked for comments regarding the Site and potential redevelopment plans for the property. The Site Inspection Report is attached as Appendix B.

6.3 Document Review

This five-year review consisted of a review of relevant documents including decision documents, monitoring plans, and monitoring reports provided by EPA (see Appendix A).

6.4 Data Review

A review was completed of various PRP-contractor plans and monitoring reports. A summary of relevant data regarding the components of the Site remedy is presented below.

6.4.1 Landfill and Former Lagoon Area Monitoring and Inspections

Annual monitoring of the four wells around the landfill and the four wells around the lagoon began in 1995. Groundwater samples are analyzed for PAHs. The certification reports indicated that 5 years of data (e.g. 1995 - 2000) would be sufficient to assess the effectiveness of the landfill liner and the landfill and lagoon caps (Fluor Daniel GTI, 1997; 1997a). The lagoon final design documents stated that if the PAH concentrations are steady or decreasing it is assumed that the caps are effective and the routine annual monitoring would continue (Chester, 1993).

Samples were collected from these wells during the 1997 TI investigations to establish site-wide groundwater conditions to demonstrate the technical impracticability of groundwater restoration. Groundwater from all 8 wells was analyzed for PAHs. All of the sample results were non-detects except for well MLC-2 where acenaphthene and naphthalene were detected (97 µg/l and 5,500 µg/l, respectively) (Fluor Daniel GTI, 1998). BTEX, arsenic, and chromium analyses were completed for samples from MLC-1 and LF-1, the two upgradient wells. Chromium was the only compound detected in both wells above the method reporting limit. The chromium

concentrations (138 µg/l and 1020 µg/l, respectively) exceeded the interim groundwater cleanup level (100 µg/l) (Fluor Daniel GTI, 1998).

The annual monitoring data for the past two years (October 2002 and October 2003) have shown a single PAH detection, (0.59J µg/l phenanthrene at LF-1, 10/30/03) at the four wells around the landfill. Two of the four wells around the former lagoon are part of the LTMP and are analyzed annually for BTEX and PAHs. The last two annual monitoring rounds have shown no detections of BTEX or PAHs at MLC-1. Acenaphthene, acenaphthylene, and fluorene have been detected at MLC-2, MLC-3, and MLC-4; generally at concentrations either near the detection limit or well below the interim groundwater cleanup level (note no cleanup level was established for acenaphthylene) (Bollinger, 2004a). Naphthalene was also detected in the three wells as summarized below; the only exceedances of the cleanup level were seen for MLC-2 (see also Section 6.4.4).

Compound	MONITORING WELL AND ANNUAL MONITORING DATE					
	MLC-2 10/30/02	MLC-2 10/30/03	MLC-3 10/30/03	MLC-3 10/30/03	MLC-4 10/30/02	MLC-4 10/30/03
Naphthalene	4730*	1630	861	520	87.3	87.4

* average of duplicate pair
Source: Bollinger, 2004a

The landfill cap is visually inspected semi-annually; the former lagoon area cap is visually inspected annually. Chester Environmental's inspection reports covering the period of October 2000 through August 2004 have noted the condition of the caps (e.g. extent of grass coverage) has improved from "fair" in October 2000 to "good" since October 2002 (Bollinger, 2004c). Grub damage and some side slope erosion was noted on the landfill cap in August 2000. Repairs were made to the landfill cap. Fertilizer and grub control is added as needed. There has been no other evidence of erosion or settlement. Brush and trees around the perimeter of each area have recently been cut; no trees have become established on the caps (Bollinger, 2004c). During the site inspection, the PRP representative noted that leachate is no longer being generated and collected from the landfill. EPA has requested information from the PRP about the frequency and volume of leachate that was generated from the landfill in the past.

6.4.2 DNAPL Recovery

The DNAPL recovery system has been in operation since 1995. Between 1995 and July 2004, approximately 56,405 gallons of DNAPL have been recovered. Approximately 54,091 gallons of the total volume recovered were collected from the DNAPL recovery wells, DRW-1, DRW-2, DRW-3, A-10, and BRW-5 (BBL, 2004c). The balance of the DNAPL was collected from other wells when greater than 1 foot of DNAPL was present during routine gauging for DNAPL as part of the LTMP.

Between 1998 and May 2003 the DNAPL recovery system operated in a dual enhanced/passive mode. Since May 5, 2003, the system has operated only in a passive mode in accordance with the PRP's April 14, 2003 O&M modifications (BBL, 2003a). The proposed 1-year passive mode evaluation period has continued beyond May 2004 to allow for the collection of additional passive recovery data (Golden, 2004). The system continues to operate in passive recovery mode. The volumes of DNAPL collected to date, over approximately 12-month periods, are summarized below for DRW-1 and DRW-2. These two recovery wells were operated in an enhanced/passive mode until May 5, 2003 and now operate in a passive mode along with the other DNAPL recovery wells. The data in the table below indicate that while maintaining the 15 gpm combined groundwater pumping rate for the two wells, the volume of DNAPL recovered between February 1998 and May 2003 declined.

DNAPL RECOVERED FROM DRW-1 & DRW-2, FEBRUARY 1998 – JUNE 2004

Time Period	DRW-1 (gallons)	DRW-2 (gallons)	Mode*
2/6/98 – 4/1/99	3565	2817	Enhanced/passive
4/1/99 - 4/13/00	2672	5345	Enhanced/passive
4/13/00 – 4/26/01	2697	2787	Enhanced/passive
4/27/01 – 5/9/02	2990	3372	Enhanced/passive
5/9/02 – 5/5/03	1771	1867	Enhanced/passive
5/5/03 – 7/31/04	131	657	Passive

* During enhanced mode groundwater was pumped from DRW-1 at 10 gpm and from DRW-2 at 5 gpm.

Source: BBL, 2002; BBL, 2004d

The volumes of DNAPL recovered during passive operations between December 2003 and June 2004 are summarized in the table below.

VOLUME OF DNAPL RECOVERED (gallons) (passive operation mode)								
Well	**Dec. 2003**	**Jan. 2004**	**Feb. 2004**	**March 2004**	**April 2004**	**May 2004**	**June 2004**	**July 2004**
DRW-1	7.26	0	4.84	0	0	2.42	0	4.84
DRW-2	70.18	19.36	30.25	16.94	70.18	33.88	31.46	19.36
DRW-3	1.74	1.74	2.61	0	1.74	1.74	1.74	0
A-2	1.74	0	7.83	11.31	6.09	3.48	6.96	4.35
A-4	75.02	0	31.46	24.2	67.76	36.3	67.76	14.52
A-10	14.79	7.83	4.35	4.35	8.70	6.96	7.83	4.35
BRW-5	0	0	2.0	1.25	1.5	1	0.5	0
BMW-6	0.25	0	1.0	0.5	0	0.5	0.75	0.50
Total Volume	170.73*	28.93**	84.34	58.55	155.97	86.28	117	47.92

* 4 ounces of DNAPL also removed from M-16
** Product lines frozen preventing collection of DNAPL
Source: BBL, 2004; BBL, 2004a; BBL, 2004b; BBL, 2004c

6.4.3 Water Treatment Plant Effluent Discharge Monitoring

The water treatment plant was designed to operate in conjunction with the in–situ bioremediation system and sized to treat groundwater extracted from the five Kettle Pond area BRW wells. After the bioremediation system was shut down and groundwater recovery in the Kettle Pond area ceased, the volume of groundwater received by the plant was limited to that pumped from DRW-1 and DRW-2 during the enhanced operation phase of the DNAPL recovery system, described in Section 4.3.6. Due to the greatly reduced volume of groundwater, the water treatment plant was switched to operate in a batch, rather than a continuous mode, treating groundwater approximately 2 days a week, 8 hours a day, four weeks out of every six (Beazer, 1998). In 1998 the PRP proposed a modification to the plant monitoring schedule.

