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Five-Year Review Report

Fourth Five-Year Review
for
Beacon Heights Landfill Superfund Site
Beacon Falls, Connecticut

September 2008

Prepared by:

The United States Environmental Protection Agency
Region 1, New England
Boston, Massachusetts

Superfund Records Center
SITE: Beacon Heights
BREAK: 6.3
OTHER:

EPA
New England

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9/30/08

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ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BCEE	bis(2-chloroethyl)ether
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
BF POTW	Beacon Falls Publicly Owned Wastewater Treatment Works
BHC	Beacon Heights Coalition
BHI	Beacon Heights, Inc.
COC	Contaminant of Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CTDEP	Connecticut Department of Environmental Protection
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FSP	Field Sampling Plan
GPC	Groundwater Protection Criteria
gpm	gallons per minute
LCS	Leachate Collection System
LFR	Levine Fricke
LTMP	Long-Term Monitoring Plan
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
ppb	parts per billion
PRP	Potentially Responsible Party(ies)
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAO	Remedial Action Objective
RCPs	Reasonable Confidence Protocols
RCRA	Resource Conservation and Recovery Act

ACRONYMS (cont.)

RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Site	Beacon Heights Landfill Superfund Site
sROD	Supplemental Record of Decision
SVOC	Semi-Volatile Organic Compound
µg/L	micrograms per liter
VOC	Volatile Organic Compound
WQS	Water Quality Standards

EXECUTIVE SUMMARY

This is the fourth five-year review for the Beacon Heights Landfill Superfund Site (the Site) located in the town of Beacon Falls, Connecticut. The review was conducted from May through July, 2008 in accordance with EPA Office of Solid Waste and Emergency Response (OSWER) Guidance No. 9355.7-03B-P. This report documents the results of this review and presents the results in accordance with the EPA OSWER Guidance, as well as previous review reports. This statutory five-year review is required because hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure. The triggering action for this statutory five-year review is based on the completion of the last five-year review in September 2003.

The Record of Decision (ROD) for the Site was signed on September 23, 1985. The major components of the remedy as outlined in the ROD include: excavation of satellite areas of contamination for consolidation with the main landfill prior to closure, construction of a cap in accordance with the Resource Conservation and Recovery Act (RCRA) over the consolidated wastes including gas venting and storm water management controls, installation of a perimeter leachate collection system, extension of a public water supply line along Skokorat Road and Blackberry Hill Road to provide water service to residences identified at the time of the ROD, enclosure of the Site with security fencing, installation of a groundwater monitoring system, and implementation of institutional controls on groundwater use in the affected area. Currently, effective institutional controls have not yet been implemented.

A Supplemental ROD (sROD) was signed for the Site on September 28, 1990. The sROD was prepared to address the following issues: selection of the manner and location of leachate treatment (on-site or off-site), determination of the extent of excavation of contaminated soils, and the need for air pollution controls on the landfill gas vents. Certain components of the response action, as constructed, varied from the selected remedial action described in the ROD and as amended in the sROD. An Explanation of Significant Differences (ESD) was prepared for the Site, describing the changes from the ROD and sROD and the reason these changes occurred. The changes described in the ESD include the change of the selected location for leachate treatment, the modifications to the RCRA landfill cap design, and the requirement for construction of compensatory wetlands. The ESD was completed on September 9, 1998.

The remedy has made progress in achieving the Remedial Actions Objectives specified in the ROD. Periodic site inspections indicate that the landfill components are in good condition and largely functioning as intended in the ROD. Ongoing operations and maintenance of the landfill and the leachate collection system and long-term monitoring are helping to maintain the current protectiveness of the remedy. While there have been changes to the ARARs cited in the ROD, updates in toxicity factors and chemical characteristics, and updated risk assessment methods, the remedy is still largely effective because capping and provision of a waterline prevent potential exposure to contaminated landfill materials and ingestion of groundwater contaminants.

Most of the contaminated overburden groundwater migrating from the landfill appears to be captured by the perimeter leachate collection system. However, contaminated groundwater is still migrating downwards into the fractured bedrock and downgradient beyond the influence of leachate collection system. Local hydrogeologic conditions cause groundwater to enter into the landfill from the bedrock unit, causing chemicals to leach and then migrate off site. Although a waterline had been installed to provide potable water to nearby residences, some residents declined the opportunity to connect in 1989 and 1994. More residential developments have been constructed since the extension of the water line in 1989 and it is uncertain whether all new residences near the Site are connected to a public water supply. New residential developments are being constructed or are planned on parcels that abut the Site to the northeast and to the south. Nearby residents with private water supply wells may be exposed to contaminated bedrock groundwater. The vapor intrusion pathway has not been evaluated previously. This pathway should be evaluated with respect to all nearby homes. Contaminated bedrock groundwater may also be discharging to an adjacent surface water body. Institutional controls (e.g., deed restrictions) to restrict groundwater use in the vicinity of the Site have not been implemented.

The remedy currently protects human health and the environment in the short term because the cap and leachate collection system are containing overburden groundwater contaminants on site, and the waterline installed along Blackberry Hill Road and Skokorat Road helps to ensure that most nearby residents are not exposed to contaminants that may remain in the groundwater. However, based on changes identified after the third five-year review, evaluation of the future protectiveness of the remedy is deferred until additional information can be

acquired and evaluated. It is expected that these additional actions will require approximately 18 months (or less) to complete.

The next five-year review will be conducted by September 2013.

FIVE-YEAR REVIEW SUMMARY FORM		
SITE IDENTIFICATION		
Site name *(from WasteLAN):* Beacon Heights Landfill Superfund Site		
EPA ID (*from WasteLAN):* CTD072122062		
Region: 1	**State:** CT	**City/County:** Beacon Falls/New Haven
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:** September 9,1998	
Has site been put into reuse?	☐ **YES**	☒ **NO**
REVIEW STATUS		
Lead agency: ☒ **EPA**	☐ **State**	☐ **Tribe** ☐ **Other Federal Agency:**
Author name: Leslie McVickar		
Author title: Remedial Project Manager	**Author Affiliation:** U.S. Environmental Protection Agency	
Review period: May to September 2008		
Date(s) of site inspection: NA		
Type of review:	☐ Post-SARA ☒ Pre-SARA ☐ NPL-Removal only ☐ NPL State/Tribe-lead ☐ Non-NPL Remedial Action Site ☐ Regional Discretion	
Review number	☐ 1 (first) ☐ 2 (second) ☐ 3 (third) ☒ Other (fourth)	
Triggering action	☐ Actual RA Onsite Construction at OU # ☐ Actual RA Start at OU# ☐ Construction Completion ☒ Previous Five-Year Review Report ☐ Other (specify)	
Triggering action date (from WasteLAN): September 30, 2003		
Due date (five years after triggering action date): September 30, 2008		

Five-Year Review Summary Form, Cont'd

Issues:

- Proposed construction of residential development on two parcels that abut the Site; if private water wells are installed, could result in potential exposure to contaminated Site groundwater.
- Offsite migration of contaminated bedrock groundwater may affect current residences that are not connected to a public water supply.
- Potential vapor intrusion pathway concerns exist for nearby homes.
- Contaminated groundwater may be discharging to Wetland Mitigation Area and Orchard Pond.
- Institutional controls (e.g., deed restrictions to prohibit use of =groundwater in the vicinity of the Site) have not been enacted.
- Several private residences had previously declined to be connected to the public water supply.

Recommendations and Follow-up Actions:

- Initiate or continue dialog with the developers to ensure that the water line is installed and that supply wells are not installed in the new developments. Periodically monitor the development status.
- Conduct an inventory to identify private well users in the vicinity of the Site. Determine whether these wells could be affected by Site groundwater contaminants and address, as appropriate.
- Evaluate whether there is the potential for vapor intrusion exposures for parcels that are near the Site. Implement mitigation measures, as appropriate.
- Continue groundwater monitoring and evaluate results against the Connecticut Remediation Standard Regulations (RSRs) Surface Water Protection Criteria (SWPC).
- Identify properties that may be at risk and implement institutional controls (e.g., deed restrictions).
- Assess whether residents on private water would like to be connected to the public water supply.

Protectiveness Statement(s):

The remedy currently protects human health and the environment in the short term because the cap and leachate collection system are containing overburden groundwater contaminants on site, and the waterline installed along Blackberry Hill Road and Skokorat Road helps to ensure that most nearby residents are not exposed to contaminants that may remain in the groundwater. Additional information is needed to evaluate the long-term protectiveness of the remedy for residences that are not connected to the waterline or may be subjected to potential vapor intrusion.

Contaminated groundwater that migrates off site through bedrock fractures may pose potential threats to downgradient residents that have private water wells. Because of the change in land use adjacent to the Site, the vapor intrusion pathway should be evaluated. Institutional controls to prevent the use of contaminated groundwater in the vicinity of the Site have not yet been implemented. New developments abutting the Site could alter groundwater flow, especially if private supply wells are installed. Therefore, for the remedy to be protective in the long term, the effects of contaminated groundwater migrating off site should evaluated and appropriate measures that are protective of human health and the environment should be implemented, as appropriate.

The future protectiveness determination of the remedy cannot be made until further information is obtained. Additional information will need to be obtained to complete the protectiveness determination.

Other Comments: None.

1.0 INTRODUCTION

As requested by the Environmental Protection Agency (EPA), a five-year review was conducted of the remedial actions selected for the Beacon Heights Landfill, in Beacon Falls, Connecticut. The purpose of the five-year review is to determine whether the remedy being implemented at the Site remains protective of human health and the environment. The methods, findings, and conclusions of the five-year review are documented in this Five-Year Review Report. In addition, this report presents issues identified during the review and provides recommendations to address them.

This Five-Year Review Report was prepared pursuant to CERCLA §121 and the National Contingency Plan. 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 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 the 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 Agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR § 300.430 (f)(4)(ii) states:

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

This is the fourth five-year review for the Site. The triggering action for this statutory review is the completion of the last five-year review in 2003. The five-year review is required because contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

2.0 SITE CHRONOLOGY

Table 1
Chronology of Site Events
Beacon Heights Landfill Superfund Site
Beacon Falls, Connecticut

DATE	EVENT
9/8/83	Site added the National Priorities List.
4/85	Remedial Investigation report completed.
8/95	Feasibility Study completed.
9/23/85	EPA issued a Record of Decision (ROD) for the Site.
9/14/87	32 potentially responsible parties (PRPs), organized as the Beacon Heights Coalition (BHC), entered into a Consent Decree with the U. S. Government.
12/89	The public water supply line is completed.
9/28/90	EPA issued a supplemental ROD for the Site.
3/31/92	Remedial Design (RD) completed
12/92	First Five-Year Review completed.
3/93	Construction of the remedial action (i.e. landfill cap, leachate collection and transfer systems) initiated.
5/93	Sewer system rehabilitation work completed.
7/93	Discharge of leachate to Beacon Falls POTW commences.
7/24/98	Construction activities specified in the ROD are complete.
9/9/98	EPA issued the Second Five-Year Review Report.
6/00	Discovery and subsequent addition of the "Rabbit Area" seep to the sampling plan.
9/30/03	EPA issued Third Five-Year Review Report.
5/04	Groundwater sampling activities changed from triennial to semi-annual events and implementation of low-flow groundwater sampling methodology.
2/07	Discussions on institutional controls between EPA and BHC were initiated.
5/08	Fourth Five-Year Review for the Site initiated.
9/08	Fourth Five-Year Review completed.

