UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
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BOSTON, MA 02114-2023

Memorandum

Records Center
Sullivan's
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Date: September 23, 2008

Subject: Transmittal of Second 5 Year Review, Sullivan's Ledge Superfund Site, New Bedford, MA

From: David O. Lederer
Remedial Project Manager

To: James T. Owens, III
Director, Office of Site Remediation and Restoration

Thru: Bob Cianciarulo,
Chief, Massachusetts Superfund Section

Larry Brill
Chief, Remediation and Restoration Branch

Richard A. Cavagnero
Deputy Director, Office of Site Remediation and Restoration

The Sullivan's Ledge Site, located in New Bedford, Massachusetts, consists of two operable units, Operable Unit 1 (OU1) and Operable Unit 2 (OU2). OU1 consists of a 12-acre historic disposal area and the adjacent unnamed stream. OU2 includes a 13-acre wooded wetland called Middle Marsh, and a 1.5 acre wetland area bordering the unnamed stream (400 feet upstream of the Middle Marsh) referred to as the "Adjacent Wetlands."

This is the second five-year review for the site. The trigger for this statutory review is the signature date of the previous five-year review report on September 29, 2003. This review is required by statute as the selected remedies for OU1 and OU2 result in site contaminants being left on the site above levels that allow for unlimited use and unrestricted exposure.

This five-year review concludes that the remedies for both OU1 and OU2 currently protect human health and the environment because the construction of the remedy is complete, and operation and maintenance and monitoring of the remedy is being performed. However, in order for the remedy to be protective in the long-term, the following actions need to be taken.

OU1

Implement Institutional Controls;

Continue to monitor the groundwater pump and treat operation effectiveness on controlling contaminant migration in order to comply with OU1 remedial action objectives (RAOs);

Continue to monitor sediment concentrations and implement corrective actions if necessary;

Continue to monitor landfill gas concentrations, assess non-compliance with ARARs and implement corrective actions if necessary; and

Continue to implement Wetlands Operation and Maintenance Plan with special emphasis on controlling invasive and nuisance species in the wetlands and controlling sediment buildup within the unnamed stream near Hathaway Road and at the entrance to Pond A.

OU2

Implement Institutional Controls;

Continue to monitor sediment concentrations and implement corrective actions if necessary; and

Implement Wetlands Operation and Maintenance Plan with special emphasis on controlling invasive and nuisance species in the wetlands

Please call me at 617-918-1325 if you have any questions.

Second Five-Year Review Report

for

Sullivan's Ledge Superfund Site

New Bedford,

Bristol County, Massachusetts

September, 2008

PREPARED BY:

United States Environmental Protection Agency
Region I
Boston, Massachusetts

Approved by:

James T. Owens III, Director
Office of Site Remediation and Restoration
U.S. EPA, New England

Date: 9-23-08

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TABLES

ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
CAA	Clean Air Act
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
GER	Grant of Environmental Restrictions
GWTP	Ground Water Treatment Plant
LEL	Lower Explosive Limit
MassDEP	Massachusetts Department of Environmental Protection
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU1	Operable Unit 1
OU2	Operable Unit 2
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PMC	Project Management Committee (OU I Settling Defendants)
PCCP	Pre-stressed Concrete Cylinder Pipe
POTW	Publicly Owned Treatment Works
PRP	Potentially Responsible Party

ACRONYM	DEFINITION
RAC	Remedial Action Contract
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SQCV	Sediment Quality Criteria Values
SVOC	Semivolatile Organic Compound
TBC	To Be Considered
TOC	Total Organic Carbon
TSCA	Toxic Substances Control Act
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The Sullivan's Ledge Site, located in New Bedford, Massachusetts, consists of two operable units, Operable Unit 1 (OU1) and Operable Unit 2 (OU2). OU1 consists of a 12-acre historic disposal area and the adjacent unnamed stream. OU2 includes a 13-acre wooded wetland called Middle Marsh, and a 1.5 acre wetland area bordering the unnamed stream (400 feet upstream of the Middle Marsh) referred to as the "Adjacent Wetlands."

The selected remedy for Sullivan's Ledge OU1 included site preparation, soil excavation/treatment, sediment treatment, construction of an impermeable cap, diversion and lining of the unnamed stream, collection and treatment of on-site groundwater, wetlands restoration/enhancement, long-term environmental monitoring, institutional controls, and five-year reviews.

Three Explanations of Significant Difference (ESDs) have been issued for OU1. The first ESD revised the remedy so that soils in the disposal area would remain in place, untreated, and covered by the cap. Also, excavated soils and sediments from other areas of OU1 that exceeded cleanup standards would remain untreated and would be disposed of beneath the cap within the disposal area. The second ESD revised the remedy so that the stream channel would be permanently placed in an underground 72-inch pre-stressed concrete cylinder pipe (PCCP) and a new stream channel was created on the golf course and vegetation planted to recreate the habitat lost. Also, the ESD called for a slurry wall along a portion of the southern boundary and two recovery wells adjacent to the slurry wall. A third ESD incorporates ARARs related to landfill gas migration and describes the actions taken to comply with the ARARs.

The selected remedy for OU2 included site preparation, excavation of contaminated sediments and soils from portions of Middle Marsh and the Adjacent Wetland, dewatering of the excavated sediment/soils, disposal of the treated sediment/soils beneath the cap, wetlands restoration, institutional controls to prevent future residential use and non-recreational commercial use and to restrict access to Middle Marsh and the Adjacent Wetland, and long-term environmental monitoring.

This is the second five-year review for the site. The trigger for this statutory review is the signature date of the previous five-year review report on September 29, 2003. This review is required by statute as the selected remedies for OU1 and OU2 result in site contaminants being left on the site above levels that allow for unlimited use and unrestricted exposure.

This five-year review concludes that the remedies for both OU1 and OU2 currently protect human health and the environment because the construction of the remedy is complete, and operation and maintenance and monitoring of the remedy is being performed. However, in order for the remedy to be protective in the long-term, the following actions need to be taken.

OU1

- Implement Institutional Controls;
- Continue to monitor the groundwater pump and treat operation effectiveness on controlling contaminant migration in order to comply with OU1 remedial action objectives (RAOs);

- Continue to monitor sediment concentrations and implement corrective actions if necessary;

- Continue to monitor landfill gas concentrations, assess non-compliance with ARARs and implement corrective actions if necessary; and

- Continue to implement Wetlands Operation and Maintenance Plan with special emphasis on controlling invasive and nuisance species in the wetlands and controlling sediment buildup within the unnamed stream near Hathaway Road and at the entrance to Pond A.

OU2

- Implement Institutional Controls;

- Continue to monitor sediment concentrations and implement corrective actions if necessary; and

- Implement Wetlands Operation and Maintenance Plan with special emphasis on controlling invasive and nuisance species in the wetlands.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Sullivan's Ledge		
EPA ID *(from WasteLAN)*: MAD980731343		
Region: 01	**State:** MA	**City/County:** New Bedford/Bristol County
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete		
Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** 3 / 29 / 2002	
Has site been put into reuse? ☐ YES ☒ NO		
REVIEW STATUS		
Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: David Lederer		
Author title: Remedial Project Manager	**Author affiliation:** US EPA, Region I	
Review period:** 3 / 18 / 2008 to 9 / 29 / 2008		
Date(s) of site inspection: 6 / 10 / 2008 and 7 / 1 / 2008		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☒ 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action: ☐ Actual RA Onsite Construction at OU 1____ ☐ Actual RA Start at OU#____ ☐ Construction Completion ☒ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 9 / 29 / 2003		
Due date *(five years after triggering action date)*: 9 / 29 / 2008		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues, Recommendations, and Follow-up Actions:

OU1

Implement institutional controls (these are in the process of being implemented);

Continue to monitor the groundwater pump and treat operation effectiveness on controlling contaminant migration in order to comply with OU1 RAOs;

Continue to monitor sediment concentrations and implement corrective actions if necessary;

Continue to monitor landfill gas concentrations, assess non-compliance with ARARs and implement corrective actions if necessary; and

Continue to implement Wetlands Operation and Maintenance Plan with special emphasis on controlling invasive and nuisance species in the wetlands and controlling sediment buildup within the unnamed stream near Hathaway Road and at the entrance to Pond A.

OU2

Implement institutional controls (these are in the process of being implemented);

Continue to monitor sediment concentrations and implement corrective actions if necessary; and

Implement Wetlands Operation and Maintenance Plan with special emphasis on controlling invasive and nuisance species in the wetlands.

Protectiveness Statement(s):

The five-year review concluded that the remedies for both OU1 and OU2 are currently protective of human health and the environment because the construction of the remedy is complete, and operation and maintenance and monitoring of the remedy is being performed. However, in order for the remedy to be protective in the long-term, the aforementioned actions need to be taken.

Other Comments:

None.

SECTION 1.0
INTRODUCTION

This document is a comprehensive and interpretive report on the five-year review conducted for the Sullivan's Ledge Superfund Site (the site) in New Bedford, Massachusetts, for the U.S. Environmental Protection Agency's (EPA) Region I office.

The five-year review was conducted to determine whether the remedies for the site are protective of human health and the environment. The methods, findings, and conclusions of the review are documented in this five-year review report. In addition, this report identifies issues found during the review and recommendations to address them.

EPA Region I has conducted this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). CERCLA §121(c) 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 NCP at Section 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) 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 site consists of two operable units, OU1 and OU2. This five-year review addresses both operable units.

This is the second five-year review for the site. The trigger for this statutory review is the signature date of the previous five-year review report on September 29, 2003. This review is required by statute as the selected remedies for OU1 and OU2 result in site contaminants being left on the site above levels that allow for unlimited use and unrestricted exposure. This is most apparent with OU1 as contaminated soils have been left in place and a groundwater contaminant plume still exists. OU2 requires a statutory review because, although the site was cleaned up to levels that are protective of aquatic organisms, the remedy calls for institutional controls that restrict residential use of the site and thus disallow unlimited use. The OU2 ROD (Page 20) notes that if EPA had assumed that the future use would be residential, cleanup levels would be lower due to higher frequency of exposure. Thus, the ROD implies that contaminants could be left in place that are above levels that allow unlimited use and unrestricted exposure.

SECTION 2.0
SITE CHRONOLOGY

The chronology of the site, including all significant site events and dates is included in Table 1.

Table 1: Chronology of Site Events	
Event	**Date**
Quarrying operations conducted at the site	prior to 1846 through 1921
Land acquired by the City of New Bedford through tax title foreclosure	1935
Pits used for waste disposal	1930's through early 1970's
Fires in quarry pits lead to backfilling of one pit	early 1970's
Geotechnical borings by Massachusetts Department of Public Works indicate presence of capacitors in subsurface	1982
EPA conducted air monitoring program of the Greater New Bedford Area	1982
EPA installed groundwater monitoring wells around the site	1983
NPL Listing	September 21, 1984
OU1 Phase I Remedial Investigation report by NUS Corporation	September 1987
OU2 Final Remedial Investigation/Feasibility Study report by Ebasco Services Inc.	January 1989
ROD issued by EPA for OU1	June 29, 1989
OU2 Final Remedial Investigation - Additional Studies of Middle Marsh report by Metcalf & Eddy, Inc.	April 1991
OU2 Feasibility Study of Middle Marsh report by Metcalf & Eddy, Inc.	May 1991
ROD issued by EPA for OU2	September 27, 1991
Consent Decree for OU2 was lodged in U.S. District Court in Massachusetts	January 25, 1993
ESD issued by EPA, modifying the remedy so that treatment would no longer be required for OU1 soil and sediments to be covered by the OU1 landfill cap.	July 26, 1995
100% remedial design approved by EPA for OU1	June 1997

Table 1: Chronology of Site Events	
Event	**Date**
Start of on-site construction at Operable Unit 1	March 2, 1998
Start of on-site construction at Operable Unit 2	April 8, 1999
Start up of the OU1 groundwater collection and treatment system	December 10, 1999
ESD issued by EPA substituting a slurry wall for the shallow collection trench along a section of the site boundary and culverting a section of the unnamed stream instead of a concrete lining	September 27, 2000
Final Remedial Construction Report, OU2 by URS Corporation and Certification of Remedial Construction Completion	August 13, 2001
Remedial Construction Report, OU1 by O'Brien & Gere Engineers, Inc. and Certification of Construction Completion	March 8, 2002
2002 Annual groundwater sampling performed	December 2002
Approval of OU2 Construction Completion Report	January 23, 2003
Approval of OU1 Construction Completion Report	January 23, 2003
ESD issued by EPA adding Solid Waste regulations as an ARAR and requiring mitigation of a landfill gas migration issue	September 29, 2003
Completion of first five-year review	September 29, 2003
2003 Annual groundwater sampling performed	December 2003
Start up of the full-scale landfill gas extraction system	June 10, 2004
2004 Annual groundwater sampling performed	December 2004
2005 Annual groundwater sampling performed	December 2005
Fifth year of post-construction wetland monitoring	2006
2006 Annual groundwater sampling performed	December 2006
2007 Annual groundwater sampling performed	December 2007

SECTION 3.0
BACKGROUND

3.1 PHYSICAL CHARACTERISTICS AND LAND AND RESOURCE USE

The Sullivan's Ledge Superfund Site is located in New Bedford, Massachusetts, Bristol County, near the intersection of Route 195 and Hathaway Road (see Figure 1, provided in Attachment 1 of this report). The Sullivan's Ledge Superfund Site consists of two operable units, OU1 and OU2.

OU1 consists of a 12-acre historic disposal area and the adjacent unnamed stream (see Figure 2, provided in Attachment 1 of this report). The unnamed stream flows from the site underneath Hathaway Road into OU2, which consists of the Middle Marsh and adjacent wetlands. The disposal area is bounded on the south by the highway interchange with Route 140 and I-195, on the east and west by commercial establishments, and on the north by Hathaway Road.

OU2 is located within the Whaling City Golf Course at New Bedford, just north of Hathaway Road. OU2 is bounded on the south by the southern banks of the tributary of the unnamed stream, on the north by the Apponogansett Swamp, and on the east and west by fairways of the golf course. OU2 includes a 13-acre wooded wetland called Middle Marsh, and a 1.5 acre wetland area bordering the unnamed stream (400 feet upstream of the Middle Marsh) referred to as the Adjacent Wetlands (see Figure 5, provided in Attachment 1 of this report).

Regional groundwater flow in the overburden, shallow bedrock, and deep bedrock is to the north. In the absence of the installed groundwater pump and treatment system, local groundwater flow in the overburden and shallow bedrock is from the southwest to the northeast corner of the former disposal area. Flow from the southwest corner of the site entered the quarry pits. A portion of the groundwater discharged out of the pits into the overburden and the unnamed stream and the remainder discharged into the bedrock. Prior to installation of the OU1 cap, most of the former disposal area was covered by a layer of fill which overlayed the bedrock and quarry pits. The thickness of the fill generally increased to the south and east across the property with the maximum observed thickness of 22.4 feet found in the southwest corner of the site. Shallow bedrock is highly fractured, with fracture planes varying in frequency and orientation, which means that the shallow bedrock exhibits the properties of a porous medium, with groundwater flowing in the direction of the hydraulic gradient. The deep bedrock contains fewer fractures than the shallow bedrock and the fractures follow a regional north/northwest lineament trend. Thus, contaminant migration in the deep bedrock is controlled by the orientation of the fractures.

3.2 HISTORY OF CONTAMINATION

The OU1 disposal area was originally operated as a granite quarry that supplied building stone to the New Bedford area. Quarry operations began in the 1800s and continued until 1921. During that time, as many as four separate quarry pits were in use on the property.

After serving as a local swimming hole, the city of New Bedford assumed ownership of the property in 1935 through a tax title foreclosure. The pits and adjacent areas were operated by the City of New Bedford and used by local industry as a disposal site for wastes such as electrical transformers and capacitors, fuel oil, volatile liquids, old tires, glass, metal, steel tanks, smoke stack soot, and scrap rubber. The site also was used for disposal of other types of debris such as brush and trees, cobblestones, bricks, and demolition materials. The pits and adjacent

areas are referred to throughout this report as the disposal area.

In the early 1970s, a major fire erupted on-site, primarily involving the mass of tires disposed of in the quarry pits. This fire was difficult to control due to the presence of the tires, and created a dense, black smoke. Due to concern regarding possible recurrence of such fires, an effort was undertaken to backfill the remainder of the smaller pit and to regrade the site, covering any exposed refuse. In early 1982, Massachusetts Department of Public Works, District 6, conducted test borings on-site in conjunction with a proposal for construction of a commuter parking lot, but recommended cancelling the project when borings indicated the presence of electrical capacitors.

EPA conducted an air monitoring program of the Greater New Bedford area in 1982 and installed groundwater monitoring wells around the site in 1983. Based in part on the results of these studies, the site was included in the National Priorities List (NPL) in September 1984.

3.3 INITIAL RESPONSE

In September 1984, EPA issued the owner and operator of the site, the City of New Bedford, an Administrative Order under Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). In compliance with this order, the City of New Bedford secured the disposal area by installing a perimeter fence and posting signs warning against unauthorized trespassing at the site.

On November 29, 1988, EPA notified parties who owned or operated the facility, generated wastes that were shipped to the facility, or transported wastes to the facility, of their potential liability with respect to the site.

A Remedial Investigation (RI) of the site was completed in two phases. The Phase I RI completed by NUS in September 1987 under subcontracts to EBASCO (EBASCO, 1987), provided the data necessary for site characterization. The draft final Phase II RI and Feasibility Study (FS) was completed in March of 1988 by E.C. Jordan under subcontract to EBASCO (EBASCO, 1989).

In June 1989, EPA concluded that additional studies of the Middle Marsh and adjacent wetland were needed and these areas were grouped into a second operable unit. The Remedial Investigation - Additional Studies of Middle Marsh report was completed in April 1991 by Metcalf & Eddy, Inc (M&E, 1991a). The Feasibility Study of Middle Marsh was completed by Metcalf & Eddy, Inc. on May 29, 1991 (M&E, 1991b).

3.4 BASIS FOR TAKING ACTION

Based on results of the Phase I and Phase II RIs, three source areas of contamination were identified for the site: the quarry pits, site soils, and PCB-contaminated sediments. The RIs also determined that contaminants from the quarry pits had contaminated on- and off-site groundwater and surface water in the unnamed stream.

The following summarizes the contamination at the site:

Soils. The Phase II RI and pre-design sampling confirmed semivolatile organic compound (SVOC) contamination within the disposal area and along the eastern site boundary.

Polychlorinated biphenyls (PCBs) were also detected within the disposal area and along the eastern site boundary.

Sediment. PCBs were the only compound of concern in the sediments. PCB contamination was detected in sediments from the unnamed stream, Middle Marsh, golf course water hazards, and Apponagansett Swamp. PCB concentrations occurred at levels above the Sediment Quality Criteria Values (SQCVs) in each of the four habitats.

Groundwater. The majority of on-site groundwater contamination is caused by volatile organic compounds (VOCs); less significant levels of SVOCs and PCBs were also reported. Results from VOCs were identified in the overburden groundwater, shallow bedrock groundwater (less than 100 feet), and deep bedrock groundwater (down to 200 feet below ground surface).

Surface Water. Relatively high concentrations of VOCs, SVOCs, and inorganics were reported in the Phase II RI at groundwater seeps located east and north of the disposal area. For several contaminants, the concentrations exceed the ambient water quality criteria (AWQC). Impacts to the unnamed stream, however, appeared minimal due to the effects of dilution by the large volume of water in the unnamed stream. There was no public health risk associated with surface water.

The human health risk assessment for OU1 estimated potential human health risks associated with exposure to contaminants of concern in surface soils, sediments, air, surface water, and groundwater. The risk assessment assumed that access to the site is restricted and the land is zoned as commercial, but considered a proposed future use of the site as a soccer field. PCBs and total PAHs contributed the majority of the total carcinogenic risk from direct contact with surface soils. Noncarcinogenic hazard from incidental ingestion of on-site soils by children was elevated due to the lead concentration in an on-site shallow soil sample. Though groundwater was not a current source of drinking water, carcinogenic risks and noncarcinogenic hazards from future ingestion of groundwater were estimated. Benzene, trichloroethene, vinyl chloride, and PCBs contributed over 99 percent of the total cancer risk. 1,1-Dichloroethene was the major contributor to the noncarcinogenic groundwater hazard at the site. Direct contact with contaminated sediments in the unnamed stream was the highest carcinogenic risk contributor from exposure to sediments. The ecological risk assessment indicated that a potential risk existed for aquatic organisms due to exposure to contaminants in surface water of the unnamed stream. It was noted that risk to aquatic organisms due to PCB exposure in water could not be accurately evaluated because the detection limit for PCBs (1.0 ug/l) was greater than the water quality criteria concentration (0.014 ug/l).

The human health risk assessment for OU2 concluded that human exposure to contaminants in Middle Marsh and the golf course/wetland area through current and future pathways would not result in significant increases in carcinogenic risk, and that there are no significant risks to human health posed by exposure to noncarcinogenic contaminants under the assumption that current and future site use would be as a golf course. The OU2 Record of Decision (ROD) notes that if EPA had assumed that the future use would be residential, cleanup levels would be lower due to higher frequency of exposure. The OU2 ROD requires the use of institutional controls to prohibit residential use and restrict commercial use, thereby assuring the protectiveness of human health. The ecological risk assessment concluded that aquatic exposures and wetland/terrestrial exposures to PCB-contaminated sediments in portions of the Middle Marsh present an unacceptable risk to biota present in OU2. This is the primary basis of the remedial action for OU2.

SECTION 4.0
REMEDIAL ACTIONS

4.1 REMEDY SELECTION

This section outlines the selected remedies for OU1 and OU2.

4.1.1 Operable Unit 1

The EPA ROD for Sullivan's Ledge OU1 was issued on June 29, 1989. The remedial action objectives (RAOs) listed in the ROD are:

- Prevent or mitigate the continued release of hazardous substances to the unnamed stream, Middle Marsh, and Apponagansett Swamp;
- Reduce risks to human health associated with direct contact with and incidental ingestion of contaminants in the surface and subsurface soils;
- Reduce risks to animal and aquatic life associated with the contaminated surface soils and sediments;
- Reduce the volume, toxicity, or mobility of the hazardous contaminants;
- Maintain air quality at protective levels for on-site workers and nearby residents during site remediation;
- Reduce further migration of groundwater contamination from the quarry pits in the upper 150 feet of the bedrock groundwater flow system;
- Significantly reduce the mass of contaminants in groundwater located in and immediately adjacent to the quarry pits;
- Provide flushing of groundwater through the pits to encourage continued removal of contaminants at the site; and
- Minimize the threat posed to the environment from contaminant migration in the groundwater and surface water.

The selected remedy for OU1, as identified in the ROD, consisted of the following components. Items related to soil/sediment excavation, treatment, and placement are source control measures. Items related to groundwater collection/treatment are management of migration measures.

- Site Preparation;
- Soil Excavation/Treatment;
- Sediment Treatment;
- Construction of an Impermeable Cap;

- Diversion and Lining of the Unnamed Stream;
- Collection and Treatment of On-site Groundwater;
- Wetlands Restoration/Enhancement;
- Long-term Environmental Monitoring and Five-Year Reviews; and
- Institutional Controls.

As stated in the ROD, the EPA determined that contaminants have contaminated on- and off-site groundwater and surface water in the unnamed stream. Due to technical impracticability, MCLs were not used as cleanup goals. Rather significant reduction of the contaminant mass and protection of surface water bodies were used as cleanup goals. A two part plan for the cleanup of on-site contaminated groundwater and seeps involved an active extraction system (bedrock extraction wells) and a passive collection system (shallow collection trench).

On July 26, 1995, EPA issued an ESD documenting changes to the remedial action specified in the OU1 ROD. The ROD called for excavation of soils within the disposal area down to the seasonal low water table, de-watering, solidification, and placement back within the disposal area under an impermeable cap. The revised remedy described in the ESD called for soils in the disposal area to remain in place, untreated, and covered by the cap. The ROD also called for soils and sediments from the unnamed stream, water hazards, and other areas of OU1 outside the disposal area that exceed cleanup standards to be excavated, treated, and disposed of under the impermeable cap within the disposal area. Under the revised remedy, excavated soils and sediments from these areas would remain untreated and would be disposed of under the impermeable cap within the disposal area.

Another ESD was issued by EPA on September 27, 2000, documenting additional changes to the remedial action specified in the OU1 ROD. The ROD described the concrete lining of about 750 feet of the unnamed stream in the portion parallel to the eastern boundary of the site. As described, the revised remedy included the permanent placement of the stream channel in an underground 72-inch PCCP, the creation of a new stream channel on the golf course, and the planting of vegetation to recreate the habitat lost. Under the ROD, passive groundwater collection along the eastern and southern boundary of the site consisted of an under drain pipe within a shallow trench. The ESD substituted this collection system with a slurry wall along a portion of the southern boundary and two recovery wells adjacent to the slurry wall.

A third ESD was issued by EPA on September 29, 2003. It incorporated methane gas collection into the remedy to comply with Massachusetts Solid Waste Management Regulations and to prevent the off-site migration of gas.