The treated effluent data for the period of July to October 1998 and January to April, June and August 1999 showed no detections of arsenic, chromium, or hexavalent chromium, the only compounds with “Gold Book” criteria applicable for the effluent discharge (Beazer, 1999). The modified monitoring schedule eliminated further analyses for these three compounds and included analysis once per batch cycle for pH, TSS, BTEX, PAHs, and a semi-annual acute toxicity screening (Beazer, 2001). After review of the 1998 and 1999 effluent data, the agencies agreed to the modifications to the monitoring schedule (Golden, 2004).

Effluent data covering the period October 2002 through June 2004 (during batch operations of the treatment plant) have shown no detections of BTEX, PAHs, or phenols in the treated effluent (Bollinger, 2004). The October 2002 acute toxicity results showed comparable cumulative percent mortality data for the primary control and the 100% effluent tests (Bollinger, 2004).

Since the DNAPL recovery system was changed from enhanced/passive operation to all passive in May 2003, the water treatment plant has been operated in batch mode on an as needed basis.

6.4.4 Long Term Monitoring

The LTMP includes baseline biological monitoring and routine monitoring, as described in Section 4.5. The results of the May 2002 baseline monitoring and routine long-term monitoring from fall 2000 through fall 2003 are discussed below.

Baseline Monitoring Results

The baseline monitoring program was conducted in May 2002 at the four sediment sample locations shown on Figure 4-2 and the table in Section 4.5. A second reference station was also sampled due to the abundant leaf litter found at station SED-3 (AMEC, 2003). The analytical results for the sediment samples are discussed below along with the other routine sediment long term monitoring data.

The bioassay toxicity test results were analyzed using t-tests. No statistically significant differences were found in survival or growth of the midge larvae (*C. tentans*) or amphipods (*H. azteca*) between the two site (e.g. within the TI zone) and three reference locations (AMEC, 2003). The t-test results for the benthic macroinvertebrate community survey indicated no statistically significant differences between the site and reference locations (AMEC, 2003). The only individual metrics found to be statistically significant between the site and reference locations were noted for the Hilsenhoff Biotic Index and percent crustaceans and mollusks. These differences appeared attributable to the results from station SED-2 (T2) (AMEC, 2003).

According to the LTMP, further biological studies would be performed if PAH concentrations in the sediment exceed the cleanup levels established in the SDD and show a statistically

increasing trend. Should these conditions occur, the LTMP decision tree outlines the steps that the PRP would take to evaluate if additional biological monitoring is appropriate (AMEC, 2003).

Routine Long-Term Monitoring Results

As discussed in Section 4.5, routine long-term monitoring includes groundwater level and DNAPL thickness measurements, and groundwater and sediment sample collection and analysis. The monitoring results over the 3-year period from fall 2000 to fall 2003 are discussed below. Sample locations are shown on Figure 4-2 and described in the table in Section 4.5.

The reporting frequency outlined in the LTMP has been modified based on agreements between EPA, MADEP, and the PRP. All parties agreed that it would be beneficial to use two or more years of data in the evaluation of the monitoring data outlined in the LTMP (Golden, 2004). Data collected in accordance with the LTMP during 2000 and 2001 were presented and findings summarized in a Long Term Monitoring Report, June 2002 (BBL, 2002a). A second Long Term Monitoring Report, summarizing the data and findings for 2002 and 2003, was submitted to the agencies on July 30, 2004 (BBL, 2004b). In accordance with the LTMP, after 5 years the data collected from the semi-annual events will be evaluated to identify trends in constituent concentrations in groundwater and selected sediments. Following the fall 2005 semi-annual event, this first 5-year data evaluation will be completed and a determination will be made as to the future monitoring required to demonstrate that the remedy and TI waiver documented in the 1999 ESD remains protective of human health and the environment (BBL, 2004b).

Water level measurements collected from all 63 wells on the Site during each semi-annual event indicate that the groundwater flows consistently northwest across the Site toward Hocomonco Pond. During the fall events, the water levels in the wells at the north end of the Site suggest that groundwater may flow northward in the areas of A-9 and the TRC-3 cluster toward the wetland areas northeast of Otis Street (see Figure 4-2) (BBL, 2004b).

DNAPL was detected in 14 of the 63 wells during the 2000 – 2001 period and in 12 of the same wells during the 2002 – 2003 period. The apparent DNAPL thickness varies between gauging rounds and ranged from trace (A-2; May 21, 2003) to 17.43 feet (A-4; May 21, 2003) (BBL, 2004b). All detections of DNAPL have been observed in wells in the Kettle Pond TI zone; DNAPL was consistently detected in the same wells. Over the 2000 – 2003 period, DNAPL

has not been detected in any of the other 49 wells on the Site. The DNAPL thicknesses recorded over the 2000 – 2003 period are summarized in the table below.

RECORDED DNAPL THICKNESS – NOVEMBER 2000 – OCTOBER 2003							
Well	**Nov. 2000**	**June 2001**	**Nov. 2001**	**May 2002**	**Oct. 2002**	**May 2003**	**Oct. 2003**
	Apparent DNAPL Thickness (feet)						
DRW-1	0.25	0.61	0.42	0.27	1.58	1.87	0.87
DRW-2	0.22	0.65	0.52	0.50	5.93	8.84	1.6
DRW-3	0.42	0.17	0.32	0.43	0.24	2.05	0.63
BMW-4	ND	Trace	ND	ND	ND	ND	0.48
BMW-6	0.45	1.88	3.28	2.15	2.27	2.8	0.78
BRW-4	ND	Trace	ND	ND	ND	ND	ND
BRW-5	ND	0.75	0.58	1.38	0.90	0.92	0.6
A-2	13.00	NM	NM	9.0	12.96	trace	NM
A-4	9.2	10.25	9.97	12.72	10.07	17.43	4.65
A-6	ND	4.95	ND	ND	ND	ND	ND
A-10	0.45	0.28	0.56	0.55	0.24	3.15	0.65
M-11D	trace	5.25	5.10	5.65	5.46	5.64	0.51
M-12S	2.82	3.5	3.9	1.21	4.27	4.01	0.47
M-16	ND	trace	1.03	1.17	2.12	2.2	1.07

ND = not detected
NM = not measured
Source: BBL, 2002a; BBL, 2004c

Groundwater monitoring data for the monitoring wells upgradient of and outside both TI zones (BMW-3 and MLC-1) and downgradient of and outside the Kettle Pond TI zone (A-9, TRC-3D, TRC-3S) have shown no exceedances of the interim groundwater cleanup levels during the long-term monitoring period to date (BBL, 2004b). The cleanup levels for benzene and naphthalene have been consistently exceeded at the wells located within the Kettle Pond TI zone (M-15S, M-15D). Attaining the cleanup levels within the TI zones was waived by the 1999 ESD. However, the benzene and naphthalene cleanup levels at MLC-2, downgradient and outside the former lagoon area TI zone, have also been consistently exceeded. Concentrations of benzene at well MLC-2 increased from 5.6 µg/l in November 2000 to 22.6 µg/l in October 2003. Naphthalene concentrations in well MLC-2 increased between November 2000 (2,000 µg/l) and October 2002 (5,350 µg/l) and then decreased in October 2003 (1,655 µg/l) (BBL, 2004b).