3.0 BACKGROUND

The Beacon Heights Landfill Superfund Site (the Site) is located in Beacon Falls, Connecticut, approximately 10 miles south of Waterbury and 2 miles east of the intersection of Connecticut Routes 8 and 42. The actual landfill area covers approximately 34 acres of an original 82-acre property. A map depicting the location of the Site is presented in Figure 1 (Appendix A).

3.1 Physical Characteristics

The Beacon Heights Landfill sits atop a ridge southeast of the intersection of Skokorat and Blackberry Hill Roads. Chain-link fencing surrounds the perimeter of the capped landfill area. The landfill cap consists of a multi-barrier cover system with a vegetative grass cover as the top layer. A leachate collection system consisting of perforated pipe and drainage media surrounds the landfill cap. Areas outside the landfill cap, but within the perimeter of the fence, are generally vegetated with bushes and trees. Low-density residential areas border the Site to the north along Blackberry Hill Road, to the southwest on Kaleas Way and Morning Wood Drive, and further to the west along Skokorat Road. The closest residence is situated approximately 500 feet to the southwest of the capped landfill area on Kaleas Way.

The Site is located within the Hockanum Brook drainage area. Hockanum Brook, a tributary of the Naugatuck River, is located about 0.5 miles northwest of the Site. Bedrock outcrops appear in many areas around the Site. The bedrock surface is fractured and dips from the south/ southeast of the Site towards the north/northwest, parallel to surface water drainage. Groundwater in the region occurs in both the unconsolidated deposits and in the bedrock and generally flows to the north/northwest. A map depicting the Site features is presented in Figure 2 (Appendix A).

3.2 Land and Resource Use

From the 1920s until 1979 the Site was used as an active landfill. The Site is currently a closed landfill and will likely remain as such because of the need to protect the integrity of the landfill cap and because the Site is privately owned. Adjacent land uses include farming, forested areas, gravel excavation operations, and residential development. Hockanum Brook is presently classified as recreational use water (Class C/B) with a goal of becoming a potential drinking water source (Class B/A). The Naugatuck River, located west of the Site, is classified as restricted recreational use water with a goal of becoming recreational use water. Groundwater in the area continues to be used as a drinking water supply; however, many of the surrounding properties replaced their private water supplies with public water when the public water supply system was extended along Skokorat and Blackberry Hill Roads as part of the cleanup in 1989.

3.3 History of Contamination

From the 1920s until 1970 a small portion of what is now known as the Beacon Heights Landfill Superfund Site was known as "Betkoski's Dump" and consisted of approximately 6 acres of active dumping and open burning in the northwestern corner of the existing Site. The dump accepted a variety of waste including municipal refuse, rubber, plastics, and industrial chemical and sludges. During this period of operation, there were general complaints and concerns due to fumes, smoke and blowing litter. The Site was not regulated by the State until 1970.

In 1970, Beacon Heights, Incorporated (BHI) purchased the Site, which included the Betkoski Dump area. BHI and its owner, Harold Murtha, owned and operated the Site as Beacon Heights Landfill and expanded the landfill area to approximately 34 acres.

From 1970 until the its closure in July 1979, the Site was used for the disposal of various waste materials including: rubber, plastics, oils, hydrocarbons, chemical liquids and sludges, and solvents. In 1977 the Connecticut Department of Environmental Protection (CTDEP) approved the spreading of wastewater sludge from the Naugatuck municipal/industrial wastewater treatment facility over covered areas of the landfill. These activities continued until the summer of 1984.

3.4 Initial Response

On June 20, 1979 BHI signed a Consent Order to close the Site by July 1, 1979. This Consent Order was entered as a final order of the Connecticut Commissioner of Environmental Protection on July 24, 1979. The closure requirements of the Order, which included the placement of a final cover and implementation of a groundwater monitoring system, were never implemented. However, on December 4, 1979, the CTDEP inspected the Site and reported that landfill operations had ceased.

3.5 Basis for Taking Action

The Remedial Investigation (RI) concluded that leachate from the landfill was migrating off site and contaminating nearby residential drinking water wells and surface water bodies (i.e., the tributary of Hockanum Brook). The leachate was generated as a result of precipitation percolating through the landfill wastes and causing various chemical contaminants to be mobilized, which then migrated into the water table. On-site soils were also contaminated by

leachate; however, direct releases of waste materials to the ground surface also contributed as a major source of soil contamination.

Based on the results of sampling conducted as part of the RI, ingestion of groundwater represented the most significant risk to human health. Benzene, chlorobenzene, chloroethanes, bis(2-chloroethyl) ether, xylenes and other site-related hazardous compounds, were detected in groundwater at concentrations well above levels considered to be protective. Moreover, as long as precipitation was allowed to percolate through the landfill wastes and soils contaminated by that waste, the potential existed for further degradation of groundwater quality to levels that would endanger public health, if consumed.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

The objectives of the remedial action described in the 1985 ROD are to:

- Reduce the generation of contaminated leachate and thereby mitigate future groundwater and surface water contamination;
- Minimize off-site migration of contaminants via surface runoff;
- Minimize direct human contact with on-site contaminated soils; and
- Assure a safe drinking water supply for area residents.

These objectives would be achieved by source control actions supplemented by off-site actions. To meet these broad objectives, the landfill wastes would be isolated to minimize contact with groundwater and surface water, and to prevent human and animal exposure.

The initial recommendations in the ROD consisted of the following activities:

- Excavation of satellite areas of contamination for consolidation with the main landfill prior to closure.

- RCRA capping of the consolidated wastes, including gas venting and stormwater management controls.

- Installation of a perimeter leachate collection system.

- Extension of a public water supply line along Skokorat Road and Blackberry Hill Road to provide water service to current residences.

- Enclosure of the Site with security fencing.

- Installation of an extensive groundwater monitoring system.

- Collection of leachate generated by the landfill and transportation of it to a licensed wastewater treatment facility or an on-site treatment facility followed by discharge to a tributary of Hockanum Brook.

- Preparation of further studies and a supplemental ROD (sROD) to select the manner and location of leachate treatment (on-site or off-site), the extent of excavation of contaminated soils, and the need for air pollution controls on the landfill gas vents.

The ROD was completed in September 1990 that utilized information contained in a Pre-Design Study, prepared by the Potentially Responsible Parties (PRPs), to evaluate on-site and off-site treatment alternatives. The major components of the sROD included:

- Contaminated leachate from the Site would be transported and subsequently treated at the Naugatuck, Connecticut wastewater treatment facility (the Naugatuck facility).

- Contaminated soils, located outside the main landfill, would be excavated to chemical concentrations specified within the sROD and placed under the cap.

- Landfill cap gas vents would be constructed such that they could be augmented with air pollution mitigating devices in the event that future air monitoring should require such action. In addition, post-construction air quality monitoring would be conducted at the Site, specifically at, but not limited to, the location of each gas vent.

Certain components of the response action (i.e., the selection of leachate treatment facility), as constructed, varied from the selected remedial action described in the ROD and as amended in the sROD. An Explanation of Significant Differences (ESD) was prepared for the Site, describing the changes from the ROD and sROD and the reason these changes occurred. The ESD was completed in September 1998.

4.2 Remedy Implementation

In a Consent Decree (CD) signed with EPA on September 14, 1987, the Beacon Heights Coalition (BHC), consisting of the 32 PRPs, agreed to perform the remedial design/remedial action (RD/RA) specified in the 1985 ROD. However, because of the uncertainty associated with: (1) the method of leachate treatment; (2) the extent of excavation of contaminated soils; and (3) the need for air pollution controls on the landfill gas vents, the RD for the Site did not commence until after the sROD was completed in September 1990. Prior to this date, the PRPs extended the existing public water supply waterline along Skokorat and Blackberry Hill Roads so that by the end of 1989, a permanent safe drinking water supply was provided to most of the homes affected by the Site. Of the initial 57 offers to connect to the waterline, 49 residents accepted the offer in 1989. At the request of the regulatory agencies in 1994, the BHC extended a final offer, resulting in the total of 52 hookups (51 single connections and one multiple connection). The old private wells were decommissioned. In Spring 2000, the BHC sampled seven homes along Skokrat and Blackberry Hill Roads where the property owners had refused BHC's offer to connect to the waterline. These sampling results did not show water quality issues related to the Site. No sampling at these seven homes has been completed since 2000.

The Remedial Design (RD) was completed in January 1992, and conditionally approved by EPA on March 31, 1993. Construction of the Remedial Action (RA) began on the Site in March 1993.

The BHC reached an agreement with the Town of Beacon Falls to treat the leachate at the Town's Publicly Owned Treatment Works (POTW), rather than constructing a leachate transportation pipeline to the Naugatuck Wastewater Treatment Facility, as called for in the sROD. This agreement allowed the BHC to connect the transportation pipeline directly to the Beacon Falls sewer system. Leachate collection and conveyance systems construction was completed and discharge of leachate to the POTW began in July 1993. As part of the

agreement with Beacon Falls, the BHC contributed to an upgrade of the Beacon Falls treatment facility. This upgrade was completed and operational in June 1995.

The completion of the landfill cap was delayed by more than 24 months as the result of several construction problems including slope failure in a portion of the landfill which damaged abutting wetlands. However, all construction problems were subsequently addressed by the BHC and the landfill cap was determined to be substantially complete by December 1995. In 1996 and 1997, the BHC performed the following activities at the Site: (1) wetlands mitigation; (2) operation and maintenance; (3) groundwater, surface water, sediment and seep monitoring; and (4) repair and improvement of portions of the landfill cap and the leachate collection and conveyance systems. On July 24, 1998, EPA performed a final inspection of the Site and determined that the RA activities were completed according to the requirements of the ROD, sROD, and ESD.

The Site achieved construction completion status when the Preliminary Closeout Report was signed on September 9, 1998.

4.3 Operation and Maintenance

The BHC conducts long-term monitoring and routine maintenance activities in accordance with the Operation and Maintenance (O&M) plan that was approved by EPA on January 22, 1999. Long-term monitoring of groundwater, surface water, and seep is conducted in accordance with the Long-term Monitoring Plan (LTMP) that was approved by EPA on November 25, 1998, and the Revised Field Sampling Plan, approved by EPA in 2006. The primary activities associated with O&M and long-term monitoring include:

- Monthly inspections of the landfill cap, leachate collection and transportation systems, and other components of the remedy;
- Semi-annual groundwater sampling events; and
- Documentation of O&M and LTM activities on a semi-annual and annual basis.