4.1.2 Operable Unit 2

The ROD for Sullivan's Ledge OU2 was issued by EPA on September 27, 1991. The remedial action objectives listed in the ROD are:

- Reduce exposure of aquatic organisms to PCB-contaminated pore water and sediments either through direct contact or diet-related bioaccumulation;

- Reduce exposure of terrestrial and wetland species to PCB-contaminated sediment/soils through direct contact or diet-related bio-accumulation;
- Prevent or reduce releases of PCBs to the unnamed stream and the Apponagansett Swamp; and
- Mitigate the impacts of remediation on wetlands.

The selected remedy, as identified in the ROD, consisted of the following components:

- Site preparation;
- Excavation of contaminated sediments and soils from portions of Middle Marsh and the Adjacent Wetland;
- Dewatering and stabilization of the excavated sediment/soils;
- Disposal of the stabilized sediment/soils beneath the cap constructed over portions of the disposal area of the site;
- Wetlands restoration;
- Institutional controls to prevent future residential use and restrict commercial use; and
- Long-term environmental monitoring.

4.2 REMEDY IMPLEMENTATION

This section summarizes the implementation of the remedial actions specified in the RODs for OU1 and OU2.

4.2.1 Operable Unit 1

The settling defendants for OU1 formed the Sullivan's Ledge Site Group led by a project management committee (PMC) and hired a design engineering firm, O'Brien & Gere Engineers, Inc. (OBG), to implement the EPA OU1 Statement of Work. In June, 1997, EPA approved the 100% design, initiating the time track for remedial action. The PMC contracted with Harding Lawson and Associates, Inc. (HLA) to implement the remedial actions. On-site construction activities for OU1 were initiated in March 1998 with Phase I mobilization.

Implementation of the remedial action for OU1 is discussed below, by component, as identified in the ROD. The information below is based primarily on the Remedial Construction Report (OBG, 2002d) for OU1.

Site Preparation

Site preparation work that was conducted included the installation of fencing and gates, clearing of vegetative material and debris and placement on the disposal area, placement of drums of soil and personal protective equipment and various construction debris on the disposal area, demolition of the former car wash located adjacent to the site and placement of the resulting debris on the disposal area, grading of the site to remove high points, abandonment of monitoring wells in the disposal area, proof rolling of the site, and placement of a 12-inch ordinary borrow interim cover on the portion of the site not scheduled for capping until a later phase.

Soil Excavation

Soil excavation was conducted in several areas of the site. The approximate total volume of material removed from each area is provided as follows:

- Unnamed Stream bed and southern tributary soil and sediments - 950 cubic yards plus 50 cubic yards of rock
- East bank soils (south of car wash) - 140 cubic yards
- Soils east of stream channel - 910 cubic yards
- East bank soils (north of car wash) - 40 cubic yards

In each area, post-excavation confirmation samples were collected and compared to the clean-up criteria for soils of 10 ppm PCBs. When necessary, additional excavation was performed until confirmation sampling indicated that the clean-up criteria had been met. The excavated materials were placed in areas within the limits of the cap system in accordance with construction specifications.

Diversion and Lining of the Unnamed Stream

This component of the remedy involved lining the unnamed stream east of the disposal area with a 72-inch PCCP. The 72-inch PCCP was installed during Phase I of the remedial action.

Collection and Treatment of On-Site Groundwater

This component of the remedy involved the construction of the active groundwater collection system, the passive groundwater collection system, the slurry wall, and the groundwater treatment plant.

The active groundwater collection system was installed during Phase I of the remedial action and consisted of the installation of three bedrock recovery wells, conversion of three existing bedrock wells to recovery wells, installation of two high density polyethylene (HDPE) piping access vaults, installation of HDPE piping from each bedrock recovery well to a manifold in the groundwater treatment plant, and installation of pumps and controls in each of the six bedrock recovery wells.

The passive groundwater collection system was installed during Phase I of the remedial action and consisted of a approximately 660 feet of shallow collection trench (12-inch diameter HDPE perforated collection pipe surrounded by crushed stone backfill), HDPE manholes, a pump station, a valve vault, and associated double-walled piping.

A slurry wall was constructed along the northern limits of the landfill cap. The slurry wall was installed to a depth of 20 to 25 feet and a width of 6 to 30 feet. Two recovery wells (called "Interim Wells") with pumps, controls, and associated piping were installed adjacent to the slurry wall.

The groundwater treatment plant was constructed during Phase I of the remedial action. The start-up period and initial operations occurred from December 10, 1999 through October 19, 2000.

Construction of an Impermeable Cap

This component of the remedy involved the following activities:

- installation of the geogrids along the former quarry limits;
- construction of the gas venting system including placement of granular material, installation of gas vent risers and horizontal gas collection pipe, and installation of 22 gas monitoring wells around the perimeter of the landfill cap system;
- installation of the geosythetic clay liner;
- installation of the flexible membrane (LLDPE) cover;
- installation of the synthetic drainage layer;
- placement of the barrier protection material;
- placement of topsoil;
- excavation and construction of the sedimentation basin;
- augmentation of the Hathaway Road culvert;
- construction of run-on/run-off controls including berms, lined swales, and culverts;
- construction of access roads; and
- installation of site security measures including fencing and gates.

Wetlands Restoration/Enhancement

The restoration of affected wetlands in OU1 was conducted concurrently with OU2 wetlands restoration. HLA subcontracted certain wetland restoration tasks (vegetation plantings, invasive control, monitoring, reporting) for both OUs to New England Environmental (NEE) of Amherst, Massachusetts.

Sediment Treatment

Sediment excavation was performed within a tributary of the unnamed stream (Tributary #2), and two golf course hazards (Ponds A and B). Post-excavation confirmation samples were collected and compared to the clean-up criteria of 20 µg PCBs/gram carbon. A total of approximately 7,590 cubic yards of sediment was excavated from these areas. Excavated sediments were transferred to the treatment pad, stabilization agents (lime kiln dust and sand) were added and mixed using an excavator, and then the material was spread out and moisture conditioned. A total of approximately 9,340 cubic yards of stabilized sediment was placed within the limits of the cap system.

The Sullivan's Ledge Superfund Site, Operable Unit 1, Remedial Construction Report was completed in March 2002 by OBG (OBG, 2002d). This report included a Certification of Completion of Construction, signed on March 8, 2002. This report was approved by EPA on

January 23, 2003, which triggered the start of the O&M period.

Institutional Controls

To date, the institutional controls identified in the OU1 ROD have not been implemented. These include:

- ordinances and zoning restrictions to prevent the use of groundwater for drinking water; and
- deed restrictions regulating land use at the site

A Grant of Environmental Restrictions (GER) was drafted by the Commonwealth of Massachusetts reflecting the above mentioned restrictions. The GER has been reviewed by the City of New Bedford and is now with the OU1 and OU2 Settling Parties for review.

Active Landfill Gas Extraction System

Active methane gas removal was not part of the remedy specified in the ROD for OU1. However, landfill gas monitoring conducted in 2001 and 2002, in accordance with the Post-Construction Environmental Monitoring Plan (OBG, 1996b), indicated that several gas monitoring wells had methane concentrations that exceeded 25% of the lower explosive limit (LEL) for methane. On-site landfill gas vents were also monitored and methane was found to be present. Methane was not detected in explosive gas screenings of subsurface structures and buildings, on and adjacent to the site. Soil gas surveys were performed in spring and summer 2002, indicating that methane was present at greater than 25% LEL both east and west of the landfill but was not detected in any adjacent buildings or structures screened.

A Corrective Action Alternative Analysis was performed to mitigate the migration of explosive gases from the landfill which exceeded the concentrations specified in 310 CMR 19.132(4)(g) and (h). The corrective action chosen was active gas control concurrent with data collection to evaluate the effectiveness in removing landfill gas and reducing off-site migration of landfill gases above 25% LEL. On November 15, 2002 a revised Corrective Action Design was submitted for approval on behalf of the Settling Parties by OBG. The PMC proposed to install a pilot gas extraction system consisting of a trailer mounted 8 horsepower blower with knockout tank and gauges to record stack discharge velocity and temperature. The pilot system was run initially for a three month period, and then continued to operate until early 2004 when it was dismantled to allow for installation of the full scale system as described below.

OBG, on behalf of the OU1 PMC, submitted a conceptual design for the full scale landfill gas collection system dated May 8, 2003. The design was based on the results of the pilot system. The design included collection from the east, west, and north sides of the landfill via a 200 GPM blower and subsequent release to the atmosphere.

Installation of the full scale landfill gas collection system was conducted during the beginning of 2004. The full scale landfill gas collection system became operational on June 10, 2004.

4.2.2 Operable Unit 2

On January 25, 1993, EPA gave notice that the Consent Decree (CD) for OU2 had been lodged in United States District Court in Massachusetts. The Consent Decree was entered into by AVX Corporation (AVX) as the lead Settling Party, the City of New Bedford, the OU1 Settling Parties, EPA, and the Massachusetts Department of Environmental Protection (MassDEP). AVX Corporation hired a design engineering firm, Dames & Moore (now known as URS Corporation) to implement the EPA Statement of Work.

The remedial action at OU2 was conducted between 1998 and 2001. The OU2 Settling Parties contracted with HLA to implement the RA.

Activities associated with soil/sediment removal were conducted from April 1999 through September 2000. The calculated volume of soil, sediment, and debris wastes that were removed from Middle Marsh and the adjacent wetland was 25,485 cubic yards. Activities associated with the stabilization of soil/sediment and placement in the disposal area were conducted from June 1999 through June 2000. Activities associated with wetlands restoration were conducted from July 1999 through September 2000.

The *Final Remedial Construction Report, Sullivan's Ledge Superfund Site, Second Operable Unit* was completed on August 13, 2001 by URS Corporation. The report included a Certification of Remedial Construction Completion, signed on August 13, 2001. This report was approved by EPA on January 23, 2003, which triggered the start of the O&M period.

To date, land use restrictions identified in the OU2 ROD have not been fully implemented. The ROD called for zoning ordinances and/or deed restrictions to ensure that future uses of Middle Marsh and the Adjacent Wetland are limited to existing recreation and conservation purposes, and to prohibit residential and restrict commercial uses.

A GER has been drafted reflecting the above mentioned restrictions by the Commonwealth of Massachusetts in consultation with EPA. The GER has been reviewed by the City of New Bedford and is now with the OU1 and OU2 Settling Parties for review.

4.3 SYSTEM OPERATIONS/O&M

The Settling Parties for OU1 and OU2 are currently performing O&M as described below.

4.3.1 Operable Unit 1

4.3.1.1 OU1 O&M Activities

An Operations and Maintenance Plan, Post-Construction Environmental Monitoring Plan, and Wetlands Restoration Plan were prepared by OBG and finalized in July 1997.

A Site Operations and Maintenance Manual (OBG, 2002a) was prepared by OBG in February 2002 as an update to the 1997 O&M Plan. The O&M activities that are specified in accordance with the Site Operations and Maintenance Manual include:

- Routine inspections of the landfill cap to look for signs of vegetative stress, burrowing animals, settlement, erosion, slope instability, or any other damage (to be performed

monthly throughout the first year and quarterly thereafter);

- Inspections of three surveyed benchmarks for signs of damage at the same frequency as landfill cap inspections;
- Inspections of the access road on the cap system at the same frequency as landfill cap inspections;
- Monthly site security inspections looking for breaches in fence integrity;
- Inspection of the gas vents for signs of damage or obstruction at the same frequency as landfill cap inspections;
- Inspection of run-on/run-off controls, including swales, berms, catchbasins, vaults, headwalls, and the sedimentation basin, at the same frequency as landfill cap inspections; and
- Inspection of the lined portion of the unnamed stream every five years and repairs as necessary.

Activities that are being conducted in accordance with the Post-Construction Environmental Monitoring Plan include:

- Quarterly groundwater compliance monitoring for the active and passive collection systems (to date, twenty-three quarterly monitoring reports have been submitted);
- Collection and analysis of surface water and sediment samples from five locations within the unnamed stream (results documented in the monitoring reports (OBG, 2001c; OBG, 2004a; OBG, 2006a; and OBG, 2008a));
- Quarterly monitoring of the perimeter gas monitoring wells for explosive gases and annual monitoring for hydrogen sulfide; and
- Monitoring of representative perimeter gas monitoring wells for VOCs using SUMMA canisters.

The Wetlands Restoration Plan specifies that wetlands monitoring be performed annually for the first three years after completion of the initial restoration, during the fifth year, and once every following five years. Monitoring activities include stream flow and elevation monitoring, groundwater elevation monitoring, and evaluation of percent cover of the restored and created wetlands. To date, six annual wetland monitoring reports have been submitted (NEE, 2002; NEE, 2003; NEE, 2004; OU1 & OU2, 2005; OU1 & OU2, 2006; and OU1 & OU2, 2007). The wetland monitoring reports address both OU1 and OU2.

A Ground Water Treatment Plant (GWTP) Operation and Maintenance Manual, finalized by OBG in August 2000, specifies the following O&M activities:

- Quarterly inspections of the GWTP to determine the total volume of remedial waste water treated since the previous inspection, average flow rate of the system, total volume of non-aqueous phase oil or hazardous materials recovered since the previous inspection,

and whether any maintenance activities are necessary;

- Routine monitoring of effluent for various parameters; and
- Routine monitoring of the air discharge from the GAC canister in service with the tank venting system for benzene, trichlorethylene, and vinyl chloride using colorimetric tubes and follow-up laboratory analyses.

The manual also describes recommended maintenance activities that should be performed on the GWTP process equipment. Monthly reports documenting the effluent monitoring and other operating data are submitted by the City of New Bedford.

4.3.1.2 Summary of OU1 O&M Issues

The OU1 remedy has generally been performed as designed since construction completion. Certain O&M issues/problems that have occurred in relation to the groundwater pump and treat system over this review period are summarized below. Additional O&M issues are discussed in other sections of this report.

Bedrock Extraction Wells. During 2005, larger pumps were installed in the two of the bedrock extraction wells (OBG-1 and BEI-1) and the pumps were lowered from a depth of 100 feet to 150 feet. During 2007, a larger pump was installed in a third bedrock extraction well (OBG-2) and the pump was also lowered (see Figure 3 in Attachment 1 for well locations). These changes were made in order to increase the rate of pumping from these wells and achieve greater drawdown in the bedrock aquifer.

Within a short period of time after well OBG-1 began pumping at the lower depth in January 2005, a "sludge of tar-like material" was pumped into the plant and was followed by a much higher level of PCBs and VOCs in the influent water from the well. The higher PCBs concentrations resulted in elevated effluent concentrations above the pretreatment limits and higher sludge PCB content resulting in increased disposal costs. In March 2005, OBG-1 was shutdown. The GWTP staff manually operated well OBG-1 for short durations of one minute per hour over a period of time; however, that frequency resulted in high levels of PCBs in treatment plant sludge. OBG-1 remained shutdown until late spring or early summer 2006 when a temporary treatment system was setup, whereby the extracted groundwater was pumped to a tank in the treatment plant, the PCB concentration checked, and the water introduced to the treatment process in a batch mode. This occurred for several months before the well was put back into normal operation in November 2006.

Bedrock extraction well BEI-1 stopped operating in February 2005 due to a hole in the riser pipe and remained shutdown until December 2005, when a larger pump was installed and the discharge piping was replaced. As mentioned above, the pump was also lowered to 150 feet below grade. Well BEI-1 was pumped for one day in January 2006, but was shutdown again when a sample of the groundwater revealed relatively high levels of PCBs. In September 2006, well BEI-1 was returned to normal operation.

Management of Migration Evaluation Report. The "Management of Migration Evaluation Report" (O'Brien and Gere, 2008a), prepared by O'Brien and Gere for the OU I PMC examined the data generated to date and made the following conclusions:

"- The capture zone of the recovery wells were previously concentrated around recovery wells BEI-2 and OBG-3. With the new recovery well pump settings at BEI-1, OBG-1, and OBG-2 the capture zone has significantly expanded across the Site.

-A larger influence area and deeper cone of depression around each of the recovery wells exists in the shallow and intermediate bedrock zones. The deep bedrock zone shows steeper hydraulic gradient to the south towards each of the recovery wells.

-This suggests that stronger groundwater management of migration now exists in each of the three bedrock zones, and that the pumping influence area has extended beyond the Site. The area of management of migration covers most of the downgradient edges of the Site and extends beyond the Site to include downgradient monitoring well ECJ-2."

The effectiveness of the groundwater pump and treat system on controlling contaminant migration will continue to be monitored going forward.

Groundwater Seepage onto Hathaway Road. In December 2005, the shallow collection trench water flowed over the landfill cap liner and seeped onto Hathaway Road following the failure of one of the shallow collection trench pumps. The collection trench water level had been higher than normal due to other recent mechanical issues. With permission from EPA, the City of New Bedford pumped the shallow collection trench water directly to the New Bedford POTW for a period of seven days in order to reduce the water level in the collection trench. The City collected samples of the water for PCBs during the direct discharge period.

Shallow Groundwater Direct Discharge. In May 2004, the City of New Bedford made a request to EPA for direct discharge of shallow groundwater from the shallow collection trench to the New Bedford POTW. The EPA allowed the City to conduct a six month pilot program with several conditions including weekly sampling for PCBs with a rush turn-around. EPA required that if the PCB concentrations exceeded 1 microgram per liter in any sample that the City immediately resume directing the water through the treatment plant prior to discharge to the New Bedford POTW. The City began diverting flow from the shallow collection trench at the beginning of March 2005. On May 23, 2005, the City ceased the direct discharge to the POTW in response to a request from EPA due to the exceedence of the PCB limit for the pilot test. The City has continued to collect samples from the collection trench for PCBs, generally on a weekly basis.

4.3.1.3 OU1 O&M Costs

Due to agreements between the OU1 Settling Parties and the City of New Bedford, O&M costs are paid separately by both groups. The table below summarizes these costs.

Table 2: Annual Approximate System Operations/O&M Costs for Operable Unit 1

Type of Cost and Time Period	Total Cost
Groundwater Treatment Plant O&M Costs:	
July 1, 2004 – June 30, 2005	$258,000
July 1, 2005 – June 30, 2006	$217,000
July 1, 2006 – June 30, 2007	$326,000
July 1, 2007 – June 30, 2008	$337,000
Monitoring, Engineering, Capital Improvement, Administrative, and Legal Costs:	
January 1, 2003 – December 31, 2003	$632,628
January 1, 2004 – December 31, 2004	$491,392
January 1, 2005 – December 31, 2005	$353,652
January 1, 2006 – December 31, 2006	$384,880
January 1, 2007 – December 31, 2007	$318,224

4.3.2 Operable Unit 2

4.3.2.1 OU2 O&M Activities

Post-construction environmental monitoring and post-construction and long-term wetlands monitoring activities are currently being performed in accordance with the Final Operation and Maintenance Plan for the Second Operable Unit, dated January 13, 1999. The O&M period officially began on January 23, 2003 (the date of approval of the Construction Completion Report). However, some O&M activities did occur prior to that date to maintain the integrity of the restored wetlands. The following post-construction environmental monitoring activities are required to be conducted once per year during the first three years, in year five, and then once every five years:

- Collection of four surface water samples from reaches of the unnamed stream and analysis for pH and PCBs;
- Collection of four sediment samples from the reaches of the unnamed stream, within the area of OU2 impacted by remedial action construction and analysis for PCBs and total organic carbon (TOC); and
- Collection of two wetland sediment/soil samples from the adjacent wetland and four sediment/soil samples from the Middle Marsh and analysis for PCBs.

The O&M Plan also specifies that post-construction wetland monitoring be conducted annually, for a period of at least five years. Long-term wetland monitoring will then be conducted to ensure

the long-term effectiveness of the wetland restoration program. Wetlands monitoring activities include monitoring of hummocks, wetlands hydrology, soil development, and biological attributes including survival rates of planted trees and shrubs, tree growth, vegetative diversity, plant community, and presence of the Mystic Valley Amphipod.

Annual O&M reports are required to be submitted to EPA. To date, six annual wetland monitoring reports have been submitted (NEE, 2002; NEE, 2003; NEE, 2004; OU1 & OU2, 2005; OU1 & OU2, 2006; and OU1 & OU2, 2007). The most recent annual wetland O&M report (OU1 & OU2, 2007) documented the fifth year of post-construction wetland monitoring which occurred during 2006. The wetland monitoring reports address both OU1 and OU2.

The next wetlands monitoring event is scheduled for 2011.

4.3.2.2 OU2 O&M Costs

Annual O&M costs incurred by the OU2 Settling Parties are presented below:

Table 3: Annual System Operations/O&M Costs for Operable Unit 2

Time Period	Total Cost
January 2004 – December 2004	$60,286
January 2005 – December 2005	$36,427
January 2006 – December 2006	$72,992
January 2007 – December 2007	$31,673

SECTION 5.0
FIVE-YEAR REVIEW PROCESS

This section describes the activities performed during the five-year review process and provides a summary of findings.

5.1 COMMUNITY NOTIFICATION AND INVOLVEMENT

An advertisement was placed in the New Bedford Standard Times on September 13, 2007 announcing that EPA had begun the Five Year Review Process for the Sullivan's Ledge Superfund Site.

Interviews were conducted with interested parties such as the PRPs, City personnel involved in O&M of the project, and a nearby business owner. A summary of responses to questions posed to PRPs and City personnel is provided in Section 5.5.

5.2 DOCUMENT REVIEW

This five-year review consisted of a review of relevant documents for both OUs including the remedial investigation reports, RODs, remedial construction reports, and O&M and monitoring plans and reports. See Attachment 2 for a list of documents that were reviewed.

5.3 DATA REVIEW

5.3.1 Operable Unit 1

5.3.1.1 Groundwater Treatment Plant Effluent Monitoring

Effluent from the GWTP is discharged to the City of New Bedford publicly-owned treatment works (POTW). The New Bedford POTW has established discharge criteria that must be met by the GWTP for discharge to the municipal sewer system. Treatment plant effluent sample analysis was evaluated to determine if pretreatment discharge limitations were met. A review of the available data indicates that pretreatment discharge limitations are being met for PCBs, Total Toxic Organics (TTO), Semi-volatile Organic Compounds (SVOCs), and 12 select metals. Table A3-1 (located in Attachment 3) provides a comparison of the most recent effluent data to the pretreatment discharge limitations. Table A3-2 (located in Attachment 3) provides a summary of recent PCB effluent data for 2007 and available data for 2008. During 2007, PCB samples were collected on a weekly basis and the pretreatment discharge limit for PCBs was exceeded four times. Each time, EPA has notified and corrective action taken.

No exceedances have occurred for available 2008 data. The effluent exceedances were generally attributed to temporary operational problems with the ultraviolet oxidation system or bedrock well pumps and maintenance or plant shutdowns that had occurred prior to sample collection.

5.3.1.2 Groundwater Monitoring

Monitoring is being conducted while the groundwater treatment plant is operating until the groundwater clean-up standards are achieved in accordance with the requirements of the CD

with the OU1 Settling Parties. Once performance standards are met, performance monitoring will be conducted for a period of three years, in order to evaluate whether achievement of the cleanup standards is sustained. After performance monitoring, long-term monitoring will be conducted (OBG, 1996b).

The Post-Closure Environmental Monitoring Plan (PCEMP)(OBG, 1996b) describes compliance monitoring requirements for both the active extraction system and the passive collection system. With regard to the active extraction system, the plan specifies that bedrock and Westbay monitoring wells be sampled on a quarterly basis and that overburden monitoring wells be sampled on a quarterly basis for the first four quarters and annually thereafter. Water level measurements are to be made prior to sampling each well. With regard to the passive collection system, the groundwater must be sampled on a quarterly basis.

The PCEMP requires the sampling of a total of twelve bedrock monitoring wells, eleven overburden monitoring wells, and multiple zones in four Westbay monitoring wells (ECJ-1 through ECJ-4). Due to issues with the integrity of certain wells, however, not all wells were sampled during each monitoring event. The sampling program has been revised to reflect the sampling of a certain subset of wells for certain analytes quarterly, while a larger group of wells are sampled for more analytes on a yearly basis.

To date, a Post-Construction Baseline Groundwater Sampling Event report (OBG, 2000a) and twenty-three quarterly groundwater monitoring reports have been submitted. The Winter monitoring reports are annual reports that provide additional discussion of historical data and data trends.

Active Collection System

The active collection system has been delivering contaminated groundwater to the treatment plant since startup in 1999. The cleanup goal identified in the ROD for the active collection system is the significant reduction in the mass of the bedrock contamination. Two criteria are used to evaluate this goal: (1) a concentration range of 1 to 10 ppm (1,000 to 10,000 ppb) of total VOCs; and/or (2) an asymptotic curve using groundwater monitoring data indicating that significant concentration reductions are no longer being achieved. Several bedrock monitoring wells serve as points of compliance and were established in the PCEMP. A summary of total VOC data for the points of compliance from 1999 through 2007 is presented in Table A3-3 (located in Attachment 3) and summarized below. Total VOC concentrations are based on totals provided in the Winter 2007 Monitoring Event report (OBG, 2008b).

