2009 EXPLANATION OF SIGNIFICANT DIFFERENCES
DOVER MUNICIPAL LANDFILL SUPERFUND SITE
DOVER, NEW HAMPSHIRE

JUNE 30, 2009

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1, NEW ENGLAND

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DECLARATION FOR THE EXPLANATION OF SIGNIFICANT DIFFERENCES

DOVER MUNICIPAL LANDFILL SUPERFUND SITE DOVER, NEW HAMPSHIRE

June 30, 2009

SITE NAME AND LOCATION

Site Name: Dover Municipal Landfill Superfund Site

Site Location: Dover, New Hampshire

IDENTIFICATION OF LEAD AND SUPPORT AGENCIES

Lead Agency: United States Environmental Protection Agency (USEPA)

Support Agency: New Hampshire Department of Environmental Services (NHDES)

STATEMENT OF PURPOSE

This decision document sets forth the basis for the determination to issue the attached Explanation of Significant Differences (ESD) for the Dover Municipal Landfill Superfund Site (the Site) located in Dover, New Hampshire. This ESD describes changes to a portion of the source control component of the remedial action only.

STATUTORY BASIS FOR ISSUANCE OF THE ESD

In accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9617(c), Section 300.435(c)(2)(i) of the National Contingency Plan (NCP), 40 CFR § 300.435(c)(2)(i), and USEPA guidance OSWER [Office of Solid Waste and Emergency Response] Directive 9200.1-23P (A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents), if USEPA determines that differences in the remedial action significantly change, but do not fundamentally alter the remedy selected in the Record of Decision (ROD) with respect to scope, performance, or cost, USEPA shall publish an Explanation of the Significant Differences (ESD) between the remedial action being undertaken and the remedial action set forth in the ROD and the reasons such changes are being made.

USEPA has determined that the adjustments to the 2004 Amended Record of Decision (2004 AROD) for the Dover Municipal Landfill Superfund Site, as explained in this ESD, are significant, but do not fundamentally alter the overall remedy for the Site with respect to scope, performance, or cost. Therefore, this ESD is being properly issued.

In accordance with Section 117(d) of CERCLA and Section 300.825(a) of the NCP, this ESD will become part of the Administrative Record for the Site, and will be available for public review at the USEPA Region 1 Record Center in Boston, Massachusetts, and the Dover Public Library, 73 Locust Street, Dover, New Hampshire, 03820.

BACKGROUND

The 2004 AROD for the Dover Municipal Landfill Site, in amending a 1991 Record of Decision (1991 ROD), selected a remedial action comprised of a Source Control (SC) component that will address hazardous substances in the soil and groundwater beneath the landfill and a Management of Migration (MOM) component that will restore contaminated groundwater outside the edge of the landfill. In summary, the current selected remedy for the Site consists of the following major components:

1. Installation of an air-sparging trench at the down-gradient toe of the landfill to intercept and treat impacted groundwater emanating from the landfill *in-situ*. The 1991 ROD SC remedy, which consists of capping the landfill with a Resource Conservation and Recovery Act (RCRA) C cap and intercepting contaminated groundwater at the landfill boundary, was retained as a contingent remedy (SC component).

2. Remediation of localized source areas in the landfill (SC component).

3. Maintenance of the permeable landfill cover (SC component).

4. Groundwater extraction and treatment in the Southern Plume (MOM component).

5. Monitored natural attenuation in the Eastern Plume, with a contingent pump-and-treat remedy (MOM component).

6. Monitoring and removing, as warranted, sediments impacted by arsenic.

7. Evaluation of a potential indoor air exposure pathway.

8. Site-wide monitoring program.

9. Institutional controls.

OVERVIEW OF THIS ESD

This ESD seeks to change one element of the 2004 AROD remedy, the air-sparging trench (item #1, above). This change is based upon pre-design investigations performed since the 2004 AROD. The results of those investigations demonstrated that the distribution of contaminants in the aquifer and the hydrogeologic conditions at the Site are such that extracting contaminated groundwater using extraction wells and sending that water off-site

for treatment is preferable to allowing ambient flow through an air-sparging trench to intercept and treat contaminated groundwater.

The 2004 AROD SC remedy (SC-A), as described above, contains several elements. The primary SC element is treatment in the air-sparging trench. Treatment consists of contaminated groundwater flowing through the 3 to 5-foot thick wall, and through air-sparging, groundwater would emerge on the other side of the wall at or below cleanup levels. The recent identification of discreet zones of contamination, and the variable flow gradients found within the landfill during the pre-design investigations, indicated that, along with its implementation challenges, the air-sparging trench may be ineffective at treating groundwater contaminants and may allow contamination to spread. However, a forced gradient, using extraction wells targeted at discreet intervals within the aquifer, would pose fewer installation challenges over the air-sparging trench, provide greater flexibility, provide active extraction and treatment, and cost significantly less than alternative SC-A.

Additionally, a Source Control Focused Feasibility Study was issued that examined alternative SC-A against a new alternative, SC-Ex, which only changes the air-sparging trench to ground water extraction while all other source control components were retained. The contaminated groundwater removed by the extraction system will be pumped from the Site and discharged to the City of Dover's (City) publicly-owned treatment works (POTW) via a sewer line to be constructed by the City along Tolend Road. This document further supports the change in one element of the 2004 AROD source control components.

The ESD also notes some minor changes to the Applicable, or Relevant and Appropriate Requirements (ARARs) that pertain to the revised remedy. The changes made to the ARARs as a result of this ESD, as compared to those identified in the 1991 ROD and 2004 AROD, are noted in Attachment A. The new alternative, SC-Ex, will meet all ARARs.

The State of New Hampshire has reviewed and commented on this ESD and concurs with its issuance.

DECLARATION

For the foregoing reasons, by my signature below, I approve the issuance of this Explanation of Significant Differences for the Dover Municipal Landfill Superfund Site in Dover, New Hampshire, and the changes stated therein.

for

James T. Owens III, Director
Office of Site Remediation and Restoration
USEPA, Region 1

6-30-09
Date

2009 EXPLANATION OF SIGNIFICANT DIFFERENCES DOVER MUNICIPAL LANDFILL SUPERFUND SITE DOVER, NEW HAMPSHIRE

I. INTRODUCTION

A. SITE NAME AND LOCATION

Site Name: Dover Municipal Landfill Superfund Site

Site Location: Dover, New Hampshire

B. LEAD AND SUPPORT AGENCIES

Lead Agency: United States Environmental Protection Agency (USEPA)
Contact: Darryl Luce, USEPA Remedial Project Manager

Support Agency: New Hampshire Department of Environmental Services (NHDES)
Contact: Andrew Hoffman, NHDES Project Manager

C. LEGAL AUTHORITY FOR THIS EXPLANATION OF SIGNIFICANT DIFFERENCES

In accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9617(c), Section 300.435(c)(2)(i) of the National Contingency Plan (NCP), 40 CFR § 300.435(c)(2)(i), and USEPA guidance OSWER [Office of Solid Waste and Emergency Response] Directive 9200.1-23P (A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents), if USEPA determines that differences in the remedial action significantly change, but do not fundamentally alter the remedy selected in the Record of Decision (ROD) with respect to scope, performance, or cost, USEPA shall publish an Explanation of the Significant Differences (ESD) between the remedial action being undertaken and the remedial action set forth in the ROD and the reasons such changes are being made.

D. SUMMARY OF CIRCUMSTANCES NECESSITATING THIS EXPLANATION OF SIGNIFICANT DIFFERENCES

The 2004 Amended Record of Decision (2004 AROD) selected a Source Control (SC) and Management of Migration remedy for the Dover Municipal Landfill Superfund Site in Dover, New Hampshire (the Site). The SC remedy employed, among other measures, an air-sparging trench located at the down-gradient perimeter of the landfill that would intercept and treat leachate-impacted groundwater *in situ*. This ESD seeks to change that SC component to a

groundwater extraction system that will actively capture contaminated groundwater at the toe of the landfill through a series of extraction wells and treat it off-site at the Dover publicly-owned treatment works (Dover POTW).

E. AVAILABILITY OF DOCUMENTS

This ESD and supporting documentation shall become part of the Administrative Record for the Site. The ESD, supporting documentation for the ESD, and the Administrative Record are available to the public at the following locations and may be reviewed at the times listed:

USEPA, Region 1
Superfund Records Center
One Congress Street, Suite 1100 (HSC)
Boston, MA 02114-2023
Phone: (617) 918-1440
Fax: (617) 918-1223
Monday through Friday, 9 a.m. to 5 p.m.
Closed on federal holidays.

Dover Public Library
73 Locust Street
Dover, New Hampshire 03820
Phone: (603) 516-6050
Monday through Wednesday, 9 a.m. to 8:30 p.m.
Thursday through Friday 9 a.m. to 5:30 p.m. and Saturday 9 a.m. to 1 p.m.

II. SITE DESCRIPTION

A. SITE LOCATION, FEATURES AND HISTORY

The Dover Municipal Landfill Superfund Site (the Site) is located to the west of Tolend Road in the western corner of the City of Dover, New Hampshire. The Site is bordered by rural, residential properties along Tolend Road to the north and undeveloped, forested wetlands to the south, east, and west. The Cocheco River and Bellamy Reservoir are located approximately 600 feet northeast and 1,500 feet south of the Site, respectively.

The Bellamy Reservoir serves the City of Portsmouth, and portions of Newington, Greenland, New Castle and Rye as a drinking water supply.[1] The City of Portsmouth draws a significant

[1] *Seacoast NH Emergency Interconnection Study*, prepared by Woodard and Curran, 2006.

amount of its drinking water from this Reservoir. The City of Dover draws approximately 40% of its drinking water from wells in the Bellamy Reservoir watershed.[2]

The Cocheco River is currently under consideration by the New Hampshire General Court for designation as a New Hampshire protected river. The particular segment of the river adjacent to the Site has been proposed to receive "Rural Community" designation. Figure 1 shows the general setting of the Site. Figures and photographs follow the body of this document.

The landfill covers approximately 50 acres and, contrary to typical landfill profiles, is quite flat and covered mostly in grasses, but has stands of poplar trees on the older portions of the landfill. *See* Photo 1. A detailed description of the Site is contained in the 2004 AROD.[3] Features of the Site and surrounding area are shown on Figure 2.

The Site was placed on USEPA's National Priority List (NPL) on September 8, 1983. Following a Remedial Investigation and Feasibility Study, USEPA issued a Record of Decision (1991 ROD) on September 10, 1991. The 1991 ROD selected a remedy, SC-7/7A, that had two components, Source Control (SC) and Management of Migration. The SC component consisted of capping the approximately 50-acre landfill with a Resource Conservation and Recovery Act Subtitle C (RCRA-C) cap and installing a system of trenches and groundwater extraction wells to dewater the landfill. The Management of Migration component addressed two groundwater contaminant plumes found to be migrating from the landfill. The Eastern Plume extends from the eastern and southern edges of the landfill and discharges to the Cocheco River. The Southern Plume extends from the southwestern edge of the landfill towards the Bellamy Reservoir. The Management of Migration remedy consisted of pumping and treating contaminated groundwater from the Southern Plume while allowing the Eastern Plume to naturally degrade.

A group of Work Settling Defendants (the "Group") completed the Landfill Cap 100% design in 1996. However, construction of the 1991 ROD remedy was deferred, with the exception of the removal of arsenic-impacted sediments from the drainage swale, because, at the request of the Group, a pilot study was performed to determine if an alternative, innovative cleanup approach could be used to replace the SC portion of the 1991 ROD remedy. New information developed during that study indicated that another SC remedial alternative was potentially viable.[4] Based on that information, the Group offered an alternative remedy (SC-A), shown in Figure 3, to the SC component of the 1991 ROD that would be less expensive, and would offer greater flexibility in addressing contamination at the Site. SC-A consists of the air-sparging trench, sheet piling walls on the northern and southern edges of the landfill, and a groundwater extraction and treatment system on the southwest corner of the landfill to address high concentrations of contaminants. That proposal, SC-A, was incorporated into the 2004 AROD.

[2] *Quantifying the Bellamy River Watershed Hydrologic Budget*, prepared for the Town of Madbury by Thomas Fargo, C.G., January 2002.
[3] *Amended Record of Decision, Dover Municipal Landfill*, USEPA, Region 1, p. 1-2, September 30, 2004.
[4] Agency Response to the Draft Final Bioremediation Pilot Assessment, Dover Municipal Landfill, Comment letter from Andrew Hoffman, NHDES, to Dean Peschel, City of Dover, April 23, 2002.