Since the last five-year review, modifications to the long-term monitoring program were requested by the PRPs in 2004, which were subsequently approved by EPA:

- Groundwater sampling activities were reduced from triennial to semi-annual events;

- During the 2005 program, EPA approved the elimination of two surface water sample locations from the LTMP: "Orchard Pond" (SW-04) and "blob" (SW-05);
- On March 1, 2006, the EPA approved the revised Field Sampling Plan (FSP), which was revised to in order to include low-flow groundwater sampling procedures;
- In 2007, BHC changed the sampling frequency of monitoring wells MW-15 and TH-10 from annual sampling to semi-annual sampling; and
- During the second half of 2007, BHC adopted the CTDEP Reasonable Confidence Protocols (RCPs) to achieve Quality Assurance/Quality Controls (QA/QC) requirements during 2008.

5.0 PROGRESS SINCE LAST REVIEW

This is the fourth five-year review for the Site. The three previous Five-Year Review Reports were completed in December 1992, September 1998, and September 2003. All issues identified in the prior reviews have been addressed. Significant activities completed after the last five-year review included the following:

- Flow restrictions were observed in several manholes during 2006 that were caused by the buildup of precipitated iron and iron-fixing bacteria. The manholes were cleared by flushing the leachate lines. Sampling and testing were performed in October 2006 to ensure that the Town of Beacon Heights POTW was not affected by the line flushing.

- As a result, the leachate lines are now flushed every other month to clear the iron and biological buildup, which improves overall leachate collection system efficiency and reduces downtime.

- The landfill cap is mowed twice per year to facilitate easier site inspections.

- As recommended by the EPA during the third five-year review, BHC implemented low-flow groundwater sampling methodology began during the 2004 LTM program.

- The sinkhole near Berm #16, noted during the 2003 five-year review, was repaired.

- In February 2007, EPA requested that the BHC prepare draft institutional controls for the Site. A draft proposal was sent by the BHC to the EPA in April 2007. The issue of

institutional controls was discussed at a meeting between the EPA met with the BHC on October 9, 2007. The BHC indicated that they would perform research on the various types of institutional controls proposed by the EPA.

6.0 FIVE-YEAR REVIEW PROCESS

6.1 Administrative Components

EPA, the lead agency for this five-year review, notified CTDEP and the PRPs in early 2008 that the five-year review would be completed. The five-year review team was led by Ms. Leslie McVickar of EPA, Remedial Project Manager for the Beacon Heights Landfill Superfund Site, and included staff from Nobis Engineering, Inc., EPA's technical support contractor. Ms. Sheila Gleason, of the CTDEP, was also part of the review team.

From May 2008, the review team established the review schedule whose review components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection and Observations;
- Local Interviews; and
- Five-Year Review Report Development and Review.

The review was completed during September 2008.

6.2 Community Involvement

EPA notified the community in a July 19, 2008 public notice, published in a local newspaper, its review of the progress of the Beacon Heights Landfill Site.

6.3 Document Review

This Five-Year Review consisted of a review of relevant documents including decision documents, O&M records, and monitoring reports. The documents reviewed are listed in Appendix B.

6.4 Data Review

As part of the review, EPA evaluated the surface water, leachate seep, air, and groundwater data collected by the BHC to confirm that contaminants within the landfill are being contained by the cap and the leachate collection system. The documents reviewed are listed in Appendix B. A summary of the data review is provided below.

Groundwater Monitoring

Groundwater monitoring is performed to assess the effectiveness of the cap and leachate collection system in decreasing the generation of contaminated leachate and minimizing the offsite migration of contaminants. Groundwater elevations are gauged to evaluate whether the leachate generation has been reduced or eliminated, and whether the water table under the landfill cap has been lowered. Groundwater from the overburden and bedrock is sampled and analyzed semiannually to assess whether contaminant concentrations are increasing or decreasing. Analyses include: volatile organic compounds (VOCs) via EPA Method 8260, semi-volatile organic compounds (SVOCs) via EPA Method 8270, Total Priority Pollutant List of 13 Metals via EPA Method 200.7 and 7474 (mercury), total iron and manganese via EPA Method 6010, and Total Kjeldahl Nitrogen (TKN) via Method SM420A. The analytical data are evaluated by comparing the results to the federal Maximum Contaminant Levels (MCL), which are cited in the ROD, and the Groundwater Protection Criteria (GPC) established in the Connecticut Remediation Standard Regulations.

a) Leachate Level – Monitoring well TH-10 is gauged semi-annually to evaluate the leachate level in the landfill. The leachate level has decreased by more than 11 feet (since the well was first gauged in 1997). However, the leachate level decline appears to be stabilizing, which indicates that an estimated 26 feet of landfill wastes remain saturated and continue to contribute contaminants to groundwater.

b) Chemical Trends – As part of the five-year review, EPA evaluated groundwater data collected from 2004 through 2007 to evaluate the effectiveness of the remedy. While the data indicated only sporadic detections of VOCs and SVOCs, the 2007 sampling results indicated more wells and more contaminants were present at concentrations exceeding the federal MCLs and the Connecticut GPCs than observed during previous years. VOCs and SVOCs detected in overburden and bedrock wells situated downgradient of

the capped landfill indicate that the ROD cleanup goals are not yet attained and that contaminants are continuing to migrate from the landfill. The primary contaminants of concern continue to consist of benzene, chlorobenzene, bis(2-chloroethyl)ether [BCEE], bis(2-ethylhexyl)phthalate [BEHP], and to a lesser extent, antimony.

Data for overburden monitoring wells indicate that BEHP was detected once in MW-15 exceeding the CT GPC during 2004 through 2007. In 2007, BEHP was detected at 2.2 µg/L (higher than the CT GPC of 2 µg/L). For the bedrock monitoring wells, benzene, chlorobenzene, BCEE, and BEHP have been detected periodically. In 2007, the VOCs benzene and chlorobenzene were detected in the bedrock monitoring well MW-11, which has been the primary well of concern, at concentrations exceeding the MCLs and the CT GPC. In 2007, benzene was detected at a concentration of 6.1 µg/L (higher than the MCL of 5 µg/L and the CT GPC of 1 µg/L), and chlorobenzene was detected at 390 µg/L (higher than the MCL and CT GPC of 100 of µg/L). BEHP was detected in bedrock well MW-13 at 32 µg/L (higher than the MCL of 6 µg/L and the CT GPC of 2 µg/L).

A statistical analysis of the analytical data indicated that there were no discernable trends for the detected VOCs and SVOCs in individual wells, and an upward trend for iron in one well.

These results indicate that contaminated groundwater containing VOCs and SVOCs that exceed standards are migrating beyond the capped landfill perimeter in both the overburden and bedrock units.

c) Hydraulic Containment – Previously, the BHC completed several investigations to assess the infiltration of groundwater into the landfill and the discharge of groundwater into the leachate collection system and various seeps occurring on the landfill's surface. Investigation results indicated that precipitation infiltrated into the landfill through the overburden unit from the upgradient direction while groundwater migrated into landfill through high angle fractures. Contaminants mobilized by the infiltration migrated out beyond the landfill through the bedrock fractures during period of vertical hydraulic gradients. While pumping tests were performed to assess potential containment and capture of contaminated groundwater, it was concluded that pumping may not provide an appreciable reduction leachate generation.

As evidenced by the leachate level and chemical data for the downgradient monitoring wells, a significant portion of the landfill material remains saturated and contaminants are migrating beyond the landfill cap in both the overburden and bedrock units.

Surface Water Monitoring

Surface water monitoring is performed to evaluate potential contamination from seeps and runoff that are ultimately discharged to the Hockanum Brook, which is used for recreational purposes. From 2004, samples are collected from three surface water stations located in the northeastern portion of the Site. The VOCs, SVOCs, and metals results are compared with the Federal National Recommended Water Quality Criteria (NRWQC) and the Connecticut Water Quality Standards (WQS). No VOCs were detected in any of the surface water samples collected during sampling events from 2002 through 2007. During both the 2006 and 2007 samplings, BEHP was detected above the NRWQC in the upstream sample (SW-01). The detection of BEHP in the SW-01 samples indicates a potential upstream, off-site source may be affecting surface water quality entering the Site. The surface water monitoring does not indicate any problems associated with the capped landfill. However, as discussed below, no monitoring is occurring with respect to a wetland and a pond near the Site.

Leachate Seep Monitoring

During the implementation of remedial actions, several seeps were observed in proximity of the landfill and a seep monitoring program was established. The Rabbit Area Seep has been monitored periodically at the Site since its discovery in 2000. Other known seeps have been adequately characterized and are no longer sampled. The leachate seep analytical data are compared to applicable NRWQC and CT WQS criteria. One "Stream" sample is collected from below the effluent of the drainage pipe that extends beneath the road to determine whether the seep is affecting this surface water body.

Review of the seep data from 2004 through 2007 indicated that benzene, chlorbenzene, BEHP, antimony, copper, iron, and manganese have occasionally been detected at concentrations exceeding the NRWQC or the CT WQS at the Rabbit Seep, but were generally not detected at

the downstream "Stream" location. These results indicate that leachate seeps emanating from the Rabbit Seep are not significantly affecting the stream on the Site.

Based on a risk evaluation performed in June 2006, the EPA concluded that the Rabbit Area Seep does not pose a threat to the stream or downgradient groundwater, and because the Site is secured by a fence, the possibility for human exposure to leachate via the Rabbit Area Seep is limited.

Stormwater Monitoring

Stormwater runoff diverted from the landfill cap is sampled and analyzed for oil and grease, pH, chemical oxygen demand, total suspended solids, total phosphorus, TKN, nitrate as nitrogen, total copper, total zinc, total lead, and aquatic toxicity. Only TKN exceeded the permit standard, and is likely the result of vegetative decay and possible animal waste. The landfill does not appear to represent a threat to stormwater runoff quality.

Air Monitoring

The analytical data for landfill gas samples collected by the BHC in August 2008 are forthcoming. The data will be evaluated and compared with applicable air regulations. During the previous sampling, the reported releases of contaminates were very low, and applicable state and federal air regulations did not require any actions at this Site.

6.5 Site Inspection

During May 2005 and May 2006, formal inspections of the landfill and the landfill components were conducted. A site-specific checklist was used to document the observations made during those inspections. During 2007 and 2008, additional observations were made of the landfill and its components including the leachate collection system in conjunction with oversight of groundwater sampling activities. A summary of the observations made between 2005 and 2008 is provided below. A Site Inspection Checklist is included as Appendix C.

- **Landfill Surface -** The landfill cover was firm and stable on the days of the site inspections with no apparent signs of cracks, erosion, or settlement. A small area of stressed vegetation was observed on the northeast slope. It was recommended the

area be monitored and reseeded if erosion occurred. During the 2006 inspection an area on the north face of the landfill surface was observed to have been taken over by brambles. It was recommended that the area be monitored to ensure that cap soils in the area remain stabilized. In May 2007, a settlement feature was noted near the area referred to as "K-2". The settlement was repaired in August 2007 by grading, filling with topsoil, compacting, and seeding the area.