Point of compliance wells ECJ-1, GCA-1, MW-13, and MW-17 are located within the former disposal area on the downgradient side. In all zones of Westbay monitoring well ECJ-1 and well GCA-1, total VOC concentrations have generally decreased since plant startup. Total VOC concentrations in ECJ-1 (267), in the deep bedrock zone, have generally fallen between 20 and 120 ppb, except for the most recent Winter 2007 round, when the total VOC concentration increased to 417 ppb. Total VOC concentrations in wells MW-13 and MW-17 have decreased since plant startup and have shown concentrations below 10 ppb since 2002.

Point of compliance wells located within the former disposal area on the upgradient side include ECJ-3, MW-2, and MW-24. Total VOC concentrations in each zone of Westbay well ECJ-3 have generally been low and were below 10 ppb during 2005 through 2007. Total VOC concentrations in well MW-24 appeared to decrease following plant startup through the Winter 2004 round and

have since steadily increased with a total VOC concentration in winter 2007 of approximately 8,000 ppb. Total VOC concentrations in well MW-2 generally decreased through the spring 2006 round and have since slowly increased with a total VOC concentration in winter 2007 of approximately 527 ppb.

Point of compliance wells ECJ-2, MW-4, MW-5, and MW-6 are located outside of the former disposal area. Total VOC concentrations in each zone of Westbay well ECJ-2 have generally decreased significantly since plant startup, with concentrations during the winter 2007 round ranging from 265 to 4,414 ppb. Total VOC concentrations in ECJ-2 (117) decreased following plant startup but have appeared to increase since the winter 2005 round. Total VOC concentrations in well MW-4 appeared to fluctuate with no apparent trend through the spring 2006 round and have since exhibited a decreasing trend with lowest concentration to date observed during the winter 2007 round (640 ppb). Total VOC concentrations in well MW-5 have been very low relative to other point of compliance wells since plant startup with no apparent increasing or decreasing trend. Total VOC concentrations in well MW-6 have decreased significantly since plant startup but have remained relatively steady over the past few years of monitoring.

For the most part, concentrations of total VOCs have decreased significantly since treatment plant startup conditions in 1999. However, continuation of the compliance monitoring set forth in the ROD in accordance with the PCEMP should continue. Special attention to any wells exhibiting increasing concentrations in total VOCs downgradient of the disposal area is warranted as data continues to be collected.

Passive Collection System

The objective of the passive collection system is to prevent degradation of the unnamed stream by collecting shallow contaminated groundwater. Cleanup levels are based on AWQC and the designated uses of the receiving waters. Compliance is measured at the influent to the treatment plant. Quarterly groundwater monitoring includes collection of groundwater from the collection system for chemical analysis. In addition to the quarterly monitoring, the City of New Bedford has generally been sampling the collection trench groundwater for PCBs on a weekly basis since March 2005 and at other frequencies prior to that time.

In general, levels of VOCs, SVOCs, PCBs, and metals have remained relatively consistent since treatment plant startup. With the exception of PCB concentrations, levels of constituents in the influent derived from the collection trench have generally been below the pretreatment discharge limitations set by the City of New Bedford. A comparison of recent collection trench data to the pretreatment discharge limitations is provided as Table A3-4 in Attachment 3. Total PCB concentrations have periodically exceeded the pretreatment discharge limit. Since the beginning of 2008, approximately 50% of the PCB samples exceeded the 5 ug/L pretreatment discharge limit. Note that the afforementioned data was collected prior to treatment of the passive collection system water in the groundwater treatment facility. A summary of available total PCB data for 2008 is provided as Table A3-5 in Attachment 3.

The passive collection system continues to collect shallow contaminated groundwater. Flow from the collection system is providing essential additional flow to the treatment plant to ensure continuous/semi-continuous operation. During dry weather periods and the resultant lower than expected flow rate from the passive collection system vault, the treatment plant has been operating intermittently. In general, the treatment plant has been online Monday through Friday

and shut down over the weekend under those conditions.

5.3.1.3 Sediment Monitoring

Bi-annual sediment sampling was performed in September 2003, September 2005, and September 2007/January 2008. Sediment samples were collected from the unnamed stream, OU1 diversion swale, sedimentation basin, just downstream of the Hathaway Road culvert, and OU1 cap swale. Sediment samples were analyzed for PCBs, PAHs, TCO, metals, and percent solids. Two sediment samples exceeded the sediment target level of 20 ug PCB/g carbon. In September 2003, the sediment sample from the OU1 diversion swale exceeded the sediment target value with a PCB concentration of 91.6 ug PCB/gC (OBG, 2004a). Subsequent PCB concentrations for this location were much lower at 10.3 ug PCB/gC and 6.9 ug PCB/gC in 2005 and 2008, respectively, indicating that the 2003 result may have been an anomaly. All other sediment samples from September 2003 showed concentrations below the sediment target level. In addition, all sediment samples from September 2005 showed concentrations below the sediment target level (OBG, 2006a).

In January 2008, the sediment sample from the unnamed stream, near Pond A, exceeded the sediment target value with a PCB concentration of 64.5 ug PCB/gC (OBG, 2008a). This concentration was elevated compared to previous concentrations of 8.1 ug PCB/gC and 5.5 ug PCB/gC in 2003 and 2005, respectively, at the same location. Future monitoring data should be assessed to determine if the 2007 results was anomaly or indicative of increased impacts at this location. All other sediment samples from September 2005 were below the sediment target level.

During each of the 2003, 2005, and 2007 sediment sampling events, PAHs were detected at all sample locations including the location upstream of the former disposal area at the OU1 cap swale. Concentrations of PAHs were generally highest in the sediment sample collected from just downstream of the Hathaway Road culvert. Similarly, several metals were detected in all sediment samples including the upstream samples from the OU1 cap swale. While the downstream metals concentrations were generally higher than the upstream metals concentrations, there do not appear to be any sharp upward trends between monitoring events. Higher metals concentrations were generally found in sediment samples collected from just downstream of the Hathaway Road culvert. OBG has attributed the higher concentrations at this location to runoff from Hathaway Road.

5.3.1.4 Surface Water Monitoring

Bi-annual surface water sampling was performed in September 2003, September 2005, and September 2007. Surface water samples were generally collected from the unnamed stream, OU1 diversion swale, sedimentation basin, downstream of the Hathaway Road culvert, and OU1 cap swale (upstream location). A surface water sample could not be obtained from the sedimentation basin during the 2005 sampling event because it was dry. The surface water samples were analyzed for VOCs, PAHs, PCBs, metals, and pH.

Generally, surface water data showed similar results for each of the three sampling events. PCBs were not detected in any surface water samples. Very low concentrations of chlorinated VOCs were detected at one to two downstream locations with no increasing trends. Metals concentrations were generally similar between the three monitoring events. PAHs were not detected during the 2003 and 2005 events but were detected in 2007 at the sampling locations

just downstream of the Hathaway Road culvert and within the OU1 diversion swale (OBG, 2004a, 2006a, and 2008a).

5.3.1.5 Landfill Gas Monitoring

As described above, a full scale active landfill gas collection system has been operating since June 2004. Landfill gas monitoring is conducted on a quarterly basis in accordance with the Surface Water, Sediment, and Landfill Gas Monitoring Field Sampling Plan. During each event, the landfill gas monitoring wells along the perimeter of the landfill cap, the discharge stack of the gas extraction system, and ambient air in the vicinity of the gas extraction unit are screened for VOCs, methane, carbon dioxide, oxygen, and hydrogen sulfide. See Figure 4, provided in Attachment 1, for the locations of the landfill gas monitoring wells and discharge stack. Ambient air inside and outside of Rosie's Restaurant, located next to the former disposal area, is also screened for landfill gases. Rosie's Restaurant has recently closed and monitoring inside the restaurant was not conducted during the Winter 2007 monitoring event.

During the recent Winter 2007 monitoring event, VOCs and hydrogen sulfide were not detected in any of the gas monitoring wells. Methane was detected in two of the landfill gas monitoring wells located on the eastern side of the landfill cap at concentrations of 838% and 300% of the lower explosive limit (LEL). As frequently occurs, two landfill gas monitoring wells on the southern perimeter of the landfill cap were not monitored because the area around the wells was submerged with water. Methane was detected at the discharge stack of the landfill gas extraction system at a concentration of 43% of the LEL. As is typical of previous monitoring events, no methane, hydrogen sulfide, or VOCs were detected in ambient air around the gas extraction system or around Rosie's Restaurant. Though indoor air was not monitored at the adjacent restaurant during the Winter 2007 event, no methane has been detected during previous monitoring events.

Methane has typically been detected in one or more landfill gas monitoring wells along the eastern perimeter of the landfill cap and no measurable vacuum is typically seen for the wells with elevated methane. The presence of methane above 25% LEL along the eastern perimeter of the landfill cap is not in compliance with applicable Massachusetts Solid Waste regulations. In December 2005, one gas monitoring well on the eastern perimeter of the landfill cap was tied directly into the gas extraction system in order to attempt to achieve greater vacuum and reduce the methane levels along the eastern perimeter. This was effective in reducing methane levels in that gas monitoring well but not in all gas monitoring wells located nearby. The system has also had problems with water collecting in the lower leg of the gas recovery system piping, which restricts vacuum on portions of the cap. The system was modified in June 2006, so that water is periodically removed automatically. The PMC has suggested that the presence of methane along the eastern perimeter may be from an off-site source, such as decaying organic material beneath the self-storage facility located adjacent to the landfill gas to the east. This possible off-site source should be further investigated or further modifications should be made to the landfill gas extraction system, such as tying additional gas monitoring wells directly into the gas extraction system, in order to achieve compliance with Massachusetts Solid Waste regulations.

5.3.1.6 Wetlands Monitoring

The biological and physical goals for wetland restoration in OU1 areas were modified to align with the goals established for OU2 area. Therefore, monitoring for OU1 and OU2 areas was combined and the data was presented in single annual reports. A summary of the data review is provided in OU2 section below.

5.3.2 Operable Unit 2

5.3.2.1 Sediment and Soil Monitoring

Since the previous five-year review, sediment samples were collected in August 2003, August 2004, and September 2006 from four locations within the unnamed stream, within the area of OU2 impacted by the remedial action construction, and analyzed for PCB, and TOC. PCB concentrations ranged from nondetect to 20 ug PCBs/gC in 2003, nondetect to 8.67 ug PCBs/gC in 2004, and 7.6 to 61 ug PCBs/gC in 2006. During the 2006 monitoring event, two out of four sediment samples from the unnamed stream exceeded the sediment target level of 20 ug PCBs/gC, with PCB concentrations of 355 µg/kg or 32 µg/gC (at 1.1% TOC) and 415 µg/kg or 61 µg/gC (at 0.68% TOC), respectively (OU1 & OU2, 2005 and OU1 & OU2, 2007). These two samples showed higher PCB concentrations and lower TOC concentrations than were reported for the same locations during monitoring performed in 2003 and 2004. Although these locations exceed the target level of 20 ug/gC, these were associated with unpresentatively low TOC values. Similar observations were made in the last five-year review. Continued monitoring of sediments in the unnamed stream should be conducted to continue to evaluate the protectiveness of the remedy.

Sediment/soil samples were collected in August 2003, August 2004, and September 2006 from four locations within non-aquatic plot areas in the Middle Marsh and two locations within the adjacent wetlands and analyzed for PCBs. PCBs were detected at four of six locations in 2003, four of six locations in 2004, and two of six locations in 2006. All detected PCB concentrations were well below the 15 mg/kg total PCBs cleanup level (OU1 & OU2, 2005 and OU1 & OU2, 2007).

5.3.2.2 Surface Water Monitoring

Since the previous five-year review, surface water samples were collected in August 2003, August 2004, and August 2006 from four locations within the unnamed stream and analyzed for PCBs and pH. Again, PCBs were not detected above the detection limit in any of the samples collected (OU1 & OU2, 2005 and OU1 & OU2, 2007).

5.3.2.3 Wetlands Monitoring

Data has been submitted for wetland monitoring events that have occurred in 2003, 2004, 2005, and 2006. No data has been submitted for the year 2007.

The data were collected and compared to the various biological and physical indicators that were established prior to remediation to monitor the progress towards reaching the goal of wetland restoration. The first two columns of the following table identify the goals that were established and described in the O&M Plan for OU2 (Dames & Moore, 1999) and subsequently adopted by OU1. Comments regarding the trajectory towards meeting these goals are provided in the third

column. Refer to Figure 5, provided in Attachment 1, for the locations of the OU1 and OU2 wetland and stream restoration areas.

Wetland Attributes	Goals	Comments
	Biological Indicators	
Survival Rates of Planted Trees and Shrubs	At least 80% of the original number of plantings of each species should be viable five years after planting. The 80% may be comprised of both plantings and volunteers of the species.	At least 80% of the original number of plantings of each species does not appear to be viable five years after planting in some areas of the site, including the OU1 Mitigation Areas (East and West) and the OU2 Middle Marsh northwestern and southeastern corners. In other areas, this attribute appears to be met.
Tree Growth	Mean tree height and diameter (dbh) for planted trees should increase at least 20% from the original planting height and dbh every 5-year interval.	The mean tree height and diameter (dbh) for planted trees does not appear to have been met in all restored areas; however, it is met in a majority of them.
Vegetative Diversity	Demonstrate an ever increasing trend up from the 15 woody and 10 herbaceous planted species, by providing at least one additional woody and one additional herbaceous non-invasive wetland species every 5 years.	Many new plant species have appeared throughout both the OU1 and OU2 areas.
Plant Community	(a) Herbaceous, shrub, and woody relative cover at the end of the second growing season must achieve an overall 75% areal coverage of wetland plant species. (Also a Performance Standard) (b) To ensure the area continues to meet the federal wetland definition, greater than 50% of the dominant plants, exclusive of invasive species, should be wetland species.	Wetland species appear to cover at least 75% of the restored wetland areas. In addition, greater than 50% of the dominant wetland plants in the sampling plots appear to meet the criteria of non-invasive wetland plant species.
Mystic Valley Amphipod	The Mystic Valley Amphipod (MVA) must occur within areas of the Second Operable Unit by the end of the third year after wetland construction. (Also a Performance Standard)	The MVA was observed in the OU2 MM in 2003. No confirmation sampling has been performed to indicate the maintenance of this species in the wetlands;

Wetland Attributes	Goals	Comments
		however, site conditions have remained stable over the 5-year period since the initial sampling.
	Physical Indicators	
Hummocks	Maintain greater than 25% mean areal coverage of hummocks in the sampling plots.	The percent of hummocks was established at greater than 25% in the MM areas, based on the 2003 Annual Report. No significant erosion has been noted over the 5-year period and the 2006 Annual Report indicates this attribute has been met; however, only two of four OU2 MM plots were analyzed for hummocks in 2006 and hummock coverage should be confirmed in the other two plots in future monitoring events.
Hydrology	Groundwater and/or saturated soils should be within 12 inches of the wetland surface for two weeks in each piezometer in the restored wetlands at least three of every five years.	Two rounds of data have not been collected within a two-week period since the project's inception and it can't be confirmed that water levels have been within 12 inches of the wetland surface for two weeks. This attribute is intended to document that hydrology in the restored wetlands is sufficient to support wetland plants. Given the high percentage of wetland plants growing throughout the restored areas, sufficient hydrology has been qualitatively confirmed.
Soil Development	Soils from all ten borings should show a trend to meet the definition of hydric within 10 years.	Soil data indicates that hydric characteristics are present throughout the site, indicating a trajectory towards meeting the definition for a hydric soil in the future.

5.4 SITE INSPECTION

Site inspections of both Operable Units were conducted periodically by Metcalf & Eddy between the previous five-year review and September 2006. An M&E engineer conducted site inspections of OU1 (not including wetland/stream areas) in June and July 2008 as part of this five-year review. Also as part of this five-year review, an inspection of the unnamed stream and OU1 and OU2 wetland restoration areas was conducted in July 2008 and was attended by the EPA remedial project manager, M&E wetlands scientist and engineer, and the City of New Bedford Conservation Agent. The observations made during these site inspections were used to provide the necessary information for this five-year review. Site Inspection checklists are provided in Attachment 4.

5.4.1 Operable Unit 1

Groundwater Extraction and Treatment System

The groundwater extraction and treatment system has been inspected by M&E periodically since start-up in 1999. The most recent inspection was performed on June 10, 2008. The system was operating on the day of inspection.

Outstanding GWTP Operational Problems. The following are GWTP operational problems ongoing during the recent site inspections.

- The pumps and influent lines for bedrock extraction wells OBG-1 and BEI-1 have been clogged with mud which has interrupted their operation. The pump for OBG-1 was not functioning for most of April, May, and June 2008 and a replacement pump was on order at the beginning of July. The plant operators have been acid cleaning the influent lines frequently, which has helped to re-establish flow through the lines.

- There is an ongoing discrepancy between influent and effluent flow readings for the groundwater treatment plant. The plant operators have had the flow meters checked and they are accurate. Based on a manual calculation of the flow, the plant operators report that the effluent meter appears to be providing the most accurate readings. Also, the plant operators noticed that the flow from Interim Well #1 is not counted by the totalizer except when the flow rate is over 5 gpm, resulting in an inaccurate measurement of total cumulative flow from the well. The OU1 Settling Parties and plant operators are continuing to evaluate these issues.

- Recent humid weather has caused the ultraviolet oxidation unit's leak detection system to trip periodically which in turn causes the plant to shutdown. The plant operators have insulated the piping and reactor vessels in the unit to minimize shutdowns. During periods of humid weather, the plant operators have been using fans inside and outside of the unit in order to minimize condensation.

On-Site Documents and Records

An interview and inspection of site documents and records at the GWTP indicate that the following documents are not up to date.

1. Site Specific Health and Safety Plan (HASP). The plant operators are using the HASP that

was developed for construction activities during the Phase 1A Remedial Action, prepared by Harding Lawson and Associates, Inc. (HLA) in April 1998. According to Section 22.4 of the Groundwater Treatment Plant O&M Manual (OBG, August 2000) a site specific HASP must be prepared and reviewed and approved by a Certified Industrial Hygienist.

2. Groundwater Treatment Plant O&M Manual. The Groundwater Treatment Plant O&M Manual (OBG, August 2000) was located at the GWTP; however, the manual should be updated to reflect changes in equipment and operations and maintenance procedures based on several years of GWTP operation.

Landfill Gas Extraction System

The gas extraction system was inspected by Metcalf & Eddy periodically since start-up in June 2004. The most recent inspection of the landfill gas extraction system was performed on July 1, 2008. The system was operating on the day of inspection.

Site Features (South of Hathaway Road)

Site features identified in the O&M Plan (Sullivan's Ledge Superfund Site, New Bedford, Massachusetts, Site Operations and Maintenance Plan, Feb. 2002) include the landfill cap, surveyed benchmarks, the access road, site security features, the gas venting system, run-on/run-off controls, and the lined portion of the unnamed stream. Site features related to OU1 have been periodically inspected by M&E since the previous five-year review and most recently on July 1, 2008.

- **Landfill cap.** M&E inspected the landfill cap most recently on July 1, 2008. In general, the cap appeared to be well vegetated and mowing had recently been conducted. Tall vegetation and shrubs were observed in and around the drainage swales and along the southern slope of the landfill cap. This vegetation should be cut down—which the City of New Bedford is in the process of arranging. There were no signs of erosion, seepage, or burrowing animals, or slope instability on the cap.

- **Surveyed benchmarks.** No signs of damage and are all accounted for.

- **Run-on/run-off controls.** As noted above, vegetation within the drainage swales should be removed. Otherwise, the swales, catchbasins, and Hathaway Road headwall appear to be in good condition.

- **Access road.** The landfill cap access road is in good condition.

- **Site security features.** Fencing, barb wire and locks are in good shape. No trespassing signs along the fence are present.

- **Gas venting system.** All gas vents are in good shape. The gas monitoring well roadbox covers were not opened, however the roadboxes appear to be in good condition.

- **Lined portion of the unnamed stream.** The liner has not been inspected since its completion. The O&M Plan indicates it is to be inspected every 5 years.

Unnamed Stream and OU1 Wetland Areas

The following observations were made by M&E during the July site inspection.

Invasive Species. The purple loosestrife population appears strong in both the OU1 and OU2 Middle Marsh areas; however, there was positive evidence of controls, with beetle damage and also sightings of the beetles on loosestrife plants during the site walk. The City of New Bedford (CONB) representative, Sarah Porter, Conservation Agent, indicated that New England Environmental (NEE) would be providing control of common reed (*Phragmites australis*) in late August/early September since that is the most effective time to control it. CONB purchased Galarucella beetles for release in OU1 and OU2 for purple loosestrife control. In 2007, 10,000 beetles were released with 5,000 each at two locations. In 2008, 10,000 beetles were divided between five locations.

There were also several stands of reed canary grass scattered across the site, both in OU1 and OU2 Middle Marsh areas. These areas should be monitored to ensure that they do not spread uncontrolled such that they endangered the biodiversity of these areas. The milfoil present in the OU1 unnamed stream should be monitored to ensure that it does not expand to the point of impeding flow. Other invasive plants, including multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus umbellata*), and cattail (*Typha latifolia*) should be monitored to ensure they do not expand to monotypic stands. If they do create such areas, control mechanisms should be implemented.

OU1 Unnamed Stream. Sediment just upstream of the double box culvert in the OU1 unnamed stream at Hathaway Road was removed in the fall of 2007. This removed the larger 'islands' of sediment and returned flow to within the design stream channel. At the time of the site visit, additional sediment had accumulated in this area again and new 'islands' were being formed. The CONB Conservation Agent, Sarah Porter, indicated that the City Department of Public Works (DPW) has agreed to a regular maintenance schedule for cleaning out the catch basins on Hathaway Road, the primary source of sediment. In addition, the City may employ use of a chemical deicer in future winter months which would reduce the amount of sand/salt on the roadway. The trees planted along the stream bank intended to provide shade over the area upstream of the double box culvert were noted. The 2006 report indicates that white pine (*Pinus strobus*), silver maple (*Acer saccharinum*), and cottonwood (*Populus deltoides*) were planted in the vicinity of the unnamed stream adjacent to Hathaway Road. Of these plantings, only a few white pines had survived. The trees may still be under warranty and should be replanted to provide coverage. The remaining stream banks downstream of the double box culverts contain significant shade primarily due to the presence of the alder (*Alnus incana*).

It was noted that the sedimentation ponds located to the west of the unnamed stream at Hathaway Road have an increasing population of woody species, which may reduce the amount of invasive species present. The height of the woody species may interfere with golfing activities, but are not anticipated to significantly impact the wetland restoration areas other than potentially (beneficially) reducing the nearby invasive species population.

The rope fence protecting the restored wetlands was not in place along the unnamed stream banks just upstream of OU2 Middle Marsh. The rope should be re-installed.

OU1 Middle Marsh. The OU1 MM area contained a wide variety of species, including emergent, shrub, and tree species. Other than the purple loosestrife and the reed canary grass population,

this area looked very good. The purple loosestrife is anticipated to be reduced through the use of the beetles and the reed canary grass should be monitored.

OU1 Mitigation Area East. The area contains a variety of species and includes shrubs in the eastern half. In the western half, the area is consistently inundated with several inches of water preventing the growth of woody species. The species diversity was observed to be very high.

OU1 Mitigation Area West. The area was observed to be almost devoid of shrubs. A few stunted planted shrubs remain; however, most of the planted shrubs have died. It is unclear how this area meets the 80% survivability attribute as described in the 2006 report. A small population of Phragmites was observed. This population should be treated during the late July/early August 2008 control event.

5.4.2 Operable Unit 2

The following observations of OU2 wetlands areas were made by M&E during the July 2008 site inspection.

Refer to the previous section for observations regarding invasive species in both OU1 and OU2.

OU2 Middle Marsh. The portion of the OU2 Middle Marsh to the east of the unnamed stream contains a smaller population of cattails compared to previous years and a diverse emergent plant population exists. The woody coverage has increased and is adequate within the majority of the OU2 Middle Marsh to the east of the unnamed stream; however, within a small portion of the area, the primary woody species is alder, which will not typically grow to a height of more than 25 feet and will not expand to provide tree canopy typical of a forested wetland. The survivability of woody tree species should be monitored in accordance with the O&M plan wetland attributes to assess the long-term trajectory of the restoration project. There was evidence of invasive species controls, loosestrife beetle damage, and actual sightings of the beetles that were released in OU2 Middle Marsh.

Similarly, the majority of OU2 Middle Marsh to the west of the unnamed stream contains significant woody coverage; however, a small area within the northwest corner has consistently been a concern due to its low elevation and subsequently permanent inundation with water. Although the area has diversified in the number of emergent species present, no significant woody population has been able to establish in this small northwestern corner. In addition, Phragmites still dominates a portion of this area.

OU2 Adjacent Wetland. This area has developed a substantial amount of woody vegetation cover over the last couple of years. A diverse emergent plant population also exists between the primary woody species (alder).

5.5 INTERVIEWS

5.5.1 Operable Unit 1

A series of interview questions were developed for the PMC and City of New Bedford for OU1. Answers to the questions were provided in writing to EPA in a letter dated August 22, 2008 from Steve Wood of the PMC.