B. 2004 AMENDED RECORD OF DECISION

In the 2004 AROD, USEPA and NHDES concluded that the proposed air-sparging trench (SC-A) had the potential to be as protective as the RCRA-C cap component of the 1991 ROD and be less expensive. It also appeared that the air-sparging trench had the potential to accelerate the cleanup by decades both through a natural flushing action and by allowing access to source areas inside the landfill. Rather than entombing wastes beneath an impermeable cap that would require perpetual maintenance and operation of wells to lower groundwater within the landfill, contaminants would be naturally flushed out, and active remedies could address individual source areas located within the landfill. The 2004 AROD also determined that institutional controls were necessary to prohibit activities on the landfill surface that may create a human health or environmental risk or that may negatively affect the cleanup until the cleanup is complete. Air-sparging would eventually allow the landfill to reach clean closure, at which time the aquifer would be restored to drinking water quality and re-use of the Site would be allowed without further CERCLA institutional controls. However, considerable uncertainty remained over the ability of the air-sparging trench to be implemented and to function as designed. Therefore, as an additional measure of protectiveness, the SC component of the 1991 ROD (*i.e.*, capping the 50 acre landfill with a RCRA-C cap) was retained as a contingent remedy. The Management of Migration remedy from the 1991 ROD was unchanged by the 2004 AROD.

C. ACTIVITIES SINCE 2004 AMENDED RECORD OF DECISION

Since the 2004 AROD, the Group has performed a number of Pre-Design Investigations (PDIs) and has begun implementation of several components of the 2004 AROD remedy. The status of the PDIs and remedial actions at the Site are as follow:

- **Southern Plume Pump-and-Treat PDI**: This PDI incorporated information from the 1994 PDI for pump-and-treat in the Southern Plume and gathered additional field data to determine the placement of extraction wells and the rate at which those wells should operate. The Group completed the PDI in 2007 and in 2008 completed the design and construction of the Southern Plume Management of Migration remedy. The system is now operating and currently, six (6) pounds of contaminants have been removed from the Southern Plume through this remedy.[5]

- **Northwest Landfill PDI:** Past monitoring demonstrated high concentrations of volatile organic contaminants in surface water in a ditch on the northwest corner of the landfill. Further investigation found a source area with concentrations far greater than any other place in the landfill. Based on that investigation, completed in 2007, the Group designed an air-sparging/vacuum extraction system to address those contaminants. That system was constructed last year and is now operating.

- **Air-Sparging Trench Pre-Construction PDI:** The PDI for the Source Control Air-Sparging trench, the subject of this ESD, is complete and detailed in the Source Control

[5] *1st Quarterly Report*, January 20, 2009, GeoInsight.

Focused Feasibility Study (SCFFS) dated February 20, 2009.[6] The original purpose of this PDI was to determine the depth, location and construction methods for the air-sparging trench. A drilling program was implemented over the landfill in 2006 to determine the structure of the subsurface, the depths to which the trench will need to go, and the nature of the contamination. Those results will be discussed further in this document.

- **Sediment Assessment PDI:** Sampling found that biota were not impacted by arsenic-containing sediments in the Cocheco River. However, further sampling and analysis are planned to further evaluate the effects associated with the arsenic-containing sediments in the Cocheco River.

- **Indoor Air Assessment PDI:** The Group submitted the completed PDI report in December 2008 and it is currently under evaluation by the Agencies.

- **Eastern Plume MNA PDI:** A PDI work plan has been submitted by the Group. Because this remedy is affected by operation of the SC remedy, the Agencies will evaluate this document once the entire SC remedy is operating.

- **Outdoor Air Assessment PDI:** This investigation requires sampling outdoor air during and following construction activities to ensure that implementation and operation of the Source Control remedy does not pose a risk to human health from outdoor air. It has not been initiated yet; however, outdoor air monitoring is a key component of the northwest landfill remedy that is now operating.

- **Groundwater Model and Fate and Transport Model PDI:** A Groundwater Model and a Fate and Transport Model have undergone Agency review and comment.[7] Subsequently, that model has been used in determining the viability of remedies proposed for use at the Site. As such, the Model PDI is considered complete but will be constantly adjusted to account for new information.

D. CURRENT SITE CONDITIONS AND CONTAMINATION

The on-going, site-wide Environmental Monitoring Plan and the recent results from several PDIs have better refined the understanding of conditions and contamination at the Site. Presently, there are five known areas of contamination: the landfill; the Southern Plume; the Eastern Plume; a surface water ditch that drains the area near the northwest corner of the landfill; and sediments within the eastern ditch, swale, and, potentially, the Cocheco River.

Currently, the landfill is the source of arsenic and organic contaminants in the groundwater, surface water and sediments at the Site. Within the landfill, two source areas, one in the northwest corner and the other in the southwest corner, account for most of the organic

[6] *Source Control Focused Feasibility Study, Dover Municipal Landfill…*, GeoInsight, February 29, 2009.
[7] *Revised Focused Feasibility Study, Dover Municipal Landfill…*, Appendix N, GeoInsight, January 2004.

contaminants present at the Site, although there are some small, isolated areas of contamination. The northwest source area contains significant concentrations of vinyl chloride, benzene, and other hydrocarbons, such as trichloroethylene (TCE), tetrachloroethylene (PCE), and *cis*-1,2 dichloroethylene (1,2 DCE). A vacuum extraction / air-sparging system began operations to remove these contaminants in June 2009. Groundwater in the southwest corner of the Site is significantly less contaminated than the northwest corner and contains mostly tetrahydrofuran (THF). This area was to be addressed through a pump-and-treat system under the 2004 AROD. The distribution of benzene, vinyl chloride, and THF throughout the landfill is shown in Figures 4, 5 and 6 (Figures 1-9A, B and C from the SCFFS), respectively. Arsenic is present in concentrations above its Interim Cleanup Level (ICL) in much of the groundwater at the Site.

Contaminants in the Southern Plume consist of benzene, vinyl chloride, 1,2 DCE, arsenic, and THF. At the time of the 2004 AROD (and also presently), these contaminants were above the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) in well SB-B2, which is located approximately halfway between the southwest corner of the landfill and the Bellamy Reservoir and is shown on Figure 8. The groundwater monitoring network in 2004 was inadequate to assess whether those contaminants had migrated further towards the reservoir. Therefore, the Group expedited efforts on performing the PDI to assess the Southern Plume area. That PDI concluded that the contaminant flow has not migrated as far in the direction of the Bellamy Reservoir as was projected by previous modeling estimates.[8] Migration of contaminants in the Southern Plume is now believed to have a larger eastward component. THF is the dominant contaminant in the Southern Plume. Figures 7, 8 and 9 (Figures 1-11A, B and C from the SCFFS) show the distribution of THF in the upper, middle and lower portions of the aquifer, respectively. Because the Cocheco River is as much as 30 feet below the level of the Bellamy Reservoir, it is most likely that the primary groundwater gradient, including the Southern Plume, is eastward towards the Cocheco River. Nevertheless, remediation of contaminants present in the Southern Plume as currently defined, is warranted to achieve site cleanup objectives. Figure 10 summarizes water quality in the Southern Plume during the November 2007 sampling round.

Contaminants in the Eastern Plume consist of arsenic, benzene, vinyl chloride, TCE, and PCE. THF is notably absent from much of this plume with the exception of its westernmost end in the vicinity of well couplets SC-10 and SC-18 (see Figures 6, 7, 8, and 9). The primary contaminant in the Eastern Plume remains arsenic. Although many of the wells in this area are below cleanup levels for organic contaminants, several of the contaminants of concern such as arsenic, benzene, vinyl chloride, and THF, are detected at concentrations above ICLs in a number of locations.

The northern ditch consists of a narrow (~3-foot wide) and shallow (<1-foot) ditch, dug shortly after the landfill closed and was designed to convey runoff from the landfill to the Cocheco River. The ditch typically fills during wet periods when the water table is high and is generally dry during other periods of the year. It drains the northwestern edge of the landfill and then runs through a pipe across most of the northern edge of the landfill and beneath Tolend Road, before re-appearing at the intersection of Tolend and Glen Hill Roads and discharging to an open ditch

[8] *Focused Feasibility Study Addendum, Dover Municipal Landfill…*, USEPA, June 18, 2004, p. 13.

and then the swale that drains to the Cocheco River. Contamination in the ditch consists of VOCs such as vinyl chloride and reflects the high water table at the northwest landfill source area (although the elevated concentrations in surface water in the ditch are below applicable surface water standards). In June 2009, an air-sparging/vacuum extraction system began operation and will ultimately remove the source area identified within the northwest corner of the landfill.

Impacts to sediments in the southern ditch and swale and potential impacts to highly localized areas of sediment in the Cocheco River originate in impacted site ground water that discharges to these features. In addition, during some periods of the year, impacted ground water that discharges to the ditch flows into the swale and then into the Cocheco River. Like the northern ditch, the southern ditch also begins on the western margin of the landfill flowing slowly east and then north. The southern ditch was also dug to convey runoff to the Cocheco River. However, the southern ditch has more flow, drains a larger area, and endures as a surface water body through most portions of the dry season. Before exiting the landfill and crossing under Tolend Road, the southern ditch widens and collects iron/arsenic contaminated sediments. The ditch then discharges to the swale. As previously mentioned, within the swale, iron/arsenic discharge from groundwater seepage is also apparent. The swale runs northward to drain into the Cocheco River. The 1991 ROD set a cleanup level of 50 mg/kg for arsenic-containing sediments in the ditch and swale. Those concentrations were detected in a highly localized area at the head of the swale and removed by the Group in 1997.

III. BASIS FOR THIS ESD

The change from an air-sparging trench (alternative SC-A) to a ground water extraction system (alternative SC-Ex) is sought because the PDIs and further research provided new information regarding site conditions that confirmed a number of concerns with SC-A and a number of advantages conferred by SC-Ex. The 2004 AROD identified several areas of uncertainty regarding the construction and operation of the air-sparging trench component of Alternative SC-A that specified operational flexibility and, failing that, contingency measures.[9] Information developed during the PDIs indicated that the performance of the air-sparging trench may be compromised by conditions found at the Site. These uncertainties coupled with the information from other PDIs generated considerable concern regarding the air-sparging trench being able to capture or destroy contaminants emitted by the landfill and yield clean groundwater on the down-gradient side of the trench. The new information and uncertainties are further described in the sub-sections that follow:

A. STRATIGRAPHY

Portions of the contaminated aquifer are very heterogeneous. *See* Photo 2 and Figures 4 & 5. The Source Control, Southern Plume, and Northwest Landfill PDIs found contaminants to be

[9] 2004 AROD, pp. 66 & 67, 71 & 72, and 75 – 76.

distributed heterogeneously throughout the inter-bedded portion of the aquifer.[10] As shown on Photo 2, the inter-bedded area is characterized by layers of clay, ½ to 6 inches thick inter-bedded with sand of similar thickness. Contaminant flow was found to occur in very narrow zones during the PDIs. A trench would span all strata potentially allowing cross-contamination of units that are not contaminated. Also, ambient flow through the inter-bedded aquifer is not uniform and may be compromised by a trench that hydraulically connects all layers. Therefore, the air-sparging trench in SC-A may be compromised by the unique hydrology, stratigraphy, and contaminant distribution at the Site. In comparison, a system of extraction wells would allow a more targeted approach to recovering contaminants, prevent the contamination of portions of the aquifer that are below ICLs, and be more flexible in addressing specific intervals of the aquifer.

B. OPERATION

The operation of the air-sparging trench as set forth in the 2004 AROD faces significant challenges to attain cleanup levels in groundwater. Figure 11 provides a schematic of the operation of the air-sparging trench under SC-A. The trench would employ three processes: entraining VOCs in the injected air stream and bringing them to the surface for recovery, co-precipitating arsenic with iron, and providing an aerobic environment to degrade THF and other VOCs. VOC recovery and THF bioremediation should pose no problems. However, recent literature has verified that if mineralization of the iron-arsenic complex is too fast, or conditions are not constant, boundary-effects may rapidly clog groundwater and contaminant flow into the air-sparging trench.[11, 12, 13, 14] In such case, it would be required that the trench would either need to be acid-washed or excavated to remove the precipitate. The 2004 AROD anticipated potential problems with the air-sparging trench and therefore retained a contingent remedy and established a pilot implementation of the trench to evaluate performance.[15, 16] However, based on the results of the PDIs, the recent literature and further consideration of the future operation of the air-sparging trench, a number of concerns came to light. The principle concern was the potential for fouling, as cited above. A related, secondary concern was how a failure of the air-sparging trench, whether due to fouling or other problems, would be detected and addressed in a timely manner. In the event of a failure of the air-sparging trench, contaminants would continue to flow from the landfill and into the Southern and Eastern Plumes. Groundwater extraction as proposed in SC-Ex, and shown in Figure 13, would eliminate these uncertainties and allow targeting only the discreet zones of contamination. If fouling, either biological or mineralization, becomes a problem in a well, that well could be re-developed or abandoned and a new well quickly

[10] 2008 Source Control Focused Feasibility Study, GeoInsight, Table 1-5.
[11] *Comparison of bioclogging effects in saturated porous media within one- and two-dimensional flow systems,* Martin Thullner, Ecological Engineering, December 2008.
[12] *Bioclogging in porous media: Model development and sensitivity to initial conditions,* A. Brovelli, F. Malaguerra, D.A. Barry, Environmental Modelling & Software. Volume 24, p. 611-626, 2009.
[13] *Engineered passive bioreactive barriers: risk-managing the legacy of industrial soil and groundwater pollution,* Robert M. Kalin, Current Opinion in Microbiology. Volume 7, p. 227-238, 2004.
[14] *Treatment of arsenic contaminated water in a laboratory scale up-flow bio-column reactor,* P. Mondal, C.B. Majumder, B. Mohanty, Journal of Hazardous Materials. Volume 153, p. 136 – 145, 2008.
[15] 2004 AROD, p. 53, 57, 58, 60, 61, 66-67 and 72.
[16] 2004 AROD, p. 63.

installed. Lastly, operation of the wells in the groundwater extraction remedy (SC-Ex) could be tailored to the varying subsurface environments encountered at the landfill, allowing more efficient, active recovery of contaminants.

