Superfund Records Center
SITE: Auburn Road
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OTHER: 522040

Five-Year Review Report

Fifth Five-Year Review Report

For

Auburn Road Landfill Superfund Site

Town of Londonderry

Rockingham County, New Hampshire

September, 2012

PREPARED BY:

United States Environmental Protection Agency
Region I - New England
Boston, Massachusetts

Approved by: Date:

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List of Acronyms

AROD	*Amended Record of Decision*
ARPPG	Auburn Road Performing Parties Group
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
cm/sec	centimeter per second
EPA	United States Environmental Protection Agency
ESD	*Explanation of Significant Difference*
ft	feet/foot
GMZ	Groundwater Management Zone
ICLs	interim clean up levels
LTEMP	Long-Term Environmental Monitoring Program
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
NHDES	New Hampshire Department of Environmental Services
NPL	National Priorities List
O&M	Operation and Maintenance
OU	operable unit
ppb	parts per billion
PCBs	polychlorinated biphenyls
PRP	Potentially Responsible Party
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
ROD	*Record of Decision*
SEA	SEA Consultants, Inc.
Site	Auburn Road Landfill Superfund Site in Londonderry, Rockingham County, New Hampshire
SME	Sevee and Maher Engineering
SVOCs	semivolatile organic compounds
VOCs	volatile organic compound
WasteLAN	The most current version of CERCLIS, the database that houses all Superfund site information. Also referred to as "CERCLIS 3."
WESTON®	Weston Solutions, Inc.

Executive Summary

The remedy for the Auburn Road Landfill Superfund Site in Londonderry, New Hampshire (Site) included installing a public water supply line, capping of three waste disposal areas, establishing institutional controls, and performing natural attenuation on the remaining contaminated groundwater. The Site achieved construction completion with signing of the Preliminary Close-Out Report on 3 April 1998. The trigger for this statutorily mandated Five-Year Review was signature of the Fourth Five-Year Review report on September 28, 2007.

The remedy implemented at the Auburn Road Landfill Superfund Site currently protects human health and the environment in the short-term because: (a) installation of a municipal water supply currently provides drinking water to residences in the affected area, and (b) implementation of institutional controls through establishment of a Groundwater Management Zone currently provides notice on groundwater use restrictions at and near the Site.

However, the 1989 *ROD* remedy predicted a cleanup time for arsenic of 5 years after capping in 1996. The 5-year period has lapsed, yet arsenic concentrations have not attained the interim cleanup level of 10 ppb. Therefore, in order for the remedy to be protective in the long-term, the following actions need to be taken: (a) schedule a meeting between the Agencies, ARPPPG, and the USGS to discuss the required follow-up actions necessary to expedite the time to reach groundwater cleanup levels, and further investigate groundwater interactions with nearby surface waters/sediments, (b) expand the institutional control (GMZ) boundary north of Auburn Road, and (c) gather additional VOC data from the Site in order to reassess potential vapor intrusion pathway, and achievement of ICLs.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Auburn Road Landfill Superfund Site		
EPA ID: NHD980524086		
Region: 1	**State:** NH	**City/County:** Town of Londonderry/Rockingham County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.		
Author(s) name (Federal or State Project Manager): Byron Mah, Remedial Project Manager, and Michael Jasinski; NH/RI Superfund Section Chief		
Author(s) affiliation: U.S. Environmental Protection Agency		
Review period: 01/20/2012 – 09/30/2012		
Date of site inspection: 07/30/2012		
Type of review: Statutory		
Review number: 5		
Triggering action date: September 28, 2007		
Due date *(five years after triggering action date)*: September 28, 2012		

Five-Year Review Summary Form (continued)

The table below is for the purpose of the summary form and associated data entry and does not replace the two tables required in Section VIII and IX by the FYR guidance. Instead, data entry in this section should match information in Section VII and IX of the FYR report.

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU1 - Waterline

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 2 and 3	Issue Category: Remedy Performance			
	Issue: Timeframe to reach Site-wide ICLs is expected to be considerably longer that originally projected, and groundwater interactions with nearby surface waters/sediments need further investigation.			
	Recommendation: Schedule a meeting between the Agencies, ARPPPG, and the USGS to discuss the required follow-up actions necessary to expedite the time to reach groundwater cleanup levels, and further investigate groundwater interactions with nearby surface waters/sediments .			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRPs	EPA/NHDES	2nd Quarter FY'2013
OU(s): 2	Issue Category: Institutional Controls			
	Issue: Arsenic exceeds 10 ppb MCL/ICL beyond the current GMZ boundary in a shallow piezometer.			
	Recommendation: Expand the institutional control (GMZ) boundary north of Auburn Road.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	ARPPG	NHDES	October 29, 2012

OU(s): 2	Issue Category: Monitoring			
	Issue: Limited groundwater data and new toxicity values for several VOCs identified at the Site requires reassessment.			
	Recommendation: Gather additional VOC data from the Site in order to reassess potential vapor intrusion pathway, and achievement of ICLs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	ARPPG	EPA/NHDES	1st Quarter FY'2014

Five-Year Review Summary Form (continued)

Protectiveness Statement(s)
Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

Sitewide Protectiveness Statement (if applicable)	
For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.	
Protectiveness Determination: Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy implemented at the Auburn Road Landfill Superfund Site currently protects human health and the environment in the short-term because: (a) installation of a municipal water supply currently provides drinking water to residences in the affected area, and (b) implementation of institutional controls through establishment of a Groundwater Management Zone currently provides notice on groundwater use restrictions at and near the Site. However, the 1989 *ROD* remedy predicted a cleanup time for arsenic of 5 years after capping in 1996. The 5-year period has lapsed, yet arsenic concentrations have not attained the interim cleanup level of 10 ppb. Therefore, in order for the remedy to be protective in the long-term, the following actions need to be taken: (a) schedule a meeting between the Agencies, ARPPPG, and the USGS to discuss the required follow-up actions necessary to expedite the time to reach groundwater cleanup levels, and further investigate groundwater interactions with nearby surface waters/sediments, (b) expand the institutional control (GMZ) boundary north of Auburn Road, and (c) gather additional VOC data from the Site in order to reassess potential vapor intrusion pathway, and achievement of ICLs.	

Five-Year Review Report

I. Introduction

The purpose of a Five-Year Review is to determine whether a remedy at a Superfund site is protective of human health and the environment. The methods, findings, and conclusions of a review are documented in a Five-Year Review report. In addition, Five-Year Review reports identify deficiencies, if any, and recommend action(s) necessary to address them.

This review is required by statute. The United States Environmental Protection Agency (EPA) must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c) as amended states:

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

The Agency interpreted this requirement further in the NCP; 40 Code of Federal Regulation §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.*

EPA Region I conducted this Five-Year Review of the remedial actions implemented at the Auburn Road Landfill Superfund Site in Londonderry, Rockingham County, New Hampshire (Site). This review was conducted from January 2012 through September 2012. Weston Solutions, Inc. (WESTON®), under contract as consultants to the Auburn Road Performing Parties Group (ARPPG), has provided technical input and summary analysis of the data evaluated for this Five-Year Review report.

This is the fifth Five-Year Review report for the Site. The triggering action for this statutory review was signature of the Fourth Five-Year Review report on September 28, 2007. This Five-Year Review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. Specifically, following implementation and construction of the landfill caps, wastes remain on-site and groundwater is currently contaminated. Figure 1 illustrates the location of the Site. Figure 2 is a detailed Site plan illustrating pertinent features including monitoring well locations, surface water bodies, and the current, 2008 Groundwater Management Zone (GMZ) boundary.

II. Site Chronology

Table 1 below summarizes the chronology of the events at the Site.

Table 1

Auburn Road Landfill
Londonderry, New Hampshire
Chronology of Site Events

Date	Event
Up to 1965	Sand and gravel operation.
1965 – 1980	Operated as a municipal solid waste landfill accepting all wastes. Disposal activities ceased and the landfill shutdown in 1980.
8 September 1983	Site listed on National Priorities List, ranking 383 out of 416 sites nationally.
1985 – 1986	*Remedial Investigation* found buried drums containing hazardous material.
Spring 1986	The United States Environmental Protection Agency (EPA) excavated and removed approximately 1,900 drums from the Auburn Road Landfill Superfund Site in Londonderry, Rockingham County, New Hampshire (Site).
17 September 1986	EPA signed *Record of Decision* (*ROD*) for construction of a public water supply line.
18 February 1987	EPA issued an Administrative Order to the Town of Londonderry to install a municipal water supply line to residents potentially affected by site contamination.
November 1987	Town of Londonderry constructed a public water supply line. Potentially affected residents along portions of Auburn Road (including Whispering Pines Pond Mobile Home Park), Longwood Avenue, and Shady Lane served by public water line.
1988	EPA removed 316 additional drums from the Site.
29 September 1989	Following additional investigations, EPA issued a second *ROD* requiring construction of a cap over the on-site wastes as well as the design and construction of a pump and treat groundwater remedy.
31 August 1990	EPA issued an Administrative Order to a group of Potentially Responsible Parties (PRPs) to perform the remedies selected in the 29 September 1989 *ROD*.
30 September 1992	EPA issued first Five-Year Review. EPA found the installation of a public water supply line to residents near the Site (along portions of Auburn Road (including Whispering Pines Pond Mobile Home Park), Longwood Avenue, and Shady Lane) to be protective of human health and the environment (EPA, 1992).
24 July 1996	EPA signed a *Remedial Action Completion Report*. The Town of Londonderry completed the landfill cap construction and drainage improvements.
19 December 1996	EPA signed an *Amended ROD* (*AROD*). Based on investigations over the previous 5 years and then-current site conditions, the *AROD* chose not to implement the pump and treat groundwater remedy and instead, to utilize an alternative remedy of natural attenuation (MNA) of the arsenic contamination.
29 September 1997	EPA issued second Five-Year Review. EPA found the water line and the landfill cap construction at the Site to be protective of human health and the environment (EPA, 1997).

Table 1 Auburn Road Landfill Londonderry, New Hampshire Chronology of Site Events (Continued)	
22 November 1999	EPA signed a Consent Decree with PRP groups for monitoring groundwater, surface water, and sediments. The agreement also bound the PRPs to performing a groundwater remedial action, if necessary.
February 2000	First annual report submitted for the Long-Term Environmental Monitoring Program (LTEMP). Subsequently, reports have been submitted annually from 2000 to 2012 [Sevee and Maher Engineering (SME), 2000; Weston Solutions, Inc. (WESTON®), 2001 through 2012a).
24 March 2000	*Natural Attenuation Remedy Project Operations Plan* for the LTEMP completed (WESTON, 2000).
24 September 2002	EPA issued third Five-Year Review. EPA found the water line and the capping of the disposal areas to be protective of human health and the environment. EPA determined that the MNA groundwater remedy for arsenic was protective of human health and the environment in the short-term. EPA believed that for the groundwater remedy to be protective in long-term, it would be necessary to increase hydraulic and contaminant monitoring in groundwater and surface water and to increase maintenance of drainage structures near the landfills (EPA, 2002).
29 September 2006	*Field Sampling Plan* and *Quality Assurance Project Plan* completed to address additional tasks associated with the Fall 2006 LTEMP sampling, including installation of two additional well couplets at downgradient locations of the proposed Groundwater Management Zone (GMZ) boundary (WESTON, 2006a, b).
December 2006	Install replacement wells MW-207A, MW-207B, MW-210A, and MW-210B to replace MW-205 and evaluate downgradient extent of plume.
2 March 2007	Draft updated Site Conceptual Model submitted with LTEMP 2006 Annual Report (WESTON, 2007).
15 May 2007	Groundwater Management Zone Permit Application submitted to the New Hampshire Department of Environmental Services (NHDES).
August 2007	Revised GMZ Permit Application submitted to NHDES per comments received on 24 July 2007.
28 September 2007	EPA issued fourth Five-Year Review. EPA found that the remedy associated with the water supply line was protective of human health. EPA found the capping of the disposal areas to be protective of human health and the environment. EPA determined that the groundwater remedy, natural attenuation of arsenic, was protective of human health and the environment in the short-term. EPA believed that for the groundwater remedy to be protective in the long-term and to achieve the new Maximum Contaminant Level (MCL) for arsenic of 10 parts per billion, the monitoring program (amongst other issues) needed to be modified to better assess water levels and geochemical conditions in the aquifer, and previous modeling efforts needed to be updated to determine a more accurate estimate of cleanup times.
October 30, 2007	NHDES issues GMZ Permit No. GWP-198803007-L-001 to Auburn Road Performing Parties Group (ARPPG)

Table 1 Auburn Road Landfill Londonderry, New Hampshire Chronology of Site Events (Continued)	
2007	Town repairs fencing and continues maintenance of landfill caps, fencing, and drainage swales.
November 26, 2007	GMZ Permit revision (1) issued by NHDES.
30 May 2008	Follow up on University of Connecticut arsenic study of Cohas Brook sediments to obtain current observations and results.
June 2008	Install replacement wells MW-211B, MW-212A, and MW-212B per findings/recommendations of fourth Five-Year Review.
July 10, 2008	GMZ Permit revision (2) issued by NHDES
31 December 2008	Volatile organic compound screening pathway letter report submitted to EPA.
8 January 2009	An arsenic modeling report was submitted by the ARPPG to evaluate surface water/groundwater interactions in the vicinity of Whispering Pines Pond, and to evaluate the MNA remedy and alternative groundwater response actions to achieve and maintain performance standards. The ARPPG concluded that the majority of dissolved arsenic detected at the Site is derived from the reductive dissolution of naturally occurring arsenic that is present in Site soils and that MNA is working at the Site. The model also updated the predicted cleanup times for arsenic at the Site estimating that it will take in excess of 50 years for the overburden wells and under 45 years for bedrock wells to decline below the cleanup goals at the downgradient property boundary.
April 2009	Install well MW-213 to refine extent of arsenic contamination on downgradient property occupied by the Whispering Pines Mobile Home Village.
4 August 2009	EPA issued an *Explanation of Significant Difference (ESD)* to document changes to the arsenic and 1,2-dichloroethylene cleanup levels at the Site.
2011-2012	EPA Region I and NHDES request assistance from the U.S. Geological Survey (New Hampshire-Vermont Water Science Center) in the "Characterization of the Hydrogeologic Framework and Arsenic Mobility" at the Site.
September 2012	EPA issues this fifth Five-Year Review

III. Background

The Site is located in the Town of Londonderry, Rockingham County, New Hampshire. The Site consists of approximately 180-acres of property owned by the Town of Londonderry; the western most portion of the Site consists of property occupied by the Whispering Pines Mobile Home Village. The Site is bordered by Auburn Road and residences to the west, Old Derry Road and residences to the south, an unnamed stream and wetland areas to the east, and Whispering Pines Pond and the mobile home park to the north/northeast (see Figures 1 and 2).

Geology

The Site is underlain by unconsolidated overburden deposits overlying the bedrock. The overburden material primarily consists of thick, glacial outwash deposits that overlie a discontinuous basal till unit. The outwash deposits are predominantly well-graded sand and gravel that range in thickness from 0 feet (ft) in the southern portion of the Site (i.e., south of the landfills); and generally thicken as you trend northward across the Site where they are approximately 75 ft thick in the vicinity of Whispering Pines Pond. The discontinuous till has been observed up to 20 ft thick in some areas of the Site and consists of poorly sorted sand, gravel, silt, and clay.

Locally, bedrock underlying the Site consists of an un-named member of the Berwick Formation that is similar in composition but contains more calc-silicate (up to 15%) than the remainder of the formation (Lyons et al., 1997). A thin band of the late Devonian two-mica granite (part of the New Hampshire Plutonic Suite) trending northeast-southwest is encountered in the southern portion of the Site, which is similar in composition to the Concord Granite (Lyons et al., 1997). The tendency of the rocks in this terrain is to develop orthagonal faults and joints with a distinctive orientation that may be conducive to groundwater flow. Bedrock classifications from four bedrock core logs (B 301A, B 302A, B 303A, B 304A) retrieved in 1992, indicate that the Site is underlain by gneiss, pegmatite, quartzite, schist, breccia, and mylonite [Sevee and Maher Engineers, Inc. (SME), 1994]. A north-northeast-striking and steeply dipping mylonitic fault zone had also been reported near the western boundary of the Site along Auburn Road. Site specific fracture interpretations indicate that bedrock fractures are primarily striking to the northeast-southwest and dipping steeply (50° and 70°) to the southeast (SME, 1994). Based on depth to bedrock measurements collected during monitoring well installation, bedrock topography generally slopes downward to the northwest. The bedrock elevation contour plan developed from this data is shown in Figure 3.

Hydrogeology

Groundwater at the Site occurs in two hydrogeologic units: the overburden and the bedrock aquifers. The overburden aquifer consists of the saturated portions of the glacial outwash and discontinuous till units. Groundwater flow within the overburden aquifer is consistently towards the north and northwest (see Figure 4) (WESTON, 2012a). The majority of overburden groundwater appears to discharge to the Whispering Pines Pond; however, some component of overburden groundwater from the Site discharges north of the Whispering Pines Pond to Cohas Brook. Hydraulic conductivities within wells in both the outwash deposits and the till vary from approximately 0.1 to 140 ft per day (SME, 1994; WESTON, 2012a). Historical (post-1999)

average spring and fall horizontal hydraulic gradients in the overburden aquifer are 0.0080 and 0.0072 ft/ft, respectively. The average overburden horizontal hydraulic gradient for all available data collected between June 2000 and October 2011 is 0.0077 ft/ft.

The inferred direction of groundwater flow within the bedrock aquifer is consistently towards the north and northwest (see Figure 5) (WESTON, 2012a). Based on historical data since 2000, the average spring and fall horizontal hydraulic gradients are 0.0091 and 0.0084 ft/ft, respectively. The average bedrock horizontal hydraulic gradient for all available data collected between June 2000 and October 2011 is 0.0088 ft/ft (SME, 1994; WESTON, 2012a).

The results of slug tests conducted in four bedrock wells indicate the hydraulic conductivity values for the bedrock range from 6.00E-06 centimeter per second (cm/sec) to 2.50E-03 cm/sec with a geometric mean hydraulic conductivity of 2.32E-04 cm/sec. These hydraulic conductivity values are typical for fractured metamorphic rock aquifers (SME, 1994). Reportedly, abandoned and in use bedrock residential drinking water wells located to the west of the Site have low yields, and depths on the order of 600 ft below ground surface (bgs) are required to generate an adequate water supply for domestic use. A hydrogeologic cross-section map and hydrogeologic cross-section A-A' and B-B' are provided as Figures 6, 7, and 8, respectively (WESTON, 2012d).

Horizontal and vertical hydraulic gradients were determined across the Site based on data collected during the additional hydrogeologic investigation conducted in fall 2006. The 2006 data indicate a downward vertical hydraulic gradient from the overburden to bedrock aquifer is more likely at the Site and is more common in the fall than the spring. The average downward vertical hydraulic gradients (-0.035 ft/ft) were approximately four times larger than the average upward hydraulic gradients (0.008 ft/ft) (WESTON, 2007). In addition to observed temporal variations, the 2006 data collected from the MW-102A/MW-102B, MW-302A/MW-302BR, and MW-303A/MW-303B couplets demonstrate the vertical hydraulic gradients between the overburden and bedrock aquifers is variable over relatively short distances.