The PMC's overall impression of the project is good. When asked if the remedy is functioning as expected and how well the remedy is performing, the PMC responded that the remedy is performing well and *"Management of migration has been achieved, the Ground Water Treatment Plant (GWTP) effectively treats constituents in extracted groundwater, and the Wetland restoration is progressing well."*

The PMC was asked if there were any comments, suggestions, or recommendations regarding the project and the following response was provided: *"During the period from July 1, 2007 to June 30, 2008, approximately 370 pounds of VOCs were removed from extracted groundwater by the GWTP. The estimated annual cost to operate and maintain the UV Ox system during that period is $250,000 ($200,000 electricity, $20,000 parts, and $30,000 labor). This results in an estimated cost/pound of $672. An air stripper sized to remove 99.9% of the VOCs in the extracted groundwater can be obtained and installed for an estimated cost of $112,500. Annual operating and maintenance costs are estimated at $17,000 and would result in an estimated cost/pound or $46, a significant reduction. The PMC recommends that an air stripper be installed in the GWTP, replacing the existing UV Ox system."*

The PMC indicated that the O&M activities are being performed consistent with the approved O&M and monitoring plans.

5.5.2 Operable Unit 2

A series of interview questions were developed for AVX Corporation, the OU2 lead Settling Party, AVX Corporation's contractor URS, the City of New Bedford, and the PMC for the Middle Marsh/OU2. Answers to the questions were provided in writing to EPA in a letter dated September 11, 2008 from Marilyn Wade, URS Corporation.

When asked about the overall impression of the project, URS indicated that the project has achieved its performance objectives. When asked if the remedy is functioning as expected and how well the remedy is performing, URS responded with the following: *"The remedy is functioning as expected. It is protective of human health and the environment. The restored wetland areas appear to be on a trajectory towards a fully functioning forested wetland both in Middle Marsh and the Adjacent Wetland. Some trees that were planted already exceed 20' in height and 3 inches DBH. A diversity of shrubs, grasses, and herbs are sufficiently dense to preclude the majority of invasive species. The Unnamed Stream appears clear and dense riparian vegetation, including young trees; provide a canopy which shades most of the stream. Wildlife, including small mammals and a variety of bird species, were sighted on a short site walk and based upon observations by the City of New Bedford personnel, a diversity of small mammals, deer and birds utilize these wetland areas for cover, feeding, breeding, nesting and/or rearing young. Turtles and small fish were sighted in the Unnamed Stream and in the pond where the Unnamed Stream discharges."*

URS indicated that there have not been any unexpected O&M difficulties or costs at the site in the last five years and URS did not have any comments, suggestions, or recommendations regarding the project. URS feels that O&M activities are being performed consistently with the approved O&M and monitoring plans.

URS was asked if they plan to continue with invasive species management between now and the next scheduled monitoring event in 2011 and what the invasive species management would involve. Also, for areas that have a monotypic stand of cattail in the understory, with little canopy yet established to provide shading, URS was asked whether they would consider continuing cattail herbicide treatments to prevent cattail from out-competing other species. URS provided the following response to these questions: *"Invasive species management has accomplished an ever increasing level of control to date, and we anticipate a decrease in the amount of activity. A combination of the biological control (beetles) and the dense growths of native species have been effective at precluding the most important invasive species including purple loosestrife and phragmites. Visual inspections have shown purple loosestrife defoliation due to beetle feeding. Additional releases are planned for 2009 and thereafter until the loosestrife population is under control and no longer a threat to native wetland plant diversity in the restoration areas. The need for future herbicide application to phragmites and other invasives on site shall be evaluated annually to determine if it shall be needed. Current science and field experience has determined that herbicide should be applied to phragmites at the end of the growing season (September) so that the herbicide is translocated down into the rhizome. Over the next several years, beetle releases and herbicide application shall completely phase out as the restored wetland reaches a "dynamic balance" with a predominance of native wetland plant species within the restored wetlands moving towards goal of a primarily forested wetland interspersed with smaller shrub and open water habitats."*

URS was asked what the PRP's plan is to ensure that all of the Middle Marsh OU2 areas continue on a general trajectory toward an increase in woody canopy between now and 2011, such that the goal of re-creating a forested wetland is achieved. URS responded by saying that future active management will consist of the beetles release and the herbicide application as discussed in the response to the previous question provided above. URS also stated that *"Planted trees and native willow are combining to increase the canopy coverage annually. Soon the canopy coverage will shade out the remaining invasive plants and eliminate the need to continue releasing beetles and applying herbicide."*

URS was asked about the status of coordination and cooperation with the golfing community. URS stated that *"Interaction with the golfing community is minimal and there are no issues or concerns. We have met with the managers to be sure they know which areas they can trim for sight distance and they are doing that."*

SECTION 6.0
PROGRESS SINCE THE LAST REVIEW

This is the second five-year review for the site. This section presents the recommendations and follow-up actions identified in the first five-year review, followed by a summary of efforts since 2003 to address the recommendations and follow-up actions.

6.1 PROTECTIVENESS STATEMENT AND RECOMMENDATIONS FROM FIRST FIVE-YEAR REVIEW

The following protectiveness statement was included in the first five-year review for OU1 and OU2:

The remedies for both OU1 and OU2 currently protect human health and the environment because there is no current use of the site resulting in an exposure to site media containing contaminant concentrations exceeding applicable criteria. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure long-term protectiveness.

OU1

- Implement institutional controls;
- Continue to evaluate performance of the groundwater extraction and monitoring system with respect to the Remedial Action Response Objectives in the ROD;
- Continue to monitor sediment concentrations and implement corrective actions if necessary;
- Install and operate a full-scale landfill gas collection system to prevent offsite migration of landfill gas; and
- Implement the Wetlands Operation and Maintenance Plan, including control of invasive and nuisance species in the wetlands.

OU2

- Implement institutional controls; and
- Implement the Wetlands O&M Plan, including control of invasive and nuisance species in the wetlands and monitoring of water table elevations.

6.2 PROGRESS SINCE LAST FIVE-YEAR REVIEW

6.2.1 OU1

Institutional Controls. Since 2003, the Commonwealth of Massachusetts has completed a draft of the Grant of Environmental Restrictions (GER) reflecting the land use restrictions identified in the RODs for OU1 and OU2. The GER has been reviewed by the City of New Bedford and is now with the OU1 and OU2 Settling Parties for review.

Groundwater Extraction System and Monitoring Performance. *The groundwater treatment* plant has been operational throughout this review period. Quarterly groundwater monitoring is conducted in order to evaluate progress toward meeting the ROD cleanup levels. A discussion of the sampling results is provided in Section 5.3.1.2. For the most part, concentrations of total VOCs have decreased significantly since treatment plant startup conditions in 1999. However, continuation of the compliance monitoring set forth in the ROD in accordance with the PCEMP should continue to monitor the effectiveness of the system over time.

The previous five-year review noted that monitoring of groundwater pump and treat operation effectiveness on controlling contaminant migration must be documented and comply with OU1 RAOs. During this review period, the PMC took steps to enhance the management of groundwater migration at the site through the installation of larger pumps in three of the bedrock extraction wells. Additionally, the pumps in those three extraction wells were lowered from 100 feet to 150 feet. These changes were made in order to increase the rate of pumping from these wells and achieve greater drawdown in the bedrock aquifer. OBG recently submitted a technical memorandum providing the evaluation of the impact of these changes on the management of groundwater migration (OBG, 2008a). The report compared groundwater elevation data from December 2006 to more recent groundwater elevation data obtained in January 2008 and March 2008 and noted that the December 2006 groundwater elevation data showed a localized cone of depression in the vicinity of two of the bedrock extraction wells, while the January and March 2008 groundwater elevation data showed more pronounced cones of depression that encompass the six bedrock recovery wells, indicating enhanced hydraulic control.

The PMC and City of New Bedford should continue to conduct groundwater extraction and treatment and evaluate performance. Periods of extended downtime for individual bedrock extraction wells should be avoided as this can impact the management of migration of the bedrock groundwater plume.

Sediment Monitoring. Since the previous five-year review, bi-annual sediment sampling has been performed in September 2003, September 2005, and September 2007/January 2008. A discussion of the sampling locations and results is provided in Section 5.3.1.3. Two exceedances of the sediment target level for PCBs occurred over this period. In September 2003, the sediment sample from the OU1 diversion swale exceeded the sediment target value for PCBs, although subsequent sediment samples from this location in 2005 and 2008 were below the cleanup level. In January 2008, the sediment sample from the unnamed stream, near Pond A, exceeded the sediment target value for PCBs. Sediment sampling was also performed within the unnamed stream for OU2 during this review period, as summarized in Section 5.3.2.1. During the most recent OU2 monitoring event in 2006, two out of four sediment samples from the unnamed stream exceeded the sediment target level for PCBs. Future monitoring data should be assessed to determine if the 2006 (OU2) and 2008 (OU1) results were an anomaly or indicative of increased impacts within the unnamed stream, in which case, corrective actions

may be warranted.

Landfill Gas Collection and Extraction System. Since the previous five-year review, a full-scale active landfill gas extraction system has been installed at the site and has been operating since June 2004. The landfill gas extraction system has generally been effective in reducing landfill gas levels along the perimeter of the cap, with the exception of the eastern perimeter, where one or more landfill gas monitoring wells generally exhibit methane levels above 25% LEL. The PMC has taken some steps to reduce methane levels along the eastern perimeter of the cap, including tying one gas monitoring well directly into the extraction system to achieve greater vacuum. Also, the system was modified to automatically remove water from the recovery system piping, since it collects in the lower leg of the piping, which restricts vacuum on portions of the cap.

Wetlands O&M. Since the previous five-year review, wetlands O&M has been performed jointly for OU1 and OU2. The biological and physical goals for wetland restoration in OU1 areas were modified to align with the goals established for OU2 areas. Therefore, monitoring for OU1 and OU2 areas was combined and the data was presented in single annual reports. A discussion of biological and physical attributes and trajectory toward meeting them is provided in Section 5.3.2.3. Data has been submitted for wetland monitoring events that have occurred in 2003, 2004, 2005, and 2006..

Invasive species controls have been implemented over the past five years in response to the large population of such plant species. Significant effort has been expended by the OU1 and OU2 Settling Parties in controlling invasive species as part of their overall implementation of the O&M Plan. However, continued attendance to the invasive species populations is required going forward.

6.2.2 OU2

Institutional Controls. Refer to the summary of progress provided under OU1.

Wetlands O&M. Refer to the summary of progress provided under OU1. Wetlands O&M has been performed jointly for OU1 and OU2.

SECTION 7.0
TECHNICAL ASSESSMENT

This section discusses the technical assessment of the remedy and provides answers to the three questions posed in EPA's Comprehensive Five-Year Review Guidance (June 2001).

7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

7.1.1 OU1

Yes, a review of documents, ARARs, risk assumptions and site inspection results indicates that the remedy has been constructed as intended by the ROD, as modified by the ESDs.

Institutional controls are in the process of being finalized for the site. A Grant of Environmental Restrictions (GER) was drafted by the Commonwealth of Massachusetts and has been reviewed by the City of New Bedford. The GER is now with the OU1 and OU2 Settling Parties for review.

The excavation of sediments and soils has been performed to comply with soil and sediment cleanup standards set in the ROD and the ESD, thus removing the source of contamination to sediment and surface water and reducing risk to human health and aquatic organisms. However, there continue to be periodic exceedances of sediment clean-up criteria for a limited number of sampling points during bi-annual sampling performed in OU1. Therefore, continued sediment sampling is necessary to monitor the effectiveness of the remedy.

Operation and maintenance of the cap, GWTP and extraction system has been effective. When there have been operating issues in the groundwater treatment plant such as equipment failures or malfunctions, they have been addressed by the Settling Parties and the City of New Bedford. During this review period, the Settling Parties took steps to enhance the management of groundwater migration at the site. The Settling Parties should continue to conduct groundwater extraction and treatment and evaluate performance toward the goal of controlling contaminant migration. Periods of extended downtime for individual bedrock extraction wells should be avoided as this can impact the management of migration of the bedrock groundwater plume.

The unnamed stream, its banks, and the other OU1 wetland restoration areas were completed in accordance with the ROD and ESDs. Continued monitoring, maintenance, and replantings are necessary to check that the wetlands restoration effort satisfies the requirements of the site Wetlands Operation and Maintenance Plan. Coordination with the golf course is necessary to avoid impacts to golfing activities due to tall woody species along the unnamed stream as it passes through fairways. OU1 O&M activities have emphasized and should continue to emphasize the control of invasive species to ensure the survival of wetlands plantings. In addition, the build-up of sediment in the unnamed stream both at Hathaway Road and the entrance to the OU1 Pond should be monitored to maintain the design elevation of the streambed and should include continued attention to maintenance of the roadway and drainage system. Accumulated sediment could have the effect of altering flow patterns, increasing water temperature, and altering dissolved oxygen levels. The Mitigation Areas – East and West – were initially intended to be restored as forested wetlands; however, due to conflicts with golf course activities, EPA agreed to allow the creation of scrub-shrub wetlands as opposed to forested wetlands. In both areas, there are portions that would be characterized during this 5-year review period as emergent wetland as opposed to scrub-shrub wetland. However, the area is

functioning as a wetland and contains a wide diversity of plants.

The migration of landfill gas in soil is being addressed. The OU1 Settling Parties installed and are operating a long-term active landfill gas collection system to prevent migration of landfill gas to off-site receptors. The landfill gas extraction system has generally been effective in reducing landfill gas levels along the perimeter of the cap, with the exception of the eastern perimeter, where one or more landfill gas monitoring wells generally exhibit methane levels above 25% LEL. The PMC has suggested that the presence of methane along the eastern perimeter may be from an off-site source, such as decaying organic material beneath the self-storage facility located adjacent to the landfill gas to the east. This possible off-site source should be further investigated or further modifications should be made to the landfill gas extraction system, such as tying additional gas monitoring wells directly into the gas extraction system, in order to achieve compliance with Massachusetts Solid Waste regulations. Continued operation of the landfill gas extraction system and monitoring of perimeter gas monitoring wells and nearby structures is necessary as a human health protectiveness measure.

7.1.2 OU2

Yes, a review of documents, ARARs, risk assumptions, and site inspection results indicates that the remedy is functioning as intended by the ROD. Sediment excavation and treatment has been performed to meet the site performance standards, thereby minimizing the risk to aquatic organisms. However, exceedances of sediment clean-up criteria have been noted for some monitoring points during the most recent monitoring event performed for OU2. Therefore, continued sediment sampling is necessary to monitor the effectiveness of the remedy.

Institutional controls are in the process of being finalized for the site, as described above for OU1. Because there are no current uses of the site that violate the intent of the institutional controls, the protectiveness of the remedy is not impacted

The OU2 wetland restoration areas have continued to develop over the past five years. Continued invasive species control is necessary to remain in compliance with the approved Wetlands Operation and Maintenance Plan. Wetland monitoring reports submitted in 2003, 2004, 2005, and 2006 indicate that most of the wetland attribute goals have been reached, while some goals have not been reached.

Although the water level monitoring of wells and piezometers in the OU2 wetlands are inconclusive regarding the presence of wetland hydrology within 12 inches of the soil surface for two continuous weeks during the growing season, the presence of predominantly wetland species is a general indicator of appropriate wetland hydrology in accordance with the Operations and Maintenance Plan requirements.

There continue to be issues with access by golfers and by golf course personnel to restored areas, including one instance where a restored area and vegetation monitoring plot was mowed. Continued access controls will be required going forward.

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?

Yes, as evaluated in this section, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid for OU1 and OU2, since any changes do not impact remedy protectiveness. In order to answer this question, OU1 and OU2 ROD ARARs were reviewed and the OU1 and OU2 risk assessments were revisited to evaluate the impact of any changes in standards, toxicity factors, exposure assumptions, and site conditions on remedy protectiveness.

7.2.1 Review of OU1/OU2 Risk Assessments and Toxicity Factors Serving as the Basis for the Remedies

An evaluation of changes in toxicity values and other contaminant characteristics, changes to the risk assessment methodology, and changes to exposure assumptions used in the human health and ecological risk assessments for the site was performed. The overall conclusion of this evaluation was that the OU1/OU2 remedies, as implemented, are protective of human health and the environment. A discussion of the results and conclusions of the evaluation is provided below.

7.2.1.1 Review of Human Health Risk Assessments

As discussed during the first five-year review (September 2003), the Phase I and Phase II human health risk assessments (OU1; Ebasco 1987; 1989) and the human health risk assessment for Middle Marsh (OU2; M&E, 1991) were conducted using methodology which would partially comply with current EPA risk assessment guidance. The primary discrepancies between current guidance and previous guidance, as noted in the first five-year review and requiring re-evaluation during this five-year review, exist in the areas of toxicity values and exposure pathways. The following provides an evaluation of these discrepancies, based on changes that have occurred since 2003 (the date of the last five-year review), and their impact on the protectiveness of the remedy.

Changes in Exposure Pathways/Assumptions

OU1

The Phase I and Phase II human health risk assessments (Ebasco, 1987; 1989) evaluated an older child exposure scenario for the area south of Hathaway Road and the unnamed stream extending north of Hathaway Road (OU1). This scenario assumes that the site will be used, to some degree, for recreational purposes. No changes in land use have occurred on or near the site, and no changes are anticipated in the near future. Therefore, the land use assumptions used in the risk assessments continue to be valid for OU1. However, the implementation of institutional controls regulating land use is necessary to assure that land use changes resulting in more intense human exposures than under current conditions do not occur in the future.

The landfill cap and perimeter fencing remain intact, based on recent inspections. Because contamination is present beneath the cap, prevention of a complete exposure pathway between human receptors (e.g., trespassers) and subsurface contamination is necessary. Continued maintenance of the landfill cap and perimeter fencing is required to assure that human exposure

to the capped material does not occur.

Future residential groundwater use was also evaluated in the risk assessment. The risk assessment assumed that groundwater was not currently used as a source of potable water, but may be used as a future resource. Unacceptable risk was estimated for this future exposure scenario using methods and exposure assumptions largely consistent with current guidance. This was the primary basis for the groundwater containment and institutional control components of the remedy. The groundwater collection and treatment system and the slurry wall are in place. Contaminant concentrations continue to be present in groundwater at levels that would be associated with unacceptable risk, should groundwater be used as a source of drinking water in the future. Once institutional controls are in place, the remedy will prevent the completion of an exposure pathway between future human receptors and groundwater contaminants.

In the risk assessment, the older child receptor was evaluated for exposures in a manner consistent with current EPA guidance. The exposure pathways evaluated include ingestion and dermal contact with soil and sediment, dermal contact with surface water while wading, and inhalation of volatile compounds and particulates. The method used to estimate dermal doses differs from the current method, but overall, resulted in an overestimate of dermal risk. However, the exposure assumptions selected were, in general, lower than current recommended values resulting in an underestimate of risk. Because the remedy required the excavation of contaminated sediment and bi-annual monitoring of surface water and sediment for PCBs, PAHs, and metals, along with VOCs in surface water, post-remediation levels of contaminants in sediment and surface water are available and most appropriate to consider when evaluating remedy protectiveness. Therefore, to determine the risk and hazard associated with current recreational exposures, should they be occurring, an assessment of contaminant concentrations in surface water and sediment within OU1 using samples collected between 2003 and 2007 has been performed.

Current contaminant levels in OU1 surface water would not be associated with an elevated risk or hazard to humans because: (1) PCBs have not been detected; (2) detected VOCs (vinyl chloride, chlorobenzene, cis-1,2-dichloroethene, and acetone) are present only at trace levels (2.26 to 0.2 ug/L) and would volatilize quickly from the skin, limiting dermal exposure; (3) total metals, though elevated in concentration up to 10-fold above upstream background levels, are poorly absorbed through the skin, again limiting dermal exposure; and (4) PAHs were detected at only one location during one sampling event at concentrations (1.55 ug/L to 0.334 ug/L) that would not be associated with a level of concern for the dermal exposure pathway. For sediment, concentrations of noncarcinogenic PAHs range from 0.039 mg/kg to 3.3 mg/kg and levels of carcinogenic PAHs range from 1.3 mg/kg to 0.18 mg/kg. These PAH concentrations would be associated with a cancer risk of approximately 1E-06 and a hazard index of less than 0.01, based on a recreational exposure scenario. Sediment metal concentrations within OU1 exceed upstream concentrations, but generally fall within the range of levels typically seen in background sediments. Two metals of concern for human exposures are arsenic and lead which were detected at maximum sediment concentrations of 5.9 mg/kg and 110 mg/kg, respectively. The maximum detected arsenic concentration would be associated with a cancer risk slightly greater than 1E-06 and a noncarcinogenic hazard of less than 0.1, and the lead level is significantly less than that considered acceptable for a residential setting (400 mg/kg). Total PCBs were detected in on-site sediments at a maximum concentration of approximately 3.5 mg/kg, which would be associated with a cancer risk of approximately 1E-06 and a noncarcinogenic hazard of less than 0.5 based on a recreational scenario. Therefore, implementation of the remedy for OU1 has resulted in surface water and sediment contaminant levels that are not of concern for human

exposures, considering current land use.

OU2

As discussed in the first five-year review, the Phase I and Phase II human health risk assessments completed in 1987 and 1989, respectively, which evaluated portions of Middle Marsh, and the OU2 human health risk assessment (completed in 1991) evaluated an older child trespasser and adult golfer scenarios for the area north of Hathaway Road. This area is currently part of or adjacent to the Whaling City Golf Course. This portion of the site will continue to be used as a golf course or for other recreational purposes in the foreseeable future. Therefore, the land use assumptions used in the risk assessments continue to be valid for OU2. However, the implementation of institutional controls regulating land use is necessary to assure that land use changes resulting in more intense human exposures than under current conditions do not occur in the future.

The older child exposure pathways evaluated included ingestion and dermal contact with soil and sediment, dermal contact with surface water while wading, and inhalation of volatile compounds and particulates. The same exposure assumptions used for the older child receptors at OU1 were applied to OU2. The adult receptor was evaluated for dermal contact with soil, sediment and surface water along with inhalation of volatile compounds and particulates. Contrary to current guidance, incidental ingestion of soil and sediment was not evaluated, resulting in an underestimate of risk. Consistent with OU1, the method used to estimate dermal doses differs from the current method, but overall, resulted in an overestimate of dermal risk. However, the exposure assumptions selected were, in general, lower than current recommended values resulting in an underestimate of risk. As discussed for OU1, current levels of contaminants in sediment and surface water are available and most appropriate to consider when evaluating remedy protectiveness. Therefore, to determine the risk and hazard associated with current recreational exposures, should they be occurring, an assessment of PCB concentrations in surface water and sediment within OU2 using samples collected between 2004 and 2008 has been performed.

Surface water exposure pathways would not be associated with an elevated risk or hazard to humans because PCBs have not been detected. For sediment, total PCBs were detected in sediment at a maximum concentration of approximately 0.83 mg/kg, which would be associated with a cancer risk of less than 1E-06 and a noncarcinogenic hazard of less than 0.1 based on a recreational scenario. Therefore, implementation of the remedy for OU2 has resulted in surface water and sediment contaminant levels that are not of concern for human exposures, considering current land use.

Changes in Toxicity

Toxicity values have changed significantly since the human health risk assessments were prepared. Because a complete exposure pathway does not exist between site groundwater and human receptors for current site use, and the slurry wall, the groundwater collection system, and the soon-to-be-implemented institutional controls will prevent future exposure, changes in toxicity values of groundwater contaminants have not been evaluated for protectiveness.

Significant differences were noted in the cancer slope factors used in the human health risk assessments for PCBs, PAHs, and vinyl chloride during the first five-year review. In all cases, the toxicity values used in the OU1 and OU2 risk assessments were at least two-fold more

conservative than the current value. A change that has occurred during the last five years is the inclusion of an early-life cancer risk for compounds with a mutagenic mode of action, including PAHs and vinyl chloride. The early-life assessment can increase the cancer risk associated with exposure for older children by up to three-fold. However, this difference in toxicity does not affect remedy protectiveness since much of the affected areas have been capped, and current surface water and sediment sampling in areas where exposures could occur indicates acceptable concentrations. Other differences between historical and current toxicity values are minimal.

Summary and Conclusions Relative to Human Health Risks

Because OU1 soils are capped and groundwater extraction and treatment is underway, the remedy is protective of human health as long as the cap is maintained, migration of the groundwater plume is controlled, and institutional controls are implemented to prevent contact with contaminated groundwater and to assure that land use changes resulting in more intense human exposures than under current conditions do not occur in the future. Because PCB-contaminated sediments were removed and levels of contaminants in sediment and surface water remaining are not of a concern for current human exposures, the remedy is also protective for the stream bed (OU1) and the area north of Hathaway Road (OU2). Overall, the remedy is considered to be protective of human health.

7.2.1.2 Review of Ecological Risk Assessments

As discussed for Human Health Risk Assessment, the Phase I and Phase II ecological risk assessments (Ebasco 1987; 1989) and the ecological risk assessment for Middle Marsh (OU2; M&E, 1991) were conducted using methodology which would generally comply with current EPA risk assessment guidance. The primary discrepancies between current guidance and previous guidance, as noted in the first 5-year review, exist in the areas of benchmarks and toxicity values utilized. The following provides an evaluation of these discrepancies, based on changes that have occurred since 2003 (the date of the last 5-year review), and their impact on the protectiveness of the remedy for ecological receptors. Recent compliance monitoring data are also reviewed to evaluate the protectiveness of the remedy. There are no newly promulgated standards, relevant to the site, which bear on the protectiveness of the remedy.