IV. DESCRIPTION OF SIGNIFICANT DIFFERENCES

This ESD seeks to change only the air-sparging trench and its associated components of the Source Control remedy shown on Figure 3. Its replacement, SC-Ex, groundwater extraction, will actively withdraw contaminants from the subsurface. A comparison of the Original 1991 ROD remedy, the 2004 AROD remedy and the proposed 2009 ESD remedy is outlined in Table 1, below:

TABLE 1
DOVER MUNICIPAL LANDFILL COMPARISON OF REMEDIES

1991 ROD REMEDY	2004 AROD REMEDY	PROPOSED 2009 ESD REMEDY
SC-7/7A	**SC-A**	**SC-Ex**
SOURCE CONTROL		
Landfill Cap • Contour the existing landfill to attain grades for drainage. • Place a RCRA type-C cap over the entire landfill. • Construct a leachate collection / groundwater diversion system. • Methane gas collection and passive venting.	**Air Sparging Trench** • Install > 3,000 feet of trenching and sheet piles to depths of up to 100 feet. • Inject air sufficient to precipitate arsenic, biodegrade THF, and entrain VOCs. • Discharge recovered VOCs to the atmosphere. • RCRA C cap is deleted but retained as a contingent remedy; the existing, natural surface will be maintained. • Install sheet piling on northern and southern edges of landfill.	**Groundwater Extraction** *(pump-and-treat)* • Install multi-depth wells along the toe of the landfill. • Pump contaminated groundwater and discharge it to sewer pipe to convey to Dover Publically-Owned Treatment Works (POTW). • RCRA C cap is maintained as a contingency. • No sheet piling used.
	Southwest Landfill Hotspot • Pump-and-treat of THF contaminated groundwater and recharge to aquifer.	**Recovery wells may be sited in this area to speed recovery, but subject to design considerations.**
	Northwest Landfill Hotspot • Air Sparging and Vacuum Extraction of contaminants from subsurface.	**No change from 2004 AROD.**
	Institutional Controls • Institutional controls to be established to restrict the use of the landfill surface to those activities that do not create a risk to human health or the environment or that interfere with the integrity of the remedy.	**No change from 2004 AROD.**

TABLE 1 (CONTINUED) DOVER MUNICIPAL LANDFILL COMPARISON OF REMEDIES		
1991 ROD REMEDY	**2004 AROD REMEDY**	**PROPOSED 2009 ESD REMEDY**
SC-7/7A	**SC-A**	**SC-Ex**
MANAGEMENT OF MIGRATION		
Southern Plume • Pump-and-treat of contaminated groundwater. • Treated groundwater to be discharged to wetlands at the Site or the Dover POTW	**No change.**	**No change.**
Eastern Plume • Monitored natural attenuation of contaminated groundwater. • Contingent, active remedy if no progress 5 – 7 years after SC remedy begins operation..	**No change.**	**No change.**
Sediment in Ditches & Swale • Monitoring and remedial action to reduce risk if > 50 mg/kg of arsenic in sediment of ditch or swale.	**Cocheco River Sediment Investigation added…** • Monitoring and remediation if a risk is posed to human health or environment.	**No change from 2004 AROD.**
	Vapor Intrusion • Monitoring of near surface groundwater adjacent to homes on Tolend Road.	**No change from 2004 AROD.**
Institutional Controls	**No change.**	**No change.**

Refer to Figure 11 for a schematic of the 2004 AROD air-sparging trench and Figures 12 and 13, for a schematic and plan view, respectively of the proposed groundwater extraction system. The components of the air-sparging trench that will also be affected by this ESD are the sheet piling walls that were to be installed on the northern and southern edges of the landfill to ensure that flow was directed to the air-sparging trench and the Southwest Landfill THF hotspot remedial effort. The sheet piling walls will not be necessary as hydraulic control can be exercised through additional extraction wells. The recovery of THF in the southwestern hotspot may be advantageous; however, it is not required as recovery may be performed at the edge of the landfill in the extraction wells. In SC-A it was believed that the air-sparging trench was incapable of treating the high concentrations of THF present in this area. However, with extraction wells that is not a concern. It is therefore anticipated that the recovery of THF from the hotspot will be a subject of design considerations.

Groundwater recovered by the extraction system, the Southern Plume Management of Migration remedy and, if needed, the THF hotspot recovery, will be discharged into a sewer pipe that will be extended to the Site. In coordination with this proposed SC-Ex remedy, the City of Dover is preparing to extend a municipal sewer line to the Site to discharge recovered, contaminated groundwater to the City POTW. The proposed sewer line extension will be constructed between

the Dover Municipal Landfill Site and the existing sewer main along Route 9, approximately 2 miles southeast of the Site as shown on Figure 14. The proposed sewer line will be constructed primarily in the road layout of Tolend Road (approximately 9,000 feet) and will cross two private properties (approximately 1,800 feet). The sewer line will be installed concurrently with planned water line upgrades within Tolend Road, which is already approved by the City of Dover. The sewer line extension is not located within the Site, therefore it is expected that local permits will be obtained that will include road opening/construction permit, sewer connection permit, and wetlands permits where applicable. The groundwater from the groundwater extraction system and Southern Plume remedy will meet applicable federal and state pretreatment standards, consistent with the POTW's requirements, before it is permitted to be discharged to the POTW. The POTW is required to be in compliance with all federal and state environmental requirements in order to be able to accept CERCLA waste. If the Dover POTW cannot receive CERCLA waste, the contaminated groundwater from the Site will need to be disposed of at another suitable facility.

This ESD also notes some minor changes to the Applicable, or Relevant and Appropriate Requirements (ARARs) that pertain to the revised remedy. The changes made to the ARARs as a result of this ESD, as compared with those identified in the 1991 ROD and 2004 AROD, are noted in Attachment A. The new alternative will meet all ARARs identified in Attachment A.

V. COMPARATIVE ANALYSIS

Section 121(b)(1) of CERCLA presents several factors that, at a minimum, USEPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives. In considering alternatives it is customary to include the no-action alternative in this comparison. USEPA performed an analysis of the no-action alternative with respect to the nine criteria in the 2004 AROD. Therefore, this comparison shall only contrast SC-A and SC-Ex. As shown in Table 1 and the narrative that follows, the principle difference between SC-A and SC-Ex is the construction and operation of the contaminated groundwater extraction system that would be installed at the toe of the landfill. Therefore, what follows is an analysis of only those components that change under this ESD.

A. THRESHOLD CRITERIA

These criteria include the Protection of Human Health and the Environment and Compliance with Applicable, or Relevant and Appropriate Requirements (ARARs).

Protection of Human Health and the Environment: There are no current excess risks associated with the Site. The goals of SC-A, the air-sparging trench, and SC-Ex, groundwater extraction, are to restore groundwater outside and under the landfill and attain clean closure. Whereas SC-Ex maintains the same objectives and conditions as SC-A, it is anticipated that SC-Ex will be equally protective of human health and the environment as SC-A.

Compliance with Applicable, or Relevant or Appropriate Requirements (ARARs): SC-Ex will comply with all ARARs. Although discharge to the Dover POTW was assessed in the 2004 AROD, ARARs are reassessed in this document due to several changes that have been made as a result of regulatory changes since the 2004 AROD or to address statutory or regulatory requirements not included in the 1991 ROD or 2004 AROD. ARARs will only apply to those portions of the sewer line that are on the Site property. Outside of the Site, the sewer line is subject to applicable local, State and federal regulatory authorities that govern such sewer systems. The ARARs for this specific alternative, compared to the ARARs identified in the 1991 ROD and 2004 AROD, are listed in Attachment A.

B. BALANCING CRITERIA

These criteria include Long-Term Effectiveness and Permanence, Reduction of Toxicity, Mobility or Volume through Treatment, Short-Term Effectiveness, Implementability, and Cost. Cost, State Acceptance and Community Acceptance (both modifying criteria) will be analyzed separately in following sections.

Long-Term Effectiveness and Permanence: Both SC-A and SC-Ex will attain cleanup levels and remain protective once cleanup levels are attained. Although it may be argued that the groundwater extraction component of SC-Ex may shorten cleanup times by creating a forced gradient, constituent migration processes within the aquifer may be diffusion-limited. Therefore, estimated cleanup times will remain as estimated in the 2004 AROD, 30 years for all contaminants except arsenic, which is greater than 100 years.

Reduction of Toxicity, Mobility or Volume through Treatment: The on-site reduction of toxicity, mobility or volume through treatment is greater for SC-A than SC-Ex since SC-A treats contaminants on-site, with the exception of arsenic, whereas SC-Ex extracts groundwater contaminants and ships them off-site for treatment at a POTW. Treatment at the POTW achieves the same level of reduction of toxicity, mobility, and volume as the on-site treatment system, but under the NCP analysis off-site treatment is not considered in evaluating this criterion. Both alternatives employ on-site treatment of the Northwest Landfill Hotspot contaminants.

However, the SC-A air-sparging treatment system has a greater degree of uncertainty regarding its ability to adequately treat the contaminated groundwater on-site. If a portion of the air-sparging trench in SC-A fails, it may be months until that is detected and it may be a year or more to repair the situation and return the trench to proper operation or employ other contingency measures.

Short Term Effectiveness: Risks to workers and the public would be greatly decreased in SC-Ex over SC-A. Under SC-A, digging a 3,000-foot long trench 3 to 5-feet wide to a depth of up to 100 feet, installing piping and permeable media will require over a year, significant truck traffic and potential exposure to contaminated aquifer media. SC-Ex will require installing a number of extraction well clusters and pipes to connect the extraction system to the City's sewer system. The truck traffic, physical construction activities, exposure of potentially impacted aquifer

media, and time required to construct SC-Ex will be far less, thereby decreasing potential exposure and hazards to the workers and public. However, site contaminants will be conveyed off-site for treatment, potentially exposing City sewer workers and POTW employees to site contaminants, but at significantly diluted levels, estimated to be at or below the POTW pretreatment levels.

Implementability: As in short-term effectiveness above, installation and operation of groundwater extraction wells is easier to perform and operate than installation and operation of the air-sparging trench. Information comparing construction and operation of the air-sparging trench as compared to groundwater extraction is available in Section 5 of the SCFFS.

C. SUMMARY OF COSTS

The most significant element of this change is the shorter implementation schedule and significantly decreased cost. Alternative SC-A is estimated to cost $22.5 million to construct and operate for 30 years. Most of this expenditure is for the construction, operation and maintenance of the air-sparging trench. In addition to these costs, there are significant potential additional costs that might be incurred in the event that precipitated arsenic in the trench requires removal ($915,000 per trench segment). In contrast, Alternative SC-Ex, which employs groundwater extraction and off-site treatment instead of the air-sparging trench, is estimated to cost $8.2 million to construct and operate for 30 years, substantially less than Alternative SC-A. Table 2 summarizes the construction and O&M costs.

Table 2
Cost Comparison

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth (30 years at 7%)
SC-A (Air Sparging Trench)	$12,300,000	$820,000	$22,500,000
SC-Ex (groundwater extraction)	$2,000,000	$500,000	$8,200,000

Cost difference between the air-sparging trench and groundwater extraction. The SCFFS contains the details of these estimates. SC-Ex differs from the estimate in the SCFFS due to costs of the connection to the Dover treatment works not being a cost associated with the remedy. The costs of the extension are approximately $530,000.

VI. SUPPORT AGENCY COMMENTS

The New Hampshire Department of Environmental Services has reviewed the proposed change to the remedy and concurs with the change described in this document. A copy of the State concurrence letter is attached as Attachment B.

VII. STATUTORY DETERMINATIONS

USEPA has determined that the modified remedy remains protective of human health and the environment, complies with all federal and state requirements that are applicable or relevant and appropriate to this remedial action, meets the remedial objectives specified in the 2004 AROD, and is cost-effective.

VIII. PUBLIC PARTICIPATION COMPLIANCE

In accordance with Section 117(d) of CERCLA and Section 300.825(a) of the NCP, this ESD and supporting documentation shall become part of the Administrative Record for the Site. This ESD and the Administrative Record are available for public review at the locations and times listed in Section I.E. above. A public notice, which summarizes the modification to the remedy as set forth in this ESD shall be published in a local newspaper of general circulation following the signing of this ESD.