Surface Water Hydrology

Surface water runoff from the landfills generally flows radially off the landfill caps. Runoff from the vicinity of the Town Dump and Tire Pile landfills is collected within constructed drainage swales that direct runoff in a northerly direction before discharging to Whispering Pines Pond. Surface water runoff across the remainder of the Site (including the Solid Waste Landfill) generally flows in a northerly direction toward Whispering Pines Pond and to the east toward an unnamed stream. The unnamed stream flows north along the eastern Site property line before ultimately discharging to Whispering Pines Pond. The pond discharges to a small stream that flows beneath Auburn Road before discharging to Cohas Brook, which flows north along Auburn Road.

The 2002 Five-Year Review noted that what appeared to be a series of beaver dams were causing Whispering Pines Pond water levels to be higher than normal. These beaver dams have continued to be observed over time (and subsequently removed by the Town), but were not observed during the July 2012 Site Inspection; drainage at the outlet of Whispering Pines Pond has improved when the beaver dams are not present, leading to lower pond surface water levels.

Site Conditions/Land and Resource Use

Although the entire Site consists of approximately 180 acres, the three disposal areas only occupy approximately 12 acres and are each approximately 4 acres in size. The disposal areas received a mix of domestic wastes and various hazardous wastes beginning in 1965 until the landfills at the Site were closed in 1980. The northernmost of the three disposal areas is the "Old Town Dump", which is the oldest of the disposal areas and has an approximate refuse thickness of 8 to 15 ft. The "Tire Pile" area is slightly larger than the "Old Town Dump", and has an approximate thickness of 10 to 20 ft. The "Solid Waste Landfill" has an approximate thickness of 8 to 10 ft (EPA, 1996a). Formerly, a septage disposal area existed to the north of the solid waste dump area; however, the Town excavated that area and the material was consolidated in the solid waste area in 1993 (see Figure 2).

The disposal areas currently have a top cover consisting of a modified Resource Conservation and Recovery Act (RCRA)-type C cap, roughly 4 ft thick with a geotextile impermeable membrane, clay liner, and a vegetated (grass) cap.

Prior to 1987, all of the local residents near the Site used groundwater as a drinking water source. In 1987 the Town of Londonderry extended a municipal drinking water supply to potentially affected groundwater users in the area along portions of Auburn Road (including Whispering Pines Pond Mobile Home Park), Longwood Avenue, and Shady Lane. There are no known private wells within 0.25 mile of the contaminant plume. In addition, institutional controls (i.e., Groundwater Management Permit No. GWP-198803007-L-001) have been implemented since October 2007 which places notices of the permit requirements on all owners of lots of record within the established Groundwater Management Zone for the Site.

Groundwater monitoring in the early 1990's found concentrations of volatile organic compounds (VOCs) decreasing until only one well, directly adjacent to the Old Town Dump (MW-102A), contained any concentrations over interim cleanup levels. It is believed the VOC contamination declined due to dilution, biodegradation, and abiotic processes. In response to this information EPA reconsidered the groundwater remedy at the Site outlined in the 1989 *Record of Decision* (*ROD*) and issued an *Amended ROD* (*AROD*) on 19 December 1996. The 1996 *AROD* changed the groundwater remedy from pump-and-treat to natural attenuation (NA) for arsenic with a contingency, engineered remedy to be used under certain, specific conditions.

The Site is currently vacant. The Town has recently negotiated an agreement allowing a tenant (model airplane club) to utilize the Site for passive recreation activities. This passive use of a portion of the Site will not compromise the selected remedy or adversely affect the short- or long-term protectiveness of the remedy.

History of Contamination/Initial Response Actions

From 1965 to 1980, the Site operated as a municipal landfill. In August 1979, an investigation by the State of New Hampshire substantiated suspicions that industrial wastes were being accepted for disposal at the Site. The state then ordered that no more drums be accepted for disposal at the Site. Following that order, EPA began investigations into conditions in groundwater and surface waters surrounding the Site. Contaminants uncovered during EPA and

State of New Hampshire investigations included various classes of compounds such as polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), VOCs, and metal contaminants.

In 1982, based on preliminary assessment investigations, EPA proposed the Site for listing on the National Priorities List (NPL). The Site was included on the NPL in 1983.

In May and June of 1986, EPA conducted test pit investigations and removed 1,900 drums from the Site, primarily in the Town Dump area. In July 1986, an endangerment assessment of the Site was completed.

In 1987, EPA issued a *ROD* and an Administrative Order to the Town of Londonderry to connect potentially affected homes to a municipal water source and to fence the property to restrict access. In 1988, EPA removed an additional 316 drums from the Town Dump.

In 1990, EPA issued a second Administrative Order that directed the Town of Londonderry to cap the three disposal areas and perform other related landfill cap maintenance and monitoring tasks. The 1990 Administrative Order also directed a separate group of PRPs to begin design and construction of a groundwater remedy.

Based on investigations over the previous 5 years and then-current site conditions, in 1996, EPA issued an *AROD* outlining the decision not to implement the pump and treat groundwater remedy and to utilize an alternative remedy of MNA of the arsenic contamination. The 1996 *AROD* acknowledged the overall decline in VOC contaminants at the Site, relieving the PRPs from having to build a groundwater remedy; however, a provision was retained for performing a contingency groundwater remedy under specific circumstances. The PRPs and the Town agreed to the provisions in the 1996 *AROD* in the 1999 Consent Decree.

Basis for Taking Action

Contaminants at the Site have included SVOCs and PCBs in drums and soils, and VOCs as well as metals in groundwater. The response actions performed by EPA, the state, and Town of Londonderry at the Site have either removed or encapsulated contaminants in soils. EPA established interim clean up levels (ICLs) for groundwater in a 1989 *ROD*. These ICLs were retained in the 1996 *AROD* and updated in a 2009 *Explanation of Significant Differences* (*ESD*). The current ICLs for groundwater are the following:

Table 2

Interim Cleanup Levels set forth in the 1989 *Record of Decision*, retained in 1996 *Amended Record of Decision*, and updated in the 2009 *Explanation of Significant Difference*

Contaminant of Concern	Cleanup Level Goal (parts per billion)
Inorganic compounds	
Arsenic	MCL of 10*
Lead	MCL of 50 (Action Level of 15)

Table 2

Interim Cleanup Levels set forth in the 1989 *Record of Decision*, retained in 1996 *Amended Record of Decision*, and updated in the 2009 *Explanation of Significant Difference (Continued)*

Volatile Organic Compounds	
Vinyl chloride	MCL of 2.0
1,2 dichloroethene	MCL of 70*
2-Butanone	Health Advisory of 172
Trichloroethene	MCL of 5.0
Tetrachloroethene	MCL of 5.0
Toluene	MCL of 1,000
Benzene	MCL of 5.0

Notes:
MCL = Maximum Contaminant Level
* = The 2009 *Explanation of Significant Difference* revised the cleanup goal for arsenic from 50 to 10 parts per billion and changed the compound trans-1,2-dichloroethylene to 1,2-dichloroethylene.

The arsenic contamination plume at the Site from the 1999 Consent Decree, Appendix A, is shown in Figure 9. The arsenic plume is from data representing Site conditions in 1995 (EPA, 1996a). No distinction between an overburden and bedrock contaminant plume was made at the time.

IV. Remedial Actions

Remedy Selection

Three *ROD/AROD*s and an *ESD* have been issued for this Site. Following additional investigation at the Site by EPA and its contractors in 1986, the first *ROD* was issued on 17 September 1986 (EPA, 1986). The 1986 *ROD* directed the installation of a 9,000-foot (ft) municipal waterline to supply drinking water to the residents surrounding the landfills. The remedial action objective was to eliminate the potential for abutting residents to drink groundwater contaminated from the Site.

After the Town installed the waterline in 1987, and EPA had removed over 2,000 drums of hazardous wastes from the Site in 1986, EPA believed that conditions at the Site had changed sufficiently to re-evaluate the property. Based on these additional investigations, EPA then issued a second *ROD* on 29 September 1989 that required the construction of both a groundwater treatment plant to remove metals and VOCs from groundwater, and a cap over the disposal areas to prevent infiltration through landfilled wastes. On 31 August 1990, EPA issued an Administrative Order to two groups of Potentially Responsible Parties (PRPs) to perform the remedies outlined in the 1989 *ROD* (EPA, 1989). The Administrative Order directed the Town to perform the Source Control component of the remedy, which was to cap the landfills and perform drainage improvements to minimize the contact of groundwater with waste materials in the landfills. The landfills were subsequently capped with modified RCRA-type C caps by the Town in 1994.

The Administrative Order also directed a group of PRPs known as the Auburn Road Management of Migration PRP Group to design and build the groundwater treatment plant. In 1991, the PRPs began the pre-design investigation to build the groundwater cleanup facility. However, the groundwater data from the pre-design investigation caused EPA to reconsider the necessity for constructing a groundwater pump and treat system. In 1991 it was noted that only arsenic was present in the groundwater and it was the only contaminant which posed a risk off-site. Based on the observations of declining concentrations and the belief, based on groundwater modeling at that time, that capping the landfills would eventually halt the arsenic contamination, EPA issued an *AROD* in 1996. The 1996 *AROD* determined that no active groundwater remedy would be implemented except as a contingency and that institutional controls regarding the use of groundwater would be established throughout the area of contamination.

In 2009, an *ESD* was issued for the Site to address significant adjustments to the 1996 *AROD*. Those adjustments were not changes that fundamentally altered the overall remedy for the Site with respect to scope, performance, or cost. After the 1996 *ROD* was issued, the MCL for arsenic was lowered from 50 micrograms per liter (µg/l) to 10 µg/l. The 2009 *ESD* revised the arsenic cleanup level to 10 µg/l to ensure the protectiveness of the remedy in the future. In addition, the 1996 *AROD* had a typographical error in Table 6, "INTERIM CLEANUP LEVELS IN GROUNDWATER." The table listed the compound trans-1,2-dichloroethene as a contaminant of concern instead of 1,2-dichloroethylene. The 2009 *ESD* made the correction to the table to include 1,2-dichloroethylene and to delete trans-1,2-dichloroethene.

Remedy Implementation

The Town completed construction of the waterline (OU1) in 1987, and the drainage swales/culvert structures and landfill caps (OU2) in 1994. Since that time the Town has performed air monitoring and other maintenance activities to protect the integrity of the caps.

According to Mr. John Trottier, Assistant Director of Public Works and Engineering for the Town of Londonderry, Kleinfelder East, Inc. (Kleinfelder) of Manchester, New Hampshire performs bi-annual visual inspections of the Site. Kleinfelder is also in charge of the gas monitoring and settlement monitoring at the landfill. Upon completion of the visual inspection by Kleinfelder, an annual report is submitted to Mr. Trottier (with copies to EPA and NHDES) outlining maintenance that is recommended at the Site (i.e., cleaning out of drainage swales, repairs to damaged fencing or gates, etc.). Mr. Trottier then assembles a crew to complete the maintenance outlined in the Kleinfelder report.

Mr. Trottier indicated that the landfill is mowed twice a year in accordance with the Site Operations and Maintenance (O&M) Plan. Primary rodent control involves the occasional trapping of the beavers and beaver dam removal; no spraying of pesticides or herbicides is conducted at the Site. In addition, Mr. Trottier visits the Site approximately once per month to personally perform visual inspections and assess any potential maintenance needs. Current site conditions were observed during the 30 July 2012 Site Inspection and discussed in Section V and Appendices B and C.

With respect to groundwater, the 1996 *AROD* indicated that lowering the water table through capping would stop groundwater contamination by arsenic. Since the issuance of the 1996 *AROD*, the ARPPG has been monitoring the environment surrounding the Site. A LTEMP, including the submission of annual reports, has been in place since 1999. Monitoring consists of groundwater, surface water, and sediment samples taken at and near the landfill, Whispering Pines Pond, and Cohas Brook.

The 1996 *AROD* also directed the establishment of institutional controls preventing the use of groundwater. These institutional controls are being implemented through the state's GMZ permit process. The ARPPG submitted a GMZ permit application to NHDES on 15 May 2007. After receiving comments from NHDES on 24 July 2007, a revised final GMZ permit application was submitted to NHDES on 15 August 2007. The GMZ Permit Number GWP-198803007-L-001 was issued by NHDES on 30 October 2007 and last revised in July 2008 (see Appendix A).

The 1996 *AROD* outlined what is termed a limited action remedy for arsenic-contaminated groundwater with the following components (EPA, 1996a):

1. Natural Attenuation of Contaminated Groundwater.

2. Establishment of a GMZ.

3. Implementation of a Long Term Monitoring Program. If the monitoring program detects significant events, additional investigation will be performed. Significant events include:

    a. Groundwater contamination from the Site migrates northward, in either the bedrock or overburden aquifers, or into Cohas Brook.

    b. A violation of the surface water standards contained in New Hampshire's Surface Water Quality Regulations, Env-Wq 1700 for the compounds with cleanup levels listed in the *AROD* and the 1989 *ROD* in either Whispering Pines Pond or Cohas Brook. The specific cases that are significant events are:

        1. Surface water quality in Cohas Brook or Whispering Pines Pond exceeds the standard for arsenic contained in Env-Wq 1700.

        2. Surface water quality violations for VOCs are exceeded.

        3. If arsenic contaminated sediments are found to be toxic to aquatic life.

4. Maintenance of Existing Site Controls.

5. Establishment of Institutional Controls.

6. A review of site conditions every 5 years.

During the eighteen years since capping of the landfills was completed, there has been limited progress towards attaining cleanup levels for arsenic in groundwater. The 2009 ESD which lowered the cleanup level for arsenic to coincide with the updated MCL has further delayed progress. Overall, the extent of arsenic contamination in groundwater at the Site has somewhat decreased between 2006 and 2012 (as illustrated in Figures 10 through 13), but high concentrations continue to persist within the overburden aquifer.

V. Progress Since the Last Five-Year Review

The last Five-Year Review was completed in September 2007. EPA found that the water line (OU1) and the capping of the disposal areas (OU2) to be protective of human health and the environment. EPA determined that the groundwater remedy, natural attenuation of arsenic, was protective of human health and the environment in the short-term. EPA believed that for the groundwater remedy to be protective in the long-term and to achieve the updated MCL for arsenic of 10 ppb, the monitoring program (amongst other issues; see below) needed to be modified to better assess water levels and geochemical conditions in the aquifer, and previous modeling efforts needed to be updated to determine a more accurate estimate of cleanup times. A summary of recommendations from the 2007 Five-Year Review and implemented actions are shown in Table 3.

Table 3

Actions Taken Since the Last Five-Year Review

Recommendations from the Last Five-Year Review	Actions Implemented Since Last Five-Year Review
1. Update groundwater and solute transport modeling, including: a.) Additional LTEMP monitoring parameters; evaluate MAROS software package and implement, as appropriate. b.) Install replacement monitoring wells for PZ-218 and C-1, and perform other investigatory field work in this area as determined necessary. c.) Evaluate surface water/groundwater interaction in vicinity of Whispering Pines Pond. d.) Evaluate MNA remedy and alternative groundwater response actions to achieve and maintain performance standards.	1. a.) MAROS evaluation and results were included in 2007 LTEMP Annual Report. The MAROS output updated with 2008/2009/2010/2011 data was included in 2011 LTEMP Annual Report. b.) Replacement well for PZ-218 (MW-211B) and C-1 (MW-212A and MW-212B) installed June 2008. Nine subsequent rounds of groundwater sampling have been conducted. c.) Summary of NUS and SME pumping tests in vicinity of Whispering Pines Pond included in arsenic modeling report to EPA. d.) Discussion/summary included in arsenic modeling cover letter to EPA.
2. Obtain approval of revised GMZ Permit from NHDES.	2. Approved GMZ Permit issued by NHDES (last modified July 2008).
3. Evaluate potential VOC vapor intrusion pathway.	3. VOC screening pathway letter report submitted to EPA in December 2008. EPA concluded that no additional VI analysis was needed at that time.
4. Repair fencing and continue maintenance of landfill caps, fencing, and drainage swales.	4. Repairs completed by the Town in 2007, and maintenance is continuing.
5. Follow up on University of Connecticut arsenic study of Cohas Brook sediments to obtain current observations and results.	5. Update was included in 2007 LTEMP Annual Report.
6. Prepare *ESD* to document change in arsenic and trans 1,2-dichloroethylene cleanup levels at the Site.	6. Completed by EPA in July 2009

Notes:
LTEMP = Long-Term Environmental Monitoring Program
NUS = NUS Corporation
MNA = monitored natural attenuation
GMZ = Groundwater Management Zone
MAROS = Monitoring and Remediation Optimization System
VOC = volatile organic compound
NHDES = New Hampshire Department of Environmental Services
ESD = Explanation of Significant Difference
EPA = United States Environmental Protection Agency
SME = Sevee and Maher Engineering

VI. Five-Year Review Process

Administrative Components

EPA Region I prepared this Five-Year Review, with assistance from Mr. Kenneth Richards, NHDES Project Manager and WESTON, consultants to the ARPPG. This Five-Year Review consisted of:

- Reviewing relevant documents listed in the reference section of this document
- Conducting a review and technical assessment of data collected during implementation of the selected remedy
- Performing a site inspection

Community Notification and Involvement

No public notice was issued or public meetings held regarding this Five-Year Review for the Site. However, a public notice will be issued to summarize the findings of this Five-Year Review upon completion.

Document Review

This Five-Year Review consisted of a review of relevant documents including O&M Records and monitoring data. The 1996 *AROD*, 2009 *ESD*, and various literature sources were consulted. A Reference Section is provided at the end of this Five-Year Review. A more complete analysis of site conditions and a bibliography is also attached to the Technical Assessment in Appendix D.

Site Inspection

Mr. Kenneth Richards (NHDES) and Mr. Andrew Fuller (WESTON) conducted a Site visit on 30 July 2012. The three disposal areas, fences, and drainage systems were inspected. Minor general maintenance issues were noted (vegetation in the stone drainage swales); however, no unusual or problematic issues were found on-Site. Mr. Al Simard attended the portion of the Site inspection conducted on the property owned by the Simard Family Trust and occupied by the Whispering Pines Mobile Home Village. No beaver activity or dams were observed in Whispering Pines Pond at the down gradient dam/culvert or the up-gradient culvert. The black polyethylene culvert pipe drains installed by the property owner were observed to be operating properly. The Site inspection activities are documented in a checklist and photographs are included as Appendix B and C, respectively. It should be noted that Site security concerns were identified during the Site inspection regarding all-terrain vehicles/motorcycles entering the property potentially through damaged fencing and gates surrounding the Town property.

Interviews

Interviews were conducted (or attempted) as part of this Five Year Review between the Town of Londonderry, New Hampshire and WESTON, as well as between Mr. Al Simard (adjacent property owner of Whispering Pines Pond Mobile Home Village), NHDES, and WESTON.

Simard Interview

Mr. Al Simard did not consent to be interviewed as part of this Five Year Review; however, Mr. Simard and his consultant hydrogeologist submitted a written statement that is included in Appendix D.

Town of Londonderry, NH Interview

On 30 July 2012, Mr. John Trottier, Assistant Director of Public Works & Engineering, and Mr. Andrew Fuller discussed the progress of the Five Year Review and any input from the Town relative to the Site. Mr. Trottier indicated that his overall impression of the project is that it is going well and he did not have any additional comments, suggestions, or recommendations regarding the Site's management or operation (see Appendix D).