OU1

There are no major changes in site conditions or exposure assumptions on which the risk assessment was based that would result in increased exposure or risk. The principal contaminants of concern for ecological receptors in OU1 identified in the risk assessment were PCBs. Target cleanup levels, protective of ecological receptors, were established for the site for sediments, surface water and soils.

As discussed in the last 5 year review, backfilled stream sediments and wetland soils act as a barrier between remaining contaminants (including PCBs) and potential aquatic and benthic receptors, thus creating an incomplete exposure pathway to aquatic and semi-aquatic organisms. The sediment cleanup level was established as 20 µg of PCBs per gram of carbon (µg/gC). This risk-based target level was developed based on potential risk to aquatic organisms and wildlife receptors. The cleanup level was estimated in the risk assessment using sediment partitioning and the ambient water quality criteria based on the protection of wildlife consuming aquatic organisms. PCB tissue concentrations estimated from direct exposure to PCB-contaminated sediments were also used in developing the risk-based target level of 20 µg/gC.

At measured sediment TOC concentrations of less than 10%, the target cleanup level corresponds to a sediment concentration of 2 ppm total PCB. Based on larger risk-based data sets from other sites in New England with aquatic habitats, this level of PCBs in sediments is expected to be protective of aquatic and semi-aquatic receptors.

During the sediment monitoring conducted between 2003 and 2008, total PCBs in OU1 were measured in sediments at a maximum concentration of approximately 3.5 mg/kg. This maximum concentration was detected in a sample collected in 2003. The concentration, corrected for total organic carbon content of 3.8 % (92 ug PCBs/gC), exceeds the target PCB level of 20 µg/gC. The other four samples collected in 2003 had much lower PCB concentrations ranging from not detected to approximately 0.05 mg/kg. One other sample collected in 2008 exceeded the target level for PCBs in sediments, with a concentration of 65 µg PCBs/gC (2.4 mg/kg total PCB). Similarly, the other four samples collected in 2008 had much lower PCB concentrations ranging from approximately 0.02 to 0.31 mg/kg total PCBs. The monitored sediment PCB concentrations showed minor exceedances of the risk-based ecological target levels. Therefore, the selected remedy is considered generally protective with regard to sediment; however, continued monitoring data should be evaluated to check compliance with the PCB clean-up goal. Since average site-wide concentrations of PCBs in sediments are below the target level, the remedy continues to be protective of benthic organisms as well as aquatic and semi-aquatic organisms.

In surface water, the standard identified in the risk assessment and ROD was 0.014 µg/L total PCBs, based on the ambient water quality criteria for the protection of aquatic life. This standard has not changed, with the 2006 National Recommended Water Quality Criteria (NRWQC, chronic) still set at 0.014 µg/L. Current contaminant levels in OU1 surface water would not be associated with an elevated risk or hazard to ecological receptors because PCBs have not been detected in surface water.

Soils east of the stream channel were generally excavated to a depth of 2 to 6 feet and capped. East bank soils (both north and south of the car wash) were excavated to a depth of several feet and capped. Because the cap creates a barrier to the contaminated layer, the exposure pathway in soil is incomplete. Thus, the potential risk to terrestrial receptors is minimal and the remedy continues to be protective.

Because contaminated sediment and soil has been removed or isolated, and the disposal area capped, the exposure pathway to surface water has also been eliminated. Thus, the potential risk to aquatic or semi-aquatic receptors is minimal. Surface water exposure pathways are not associated with an elevated risk to ecological receptors because PCBs have not been detected in surface water samples collected as part of the environmental monitoring since 2002.

Although the method used to perform the ecological risk assessments differs from current methods and guidance, target clean-up levels and the selected remedy for OU1 appears to still be valid.

OU2

Similar to OU1, there are no major changes in site conditions or exposure assumptions on which the risk assessment was based that would result in increased exposure or risk to ecological receptors. The primary basis for action in OU2 was the risk related to ecological receptors from PCBs in sediments of Middle Marsh. As discussed in the previous 5 year review, the Phase I and Phase II investigations demonstrated that the primary source of contamination was the OU1 disposal area. Before the implementation of the remedial action, flood waters from the disposal area could transport contaminants downstream. Because the remedy at OU1 consisted of capping the upstream disposal area, and the remedy at OU2 consisted of excavating sediment from the Middle Marsh to the edge of the flood plain and restoring wetlands, the source of contaminants has been eliminated. Thus, flood water will no longer transport contaminants via surface water or sediment. Furthermore, the clean fill and wetland soil used to reconstruct the Middle Marsh and the Adjacent Wetland act as a barrier to any residual contaminants below the excavation area, effectively eliminating the exposure pathway into sediment pore water. Therefore, the selected remedy is protective of benthic organisms as well as aquatic and semi-aquatic organisms.

The mean sediment quality criterion (20 µg PCB/gC) was established as the cleanup level of aquatic areas in the Middle Marsh. The risk-based sediment/soil cleanup levels for non-aquatic areas in Middle Marsh and for the adjacent wetland were established using site specific food chain modeling and set at 15 mg/kg total PCBs to be protective of wildlife. As with OU1, the surface water standard of 0.014 µg/L was used, and is consistent with current water quality criteria.

As discussed for OU1, current levels of contaminants in sediment, wetland soil, and surface water are available and most appropriate to consider when evaluating remedy protectiveness. The maximum PCB concentration measured in sediments from the Unnamed Stream (SDPC-2) was 653 µg/kg or 7.6 µg/gC (at 8.6% TOC), which is below the 20 ug/gC cleanup level. However, during the same monitoring event in 2006, two other sediment samples from the Unnamed Stream (SDPC-1 and SDPC-3) contained PCB concentrations of 355 µg/kg or 32 µg/gC (at 1.1% TOC) and 415 µg/kg or 61 µg/gC (at 0.68% TOC), respectively. These two samples showed higher PCB concentrations and lower TOC concentrations than were reported for the same locations during monitoring performed in 2002, 2003, and 2004. Although two out of the four 2006 samples from the Unnamed Stream exceed the target level of 20 ug/gC, these were associated with very low TOC. The PCB levels in the OU2 monitoring have remained below 1 ppm total PCBs. Continued monitoring of sediments in OU2 should be conducted to continue to evaluate the protectiveness of the remedy.

The maximum concentration of total PCBs in non-aquatic soil/sediment samples from the Middle Marsh and Adjacent Wetlands for monitoring data from 2002 to 2006 were all below the cleanup level of 15 ppm. The maximum concentration of total PCBs in wetland soils was less than 1 ppm, indicating that the remedy is protective for non-aquatic soils/sediments.

Similar to OU1, contaminant levels in surface water measured for OU2 would not be associated with an elevated risk or hazard to ecological receptors because PCBs have not been detected in surface water.

Based on removal of contaminated sediments in Middle Marsh and wetland soils, and the capping of the upstream disposal area in OU1, the source of PCBs for exposure of ecological

receptors has been eliminated. Monitoring data since 2002 have indicated that the total PCB concentrations in the surface water and sediment/soils of OU2 are generally meeting the levels established to be protective of ecological receptors, although individual sediment samples have at times exceeded the sediment cleanup level on a total carbon basis. Continued monitoring is recommended to continue to evaluate the protectiveness of the remedy.

Summary and Conclusions Relative to Ecological Risks

In conclusion, although the method used to perform the Ecological Risk Assessment differs from current methods and guidance, target clean-up levels and the selected remedy for OU2 appear to be protective. The remedies implemented adequately address the risk to ecological receptors, and monitoring data indicate that the current concentrations of contaminants in site media are meeting levels protective of ecological receptors on the site.

7.2.2 ARARs Review

A review of Applicable or Relevant and Appropriate Requirements to check the impact on the remedy of changes in standards that were identified as ARARs in the ROD, newly promulgated standards for chemicals of potential concern, and TBCs (to be considereds) that may affect the protectiveness of the remedy. The tables in Attachment 5 provide the review. The review is summarized below.

OU1

The 1989 ROD for OU1 (USEPA, 1989) set forth the following ARARs for the selected remedy:

- Safe Drinking Water Act
- Toxic Substances Control Act (TSCA)
- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Clean Air Act (CAA)
- Occupational Safety and Health Administration (OSHA)
- U.S. Department of Transportation
- 310 CMR 22.00 - Massachusetts Drinking Water Regulations
- 314 CMR 6.00 - Massachusetts Groundwater Quality Standards
- 310 CMR 30.00 - Massachusetts Hazardous Waste Management Regulations
- 314 CMR 8.00 - Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities
- 314 CMR 4.00 - Massachusetts Surface Water Quality Standards
- 310 CMR 10.00 - Massachusetts Wetlands Protection Regulations
- 310 CMR 6.00 - Massachusetts Ambient Air Quality Standards
- 454 CMR 21.000 - Massachusetts Right to Know Regulations
- 310 CMR 7.00 - Massachusetts Air Pollution Control Regulations

In addition, Executive Order 11988 (Floodplain Management), Executive Order 11990 (Protection of Wetlands), and Interim Sediment Quality Criteria were identified in the ROD as To Be Considered (TBC).

Table A5-1 of Attachment 5 provides an evaluation of ARARs for OU1 using the regulations and requirement synopses listed in the ROD as a basis. The evaluation includes a determination of

whether the regulation is currently ARAR or TBC and whether the requirements have been met.

As indicated in the previous five-year review, the Massachusetts Solid Waste Management Regulations (310 CMR 19.117, 19.132(4), and 19.150) were not included in the ROD, but are now considered applicable because they provide a means to detect, monitor, and address landfill gas at property boundaries at concentrations greater than 25% LEL. These regulations require that the MassDEP be notified when concentrations of landfill gases at the property boundary are measured above 25% LEL. They also mandate the control of landfill gases to concentrations less than 25% LEL to prevent public health and safety concerns. These ARARs were the topic of the ESD issued by EPA on September 29, 2003. Since the ESD was issued, an active landfill gas extraction system has been implemented at the site and quarterly landfill gas monitoring is conducted in order to evaluate the effectiveness of the system in controlling landfill gas migration.

The requirements of many of the ARARs identified in the ROD were met during remedy construction and are no longer ARAR or TBC.

OU2

The 1991 ROD for OU2 (USEPA, 1991) set forth the following ARARs for the selected remedy:

Location-specific:

- Clean Water Act (CWA)
- Executive Order 11988 (Floodplain Management)
- Executive Order 11990 (Protection of Wetlands)
- Fish and Wildlife Coordination Act
- Resource Conservation and Recovery Act (RCRA)
- 990 CMR 1.00 - Hazardous Waste Facility Siting Regulations
- 310 CMR 10.00 - Massachusetts Wetlands Protection Act Regulations
- 321 CMR 10.00 - Massachusetts Endangered Species Act Regulations

Action-specific:

- Clean Water Act (CWA)
- Executive Order 11988 (Floodplain Management)
- Executive Order 11990 (Protection of Wetlands)
- Fish and Wildlife Coordination Act
- Toxic Substances Control Act (TSCA)
- Clean Air Act (CAA)
- Federal Noise Control Act
- 314 CMR 4.00 - Massachusetts Surface Water Quality Standards
- 310 CMR 10.00 - Massachusetts Wetlands Protection Act Regulations
- 321 CMR 9.00 - Massachusetts Endangered Wildlife and Wild Plants Regulations
- 314 CMR 9.00 - Massachusetts Certification for Dredging, Dredged Material Disposal, and Filling in Waters
- 314 CMR 8.00 - Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities
- 310 CMR 30.00 - Massachusetts Hazardous Waste Management Regulations
- 310 CMR 6.00 - Massachusetts Ambient Air Quality Standards
- 310 CMR 7.00 - Massachusetts Air Pollution Control Regulations

Additional policies, criteria, and guidance were identified in the ROD as TBC, including:

- Massachusetts Wetlands Protection Policy 90-2
- TSCA Subpart G PCB Spill Cleanup Policy
- Interim Sediment Quality Criteria, Massachusetts Allowable Ambient Air Limits - Annual (AALs) and Massachusetts Threshold Effects Exposure Levels (TELs)
- Guidance on Remedial Actions for Superfund Sites with PCB Contamination
- EPA Interim Policy for Planning and Implementing CERCLA Response Actions

Tables A5-2 and A5-3 of Attachment 5 provide an evaluation of location-specific and action-specific ARARs for OU2 using the regulations, requirement synopses, and descriptions of actions to be taken that were listed in the ROD as a basis. The evaluation includes a determination of whether the regulation is currently ARAR or TBC and whether the requirements have been met. In some cases, the description of actions to be taken to attain the location-specific ARARs differed for the selected and contingency remedies. In these cases, both descriptions were provided in Table A5-3.

7.2.3 Overall Answer to Question B

In general, a review of ARARs and risk information that were the basis of the OU1 and OU2 remedies indicates that there were no changes that would impact the protectiveness of the remedies.

7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

7.3.1 OU1

No, since the previous five-year review, no information has come to light that could call into question the protectiveness of the remedy.

7.3.2 OU2

No, since the previous five-year review, no information has come to light that could call into question the protectiveness of the remedy.

SECTION 8.0
ISSUES

Based on the activities conducted during this Five-Year Review, the issues identified in Table 4 have been noted.

Table 4: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
OU1 Institutional Controls are in process of being finalized.	N	Y
Continued monitoring of the effectiveness of the groundwater pump and treat operation on controlling contaminant migration is needed comply with OU1 RAOs.	N	Y
Monitoring of landfill gas concentrations at certain perimeter locations does not indicate compliance with Massachusetts Solid Waste Regulations.	N	Y
Control of invasive and nuisance species and control of sediment buildup in the unnamed stream near Hathaway Road and the entrance to Pond A needs to continue in compliance with the Wetlands Operation and Maintenance Plans	N	Y
Monitoring of sediments has indicated some PCB concentrations above the clean-up levels.	N	Y
OU2 Institutional Controls are in process of being finalized.	N	Y
Control of invasive and nuisance species needs to continue in compliance with the Wetlands Operation and Maintenance Plans	N	Y
Monitoring of sediments has indicated some PCB concentrations above the clean-up levels.	N	Y

SECTION 9.0
RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, it is recommended that the actions listed in Table 5 be taken:

Table 5: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
OU1 Institutional Controls	Finalization of Institutional Controls.	MassDEP & EPA & City of New Bedford	EPA/ MassDEP	2008	N	Y
Performance of groundwater extraction system	Evaluate and demonstrate compliance with RAOs	OU I Settling Parties	EPA/ MassDEP	monthly basis	N	Y
Landfill gas migration	Continue to monitor. Assess non-compliance with ARARs and implement corrective actions if needed.	OU I Settling Parties	EPA/ MassDEP	quarterly basis	N	Y
Sediment PCB concentrations	Continue to monitor and implement corrective actions if needed.	OU I Settling Parties	EPA/ MassDEP	2009	N	Y
Implement Wetland O&M Plan	Nuisance and invasive species control and control of sediment buildup in the unnamed stream	OU I Settling Parties	EPA/ MassDEP	annual basis	N	Y
OU2 Institutional Controls	Finalization of Institutional Controls.	MassDEP, EPA, & City of New Bedford	EPA/ MassDEP	2008	N	Y

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Sediment PCB concentrations	Continue to monitor and implement corrective actions if needed.	AVX Corporation & City of New Bedford (OU2 Settling Parties)	EPA/ MassDEP	2011	N	Y
Implement Wetland O&M Plan	Nuisance and invasive species control	OU2 Settling Parties	EPA/ MassDEP	annual basis	N	Y

SECTION 10.0
PROTECTIVENESS STATEMENTS

OU1 and OU2

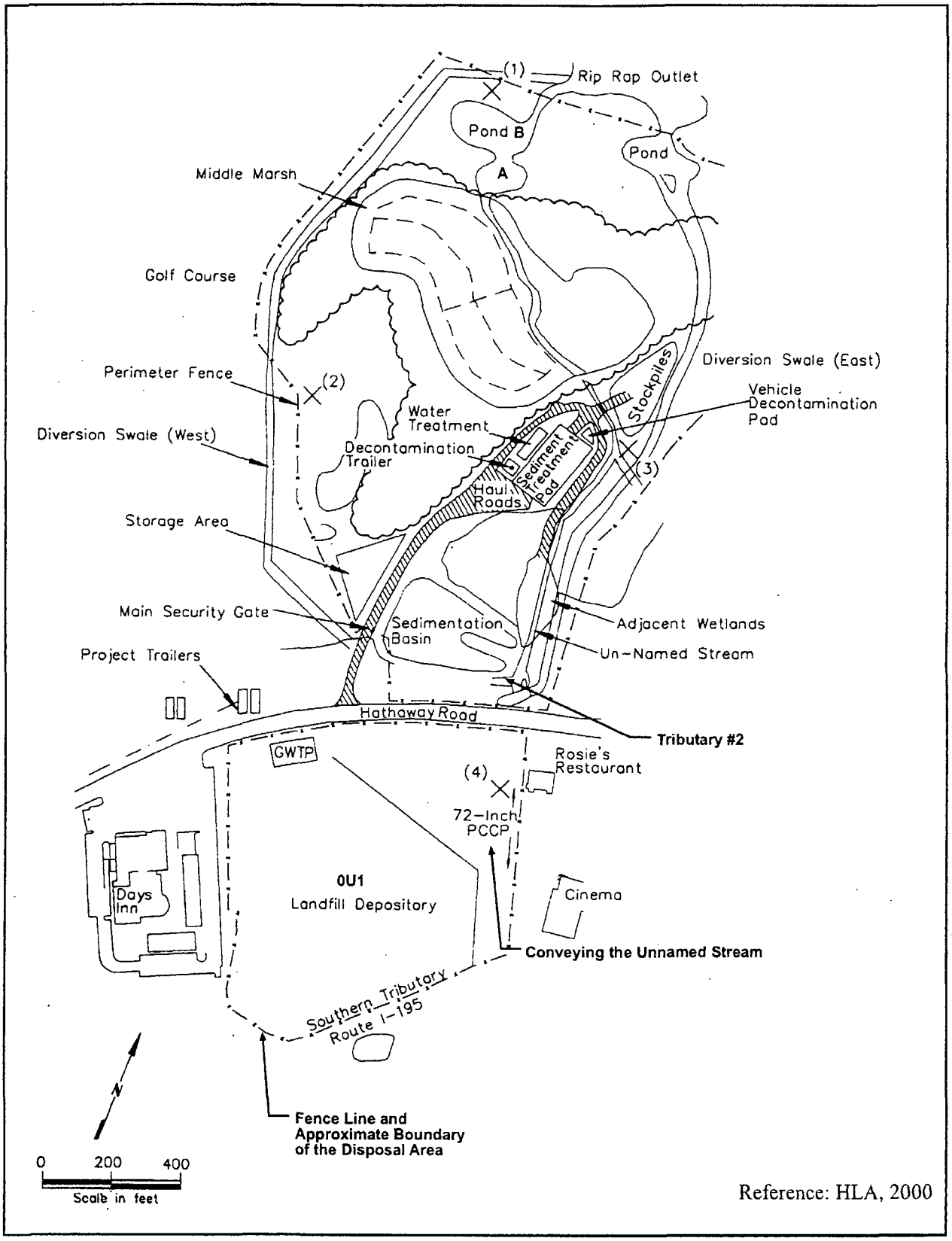
The remedies for both OU1 and OU2 currently protect human health and the environment because the construction of the remedy is complete, and operation and maintenance and monitoring of the remedy is being performed. However, in order for the remedy to be protective in the long-term, the follow-up actions noted in Section 9.0 need to be taken for long-term protectiveness.

SECTION 11.0
NEXT REVIEW

The next Five-Year Review for the site is scheduled to begin on March 30, 2013.

ATTACHMENT 1
SITE MAPS

FIGURE 1.
SITE LOCATION MAP
SULLIVANS LEDGE SITE
NEW BEDFORD MASSACHUSETTS



01/7341

FIGURE 2. SITE PLAN
SULLIVAN'S LEDGE SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

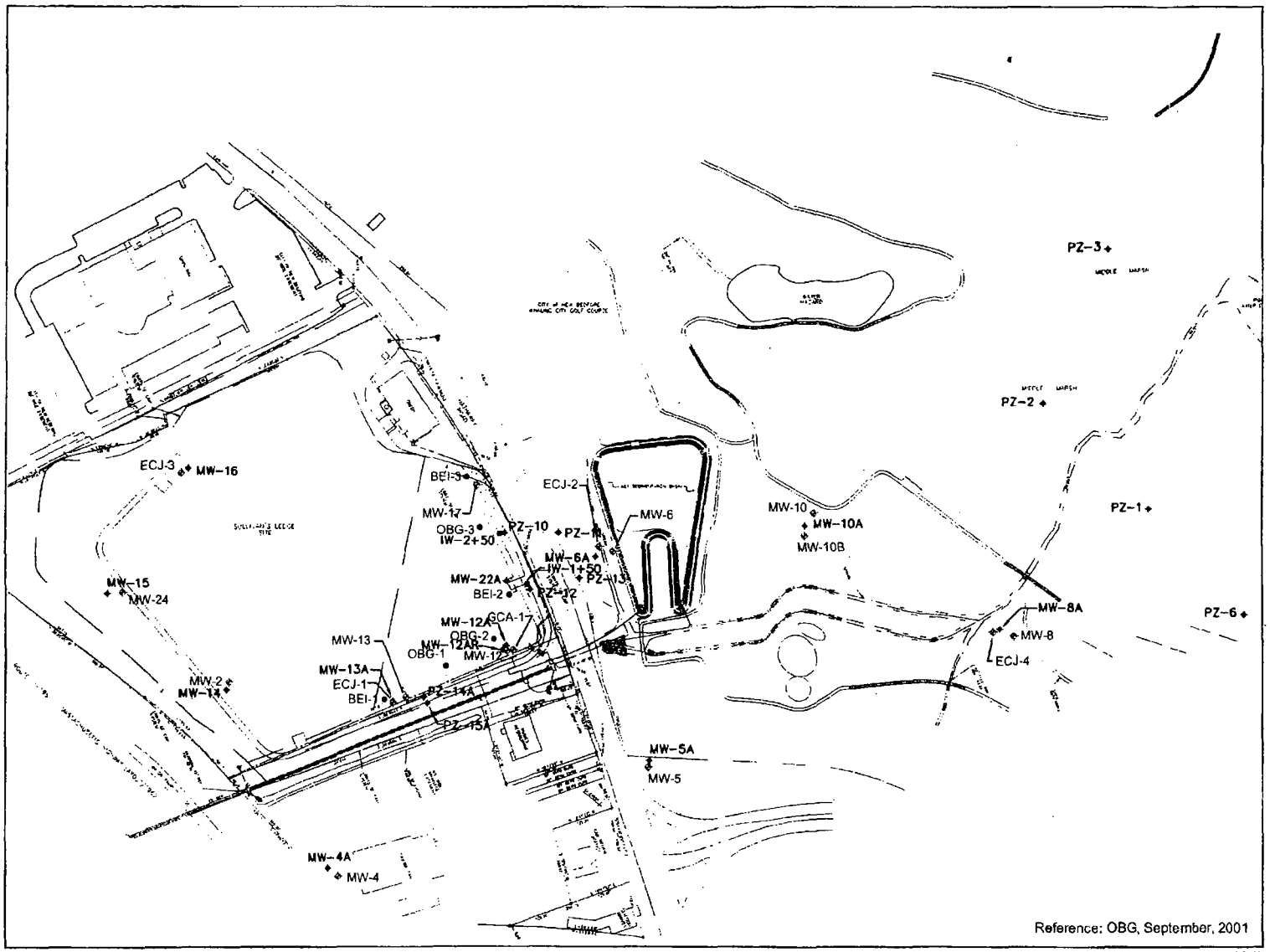


FIGURE 3.
GROUNDWATER WELL LOCATIONS
SULLIVAN'S LEDGE SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

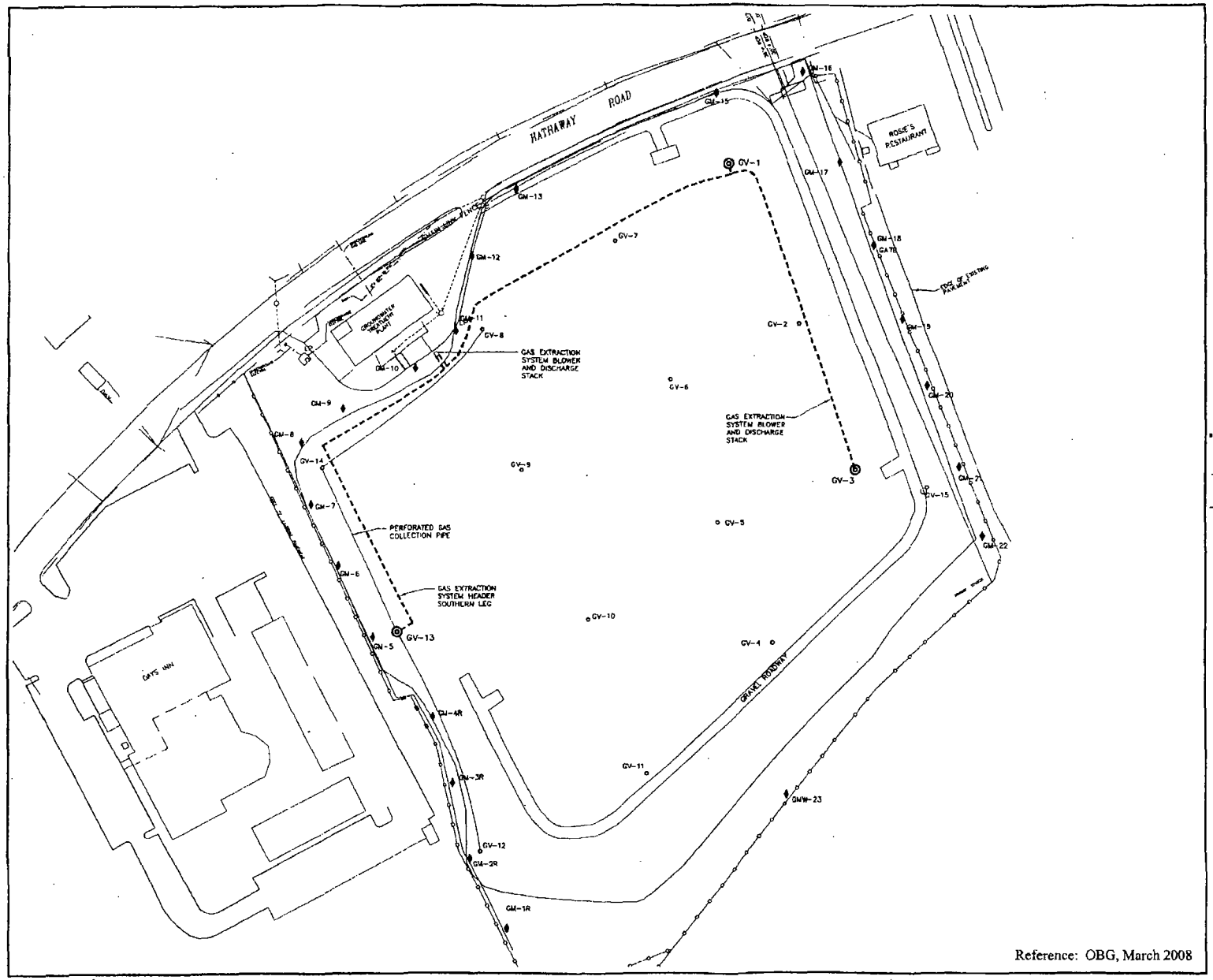


FIGURE 4.
LANDFILL GAS VENT AND MONITORING WELL LOCATIONS
SULLIVAN'S LEDGE SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