EPA conducted a public meeting on April 27, 2009 at the City of Dover, New Hampshire Department of Public Works garage. The public was invited to attend, a presentation was made by the EPA Remedial Project Manager who also answered questions. It was also announced at the meeting that a 30-day comment period would commence for those who wished to comment on the change. EPA received no comments that questioned this change; however, a number of other topics were raised by the Technical Assistance Group, NH TAG Force, that EPA has responded to in Appendix C.

JUNE 2009 EXPLANATION OF SIGNIFICANT DIFFERENCES
FIGURES AND PHOTOGRAPHS

Figures and Photographs in Order of Presentation

Figure 1 – Locus map of area surrounding the site.

Photo 1 – The landfill surface taken from the southwest corner looking northeast.

Figure 2 – Aerial photo of site with important features superimposed.

Figure 3 – 2004 Amended Record of Decision source control remedy, SC-A.

Results from 2009 Source Control Focused Feasibility Study and other Pre-Design Investigations:

Figure 4 – Vertical distribution of benzene within the landfill.

Figure 5 – Vertical distribution of vinyl chloride within the landfill.

Figure 6 – Vertical distribution of tetrahydrofuran within the landfill.

Figure 7 – Distribution of tetrahydrofuran within the upper stratigraphic interval.

Figure 8 – Distribution of tetrahydrofuran within the middle stratigraphic interval.

Figure 9 – Distribution of tetrahydrofuran within the lower stratigraphic interval.

Figure 10 – Contaminant concentrations in the Southern Plume as of 2007.

Photo 2 – Exposed middle stratigraphic interval at the Cocheco River.

Figure 11 – Schematic of the air-sparging trench, SC-A.

Figure 12 – Plan view of groundwater extraction system, SC-Ex.

Figure 13 – Schematic of the groundwater extraction system, SC-Ex.

Figure 14 – Route of Sewer line extension from the Site to the Main line.

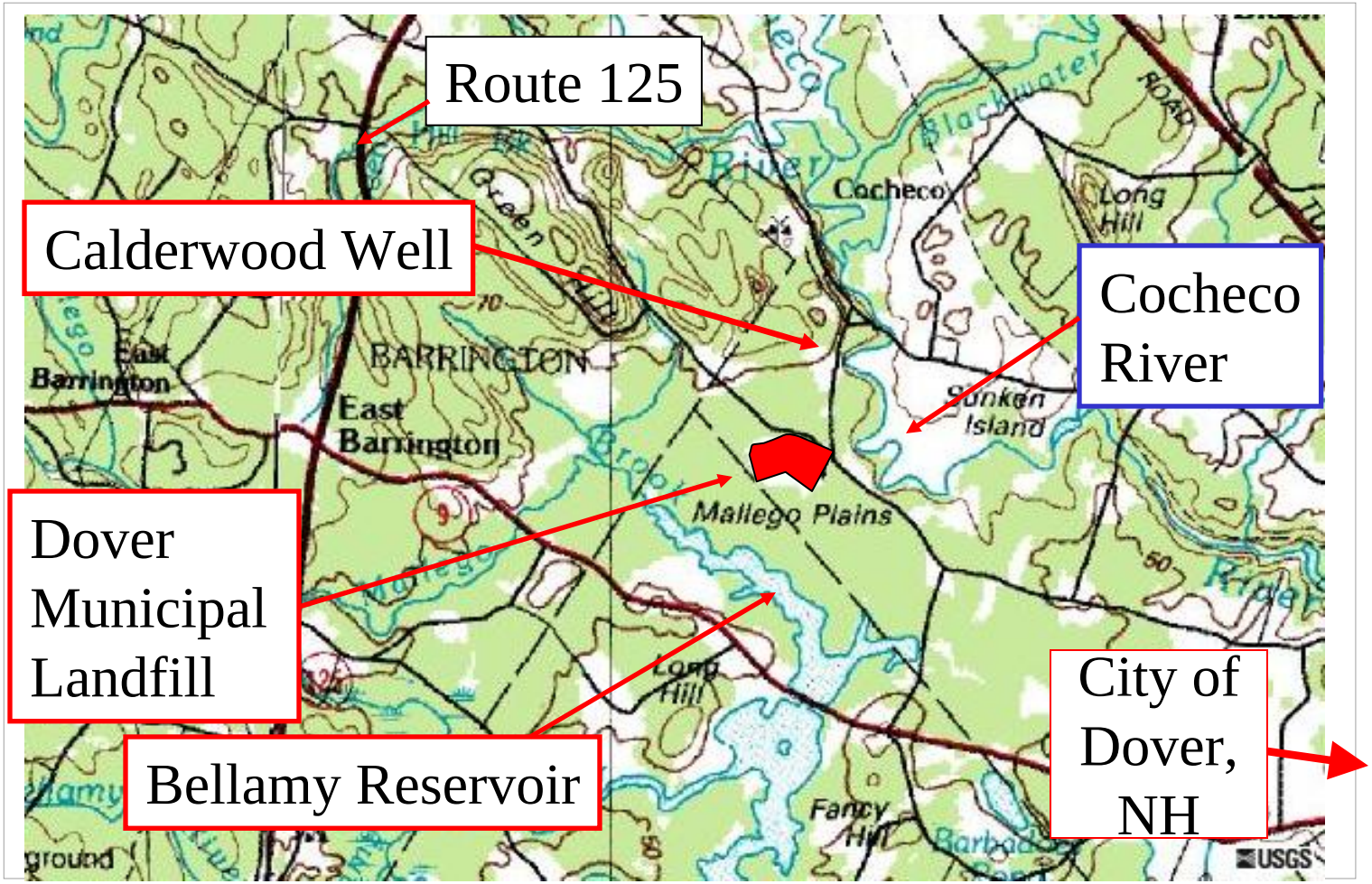

Image courtesy of the U.S. Geological Survey

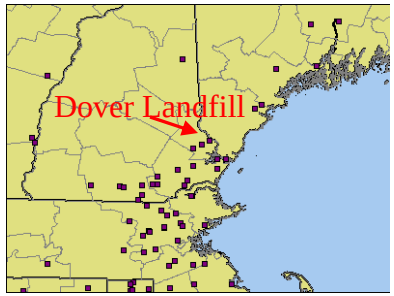

Figure 1: Locus Map of area surrounding the site.

Photo 1: The Landfill surface, standing at the southwest corner and looking northeast.

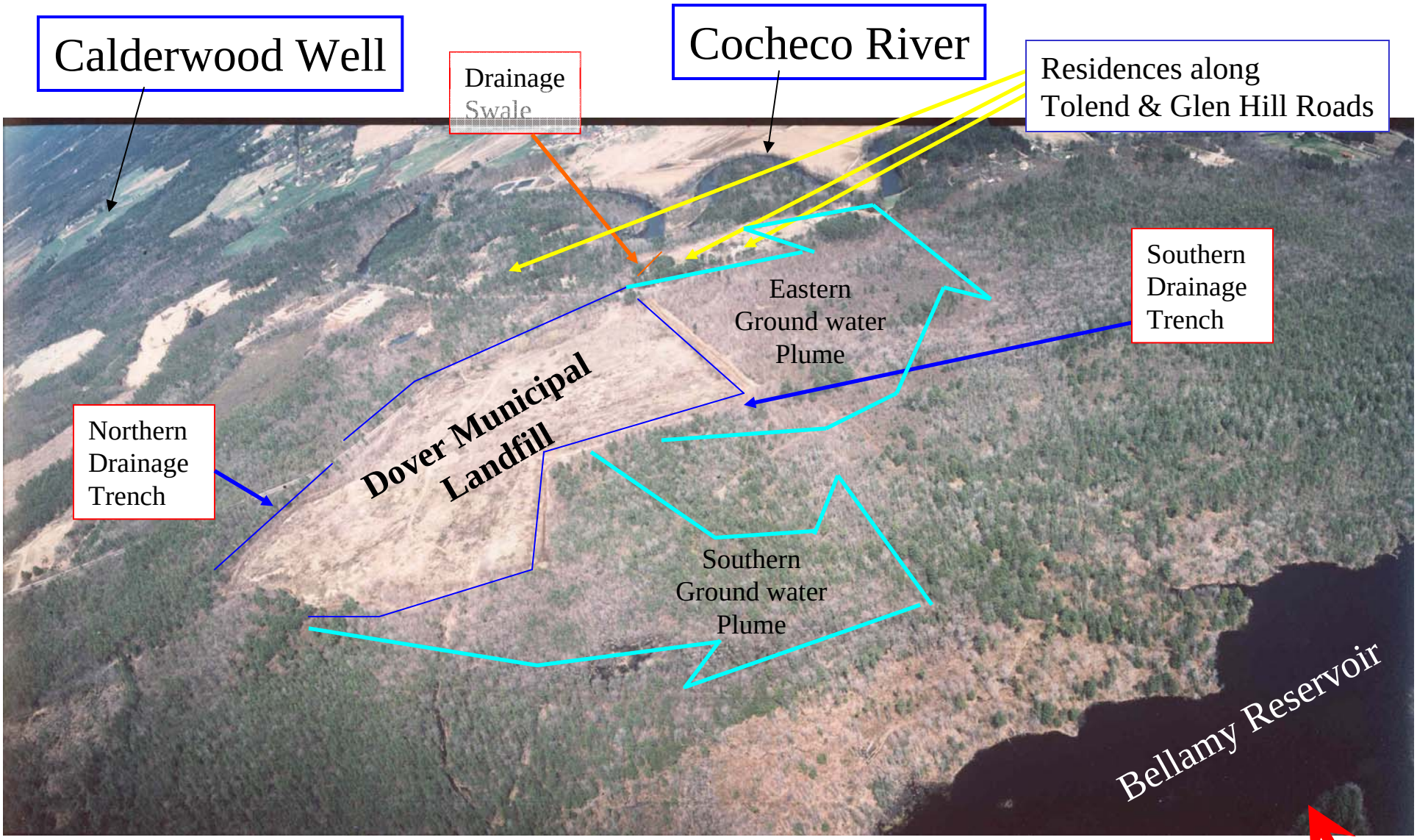

Figure 2: Dover Municipal Landfill Site features.

EPIC photo, May 7, 1992

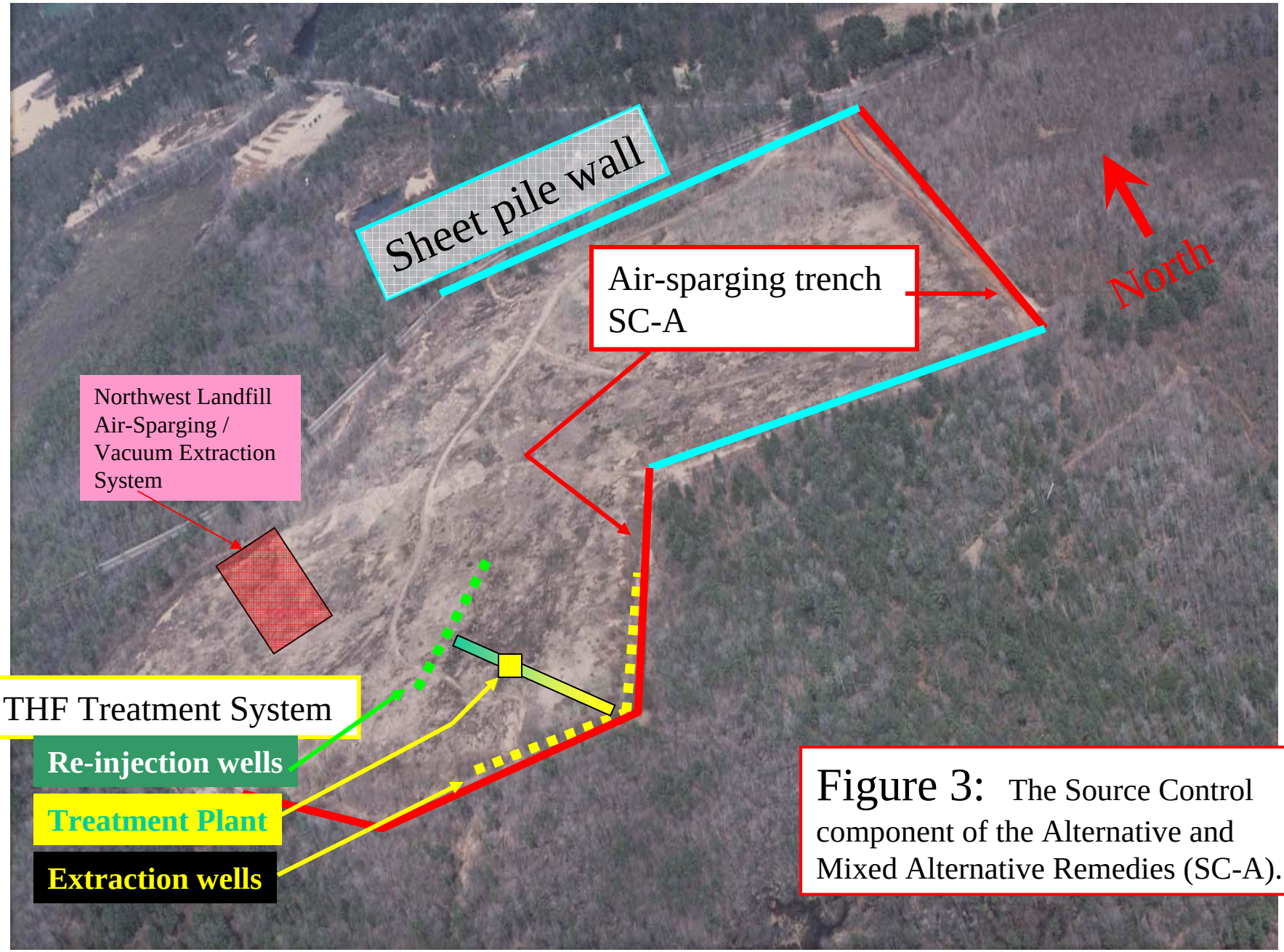

Figure 3: The Source Control component of the Alternative and Mixed Alternative Remedies (SC-A).