Risk Information and Applicable or Relevant and Appropriate Requirements Review

Data provided and analyzed indicate no change in Site conditions that would warrant a re-evaluation of risk. In February 2002, EPA revised the MCL for arsenic from 50 ppb to 10 ppb. The 2009 *ESD* changed the ICL for the Site to 10 ppb to be consistent with the MCL. This change does not affect the risk calculated at the Site, which was based on the average and maximum concentrations of arsenic observed in Site groundwater at the time of the risk assessment; however, it is a relevant and appropriate requirement.

EPA has endorsed the New Hampshire Groundwater Protection Act: RSA 485-C. New Hampshire law holds that all groundwater should be drinking water quality. The exception is for areas in which GMZ permits have been issued to address contamination and in that case the purpose of the permit is to regulate the restoration of the aquifer to drinking water quality. The GMZ permits establish areas within which it is acknowledged that groundwater is contaminated above drinking water standards and includes mechanisms to prevent the use of groundwater for any purpose. Within a GMZ, actions are required to eventually return groundwater to drinking water standards. The ARPPG submitted a GMZ permit application to NHDES on 15 May 2007. After receiving comments from NHDES on 24 July 2007, a revised final GMZ permit application was submitted to NHDES on 15 August 2007. The GMZ Permit Number GWP-198803007-L-001 was issued by NHDES on 30 October 2007 and was revised on two separate occasions thereafter (see Appendix A). The permit will expire on October 29, 2012 unless a permit renewal is submitted by the ARPPG.

Data Review

EPA analyzed trends in groundwater, surface water, and sediment monitoring data collected from 1993 to the present. Additional environmental data, including groundwater

elevations and precipitation data, was reviewed with respect to trends in the arsenic concentrations. A summary of the general trends in contamination levels are:

Groundwater

The current nature and extent of arsenic in groundwater (2007-Spring 2012) indicates that arsenic concentrations are decreasing in some monitoring wells, although some wells are showing increasing or no trend (see further discussion of trends below under the MAROS update). However, concentrations in wells showing increasing trends in the 2007-2012 timeframe are still within the historical range of concentrations (1993-2007). The arsenic contamination plume in the overburden and bedrock aquifers based on data collected in the July 2012 sampling round are shown in Figures 12 and 13, respectively (WESTON, 2012d).

During 2011 and 2012, the United States Geological Survey (USGS), through a Cooperative Agreement with EPA and NHDES, was tasked with further characterizing the hydrogeologic framework and arsenic mobility at the Site. This included completing surface geophysical surveys and the installation of piezometers to evaluate the interaction between groundwater and surface water at the Site. The data from these investigations is currently being evaluated by the USGS and had not been published as of the time this Five-Year Review was completed. However, the newly installed piezometers were included in the most recent monitoring round conducted in July 2012. Laboratory analytical results indicate that arsenic was detected above the interim cleanup level in the shallow piezometer (CB1) installed along the edge of Cohas Brook downgradient from the property occupied by the Whispering Pines Mobile Home Village and beyond the current GMZ. The groundwater sample collected from this piezometer location exhibited arsenic at a concentration of 88.9 μg/L (see Figure 12).

Surface Water

Arsenic concentrations in surface water at the Site have been consistently below New Hampshire Surface Water Quality Criteria (SWQC) for protection of freshwater aquatic life. The highest arsenic concentration in surface water was detected in a sample collected from SW-9 in 2001 at a concentration of 1,300 μg/L, but has continued to be below the freshwater acute criteria since this time. However, no sample was collected from SW-9 during the July 2012 sample event due to excessive dry conditions.

As mentioned previously, recent laboratory analytical results for a sample collected from CB1 indicates that arsenic is present above the applicable interim cleanup level in groundwater directly adjacent to the Cohas Brook. In addition, Cohas Brook is considered a Class B surface water body by NHDES which means it is considered acceptable for fishing, swimming, and other recreational purposes; but is also categorized as impaired/TMDL needed (severe impairment) in accordance with 303(d). This would potentially mean that further evaluation and sampling maybe needed.

Sediment

Sediment arsenic concentrations appear to vary considerably over time at two (SD-2 and SD-9) of the four sample locations included in the LTEMP. However, sediment toxicity testing

indicates that the arsenic in the sediments does not impair the environment or benthic community.

Updated MAROS Results and Recommendations

As a requirement of the September 2007 *Five-Year Review,* available groundwater total arsenic data (since 1993) was formatted for input into the MAROS software for the following LTEMP monitoring well locations:

- Overburden monitoring wells: MW-1B, PZ-218 (shallow piezometer), MW-101B, MW-104B, MW-106B, MW-109B, MW-207B, MW-210B, MW-211B, MW-212B, MW-302R, MW-303B, GZ-1-2R, GZ-6-2R, GZ-6-3R (well cluster with GZ-6-2R), GZ-9-4R, NUS-1-2, and NUS-2-2.

- Bedrock monitoring wells: C-1, GZ-1-3R, MW-101A, MW-102A, MW-106A, MW-108A, MW-109A, MW-1A, MW-207A, MW-210A, MW-212A, MW-302A, and MW-303A.

As part of the 2011 Annual report for the Site, the input data for MAROS was updated to include the 2011 LTEMP sampling results. As of 2011, the newly installed wells, MW-211B, MW-212A and MW-212B, have sufficient data to be included in the MAROS model for individual concentration trend analysis (WESTON, 2012).

The updated evaluation of the 1993 to 2011 groundwater data continued to include both quantitative and qualitative analyses with a focus on the LTEMP data (2000-2011). The quantitative statistical evaluation of the Site was conducted using tools in the MAROS software. The MAROS analysis results, in combination with hydrogeological conditions, well construction details, and well locations, were qualitatively reviewed to generate recommendations to support site monitoring objectives. The bedrock aquifer was evaluated by MAROS for plume stability and monitoring program optimization; however, reliable results were not obtained because of limited sampling rounds for most of bedrock monitoring well locations as well as significant seasonal variation in the available data. The following general conclusions were drawn based on the results of these analyses:

- The estimated total mass of arsenic in the groundwater plume during the LTEMP period (2000 to 2011) shows a "stable" trend over time with an increasing trend in the source zone wells and decreasing trend in the downgradient wells.

- There is a decreasing trend in the distance of the center of mass from the source, indicating the arsenic mass has receded closer to the source zone over time. This is consistent with the increase of concentrations in the source zone.

- The spring second moment analysis showed decreasing trends for the groundwater flow direction and the direction perpendicular to groundwater flow. The fall second moment analysis showed increasing trends for the groundwater flow direction and "NT" trend for the direction perpendicular to groundwater flow. These results indicate that the plume experienced seasonal variations related to hydrogeologic conditions.

- The spatial redundancy analysis indicated that no wells should be removed from the routine monitoring program. The MAROS analyses indicated that reduction of sampling interval to annual sampling frequency may be considered for the wells in the monitoring network, except for locations GZ-6-2R, MW-302BR, and NUS-2-2. Qualitative analysis of individual location conditions recommended continuation of the LTEMP semi-annual/annual monitoring frequency.

The complete updated 2011 MAROS evaluation and results for the Auburn Road data set, including details of MAROS methodology, are discussed further in the 2011 Annual Report for the Site (WESTON, 2012a).

VII. Technical Assessment

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

No – While immediate threats at the Site have been addressed through implementation of the waterline required under the 1986 *ROD* and generally through the establishment of a GMZ (Permit Number GWP-198803007-L-001) in accordance with the 1996 *AROD,* the achievement of the interim cleanup levels for groundwater at the Site has taken considerably longer time than the predictions made at that time of the *AROD.* In fact, the 1996 *ROD* remedy predicted attainment of the, then 50 ppb interim groundwater cleanup level for arsenic within 5 years after capping of the three landfills. That 5 year period expired 11 years ago, yet arsenic concentrations have not attained the 50 ppb or the revised interim cleanup level (ICL) for arsenic of 10 ppb per the 2009 *ESD.*

Furthermore, recent work by the USGS immediately north of Auburn Road (along the south side of Cohas Brook and beyond the existing GMZ boundary) has identified arsenic in a shallow groundwater piezometer approximately 9 times the ICL.

However, based on current information with respect to the limited, potential current exposure to contamination at the Site due to the existing municipal water supply and institutional controls, the remedy continues to be protective of human health and the environment in the short-term. Refer to Appendix D for additional supporting information.

- *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?*

No - In February 2002, EPA revised the MCL for arsenic from 50 ppb to 10 ppb and the 2009 *ESD* changed the interim cleanup level (ICL) stated in the *AROD* to be consistent with the 10 ppb MCL. However, this change does not affect the risk calculated at the Site, which was based on the average and maximum concentrations of arsenic observed in Site groundwater at the time of the risk assessment.

Table 4

Changes in Chemical-Specific Standards

Contaminant	Media	Cleanup Level	Standard		Citation/Year
Arsenic	groundwater	10 µg/L	Previous	50 µg/L	SDWA 1988
			New	10 µg/L	SDWA 2002-*ESD* 2009

Notes:
µg/L = micrograms per liter
ESD = Explanation of Significant Difference
SDWA = Safe Drinking Water Act

In addition, the *AROD* provided updated cancer and non-cancer risk calculations for groundwater as well as toxicity values that were current at that time. There have been several updates in the toxicity values since 1996:

- The non-cancer reference doses for the following contaminants have been reduced, corresponding to an increase in the total non-cancer health effects associated with the consumption of Site groundwater: 1,2-dichloroethylene and toluene.

- Non-cancer reference doses were not provided in the 1996 AROD for several contaminants. Including these contaminants in the calculation of non-cancer health effects would result in an increase in the total non-cancer health effects associated with the consumption of Site groundwater. These contaminants include: vinyl chloride, trichloroethylene, benzene, tetrachloroethylene and arsenic.

- The cancer risk values for both vinyl chloride and tetrachloroethylene have decreased since 1996. This decrease corresponds to a reduction in the total cancer risk associated with the consumption of Site groundwater.

- The cancer risk values for both trichloroethylene and benzene have increased since 1996. This increase would correspond to an increase in the total cancer risk associated with the consumption of Site groundwater.

While these toxicity values have been updated, potentially resulting in an increased calculated cancer risk or non-cancer health effects, the groundwater remedy is currently protective of human health because there is no consumption of groundwater as a result of the municipal water supply line and a GMZ has been established as a form of institutional control for restricting groundwater use at the Site.

In the 2005 Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA recommends that an age dependent adjustment factor (ADAF) be applied to the cancer slope factor of chemicals determined to be carcinogenic by a mutagenic mode of action. Application of an ADAF accounts for the potential for increased susceptibility to cancer from early-life exposure, relative to comparable exposure later in life. Vinyl chloride has been determined to be carcinogenic by a mutagenic mode of action. However, because chemical-specific data on susceptibility from early-life exposures were available for the derivation of vinyl chloride's updated cancer slope factor, the slope factor is used for risk characterization, and an ADAF is not applied. This is consistent with EPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005). Trichloroethylene has also been determined to have a mutagenic mode of action, for one of three target organs, and therefore an ADAF should be applied to the cancer slope factor for that target organ.

The application of an ADAF would be relevant to a child's exposure up to the age of 16. EPA 2005 identifies that for exposures to children between the ages of 2 and <16 a 3-fold adjustment should be made (for the adult exposure scenario the ADAF is 1, and therefore no adjustment is made). Because there is presently no exposure to groundwater, as a result of institutional controls, the application of the ADAF for those contaminants with a mutagenic mode of action

would not affect risk associated with current use. Should consumption of groundwater occur in the future, ADAFs should be applied as appropriate to estimate cancer risk associated with such exposure.

Finally, since the 2007 FYR, an evaluation of the potential for the vapor intrusion was conducted (October 2009). Subsequent to this evaluation there have been updates to the vapor intrusion screening levels. Specifically, for Site COCs, the screening level for both TCE and vinyl chloride has decreased. However, none of the wells, determined to be adequate for the previous vapor intrusion evaluation, are monitored as part of the current LTEMP; therefore, a comparison of more current VOC concentrations to the updated screening levels could not be conducted for this FYR. That being said, a comparison of the TCE and vinyl chloride concentrations used for the original 2009 vapor intrusion evaluation to the updated screening levels shows that the risk associated with these concentrations would not result in risk outside of the risk range.

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

No - None are known at this time other than what has been noted above.

Technical Assessment Summary

The primary contaminant at the Site is arsenic in groundwater. However, lesser occurrences (based on limited data) of trichloroethylene and tetrachloroethylene have been identified in groundwater adjacent to the old Town Dump. The arsenic contamination continues to persist throughout the Site and has migrated beyond the existing groundwater institutional control area (aka, GMZ boundary) in one piezometer location adjacent to Cohas Brook. No groundwater is being extracted or used in or near the plume as a waterline has been in-place since 1987. The arsenic-contaminated groundwater plume discharges to Cohas Brook forming a red to orange sediment that contains iron and some arsenic. In addition, recent USGS preliminary information suggests that the arsenic groundwater plume may also discharge into Whispering Springs Pond. While sediment and surface water are tested on a routine basis, additional sampling appears to be warranted at this time.

VIII. Issues

Table 5 summarizes the issues for this Five-Year Review.

Table 5

Summary of Issues

Issues	Affects Protectiveness (Y/N)	
	Current	Future
1) Timeframe to reach Site-wide ICLs is expected to be considerably longer that originally projected, and groundwater interactions with nearby surface waters/sediments need further investigation.	N	Y
2) Arsenic exceeds 10 ppb MCL/ICL beyond the current GMZ boundary in a shallow piezometer.	N	Y
3) Limited groundwater data and new toxicity values for several VOCs identified at the Site requires reassessment.	N	Y

Notes:
MCL = Maximum Contaminant Level
ppb = parts per billion

IX. Recommendations and Follow-up Actions

Table 6 summarizes the recommendations and follow-up actions for this Five-Year Review.

Table 6

Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1)	Following receipt of the USGS evaluation report for the Site (expected in December 2012), schedule a meeting between the Agencies, ARPPPG, and the USGS to discuss required follow-up actions to address this issue.	PRPs	EPA/NHDES	2nd Quarter FY'2013	N	Y
2)	Expand GMZ boundary prior to expiration date established for current GMZ permit.	ARPPG	NHDES	October 29, 2012	N	Y
3)	Gather additional VOC data from the Site to reassess potential vapor intrusion pathway, and achievement of ICLs.	ARPPG	EPA/NHDES	1st Quarter FY'2014	N	Y

X. Protectiveness Statement(s)

The remedy implemented at the Auburn Road Landfill Superfund Site currently protects human health and the environment in the short-term because: (a) installation of a municipal water supply currently provides drinking water to residences in the affected area, and (b) implementation of institutional controls through establishment of a Groundwater Management Zone currently provides notice on groundwater use restrictions at and near the Site.

However, the 1989 *ROD* remedy predicted a cleanup time for arsenic of 5 years after capping in 1996. The 5-year period has lapsed, yet arsenic concentrations have not attained the interim cleanup level of 10 ppb. Therefore, in order for the remedy to be protective in the long-term, the following actions need to be taken: (a) schedule a meeting between the Agencies, ARPPPG, and the USGS to discuss the required follow-up actions necessary to expedite the time to reach groundwater cleanup levels, and further investigate groundwater interactions with nearby surface waters/sediments, (b) expand the institutional control (GMZ) boundary north of Auburn Road, and (c) gather additional VOC data from the Site in order to reassess potential vapor intrusion pathway, and achievement of ICLs.

XI. Next Review

This Site requires on-going, statutory five-year reviews. The next review will be conducted and issued before September 28, 2017, five years from the date of signature of this report.

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FIGURES

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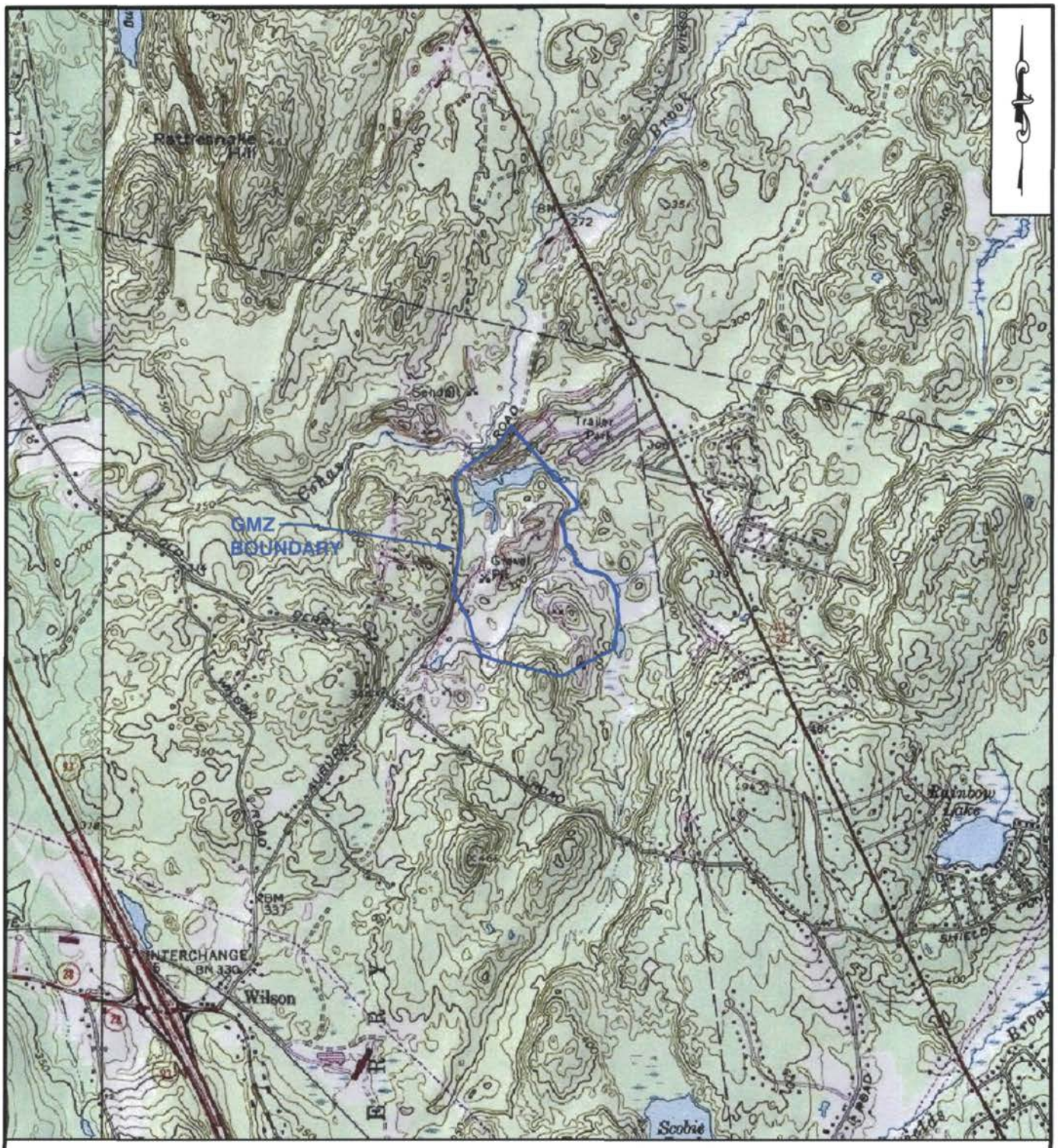
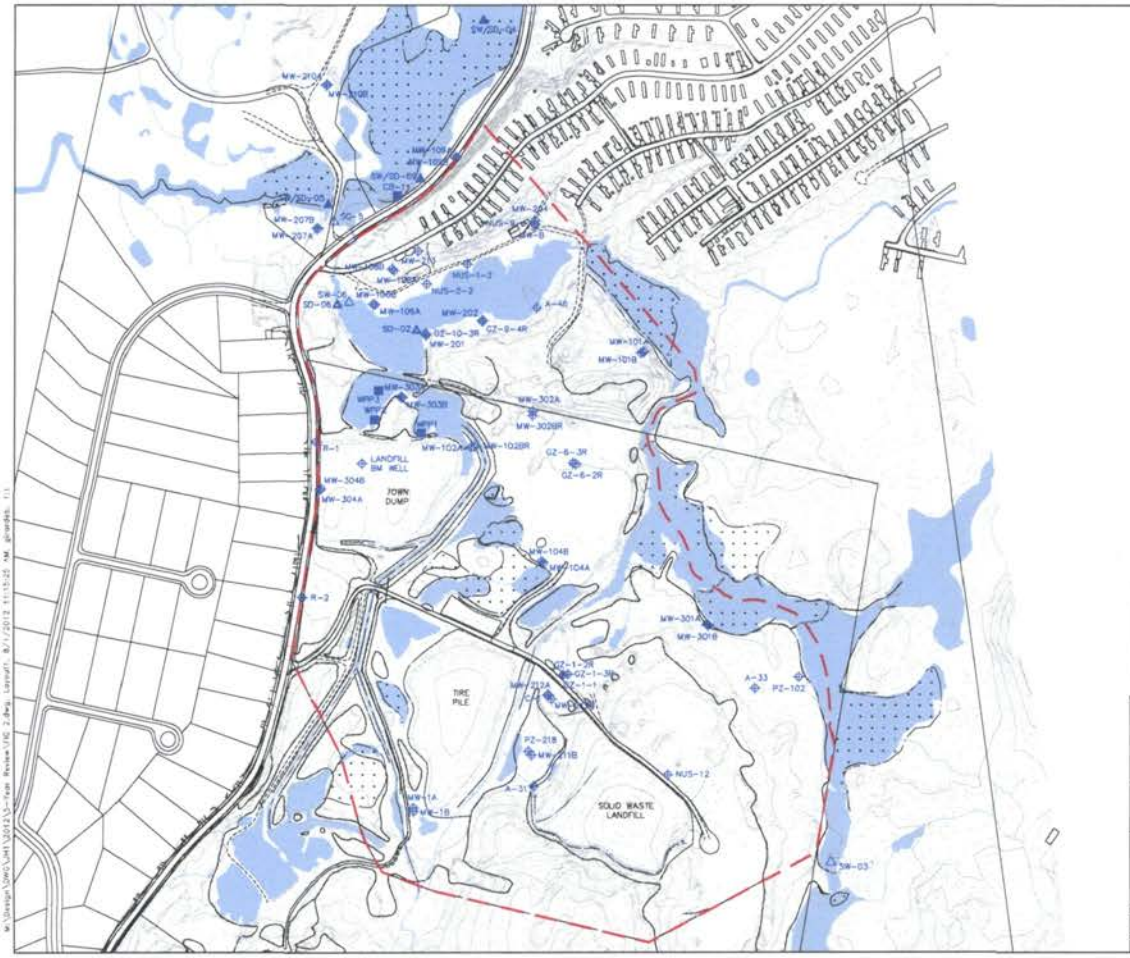