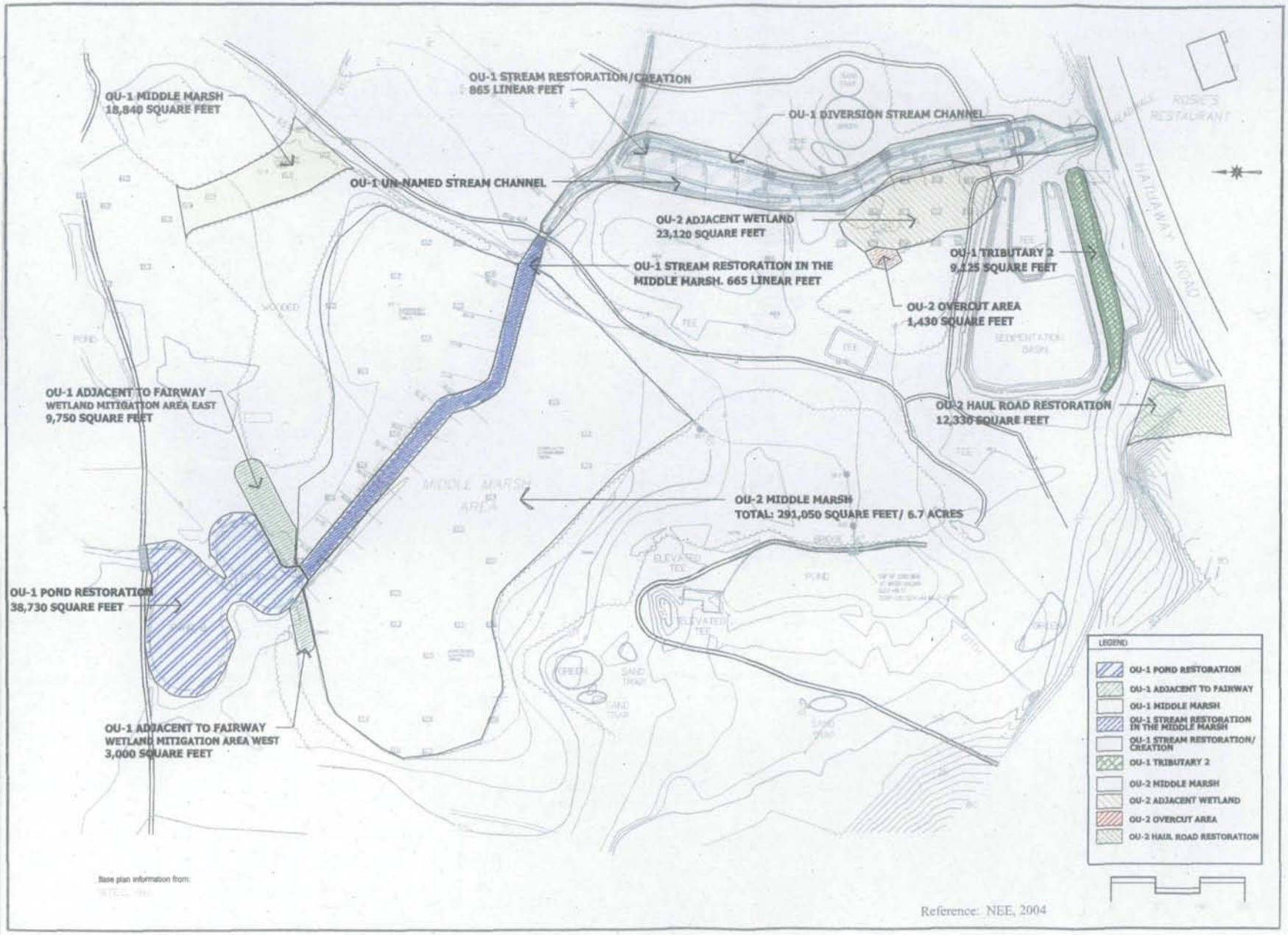


FIGURE 5.
OU1 AND OU2 WETLAND RESTORATION AREAS
SULLIVAN'S LEDGE SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

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ATTACHMENT 3
MONITORING DATA

Table A3-1
Comparison of Groundwater Treatment Plant Effluent Data to
City of New Bedford Pretreatment Discharge Limitations

	Effluent Sample from 4/2/08 (mg/l)	City of New Bedford Pretreatment Discharge Limitations (mg/l)
Volatile Organic Compounds[1]		
Acrolein	NA	4.000
Chloromethane	0.0086	(2)
Polychlorinated Biphenyls		
Aroclor 1016	0.00055 U	0.005
Aroclor 1221	0.00055 U	0.005
Aroclor 1232	0.00093	0.005
Aroclor 1242	0.00055 U	0.005
Aroclor 1248	0.00055 U	0.005
Aroclor 1254	0.00055 U	0.005
Aroclor 1260	0.00055 U	0.005
Metals		
Arsenic	0.004 U	1.4
Cadmium	0.001 U	1.2
Chromium	0.004	5
Copper	0.007	4.5
Lead	0.001 U	0.6
Mercury	0.0002 U	0.01
Molybdenum	0.01 U	(3)
Nickel	0.006	2.1
Silver	0.001 U	0.5
Zinc	0.015	3.5
Cyanide	0.02	1.9

NOTES
1. Only VOCs which were detected or for which there is a discharge limitation have been presented.
2. Total toxic organics (TTO) less than 2.0 mg/l limit.
3. There is no pretreatment dishcarge limitation for molybdenum.

NA - Not Analyzed
Reference: City of New Bedford's April 2008 Monthly GWTP Report

Table A3-2
Groundwater Treatment Plant Effluent Total Polychlorinated Biphenyls Data
January 2007 through April 2008

Date	Total PCBs (mg/L)
1/4/2007	**0.0059**
1/18/2007	**0.0294**
2/7/2007	0.0015
2/15/2007	0.0005 U
2/22/2007	0.00056
3/2/2007	0.0005 U
3/7/2007	0.00086
3/14/2007	0.0005 U
3/21/2008	0.00093
3/27/2007	0.0005 U
4/1/2007	0.001
4/10/2007	0.0009
4/18/2007	0.0014
4/24/2007	0.0012
5/1/2007	0.0014
5/9/2007	**0.0062**
5/16/2007	0.0022
5/22/2007	0.001
6/5/2007	0.0011
6/14/2007	0.00079
6/21/2007	0.0031
6/27/2007	0.0029
7/3/2007	0.0018
7/10/2007	0.00065
7/18/2007	0.0005 U
8/1/2007	0.00098
8/10/2007	0.00089
8/15/2007	0.00016
8/22/2007	0.0005 U
8/28/2007	0.0014
9/7/2007	0.00077
9/11/2007	0.0035
9/19/2007	0.0005 U
9/26/2007	0.0005
10/2/2007	0.0005 U
10/12/2007	0.0018
10/18/2007	0.0005 U
10/25/2007	**0.012**
11/2/2007	0.0019
11/8/2007	0.0023
11/14/2007	0.00186
11/20/2007	0.0026
11/28/2007	0.0012
12/7/2007	0.0005 U
12/18/2007	0.0005 U
12/27/2007	0.00088

Date	Total PCBs (mg/L)
1/3/2008	0.0005 U
1/9/2008	0.00099
1/18/2008	0.0011
1/23/2008	0.00055
1/30/2008	0.0013
2/6/2008	0.0015
2/14/2008	0.0005 U
2/20/2008	0.00053 U
2/29/2008	0.0005 U
3/5/2008	0.00054 U
3/12/2008	0.00055 U
3/19/2008	0.00053 U
3/25/2008	0.00054 U
4/2/2008	0.00093
4/8/2008	0.00053 U
4/17/2008	0.00053 U
4/23/2008	0.00052 U

Notes
Bolded and boxed values exceed the pre-treatment discharge limit of 0.005 mg/L.
Reference: City of New Bedford GWTP Monthly Reports

Table A3-3
OU-1 Active Recovery System
Points of Compliance - Bedrock Monitoring Wells

Well	Well Screen Location	Total Volatile Organic Compounds (ug/L)										
		Winter 1999	Spring 2001	Summer 2001	Fall 2001	Winter 2001	Spring 2002	Summer 2002	Fall 2002	Winter 2002	Spring 2003	Summer 2003
ECJ-1 (37)	Shallow Bedrock	2,297.6	109.0	64.0	83.0	64.0	64.2	53.2	46.1	37.4	20.3	45.9
ECJ-1 (62)	Shallow Bedrock	72,950.1	9,410	5,383	3,180	1,860	1,164.5	2,017.3	1,505	1,060	1,350	1,120
ECJ-1 (72)	Shallow Bedrock	145,337.1	26,780	37,050	38,330	41,770	66,900	60,690	56,710	33,550	60,800	77,200
ECJ-1 (122)	Intermediate Bedrock	71,911.5	8,532	8,220	6,670	13,263	42,400	8,155	32,760	10,937	6,290	6,570
ECJ-1 (148)	Intermediate Bedrock	36,477.2	74,600	104,600	16,270	18,520	49,550	36,390	71,750	34,900	33,180	27,000
ECJ-1 (267)	Deep Bedrock	106.5	52.1	39.8	37.5	52.5	-	-	-	39.5	-	-
ECJ-2(47)	Shallow Bedrock	2,533	1,920	2,468	1,511	2,171	1,150	2,130	3,167	2,970	1,690	2,530
ECJ-2(82)	Intermediate Bedrock	15,942	16,080	23,990	15,740	18,810	23,470	27,060	22,840	21,200	14,400	13,100
ECJ-2(117)	Intermediate Bedrock	55,380	29,730	51,600	37,600	48,800	31,680	31,800	27,610	29,600	35,410	38,800
ECJ-2(152)	Intermediate Bedrock	400.4	4,594	6,180	11,330	19,570	18,840	38,640	46,030	58,500	62,100	89,300
ECJ-2(187)	Deep Bedrock	3,605.8	4,440	76.4	43,460	5,200	19,220	2,011	29,191	80,240	24,610	25,480
ECJ-3(51)	Shallow Bedrock	-	15.0	ND	12.0	0.6	-	-	-	ND	-	-
ECJ-3(91)	Shallow Bedrock	-	ND	1.0	ND	1.1	-	-	-	ND	-	-
ECJ-3(126)	Intermediate Bedrock	-	ND	1.0	0.9	1.2	-	-	-	ND	-	-
ECJ-3(146)	Intermediate Bedrock	-	-	-	ND	ND	-	-	-	ND	-	-
MW-2	Shallow Bedrock	3,440	2,181	905	1,139	963	1,003	1,163	1,257	1,205	1,349	403.6
MW-12	Shallow Bedrock	106.1	-	-	-	-	-	-	-	-	-	-
MW-13	Shallow Bedrock	991.6	7.1	2.1	13.1	26.9	-	-	-	10.5	-	-
MW-17	Shallow Bedrock	36.4	1.2	20.2	18.4	28.8	-	-	-	0.6	-	
MW-24	Shallow Bedrock	3,843.3	6,530	3,480	6,370	6,040	4,600	3,145	6,052	5,600	3,640	3,860
GCA-1	Shallow Bedrock	13,946.0	172.9	229.6	321.9	284.5	960.0	300.7	822.3	1,054	269.1	207.1
MW-4	Shallow Bedrock	1,271.9	1,034.2	1,113.2	1,149	753.9	1,260	1,193	1,393	1,078	912.4	1,664.5
MW-5	Shallow Bedrock	ND	6.8	3.6	3.9	3.6	-	-	-	2.0	-	-
MW-6	Shallow Bedrock	4,837.2	2,950	3,998	2,137	4,533	4,728	6,081	9,469	6,100	4,000	4,725

Notes
- = Not sampled
ND = Not detected above detection limits
Reference: OBG, 2008

Table A3-3
OU-1 Active Recovery System
Points of Compliance - Bedrock Monitoring Wells

Well	Well Screen Location	Total Volatile Organic Compounds (ug/L)										
		Fall 2003	Winter 2003	Spring 2004	Summer 2004	Fall 2004	Winter 2004	Spring 2005	Summer 2005	Fall 2005	Winter 2005	Spring 2006
ECJ-1 (37)	Shallow Bedrock	80.97	55.33	73.51	41.98	60.07	21.1	9.36	512	293.03	40.1	478.58
ECJ-1 (62)	Shallow Bedrock	196.1	100.1	122.77	46.32	50.37	19.39	28.12	61.86	111.82	43.86	72.99
ECJ-1 (72)	Shallow Bedrock	54,200	44,920	39,614	51,170	1378.9	612.5	209.48	611.76	392.3	203.4	244.75
ECJ-1 (122)	Intermediate Bedrock	13,975	3,694	29,582	7,927	23,210	23,990	23,880	55,510	62,480	87,990	118,080
ECJ-1 (148)	Intermediate Bedrock	25,060	29,150	63,170	41,550	54,530	43,420	27,160	55,140	71,040	83,680	108,880
ECJ-1 (267)	Deep Bedrock	-	40.2	-	-	-	45.6	-	-	-	23.63	-
ECJ-2(47)	Shallow Bedrock	1,661	1,466	1,233.9	1,263.7	977.2	403.7	508.8	864.2	785.6	1,005	885.8
ECJ-2(82)	Intermediate Bedrock	25,500	23,100	18,810	13,960	7941.3	2,481.2	1,992.5	2,050	1,885	1,160.5	603
ECJ-2(117)	Intermediate Bedrock	47,100	13,120	9,244	4,638.3	4196.1	3,430.5	1,492	841.5	1,069.5	683.8	1,029.5
ECJ-2(152)	Intermediate Bedrock	50,700	60,100	34,298	27,081	29483	7,004.1	5,341	4,215.5	3,125	3,966	4,048.5
ECJ-2(187)	Deep Bedrock	21,770	17,050	15,692	12,900	15,394	5,047.4	1,769	2,273.8	2,869	2,108.5	2,792
ECJ-3(51)	Shallow Bedrock	-	12	-	-	-	0.13	-	-	-	0.13	-
ECJ-3(91)	Shallow Bedrock	-	ND	-	-	-	28	-	-	-	ND	-
ECJ-3(126)	Intermediate Bedrock	-	6	-	-	-	57	-	-	-	ND	-
ECJ-3(146)	Intermediate Bedrock	-	45.47	-	-	-	0.2	-	-	-	1.06	-
MW-2	Shallow Bedrock	494.8	546.3	596.6	558.4	561.8	553.9	649.5	374.5	313.5	578.6	238.58
MW-12	Shallow Bedrock	-	-	-	-	-	-	-	-	-	-	-
MW-13	Shallow Bedrock	-	3	-	-	-	0.91	-	-	-	0.94	-
MW-17	Shallow Bedrock	-	2.2	-	-	-	0.17	-	-	-	0.86	-
MW-24	Shallow Bedrock	3,222	4,150	3,122	2,879	2,778	2,037	2,467	4,362	3,800	3,050	3,576
GCA-1	Shallow Bedrock	282.6	253.7	292.3	206.6	219.61	164.78	164.25	285.1	203.3	167.65	166.85
MW-4	Shallow Bedrock	2,449	1,019.8	1,495.6	1,532.1	1,373.7	1,172.4	1,122.3	1,774	1,016.5	1,725.25	2,588.05
MW-5	Shallow Bedrock	-	ND	-	-	-	0.15	-	-	-	ND	-
MW-6	Shallow Bedrock	1,001	1,639	1,615.2	992	1,055.3	1,321.9	1,858.2	2,012	1,804.5	1,979.5	1,801.3

Notes
- = Not sampled
ND = Not detected above detection limits
Reference: OBG, 2008

Table A3-3
OU-1 Active Recovery System
Points of Compliance - Bedrock Monitoring Wells

Well	Well Screen Location	Total Volatile Organic Compounds (ug/L)						
		Summer 2006	Fall 2006	Winter 2006	Spring 2007	Summer 2007	Fall 2007	Winter 2007
ECJ-1 (37)	Shallow Bedrock	274.4	199.9	36.13	-	-	-	21.19
ECJ-1 (62)	Shallow Bedrock	62.51	48.1	113.3	107.55	-	-	69.1
ECJ-1 (72)	Shallow Bedrock	249.8	303.05	620.9	814.1	708.75	289.3	650.8
ECJ-1 (122)	Intermediate Bedrock	111,880	113,980	487	984.65	902.05	227.3	658.4
ECJ-1 (148)	Intermediate Bedrock	111,860	118,020	635.4	944	814.6	260.3	635.4
ECJ-1 (267)	Deep Bedrock	-	-	116.05	-	-	-	416.85
ECJ-2(47)	Shallow Bedrock	688.8	1,859	1,210.2	552	1,601.5	881.15	391.2
ECJ-2(82)	Intermediate Bedrock	774.8	1,710	1,101.6	820.7	1,708	969	265
ECJ-2(117)	Intermediate Bedrock	981.5	2,542	3,102.4	3,110.5	4,114.5	9,901.5	4,414
ECJ-2(152)	Intermediate Bedrock	2,966	6,014	2,322.5	2,739.5	2,451	1,932.5	2,448
ECJ-2(187)	Deep Bedrock	3,493.5	6,502	1,722	2,024	1,737.5	1,775	1,345.5
ECJ-3(51)	Shallow Bedrock	-	-	ND	-	-	-	0.51
ECJ-3(91)	Shallow Bedrock	-	-	ND	-	-	-	1.61
ECJ-3(126)	Intermediate Bedrock	-	-	0.11	-	-	-	0.24
ECJ-3(146)	Intermediate Bedrock	-	-	0.24	-	-	-	1.95
MW-2	Shallow Bedrock	244.92	246.92	329.19	426.7	408.4	492.1	527.2
MW-12	Shallow Bedrock	-	-	-	-	-	-	-
MW-13	Shallow Bedrock	-	-	0.88	-	-	-	1.72
MW-17	Shallow Bedrock	-	-	1.07	-	-	-	6.61
MW-24	Shallow Bedrock	4,056	7,192	6,708	5,743	6,696	8,337.5	8,056
GCA-1	Shallow Bedrock	206.35	191.3	204.05	171.95	157.1	177.3	193.4
MW-4	Shallow Bedrock	2,110	2,207	1,553.5	1,220.5	982.5	967.75	639.6
MW-5	Shallow Bedrock	-	-	4.64	-	-	-	8.28
MW-6	Shallow Bedrock	1,694.5	2,074.5	2,061.5	1,777.5	1,579.5	1,603	1,359

Notes
- = Not sampled
ND = Not detected above detection limits
Reference: OBG, 2008

Table A3-4
Comparison of Shallow Collection Trench Data to
City of New Bedford Pretreatment Discharge Limitations

	Sample from 12/7/07 (mg/l)	City of New Bedford Pretreatment Discharge Limitations (mg/l)
Volatile Organic Compounds[1]		
Benzene	0.0376	(2)
Toluene	0.00545	(2)
Ethylbenzene	0.00635	(2)
Xylene (total)	0.00065 J	(2)
Trichloroethene	0.0185	(2)
1,2-DCE (total)	0.125	(2)
Vinyl Chloride	0.0045 J	(2)
Chlorobenzene	0.067	(2)
Chloroethane	0.0052	(2)
Acrolein	NA	4.000
Semivolatile Organic Compounds[1]		
Fluoranthene	0.01 U	1.1
Pentachorophenol	0.052 U	2.5
Polychlorinated Biphenyls		
Total PCBs	0.00168	0.005
Metals		
Arsenic	0.01 U	1.4
Cadmium	0.01 U	1.2
Chromium	0.01 U	5
Copper	0.01 U	4.5
Lead	0.01 U	0.6
Mercury	0.0002 U	0.01
Nickel	0.05 U	2.1
Silver	0.01 U	0.5
Zinc	0.041	3.5
Cyanide	NA	1.9

Notes
1. Only VOCs or SVOCs which were detected or for which there is a discharge limitation have been presented.
2. Total toxic organics (TTO) less than 2.0 mg/l limit.

NA - Not Analyzed
Reference: OBG, 2008

Table A3-5
Summary of Recent PCB Data for the Collection Trench (Before Treatment)

Date	Total PCBs (mg/L)
1/3/2008	0.0026
1/11/2008	0.0031
1/18/2008	0.0029
1/23/2008	0.0014
1/30/2008	0.0041
2/6/2008	0.0033
2/14/2008	ND
2/20/2008	0.0049
2/29/2008	0.0043
3/5/2008	**0.0053**
3/13/2008	0.0034
3/19/2008	**0.010**
3/25/2008	**0.0095**
4/2/2008	**0.010**
4/8/2008	**0.020**
4/17/2008	**0.010**
4/23/2008	**0.010**
5/1/2008	ND
5/14/2008	**0.0052**
5/21/2008	**0.0062**
5/28/2008	**0.0094**

Notes
Bolded and boxed values exceed the pre-treatment discharge limit of 0.005 mg/L.
Reference: City of New Bedford Monthly GWTP Reports

ATTACHMENT 4
SITE INSPECTION DOCUMENTATION

Five-Year Review Site Inspection Checklist for Operable Unit 1 (OU1)

(Note: OU1 wetland restorations areas are included in separate checklist)

I. SITE INFORMATION	
Site name: *Sullivan's Ledge OU1*	**Date of inspection:** *6/10/08 and 7/1/2008*
Location and Region: *New Beford, MA / Region 1*	**EPA ID:** *MAD980731343*
Agency, office, or company leading the five-year review:	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other_____

- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

Interviews were conducted separately. See text of Five-Year Review report for documentation.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☒ O&M manual — ☒ Readily available — ☐ Up to date — ☐ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks *GWTP O&M manual has not been updated since system start-up.*

2. **Site-Specific Health and Safety Plan** — ☒ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks *HASP is out of date and was preparation during remedy construction.*

3. **O&M and OSHA Training Records** — ☒ Readily available — ☐ Up to date — ☐ N/A

   Remarks *Present but not closely reviewed.*

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Other permits _____ — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks *Permit for discharge to POTW not reviewed.*

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks *Not verified; however, monthly reports document periodic inspections of the monuments.*

7. **Groundwater Monitoring Records** — ☒ Readily available — ☐ Up to date — ☐ N/A

   Remarks *Included in monthly and quarterly reports.*

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☒ Water (effluent) — ☒ Readily available — ☐ Up to date — ☐ N/A

   Remarks *Water effluent data is included in monthly reports.*

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☒ N/A

    Remarks *Not reviewed.*

IV. O&M COSTS

O&M costs were obtained separately and are provided in the text of the Five-Year Review report.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
   Remarks *Fence appeared in good condition.*

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks *"No Trespassing" signs are in place along the fence.*

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A
   Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.