Although the data over the 3-year period from all of the wells, with two exceptions, have shown benzo(a)pyrene at the analytical reporting limit ($\geq$ 5 µg/l), for all monitoring events the reporting limit for benzo(a)pyrene was higher than the interim groundwater cleanup level (0.2 µg/l). The analytical results for the wells where exceedances have been consistently noted are shown in the table below.

EXCEEDANCES OF INTERIM GROUNDWATER CLEANUP LEVELS							
Well	**Nov. 2000**	**June 2001**	**Nov. 2001**	**May 2002**	**Oct. 2002**	**May 2003**	**Oct. 2003**
	Groundwater Concentrations (µg/l)						
M-15S							
Benzene*	62	42	<100	3.8	65.9	50.5	16.4
Naphthalene**	9,600	5,010	8,760	1,150	5,570	5,260	4,960
M-15D							
Benzene*	<50	10	<100	37.8	15.8	10.1	11.6
Naphthalene**	10,000	10,100	9,980	8,420	10,700	9,170	8,580
MLC-2							
Benzene*	5.6	NS	15.3	NS	12.3	NS	22.6
Naphthalene**	2,000	NS	4,190	NS	5,350	NS	1,630

* Benzene interim groundwater cleanup level = 5 µg/l
** Naphthalene interim groundwater cleanup level = 1,500 µg/l
NS = Not sampled
Source: BBL, 2004c

The PRP's July 30, 2004 Long-Term Monitoring Report presented results for time trend analyses and regression analysis using data for the three wells where interim groundwater cleanup levels are consistently exceeded. The analyses indicated that benzene and naphthalene concentrations in M-15S and M-15D are decreasing. The analyses for MLC-2 were based on only four data points and showed an apparent increase in benzene concentrations and an apparent decrease in naphthalene concentrations (BBL, 2004b).

Sediment sample results over the October 2000 to October 2003 long-term monitoring period show no exceedances of the cleanup levels for total PAH (35 mg/kg) and phenanthrene (4 mg/kg) at stations SED-HP, SED-2, and SED-3, with the exception of one exceedance of the total PAH limit at SED-2 in May 2003 (36 mg/kg) (BBL, 2004b). Over this 3-year period the concentrations of total PAHs ranged from ND to 0.2 mg/kg at SED-HP and SED-3 (reference station DS-REF-1). There were no detections of phenanthrene at SED-HP and SED-3. Stations SED-2 and SED-1 are both located within the Kettle Pond TI zone, in the area where groundwater from the Kettle Pond area is expected to discharge to Hocomonco Pond. The

long-term monitoring results compared to the initial 1998 data for these two sediment stations are summarized in the table below.

LONG-TERM MONITORING RESULTS – SEDIMENTS								
Sediment Station	**Dec. 1998**	**Oct. 2000**	**May 2001**	**Nov. 2001**	**May 2002**	**Oct. 2002**	**May 2003**	**Oct. 2003**
	Sediment Concentrations (mg/kg)							
SED-1 (T-1)								
Total PAHs*	105	90.8	69.0	21.5	143.9	51	52.1	60.1
Phenanthrene**	9.6	3.9	3.9	1.7	9.3	7.0	4.15	6.0
SED-2 (T-2)								
Total PAHs*	32.6	13.2	15.6	14.8	22.95	8.9	35.6	18.1
Phenanthrene**	4.3U	0.43J	1.0	1.02	2.25	0.66	2.3	1.2

* Cleanup level = 35 mg/kg
** Cleanup level = 4 mg/kg
Source: BBL, 2004c

Concentrations of total PAHs and phenanthrene in sediments from station SED-2 have ranged from 13.2 mg/kg to 35.6 mg/kg and 0.43J mg/kg to 2.3 mg/kg, respectively. These concentrations are comparable to the 1998 results for this station. Sediments from station SED-1 have exceeded the total PAH cleanup level in 6 of the 7 sampling events over the October 2000 to October 2003 period. Total PAH concentrations have ranged from 21.5 mg/kg (November 2001) to 143.9 mg/kg (May 2002). The phenanthrene cleanup level was exceeded in the May 2002 through October 2003 events, at concentrations ranging from 4.15 mg/kg (May 2003) to 9.3 mg/kg (May 2002) (BBL, 2004b). These concentrations are comparable to the 1998 results for this station. The concentrations of total PAHs and phenanthrene declined from December 1998 until November 2001, increased significantly in May 2002, and have subsequently declined, although with no consistent downward trend.

6.5 Site Inspection

A site inspection conducted on June 9, 2004 by representatives from EPA, MADEP, Beazer East, Inc., the Westborough Board of Health, and TtNUS. The inspection included a site walkover, an inspection of the water treatment plant, the on-site double-lined landfill, former lagoon area, Kettle Pond and other site features. A site inspection report, including site photographs, is included in Appendix B.

The on-site landfill and former lagoon capped areas were well vegetated; no erosion or damage to the caps were noted. All monitoring wells that were observed appeared to be in good condition and secured with well locks. The piping from the in-situ bioremediation system in the Kettle Pond area remains in place. The treatment plant was not operating but all equipment remains in place. The DNAPL recovery system continues to operate in a passive mode. The Beazer representative stated that over 50,000 gallons of DNAPL have been collected to date. Passive DNAPL recovery has been performed over the past year. The shoreline of Hocomonco Pond was observed from the former boat ramp area, as was the rock-lined discharge channel for the relocated storm drain.

The northwestern, southern, and a portion of the eastern sides of the Site, are secured by a chain link fence topped with barbed wire. Part of the eastern side and the northern side of the property are secured by a 5-foot high chain link fence. The fencing does not enclose the entire site boundary, just the areas of contamination. "No Trespassing" signs are posted on the eastern side of the property, along Otis Street near the entrance to the Site. No warning signs were observed along the balance of Otis Street or along Smith Valve Parkway. There did not appear to be any evidence of vandalism and no reports of vandalism were noted.

6.6 Interviews

General discussions and observations were documented during the site inspection on June 9, 2004. Telephone interviews and e-mail correspondence were completed as a follow-up to the site inspection. Information obtained during the interviews is summarized below. A list of individuals interviewed regarding this five-year review is included in Appendix C.

Paul McNulty, Westborough Director of Public Health, discussed the town's interest in the recreation potential of the Site. The selectmen have approved a future use plan including passive recreation activities for the Site once all remediation activities are complete. Mr. McNulty distributed copies of an aerial photo of the Site showing the location of a proposed walking trail (see Appendix D) outside the fenced areas of the Site, and requested EPA and MADEP approval for the town to complete the trail later in the summer. Mr. McNulty was not aware of any concerns expressed by the public about the Site, or of any Technical Assistance Groups. He confirmed that municipal water supplies for the town, including the Otis Street municipal well, are located in portions of the town that have not been impacted by the Site.