SOURCE:
TOPO! © 2011 NATIONAL GEOGRAPHIC

GRAPHIC SCALE
2000 1000 0 1000 2000
APPROXIMATE SCALE IN FEET

SITE LOCATION MAP	CONCORD				NEW HAMPSHIRE
5-YEAR REVIEW AUBURN ROAD LANDFILL LONDONDERRY, NEW HAMPSHIRE	DRAWN BEG	DATE JUL 2012	DES. ENG.	DATE	W.O. NO. 12438.001.022
	CHECKED	DATE	SCALE AS SHOWN	REVISION	FIGURE NO. 1

M:\Design\DWG\JH1\2012\5-Year Review\FIG 1.dwg, Layout1, 7/31/2012 4:42:50 PM, girardeb, 1:1



LEGEND

- MW-303B — MONITORING WELL LOCATION
- SD-02 — SEDIMENT (ONLY) SAMPLING LOCATION
- SW-06 — SURFACE WATER (ONLY) SAMPLING LOCATION
- SW/SD-04 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- WPP-3 — USGS PIEZOMETER LOCATION
- GMZ BOUNDARY

GRAPHIC SCALE

400 200 0 200 400

APPROXIMATE SCALE IN FEET

NOTES:

1. THE PLANAMETRICS AND TOPOGRAPHY SHOWN ON THIS PLAN ARE BASED ON AERIAL PHOTOGRAPHY DATED DECEMBER 21, 1997, AND COMPILED BY EAST COAST MAPPING, INC. IN FEBRUARY 1998 AND FEBRUARY 2007.
2. THE LOCATIONS AND ELEVATIONS OF THE MONITORING WELLS ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED IN FEBRUARY OF 2007 BY HOLDEN ENGINEERING AND SURVEYING, INC.
3. THE HORIZONTAL AND VERTICAL DATUMS FOR THE AERIAL MAPPING AND GROUND SURVEY ARE BASED ON NAD83 AND NGVD 29. ALL BEARINGS ARE BASED ON NH STATE PLANE COORDINATES GRID NORTH.

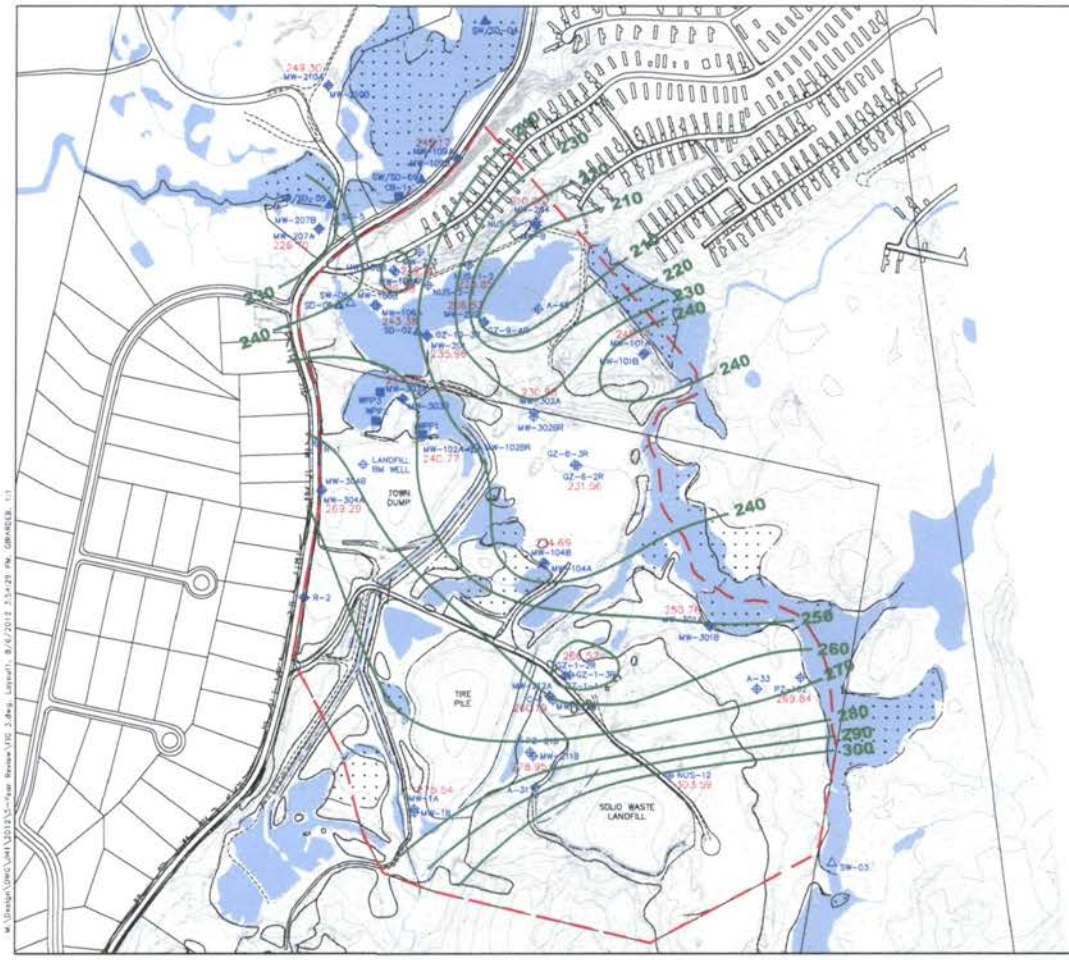
WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

SITE PLAN

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	2
CHECKED	W.O. No. 12438.001.022	



LEGEND

- MW-303B — MONITORING WELL LOCATION
- SD-02 — SEDIMENT (ONLY) SAMPLING LOCATION
- SW-08 — SURFACE WATER (ONLY) SAMPLING LOCATION
- SW/SD-04 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- WPP.5 — USGS PIEZOMETER LOCATION
- 231.56 — BEDROCK ELEVATION
- GMZ BOUNDARY
- 230 — BEDROCK ELEVATION CONTOUR

GRAPHIC SCALE

400 200 0 200 400

APPROXIMATE SCALE IN FEET

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1. THE PLANAMETRICS AND TOPOGRAPHY SHOWN ON THIS PLAN ARE BASED ON AERIAL PHOTOGRAPHY DATED DECEMBER 21, 1997, AND COMPILED BY EAST COAST MAPPING, INC. IN FEBRUARY 1998 AND FEBRUARY 2007.
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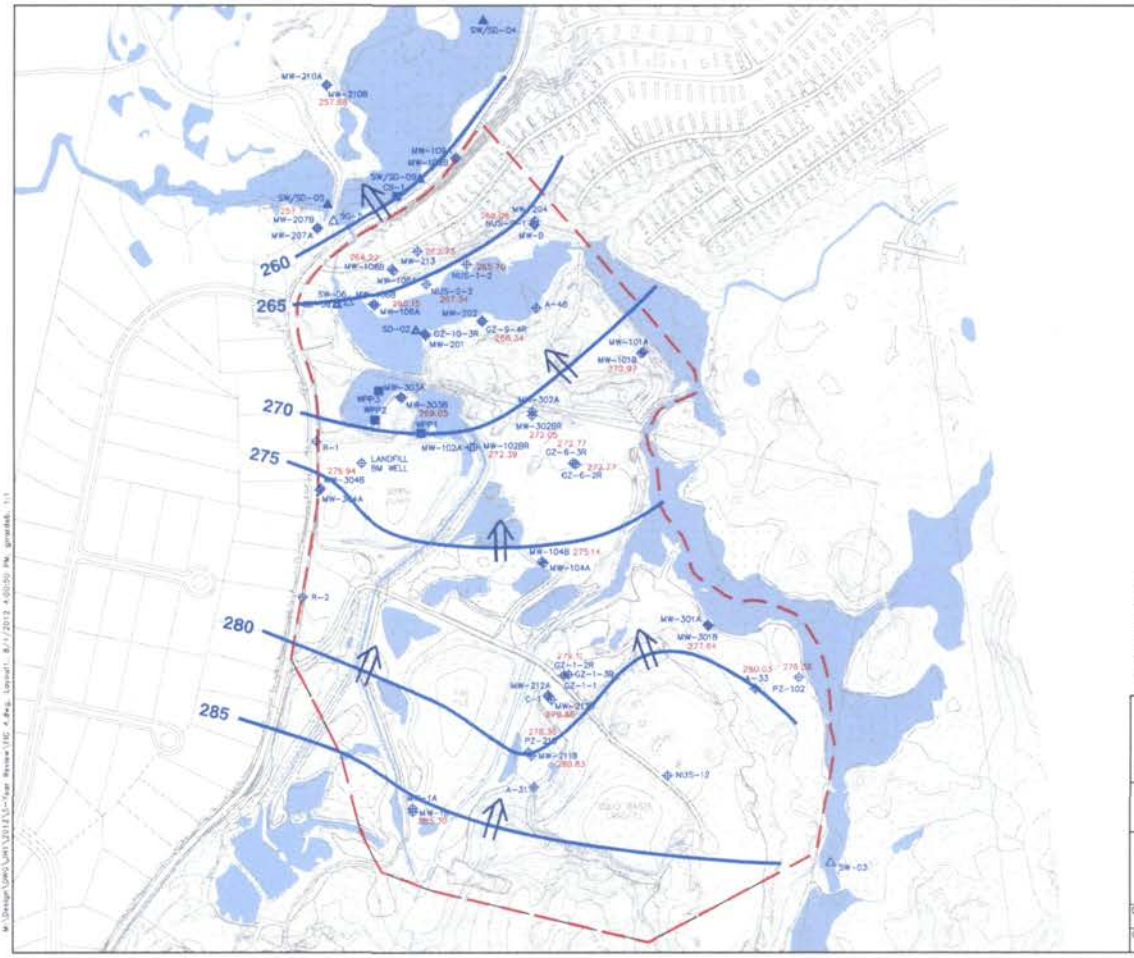
WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

BEDROCK ELEVATION CONTOUR PLAN

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	3
CHECKED	W.O. No. 12438.001.022	



LEGEND

- MW-303B — MONITORING WELL LOCATION
- SD-02 — SEDIMENT (ONLY) SAMPLING LOCATION
- SW-08 — SURFACE WATER (ONLY) SAMPLING LOCATION
- SW/SD-04 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- MPP3 — USGS PIEZOMETER LOCATION
- GMZ BOUNDARY
- 272.77 — GROUNDWATER ELEVATION
- 275 — GROUNDWATER CONTOUR LINE WITH ELEVATION
- ESTIMATED DIRECTION OF GROUNDWATER FLOW

GRAPHIC SCALE

400 200 0 200 400

APPROXIMATE SCALE IN FEET

NOTES:

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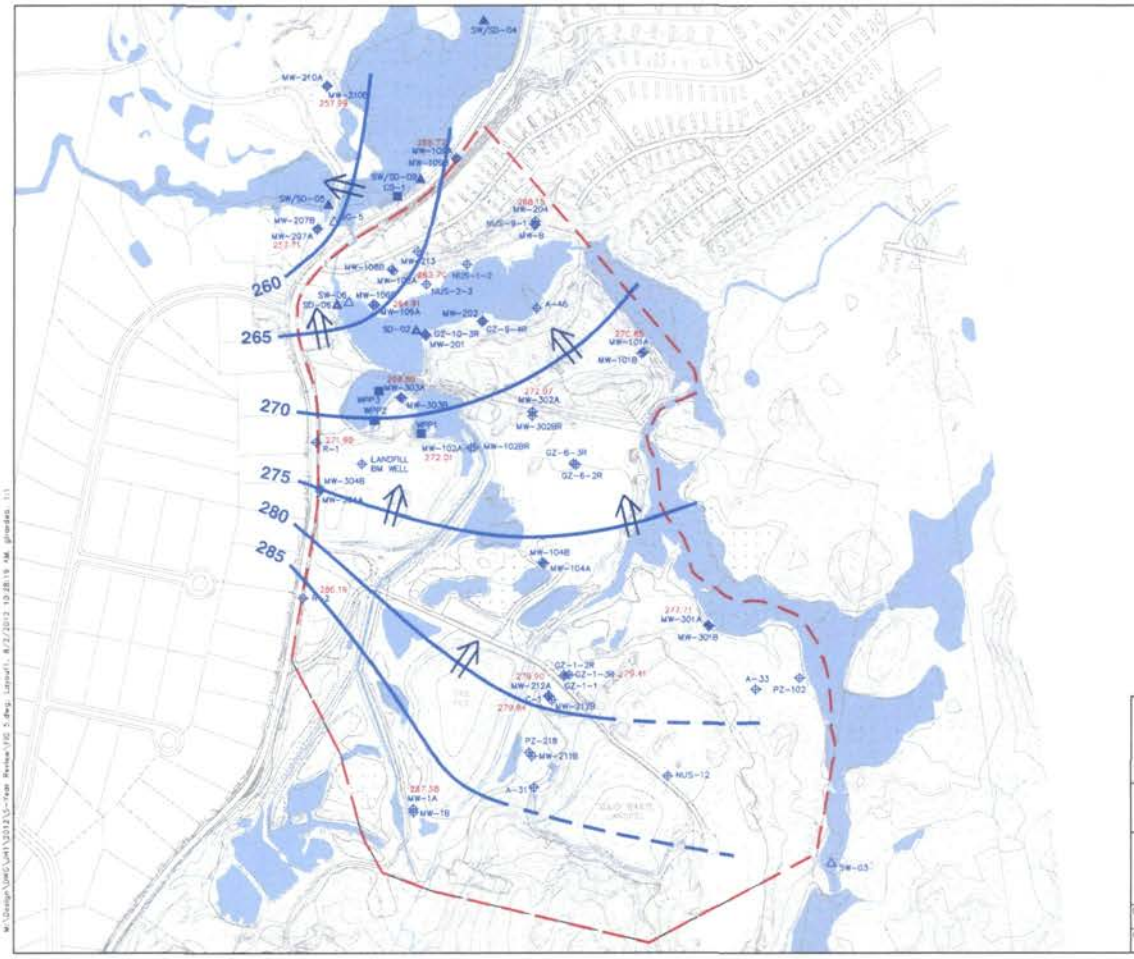
WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

OVERBURDEN GROUNDWATER POTENTIOMETRIC SURFACE MAP SUMMER 2012

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	4
CHECKED	W.O. No. 12438.001.022	



LEGEND

- MW-303B — MONITORING WELL LOCATION
- SD-03 — SEDIMENT (ONLY) SAMPLING LOCATION
- SW-06 — SURFACE WATER (ONLY) SAMPLING LOCATION
- SW/SD-04 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- WPF3 — USGS PIEZOMETER LOCATION
- GMZ BOUNDARY
- 272.01 — GROUNDWATER ELEVATION
- 275 — GROUNDWATER CONTOUR LINE WITH ELEVATION
- ESTIMATED DIRECTION OF GROUNDWATER FLOW

GRAPHIC SCALE

400 200 0 200 400

APPROXIMATE SCALE IN FEET

NOTES:

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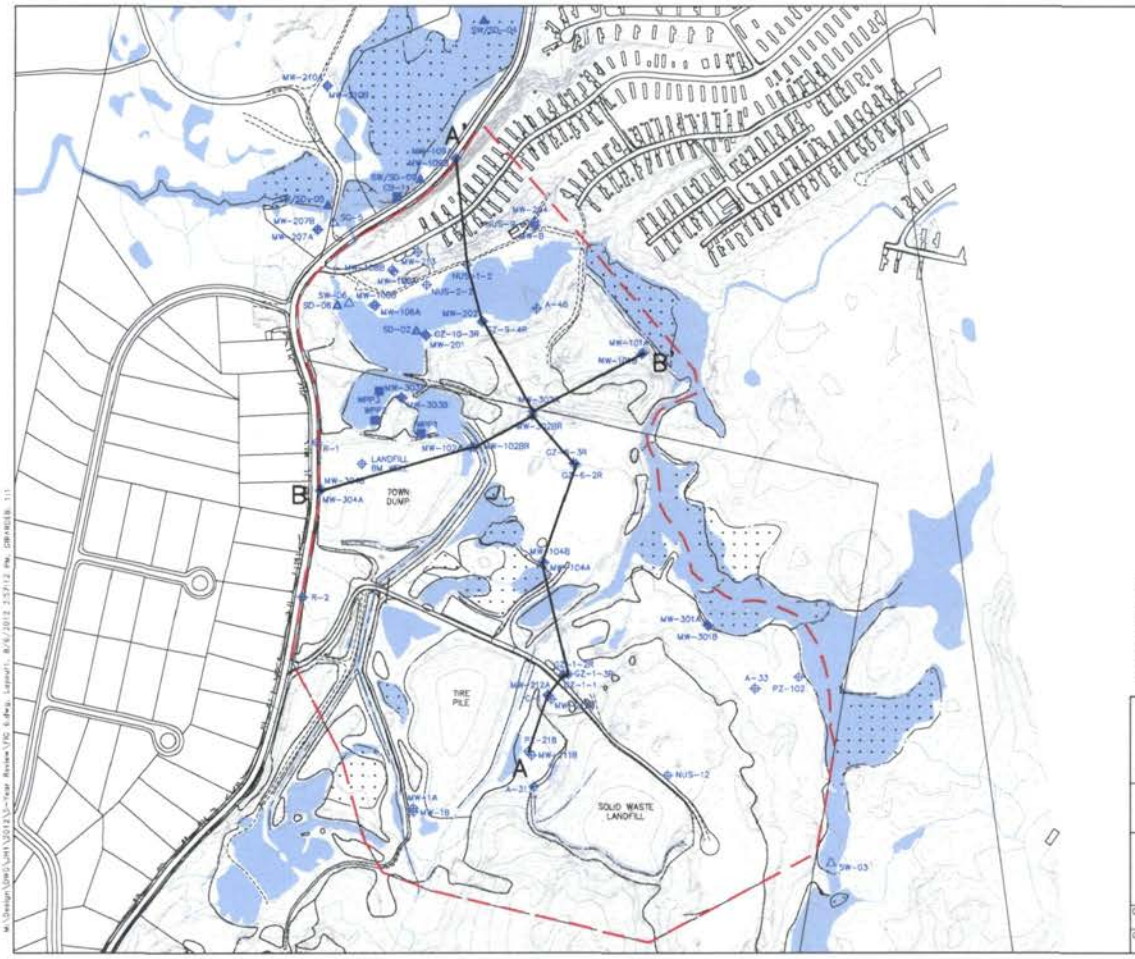
WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

BEDROCK GROUNDWATER POTENTIOMETRIC SURFACE MAP
SUMMER 2012

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	5
CHECKED	W.O. No. 12438.001.022	



LEGEND

- MW-303B — MONITORING WELL LOCATION
- SD-02 — SEDIMENT (ONLY) SAMPLING LOCATION
- SW-06 — SURFACE WATER (ONLY) SAMPLING LOCATION
- SW/SD-04 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- WPP3 — USGS PIEZOMETER LOCATION
- GMZ BOUNDARY

GRAPHIC SCALE

400 200 0 200 400

APPROXIMATE SCALE IN FEET

NOTES:

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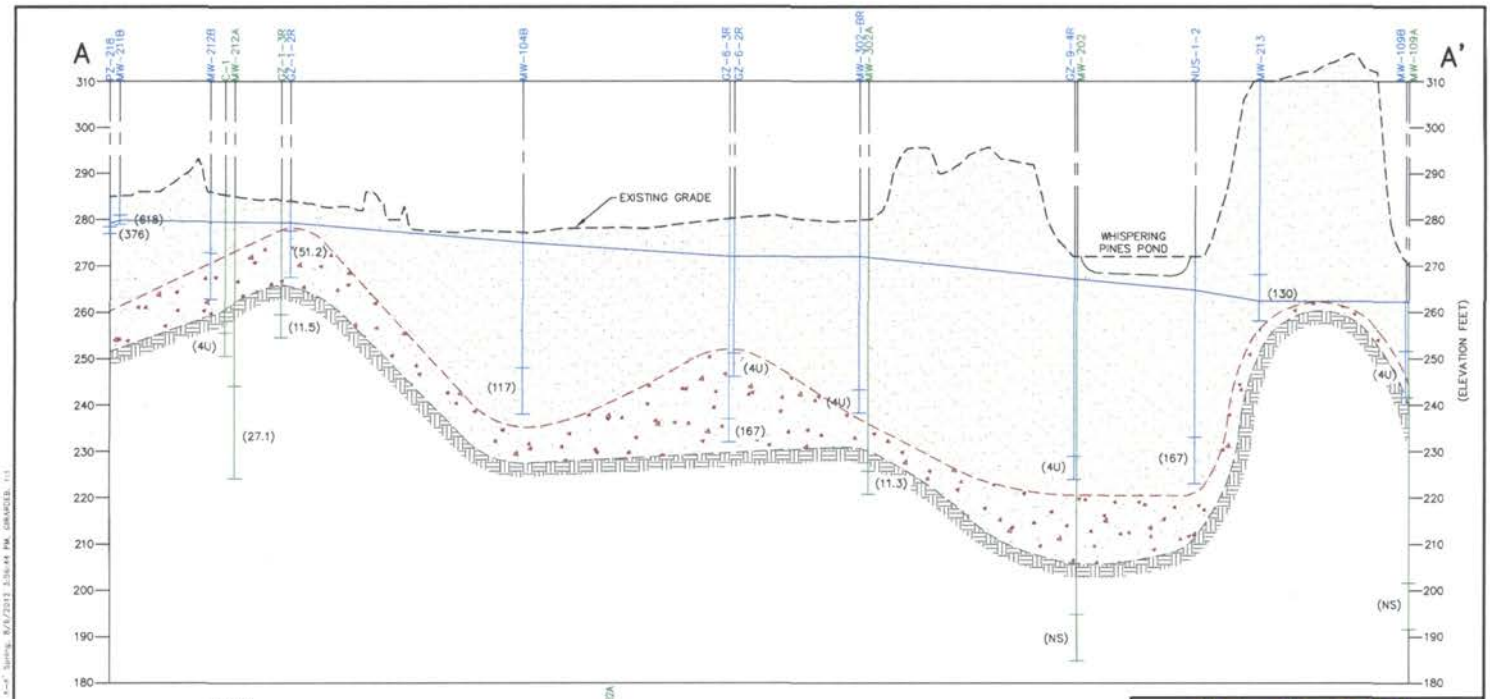
WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

CROSS SECTION PLAN VIEW

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	6
CHECKED	W.O. No. 12438.001.022	



LEGEND

MW-302B	OVERBURDEN MONITORING WELL
MW-302A	BEDROCK MONITORING WELL
	SAND
	TILL
	BEDROCK
	OVERBURDEN GROUNDWATER ELEVATION
(ND)	NOT DETECTED (<10 ug/L)
(NS)	NOT SAMPLED

MW-302A

WELL SCREEN

(5.9) ARSENIC CONCENTRATION ug/L

GRAPHIC SCALE

200 100 0 100 200

APPROXIMATE HORIZONTAL SCALE IN FEET

VERTICAL EXAGGERATION 10X

NOTES:
SCREEN LENGTH AT MONITORING WELL LOCATION NUS-1-2 IS UNKNOWN. SHOWN AT AN ASSUMED LENGTH OF 10 FEET.

WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

HYDROGEOLOGIC CROSS SECTION A-A'
SUMMER 2012

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	7
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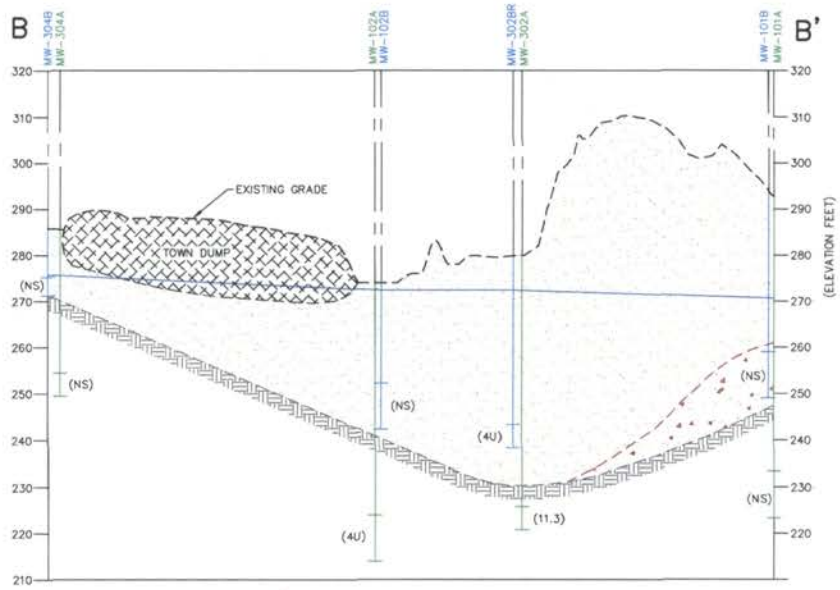

GRAPHIC SCALE

200 100 0 100 200

APPROXIMATE HORIZONTAL SCALE IN FEET

VERTICAL EXAGGERATION 10X

LEGEND

MW-304B OVERBURDEN MONITORING WELL

MW-304A BEDROCK MONITORING WELL

SAND

TILL

BEDROCK

OVERBURDEN GROUNDWATER ELEVATION (DASHED WHERE INFERRED)

(ND) NOT DETECTED (<10 ug/L)

(NS) NOT SAMPLED

NOTES:
DEPTH OF BOTTOM OF TOWN DUMP BASED ON FORMER PIEZOMETER INFORMATION.

WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

HYDROGEOLOGIC CROSS SECTION B–B'
SUMMER 2012

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	8
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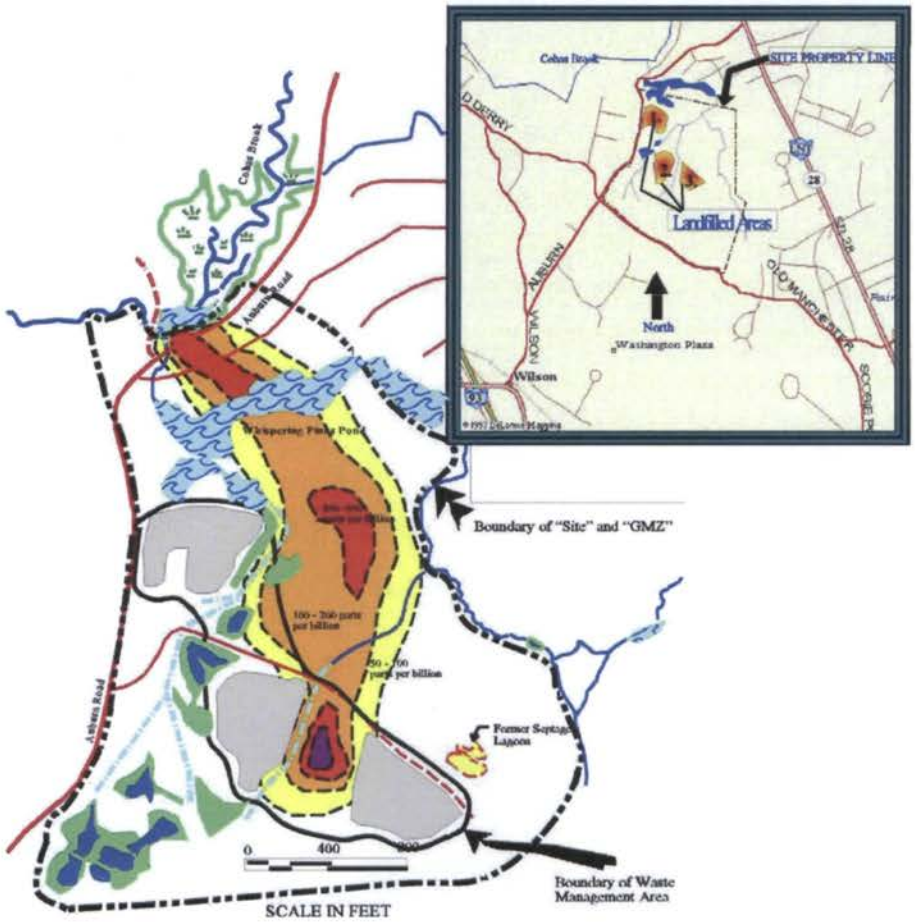


SOURCE:

FIGURE FROM THE 2002 FIVE-YEAR REVIEW SHOWING ARSENIC PLUME BASED ON THE 1999 CONSENT DECREE.

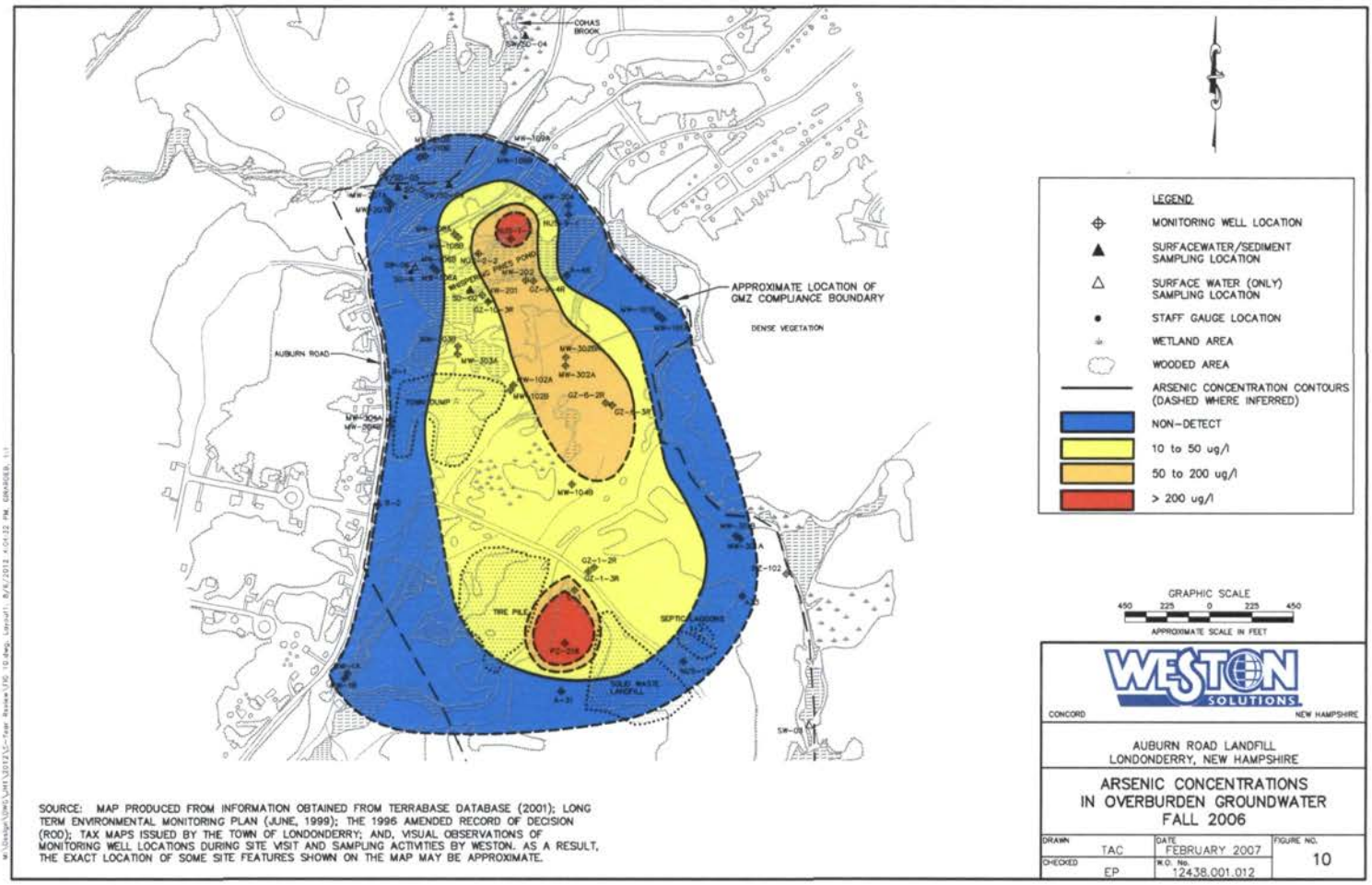
WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

ARSENIC CONCENTRATIONS IN GROUNDWATER 1995

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	9
CHECKED	W.O. No. 12438.001.022	

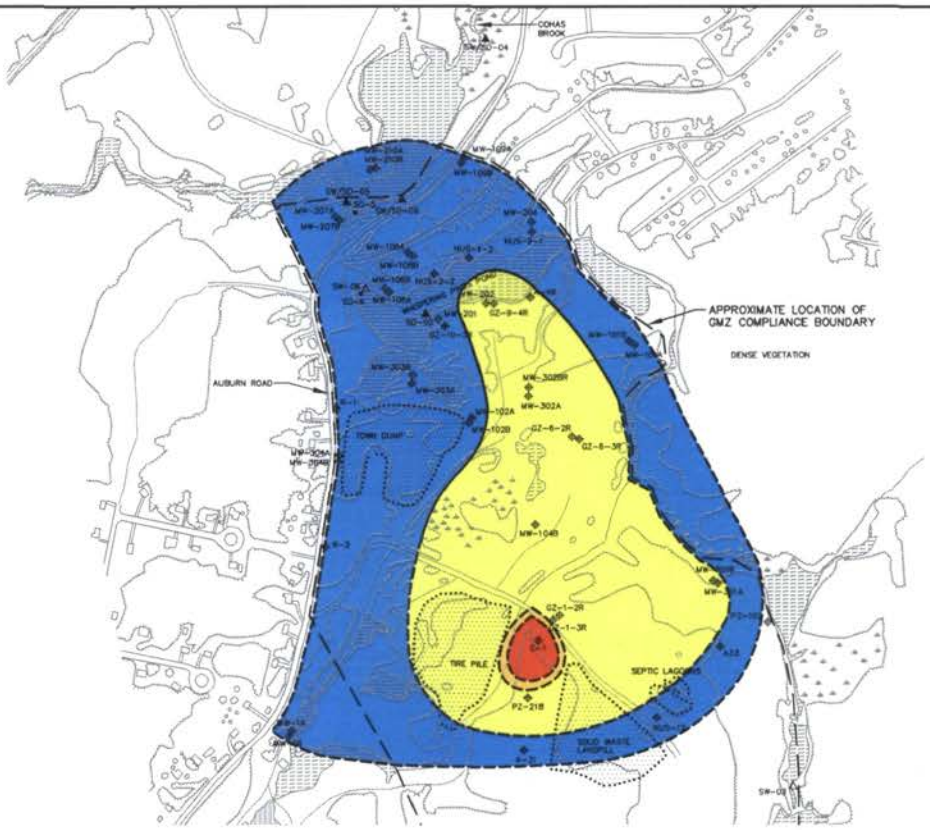


SOURCE: MAP PRODUCED FROM INFORMATION OBTAINED FROM TERRABASE DATABASE (2001); LONG TERM ENVIRONMENTAL MONITORING PLAN (JUNE, 1999); THE 1996 AMENDED RECORD OF DECISION (ROD); TAX MAPS ISSUED BY THE TOWN OF LONDONDERRY; AND, VISUAL OBSERVATIONS OF MONITORING WELL LOCATIONS DURING SITE VISIT AND SAMPLING ACTIVITIES BY WESTON. AS A RESULT, THE EXACT LOCATION OF SOME SITE FEATURES SHOWN ON THE MAP MAY BE APPROXIMATE.