- **Benches (berms)** – The length of each slope bench was inspected during the site inspections. The benches were in good condition with no signs of sedimentation, breaching, or bypass. Areas where erosion had been observed during the Spring 2004 site inspection (intersection of Berm #11 with the North Downchute and the northern end of Berm #16) were repaired and appeared stable. During the 2006 inspection, erosion was observed at the northern end of Bench #13 where storm water enters the riprap lined perimeter drainage ditch. Riprap had been placed in the bottom of the bench at this area to repair past erosion.

- **Letdown Channels (downchutes)** – The riprap lined downchute channels on the north and east sides of the landfill were inspected for settlement, material degradation, erosion, undercutting, obstructions or vegetative growth. The East and North Downchutes appeared to be in good condition at the time of the 2006 inspection. The repair area in the lower portion of the North Downchute was in good condition with no apparent indications of settlement. Some minor sedimentation was observed at the bottom of the North Downchute.

- **Cover penetrations** - Cover penetrations through the landfill cover system include 12 leachate collection system manholes and 17 passive gas vent structures. The aboveground portions of the manholes appear to be vertical or nearly vertical and in good condition with no obvious signs of damage. The gas vents all appeared to be vertical or nearly vertical at the time of the inspection. Wire mesh bird screens were secured to the openings of all of the gas vents during the 2005 inspection. Missing bird screens noted during the Spring 2004 site inspection have apparently been replaced. During the 2006 inspection, the wire mesh bird screen was observed to be missing from gas vent #7.

- **Cover drainage layer –** During both the 2005 and 2006 inspections, the riprap outlet of the drainage layer at the perimeter of the cover system appeared to be in good condition with no obvious damage and no displacement of the riprap. There was no evidence of erosion or flow bypassing in the riprap drainage ditch from the high wall slope.

- **Retaining wall –** The retaining wall at the north end of the landfill appeared to be in good condition at the time of the inspection. During the 2005 inspection, water was observed trickling from the weep hole in the retaining wall at a rate of less than one gallon per minute. During the 2006 inspection, water was observed flowing from the weep hole in the retaining wall at a rate of less than 5 gallons per minute.

  During May 2007, surficial cracks were noted in the retaining wall at the top of the Florida Area. The retaining wall was evaluated by a structural engineer, and it was deemed that the cracks were minor and not due to failure modes. The cracks were filled with hydraulic cement in June 2007, and since that time no additional cracks have been observed.

- **Leachate collection system -** The above ground portions of the system appeared to be in good overall condition.

- **Seeps –** On the day of the 2005 Site inspection, water was flowing from the Rabbit Area Seep on the northeast side of the landfill. The flow from the Rabbit Seep appeared darker in color and slightly larger than it had during previous inspections. During the 2006 inspection, observations of this area were consistent with conditions observed in 2005. The dark coloring likely consisted of dissolved manganese that had precipitated when exposed to ambient air.

- **Perimeter ditches and off-site discharge -** The perimeter ditches were in good condition, with no significant sedimentation or vegetation. During both the 2005 and 2006 inspections, possible flow bypass conditions were observed under the 24-inch concrete drainage culvert just north of the Rabbit Area seep. Water appeared to be flowing underneath the concrete culvert pipe from the rip rap perimeter ditch and then re-entering the culvert pipe at the first joint between the concrete pipe sections. Although

there was no evidence of erosion of the culvert, potential erosion may occur during significant rainfall events.

- **Fencing and roads -** The fence that surrounds the landfill cap and the gravel roads were generally in good condition during the site inspections.

Recommendations for corrective actions based on the site inspections included the following:

- Continuing the existing O&M programs;
- Continue monitoring for cap settlement;
- Continue monitoring of the Rabbit Area leachate seep and document changes in the seep characteristics;
- Continue the monitoring of the leachate collection system components to ensure proper operation;
- Monitoring the vegetative cover for areas of brambles and stressed vegetation, and reseeding as needed to stabilize erosion; and
- Monitoring the 24-inch concrete culvert for erosion.

6.6 Interviews

As part of the preparation of this Five-Year Review Report, interviews were conducted with local town officials and persons knowledgeable about the Site. Refer to Appendix C for an Interview List of the individuals contacted.

Mr. Russ Dirienzo, a Senior Associate of LFR, the BHC's operation and maintenance contractor, was interviewed on July 2, 2008, to identify any current issues at the Site. Mr. Dirienzo indicated that the Site is in excellent condition and is being maintained in accordance with the O&M Plan. However, Mr. Dirienzo indicated that the remedy is not functioning as expected in the ROD because it is assumed that leachate levels will decrease to zero over a 20 year period, but this hasn't been the trend, and is likely due to springs that exist under the landfill cap.

Mr. Dirienzo identified several changes to O&M activities at the Site including the following:

- The leachate system lines are flushed every other month, which is not required in the O&M Plan. This practice was implemented because of biological build-up in the system lines and more frequent cleaning result in less downtime;
- The sampling methodology for groundwater was changed to low-flow sampling; and
- The landfill is mowed twice per year instead of once to facilitate easier site inspections.

According to Mr. Dirienzo, in the last 5 years the most significant change is the planned construction of residential subdivisions that will abut the Site to the North, East, and West. The new homes will be serviced by the public water supply.

Ms. Sheila Gleason, Remedial Project Manager at the CTDEP, was interviewed on July 9, 2008, regarding the Site. Ms. Gleason indicated that her involvement with the Site is limited, but to the best of her knowledge, the Site is in good condition and functioning as planned. Ms. Gleason is aware of the development next to the Site.

On July 10, 2008, Ms. Susan Ann Cable, First Selectman of the Town of Beacon Falls, was interviewed regarding the Site. According to Ms. Cable, the Site is in good condition, and the town is pleased that development is occurring in the area. Ms. Cable was not aware of any issues or problems with the Site.

7.0 TECHNICAL ASSESMENT

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

No. Although review of documents, evaluation of compiled data, and the inspection results indicate that the remedy is generally functioning as intended in the ROD, there are certain exceptions. The various components of the landfill cover system and leachate collection system are working as designed. The cap and the leachate collection system have reduced the release or migration of contaminants to other environmental media, and have prevented direct contact with or ingestion of contaminants in soil. However, contaminated groundwater continues to migrate beyond the capped landfill and leachate collection system and effective institutional

controls (e.g., deed restrictions) have not been implemented. These issues and the performance of the rest of the remedy are reviewed below.

The multi-layer cap has achieved the objective for reducing leachate generation by minimizing precipitation infiltration. The cap and leachate collection system together have helped to lower the liquid level within the capped area, resulting in less leachate generation. Capping has also achieved the objectives to minimize surface runoff and potential direct contact threats. The leachate collection system appears to be functioning as designed by intercepting overburden groundwater migrating from the landfill. However, because of recharge through the bedrock (i.e., groundwater enters the landfill wastes from below) contaminants continue to be leached from the landfill wastes. This contaminated groundwater may migrate out of the landfill through the overburden unit and through bedrock fractures underlying the Site.

Review of the available data indicates that the hydrogeological setting of the landfill precludes eliminating leachate generation in the long term. Upgradient groundwater enters the Site along the landfill's eastern perimeter through the overburden and through the bedrock fractures underlying the landfill when the vertical gradient is upwards. Contaminants are leached periodically from the landfill waste materials and migrate off site through the bedrock fractures under downward vertical gradients conditions. Contaminated groundwater may also be migrating out of the overburden, but VOCs were not detected in monitoring wells situated downgradient of the landfill. Although the water table has been lowered approximately 11 feet, an estimated 26 feet of saturated thickness remains. Past hydrogeologic studies have indicated that extracting (pumping) groundwater from the shallow and deep bedrock has limited effect on leachate capture. While the remedy components were constructed as designed, the local hydrogeology limits their effectiveness to lower the water table below the waste materials.

A waterline was installed and a safe drinking water supply was provided to local area residents during the Remedial Action (1989 and 1994). Additional residences have since been constructed and some of these residences may not be connected to a public water supply. In addition it appears that several previously constructed residences are still using groundwater based on their refusal to connect to public water at the time the water lines were constructed.

The BHC has been performing environmental monitoring and routine site inspections as required by the remedy. The results of these activities have been submitted to and reviewed by

EPA and its technical consultant. Review of the records and site observations indicate that the cap and leachate collection system have been well maintained and required repairs are made in a timely manner. Issues identified during the routine site inspections have been corrected or are continuing to be monitored.

There were no opportunities for system optimization observed during this review. The landfill cap and leachate collection system continue to function as designed. However, because of the increase in detected contaminant concentrations in downgradient monitoring wells, EPA will continue to evaluate the groundwater data to determine whether there is a need to implement additional remedial measures.

The maintenance program should be continued as designed, including monitoring the leachate seeps and surrounding leachate collection system components to ensure proper leachate system operation and to document and changes in the seep characteristics.

Current institutional controls include ownership of the land to the west of the landfill to provide a buffer zone, the public supply of water to nearby residents, and the fencing of the Site to prevent unauthorized access. Institutional controls to restrict groundwater use (e.g., deed restrictions) for the area affected by Site contamination have not yet been implemented. Given that contaminated groundwater is migrating beyond the capped landfill perimeter in both the overburden and bedrock units, and given that some residents are not connected to public water, restricting groundwater use is an important follow-up issue. Aside from this issue and the continued saturation of the landfill waste, the remedy is generally functioning as intended.

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

No, the exposure assumptions and toxicity data used at the time of the remedy selection are no longer valid. Toxicity values, exposure assumptions, exposure pathways to be considered, and methods of evaluating risk have all been updated since the time of the remedy selection. Potential dermal contact with groundwater used as a household water source, inhalation of VOCs during household water use, and the vapor intrusion pathway have not previously been evaluated. The 1990 ROD established soil clean-up goals protective of the aquifer based on the MCLs. The MCLs listed in the 1990 ROD for establishing soil clean-up goals protective of

the aquifer continue to be valid, with the exception of the MCLG for toluene. The RAOs used at the time of the remedy selection are still valid. Toluene has only been detected infrequently in groundwater samples, but at concentrations well below the MCL during this review period.

Changes in Standards or TBCs

The 1985 ROD, page 21, identifies the following laws, regulations and guidance as applicable to the remedy. Changes in standards since the 1985 ROD do not appear to change the protectiveness of the remedy, except potentially with respect to nearby residents with private wells (e.g., residents who have declined to connect to public water).

- Resource Conservation and Recovery Act (RCRA) Part 264. The landfill cap and all subsequent repairs and modifications to the cap were designed in accordance with applicable RCRA requirements. EPA approved the cap on September 9, 1998, and the BHC continues to perform O&M as necessary. Groundwater monitoring is performed in accordance with the RCRA Groundwater Protection Standard specified in 40 CFR 264.97.

- Clean Water Act. Leachate from the landfill is transported to Town of Beacon Falls Publicly Owned Treatment Works (POTW) where it is commingled with other wastes, then treated in accordance with regulatory criteria.

- Clean Air Act. Landfill gas emissions at the Site continue to be well below concentrations that would trigger requirements under the federal Clean Air Act.