   Reporting is up-to-date ☐ Yes ☐ No ☒ N/A
   Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

   Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A
   Violations have been reported ☐ Yes ☐ No ☒ N/A
   Other problems or suggestions: ☐ Report attached
   Grant of Environmental Restrictions is not yet in place. Draft GER being reviewed by PRP's attorneys.

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A
   Remarks *ICs have not been finalized yet. Draft GER being reviewed by PRP's attorneys.*

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
   Remarks

2. **Land use changes on site** ☒ N/A
   Remarks None.

3. **Land use changes off site** ☐ N/A
Remarks *Neighboring restaurant has closed.*

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Areal extent Depth
Remarks

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
Lengths Widths Depths
Remarks

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Areal extent Depth
Remarks

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
Areal extent Depth
Remarks

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
☒ Trees/Shrubs (indicate size and locations on a diagram)
Remarks *Shrubs and tall vegetation along southern slope should be cut down.*

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
Remarks

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☒ Properly secured/locked ☐ Functioning ☒ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____*Covers not opened.*_____

3. **Monitoring Wells** (within surface area of landfill)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_____

5. **Settlement Monuments** ☒ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☒ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☒ Good condition ☐ Needs Maintenance
   Remarks *Active landfill gas extraction/blower system in place and operating.*

2. **Gas Collection Wells, Manifolds and Piping**
   ☒ Good condition ☐ Needs Maintenance
   Remarks *Most of the piping is underground.*

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☒ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks *Gas monitor at adjacent motel was not inspected. PRPs indicated it is still operating.*

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks

G. Detention/Sedimentation Ponds ☒ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☒ Siltation not evident
   Remarks

2. **Erosion** Areal extent_____ Depth_____
   ☒ Erosion not evident
   Remarks

3. **Outlet Works** ☒ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☒ N/A
   Remarks

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☒ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks____*Tall vegetation and shrubs were present along drainage swales and should be cut down.*

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☒ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**

☒ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A

Remarks *Bedrock extraction well OBG-1 was not operating during 6/10/08 and 7/1/08 inspections. The pump was subsequently repaired.*

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☒ Needs Maintenance

Remarks *The plant operators noted that blockages were present in influent lines from two of the extraction wells and planned to conduct maintenance.*

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**

☐ Good condition ☐ Needs Maintenance

Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☐ Needs Maintenance

Remarks

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)

☒ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☒ Filters_____
☒ Additive (*e.g.*, chelation agent, flocculent)_____
☒ Others__*ultraviolet oxidation* _____
☒ Good condition ☐ Needs Maintenance
☒ Sampling ports properly marked and functional
☒ Sampling/maintenance log displayed and up to date (including in monthly reports)
☒ Equipment properly identified
☐ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks___*UV/Ox system shuts down periodically due to high humidity, which triggers the system's leak detector.* _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks__*Not verified.* _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs Maintenance
Remarks_____

4. **Discharge Structure and Appurtenances**

☒ N/A ☐ Good condition ☐ Needs Maintenance
Remarks___*Not accessible but operating.* _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
☒ Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks_____

D. Monitoring Data

1. Monitoring Data

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:

☐ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

D. Monitored Natural Attenuation **Not Applicable**

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

See report text Section 4.3 for discussion of system operations/O&M issues.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

See report text Section 4.3 for discussion of O&M issues.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. *N/A*
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *N/A*

Sullivan's Ledge Superfund Site
Wetlands Restoration Area (OU-1)
Site No.
5-Year Review Checklist

The following checklist was created to review maintenance and monitoring of the mitigation wetlands on the north side of Hathaway Road at Sullivan's Ledge Superfund Site in New Bedford, MA. A project site inspection was completed on July 1, 2008. Attendees at the site inspection included EPA (D. Lederer), City of New Bedford (CONB) Conservation Commission (S. Porter), M&E scientist (C. Hoffman), and M&E engineer (C. Castleberry). The project goals stated in the Wetlands Restoration Plan (WRP) dated July 1997 were used as a basis for the OU-1 checklist.

I. HYDROLOGY			
Has the long-term goal for the wetland hydrology, namely the presence of groundwater and/or saturated soils within 12 inches of the wetland surface in each piezometer for at least three of the first five years and each fifth year thereafter, been met?	Yes **X**	No	Unknown
Comment: Two rounds of data have not been collected within a two-week period since the project's inception and it can't be confirmed that water levels have been within 12 inches of the wetland surface for two weeks. This attribute is intended to document that hydrology in the restored wetlands is sufficient to support wetland plants. Given the high percentage of wetland plants growing throughout the restored areas, and visible observations of saturated soils across the site throughout the growing season, sufficient hydrology has been qualitatively confirmed and observed during the 2008 site visit and previous site visits.			
II. PERMANENT SAMPLING PLOTS			
Did the OU-1 restoration and mitigation areas achieve and maintained a total 75% areal coverage of wetland plant species by the end of the second growing season?	Yes **X**	No	Unknown
Comment: *Since this is a 5-year review, the discussion can be expanded to conditions beyond the second growing season.* The 2006 Wetland Monitoring Report indicates that wetland species have been documented to cover at least 75% of the restored wetland areas. The restored OU1 Middle Marsh area contained a wide variety of species, including emergent, shrub, and tree species. The species diversity was also observed to be very high in the OU1 Mitigation Area – East and West, both of which appear to meet the 75% areal coverage requirement.			
Has greater than 25% mean areal coverage of hummocks within the OU-1 Middle Marsh restoration area been maintained?	Yes **X**	No	Unknown
Comment: According to the 2006 Wetland Monitoring Report, both OU-1 Middle Marsh plots contained greater than 25% hummock.			
III. HYDRIC SOILS			
Has an annual soil profile description for test pits within the 13 sampling plots been produced annually for the first three years, at the end of the fifth growing season, and every five years	Yes **X**	No	Unknown

thereafter?			
Comment: The 2002, 2003, 2005, and 2006 Wetland Monitoring Reports included a soil description of test pits adjacent to the permanent sampling plots. No complete soil profiles have been produced; however, evidence of hydric soil characteristics were recorded and reported. According to the 2005 and 2006 reports, all wetland plant plots exhibited soil characteristics indicative of wetland hydrology.			
IV. MAINTENANCE			
Has the Contractor been performing periodic replanting in areas where the vegetation did not survive?	Yes **X**	No	Unknown
Comment: The Contractor has installed several hundred additional plants in the OU-1 areas since the last 5-year inspection/review. The OU1 Mitigation Area – West was observed to be almost devoid of shrubs during the 2008 inspection. A few stunted planted shrubs remain; however, most of the planted shrubs have died, even after being replaced over the last 5 years. The area appears too wet to support woody vegetation. In addition, the 2006 report indicates that white pine (*Pinus strobus*), silver maple (*Acer saccharinum*), and cottonwood (*Populus deltoides*) were planted in the vicinity of the unnamed stream adjacent to Hathaway Road. Of these plantings, only a few white pines had survived and were observed during the 2008 site visit. The trees may still be under warranty and should be replanted to provide the intended shade/coverage.			
Has the Contractor been providing adequate control of invasive species in the OU-1 restoration and mitigation areas?	Yes **X**	No	Unknown
Comment: CONB purchased *Galarucella* beetles for release in OU1 and OU2 for purple loosestrife control. In 2007, 10,000 beetles were released with 5,000 each at two locations. In 2008, 10,000 beetles were divided between five locations. There was positive evidence of controls, with beetle damage and also sightings of the beetles on loosestrife plants during the 2008 site visit. The Contractor has also maintained annual mechanical and/or chemical methods to suppress the population of invasive species to allow the non-invasive species the opportunity to establish without great competition from cattail (*Typha* sp.) and common reed (*Phragmites australis*). The population of invasive species has been reduced since the last 5-year review.			
Is erosion being controlled at:			
- Stream Channel?	Yes **X**	No	Unknown
- OU-1 Tributary 2?	Yes **X**	No	Unknown
- OU-1 Ponds?	Yes **X**	No	Unknown
- OU-1 Middle Marsh restoration area?	Yes **X**	No	Unknown
Comment: The permanent fence to keep golfers out of the restored pond banks and the middle marsh and mitigation areas was provided during the end of the 2002 growing season. During the 2008 inspection, it was noted that a portion of the rope fence was not in place along the unnamed stream banks just upstream of OU2 Middle Marsh. The rope should be re-installed to ensure continued protection of the bank. No significant erosion at any of the listed locations was noted in the 2006 Wetland Monitoring Report or during the July 2008 site visit.			
V. ADDITIONAL COMMENTS			
Comment: Sediment build-up in the Unnamed Stream immediately north of Hathaway Road disrupts water flow, with the potential to have adverse impacts to water quality (including temperature, etc.). The CONB has removed accumulated sediment in this area; however, during the 2008 site visit, some newly-formed sediment was noted. A maintenance plan to address the sediment accumulation should be prepared and followed to ensure the maintenance of the design elevation of the streambed.			

Sullivan's Ledge Superfund Site
Wetlands Restoration Area (OU-2)
Site No.
5-Year Review Checklist

The following checklist was created to review maintenance and monitoring of the mitigation wetlands on the north side of Hathaway Road. A project site inspection was completed on July 1, 2008. Attendees at the site inspection included EPA (D. Lederer), City of New Bedford (CONB) Conservation Commission (S. Porter), M&E scientist (C. Hoffman), and M&E Engineer (C. Castleberry). The Performance Standards and Wetland Attribute Goals stated in the Final Operation and Maintenance (O&M) Plan Second Operable Unit were used as a basis for the OU-2 Wetland Restoration Area checklist.

I. Biological Indicators			
Survival			
Did 80% of the plantings of each tree and shrub species in the restored wetland survive after five years?	Yes	No	Unknown **X**
Have dead or moribund plants been replaced at the earliest possible time consistent with the growing season to achieve a minimum of the original plant density?	Yes **X**	No	Unknown
Comment: The Contractor modified the sampling plots in 2003 to include a 30-foot radius plot for sampling woody species around the center of the existing 100 square foot plots. This modification was an attempt to include more woody species during the sampling event. Although the survivorship requirement of 80% is reported to have been met in the 2006 Wetland Monitoring Report, there are areas where woody species have not survived and replacement plants have died. Data indicating the number of woody plantings versus the number of survivors has not been provided in the 2008 report. As noted during the 2008 site visit and previous inspections, where the OU2 Middle Marsh consistently contains several inches of standing water (e.g. in the northwest corner and southeast corner of Middle Marsh), suitable habitat is not present for the survival of woody species. Other areas of OU2 Middle Marsh contain thriving woody species.			
Tree Growth			
Did the tree height and dbh increase every five years at least 20% from original planting height?	Yes **X**	No	Unknown
Comment: Woody species present at the site during the 2008 site visit were notably larger and more robust than in previous years, but 2006 Wetland Monitoring Report indicates that this goal has been met in five of the six OU2 monitoring plots.			
Vegetative Diversity			
Was at least one woody and herbaceous non-invasive wetland species, in addition to the planted species, noted after five years and every five years thereafter?	Yes **X**	No	Unknown
Comment: As reported in all monitoring reports received since the 2003 monitoring, this standard has been met.			
Vegetative Cover			
Has 75% areal coverage of wetland plant species been achieved?	Yes **X**	No	Unknown
If 75% areal coverage of wetland plant species has not been achieved by the second growing season, has a plan of action	Yes	No	N/A **X**

been submitted?			
Comment: The goal of the 75% areal coverage has been correctly interpreted by the Contractor to include only non-invasive wetland species. As reported in the 2006 Wetland Monitoring Report, this goal has been met in OU2.			
Are greater than 50% of the dominant plants, exclusive of invasive species, wetland species?	Yes **X**	No	Unknown
Comment: As reported in the 2006 Wetland Monitoring Report, this goal has been met in OU2.			
II. Mystic Valley Amphipod (MVA)			
OU-2 wetland areas with suitable MVA habitat restored based on presence of MVA in restored OU-2 areas?	Yes **X**	No	Unknown
Plan for re-establishment required due to lack of presence of MVA within 3 years of initiation of restoration (in 2000)?	Yes	No	Not Applicable **X**
Comment: The 2003 Wetland Monitoring Report indicated that the Mystic Valley Amphipod was found in the restored OU2 areas during the sampling events in 2003.			
III. Wetland Substrate/Soils			
Physical Substrate Restoration			
Have areas of eroded soil been repaired?	Yes **X**	No	Unknown
Are hydric soils present based on soil profile descriptions?	Yes **X**	No	Unknown
Comment: The goal for restored wetland soils will be a trend for soils from all ten borings to meet the definition of hydric within ten years. However, based on soil data included in the 2006 Wetland Monitoring Report, the soils within the restored areas are showing positive indicators of ground water presence within 12 inches of the ground surface during the growing season.			
Has 25% mean areal coverage of hummocks in Middle Marsh been achieved?	Yes **X**	No	Unknown
Comment: Data contained in the 2003 and 2006 Wetland Monitoring Reports indicate that Middle Marsh Plots #2 and #4 contain greater than 25% hummocks. The contractor indicates that Plots #1 and #3 are not monitored for hummock coverage. This is an item of discrepancy as all of OU2 Middle Marsh was intended to be restored with hummock/hollow topography. Therefore, the contractor should record a percentage of hummock within Plots #1 and #3 in future reports.			
IV. Wetland Hydrology			
Restored wetland sediments replicate water retention characteristics of the pre-remediation conditions?	Yes	No	Unknown **X**
Comment: No discussion of the water retention characteristics of the sediments was presented in any of the Wetland Monitoring Reports received over the last five years. This topic should be addressed by the Contractor in future reports using comparison of baseline and current sediment samples.			
Depth to groundwater less than 12 inches at piezometer locations?	Yes **X**	No	Unknown
Hydrology restored to pre-remediation conditions in Middle Marsh?	Yes **X**	No	Unknown
Comment: Two rounds of data have not been collected within a two-week period since the project's inception and it can't be confirmed that water levels have been within 12 inches of the wetland surface for two weeks. This attribute is intended to document that hydrology in the restored wetlands is sufficient to support wetland plants. Given the high percentage of wetland plants growing throughout the restored areas, and visible observations of saturated soils across the site throughout the growing season, sufficient hydrology has been qualitatively confirmed and observed during the 2008 site visit and previous site visits.			
V. Post-Construction and Long-Term Monitoring			
Are post-construction and long-term monitoring events occurring annually and every five years, respectively? (O&M 1/99 4.2)	Yes **X**	No	Unknown

Are monitoring reports being prepared and submitted for review in accordance with the monitoring programs? (O&M 1/99 4.5)	Yes **X**	No	Unknown
Are corrective actions required for death or failure of plants to properly grow? (O&M 1/99 4.4)	Yes **X**	No	Unknown
Are corrective actions required for excessive plant damage caused by animals? (O&M 1/99 4.4)	Yes	No **X**	Unknown
Are corrective actions required for invasion of opportunistic plant species into restoration areas? (O&M 1/99 4.4)	Yes **X**	No	Unknown
Are corrective actions required for erosion of an amount of topsoil/backfill that modifies the topography of restoration areas to a degree that it would affect the success of restoration in those areas? (O&M 1/99 4.4)	Yes	No **X**	Unknown
Comment: Due to plant death, additional woody species continue to be planted in the OU-2 restoration areas. CONB purchased *Galarucella* beetles for release in OU1 and OU2 for purple loosestrife (*Lythrum salicaria*) control. In 2007, 10,000 beetles were released with 5,000 each at two locations. In 2008, 10,000 beetles were divided between five locations. There was positive evidence of controls, with beetle damage and also sightings of the beetles on loosestrife plants during the 2008 site visit. The Contractor has also maintained annual mechanical and/or chemical methods to suppress the population of invasive species to allow the non-invasive species the opportunity to establish without great competition from cattail (*Typha* sp.) and common reed (*Phragmites australis*). The population of invasive species has been reduced since the last 5-year review, as observed during the 2008 site visit.			

ATTACHMENT 5
APPLICABLE RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

TABLE A5-1. REVIEW OF ARARS FOR OPERABLE UNIT 1
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Safe Drinking Water Act Regulations, 40 CFR Part 141, Subpart B	ROD: waived	Establishes MCLs for public drinking water supplies. These relevant and appropriate regulations will be waived because of technical impracticability.	Not provided in ROD	These regulations were waived in the ROD.
TSCA PCB Disposal Requirements, 40 CFR 761.60	ROD: applicable, *some* requirements will be waived	Disposal of soils and sediments with PCBs over 50 ppm, must be by incinerator or *equivalent alternative method, or chemical* waste landfill. Remedy will result in chemical waste landfill containing existing wastes which have been previously landfilled on site and solidified soils and sediments. Some requirements of chemical waste landfill which are not necessary to protect against risk of injury to health or environment will be waived under the waiver provisions of the TSCA regulations.	Not provided in ROD	The requirements of 40 CFR 761.75(b)(4-9) were met during remedy construction. *Other requirements of chemical waste* landfills were waived in the ROD. These requirements were also complied with for off-site disposal of sludge from the GWTP. When the sludge was determined to contain greater than 50 ppm PCBs, the sludge was disposed of at an EPA-approved chemical waste landfill.
RCRA Land Disposal Regulations, 40 CFR 268 Subpart C	ROD: not applicable	These regulations are not applicable because solidified soils are not expected to contain characteristic or listed hazardous waste.	Not provided in ROD	These regulations are not applicable because pre-design studies (TCLP metals analyses) showed that soil and sediment, representative of material that was excavated, did not exhibit the toxicity characteristics and therefore did not constitute a hazardous waste.
RCRA Minimum Technology Regulations, 40 CFR 264.300	ROD: not applicable	These regulations establish standards for new or replacement landfills, or lateral expansions of landfills, including double liner and leachate collection. Not applicable because remedy does not involve creation of new or replacement landfill, or lateral expansion of landfill. Double liners are not relevant and appropriate because it is technically infeasible to construct a double liner separating wastes in quarry pits from the groundwater. Remedy will comply with leachate collection requirements, except inappropriate length of operation requirements.	Not provided in ROD	It should be noted that numerous amendments have been made to these regulations since June 28, 1989. The remedy remains protective because the groundwater treatment plant continues to collect and treat groundwater and leachate collected.

TABLE A5-1. REVIEW OF ARARS FOR OPERABLE UNIT 1
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Surface Water Discharge Regulations, 40 CFR 122, promulgated pursuant to Clean Water Act	ROD: applicable	Applicable to discharge of groundwater treatment system effluent. If effluent is discharged to surface waters, regulations will be attained through compliance with state water quality standards, and monitoring of discharge.	Not provided in ROD	These regulations are not applicable to the groundwater treatment system effluent, since it is discharged to the POTW. The discharge contemplated in the ROD is no longer necessary. Therefore the remedy remains protective.
Pretreatment Regulations for Indirect Discharges to POTWs, 40 CFR Part 403	ROD: applicable	These regulations control the discharge of pollutants into POTWs, including specific and general prohibitions. If groundwater from passive collection system is discharged to sewer after New Bedford secondary treatment plant becomes operational, these regulations will be applicable, and the remedy will comply through pretreatment.	Not provided in ROD	Numerous amendments have been made to these regulations since June 28, 1989. Changes to the regulations do not impact the protectiveness of the remedy because the GWTP is complying with the local sewer use ordinance which complies with the regulations.
Discharge of Dredged and Fill Materials Regulations, 40 CFR 230, promulgated under Section 404 of Clean Water Act	ROD: applicable	This regulation applies to the use of fill material in stream and wetlands. Remedy will comply because there is no practicable alternative having a less adverse impact on aquatic organisms, and steps will be taken to minimize adverse impacts, such as sedimentation basins, baffles and stream and wetlands restoration.	Not provided in ROD	There are no impacts to the protectiveness of the remedy. These requirements were applicable during remedy construction but are no longer part of any action contemplated during operation and maintenance of the site.
National Ambient Air Quality Standards (NAAQS), 40 CFR 50.6, promulgated pursuant to Clean Air Act	ROD: applicable	These applicable regulations set primary and secondary 24-hour concentrations for emissions of particulate matter. Fugitive dust from excavation, treatment, solidification and disposal will be maintained below these standards, by dust suppressants if necessary.	Not provided in ROD	These requirements remain applicable if further land disturbing activities are conducted. No major activities of this kind are currently anticipated.

TABLE A5-1. REVIEW OF ARARS FOR OPERABLE UNIT 1
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
OSHA Worker Safety Regulations, 29 CFR Part 1910	ROD: applicable	These applicable regulations contain safety and health standards that will be met during all remedial activities, including construction of the cap and installation of groundwater wells.	Not provided in ROD	OSHA worker protection standards are no longer considered ARAR for CERCLA response actions, but are To Be Considered. The Settling Parties and their Contractors are required to comply with OSHA worker protection standards during operation and maintenance of facilities on-site that are still contaminated with hazardous substances; for instance the groundwater treatment facility.
Department of Transportation Regulations for Transport of Hazardous Materials, 49 CFR Parts 107, 171.1 - 172.558	ROD: applicable	Requirements for transporting hazardous materials off-site will be met.	Not provided in ROD	Transport of treatment residuals and chemicals to/from the site is performed in compliance with DOT rules.
Massachusetts Drinking Water Regulations (310 CMR 22.00)	ROD: waived	Establishes maximum contaminant levels for public drinking water supplies. Attainment of this relevant and appropriate regulation will be waived because of technical impracticability.	Not provided in ROD	These regulations were waived in the ROD.
Massachusetts Groundwater Quality Standards (314 CMR 6.00)	ROD: waived	Establishes minimum groundwater criteria. Attainment of this relevant and appropriate regulation will be waived because of technical impracticability.	Not provided in ROD	These regulations were waived in the ROD.
Massachusetts Hazardous Waste Closure and Post Closure Regulations, 310 CMR 30.580 and 30.590	ROD: relevant and appropriate	The closure and post closure regulations are relevant and appropriate. The cap will be constructed and maintained and monitoring will be performed in compliance with these requirements.	Not provided in ROD	The closure and post closure regulations are applicable and maintenance and monitoring are being performed in accordance with the Site Operations and Maintenance Manual. A Site Closure Plan was developed in compliance with 310 CMR 30.580.
Massachusetts Hazardous Waste Location Regulations, 310 CMR 30.700	ROD: relevant and appropriate	The cap will be constructed outside the 100-year floodplain in accordance with these relevant and appropriate regulations.	Not provided in ROD	These location requirements were met during construction. The culverts beneath Hathaway Road were augmented to carry the potential flood from the 100-yr storm away from the cap.

TABLE A5-1. REVIEW OF ARARS FOR OPERABLE UNIT 1
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Massachusetts Hazardous Waste Groundwater Protection Regulations, 310 CMR 30.660	ROD: relevant and appropriate	The groundwater monitoring requirements are relevant and appropriate. Semi-annual monitoring for specified indicators of hazardous constituents are required to verify the effectiveness of closure. The remedy will comply with the substantive requirements, except that monitoring will be quarterly for the first three years and the frequency will be reevaluated thereafter.	Not provided in ROD	Groundwater monitoring is being conducted on a quarterly basis in accordance with the Post-Construction Environmental Monitoring Plan.
Massachusetts Hazardous Waste Landfill Regulations, 310 CMR 30.620	ROD: relevant and appropriate	Landfill requirements include double liners, leachate collection systems, and technical requirements for cap. Double liner requirements are not appropriate to this site, since groundwater below landfill will remain contaminated. Other requirements are relevant and appropriate and will be attained, except that leachate collection may be terminated prior to 30 years after closure, if target levels for the passive system have been achieved.	Not provided in ROD	The requirement for post-closure care is relevant and appropriate and is on-going in accordance with the Site Operation and Maintenance Manual.
Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities, 314 CMR 8.00	ROD: applicable	RCRA facilities subject to surface water discharge requirements must also comply with DEQE regulations regarding location, technical standards for landfills, closure and post-closure, and management standards.	Not provided in ROD	These requirements are not applicable because the groundwater treatment plant discharges to the New Bedford POTW, not to surface water.
Massachusetts Surface Water Quality Standards, 314 CMR 4.00	ROD: applicable	Surface waters must be free from pollutants which are present in toxic amounts, which exceed recommended limits for most sensitive use, or which exceed safe exposure levels. These applicable standards will be attained during remedial design and operation of the treatment system.	Not provided in ROD	As constructed, the groundwater treatment plant discharges to the New Bedford POTW, not to surface water. As a result, surface waters are not impacted by a discharge at the Site.

TABLE A5-1. REVIEW OF ARARS FOR OPERABLE UNIT 1
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Massachusetts Wetlands Protection Regulations, 310 CMR 10.00	ROD: applicable	This applicable regulation sets performance standards for dredging banks, vegetated wetlands, and lands under water. The remedy and mitigative measures will attain these standards.	Not provided in ROD	The soil and sediment excavation and stream lining were conducted so that adverse effects were minimized. Erosion control measures were used throughout remedy construction. A Wetlands Restoration Plan was prepared which outlined measures to attain these standards. Post-construction wetland monitoring has been conducted annually since excavation and initial wetlands restoration was completed. Long-term wetland monitoring will be conducted every five years to ensure the long-term effectiveness of the wetland restoration program. Annual wetland monitoring reports have been submitted during the post-construction period that summarize maintenance and monitoring performed within wetland restoration areas of OU1 and OU2.
Massachusetts Ambient Air Quality Standards, 310 CMR 6.00	ROD: applicable	This applicable regulation sets primary and secondary standards for emissions of particulate matter. These standards will be met during implementation.	Not provided in ROD	These requirements were met during remedy construction activities.
Massachusetts Right to Know Regulations, 454 CMR 21.000	ROD: applicable	Informational requirements of these regulations will be attained during implementation.	Not provided in ROD	Worker safety rules are no longer considered ARAR for CERCLA reponse actions but are To Be Considered.