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

ARSENIC CONCENTRATIONS IN OVERBURDEN GROUNDWATER FALL 2006

DRAWN	DATE	FIGURE NO.
TAC	FEBRUARY 2007	10
CHECKED EP	W.O. No. 12438.001.012	



LEGEND

- MONITORING WELL LOCATION
- SURFACEWATER/SEDIMENT SAMPLING LOCATION
- SURFACE WATER (ONLY) SAMPLING LOCATION
- STAFF GAUGE LOCATION
- WETLAND AREA
- WOODED AREA
- ARSENIC CONCENTRATION CONTOURS (DASHED WHERE INFERRED)
- NON-DETECT
- 10 to 50 ug/l
- 50 to 200 ug/l
- > 200 ug/l

GRAPHIC SCALE

450 225 0 225 450

APPROXIMATE SCALE IN FEET

SOURCE: MAP PRODUCED FROM INFORMATION OBTAINED FROM TERRABASE DATABASE (2001); LONG TERM ENVIRONMENTAL MONITORING PLAN (JUNE, 1999); THE 1996 AMENDED RECORD OF DECISION (ROD); TAX MAPS ISSUED BY THE TOWN OF LONDONDERRY; AND, VISUAL OBSERVATIONS OF MONITORING WELL LOCATIONS DURING SITE VISIT AND SAMPLING ACTIVITIES BY WESTON. AS A RESULT, THE EXACT LOCATION OF SOME SITE FEATURES SHOWN ON THE MAP MAY BE APPROXIMATE.

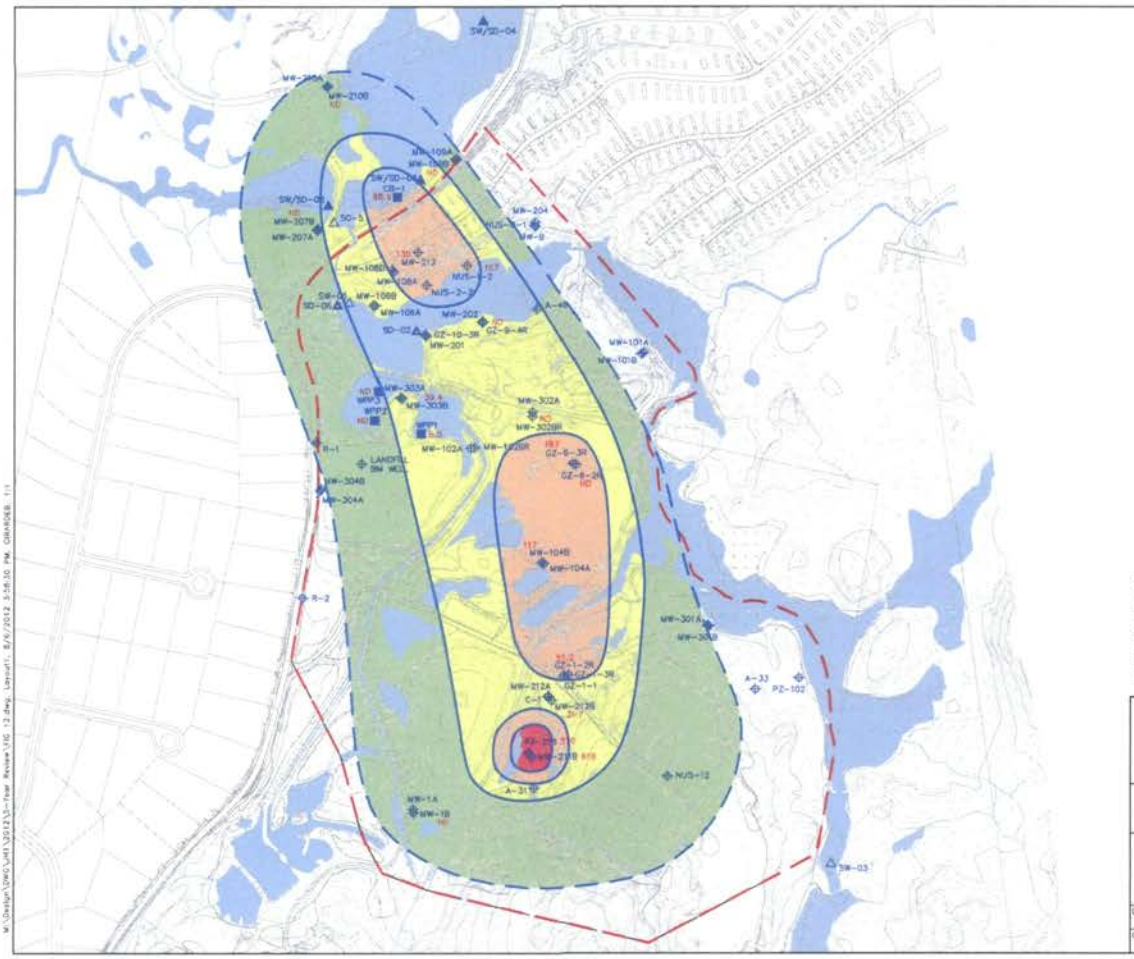
WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

ARSENIC CONCENTRATIONS IN BEDROCK GROUNDWATER FALL 2006

DRAWN	TAC	DATE FEBRUARY 2007	FIGURE NO.
CHECKED	EP	W.O. No. 12438.001.012	11



LEGEND

- MW-303B — MONITORING WELL LOCATION
- SD-02 — SEDIMENT (ONLY) SAMPLING LOCATION
- SW-06 — SURFACE WATER (ONLY) SAMPLING LOCATION
- SW/SD-04 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- WPP3 — USGS PIEZOMETER LOCATION
- 171 — ARSENIC CONCENTRATION
- GMZ BOUNDARY
- ARSENIC CONCENTRATION CONTOUR (DASHED WHERE INFERRED)
- NON-DETECT (<10 ug/L)
- 10-50 ug/L
- 50-200 ug/L
- > 200 ug/L
- NO DATA AVAILABLE

GRAPHIC SCALE

400 200 0 200 400

APPROXIMATE SCALE IN FEET

NOTES:

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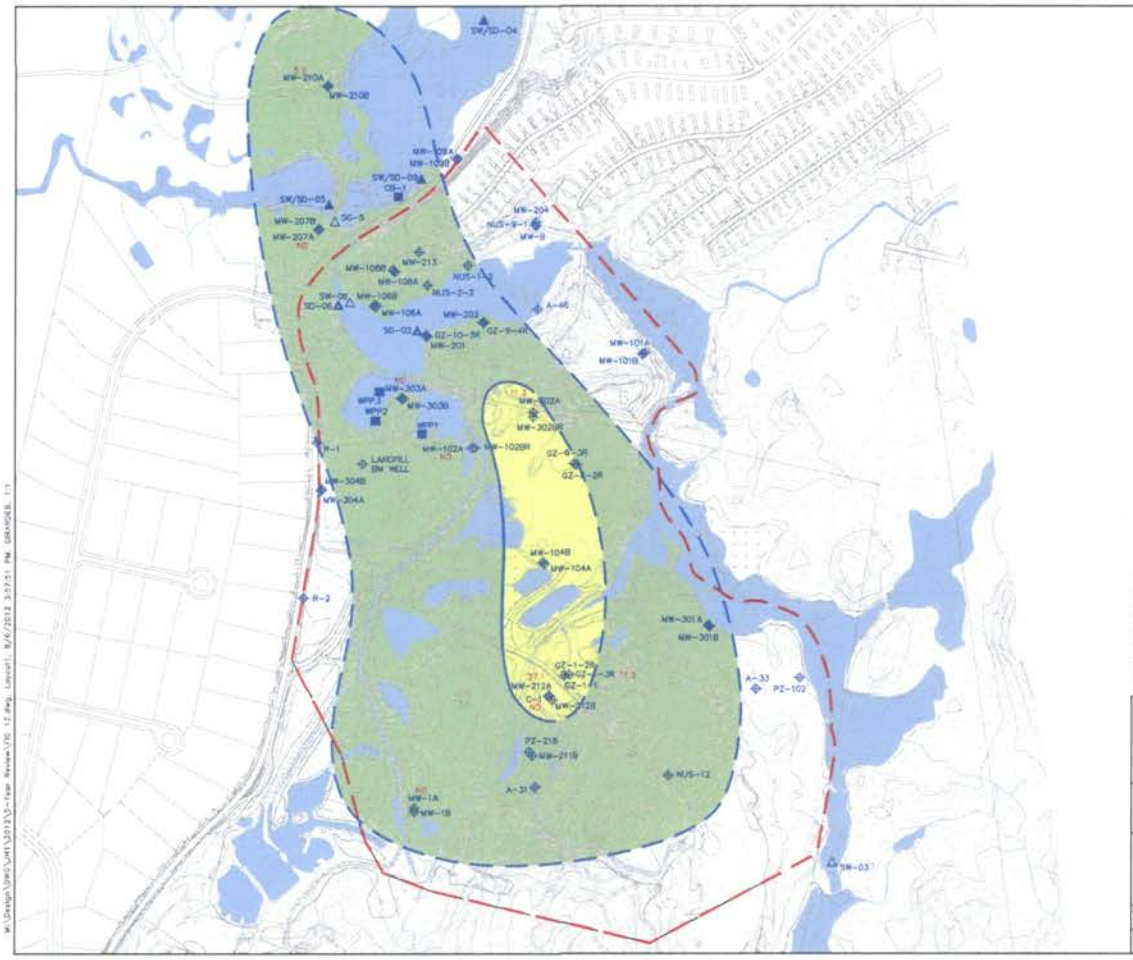
WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

ARSENIC CONCENTRATIONS IN OVERBURDEN GROUNDWATER SUMMER 2012

DRAWN	DATE	FIGURE NO.
BEG	JUL 2012	12
CHECKED	W.O. No. 12438.001.022	



LEGEND

- MW-303B — MONITORING WELL LOCATION
- SD-02 — SEDIMENT (ONLY) SAMPLING LOCATION
- SW-06 — SURFACE WATER (ONLY) SAMPLING LOCATION
- SW/SD-04 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- WPP3 — USGS PIEZOMETER LOCATION
- 27.1 — ARSENIC CONCENTRATION
- GMZ BOUNDARY
- ARSENIC CONCENTRATION CONTOUR (DASHED WHERE INFERRED)
- NON-DETECT (<10 ug/L)
- 10-50 ug/L
- 50-200 ug/L
- > 200 ug/L
- NO DATA AVAILABLE

GRAPHIC SCALE

400 200 0 200 400

APPROXIMATE SCALE IN FEET

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WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL
LONDONDERRY, NEW HAMPSHIRE

ARSENIC CONCENTRATIONS IN BEDROCK GROUNDWATER SUMMER 2012

DRAWN	DATE	FIGURE NO.
BCG	JUL 2012	13
CHECKED	W.O. No. 12438.001.022	

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APPENDIX A

MODIFIED GROUNDWATER MANAGEMENT PERMIT (JULY 2008)

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The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

July 10, 2008

Auburn Road Performing Parties Group (ARPPG)
c/o Joanne Wallach, Project Manager
ExxonMobil Refinery and Company
3225 Gallows Road, RM 8B 0830
Fairfax, VA 22037

SUBJECT: **Londonderry** – Auburn Road Landfill Superfund Site
DES Site # 198803007, Project RSN # 506

Modified Groundwater Management Permit Number GWP-198803007-L-001

Dear Ms. Wallach:

Please find enclosed revised Groundwater Management Permit Number GWP-198803007-L-001, approved by the Department of Environmental Services (Department). This permit has been modified to reflect the addition of Special Condition # 12 to the permit. In the absence of a right to access Simard's property within the Groundwater Management Zone, the ARPPG has not obtained the legal right from the property owner to allow any authorized staff of the Department, or its agent, to enter the property covered by the permit for the purpose of collecting groundwater samples, or undertaking other action associated with the permit. On the basis outlined in the Department's modification letter dated February 19, 2008, the permit is modified with the following actions:

- Consistent with the terms of the 2000 consent decree, Part IX, ARPPG shall use its best efforts to obtain an enforceable access agreement to the Simard property, such efforts to include, without limitation, the payment of money and, to the extent necessary, the commencement and prosecution of litigation against the Simard Family Trust. If ARPPG has not secured an enforceable access agreement by September 1, 2008, ARPPG shall promptly notify the Department in writing, and shall include in that notification a summary of the steps that ARPPG has taken to attempt to comply with this requirement of the permit.

All monitoring summaries and all required sampling results must be submitted to the Groundwater Management Permits Coordinator at the address below. All correspondence shall contain a cover letter that clearly shows the Department identification number for the site (DES Site # 198803007). **Please note that upon issuance of this permit, it is only necessary to submit monitoring results to the "Groundwater Management Permits Coordinator" and not to my attention.**

Also, please note that Condition # 10 requires the permit holder to record "Notice" of the permit (not the permit), within 60 days of issuance, at the registry of deeds in the chain of title for the lot(s) within the GMZ. However, due to the timeframe in Condition # 10 already satisfied in the original permit, the Department requires the immediate recordation of the Notice of the original

permit. A copy of the recorded Notice shall be submitted to the Department within 30 days of recordation.

All other conditions of the original permit as issued on October 30, 2007 remain unchanged at this time.

Should you have any questions, please contact me at the Waste Management Division.

Sincerely,

Thomas C. Andrews, P.E.
Hazardous Waste Remediation Bureau
Tel: (603) 271-2910
Fax: (603) 271-2181
Email: thomas.andrews@des.nh.gov

Enclosure(s): Permit GWP-198803007-L-001

cc: Dean Brammer, Weston Solutions, Inc.
Byron Mah, USEPA
Alan G. Simard, Simard Family Trust
David Caron, Town Manager
Londonderry Health Officer

The

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

hereby issues

GROUNDWATER MANAGEMENT PERMIT NO. GWP-198803007-L-001

as revised

to the permittee

AUBURN ROAD PERFORMING PARTIES GROUP (ARPPG)

to monitor the past discharge of

Arsenic and VOCS

at

AUBURN ROAD LANDFILL SUPERFUND SITE
(88 Auburn Road)

in LONDONDERRY, N.H.

via the groundwater monitoring system comprised of

Thirty (30) monitoring wells, Five (5) surface water monitoring locations, and
Four (4) sediment monitoring locations

as depicted on the Site Plan entitled: NHDES Groundwater Management Zone (GMZ)

dated August 15, 2007, prepared by Weston Solutions, Inc.

TO: *AUBURN ROAD PERFORMING PARTIES GROUP*
3225 GALLOWS ROAD, RM 8B 0830
FAIRFAX, VA 22037

Date of Issuance: October 30, 2007
Date of Revision (1): November 26, 2007
Date of Revision (2): July 10, 2008
Date of Expiration: October 29, 2012

Pursuant to authority in N.H. RSA 485-C:6-a, the New Hampshire Department of Environmental Services (Department), hereby grants this permit to monitor past discharges to the groundwater at the above described location for five years subject to the following conditions:

(continued)

STANDARD MANAGEMENT PERMIT CONDITIONS

1. The permittee shall not violate Ambient Groundwater Quality Standards adopted by the Department (N.H. Admin. Rules Env-Or 600) in groundwater outside the boundaries of the Groundwater Management Zone, as shown on the referenced site plan.

2. The permittee shall not cause groundwater degradation that results in a violation of surface water quality standards (N.H. Admin. Rules Env-Ws 1700) in any surface water body.

3. The permittee shall allow any authorized staff of the Department, or its agent, to enter the property covered by this permit for the purpose of collecting information, examining records, collecting samples, or undertaking other action associated with this permit.

4. The permittee shall apply for the renewal of this permit at least 90 days prior to its expiration date.

5. This permit is transferable only upon written request to, and approval of, the Department. Compliance with the existing Permit shall be established prior to permit transfer. Transfer requests shall include the name and address of the person to whom the permit transfer is requested, signature of the current and future permittee, and a summary of all monitoring results to date.

6. The Department reserves the right, under N.H. Admin. Rules Env-Or 600, to require additional hydrogeologic studies and/or remedial measures if the Department receives information indicating the need for such work.

7. The permittee shall maintain a water quality monitoring program and submit monitoring results to the Department's Groundwater Management Permits Coordinator no later than 45 days after sampling. Samples shall be taken from on-site and off-site monitoring wells, surface water sampling points and sediment sampling points as shown and labeled on the referenced site plan and other sampling points listed on the following table in accordance with the schedule outlined herein:

Monitoring Locations	**Sampling Frequency**	**Parameters**
Monitoring Wells: GZ-1-2R, GZ-1-3R, GZ-6-2R, GZ-6-3R, GZ-9-4R, MW-1B, MW-109B, MW-207B, MW-210B, MW-302BR, MW-303B, NUS-1-2, PZ-218, C-1, MW-1A, MW-207A, MW-210A, & MW-302A	April & October each year	Arsenic & Static Water Level Elevation
MW-101B, MW-106B, MW-108B, NUS-9-1, MW-101A, MW-106A, MW-108A, MW-109A, & MW-204	October each year	Arsenic & Static Water Level Elevation

(continued)

Monitoring Locations	**Sampling Frequency**	**Parameters**
GZ-1-3R & NUS-1-2	October each year	NHDES Waste Management Division Full List of Analytes for Volatile Organics (VOC Full List)
NUS-2-2	October each year	Arsenic, VOC Full List & Static Water Level Elevation
MW-102A & MW-303A	April & October each year	Arsenic, VOC Full List & Static Water Level Elevation
Surface Water Points: SW-3, SW-4, SW-5, SW-6, & SW-9 (filtered & unfiltered)	April & October each year	Arsenic
Sediment Sampling Points: SD-2, SD-4, SD-5, & SD-9	October each year	Arsenic & Toxicity

Sampling shall be performed in accordance with the documents listed in Env-Or 610.02 (e). Samples shall be analyzed by a laboratory certified by the U.S. Environmental Protection Agency or the New Hampshire Department of Environmental Services. It is proposed the GMZ water quality monitoring program will be conducted in conjunction with the Auburn Road Landfill Long-Term Environmental Monitoring Program (LTEMP). The LTEMP defines in detail the sampling and data-gathering methods to be used on the Auburn Road Landfill project.

Summaries of water quality shall be submitted annually to the Department's Waste Management Division, attention Groundwater Management Permits Coordinator, in the month of December using a format acceptable to the Department. The Summary Report shall include the information listed in Env-Or 607.04 (a), as applicable.

The Annual Summary Report shall be prepared and stamped by a professional engineer or professional geologist licensed in the State of New Hampshire.

8. Issuance of this permit is based on the Groundwater Management Permit Application dated May 15, 2007 and the historical documents found in the Department file DES Site # 198803007. The Department may require additional hydrogeologic studies and/or remedial measures if invalid or inaccurate data are submitted.

9. Within 30 days of the date of Department approval of this Groundwater Management Permit, the permittee shall provide notice of the permit by certified mail, return receipt requested, to all owners of lots of record within the Groundwater Management Zone. The permittee shall submit documentation of this notification to the Department within 60 days of permit issuance.

(continued)

10. Within 60 days of the date of Department approval of this Groundwater Management Permit, the permit holder shall record notice of the permit in the registry of deeds in the chain of title for the **lots** within the Groundwater Management Zone. **This recordation requires that the registry be provided with book and page numbers for the deed of each lot encumbered by this permit. Portions of State/Town/City roadways and associated right-of-way properties within the Groundwater Management Zone do not require recordation.** A copy of the recorded notice shall be submitted to the Department within 30 days of recordation.