- Safe Drinking Water Act; EPA Groundwater Protection Strategy. New applicable or relevant and appropriate requirements (ARARs) promulgated since the 1985 ROD and 1990 ROD include Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs). The 1985 ROD specified groundwater clean-up levels based on MCLs, background, or alternate concentration levels. The MCLs listed in the 1990 ROD for establishing soil clean-up goals (based on leaching calculations) protective of the aquifer continue to be valid, with the exception of the MCLG for toluene, which has been reduced from 2,000 µg/L to 1,000 µg/L. Because current concentrations of toluene in groundwater at the Site are below the current MCL, indicating that toluene

is not leaching from soils into groundwater at unacceptable concentrations, the protectiveness of the remedy is not affected by the changes in MCL values. At the time of the 1990 ROD, there was no MCL for BEHP; therefore, a soil clean-up value was developed based on a 3 microgram per liter (µg/L) groundwater value, which was considered to represent a cancer risk level of 10^{-6}. Currently, the MCL for BEHP of 6 µg/L is available. This also does not affect protectiveness because the ROD standard for BEHP is lower than the current MCL. Additionally neither of the new MCLs would affect the protectiveness of the remedy with respect to most nearby residences, which rely on public water.

Newly Promulgated Standards

- Connecticut Remediation Standard Regulations (RSRs) (Section 22a-133k-1 through 22a-133k-3 of the Regulations of Connecticut State Agencies). The RSRs were promulgated in 1996 and contain numeric and narrative standards for soil and groundwater remediation, and take into consideration factors that include land use, groundwater classification, and proximity to sensitive receptors. The Groundwater Protection Criteria (GPC) of the RSRs identifies the numeric chemical concentrations to be attained for groundwater plume remediation in GA and GB aquifers. Bedrock groundwater is sampled, analyzed, and evaluated against the RSR GPC under the Site's long-term monitoring program.

- Groundwater plumes that discharge to a surface water body must attain the numerical limits established under the Surface Water Protection Criteria (SWPC). Because groundwater discharges to the Wetland Mitigation Area and Orchard Pond in the vicinity of the landfill, it is possible some groundwater contaminants are migrating into this surface water body. Evaluation of groundwater with respect to the SWPC should be performed. If groundwater concentrations exceed the SWPC in the vicinity of the groundwater discharge, then Orchard Pond should be sampled to assess potential impacts from the groundwater discharge.

- Groundwater containing VOCs within 15 feet of the ground surface or an occupied industrial or residential structure will need to comply with the RSRs' Volatilization Criteria

(VC). If contaminated overburden groundwater is determined to be migrating off site and may be affecting downgradient residences, then these regulations will be applicable.

- Proposed Revisions (2003) to the Connecticut RSRs Volatilization Criteria. The Proposed Revisions modify the applicability of the groundwater VC from 15 to 30 feet. Based on new toxicity data and new exposure assumptions, numerical limits for many groundwater VOCs were lowered and new limits were proposed for VOCs that were not addressed in the 1996 RSRs. If downgradient potential residential properties are affected by contaminated overburden groundwater, then the proposed VC revisions will need to be assessed.

Changes in Exposure Pathways

The exposure pathways considered in the public health and environmental analysis performed during the 1985 RI/FS included: (1) ingestion of groundwater; (2) direct contact with leachate; (3) inhalation of the contaminants from the soil, groundwater, surface water, and leachate by workers, and (4) consumption of fish. With the completion of the landfill cap, leachate collection system, and security fence, each of these pathways except the ingestion of groundwater pathway, is no longer applicable. Potential dermal contact with groundwater used as a household water source and inhalation of VOCs during household water use have not previously been evaluated. Despite the expansion of the public water supply in 1989, the potential ingestion of contaminated groundwater remains a concern and dermal contact and inhalation of VOCs from groundwater used as a household water source present additional concerns because of the lack of institutional controls prohibiting groundwater use as drinking water at neighboring properties and the refusal of some neighboring property owners to hook up to the public water supply system.

The vapor intrusion pathway was not evaluated in the original public health and environmental assessment.

Because more residences have been built and more will be built adjacent to the landfill, it is unknown whether they may be at risk from VOCs associated with offsite migration of contaminated groundwater. Current and past analytical data indicate the presence of VOCs in

bedrock groundwater along the northwestern portion of the landfill perimeter. It is unknown whether the bedrock groundwater could discharge to the overburden unit.

Changes in Toxicity and Other Contaminant Characteristics

Since the time of the original public health and environmental assessment performed as part of the RI/FS, EPA has re-examined and updated toxicity factors for each of the indicator contaminants evaluated. In addition, since the 1985 ROD and the 1990 sROD, toxicity factors used in developing MCLs, MCLGs, and risk-based groundwater concentrations, which were the basis for the soil clean-up goals, have been updated for several of the contaminants. Changes in these toxicity factors do not affect the remedy's protectiveness, except potentially with respect to residents who have private wells (e.g., residents who have declined to hook up to public water). For everyone else, the reliance on public water and the prevention of direct contact with soil minimizes the impacts of updated toxicity factors.

Changes in Risk Assessment Methods

Since the public health and environmental analysis performed during the 1985 RI/FS and the 1985 ROD, changes have occurred in the formulas used to calculate risks from exposures to soil and groundwater (including the additional pathways of dermal contact and inhalation discussed above) and the methods for evaluating the vapor intrusion pathway. However, changes in risk assessment methods do not affect the remedy, except potentially with respect to residents who have private wells. For everyone else, the reliance on public water and the prevention of direct contact with soil minimizes the impacts of updated risk assessment methods.

New Contaminants and/or Contaminant Sources

No new contaminants or contaminant sources have been identified since startup of the remedy. The contaminants detected at highest concentrations in groundwater samples are those identified in the ROD as contaminants of concern. No new contaminants of concern have been identified. No toxic byproducts of the remedy were identified during the review.

Expected Progress Towards Meeting RAOs

The remedy is making progress toward achieving RAOs. The landfill cap and leachate collection system have reduced the release of contaminants from the landfill to groundwater, surface water, sediments, soils, and air. Capping and fencing are preventing potential direct human contact with contaminated soils in the source area. The provision of the public water distribution system to nearby homes along Blackberry Hill Road and Skokorat Road has eliminated exposures to groundwater as the primary drinking water source at the majority of homes in the area identified during the time of the 1985 ROD.

While progress has been made, several significant issues remain unresolved. Groundwater concentrations exceeding drinking water standards at bedrock monitoring wells MW-11 and MW-13 indicate that contaminants are bypassing the perimeter leachate collection system and continuing to be present downgradient from the Site. Institutional controls in the form of deed restrictions prohibiting groundwater use as drinking water at neighboring properties are not in place, and some neighboring property owners have not connected to the public water supply system. Public exposures to contaminants in groundwater may still be occurring. The vapor intrusion pathway has not been evaluated previously. Because residential development is occurring, more homes are being constructed closer to the landfill. It is unknown whether these residences may be subject to vapor intrusion issues.

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

Yes. Construction of a 17-unit development to the northeast of the Site is ongoing, and a development of 55 residential units on parcels that abut the Site to the south has been proposed (Figure 3, Appendix A). These new homes have the potential to affect the protectiveness of the remedy. If supply wells are installed in the new development, contaminated groundwater could be drawn to these residential units and pose potential health risks through ingestion, dermal contact, or inhalation of contaminants or vapor intrusion threats resulting from volatilization of VOCs in inhabited structures. Since the 1985 ROD and the 1990 sROD, more residential structures have been built along Blackberry Hill Road and Skokorat Road. While many residential units are connected to a public water supply, information obtained from the Aquarion Water Company indicates that there are homes in the vicinity of the Site that are not customers. The closest home is approximately 400 feet southwest of the capped landfill perimeter.

Continued development of parcels that abut the Site has the potential to affect the local groundwater flow regime. Potential effects of local development include: installation of private water supply wells that may be affected by contaminated bedrock groundwater and could alter groundwater flow; an increase in the amount of water discharged to the subsurface through septic discharge if there is no sewerage; the elimination of trees and other vegetated areas allow for more complete infiltration of precipitation (eliminating uptake); and the re-grading of these parcels, which has the potential to alter the physical behavior as well as the geochemistry of the flow systems. The PRPs have been in discussion with the developer to consider connections to the waterline. Continued groundwater monitoring at the Site as well as the continued evaluation of activities surrounding the Site will be required. Other steps to address issues raised by recent and future construction near the Site are discussed below.

7.4 Technical Assessment Summary

Based on the data reviewed, the site inspection, and interviews, the remedy is generally functioning as intended by the ROD, except that landfill waste remains largely saturated and effective institutional controls have not been implemented. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. While there have been changes to the ARARs cited in the ROD, updates in toxicity factors and chemical characteristics, and updated risk assessment methods, the remedy is still effective with respect to most potentially impacted individuals, because capping and provision of the waterline prevent potential exposure to contaminated landfill materials and ingestion of groundwater contaminants by the majority of nearby residents (i.e., those on public water).

Most of the contaminated overburden groundwater migrating from the landfill is being captured by the perimeter leachate collection system. However, contaminated groundwater is still migrating downwards into the fractured bedrock and downgradient beyond the influence of leachate collection system. More residential developments have been constructed since the extension of the water line and it is uncertain whether all new constructions near the Site are connected to the water line. Nearby residents with private water supply wells may be exposed to contaminated bedrock groundwater. With new developments occurring on two parcels abutting the Site, alteration in groundwater flow may be possible. The vapor intrusion pathway had not been evaluated previously. Because of the proximity of newer and future residential constructions, this pathway should be evaluated. Contaminated bedrock groundwater may also

be discharging to an adjacent surface water body. Institutional controls to prohibit the use of bedrock groundwater in the vicinity of the Site have not been implemented.

8.0 ISSUES

Based on the activities conducted during this five-year review, the issues identified in Table 2 have been noted.

Table 2
Issues
Beacon Heights Landfill Superfund Site
Beacon Falls, Connecticut

Issues	Affects Current Protectiveness	Affects Future Protectiveness
Proposed construction of residential development on parcels that abut the Site. Potential use of contaminated groundwater if private wells are installed.	No	Deferred[1]
Offsite migration of contaminated bedrock groundwater may affect existing residences that are not connected to a public water supply.	No	Deferred[1]
Potential vapor intrusion pathway concerns at new and existing residences.	No	Deferred[1]
Contaminated groundwater may be discharging to Wetland Mitigation Area and Orchard Pond.	No	Deferred[1]
Institutional controls to prevent use of bedrock groundwater in the vicinity of the Site have not been enacted.	No	Deferred[1]
Several private residences had previously declined to be connected to the public water supply.	No	Deferred[1]

Note: 1. Assessment of the future protectiveness is deferred because there is insufficient information to complete this evaluation. Once additional information is acquired, the determination of protectiveness will be made.