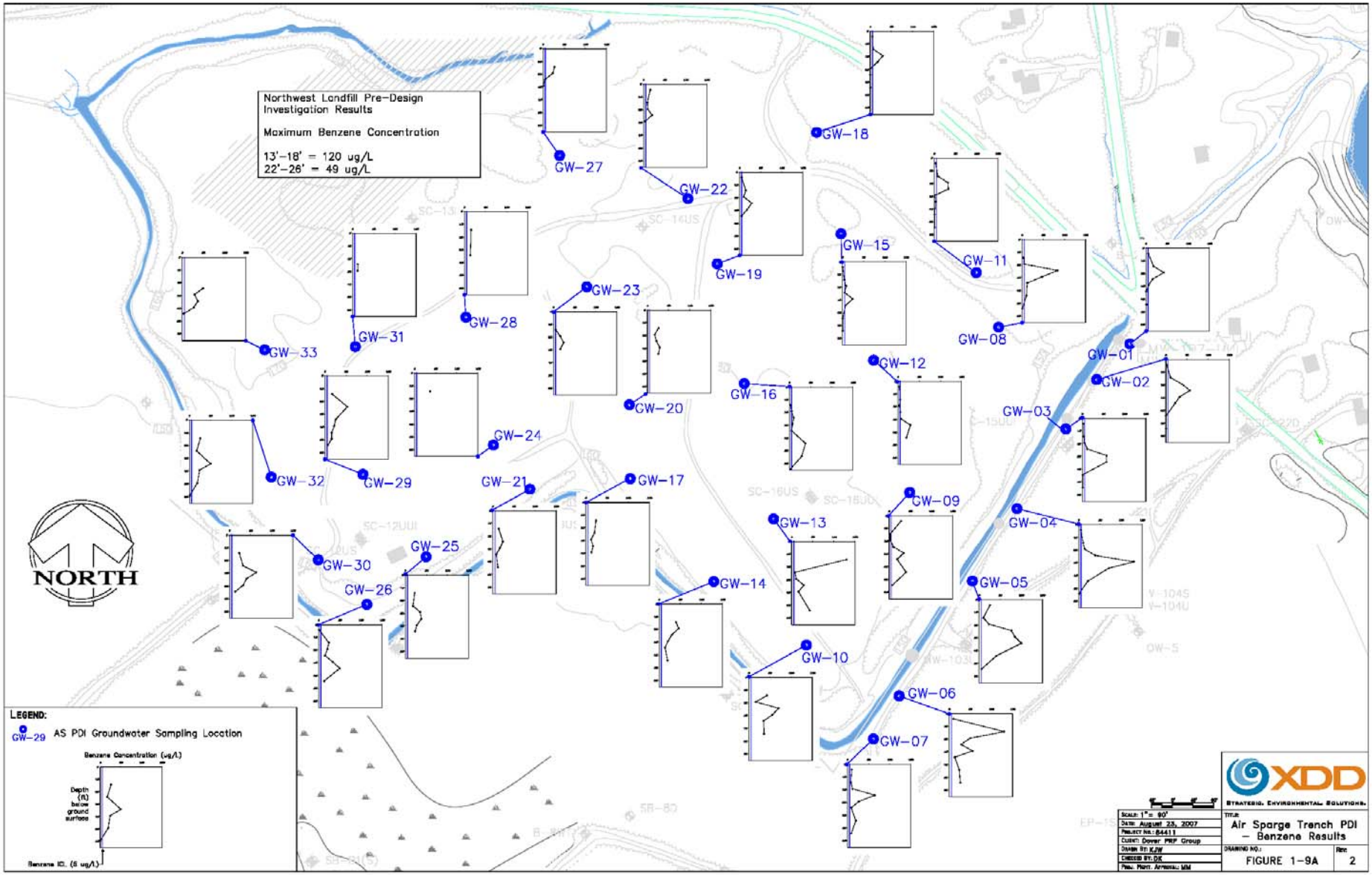

Figure 4 – Geoprobe results from the Trench PDI for Benzene in the landfill footprint. The upper, horizontal scale is in increments of 50 ppb and the cleanup level is denoted by a blue line that drops from 5 ppb. The vertical depth scale begins with 5' at the origin and descends in increments of 10 feet to a depth of 65 feet.

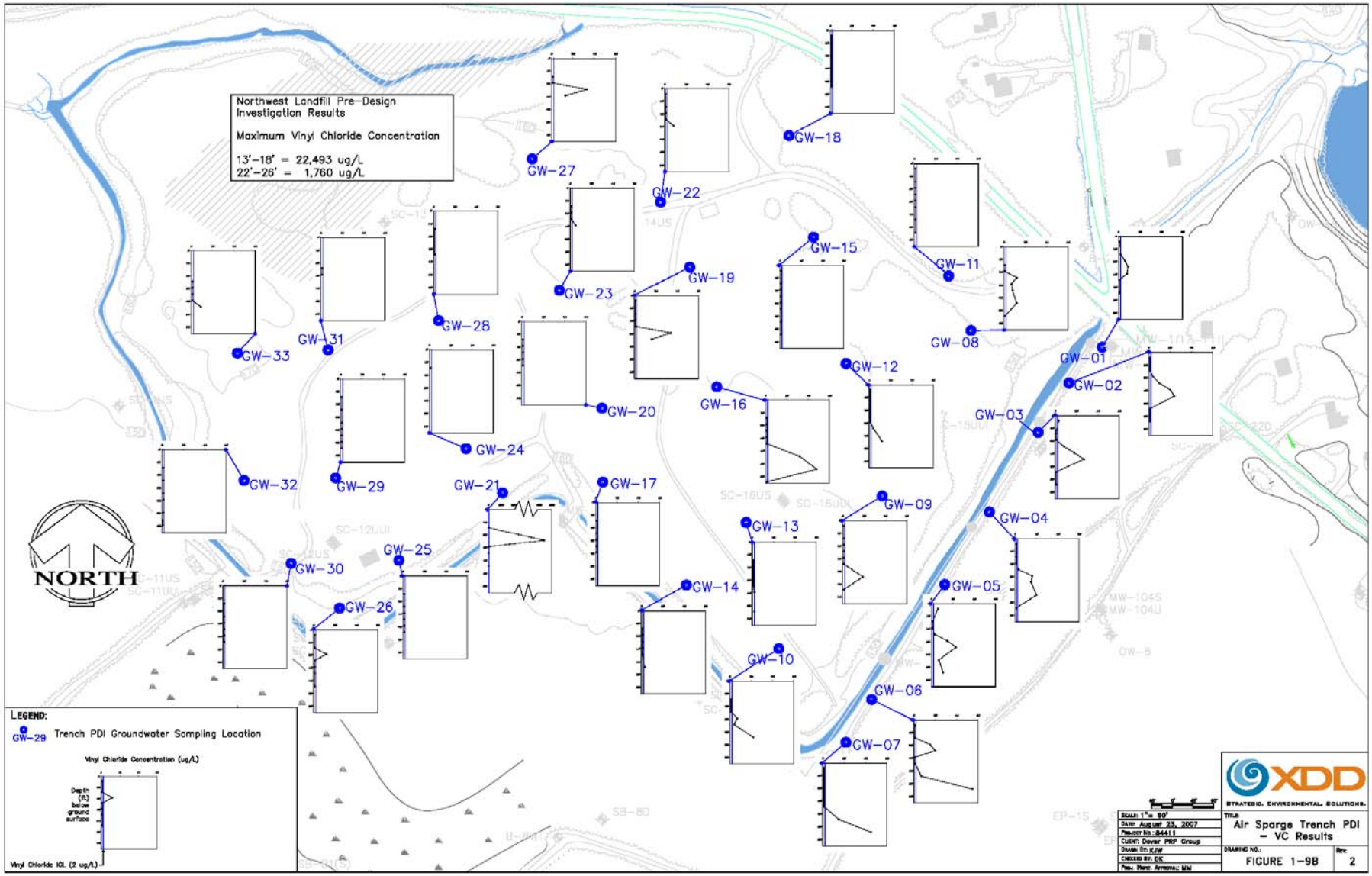

Figure 5 – Geoprobe results from the Trench PDI for Vinyl Chloride in the landfill footprint. The upper, horizontal scale is in increments of 20 ppb and the cleanup level is denoted by a blue line that drops from 2 ppb. The vertical depth scale begins with 5' at the origin and descends in increments of 10 feet to a depth of 65 feet.

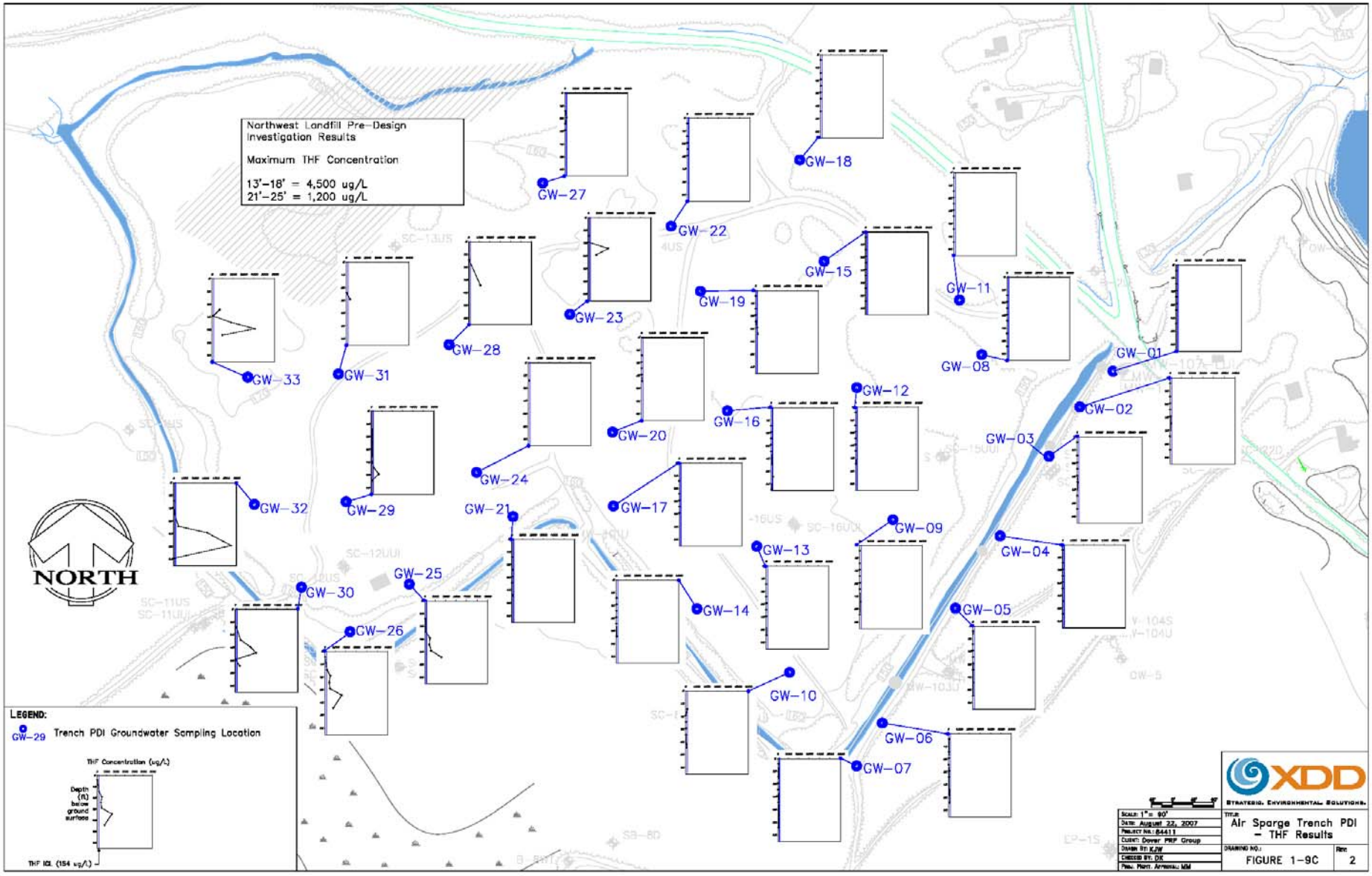

Figure 6 – Geoprobe results from the Trench PDI for THF in the landfill footprint. The upper, horizontal scale is in increments of 1000 ppb and the cleanup level is denoted by a blue line that drops from 154 ppb. The vertical depth scale begins with 5' at the origin and descends in increments of 10 feet to a depth of 65 feet.