11. Within 30 days of discovery of a violation of an ambient groundwater quality standard at or beyond the Groundwater Management Zone boundary, the permittee shall notify the Department in writing. Within 60 days of discovery, the permittee shall submit recommendations to correct the violation. The Department shall approve the recommendations if the Department determines that they will correct the violation.

SPECIAL CONDITIONS FOR THIS PERMIT

12. Consistent with the terms of the 2000 consent decree, Part IX, ARPPG shall use its best efforts to obtain an enforceable access agreement to the Simard property, such efforts to include, without limitation, the payment of money and, to the extent necessary, the commencement and prosecution of litigation against the Simard Family Trust. If ARPPG has not secured an enforceable access agreement by September 1, 2008, ARPPG shall promptly notify the Department in writing, and shall include in that notification a summary of the steps that ARPPG has taken to attempt to comply with this requirement of the permit.

13. Recorded property within the Groundwater Management Zone shall include the lots as listed and described in the following table:

Tax Map/ Lot #	**Property Address**	**Owner Name and Address**	**Deed Reference (Book/Page)**
Map 18 Lot 33	Simard Family Trust P.O. Box 85 Derry, NH 03038	Simard Family Trust P.O. Box 85 Derry, NH 03038	Book 2772 Page 761
Map 16 Lot 23	Town of Londonderry 268B Mammoth Rd. Londonderry, NH 03053	Town of Londonderry 268B Mammoth Rd. Londonderry, NH 03053	Book 3524 Page 1485

14. All monitoring wells at the site shall be properly maintained and secured from unauthorized access or surface water infiltration.

Carl W. Baxter, P.E., Administrator
Hazardous Waste Remediation Bureau
Waste Management Division

Under RSA 21-0:14 and 21-0:9-V, any person aggrieved by any terms or conditions of this permit may appeal to the Waste Management Council in accordance with RSA 541-A and N.H. Admin. Rules, Env-WMC 200. Such appeal must be made to the Council within 30 days and must be addressed to the Chairman of the Waste Management Council, c/o Appeals Clerk, Department of Environmental Services Legal Unit, 29 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095.

GWP-198803007-L-001

APPENDIX B

2012 INSPECTION CHECKLIST

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Auburn Road Landfill	**Date of inspection:** 7/30/12
Location and Region: Londonderry, NH; EPA Region I	**EPA ID:** NHD980524086 **NH Site ID:** 0101137
Agency, office, or company leading the five-year review inspection: Ken Richards, NHDES	**Weather/temperature:** 80° Sunny

Remedy Includes: (Check all that apply)

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

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** John R. Trottier, P.E. (Name) Asst Dir. of Public Works and Eng. (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☑ by phone Phone no. (603) 432-1100 ext 146
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐Report attached _____

Site Inspection Checklist (Continued)

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 NHDES
Contact Kenneth Richards | Project Manager | 7/30/12 | _____
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 _____

Agency _____
Contact _____ | _____ | _____ | _____
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached _____

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

Site Inspection Checklist (Continued)

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 Passive vents			
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			

Site Inspection Checklist (Continued)

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 (Date)	To (Date)	Total cost	
2007	2008	75,000	☐ Breakdown attached
2008	2009	75,000	☐ Breakdown attached
2009	2010	75,000	☐ Breakdown attached
2010	2011	75,000	☐ Breakdown attached
2011	2012	75,000	☐ Breakdown attached

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 Fencing does not extend around entire landfill. Fencing primarily limits access by ATVs and no fencing is present in heavily wooded areas.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks No issues

Site Inspection Checklist (Continued)

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) Visual inspections
Frequency Periodic
Responsible party/agency PRPs
Contact Steve Anastos — Project Manager, ExxonMobil — (703) 846-3393
Name — Title — Phone no.
John Trottier — Town of Londonderry — (603) 432-1100
Name — Title — 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
Institution controls have been in place through the Consent Decree that binds the Town in maintaining ICs on the property (Site). The groundwater PRP have established a Groundwater Management Zone (GMZ) on the Site and affected adjacent property to the north.

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 No vandalism evident on landfills. Evidence present of trespassing with ATVs on roadways and in gravel pit.

2. **Land use changes on site** ☐ N/A
Remarks Town has lease agreement with a tenant (model airplane club) to utilize the property for passive recreational activities.

3. **Land use changes off site** ☑ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

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

Site Inspection Checklist (Continued)

B. Other Site Conditions

Remarks _____

_____

_____

VII. LANDFILL COVERS ☑ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☑ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☑ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

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

4. **Holes** ☐ Location shown on site map ☑ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☑ Grass ☑ Cover properly established ☑ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

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_____

Site Inspection Checklist (Continued)

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_____		

Site Inspection Checklist (Continued)

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__Minimal vegetation growth developing in rip/rap drainage swales at some locations.

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_____

Site Inspection Checklist (Continued)

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_____

Site Inspection Checklist (Continued)

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 Approx. 2,000 linear feet of swales Type Misc. shrubs, grasses
   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_____

Site Inspection Checklist (Continued)

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

Site Inspection Checklist (Continued)

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.
_Some protective casings are damaged and locks are missing/rusted shut at a few locations._____

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.).

_____
_____
_____
_____
_____
_____

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.

_____
_____
_____
_____

Site Inspection Checklist (Concluded)

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. _____ _____ _____ _____ _____ _____ _____ _____ _____
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. _____ _____ _____ _____ _____ _____ _____

APPENDIX C

PHOTOGRAPHS DOCUMENTING SITE CONDITIONS

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Photo 1 – View of Town Dump facing west.

Photo 2 – View of Town Dump Western Boundary Along Auburn Road

Photo 3 – View of Tire Pile Area

Photo 4 – View of Fence at Tire Pile Area

Photo 5 – View of Solid Waste Area Facing South

Photo 6 – View of Solid Waste Area Rip-Rap Swale Facing North

Photo 7 – View of Access Gate Between Downgradient Property and Landfill Area

Photo 8 – View of Culvert Directing Flow Into Whispering Pines Pond.

Photo 9 – View of Whispering Pines Pond and SW-6 Sample Area

Photo 10 – View Downgradient from SW-6 Facing Cohas Brook

Photo 11 – View of Former Production Well For Whispering Pines Mobile Home Village

Photo 12 – View of Former Pump House for Production Wells

APPENDIX D

SUPPLEMENTAL INTERVIEW ATTACHMENTS/SUPPORT DOCUMENTATION

INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Mr. John Trottier, PE	Assistant Director of Public Works and Engineering	Town of Londonderry	7/30/12

INTERVIEW RECORD

Site Name: Auburn Road Landfill Superfund Site	**EPA ID No.:** NHD980524086	
Subject: ARLF 5-Year Review	**Time:** 14:00	**Date:** 7/30/12
Type: ▫ **Telephone** ▫ Visit ▫ Other **Location of Visit:**	▫ **Incoming** ▫ Outgoing	

Contact Made By:

Name: Andrew M. Fuller	**Title:** Project Geoscientist	**Organization:** Weston Solutions, Inc.

Individual Contacted:

Name: John R. Trottier, P.E.	**Title:** Assistant Director of Public Works and Engineering	**Organization:** Town of Londonderry, NH

Telephone No: (603) 432-1100 ext 146 **Fax No:** (603) 432-1128 **E-Mail Address:** jrtrottier@londonderrynh.org	**Street Address:** 268B Mammoth Road **City, State, Zip:** Londonderry, NH 03053

Summary Of Conversation

In the ten years that Mr. Trottier has been involved with the Auburn Road Landfill site, his overall impression is that things are going well. He is unaware of any negative effects site operations have had on the surrounding community and is unaware of any particular concerns that the community has regarding the site or its operation. Mr. Trottier is not aware of any events, incidents, or activities that have occurred at the site such as vandalism, trespassing or emergency responses from local authorities with the exception of people occasionally trespassing with all-terrain vehicles (ATVs). He believes that the local police department now has an ATV that allows them to patrol the area when complaints are made by surrounding residents. Mr. Trottier indicated that he visits the site approximately once monthly to inspect the landfills, and he will stop by if he notices the gate to the site is open when driving. Mr. Trottier indicated that he feels well informed about the site's activities and progress and did not have any comments, suggestions, or recommendations regarding the Site's management or operation.

Weston Solutions, Inc.
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Concord, New Hampshire 03301
603-656-5400 • Fax 603-656-5401
www.westonsolutions.com

The Trusted Integrator for Sustainable Solutions

11 September 2012

Mr. Byron Mah
US Environmental Protection Agency - New England
John W. McCormack Building
5 Post Office Square, Mail Code: OSRR07-1
Boston, MA 02109

Work Order No. 12438.001.016

Re: Fifth Five -Year Review-Support Documentation
Auburn Road Landfill Superfund Site
Londonderry, New Hampshire
NHDES Site No. 198803007

Dear Mr. Mah:

Weston Solutions, Inc. (WESTON®) has prepared this letter for the Auburn Road Performing Party Group (ARPPG) in support of the fifth five-year review for the Auburn Road Landfill Superfund Site (Site) in Londonderry, New Hampshire. On 28 August 2012, U.S. Environmental Protection Agency (EPA) personnel contacted WESTON to provide supporting information to document conditions for the risk assessment component of the fifth five-year review.

Information requested was related to potential impacts to sensitive receptors downgradient of the Site and newly installed U.S. Geological Survey (USGS) piezometer CB-1 (Figure 1). This piezometer was installed in May 2012 and analytical data collected in July and August 2012 indicated that arsenic exceeded its New Hampshire Department of Environmental Services (NHDES) Ambient Groundwater Quality Standard (AGQS).

Recreational Use of Cohas Brook Area (Boating/Fishing/Hunting)

Located to the north/northwest and downgradient of the Site, Cohas Brook is a wet marshy area with limited flow due to high density vegetation growth. Conditions within this water feature likely restrict the use of recreational boats; however, there is the potential for fishing, hiking, or hunting. Since WESTON began work at the site in 2000, personnel have not observed any of these activities or found any evidence that these activities had historically occurred in this area.

Drinking Water Supply Wells

Following significant investigation at the Site by EPA in the mid 1980s, a Record of Decision (*ROD*) was completed, which directed the installation of a 9,000-foot (ft) municipal waterline to supply drinking water to nearby residents.

On 30 August 2012, WESTON personnel contacted Mr. John Trottier, PE, the Assistant Director of Public Works and Engineering for the Town of Londonderry. According to Mr. Trottier, all properties along Auburn Road and in the vicinity of the Site receive water from the municipal water line in the area.

Three parcels not located on Auburn Road, but downgradient of the Site were also investigated for the presence of private wells. Lots 18-36 and 18-34 are either undeveloped or there is no water supply (municipal connection or private well). Currently lot 18-32 is undeveloped; however, Mr. Trottier indicated that the parcel is scheduled for residential development. Acording to Mr. Trottier, all new residences in this development will be connected to the town municipal water supply line. Please refer to attached Town of Londonderry Tax Map 018 for lot locations.

Please do not hesitate to contact me at (603) 656-5453 if you have any questions or require additional information.

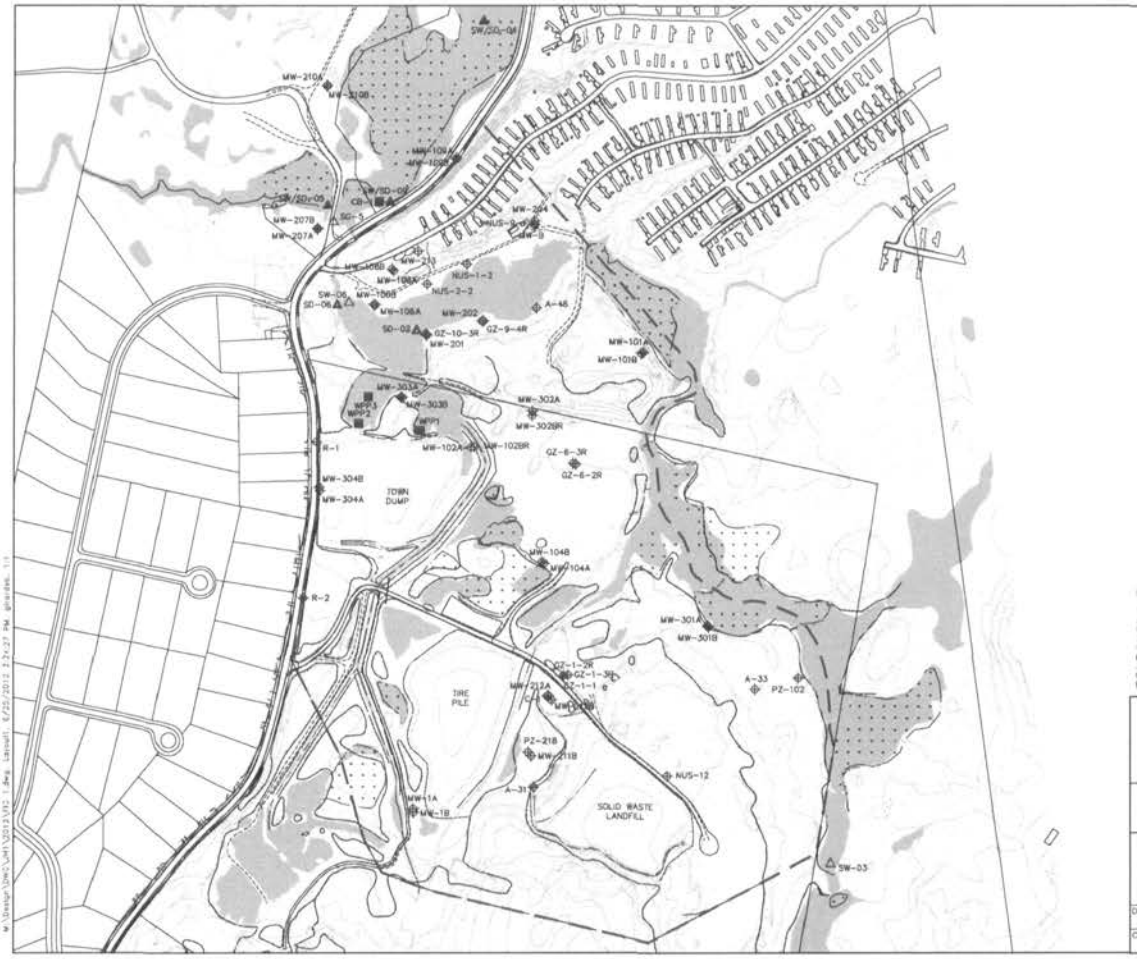
Very truly yours,

WESTON SOLUTIONS, INC.

Sean P. Combs LEED AP BD+C
Project Manager

SPC/cag

FIGURES



LEGEND

- MW-303B — MONITORING WELL LOCATION
- SD-02 — SEDIMENT (ONLY) SAMPLING LOCATION
- SW-06 — SURFACE WATER (ONLY) SAMPLING LOCATION
- SW/SD-05 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- WPP1 — USGS PIEZOMETER LOCATION
- GMZ BOUNDARY

GRAPHIC SCALE

400 200 0 200 400

APPROXIMATE SCALE IN FEET

NOTES:

1. THE PLANAMETRICS AND TOPOGRAPHY SHOWN ON THIS PLAN IS BASED ON AERIAL PHOTOGRAPHY DATED DECEMBER 21, 1997, AND COMPILED BY EAST COAST MAPPING , INC. IN FEBUARY 1998 AND FEBUARY 2007.
2. THE LOCATIONS AND ELEVATIONS OF THE MONITORING WELLS ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED IN FEBUARY OF 2007 BY HOLDEN ENGINEERING AND SURVEYING, INC.
3. THE HORIZONTAL AND VERTICAL DATUM FOR THE AERIAL MAPPING AND GROUND SURVEY ARE BASED ON NAD83 AND NGVD 29. ALL BEARINGS ARE BASED ON NH STATE PLANE COORDINATES GRID NORTH.

WESTON SOLUTIONS

CONCORD NEW HAMPSHIRE

AUBURN ROAD LANDFILL

LONDONDERRY, NEW HAMPSHIRE

SITE PLAN

DRAWN	DATE	FIGURE NO.
BEG	JUN 2012	1
CHECKED	W.O. No. 12438.001.023	

Town of Londonderry
New Hampshire
Parcel Atlas
April, 2011
Legend
Zoning Districts
Tax Map
018
AUBURN
MANCHESTER
DERRY

COMMENTS REGARDING THE FORTHCOMING EPA 5-YEAR REVIEW FOR THE AUBURN ROAD LANDFILL SUPERFUND SITE, DERRY, NH

From Alan Simard, Trustee of the Simard Family Trust **August 15, 2012**

Here are my concerns and comments regarding EPA's forthcoming 5-year review of the cleanup status at the Auburn Road Superfund Site (Site) which abuts the south side of my commercial residential and sales property.

In 1989, EPA issued a Record of Decision (ROD) for the Site to clean up arsenic and volatile organic compound contamination in groundwater by a pump-and-treat remedy. That remedy was never implemented. Seven years later, an amendment to the ROD was issued by the EPA which changed the remedy from a pump-and-treat remedy to a monitored natural attenuation (MNA) remedy, which was then implemented. The MNA remedy was effective in reducing VOCs to acceptable levels but not arsenic. Overall arsenic concentrations in groundwater declined from 1993 to 2000 or 2001, but have failed to reflect any consistent declining trend since then. A substantial plume of arsenic contamination exceeding the 10 parts per billion (ppb) drinking water limit still exists on-site and off-site and groundwater containing greater than 10 ppb arsenic continues to be released from the Site to my property, as it has for the past 33 years or more.

The monitoring data for the past 12 years has clearly shown that the MNA remedy has failed to meet requirements and objectives. Groundwater modeling results have also indicated that the MNA remedy cannot be expected to achieve cleanup objectives over the next 50 years or so.

My hydrogeologist consultant, John Robertson, has submitted several technical reports and requests to the EPA pointing out the failures of the MNA remedy over the past 15 years, or so. One of those reports is attached to this comment, as an example. Some of Mr. Robertson's more recent and relevant submissions include the following:

- A TECHNICAL ASSESSMENT OF THE FAILED GROUNDWATER MONITORED NATURAL ATTENUATION REMEDY ATTEMPTED AT THE AUBURN ROAD LANDFILL SUPERFUND SITE, DERRY, NEW HAMPSHIRE, September 2007
- JUSTIFICATION FOR ENHANCING THE GROUNDWATER REMEDY AT THE AUBURN ROAD SUPERFUND SITE, DERRY, NEW HAMPSHIRE, September 2008
- A PROPSAL FOR IMPLEMENTING AN EFFECTIVE REMEDY FOR CONTAMINATED GROUNDWATE AT THE AUBURN ROAD SUPERFUND SITE, DERRY, NEW HAMPSHIRE, January 2009

- CRITICAL REVIEW OF REPORTS: *RESULTS OF MODEL SIMULATIONS PREDICTED ARSENIC CLEANUP TIME AT THE AUBURN ROAD LANDFILL LONDONDERRY, NEW HAMPSHIRE* (by HydroQual, Inc., January 2009) and *2008 ANNUAL REPORT LONG TERM ENVIRONMENTAL MONITORING PROGRAM AUBURN ROAD LANDFILL SITE LONDONDERRY, NEEW HAMPSHIRE* (by Weston Solutions, Inc., February 2009), September 2009

As far as I can tell, the EPA has not responded to those comments and recommendations in any kind of a concrete way.