Mike Bollinger, Beazer East, Inc., reported that over 50,000 gallons of DNAPL have been collected to date. Passive DNAPL recovery has been performed over the past year. Typically about 100 gallons/month are collected; usually from the same DNAPL recovery wells. He stated that institutional controls to cover the deed restriction requirements of the ROD and ESDs have been drafted but not yet finalized. Mr. Bollinger stated that there have been no problems with trespassers or vandalism. The landfill and former lagoon caps and other areas of the Site are inspected periodically.

Jay Naparstek, MADEP, stated that MADEP would discuss the town's request to construct the walking trail with EPA. He indicated a generally favorable response to the proposal.

Derek Saari, Westborough Planning Department, was familiar with the Site. He indicated that the public does not appear to be concerned about the site cleanup activities but noted that there are pressures to develop town-owned and industrial-zoned land near the Site.

Two reference librarians at the Westborough Public Library confirmed that site documents are available at the library, although most site documents are in storage. They indicated that both adults and school children have access information about the Site and the status of the cleanup activities. In addition, they confirmed that there do not appear to be concerns about the Site, but there is interest in development/use of the Site when cleanup activities are completed.

Frank Desiata, Westborough Recreation Director, was interviewed by the Westborough News in a July 23, 2004 article about the Site and the five-year review. He indicated that his department and the Department of Public Works are interested in using the water treatment plant building as a joint storage facility (after the treatment plant has been decommissioned, the equipment removed, and the building decontaminated and released to the town by EPA) and sees a potential for passive recreational use of the Site.

7.0 TECHNICAL ASSESSMENT

This section provides a technical assessment of the remedy implemented at the Site, as outlined in the *Comprehensive Five-Year Review Guidance* (EPA, 2001). The assessment evaluated: whether the remedy is functioning in accordance with decision documents; whether exposure assumptions, toxicity values, cleanup levels, and RAOs have changed or been updated; and whether any other information exists that could affect the remedy's protectiveness. There were no ARARs and/or "to be considered" (TBCs) identified in the 1985 ROD since it was a pre-SARA ROD. Chemical-specific ARARs were identified in the SDD as part of the establishment of interim groundwater cleanup levels. Action-specific ARARs, including post-closure care O&M requirements, were identified during the remedial design process for the on-site double-lined landfill and former lagoon area cap.

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

Remedial Action Performance. The on-site landfill and former lagoon area cap are in good condition and are functioning as designed. They are covered by grasses; no erosion was noted. Annual groundwater monitoring around the landfill has shown few detections of PAHs. Monitoring around the former lagoon area has detected naphthalene at three of the four wells. Concentrations at well MLC-2, outside the former lagoon TI zone, have routinely exceeded the benzene and naphthalene interim groundwater cleanup levels. The water treatment plant effluent has met the applicable effluent discharge criteria.

The monitoring program established to ensure plume containment within the identified TI zones is ongoing, as is DNAPL recovery. Through July 2004, approximately 56,405 gallons of DNAPL have been recovered (BBL, 2004c). A significantly larger volume of DNAPL was recovered during operation of the system in enhanced/passive mode than in the passive only mode. The 2002 DNAPL recovery evaluation and pump tests indicated that the volume of DNAPL recovered at the optimal pumping rates established in 1998 had declined over time (BBL, 2003). The evaluation confirmed an increase in the ratio of gallons of groundwater pumped to recover one gallon of DNAPL. The results of the series of stepped pumping tests conducted as part of the 2002 DNAPL recovery evaluation indicated that the increase in system efficiency was negligible at pumping rates above 6 gpm for DRW-1 and 4 gpm for DRW-2 (BBL, 2003). DNAPL continues to be detected, and recovered, in the same group of wells where it has

historically been found. The DNAPL thickness measured in the 14 wells in the Kettle Pond TI zone, where DNAPL is consistently detected, has varied over the 3-year period for which data were available. No consistent trend of increasing, or decreasing, thickness was measured in the 14 wells between November 2000 and October 2003. The greatest thickness recorded in 6 of the wells was measured in May 2003; there was a significant decline in the recorded thicknesses in October 2003.

The LTM data indicate that groundwater within the TI zones remains at generally stable concentrations, with decreasing concentrations in a few locations. Groundwater concentrations at one of the monitoring wells (MLC-2), outside the former lagoon TI zone, exceed the interim groundwater cleanup standards for benzene and naphthalene. The two monitoring wells (M-15S, M-15D) inside the Kettle Pond TI zone show varying trends in concentrations. Benzene and naphthalene concentrations in the two wells exceed the respective interim groundwater cleanup standards.

PAH and phenanthrene concentrations in sediments sampled as part of the LTMP have varied over the 3-year period. Concentrations at one of the two stations located within the Kettle Pond TI zone (SED-1) have exceeded the sediment cleanup levels, indicating an apparent impact of the groundwater discharge from the Kettle Pond area to Hocomonco Pond. The concentrations are generally stable or decreasing and are comparable to the December 1998 sediment concentrations. Based on the data collected to date in accordance with the LTMP, the areal extent of the DNAPL plume appears to be contained.

System Operations/O&M. The ROD estimated the following costs for the O&M activities associated with the selected remedies:

- Former lagoon area - $21,000 annually for water quality monitoring and cap maintenance;
- On-site landfill - $20,000 annually for water quality monitoring; and
- Otis Street storm drain - $5,000 annually for discharge monitoring.

No information was available to assess O&M costs incurred versus the costs estimated in the ROD. The modifications to the ROD-selected remedies specified in the 1992 ESD and 1999 ESD have changed the groundwater RAO from plume restoration to plume containment. This

resulted in establishment of the LTMP and a monitoring program different from that envisioned in the ROD. No cost estimate for the LTMP was available. The O&M activities for the landfill and former lagoon area, as well as the LTMP, continue to be implemented as required.

Opportunities for Optimization. The on-going passive DNAPL recovery operations were implemented to collect data to evaluate whether elimination of enhanced DNAPL recovery as well as decommissioning of the water treatment plant, is appropriate. These actions have the potential to reduce the O&M costs associated with batch operation and maintenance of the plant. The effluent discharge monitoring frequency and parameters were reduced in 2002. The PRP estimated that this change would significantly reduce their annual costs for monitoring the water treatment plant.

The use of enhanced DNAPL recovery has been shown to remove significantly larger volumes of DNAPL than the passive recovery mode. However, during the 1998 to 1993 period of enhanced/passive operation with the system operating at constant groundwater pumping rates (10 gpm for DRW-1 and 5 gpm for DRW-2), the volume of DNAPL recovered declined. Since EPA policy supports removal of DNAPL/source where possible, DNAPL recovery will need to continue to reduce the source of the dissolved-phase DNAPL in the groundwater. EPA and MADEP will evaluate whether passive DNAPL recovery is protective during the 4th quarter of 2004. An evaluation of the LTM program will be made after 5 years of data have been collected. Following the fall 2005 semi-annual monitoring event, an evaluation of groundwater trends and possible modifications to the program will be made.

Indicators of Remedy Problems. No problems with the remedies in place or the on-going O&M activities were identified during this five-year review. The LTM data indicate that groundwater concentrations are generally stable and the areal extent of the DNAPL plume appears to be contained.