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, it is recommended that the actions listed in Table 3 be taken:

Table 3
Recommendations and Follow-up Actions
Beacon Heights Landfill Superfund Site
Beacon Falls, Connecticut

Issue	Recommendation and Follow-up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Proposed residential developments	Initiate or continue dialog with the developers to ensure that the water line is installed and that supply wells are not installed in the new developments. Periodically monitor development status.	PRP (BHC)	EPA & CTDEP	18 months	No	Deferred[1]
Existing residences not connected to public water	Conduct an inventory to identify private well users in the vicinity of the Site. Determine whether private wells not connected to a public water supply could be affected by Site groundwater contaminants and address, as appropriate.	PRP (BHC)	EPA & CTDEP	6 months	No	Deferred[1]
Potential vapor intrusion concerns	Evaluate whether there is the potential for vapor intrusion exposures for parcels that adjoin the Site. Implement mitigation measures, as appropriate.	PRP (BHC)	EPA & CTDEP	18 months	No	Deferred[1]
Groundwater discharge to Wetlands and Pond	Continue groundwater monitoring and evaluate results against the CT RSR SWPC.	PRP (BHC)	EPA & CTDEP	18 months	No	Deferred[1]
Institutional controls not implemented	Identify properties that may be at risk and implement institutional.	PRP (BHC)	EPA & CTDEP	18 months	No	Deferred[1]
Several private residences that previously declined to be connected to public water supply	Assess whether these residences would like to be connected to the public water supply.	PRP (BPC)	EPA & CTDEP	6 months	No	Deferred[1]

Note: 1. Assessment of the future protectiveness is deferred because there is insufficient information to complete this evaluation. Once additional information is acquired, the determination of protectiveness will be made.

10.0 PROTECTIVENESS STATEMENT(S)

The remedy at the Beacon Heights Landfill Superfund Site currently (in the short term) protects human health and the environment because the cap and leachate collection system are containing overburden groundwater contaminants on site, and the waterline installed along Blackberry Hill Road and Skokorat Road helps to ensure that most nearby residents are not exposed to contaminants that may remain in the groundwater. Additional information is needed to evaluate the long-term protectiveness of the remedy for residences that are not connected to the waterline or may be subjected to potential vapor intrusion.

Contaminated groundwater that migrates off site through bedrock fractures may pose potential threats to downgradient residents that have private water wells. Because of the change in land use adjacent to the Site, the vapor intrusion pathway should be evaluated. Effective institutional controls to prevent the use of contaminated groundwater in the vicinity of the Site have not yet been implemented. New developments abutting the Site could alter groundwater flow, especially if private supply wells are installed. Therefore, for the remedy to be protective in the long term, the effects of contaminated groundwater migrating off site should evaluated and appropriate measures that are protective of human health and the environment should be implemented, as appropriate. The future protectiveness determination of the remedy cannot be made until further information is obtained. Additional information will be obtained by the following actions:

- Continuing discussions with the developer and ensuring that nearby residential developments will be connected to a public water supply, and that use restrictions are evaluated and implemented, as necessary.

- Conducting an inventory of private well users and determining whether they may be affected by contaminated Site groundwater.

- Evaluating whether properties near the Site may be at risk from vapor intrusion.

- Identifying properties that may require institutional controls and implementing the controls.

- Evaluating whether contaminated groundwater migrating off site may pose potential threats to surface water quality in the wetland.

- Assessing whether residences who previously declined connection to the public water supply would like to be connected.

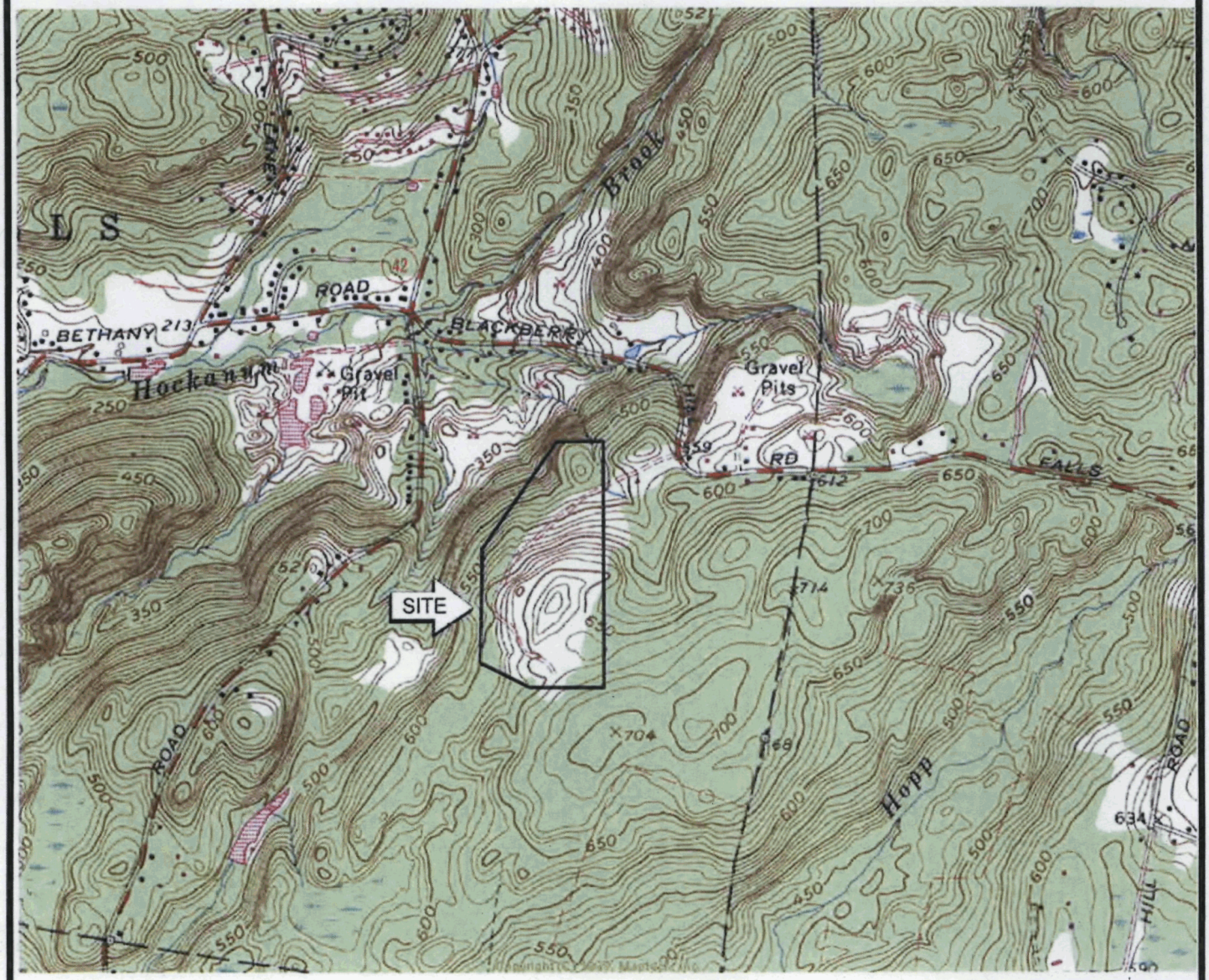
11.0 NEXT REVIEW

The next five-year review will be conducted by September 2013.

APPENDIX A

FIGURES

DWG. NAME: LOCUS



NORTH

USGS TOPOGRAPHIC MAP

NAUGATUCK

1984

APPROXIMATE SCALE
1 INCH = 1,500 FEET

Nobis Engineering, Inc.
439 South Union Street
Building 2, Suite 207
Lawrence, MA 01843-2800
Tel (978) 683-0891
Fax (978) 683-0956
www.nobisengineering.com

QUADRANGLE LOCATION

FIGURE 1

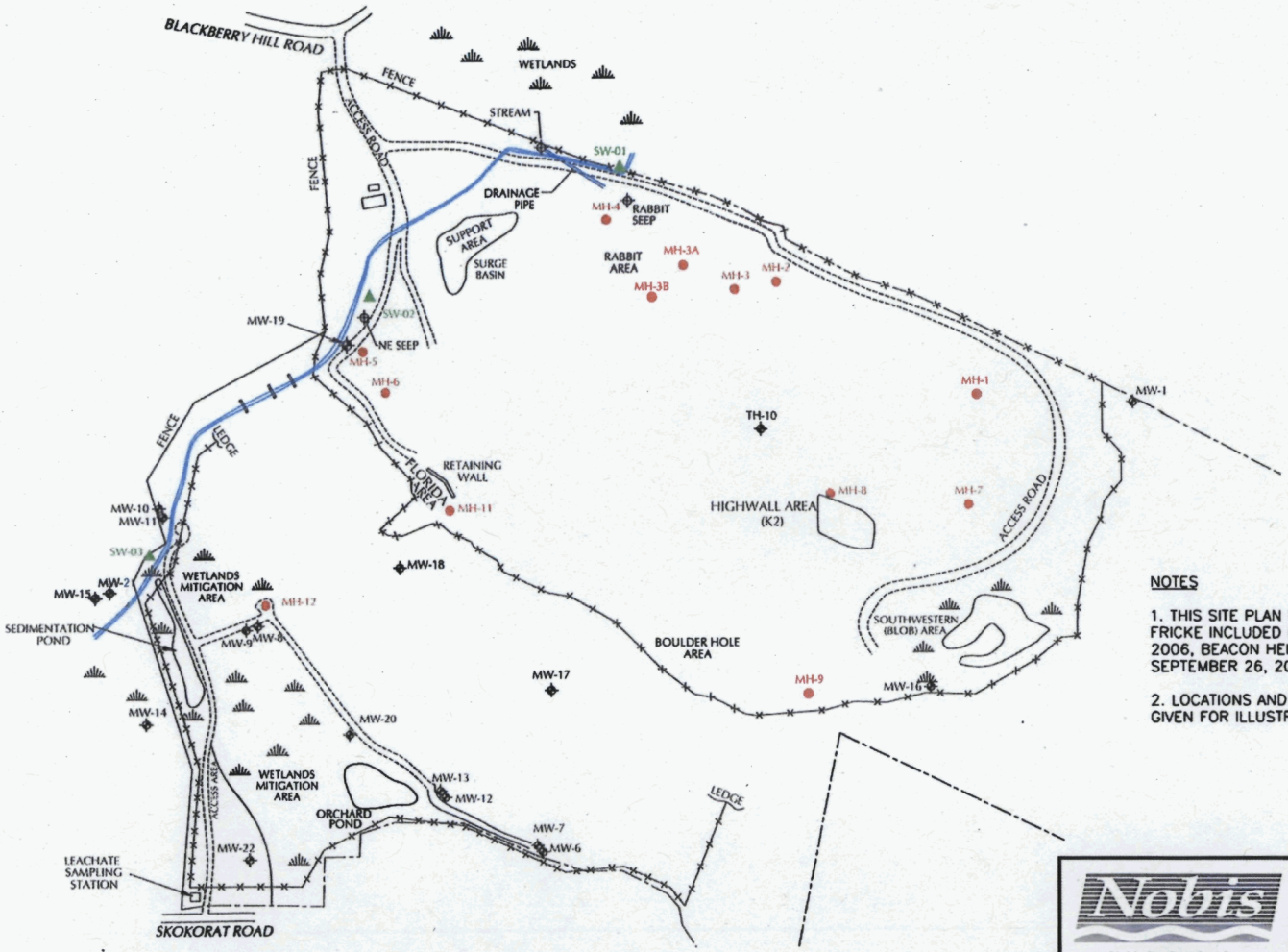
LOCUS PLAN

BEACON HEIGHTS LANDFILL
BLACKBERRY ROAD
BEACON FALLS, CONNECTICUT

PROJECT 80008.01

MAY 2007

DWG. NAME: SITE PLAN



LEGEND:

- MONITORING WELL LOCATION
- MANHOLE LOCATION
- SURFACE-WATER MONITORING LOCATION
- SEEP MONITORING LOCATION

NOTES

1. THIS SITE PLAN WAS DEVELOPED FROM A SITE PLAN PREPARED BY LEVINE FRICKE INCLUDED IN THE SEMI ANNUAL O&M PROGRESS ROPORT, FIRST HALF 2006, BEACON HEIGHTS LANDFILL SITE, BEACON FALLS, CONNECTICUT DATED SEPTEMBER 26, 2006.