TABLE A5-1. REVIEW OF ARARS FOR OPERABLE UNIT 1
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Executive Orders 11990 and 11988	ROD: To be considered	These executive orders regarding protection of floodplains and wetlands were considered in the evaluation and development of remedial alternatives. The soil and sediment excavation and stream lining will be conducted in such a manner to avoid or minimize adverse impacts.	Not provided in ROD	The requirements to avoid or minimize adverse impacts to wetlands were met during remedy construction. A Wetlands Restoration Plan was prepared which outlined measures to attain these standards. Post-construction wetland monitoring has been conducted annually since excavation and initial wetlands restoration was completed. Long-term wetland monitoring will be conducted every five years to ensure the long-term effectiveness of the wetland restoration program. Annual wetland monitoring reports have been submitted during the post-construction period that summarize maintenance and monitoring performed within wetland restoration areas of OU1 and OU2.
Interim Sediment Quality Criteria	ROD: To be considered	Interim sediment quality criteria were considered in establishing target levels for cleanup of sediments.	Not provided in ROD	Although the Interim Sediment Quality Criterion for PCBs was never finalized, the technical basis for sediment quality criteria for non-ionic organic contaminants such as PCBs remains a scientifically defensible approach to setting sediment quality criteria for PCBs. These criteria were considered in the development of cleanup standards for the site.

TABLE A5-1. REVIEW OF ARARS FOR OPERABLE UNIT 1
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Masachusetts Solid Waste Management Regulations, 310 CMR 19.117	ROD: not provided in ROD	Not provided in ROD	Not provided in ROD	Considered applicable due to the detection of landfil gas at perimeter monitoring wells at concentrations greater than 25% LEL. The provisions of this regulation mandate the control of landfill gases to concentrations less than 25% LEL to prevent public health and safety concerns. Although this regulation was not included in the ROD, it provides a mechanism to measure the performance of landfill gas generation at the site. Other ARARs listed do not provide such a mechanism. A process is in place to comply with the regulation. An active landfill gas collection system has been implemented by the OU1 Settling Parties. Quarterly landfill gas monitoring is conducted in order to evaluate the effectiveness of the system in controlling landfill gas migration.
Masachusetts Solid Waste Management Regulations, 310 CMR 19.118(4)	ROD: not provided in ROD	Not provided in ROD	Not provided in ROD	Considered applicable; requires the installation of gas monitoring wells to monitor the possible migration of explosive gases.
Masachusetts Solid Waste Management Regulations, 310 CMR 19.132 (4)	ROD: not provided in ROD	Not provided in ROD	Not provided in ROD	Considered applicable due to the detection of landfil gas at perimeter monitoring wells at concentrations greater than 25% LEL. The provisions of this regulation require the DEP be notified when concentrations of landfill gas are measured above 25% LEL at the property boundary. Although this was not included in the ROD, other ARARs listed do not provide a requirement to notify the DEP under such conditions, which is considered an appropriate means to maintain public health and safety.

TABLE A5-1. REVIEW OF ARARS FOR OPERABLE UNIT 1
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Masachusetts Solid Waste Management Regulations, 310 CMR 19.150	ROD: not provided in ROD	Not provided in ROD	Not provided in ROD	Considered applicable due to the detection of landfill gas at property boundaries at concentrations greater than 25% LEL. Although this was not included in the ROD, it provides a method to address the landfill gas concentrations above 25% LEL, and is referenced in 310 CMR 19.132(4). Other ARARs do not provide a means to address the landfill gas concentrations.
Massachusetts Air Pollution Control Regulations, 310 CMR 7.00	ROD: applicable	Applicable to emissions of particulates during implementation of remedy.	Not provided in ROD	The emissions of particulates during remedy construction were addressed. 310 CMR 7.00 is applicable to the discharge of emissions from the active landfill gas collection system which has been implemented and is currently operating. The need for off-gas controls was evaluated as part of the design for the gas extraction and discharge system and was determined to not be needed based on anticipated VOC discharges. Quarterly monitoring of the stack effluent and ambient air at locations near and downwind of the discharge point is being conducted.

TABLE A5-2. REVIEW OF LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE FOR OPERABLE UNIT 2 (MIDDLE MARSH)
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

Medium/Authority (from ROD)	ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Federal Regulatory Requirements	Clean Water Act (CWA) Guidelines for Disposal of Dredged or Fill Material (33 U.S.C. 1344) (40 CFR Part 230)	ROD: Applicable	No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the discharge which would have a less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken which will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem.	Any activities that involve the discharge of dredge or fill materials in wetlands shall be conducted in a manner utilizing the alternative which would have the least adverse impact on the aquatic ecosystem and the environment, pursuant to 40 CFR 230.10(a).	This requirement was met during remedy construction. The discharge of fill materials in wetlands was conducted to have the least adverse impact on the aquatic ecosystem and the environment. Fill materials were obtained from off-site. Soils used as fill were tested to demonstrate that they met wetland soil requirements and had less than 1 mg/kg total PCBs.
	Statement of Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A)	ROD: Applicable	Federal agencies shall avoid, wherever possible, the long and short term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a precticable alternative in accordance with Executive Orders 11990 and 11988. The agency shall promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review.	All practicable means will be used to minimize harm to wetlands and floodplains. Wetlands and floodplains disturbed by excavation will be restored to their original conditions.	Remedial construction was conducted so that impacts to wetlands were minimized. Erosion control measures were used throughout construction. A wetlands restoration plan was prepared which outlined measures to attain these standards. Post-construction wetland monitoring has been conducted annually since excavation and initial wetlands restoration was completed. Long-term wetland monitoring will be conducted every five years to ensure the long-term effectiveness of the wetland restoration program. Annual wetland monitoring reports have been submitted during the post-construction period that summarize maintenance and monitoring performed within wetland restoration areas of OU1 and OU2.
	Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.)	ROD: Applicable	Under 662, any modification of a body of water requires consultation with the U.S. Fish and Wildlife Services, to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife. This requirement is addressed under CWA Section 404 requirements.	During the identification, screening, and evaluation of alternatives, the effects on wetlands are evaluated. If an alternative modifies a body of water, EPA must consult the U.S. Fish and Wildlife Service. Whenever possible, the remedial alternative describes measures to prevent, mitigate, or compensate for losses to fish and wildlife.	This requirement was met during remedy construction. U.S. Fish and Wildlife Service was consulted.

TABLE A5-2. REVIEW OF LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE FOR OPERABLE UNIT 2 (MIDDLE MARSH)
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

Medium/Authority (from ROD)	ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
	RCRA Location Standards (40 CFR 264.18)	ROD: Relevant and Appropriate	This regulation outlines the requirements for constructing a RCRA facility on a 100-year floodplain.	A RCRA facility that is located on a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless waste may be removed safely before floodwater can reach the facility or no adverse effects on human health and the environment would result if washout occurred.	No facility has been constructed within OU2. If a facility is proposed, it must be approved in accordance with this regulation.
	Hazardous Waste Facility Siting Regulations (990 CMR 1.00)	ROD: Relevant and Appropriate	These regulations outline the criteria for the construction, operation, and maintenance of a new facility or increase in an existing facility for the storage, treatment, or disposal of hazardous waste.	No portion of the facility may be located within a wetland or bordering a vegetated wetland, or within a 100-year floodplain, unless approved by the state.	These regulations are not applicable since no facility has been constructed within OU2.
State Regulatory Requirements	Massachusetts Wetlands Protection Act (M.G.L. 131, §40); Massachusetts Wetlands Protection Regulations (310 CMR §10.00)	ROD: Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, altering, polluting of inland wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that effects on wetlands be mitigated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetlands.	If alternatives involve removing, filling, dredging, or altering a DEP-defined wetland, or conducting work within 100 feet of a wetland, it must be demonstrated that the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Whenever possible, remedial actions will be conducted so that impacts to wetlands will be minimized or mitigated.	Remedial construction was conducted so that impacts to wetlands were minimized. Erosion control measures were used throughout construction. A wetlands restoration plan was prepared which outlined measures to attain these standards. Post-construction wetland monitoring has been conducted annually since excavation and initial wetlands restoration was completed. Long-term wetland monitoring will be conducted every five years to ensure the long-term effectiveness of the wetland restoration program. Annual wetland monitoring reports have been submitted during the post-construction period that summarize maintenance and monitoring performed within wetland restoration areas of OU1 and OU2.

TABLE A5-2. REVIEW OF LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE FOR OPERABLE UNIT 2 (MIDDLE MARSH)
SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

Medium/Authority (from ROD)	ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
	Massachusetts Endangered Species Act (M.G.L. ch. 131, §40); Massachusetts Endangered Species Act Regulations, Part III (321 CMR §§10.30 - 10.43)	ROD: Applicable	These regulations established Massachusetts' list of threatened and endangered species and species of special concern. The habitat of any species listed under this requirement is protected by the regulations promulgated under the MA Wetlands Protection Act.	If alternatives involve impacts to the habitat of any listed species, appropriate actions must be taken during remediation to mitigate or minimize impacts to the species and its critical habitat. Habitats of any listed species will be identified prior to remediation.	This requirement was met during remedial design and construction. The Mystic Valley amphipod was identified as a species of special concern at the site, and measures were taken to minimize impacts to the species and its critical habitat.
State Nonregulatory Requirements to be Considered	Massachusetts Wetlands Protection Policy 90-2; Standards and Procedures for Determining Adverse Impacts to Rare Species	ROD: To be Considered	This policy clarifies the rules regarding rare species habitat contained at 310 CMR 10.59.	Habitats of rare species, as determined by the Massachusetts Natural Heritage Program, will be considered in the mitigation plans.	This requirement was met during remedial design and construction. The Mystic Valley amphipod was identified as a species of special concern at the site, and was considered in the site mitigation plans.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
National Pollution Discharge Elimination System (NPDES) (40 CFR 122 and 125)	ROD: Applicable	Regulates the discharge of water into public surface waters.	Discharged water will be monitored for the required pollutants and standards will be met.	No water was discharged to surface waters during construction. Instead, construction water was treated and discharged to the New Bedford POTW in accordance with pretreatment program requirements.
Toxic Pollutant Effluent Standards (40 CFR 129)	ROD: Applicable	Regulates the discharge of the following pollutants: aldrin/dieldrin, DDT, endrin, toxaphene, benzidine, and PCBs.	All discharge waters will be monitored for the regulated pollutants and will meet standards.	No water was discharged to surface waters during construction. Instead, construction water was treated and discharged to the New Bedford POTW in accordance with pretreatment program requirements.
Massachusetts Surface Water Quality Standards 314 CMR 4.00	ROD: Applicable	These standards designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected. Minimum water quality criteria required to sustain the designated uses are established. Federal AWQC are to be considered in determining effluent discharge limits. Where recommended limits are not available, site-specific limits shall be developed. Any on-site water treatment and discharge is subject to these requirements.	Water from the dewatering process will be discharged directly to the unnamed stream. If this water does not meet state standards, it will be treated prior to discharge. Effluent limitations for water discharges will be established so that such discharges shall not result in a violation of state water quality standards.	These regulations are not applicable since no water was discharged to surface waters during construction. Instead, construction water was treated and discharged to the New Bedford POTW in accordance with pretreatment program requirements.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Clean Water Act 404 (40 CFR 230)	ROD: Applicable	No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the discharge which would have a less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken which will minimize the potential adverse impacts of the discharge material on the aquatic ecosystem.	**Selected Remedy:** Any activities that involve the discharge of dredge or fill materials in wetlands shall be conducted in a manner utilizing the alternative which would have the least adverse impact on the aquatic ecosystem and the environment, pursuant to 40 CFR 230.10(a), and any excavated areas to be filled shall be filled with clean materials from off-site, in accordance with 40 CFR 230. **Contingency Remedy:** Any activities that involve the discharge of dredge or fill materials in wetlands shall be conducted in a manner utilizing the alternative which would have the least adverse impact on the aquatic ecosystem and the environment, pursuant to 40 CFR 230.10(a), and any excavated areas to be filled shall be filled with adequately treated and appropriately reconditioned materials.	This requirement was met during remedy construction. The discharge of fill materials in wetlands was conducted to have the least adverse impact on the aquatic ecosystem and the environment. Fill materials were obtained from off-site. Soils used as fill were tested to demonstrate that they met wetland soil requirements and had less than 1 mg/kg total PCBs.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App A)	ROD: Applicable	Federal agencies shall avoid, wherever possible, the long and short term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency shall promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review.	This alternative will take into consideration this statement. All practicable means will be used to minimize harm to wetlands and floodplains. Wetlands and floodplains disturbed by excavation will be restored to their original conditions. Temporary fill placed in the golf course and wetland for access roads and staging area will not have a significant impact on the extent of flooding. Culverts will be placed under the access roads to allow for undiverted passage of flood waters.	Remedial construction was conducted so that impacts to wetlands were minimized. Erosion control measures were used throughout construction. A wetlands restoration plan was prepared which outlined measures to attain these standards. Post-construction wetland monitoring has been conducted annually since excavation and initial wetlands restoration was completed. Long-term wetland monitoring will be conducted every five years to ensure the long-term effectiveness of the wetland restoration program. Annual wetland monitoring reports have been submitted during the post-construction period that summarize maintenance and monitoring performed within wetland restoration areas of OU1 and OU2.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Massachusetts Wetlands Protection Act (M.G.L. 131, §40) (310 CMR 10.00)	ROD: Applicable	The dredging, filling, altering, or polluting of inland wetlands and work within 100 feet of a wetland is regulated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetlands.	Wetlands disturbed by excavation will be restored to original conditions. All practicable means will be used to minimize wetland disturbance. Remedial activities will be selected based on the ability to minimize adverse effects on such habitats.	Remedial construction was conducted so that impacts to wetlands were minimized. Erosion control measures were used throughout construction. A wetlands restoration plan was prepared which outlined measures to attain these standards. Post-construction wetland monitoring has been conducted annually since excavation and initial wetlands restoration was completed. Long-term wetland monitoring will be conducted every five years to ensure the long-term effectiveness of the wetland restoration program. Annual wetland monitoring reports have been submitted during the post-construction period that summarize maintenance and monitoring performed within wetland restoration areas of OU1 and OU2.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Massachusetts Endangered Wildlife and Wild Plants Regulations (321 CMR 8.00)	ROD: Applicable	These regulations established Massachusetts' list of threatened and endangered species and species of special concern. The habitat of any species listed under this requirement is protected by the regulations promulgated under the Massachusetts Wetlands Protection Act.	If the alternative involves impact to the habitat of any listed species, appropriate actions must be taken during remediation to mitigate or minimize impacts to the species and its critical habitat. Habitats of any listed species will be identified prior to remediation.	This requirement was met during remedial design and construction. The Mystic Valley amphipod was identified as a species of special concern at the site, and actions were taken to mitigate or minimize impacts to the species and critical habitat.
Massachusetts Certification for Dredging, Dredged Material Disposal, and Filling in Waters (314 CMR 9.00)	ROD: Applicable	The substantive portions of these regulations establish criteria and standards for the dredging, handling and disposal of fill material and dredged material.	Excavation, filling, and disposal operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected waters and to minimize the impact on the environment.	This requirement was met during remedy construction. The discharge of fill materials in wetlands was conducted to have the least adverse impact on the aquatic ecosystem and the environment. Fill materials were obtained from off-site. Soils used as fill were tested to demonstrate that they met wetland soil requirements and had less than 1 mg/kg total PCBs.
Fish and Wildlife Coordination Act (16 U.S.C. 166 et seq.)	ROD: Applicable	Any modification of a body of water requires prior consultation with the U.S. FWS to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife.	Prior to excavation, EPA will consult with U.S. FWS. This alternative includes measures to prevent, mitigate, or compensate for losses to fish and wildlife.	This requirement was met during remedy construction. U.S. Fish and Wildlife Service was consulted.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.65, 761.79)	ROD: Applicable if PCB concentrations are >50 ppm; Relevant and appropriate if PCB concentrations are <50 ppm	All dredged materials that contain PCBs at concentrations of 50 ppm or greater shall be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. On-site storage facilities for PCBs shall meet, at a minimum, the following criteria: • Adequate roof and walls to prevent rain • Adequate floor with continuous curbing • No openings that would permit liquids to flow from curbed area • Not located at a site that is below the 100-year flood water elevation	**Selected Remedy:** Disposal of soils/sediments under the cap at the Disposal Area will comply with comply with chemical waste landfill requirements except requirements waived in the ROD for the First Operable Unit. These regulations will be considered by U.S. EPA Region I in the selection of this alternative and in the design of storage facilities. Solid debris,excluding trees and bushes, shall be decontaminated prior to off-site transport or off-site disposal in accordance with 40 CFR 761.79; storage facilities shall be designed consistent with 40 CFR 761.65(b)(a)(i), (ii), and (iii). **Contingency Remedy:** These regulations will be considered by U.S. EPA Region I in the selection of this alternative and in the design of storage facilities. Solid debris, excluding trees and bushes, shall be decontaminated prior to off-site transport or off-site disposal in accordance with 40 CFR 761.79; storage facilities shall be designed consistent with 40 CFR 761.65(b)(a)(i), (ii), and (iii). PCB-concentrated waste oils from the solvent extraction process will be disposed of in accordance with these regulations.	This requirement was met during remedy construction. None of the soils handled during OU2 remedial actions exceeded the 50 ppm level for PCBs. No off-site treatment or disposal of solid debris was required during construction. The contingency remedy identified in the ROD was not utilized.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00)	ROD: Relevant and Appropriate	Water treatment units which are exempted from M.G.L.c.21C and which treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner which protects public health and safety and the environment.	If treatment of sediment/soil dewatering water is necessary, all process will comply with Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards.	Temporary treatment of sediment dewatering water during remedial actions complied with Massachusetts regulations.
Massachusetts Hazardous Waste Regulations 310 CMR 30.000)	ROD: Applicable if sediments/soils are defined as hazardous waste under Mass. Law; relevant and appropriate if sediments/soils are similar to hazardous wastes; For contingency remedy, applicable to PCB-concentrated waste oil	Regulate the generation, storage, collection, transport, treatment, disposal, use, reuse, and recycling of hazardous waste in Massachusetts. The regulations provide procedural standards for the following: generators (310 CMR 30.300), general management standards for all facilities (301 CMR 30.510), contingency plan, emergency procedures, preparedness, and prevention (314 CMR 30.520), manifest system (310 CMR 30.530), closure and post-closure (310 CMR 30.580), landfill requirements (310 CMR 30.620), protection (310 CMR 30.660), use and management of containers (310 CMR 30.680), and facility location standards and land disposal restrictions (310 CMR 30.700).	**Selected and Contingency Remedies:** Based on known information, EPA expects that the sediment/soil are not hazardous waste under Massachusetts law. However, if the sediment/soil is designated hazardous waste under Massachusetts law, all processes involving the contaminated sediment/soil will be conducted in accordance with state hazardous waste regulations. **Contingency Remedy:** All processes involving the PCB-concentrated waste oil will be conducted in accordance with these regulations.	Post-closure requirements are being addressed by OU1. the contingency remedy identified in the ROD was not ultilized.
RCRA, Land Disposal Regulations (40 CFR 268, Subpart C)	ROD: Applicable if the sediments/soil are characteristic of hazardous waste under federal law	Prohibits the disposal of RCRA hazardous waste in the land unless treatment standards are met or treatability variance is obtained.	Based on known information, EPA expects that the sediment/soil are not hazardous waste. However, if the sediment/soil is hazardous waste due to the presence of metals, it will be solidified to render it non-hazardous or, alternatively, to meet the treatability variance requirements in the land disposal requirements.	These regulations are not applicable because pre-design studies (TCLP metals analyses) conducted for OU1 showed that soil and sediment, representative of material that was excavated, did not exhibit the toxicity characteristics and therefore did not constitute a hazardous waste.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
National Ambient Air Quality Standards (NAAQS), 40 CFR 50.6, promulgated pursuant to Clean Air Act	ROD: Applicable	The maximum primary and secondary 24-hr. concentration for particulate emissions from site excavation activities must be maintained below 150 ug/m^3, 24-hour average for particulates having a mean diameter of 10 micrometers or less. The annual standard is 50 ug/m^3, annual arithmetic mean.	The ambient air will be continuously monitored to ensure compliance with federal regulations.	Particulate monitoring was conducted and dust suppressants were used when necessary to control fugitive dust. These requirements are only applicable if further land disturbing activities are conducted.
Massachusetts Ambient Air Quality Standards (310 CMR 6.00) and Massachusetts Air Pollution Control Regulations (310 CMR 7.00)	ROD: Applicable	**Selected Remedy:** The applicable portions of these regulations prohibit burning or emissions of dust which causes or contributes to a condition of air pollution. **Contingency Remedy:** All construction and treatment activities will utilize Best Available Control Technology in order to prevent contaminant transfer between other media and air. Massachusetts AALs and TELs are used in determining compliance with these regulations. Burning or emissions of dust which causes or contributes to a condition of air pollution are prohibited.	**Selected Remedy:** Control measures will be implemented to ensure compliance with state regulations. **Contingency Remedy:** The ambient air will be continuously monitored and control measures shall be implemented to ensure compliance with state regulations.	These requirements were met during remedy construction activities. The contingency remedy identified in the ROD was not utilized.
Federal Noise Control Act (40 CFR 204, 205, 211)	ROD: Relevant and Appropriate	Regulates construction and transportation equipment noise, process equipment and noise levels, and noise levels at the property boundaries of the project.	Site noise levels will be in accordance with federal requirements.	These requirements were met during remedy construction.
Toxic Substance Control Act (TSCA), Subpart G, PCB Spill Clean-up Policy (40 CFR 761.120-135)	ROD: To be considered	Sets cleanup levels for PCB spills of 50 ppm or greater at 10 ppm for non-restricted access areas, and 25 ppm for restricted access areas.	Cleanup levels established in Chapter Six of the Feasibility Study are consistent with this policy.	The requirements were met during remedy construction. Soils and sediment sampling is being conducted as part of post-construction environmental monitoring to verify continued compliance with the cleanup levels.
Interim Sediment Quality Criteria	ROD: To be considered	These criteria were developed by U.S. EPA for certain hydrophobic organic compounds, including PCBs, to protect benthic organisms. The criteria for PCBs is 19.5 ug PCB/g carbon.	The cleanup levels developed in Chapter 6 of the Feasibility Study are consistent with interim criteria.	The Interim Sediment Quality Criterion for PCBs was never finalized. The technical basis for sediment quality criteria for non-ionic organic contaminants such as PCBs remains a scientifically defensible approach to setting sediment quality criteria for PCBs in sediment.

TABLE A5-3. REVIEW OF ACTION-SPECIFIC ARARS FOR THE SELECTED AND CONTINGENCY REMEDIES, OPERABLE UNIT 2 (MIDDLE MARSH) SULLIVAN'S LEDGE SUPERFUND SITE, NEW BEDFORD, MASSACHUSETTS

ARAR (from ROD)	Status (from ROD)	Requirement Synopsis (from ROD)	Action to be Taken to Attain ARAR (from ROD)	Five-Year Review
Massachusetts Allowable Ambient Air Limits - Annual (AALs) and Massachusetts Threshold Effects Exposure Levels (TELs)	ROD: To be considered	These guidances are to be considered in evaluating whether a condition of air pollution exists. The TEL for PCB is 0.003 ug/m^3 and the AAL is 0.005 ug/m^3.	Massachusetts air limits and exposure levels will be considered in the evaluation of emissions monitoring results.	These requirements were considered during construction. An air monitoring program was implemented to monitor and ensure compliance with these emission limits.
Guidance on Remedial Actions for Superfund Sites with PCB Contamination	ROD: To be considered	Describes various scenarios and considerations pertinent to determining the appropriate level of PCBs that can be left in each contaminated media to achieve protection of human health and the environment.	This guidance will be considered in determining the appropriate level of PCBs that will be left in the sediment/soil. Management of PCB-contaminated residuals will be designed in accordance with the guidance.	This guidance was considered during remedial design.
EPA Interim Policy for Planning and Implementing CERCLA Response Actions. Proposed Rule, 50 CFR 45933 (November 5, 1985)	ROD: To be considered	Discusses the need to consider treatment, recycling, and reuse before offsite land disposal is used. Prohibits use of a RCRA facility for offsite management of Superfund hazardous substances if it has significant RCRA violations.	**Selected Remedy:** This policy will be considered in the treatment of the PCB-contaminated sediment/soil. **Contingency Remedy:** This policy will be considered in the treatment of the PCB-contaminated waste oil stream.	Off-site disposal of PCB-contaminated sediment/soil was not conducted. The contingency remedy identified in the ROD was not utilized.