Sediment data show exceedances of the cleanup level at station SED-1. This station is located within the Kettle Pond TI zone. Exceedances of the interim groundwater cleanup levels are consistently seen at monitoring well MLC-2, which is located just outside the former lagoon area TI zone. The exceedances along with the other LTM data, will be evaluated following the process described in the LTMP. The decision tree used in the LTMP was developed to allow for flexibility in evaluating the monitoring data and considering what follow up actions, if any, are

required. According to the decision tree, professional judgment would be used to determine whether additional remediation is warranted (Golden, 2004).

Implementation of Institutional Controls. As noted in Section 4.3.9, the ROD and 1999 ESD both require institutional controls in the form of deed restrictions. These deed restrictions, to restrict development in the area of the former lagoon, landfill, and along the embankment of Otis Street, and to prohibit extraction of the groundwater for purposes other than the remedial action unless certain conditions are met, have been prepared in draft form but have not yet been finalized and recorded. The fencing around the remediated areas of contamination is in good condition and appears to adequately control access to the areas.

7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels and Remedial Action Objectives (RAOs) used at the Time of Remedy Selection Still Valid?

Changes in Standards and TBCs. The action-specific ARARs applicable to the landfill and former lagoon area covering post-closure care have not changed. The federal RCRA regulations in 40 CFR Part 264 (§264.310) and the companion state regulations in 310 CMR 30.633 remain applicable to long-term post-closure care and groundwater monitoring. The MCL-based chemical-specific ARARs have not changed, but the interim cleanup levels for ethylbenzene, toluene, xylenes (total), and chromium (total) now represent the final MCLs for each compound, rather than the final MCLGs which were in place when the SDD was completed in 1992.

State groundwater standards have been promulgated since the SDD interim groundwater cleanup levels were established. The Massachusetts Contingency Plan (MCP) includes risk-based groundwater standards for three different types of exposure. The risk-based MCP Method 1 GW-1 standards are applicable if the groundwater is located within a “current drinking water source area,” which is defined in the MCP as groundwater within a Zone II aquifer (310 CMR 40.0006). As mentioned in Section 3.2, the Site is located within a Zone II aquifer, thus the state GW-1 standards are applicable and relevant.

The most current groundwater monitoring data provided by the PRP during this review (from October 2003), indicated that the following GW-1 standards (310 CMR 40.0974(2)) are exceeded for monitoring wells outside of the TI zones: benzene (GW-1 standard = 1 µg/l) at

wells A-9 and MLC-2; acenaphthene (GW-1 standard = 20 µg/l) at well TRC-3S; and naphthalene (GW-1 standard = 20 µg/l) at wells A-9, MLC-2, MLC-3, MLC-4, and TRC-3S. In addition, the analytical method reporting limit used for the PAH analyses for the landfill monitoring well samples (LF-1 through LF-4), the former lagoon area monitoring well samples (MLC-1 through MLC-4), and the eight LTM well samples is higher than the GW-1 standard for the following carcinogenic PAHs (cPAHs): benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; dibenzo(a,h)anthracene; and ideno(1,2,3-cd)pyrene. Thus it is not possible to evaluate the concentrations of these cPAHs from the landfill, former lagoon area, and LTM monitoring wells against the GW-1 standards using the current analytical method.

Changes in Exposure Pathways. The zoning of the area around the Site has remained as general industrial. The Town of Westborough is considering a change to the zoning ordinance and addition of a village townhouse overlay district. Should this change be implemented, village townhouses would be allowed in an area west of the Site. The town also plans to reuse the Site for passive recreation after all site cleanup activities are completed. The Westborough Master Plan defines passive recreation as “activities done in a natural setting with little or no facility development. These activities include hiking, biking, boating, and bird watching” (Daylor, 2003). Passive recreation uses would not result in any new exposure pathways that could affect the protectiveness of the remedy.

The excavation and dredging actions and subsequent disposal of the contaminated materials in the on-site double-lined landfill or within the former lagoon area cap have eliminated the direct contact, ingestion, and inhalation exposure pathways that were evaluated for human health risks in the SDD. Once the required deed restrictions are in place, any future exposure to materials beneath the caps will be prevented, as will potential exposure via ingestion of groundwater.

Changes in Toxicity and Other Contaminant Characteristics. In the development of the soil and sediment cleanup levels, all PAHs were considered to be equal in toxicity to the most toxic, benzo(a)pyrene. Since the development of these levels, EPA has approved a relative potency method for evaluating risks to carcinogenic PAHs whereby each individual cPAH is evaluated using the toxicity value for benzo(a)pyrene in combination with a comparative relative potency factor. Among the other cPAHs, only dibenzo(a,h)anthracene is considered equal in toxicity to benzo(a)pyrene. All other cPAHs are considered less toxic. Since the cleanup levels were

developed using the benzo(a)pyrene toxicity factor for all cPAHs without the relative potency factors, the levels are more protective than they would be if they were re-calculated today.

Risk-based interim groundwater cleanup levels were calculated for noncarcinogenic PAHs. Toxicity values used in the calculation of groundwater clean-up levels (RfDs and CSFs) remain unchanged with the exception of the RfD for naphthalene, which has decreased by 50 percent. For this reason, if the groundwater clean-up level for naphthalene was recalculated today, it would decrease to 750 µg/L from the current cleanup level of 1,500 µg/L.

Changes in Risk Assessment Methods. Soil and sediment clean-up levels for human health were developed for total cPAHs assuming adult and child recreational exposures to soil and sediment through ingestion and dermal contact. Contact was assumed to occur 24 days per year during summer months at most locations within the Site. For the area of the discharge stream, contact was assumed to occur 12 days per year. The selected clean-up levels correspond to cancer risk levels of 10^{-6}. The assumptions used in developing these clean-up goals remain reasonable.

Sediment clean-up levels for protection of aquatic life were developed for total PAHs and phenanthrene. Three different methods were used to develop the ecological clean-up levels, with the average of the three methods selected as the final level. Since the ecological clean-up level for total PAHs is greater than the human health level for total PAHs, the clean-up level used for shallow sediments (0 to 2 feet) was the more stringent human health based clean-up level.

Groundwater clean-up levels for human health were developed based on the assumption that groundwater could be used as a drinking water source. The selected clean-up levels correspond to cancer risk levels of 10^{-6} and Hazard Quotients of 1.0, consistent with current EPA guidelines. Exposure assumptions were consistent with the assumptions that are still accepted today for drinking water scenarios.

Expected Progress Towards Meeting RAOs. The portions of the remedy involving excavation and dredging of contaminated soils and sediments, and placement in the on-site double-lined landfill or the capped former lagoon area, have met the RAOs described in the ROD for the areas of contamination. The RAO for groundwater was changed by the 1999 ESD and TI

waiver from groundwater restoration to plume containment in the identified TI zones. The on-going long-term monitoring program was developed at the agencies' request to demonstrate that the plume containment remedy is protective of human health and the environment. The evaluation of the LTM data after 5 years outlined in the LTMP was designed to assess trends in concentrations of individual constituents. This evaluation should occur following the fall 2005 semi-annual monitoring event. In the meantime, the remedy is progressing as expected. Based on the information available at the time of this five-year review, the remedy appears to be effective at containing DNAPL.