2. LOCATIONS AND SITE FEATURES DEPICTED HEREON ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES ONLY.

APPROXIMATE SCALE

0' 175' 250' 500'

Nobis

Nobis Engineering, Inc.
439 South Union Street
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Lawrence, MA 01843-2800
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Fax (978) 683-0966
www.nobisengineering.com

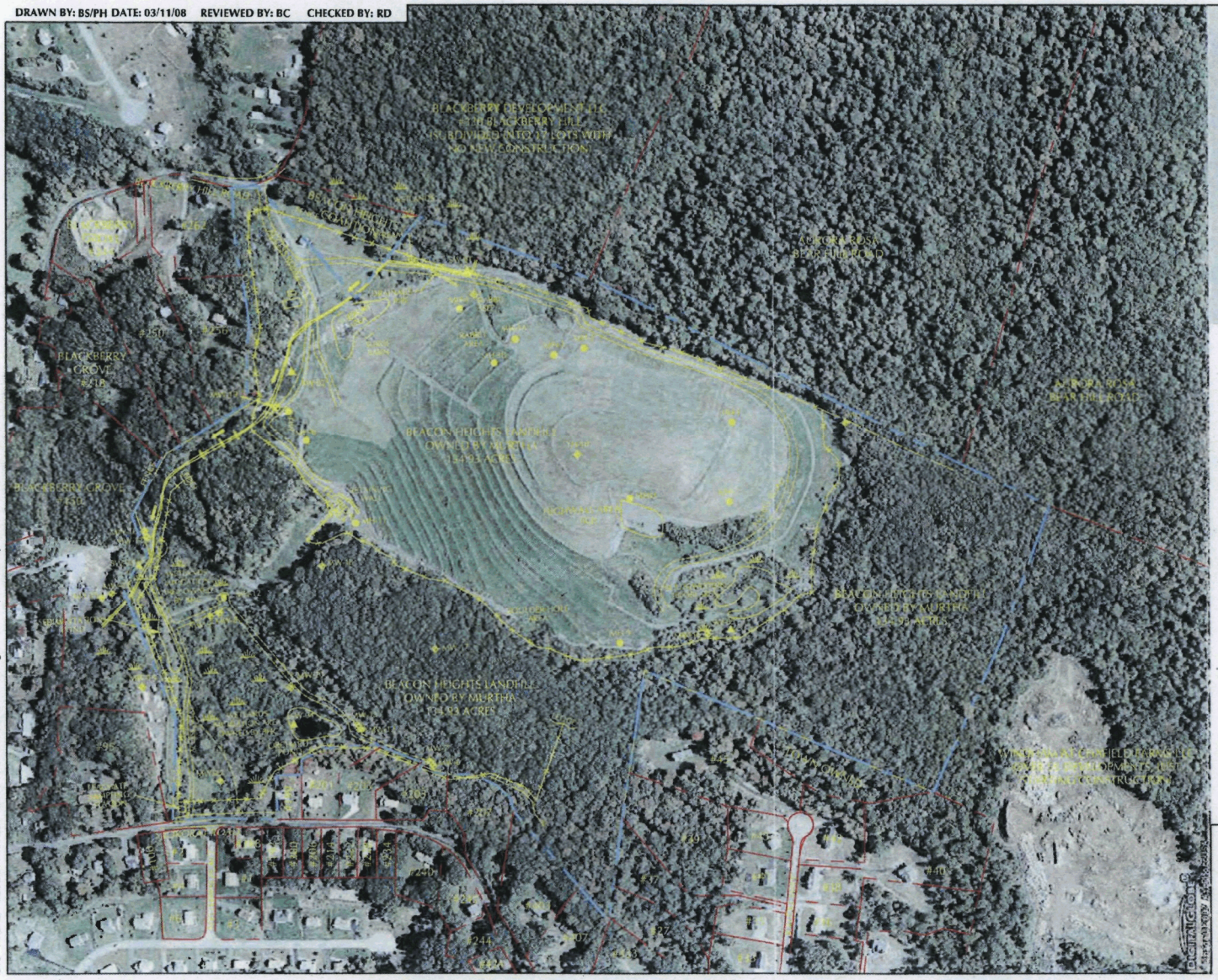
FIGURE 2

SITE PLAN

BEACON HEIGHTS LANDFILL
BLACKBERRY HILL ROAD
BEACON FALLS, CONNECTICUT

PROJECT 80008.01 | MAY 2007

DRAWN BY: BS/PH DATE: 03/11/08 REVIEWED BY: BC CHECKED BY: RD



EXPLANATION:

- MONITORING WELL LOCATION
- MANHOLE LOCATION
- SURFACE-WATER MONITORING LOCATION
- SEEP MONITORING LOCATION
- STREAM FLOW DIRECTION

NOTES:

1. ALL LOCATIONS, AND PROPERTY LINES DEPICTED ON THIS PLAN ARE APPROXIMATE. THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION OR LAND CONVEYANCE PURPOSES.

2. AERIAL PHOTO IMAGE DATED OCTOBER 1, 2006, SUPPLIED BY GLOBEXPLORER AERIAL IMAGING.

N

300' 0 300'

Scale: 1" = 300'

Site Plan With Monitoring Wells, Surface Water & Seep Locations

Beacon Heights Landfill
Beacon Falls, Connecticut

LFR

Figure 3

015 H:\CAD Files\024 Files\024-12001-00\024-12001-08-003.dwg Mar 12,2008-3:45pm

APPENDIX B

DOCUMENT REVIEW LIST/REFERENCES

DOCUMENTS REVIEWED/REFERENCES CITED

EPA, 1985. EPA Superfund *Record of Decision.* Beacon Heights Landfill, EPA ID: CTD072122062, OU 01, Beacon Falls, CT. Environmental Protection Agency. September 23, 1985.

EPA, 1990. EPA Superfund *Record of Decision.* Beacon Heights Landfill, EPA ID: CTD072122062, OU 02, Beacon Falls, CT. Environmental Protection Agency. September 28, 1990.

EPA, 1998. EPA Superfund *Explanation of Significant Differences:* Beacon Heights Landfill, EPA ID: CTD072122062, OU 01, Beacon Falls, CT. Environmental Protection Agency. September 9, 1998.

EPA, 2001. *Comprehensive Five-Year Review Guidance.* Environmental Protection Agency. June 2001.

EPA, 2002. *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils.* Environmental Protection Agency. November 2002.

EPA, 2003. *Five Year Review Report.* Environmental Protection Agency. September 19, 2003.

GeoSyntec, 1995. *Work Plan No. 40. Evaluation of Ground-water Flow, Beacon Heights NPL Site, Beacon Falls, Connecticut.* GeoSyntec Consultants, December 26, 1995.

GeoSyntec, 1996. *Status Report on Work Plan No. 40 – Step 2 Activities.* Beacon Heights NPL Site, Beacon Falls, Connecticut. GeoSyntec Consultants, July 1, 1996.

GeoSyntec, 1996. *Status Report No. 2 on Work Plan No. 40 – Step 2 Activities.* Beacon Heights NPL Site, Beacon Falls, Connecticut. GeoSyntec Consultants, August 2, 1996.

GeoSyntec, 1996. *Ground Water, Surface Water, Sediment, and Seep Monitoring Plan.* GeoSyntec Consultants, September 6, 1996.

GeoSyntec, 1997. *Work Plan No. 40 – Evaluation of Ground-water Flow* (report). Beacon Heights NPL Site, Beacon Falls, Connecticut. GeoSyntec Consultants, February 11, 1997.

LFR, 2006. *Field Sampling Plan.* Levine Fricke, February 2006.

LFR, 2006. *2005 Annual Monitoring Report.* Levine Fricke, June 12, 2006.

LFR, 2006. *Semi-Annual O&M Progress Report - First Half 2006.* Levine Fricke, September 26, 2006.

LFR, 2007. *Semi-Annual O&M Progress Report - Second Half 2006.* Levine Fricke, March 27, 2007.

LFR, 2007. *2006 Annual Monitoring Report.* Levine Fricke, June 14, 2007.

LFR, 2007. *Semi-Annual O&M Progress Report – First Half 2007.* Levine Fricke, September 25, 2007.

LFR, 2008. *Semi-Annual O&M Progress Report – Second Half 2007.* Levine Fricke, March 31, 2008.

LFR, 2008. *2007 Annual Monitoring Report.* Levine Fricke, June 13, 2008.

TRC, 2005. *Semi-Annual Inspection Report, Spring 2005.* TRC, July 11, 2005.

TRC, 2006. *Annual Inspection Report, Spring 2006.* TRC, June 9, 2006.

APPENDIX C

SITE INSPECTION CHECKLIST AND INTERVIEWS

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Beacon Heights Landfill Superfund Site	**Date of inspection:** N/A
Location and Region: Beacon Falls, CT – Region 1	**EPA ID:** CTD072122062
Agency, office, or company leading the five-year review: EPA	**Weather/temperature:** N/A

Remedy Includes: (Check all that apply)

- ☑ Landfill cover/containment
- ☑ Access controls
- ☑ Institutional controls
- ☑ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☑ Groundwater containment
- ☐ Vertical barrier walls
- ☐ Other_____

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Russ Dirienzo, P.G., LEP Senior Associate 7/2/2008

Name Title Date

Interviewed ☐ at site ☐ at office ☑ by phone Phone no. (203) 364-9700

Problems, suggestions; ☐ Report attached Mr. Dirienzo reported that the remedy is not functioning as intended because leachate levels from the landfill have not decreased as they were expected to.

2. **O&M staff** _____ _____
_____

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____

Problems, suggestions; ☐ Report attached

_____

_____
___

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency CTDEP

Contact Sheila Gleason Remedial Project Manager 7/9/2008 860-424-3767

Name Title Date Phone no.