It is long past time for EPA to admit that the selected remedy has failed and will continue to fail. A permanent, effective engineered remedy is needed. There are simple, cost-effective proven technologies available to implement such a remedy. They include the pump-and-treat containment remedy conceptually proposed previously by Mr. Robertson, as well as some in-situ methods. In-situ methods could include air injection into groundwater to oxidize arsenic (perhaps combined with some other additives) and emplacement of a permeable reactive subsurface barrier wall filled with zero-valent iron, basic oxygen furnace slag, or activated alumina. I would prefer a pump-and-treat containment remedy to immediately stop the migration of arsenic onto my property, but any other equally effective engineered remedy would be acceptable, as long as it permanently stops the off-site migration of arsenic above drinking water limits and reduces overall contamination levels over time.

It is unacceptable to allow this Site to continue to bleed arsenic to my property at concentrations exceeding drinking water limits. The EPA and the responsible parties have procrastinated much too long in making a reasonable and responsible effort to clean up this problem, as required by law.

CERCLA has a fundamental requirement for the selection of a remedy: it has to be permanent and result in a reduction of the contamination. This principle is codified in 42 USC §9621 (b) (1) as the primary general rule to be followed by EPA in selecting the remedy:

- Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants, and contaminants is a principle element, are to be preferred over remedial actions not involving such treatment.

The remedy selected by EPA in the December 19, 1996 Amended ROD no longer meets this statutory requirement, if it ever did. The ROD selected Monitored Natural Attenuation (MNA) based upon the belief that MNA would result in arsenic concentrations in the off-site groundwater being in compliance with the MCL at the end of five years. That belief was the foundation upon which the MNA remedy was chosen, as evidenced by the repeated references in the ROD (verbatim text quoted):

- No technology , neither established nor innovative, was found that either the EPA or the State believed was capable of achieving cleanup levels for arsenic any faster than capping the disposal areas and allowing natural attenuation to occur as proposed for the limited action alternative. (p. 36)
- Preliminary modeling shows that natural attenuation should achieve cleanup levels for arsenic, off-site, within five-years. (p. 37)
- Ground water modeling has shown that the arsenic in ground water should meet cleanup levels off-site within five years of the installment of the cap. (p. 38)
- Ground water modeling indicates that the time to achieve cleanup levels off-site is 5 years from when the cap was placed on the landfill. (p. 39)
- Based on the results of ground water modeling, EPA expects that contaminants leaching from the landfilled areas will diminish due to the caps and that ground water will meet cleanup levels off-site within five years. (p. 45)
- ... no active remedy will restore the aquifer any faster than natural attenuation ... (p. 49)
- ... the remedy will attain cleanup levels and will meet all ARARs within a reasonable time frame; the remedy will be permanent ... (p. 50)
- Ground water modeling has shown that natural attenuation should attain cleanup levels off-site in five years. (p. 50)
- The EPA has estimated that these levels will be obtained within five years after completion of the source control component. (p. 55)
- In the overburden and bedrock aquifers MCLs are expected to be attained off site in approximately five years. (p. 62)
- The time to achieve these standards is expected to be five years. (p. 63)
- Although generally a preference for treatment exists, the EPA and State believe that no treatment system will achieve cleanup levels in ground water any faster than natural attenuation. (p. 66)

The sampling results over the past fifteen (15) years have shown that the predicate for selection of MNA was faulty. Arsenic remains as much a problem off-site now as was present two decades ago. The landfill cap was completed in 1994; arsenic remained a problem in 1999. EPA had an opportunity to address this issue in the Explanation of Significant Differences (ESD) issued in 2009, but did not do so. The ESD modified the

MCL for arsenic to the lower 10 ppb limit adopted by the State of New Hampshire, but did not address the failure of MNA. Even the ARPPG modeling study submitted to EPA makes clear that with continued reliance upon MNA, the arsenic levels will remain in excess of the MCL for the next few decades. The failure of the MNA remedy to comply with the statutory requirements of CERCLA cannot be credibly disputed.

The EPA has the right, and the obligation, to require that the performing parties and the Town of Londonderry implement and fund (as appropriate) an effective remedy at the site, as provided for in §19 of the Consent Decree applicable to the site. That remedy could be the pump and treat described in the attached memo by my hydrogeologist, or one of the in-situ methods referenced above. The costs would be relatively minor, but the results would be dramatic, and finally achieve the goals of the ROD.

The off-site migration of arsenic to the Trust property was caused by the contamination at the Auburn Road landfill, as expressly declared in Section V of the Amended ROD. The Simard Family Trust did not cause the arsenic contamination in its groundwater, but has suffered from that contamination for over 30 years. The status quo must change; MNA has been definitively shown to be ineffective at this site, and will not result in a permanent solution in the lifetime of anyone involved in this case. It is time for the performing parties to actually perform the remedy.

I ask that the EPA provide me with a detailed response to my concerns and requests in writing. Please provide an explanation regarding why previous pleas from me have been ignored or denied. I feel like I have been a voice crying in the wilderness. It is your job to enforce the Superfund law that requires contaminated sites to be cleaned up on a timely and effective basis and that the interests and rights of innocent abutting property owners like me should be protected from the adverse impacts toxic waste sites.

As you proceed with the 5-year review, please consider my interests and make an honest, objective admission regarding the failure of the remedy. Please proceed post haste in correcting past mistakes by implementing an effective permanent remedy.

Thank you for your consideration.

Alan Simard, Trustee

For the Simard Family Trust

ATTACHMENT

A PROPOSAL FOR IMPLEMENTING AN EFFECTIVE REMEDY FOR CONTAMINATED GROUNDWATER AT THE AUBURN ROAD SUPERFUND SITE, DERRY, NEW HAMPSHIRE

By John B. Robertson, P.G.

Phoenix, Arizona

January 2009

INTRODUCTION

Twenty years ago, the US Environmental Protection Agency (EPA) issued a Record of Decision (ROD) for remediating contaminated groundwater at the Auburn Road Superfund Site, Derry, New Hampshire (Site). That ROD specified, among other steps, that groundwater contaminated with arsenic and chlorinated volatile organic compounds (VOCs) should be remediated by implementing a pump-and-treat system to actively remove both types of contaminants from groundwater, with the goal of restoring the natural groundwater resource to drinking-water conditions. The pump-and-treat part of the remedy was never implemented by the group of potentially-responsible parties (PRPs), known as the Auburn Road Performing Parties Group (ARPPG), who have agreed to implement the remedy. In fact, the EPA decided to revisit the 1989 decision in 1996 and changed the remedy from an active pump-and-treat system to a passive "monitored natural attenuation" (MNA) remedy, with the issuance of a "Record of Decision Amendment" dated December 19, 1996.

Three 5-Year Reviews have been conducted at the site, as required by law, since the 1989 ROD was implemented. All three of these reviews, together with Annual Reports each year, have confirmed that the MNA remedy is not performing as intended. I therefore believe that it is time to change the remedy, as the provisions of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) require. After nearly 20 years, arsenic concentrations have failed to drop to acceptable levels. In fact, annual monitoring data indicate that there has been no decreasing trend in arsenic concentrations for most of the monitoring wells in the plume since 2000 or 2001.

Groundwater with arsenic concentrations greatly exceeding the 10 parts per billion (ppb) cleanup level continues to flow off the Site property and onto the Simard private property abutting the Site to the north, and into Whispering Pines Pond on the Simard property.

PURPOSE

The purpose of this document is to provide a conceptual proposal for changing the groundwater remedial action at the site from passive MNA to an active pump-and-treat (or equally effective alternative) remedy to contain arsenic and any other contaminants of concern within the site boundary and to diminish the on-Site arsenic concentrations. This will curtail the continuing adverse impacts to groundwater, surface water and sediments on Simard property and will reduce off-Site and on-Site risks to public health and the environment.

The remedy change recommended herein will allow the State's Groundwater Management Zone (GMZ) to be established at the boundary of the site, rather than at the currently-proposed location at the edge of the off-site contamination plume.

The basis for the recommended change derives from regulatory criteria and precedent, as well as from common scientific and engineering logic.

MONITORED NATURAL ATTENUATION AS A REMEDIAL ALTERNATIVE

MNA is a remedial method in which contaminants of concern can be demonstrated to decline to acceptable levels within a reasonable period of time by natural degradation or attenuation processes that involve no anthropogenic intervention. MNA is a relatively recent approach that has been implemented at CERCLA and other contamination sites in the past 20 years, or so. It has been used primarily at sites where the sources of contamination have been eliminated and where the primary contaminants of concern (COCs) consist of organic compounds that readily undergo chemical, physical, or biochemical degradation that converts the toxic compounds to non-toxic degradation products or otherwise permanently reduces the concentrations of COCs to acceptable levels by totally natural means.

MNA has worked successfully at a large number of sites with groundwater contaminated by petroleum products and to a lesser extent by chlorinated VOCs. The Auburn Road site is, in fact, a good example of how MNA has been successful for the chlorinated VOCs that were formerly major COCs at the site. Those VOC compounds have largely dissipated to acceptable levels in the past 20 years. However, arsenic, which is not an organic compound and is not biodegradable, has not reflected the same decline.

MNA has also been selected as a component of remedial actions for some sites contaminated by inorganic toxic metals, such as arsenic and lead. However, the use of MNA at metals sites is much less common because of greater uncertainties associated with the relevant attenuation processes and because the processes do not typically result in permanent removal of the COCs. MNA for metals in groundwater relies on changes in chemical conditions that result in removal of the metal of concern by chemical precipitation on mineral surfaces or on physical/chemical adsorption of the metal on mineral surfaces (including ion exchange). One of the problems with MNA for metals is the fact that the chemical conditions that cause the removal of the metal can change in the future, resulting in the re-release of the immobilized contaminant back into the groundwater.

In 1999, the EPA Office of Solid Waste and Emergency Response (OSWER) issued Directive 9200.4-17P, entitled *"Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites"*. That directive specified guidance criteria for selecting and implementing MNA at contamination sites. As is pointed out below, the MNA remedy selected for the Auburn Road site does not comply with the criteria specified in the Directive. In addition, the EPA has issued follow-on guidance documents more specifically aimed at the use of MNA for inorganic contamination sites, including those contaminated with arsenic. As is further pointed out below, the MNA remedy selected for this site does not meet the standards prescribed in these more recent documents.

One of the factors I considered in my investigation of this issue is how the EPA and other regulatory agencies have implemented MNA at other arsenic-contaminated sites. I found 15 other sites where MNA has apparently been selected as one component of multiple-component remedial actions for sites with arsenic as one of the COCs. None of these sites are very comparable to the Auburn Road site, either in site conditions, or in the manner in which MNA is implemented. Several of the 15 sites are not CERCLA sites. As far as I can determine, nearly all of the sites in which MNA is a significant component for arsenic also have a specified contingency plan for implementing an active groundwater remediation if MNA fails to result in

specified minimum performance goals within 3 to 5 years. Such a direct provision was not included in the Auburn Road ROD.

For some of the other 15 above-mentioned sites, the arsenic contamination was already contained within the site boundary and had reflected declining, or at least stable, concentrations before the remedy decision was made. Again, this is not the case with the Auburn Road site.

At least two of the 15 sites, the Saco Landfill site in Maine and the Coakley Landfill site in New Hampshire, MNA for arsenic has failed, just as it has at the Auburn Road site. Organic contaminants declined at those two sites (as they did at Auburn Road), but arsenic has not declined as originally anticipated. The reasons for these failures are apparently related to the reasons for the failure of the Auburn Road site failure – a failure to understand the complex geochemistry associated with the releases of on-site sources of arsenic, and a failure to understand the processes that control the chemical status and behavior of arsenic as it migrates in the subsurface hydrogeologic environment.

RELATIVE SIMPLE AND COST-EFFECTIVE ACTIONS CAN CORRECT THE PROBLEMS WITH THE AUBURN ROAD SITE MNA REMEDY

The failure of the Auburn Road site MNA remedial action can readily be mitigated with a cost-effective and easily-implemented groundwater pump-and-treat system. The objectives of this system would be two-fold: (1) to capture the most contaminated portion of the arsenic plume at the site boundary before it migrates off-site at concentrations above above 10 ppb, and (2) to reduce the concentration and total mass of arsenic in groundwater in the source landfill areas on Site. This would be done by strategically-placed extraction wells which would pump contaminated groundwater to a treatment plant where arsenic concentrations are reduced to below-10 ppb levels. The treated effluent would be then returned to the ground or to local surface water.

Conceptually, the system would probably require approximately five extraction wells, located in the positions shown approximately on Figure 1, attached. Each well would likely require a pumping rate of 5 to 10 gallons per minute and would extract water with arsenic concentrations averaging from 15 to 300 ppb. The extracted contaminated water would be treated with recently-developed ion-exchange technology. This technology has been successfully field tested by EPA-

sponsored studies at several sites, including sites in New England. The results of the tests have been published in publicly-available sources.

Based on the published performance and cost data reported for the EPA-sponsored field demonstration projects, it appears that the cost of a treatment system for arsenic-contaminated groundwater can be expected to be about $1,200 per gallon-per-minute plant capacity. Assuming a plant capacity of 50 gpm (5 extraction wells at 10 gpm each) for the Auburn Road site, the treatment plant could be installed for about $60,000. Adding a contingency factor of 50 percent would bring the cost conservatively to $90,000.

Another capital cost would be the cost of the 5 extraction wells, assumed to be about 50 feet deep, 4 inches in diameter, and cased and screened with PVC. This cost would be approximately $12,000 per well, or a total of $60,000, based on information provided by New Hampshire Boring, Inc., of Derry. These wells are assumed to be completed in overburden sediments.

Each well would be equipped with a 3-inch Grundfos stainless steel submersible pump and controller at an approximate cost of $1,200 each, for a total of $6,000. Electrical, piping, winterization protection would cost an estimated $1,500 per well, for a total of $9,000.

Other miscellaneous capital and contingency costs might amount to $20,000.

Total estimated capital costs would therefore amount to about $185,000.

Based on limited data from the EPA-sponsored studies, operation and maintenance costs for operating the extraction wells and treatment plant would likely amount to about $10,000 per year, or less. In addition, current monitoring costs for sampling monitoring wells, surface water, and sediments would continue similar to past costs. I do not know what those costs have been running, but the ARPPG PRPs have records of them.

The technology and engineering involved in this system is off-the shelf and could be fully implemented in a few months.

These estimates indicate that the total capital and O & M costs for these changes would be quite modest in the big scheme of things. Implementing these changes would result in the following benefits:

- Would bring the remedy into consistency with the CERCLA National Contingency Plan and with other relevant regulatory directives and guidance

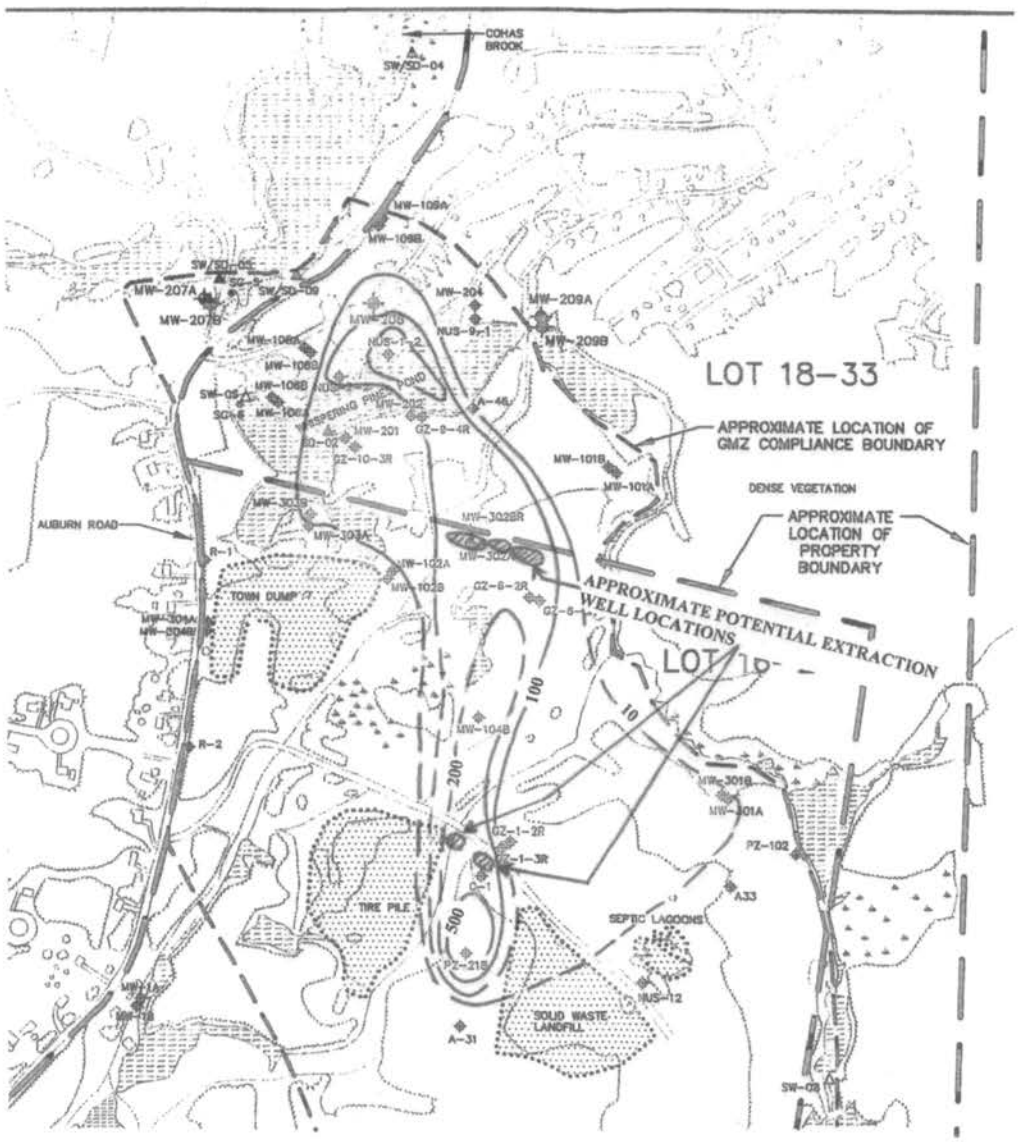
- Would promptly result in reduced risks to public health and the environment by reducing arsenic concentrations in off-Site and on-Site groundwater and reducing the influx of arsenic to off-site surface water bodies (i.e., Whispering Pines Pond and Cohass Brook)

- Would result in faster restoration of off-site groundwater resources to maximum beneficial use (drinking water)

- Would allow the establishment of the GMZ boundary at the site boundary, thus eliminating the need for long-term institutional controls on off-site property

- Would greatly reduce the time required to meet ultimate remediation objectives

- Would leads to greater cooperation from the abutting land owner to the north because of reduced impacts to his property



GRAPHIC SCALE

450 225 0 225 450

APPROXIMATE SCALE IN FEET

FIGURE 1

Approximate configuration of the arsenic plume in groundwater, Auburn Road Superfund Site, Derry, NH, based on fall 2006 sampling results from overburden and bedrock wells. Arsenic concentrations are in micrograms per liter. Also shown are potential locations of extraction wells which could be installed to capture and contain the plume on-site.