7.3 Question C: Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has been identified during completion of this five-year review that could affect the protectiveness of the remedy. There have been no reports of flooding in the low-lying portions of the Site. No new ecological risks have been identified. Additional benthic invertebrate community monitoring will be performed if warranted based on the decision tree process outlined in the LTMP.

7.4 Technical Assessment Summary

The landfill and former lagoon area caps are in good condition and are functioning as designed. The monitoring established to ensure plume containment within the identified TI zones is ongoing, as is DNAPL recovery. An evaluation of the LTM program will be made after 5 years of data have been collected. Following the fall 2005 semi-annual monitoring event, an evaluation of groundwater trends and possible modifications to the program will be made. The required deed restrictions are not yet in place; however EPA anticipates that they will be finalized by December 2004.

There have been no changes to ARARs or other applicable standards identified in the SDD and design documents. The MCP contains risk-based groundwater standards that are applicable and relevant for groundwater at the Site outside of the two TI zones. There have been no land use changes or changes to exposure pathways. EPA has approved a relative potency method for evaluating risks to cPAHs whereby each individual cPAH is evaluated using the toxicity value for benzo(a)pyrene in combination with a comparative relative potency factor. All individual cPAHs are considered less toxic or equal in toxicity to benzo(a)pyrene. Since the cleanup

levels were developed using the benzo(a)pyrene toxicity factor for all cPAHs without the relative potency factors, the levels are more protective than they would be if they were re-calculated today. The RfD for naphthalene has decreased by 50 percent. If the groundwater clean-up level for naphthalene was recalculated today, it would decrease to 750 µg/L from the current cleanup level of 1,500 µg/L. Pending the planned evaluation of the long-term monitoring data following the 2005 semi-annual monitoring events, the remedy is progressing as expected.

8.0 ISSUES

This section provides a summary of the issues identified during this five-year review. Recommendations and follow-up actions are presented in Section 9.0.

The required deed restrictions are not yet in place. The documents have been drafted and are under review. EPA anticipates that the deed restrictions will be in place by December 2004 (Golden, 2004).

Monitoring well MLC-2 groundwater concentrations exceed interim groundwater cleanup levels for benzene and naphthalene. Since the RfD for naphthalene has decreased by 50 percent, the groundwater from MLC-2 would exceed a recalculated naphthalene interim cleanup level by a larger amount. This well is located immediately downgradient of the former lagoon area TI zone. As noted in the Long Term Monitoring Report, only four data points for this well were available for statistical analysis since this location is sampled annually (BBL, 2004b). The majority of the monitoring wells included in the LTMP are sampled semi-annually. As a result, twice as many data points were available for performing the time trend analyses and regression analysis for those wells. Groundwater from monitoring wells MLC-2, MLC-3, MLC-4, A-9, and TRC-3S, located outside the TI zones, exceed the GW-1 standards for certain cPAHs. As previously mentioned, the former lagoon area monitoring wells are currently sampled only in the fall; the other two wells are sampled in both the spring and the fall.

The current analytical reporting limits for all cPAHs for which there are applicable GW-1 standards and/or MCLs are higher than federal or state standards. Therefore it is not possible to assess whether groundwater from any of the four landfill monitoring wells, the four former lagoon area monitoring wells, or the monitoring wells included in the LTMP meets the applicable standard for each cPAH.

Passive recovery of DNAPL following one year has been extended beyond May 2004 to allow for collection of additional data. The evaluation of the passive recovery system is needed to determine if passive recovery is containing the DNAPL plume as required by the 1999 ESD to ensure that the remedy remains protective of human health and the environment.

The evaluation of the long-term monitoring results following the collection of 5 years of data is needed to determine trends in the magnitude or areal extent of DNAPL contamination. Long term monitoring was required by the 1999 ESD to ensure that the remedy remains protective of human health and the environment.

Information and data collected by the PRP will be required to assess the operation of the remedy prior to the next five-year review.

The Town of Westborough has indicated plans to reuse the Site for passive recreation, defined as hiking, biking, boating, and bird watching in the Westborough Master Plan. Should site reuse plans include catch and release fishing or swimming, the ingestion of surface water or fish and dermal contact with surface water exposure pathways should be re-evaluated based on new data reflecting current conditions.

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The following is a summary of recommendations and follow-up actions that are proposed for the Site.

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Deed restrictions are not in place	Finalize draft documents and record the deed restrictions	PRP	EPA	December 2004	Y	Y
Groundwater cleanup levels and GW-1 standards exceeded at wells outside the TI zones	Increase frequency of sampling MLC-2 from annual to semi-annual; include GW-1 standards in all future groundwater monitoring evaluations	PRP	EPA	As of the fall 2004 LTM event	N	Y
Analytical reporting limit for cPAHs is too high	Use SIMs analytical method for PAHs to achieve lower reporting limits	PRP	EPA/ MADEP	Prior to fall 2004 LTM event	N	Y
Passive DNAPL recovery evaluation	Complete the evaluation based on discussions at the August 31, 2004 technical meeting	PRP	EPA/ MADEP	4th quarter 2004	N	Y
Evaluation after collection of 5 years of long-term monitoring data	Ensure evaluation includes GW-1 standards and that it is completed as soon as the 2005 semi-annual events are completed	PRP	EPA/ MADEP	Early 2006	N	Y
Information and data required for 2nd five-year review	Compile all O&M and LTMP data and information	PRP	EPA	2nd quarter 2009	N	N
Potential reuse of the Site for catch-and-release fishing or swimming	Re-evaluate potential routes of exposure based on collection of new surface water and fish tissue data	Town of Westborough	EPA/ MADEP	Prior to implementation of planned reuse scenario	N	Y

10.0 PROTECTIVENESS STATEMENTS

The remedies for the Hocomonco Pond Site are expected to be protective of human health and the environment once the deed restrictions are in place. In the interim, exposure pathways that could result in unacceptable risks are being controlled. Continuation of post-closure care for the on-site and fill and former lagoon area cap is required to ensure the remedy remains protective. Consistent with the 1999 ESD, DNAPL recovery must continue until EPA and MADEP provide written approval stating otherwise. Long-term monitoring required by the 1999 ESD must continue consistent with the LTMP. Following the evaluation of the passive DNAPL recovery operation (expected in the 4th quarter of 2004) and the 5-year assessment of trends indicated by the monitoring data (expected in early 2006), recommendations, such as continued monitoring, additional site work, or engineering controls, will be made to ensure the remedy remains protective of human health and the environment in the long term.

11.0 NEXT REVIEW

A second five-year review for the Hocomonco Pond Site will be conducted in 2009.

APPENDIX A

DOCUMENT REVIEW LIST/REFERENCES

DOCUMENTS REVIEWED/REFERENCES CITED

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APPENDIX B

SITE INSPECTION REPORT

Hocomonco Pond Site Inspection – June 9, 2004
Five Year Review, WA # 138-FRFE-0137

Attendees:

Mike Bollinger – Beazer East, Inc., PRP, Project Manager
Bart Hoskins – EPA Region I, Risk Assessor
Jay Naparstek – MADEP, Project Manager
Paul McNulty – Town of Westborough, Director of Public Health
Phoebe Call – TtNUS, EPA Contractor, Project Manager
Mary Spofford – TtNUS, EPA Contractor, Project Specialist

The site inspection commenced at approximately 10:00 AM and concluded approximately 12:30 PM. The weather was sunny and clear with a light breeze and a temperature of approximately 75 degrees. Observations made by the EPA contractor are noted below.