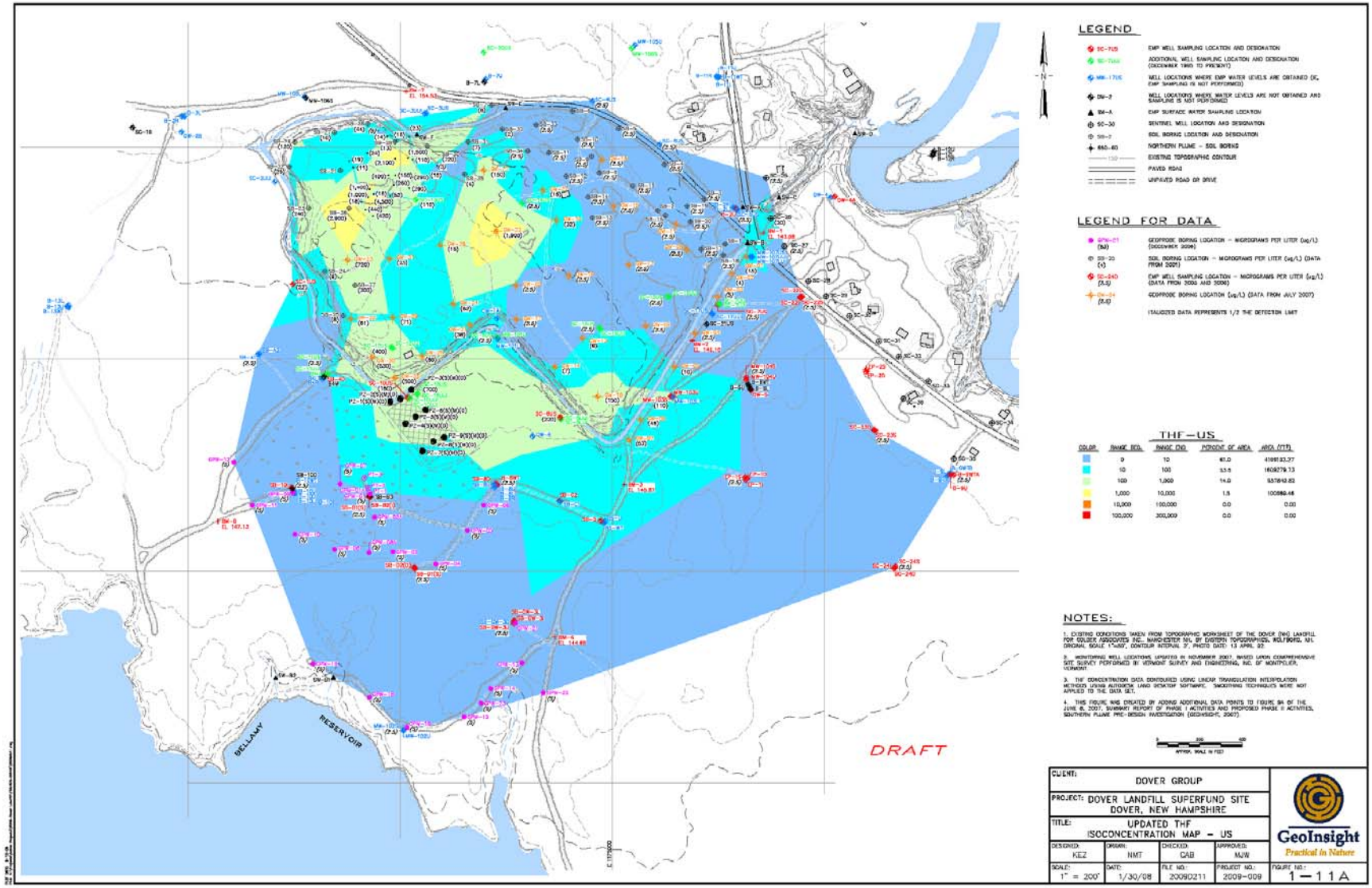

Figure 7 – Distribution of THF in the upper-most stratigraphic unit, the Upper Sand (US). The blue colors are below cleanup levels, the pale green and brighter colors are at or above the cleanup levels.

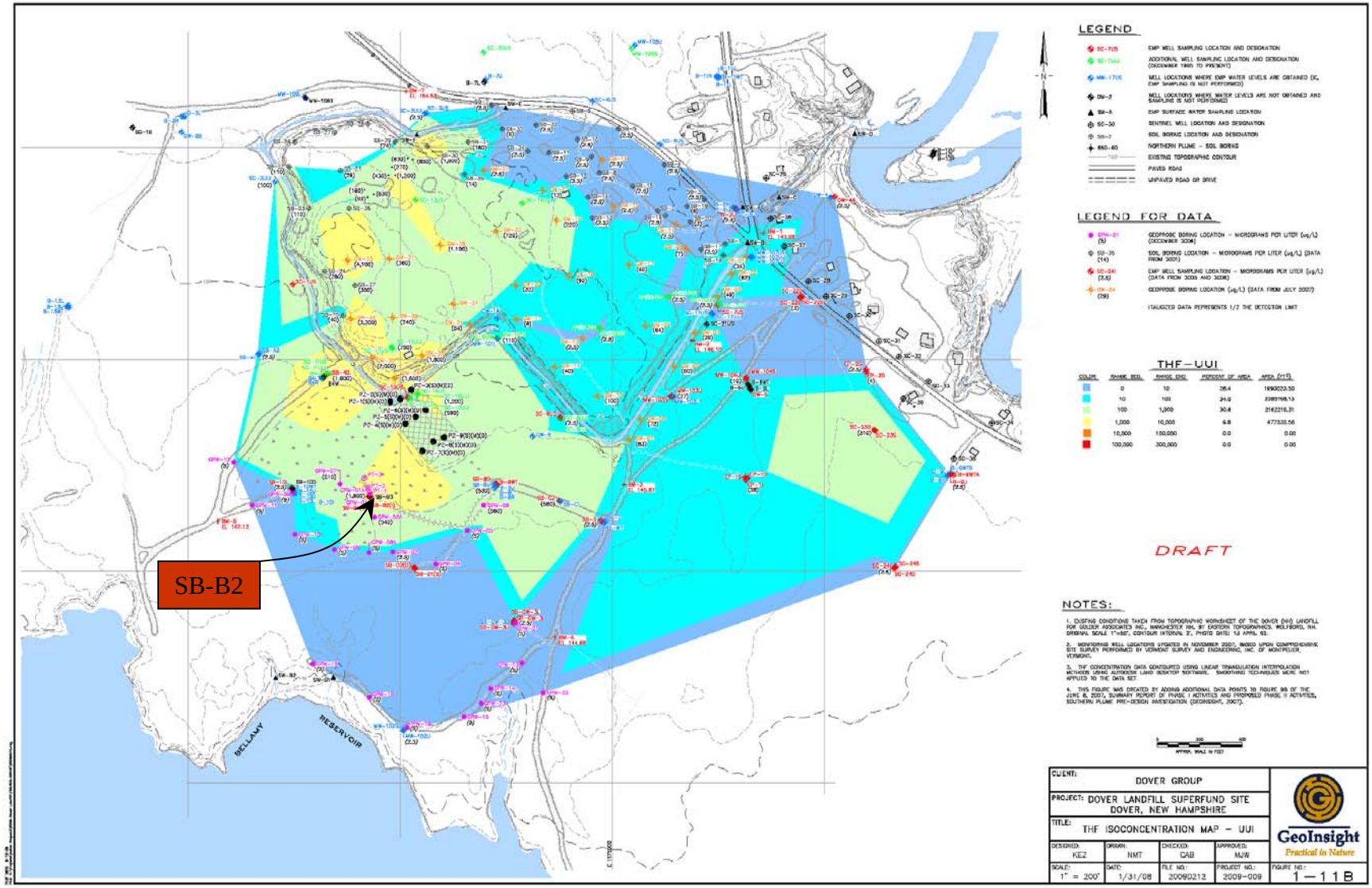

Figure 8 – Distribution of THF in the middle stratigraphic unit, the Upper-Upper Interbedded (UUI). The blue colors are below cleanup levels, the pale green and brighter colors are at or above the cleanup levels.

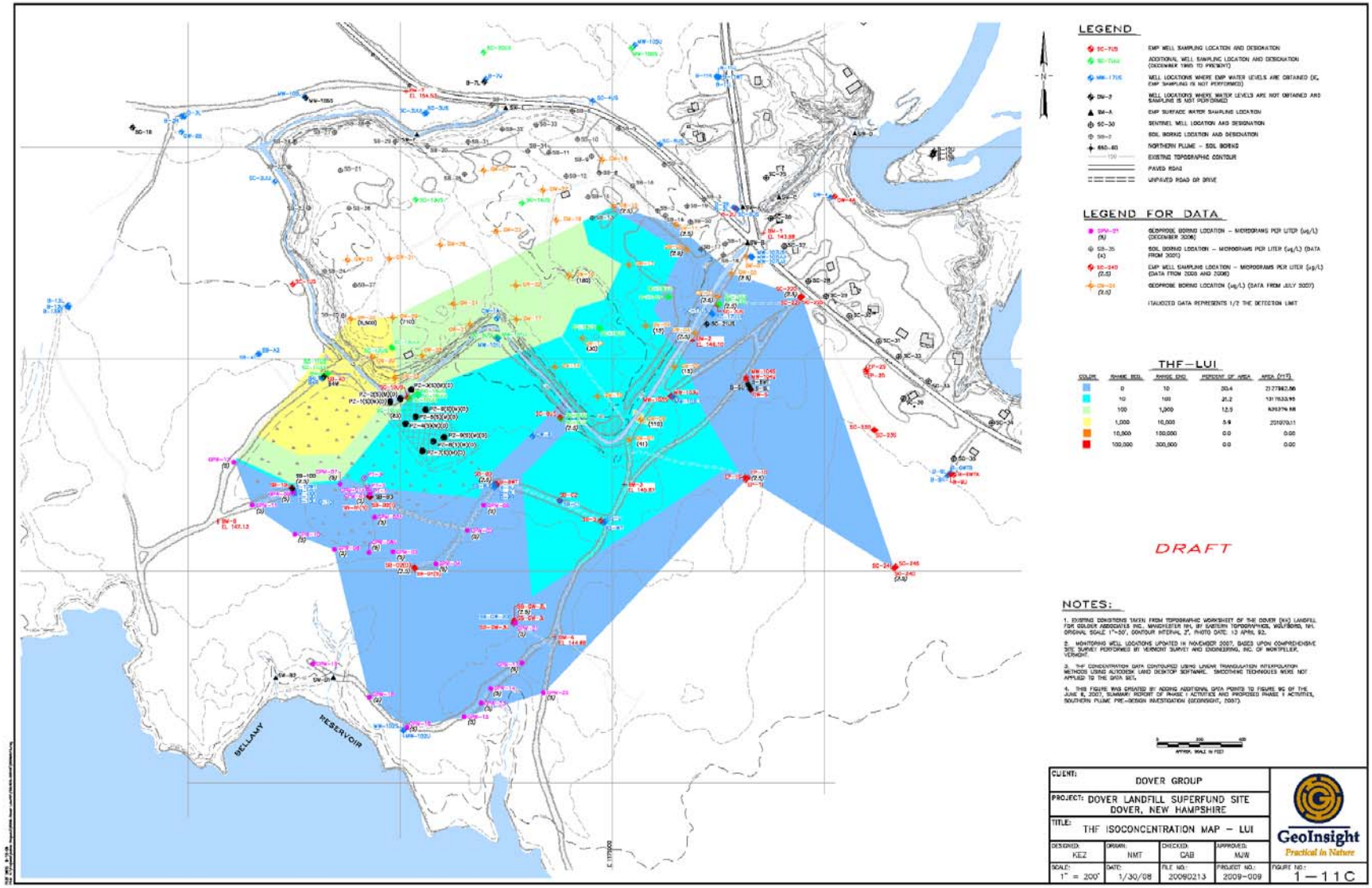

Figure 9 – Distribution of THF in the lower stratigraphic unit, the Lower-Upper Interbedded (UUI). The blue colors are below cleanup levels, the pale green and brighter colors are at or above the cleanup levels.