Problems; suggestions; ☐ Report attached A residential housing development is being constructed on a property adjacent to the Site.

Agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Problems; suggestions; ☐Report attached _____

Agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Problems; suggestions; ☐Report attached _____

Agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

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_____			
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_____			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks_____			
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_____			

5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
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			

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

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State

☐ PRP in-house ☑ Contractor for PRP

☐ Federal Facility in-house ☐ Contractor for Federal Facility

☐

Other_____

___

_____

_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place

Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons:
	V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A
	A. Fencing
1.	**Fencing damaged** ☐ Location shown on site map ☑ Gates secured ☐ N/A Remarks:
	B. Other Access Restrictions
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks: Warning signs are posted on all gates and manhole covers.

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

Institutional controls outlined in the Record of Decision (ROD) have not yet been implemented at _____ the Site. _____

_____

2.	**Adequacy**	☐ ICs are adequate ☐ ICs are inadequate ☑ N/A
	Remarks	
D. General		
1.	**Vandalism/trespassing**	☐ Location shown on site map ☑ No vandalism evident
	Remarks	
2.	**Land use changes on site**	☑ N/A
	Remarks	
3.	**Land use changes off site**	☐ N/A
	Remarks Construction of a residential development is underway on a property adjacent to the Site.	
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 A settlement near the K-2 area was repaired in August 2007.

_____

_____

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 Erosion of Benches #11 and #16 were observed in the Spring of 2004, and has subsequently been repaired.

_

_____

_____

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_____		
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 Minor sedimentation was observed at the bottom of the North Downchute.		
	_		
	_____		
	_____		

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_____
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_____
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks_____
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks_____
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_____

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_____ _____ _____ _____

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_____ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐Equipment properly identified ☐ Quantity of groundwater treated annually_____ ☐ Quantity of surface water treated annually_____ Remarks_____
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks_____

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_____
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 Remarks Contaminated groundwater is still migrating downwards into the fractured bedrock and downgradient beyond the influence of leachate collection system.

D. Monitored Natural Attenuation

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.).

The remedy is designed to prevent of minimize further release of contaminants in groundwater, surface water, sediments, soil and air. The landfill cover system, leachate collection system, and groundwater extraction system are all in good condition and functioning as designed, therefore accomplished the goal of the remedy.

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. No 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. None. –

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None. –

INTERVIEW RECORD

Site Name: Beacon Heights Landfill Superfund Site	**EPA ID No.:**CTD07122062	
Subject: Fourth Five-Year Review (2008)	**Time:** 1530	**Date:** 7/2/2008
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Liyang Chu and Danielle Gray	**Title:** Senior Project Manager and Staff Scientist	**Organization:** Nobis Eng., Inc.

Individual Contacted:

Name: Russ Dirienzo, P.G., LEP	**Title:** Senior Associate	**Organization:** LFR

Telephone No: (203) 364-9700 **Fax No:** (203) 364-9800 **E-Mail Address:** russ.dirienzo@lfr.com	**Street Address:** 75 Glen Road, Suite 305 **City, State, Zip:** Sandy Hook, CT 06482

Summary Of Conversation

Q1: What is your overall impression of the project and site?
A1: The site is in excellent condition and is being maintained in accordance with the O&M Plan. The site is operating as designed.

Q2: Are you aware of any issues the five-year review should focus on?
A2: Institutional controls need to be put in place because a subdivision is under construction on the abutting property.

Q3: Whom should Nobis Engineering, Inc. speak to in the community to solicit local input?
A3: Susan Cable, Selectman for the Town of Beacon Falls.

Q4: Is the remedy functioning as expected?
A4: No. The ROD expects leachate levels to drop to zero in 20 years, and this isn't happening. Springs exist under the landfill cap.

Q5: Has there been any significant changes in the O&M activities or a chance to optimize the O&M?
A5: The leachate system is flushed every other month, which is not required in the O&M Plan. This measure was implemented due to biological build-up in the system. The sampling methodology for groundwater was changed to low-flow sampling. The landfill is being mowed twice per year.

Q6: Is the Town actively involved in the site?
A6: Yes. Correspondence occurs between LFR and Beacon Falls Wastewater Treatment Plant (BFWTP) before the leachate system is flushed. The BFWTP was upgraded by the Beacon Heights Coalition (BHC). The town's

Conservation Commission wants access to the site for bird watching. The Site provides a large fly over habitat for birds. Turkeys, coyote, and deer are seen on and around the landfill.

Q7: Do you feel that information related to the site is readily available?
A7: Site reports are available at the local library.

Q8: Have there been any changes in the site or surrounding property in the last 5 years, or are changes planned?
A8: A subdivision with 17 lots is proposed that will abut the Site to the North, East, and West.

Q9: Are you aware of any changes in the state ARARs, groundwater quality standards, etc., since 2003?
A9: Volatilization criteria are currently being amended.

Q10: Are you aware of any pending or future water needs or any change in water usage in the area?
A10: Public water supply services the residents all around the site. Some residents (7 homes) have refused to be connected to the public water supply. All homes downgradient of the site are connected to the public water supply. The BHC has suggested that LFR verify the status of downgradient houses that might not be hooked up to the public water supply.

INTERVIEW RECORD

Site Name: Beacon Heights Landfill Superfund Site		**EPA ID No.:** CTD07122062
Subject: Fourth Five-Year Review (2008)	**Time:** 1530	**Date:** 7/9/2008
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**		☐ Incoming ☒ Outgoing

Contact Made By:

Name: Danielle Gray	**Title:** Staff Scientist	**Organization:** Nobis Eng., Inc.

Individual Contacted:

Name: Sheila Gleason	**Title:** Remedial Project Manager	**Organization:** Connecticut Department of Environmental Protection

Telephone No: 860-424-3767 **Fax No:** Unknown **E-Mail Address:** sheila.gleason@ct.gov	**Street Address:** 79 Elm Street **City, State, Zip:** Hartford, CT 06106

Summary Of Conversation

Q1: What is your overall impression of the project and site?
A1: Ms. Gleason receives copies of the Annual Monitoring Reports for the Site. She has very little involvement with the Site.

Q2: Are you aware of any issues the five-year review should focus on?
A2: Other than issues identified by the EPA, no.

Q3: Whom should Nobis Engineering, Inc. speak to in the community to solicit local input?
A3: Ms. Gleason does not know anyone in the community that should be contacted.

Q4: Is the remedy functioning as expected?
A4: Based on her review of the Annual Monitoring reports, yes.

Q5: Has there been any significant changes in the O&M activities or a chance to optimize the O&M?
A5: Ms. Gleason does not have enough involvement with the site to know.

Q6: Is the Town actively involved in the site?
A6: As far as she knows, no.

Q7: Do you feel that information related to the site is readily available?
A7: Yes. Ms. Gleason receives calls from local residents about the site a few times per year.

Q8: Have there been any changes in the site or surrounding property in the last 5 years, or are changes planned?
A8: A subdivision is being constructed next to the site.

Q9: Are you aware of any changes in the state ARARs, groundwater quality standards, etc., since 2003?
A9: Not that Ms. Gleason is aware of.

Q10: Are you aware of any pending or future water needs or any change in water usage in the area?
A10: No. The subdivision will be on the public water supply.

INTERVIEW RECORD

Site Name: Beacon Heights Landfill Superfund Site	**EPA ID No.:** CTD07122062	
Subject: Fourth Five-Year Review (2008)	**Time:** 1045	**Date:** 7/10/2008
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Danielle Gray	**Title:** Staff Scientist	**Organization:** Nobis Eng., Inc.

Individual Contacted:

Name: Susan Ann Cable	**Title:** First Selectman	**Organization:** Town of Beacon Falls

Telephone No: 203-729-4340 **Fax No:** Unknown **E-Mail Address:** Unknown	**Street Address:** Town Hall, 10 Maple Avenue **City, State, Zip:** Beacon Falls, CT 06403

Summary Of Conversation

Q1: What is your overall impression of the project and site?
A1: The clean up is going very well. The Site looks good and development is happening around the Site.

Q2: Are you aware of any issues the five-year review should focus on?
A2: No.

Q3: Whom should Nobis Engineering, Inc. speak to in the community to solicit local input?
A3: The Inlands Wetland Commission.

Q4: Is the remedy functioning as expected?
A4: Yes. The amount of leachate from the Site being transported to the Beacon Falls Wastewater Treatment Plant was expected to decrease, but the amount of leachate has remained relatively consistent.

Q5: Has there been any significant changes in the O&M activities or a chance to optimize the O&M?
A5: No.

Q6: Is the Town actively involved in the site?
A6: No.

Q7: Do you feel that information related to the site is readily available?
A7: Yes. Reports are kept at the Town Hall and available to anyone who would like to see them.

Q8: Have there been any changes in the site or surrounding property in the last 5 years, or are changes planned?
A8: Construction of the subdivision is underway. Construction is complete on some houses in the area, and they are occupied.

Q9: Are you aware of any changes in the state ARARs, groundwater quality standards, etc., since 2003?
A9: No.

Q10: Are you aware of any pending or future water needs or any change in water usage in the area?
A10: All developments around the Site will be connected to the public water supply.

INTERVIEW RECORD

Site Name: Beacon Heights Landfill Superfund Site	**EPA ID No.:** CTD07122062
Subject: Fourth Five-Year Review (2008)	**Time:** 2:00 PM / **Date:** 8/5/2008
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☒ Outgoing

Contact Made By:

Name: Cynthia Woods	**Title:** Senior Risk Assessor	**Organization:** Avatar Environmental, LLC.

Individual Contacted:

Name: unnamed	**Title:** untitled	**Organization:** Naugatuck Valley Health Dept.

Telephone No: 203-881-3255 **Fax No:** 203-881-3259 **E-Mail Address:** Unknown	**Street Address: 98 Bank Street** **City, State, Zip: Seymour, CT 06483**

Summary Of Conversation

Q1: What is your overall impression of the project and site?
A1:

Q2: Are you aware of any issues the five-year review should focus on?
A2:

Q3: Whom should Nobis Engineering, Inc. speak to in the community to solicit local input?
A3:

Q4: Is the remedy functioning as expected?
A4:

Q5: Has there been any significant changes in the O&M activities or a chance to optimize the O&M?
A5:

Q6: Is the Town actively involved in the site?
A6:

Q7: Do you feel that information related to the site is readily available?
A7:

Q8: Have there been any changes in the site or surrounding property in the last 5 years, or are changes planned?
A8:

Q9: Are you aware of any changes in the state ARARs, groundwater quality standards, etc., since 2003?
A9:

Q10: Are you aware of any pending or future water needs or any change in water usage in the area?
A10:
Naugatuck Valley Health Department serves multiple towns, including Beacon Falls, CT. Drillers are required to obtain permits for drilling wells in the area. Naugatuck Valley took over the health department in 1980 and therefore, only has records back to that date. They are able to look up specific addresses to determine if a permit has been obtained for a well at that location since 1980. To do so, fax them a list of specific properties at 203-881-3259 and they will check.