Site Inspection Notes:

M. Bollinger led the inspection, starting in the water treatment plant, which is not currently in operation. He reported that the plant operated continuously from 1994 until about 1999 and then operated on an "as needed" basis until about 2003. A strong PAH/creosote odor was evident inside the building.

Two large (5,000 - 6,000 gallon) outdoor tanks are located on the north side of the treatment building. One is used for storage of recovered DNAPL, the other for residuals. M. Bollinger reported that over 50,000 gallons of DNAPL have been collected to date. Passive DNAPL recovery has been performed during the past year. Typically about 100 gallons/month are collected, usually from the same recovery wells. The DNAPL is disposed of off-site via tanker truck (approximately 5,000 gallons/load) and taken to an incinerator. Solids are stored in the second outdoor tank until enough volume has accumulated for off-site disposal.

The group inspected the remediated Kettle Pond area. The above-ground piping has remained in place following cessation of the in-situ bioremediation activities. M. Bollinger described the set up and problems encountered during the bioremediation. The groundwater recovery wells and piping are on the northwest side of the Kettle Pond area, while the groundwater injection wells and piping are on the southeast side. The depression where the Kettle Pond had been was visible. The remediated area was well vegetated and is bounded by the Otis Street fence line to the east, a dense group of trees to the west, and the two sets of piping described above.

The on-site landfill was well vegetated (and was being mowed during the site inspection). Methane gas vents and piping for leachate collected from beneath the double-lined landfill were visible. The leachate collected was piped to the treatment plant. M. Bollinger reported that leachate is no longer being produced and collected from the landfill. The PRP performs periodic inspections of the landfill cap and other routine maintenance activities. Details of the frequency of O&M activities for the landfill and lagoon were not available. M. Bollinger indicated that the O&M activities are reported in monthly status reports submitted to EPA and MADEP as required by the design documents. He reported one incident of damage to the cap, due to grubs and skunks. The damaged portion of the cap was replanted; no other issues with the integrity of the cap were reported.

The gravel berm around the covered lagoon appeared to be in good condition. The top of the covered lagoon was well vegetated. No erosion or slope instability was observed at either the landfill or the lagoon. There have been no reports of vandalism at the site. Several monitoring wells were observed along the base of the landfill. These, as well as all other monitoring wells observed on-site, were secured by padlocks and appeared to be in good condition.

Some concrete and other debris were observed near the west end of the fenced portion of the Site. The group observed the shoreline of the pond where contaminated sediments had been dredged. Access to the shoreline was along the former boat launch. The rock-lined discharge to the pond from the relocated storm drain (which had previously run along side the lagoon) was observed to the right of the former boat launch.

The group observed the DNAPL recovery wells and piping. All piping and wells appeared to be in good condition and were secured by padlocks. Mr. Bollinger stated that DNAPL recovery from these wells began in 1994 and DNAPL has been consistently recovered over the past ten years. He also indicated that DRW-1 and DRW-2 are typically the largest producers of DNAPL via the passive recovery system now in use. The other wells included in the long-term monitoring program are checked for the presence of DNAPL on a weekly basis. DNAPL is removed if more than one foot is measured. The recovery wells were reported to be approximately 120 feet deep and have a collection sump in the bottom of each well.

M. Bollinger indicated that institutional controls have been drafted to cover the deed restriction requirements of the ROD, but they have not yet been finalized. Thus, none of the ROD-required deed restrictions are in place. The current site fencing surrounds only the contaminated areas; the actual Site boundary is larger than the area enclosed by the fencing. The 8-10 foot fence appears to be in good condition with no man-made cuts or damage. There were no “no trespassing” or other signs observed along the Smith Valve Parkway fence line. Approximately three signs were posted along the Otis Street fence line, roughly within 20 feet of the dirt access road to the treatment plant. According to M. Bollinger the integrity of the fence is checked periodically. No other security measures are currently implemented to restrict or limit access to the contaminated areas.

P. McNulty provided the group with a site aerial photo indicating a proposed location for a walking trail and requested approval from the agencies for the town to proceed with construction of the trail. The trail would be on the Site but outside the perimeter fence line, just west of the former lagoon area. J. Naparstek indicated that MADEP would discuss the request with EPA. The town is interested in using the area for passive recreation. In the past catch and release fishing in the pond and boating were the primary recreational activities. He indicated that the public is well aware of the site history. To his knowledge there have not been any active TAG groups or other public concerns expressed. The town selectmen have approved a future use plan for passive recreation for the Site once all remediation activities are complete and responsibility for the Site reverts to the Town of Westborough.

Mr. McNulty indicated that the existing Otis Street municipal well is one of two planned in that location in the early 1980s. The second well was not installed since pumping would have increased the groundwater flow gradients northward from the Site toward the well field. He stated that the wells along the SuAsCo Reservoir are the next closest municipal wells to the Site. Municipal surface water supplies come from the Westborough Reservoir, located in the southeast corner of Westborough. Surface water from the SuAsCo Reservoir is not used as a source of public water supply.

Site photographs taken during the site inspection follow this report.

Town Hall Visits

The TtNUS personnel visited the Planning Department and spoke with Derek Saari, since Jim Robbins, the Town Planner, was not available. Mr. Saari was familiar with the Site and provided TtNUS with a copy of the Aquifer and Watershed Protection Districts map for the Town of Westborough. The Otis Street well is the only municipal well near the Site. Andrews 1 & 2, which are municipal wells just south of the Site, are located on the south end of the SuAsCo Reservoir. The municipal wells located at the south end of Lake Chauncy (north of Route 9) may be used for an increase in capacity for the town.

Mr. Saari mentioned that he has been dealing with issues on a property contiguous to the Site and indicated he had spoken with Derrick Golden of EPA about the issues. Mr. Saari stated that the public does not appear to be concerned about the Site but there are pressures for development in the area surrounding the site. An overlay district to allow village townhouses (to provide more economical housing for town residents) has been proposed by the Planning Department. This change requires Town Meeting approval and a zoning ordinance modification. If approved, the overlay district would include an area for village townhouses located just west of the Site.

Westborough Public Library

The TtNUS personnel then visited the public library. Two reference librarians were present. They indicated that some of the older site documents are in storage. The library has not received any new documents over the last 2-3 years. People do come in and access the documents; both for school projects and to check on the status of the Site cleanup. The librarians indicated that in general, people who inquire about the site are interested in whether all cleanup activities have been completed. There do not appear to be any concerns about site activities but there is interest in what will happen with the Site when the remediation activities are complete.

HOCOMONCO POND SITE INSPECTION
PHOTOGRAPHIC RECORD

Photo No.: 1

Date: June 9, 2004

Comments: DNAPL recovery well (DRW-1), associated equipment and piping. Note another recovery well (DRW-2) in the background.

Photo No.: 2

Date: June 9, 2004

Comments: East side of landfill. Note the white gas vent pipes. The leachate collection piping is visible in the center of photo.

HOCOMONCO POND SITE INSPECTION
PHOTOGRAPHIC RECORD (CONT.)