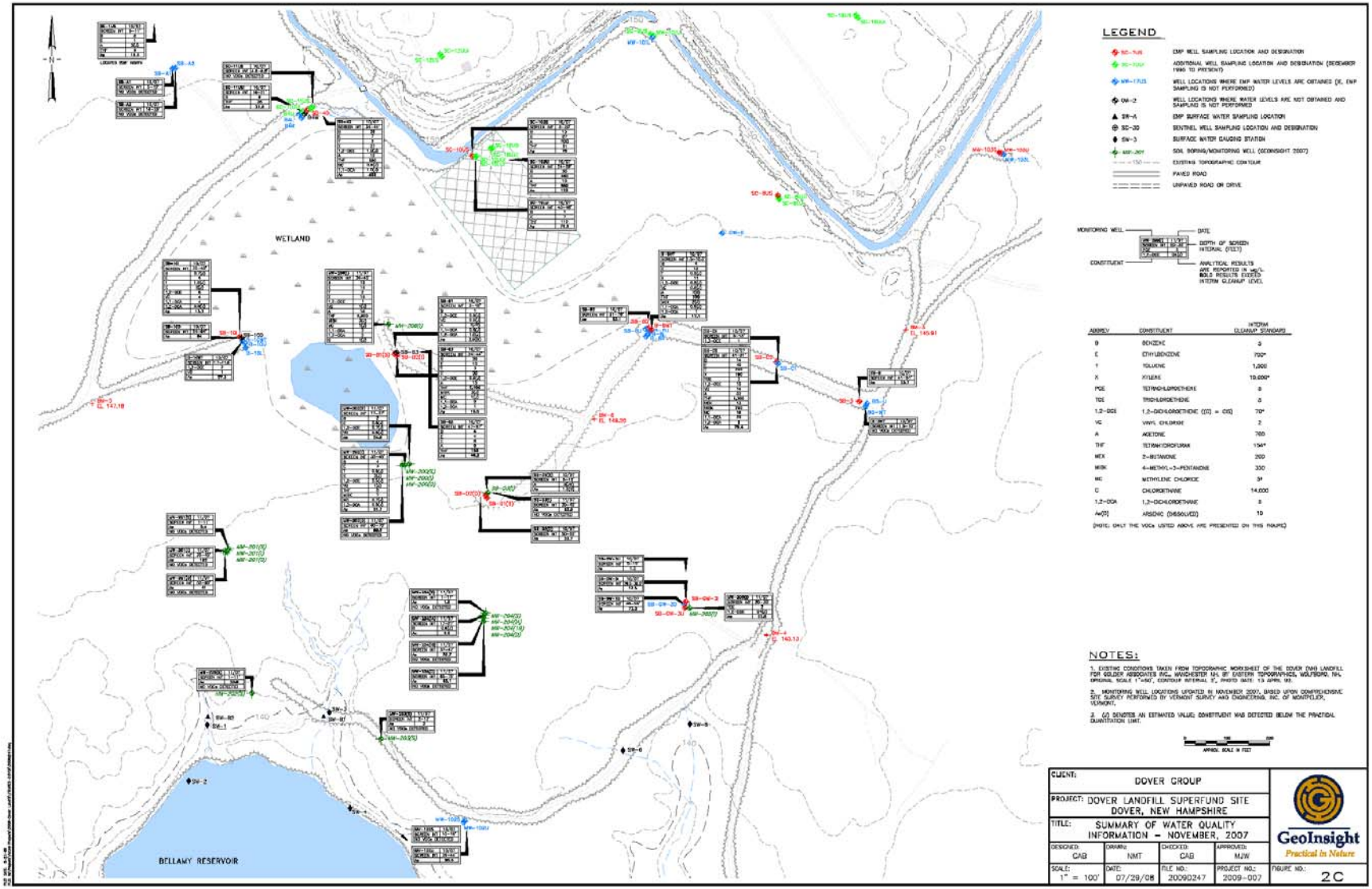

Figure 10 – A summary of water quality information in the Southern Plume as of November 2007 in monitoring wells on-site. Detection of contaminants above cleanup levels are in bold.

Photo 2 – Exposed middle stratigraphic (upper inter-bedded unit) on the Cocheco River. The open face shown here is approximately 6 feet high.

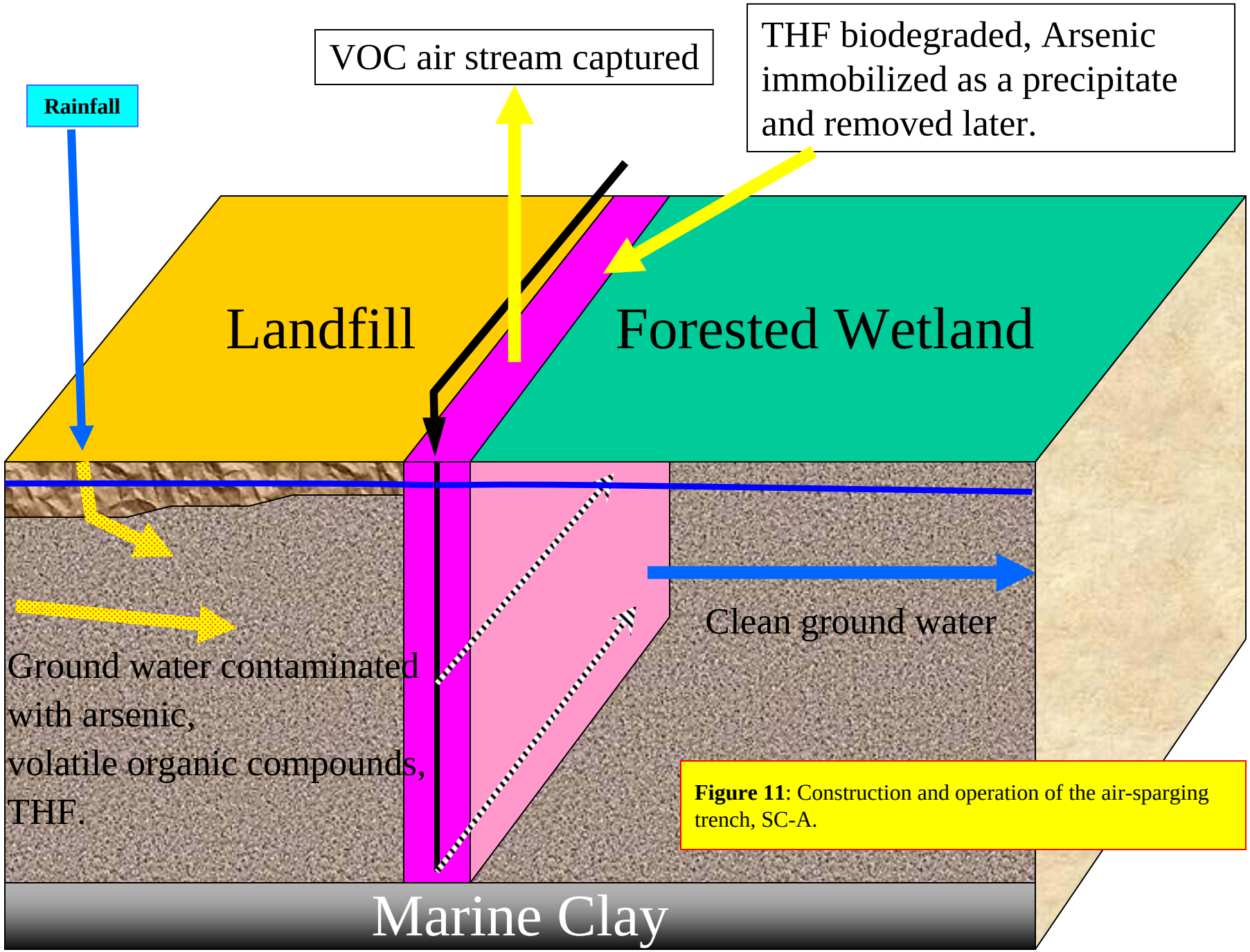

Figure 11: Construction and operation of the air-sparging trench, SC-A.

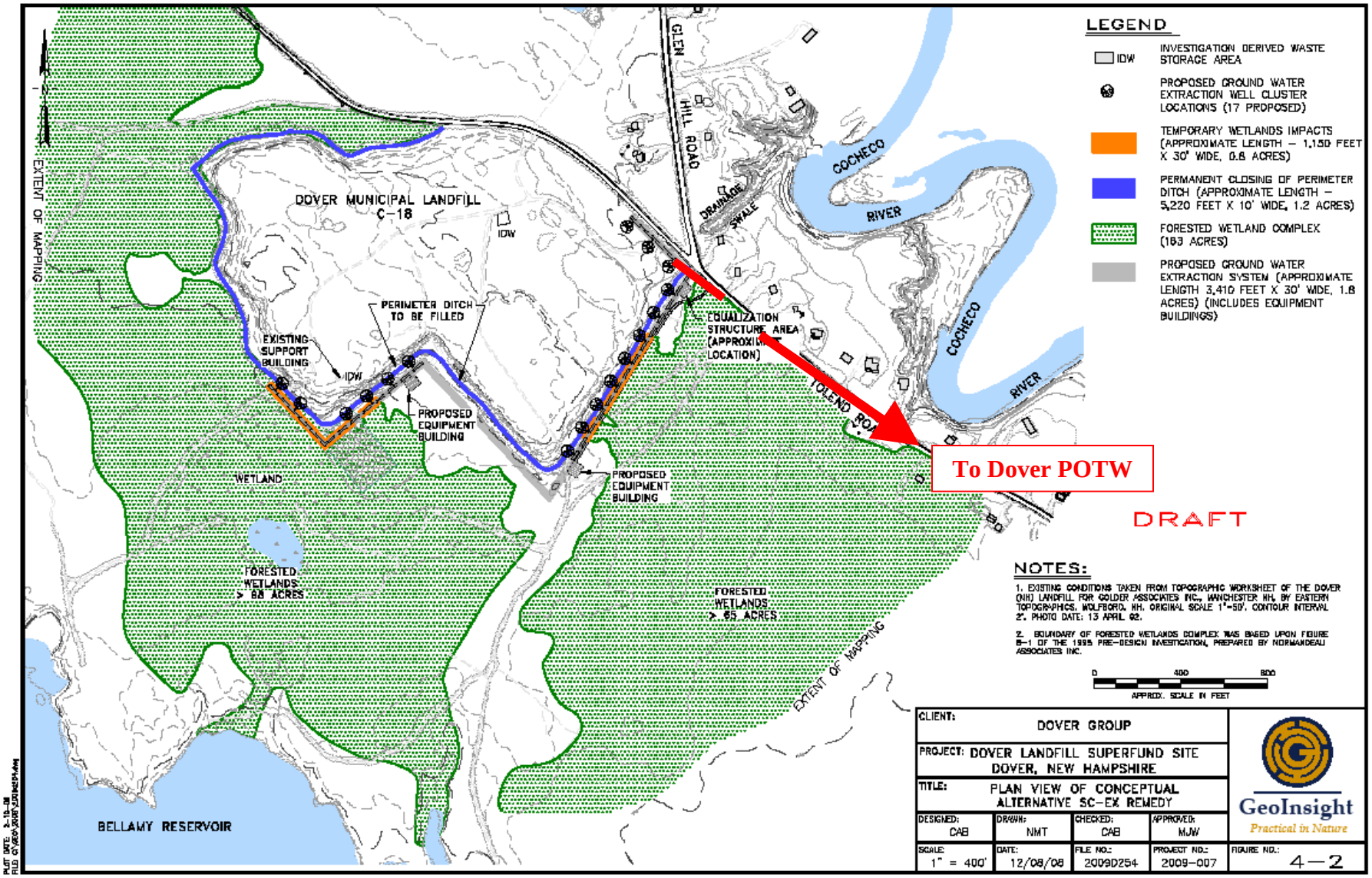

Figure 12 – Plan view of the proposed Source Control groundwater extraction system, SC-Ex. The groundwater extraction system would follow the path of the air-sparging trench.