Photo No.: 3

Date: June 9, 2004

Comments: North side of the covered lagoon, facing south. Note the gravel berm and the manhole cover for the relocated storm drain.

Photo No.: 4

Date: June 9, 2004

Comments: Same view as Photo No. 3 but closer to the lagoon. Note the berm and the vegetated cover of the lagoon.

HOCOMONCO POND SITE INSPECTION
PHOTOGRAPHIC RECORD (CONT.)

Photo No.: 5

Date: June 9, 2004

Comments: Discharge point of relocated storm drain to Hocomonco Pond. The culvert and rock-lined channel to the Pond were remediated as part of the storm drain relocation activities.

Photo No.: 6

Date: June 9, 2004

Comments: View of remediated Kettle Pond Area, from Otis Street looking west.

HOCOMONCO POND SITE INSPECTION
PHOTOGRAPHIC RECORD (CONT.)

Photo No.: 7

Date: June 9, 2004

Comments: Inactive bioremediation recovery wells and associated piping on the northwest side of Kettle Pond Area (seen in center of the photo). Photo taken from Otis Street outside the site perimeter fence.

Photo No.: 8

Date: June 9, 2004

Comments: Inactive bioremediation injection wells and associated piping on southeast side of Kettle Pond Area (to left of the photo). Photo taken facing Otis Street. Note the site perimeter fence in the background.

HOCOMONCO POND SITE INSPECTION
PHOTOGRAPHIC RECORD (CONT.)

Photo No.: 9

Date: June 9, 2004

Comments: Concrete base or footing located west of the covered lagoon, on ridge above the Pond. In the general area of the former wood treating building.

Photo No.: 10

Date: June 9, 2004

Comments: View of Hocomonco Pond from the west side of the Site. Fence extends down to the water's edge and defines the western limit of contamination. Note the steep downward slope to the Pond.

APPENDIX C

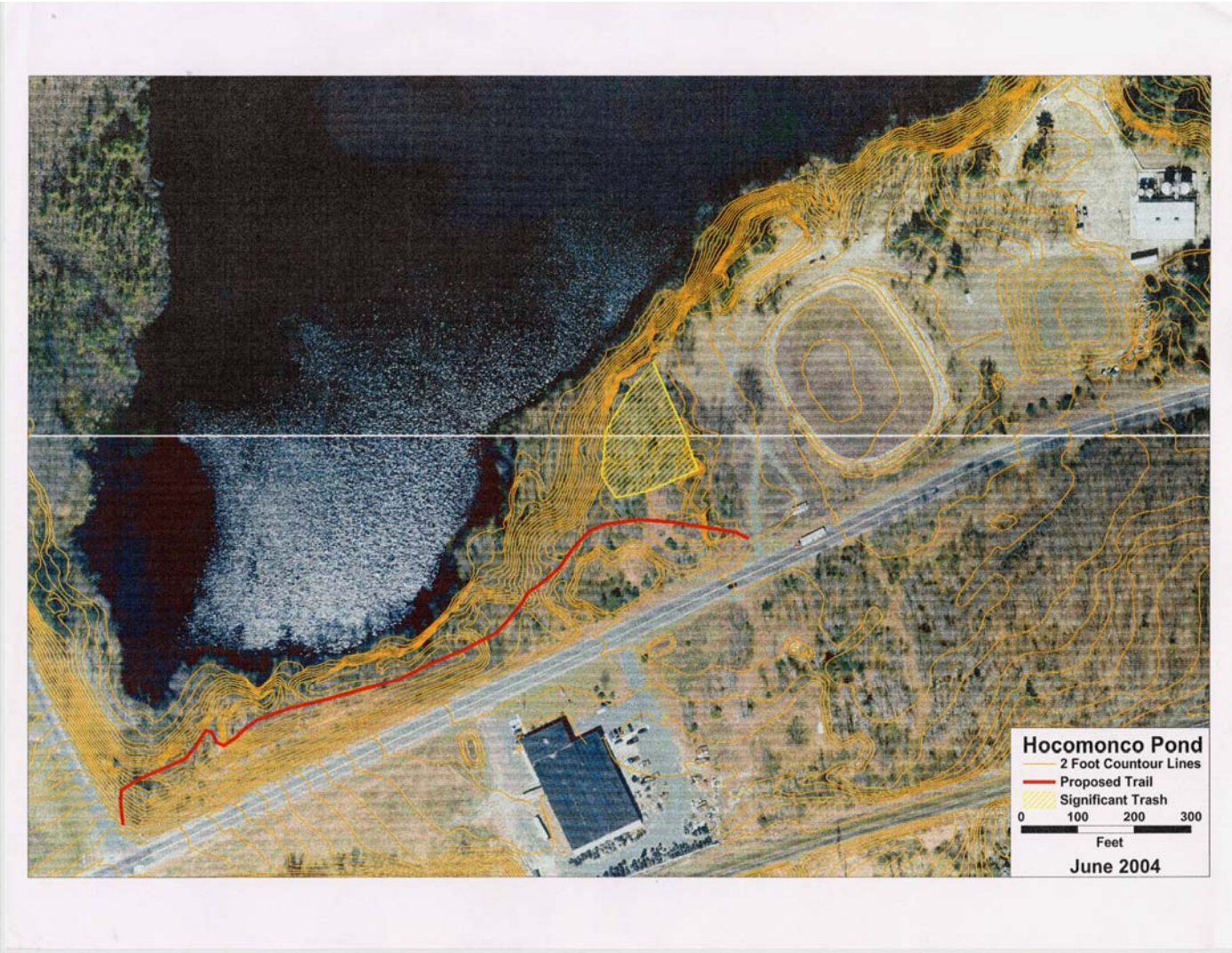
INTERVIEW LIST

INDIVIDUALS INTERVIEWED FOR THE HOCOMONCO POND FIVE-YEAR REVIEW

Name/Position	Organization/Location	Date
Derrick Golden/ EPA RPM	EPA/Boston, MA	05/19/04 8/04-9/04
Bart Hoskins/ EPA Risk Assessor	EPA/Boston & Chelmsford, MA	6/9/04
Jay Naparstek/Chief Bureau of Waste Site Cleanup	MADEP/Boston, MA	6/9/04
Michael Bollinger/ Manager, Remediation	Beazer East, Inc. Pittsburgh, PA	6/9/04
Cindy Woods/ TtNUS Risk Assessor	Tetra Tech NUS/Wilmington, MA	8/16/04
Paul McNulty, P.E./ Director of Public Health	Town of Westborough, Board of Health, Westborough, MA	6/9/04 9/16/04
Derek Saari/ Planning Dept. Staff	Planning Department/Westborough, MA	6/9/04
Reference Librarian	Westborough Public Library/ Westborough, MA	6/9/04

APPENDIX D

PROPOSED WALKING TRAIL



PROPOSED WALKING TRAIL

Aerial photograph provided by Paul McNulty, Town of Westborough, MA, Director of Public Health, June 9, 2004.

Notes: The proposed trail is outside the fenced-in areas of contamination. Smith Valve Parkway can been seen in the photograph just south of the proposed trail. The capped former lagoon area, on-site landfill, and water treatment plant are visible from left to right across the area of the photograph between Smith Valve Parkway and Hocomonco Pond.