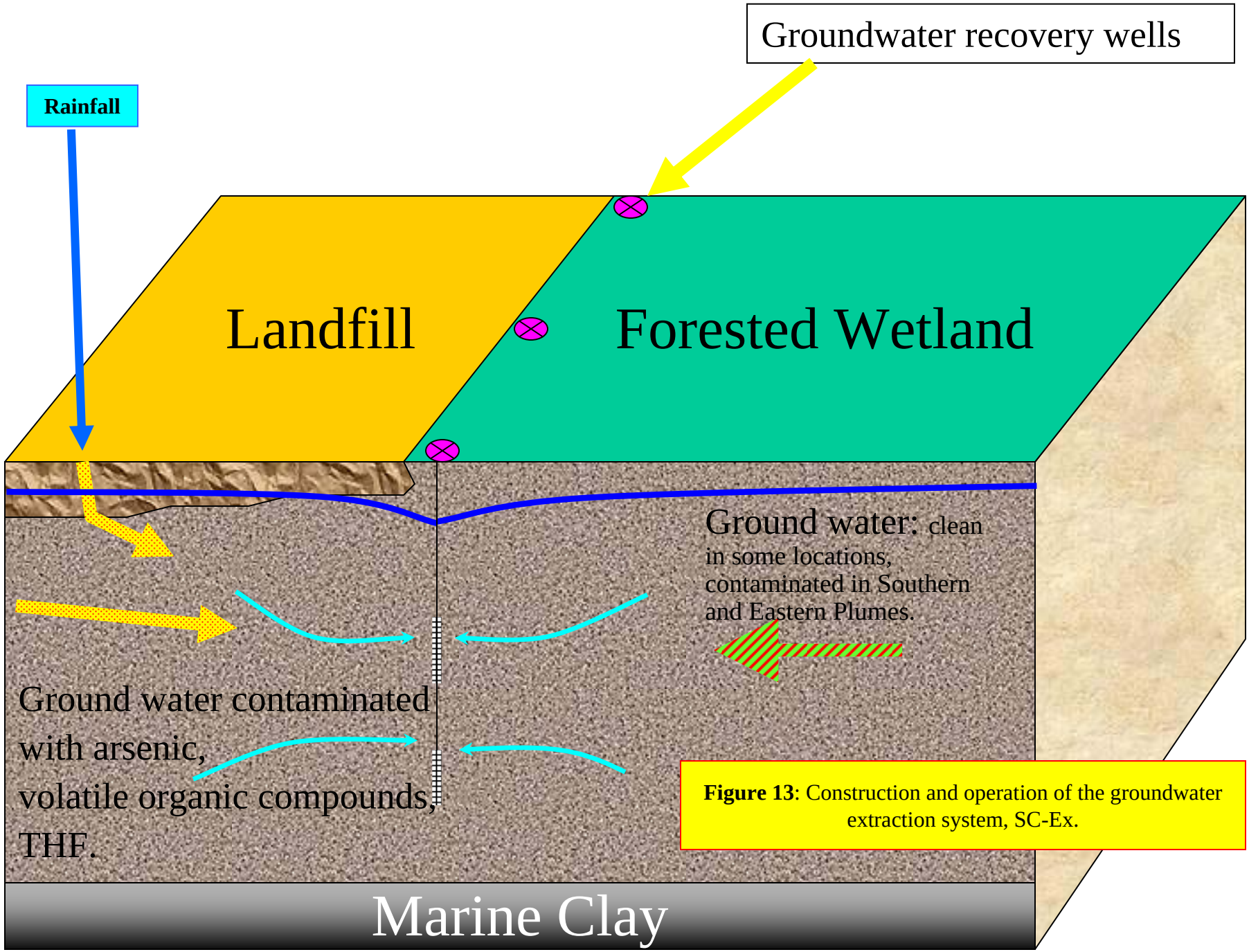

Figure 13: Construction and operation of the groundwater extraction system, SC-Ex.

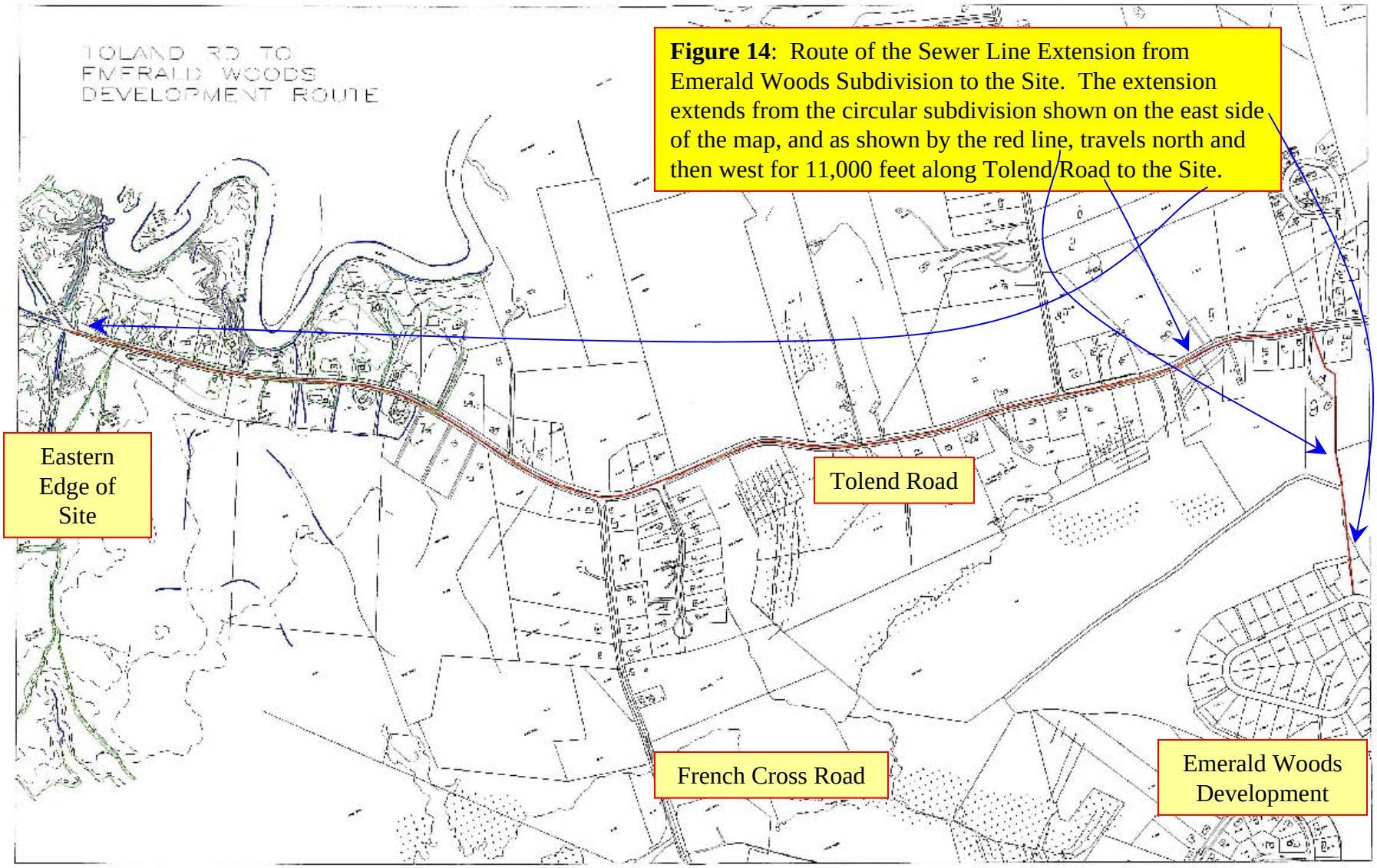

Figure 14: Route of the Sewer Line Extension from Emerald Woods Subdivision to the Site. The extension extends from the circular subdivision shown on the east side of the map, and as shown by the red line, travels north and then west for 11,000 feet along Tolend Road to the Site.

JUNE 2009 EXPLANATION OF SIGNIFICANT DIFFERENCES

ATTACHMENT A

APPLICABLE, OR RELEVANT AND APPROPRIATE REQUIREMENTS

Attachment A - Dover Municipal Landfill Superfund Site
Chemical-specific ARARs
1 of 6

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
Federal Requirements	Safe Drinking Water Act (42 U.S.C. §300f *et seq.*); National primary drinking water regulations - Maximum Contaminant Levels (MCLs) (40 C.F.R. 141, Subpart B and G)	Relevant and Appropriate	Establishes maximum contaminant levels (MCLs) for common organic and inorganic contaminants applicable to public drinking water supplies. Used as relevant and appropriate cleanup standards for aquifers and surface water bodies that are potential drinking water sources.	On-and off-site ground water will attain MCLs at the completion of the remedy through capping, lowering of groundwater table under the landfill and through extraction and treatment of groundwater in southern plume. Groundwater in eastern plume expected to meet levels through natural attenuation. MCL for arsenic determined not to be a relevant standard due to high background levels.	On and off-site ground water will attain MCLs through successful operation of the treatment trench, addressing localized sources in the landfill and potentially through extraction and treatment of groundwater in the southern plume and natural attenuation in the eastern plume. Otherwise, the contingencies of capping the landfill and active treatment of groundwater in the eastern plume will meet cleanup levels in groundwater. The MCL for arsenic was adopted as a relevant and appropriate cleanup standard.	On and off-site ground water will attain MCLs through successful operation of the hydraulic controls and off-site disposal of contaminated groundwater to the POTW, addressing localized sources in the landfill and potentially through extraction and treatment of groundwater in the southern plume and natural attenuation in the eastern plume. Otherwise, the contingencies of capping the landfill and active treatment of groundwater in the eastern plume will meet cleanup levels in groundwater outside of the compliance boundary for the capped area and institutional controls will prevent exposure to contaminated groundwater within the capped area. Institutional controls will be maintained until risks identified under these standards are eliminated. The MCL for arsenic has been retained as a relevant and appropriate cleanup standard.
	Safe Drinking Water Act (42 U.S.C. §300f *et seq*.); National primary drinking water regulations - Maximum Contaminant Level Goals (MCLGs)(40 C.F.R. 141, Subpart F)	Relevant and Appropriate for non-zero MCLGs only; MCLGs set as zero are To Be Considered	Establishes maximum contaminant level goals (MCLGs) for public water supplies. MCLGs are health goals for drinking water sources. These unenforceable health goals are available for a number of organic and inorganic compounds.	On-and off-site ground water will attain nonzero MCLGs when there is no MCL or State drinking water standards, whichever is more stringent at the completion of the remedy through capping, lowering of groundwater table under the landfill and through extraction and treatment of groundwater in southern plume. Groundwater in eastern plume expected to meet levels through natural attenuation.	On and off-site ground water will attain nonzero MCLGs when there is no MCL or State drinking water standards, whichever is more stringent at the completion of the remedy through successful operation of the treatment trench, addressing localized sources in the landfill and potentially through extraction and treatment of groundwater in the southern plume and natural attenuation in the eastern plume. Otherwise, the contingencies of capping the landfill and active treatment of groundwater in the eastern plume will meet cleanup levels in groundwater.	On and off-site ground water will attain nonzero MCLGs when there is no MCL or State drinking water standards, whichever is more stringent at the completion of the remedy through successful operation of the hydraulic controls and off-site disposal of contaminated groundwater to the POTW, addressing localized sources in the landfill and potentially through extraction and treatment of groundwater in the southern plume and natural attenuation in the eastern plume. Otherwise, the contingencies of capping the landfill and active treatment of groundwater in the eastern plume will meet cleanup levels in groundwater.

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
Federal Criteria, Advisories, and Guidance	EPA Risk Reference Dose (RfDs)	To Be Considered	RfDs are considered to be the levels unlikely to cause significant noncarcinogenic adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	RfDs will be used to characterize noncarcinogenic risks associated with residual COC concentrations.	RfDs will be used to characterize noncarcinogenic risks associated with residual COC concentrations.	Hazards due to noncarcinogens with EPA RfDs are used to evaluate exposures to contaminated media. The remedy prevents exposure to contaminants though institutional controls to restrict exposure until cleanup goals are achieved through hydraulic controls and off-site disposal of contaminated groundwater to the POTW, addressing localized sources in the landfill, potential extraction and treatment of groundwater in the southern plume, and natural attenuation in the eastern plume outside of the compliance boundary for the capped area and institutional controls will prevent exposure to contaminated groundwater within the capped area. Institutional controls will be maintained until risks identified under these standards are eliminated.
	Carcinogen Group Potency Factors	To Be Considered	CPFs will be used to characterize risks associated with residual COC concentrations.	CPFs will be used to characterize risks associated with residual COC concentrations.	CPFs will be used to characterize risks associated with residual COC concentrations.	**Unclear whether EPA still uses this guidance for risk assessments.**
	EPA Carcinogenicity Slope Factor	**To Be Considered**	**Slope factors are developed by EPA from Health Effects Assessments and present the most up-to-date information on cancer risk potency. Slope factors are developed by EPA from Health Effects Assessments by the Carcinogenic Assessment Group.**	**Not cited in the ROD.**	**Not cited in the AROD.**	**Risks due to carcinogens as assessed with slope factors are used to evaluate exposures to contaminated media. The remedy prevents exposure to contaminants though institutional controls to restrict exposure until cleanup goals are achieved through hydraulic controls and off-site disposal of contaminated groundwater to the POTW, addressing localized sources in the landfill, potential extraction and treatment of groundwater in the southern plume, and natural attenuation in the eastern plume. Institutional controls will be maintained until risks identified under these standards are eliminated.**

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
	Guidelines for Carcinogen Risk Assessment EPA/630/P-03/001F (March 2005)	**To Be Considered**	**Guidance for assessing cancer risk.**	**Not cited in the ROD.**	**Not cited in the AROD.**	**Risks due to carcinogens are assessed using these guidelines. The remedy prevents exposure to contaminants though institutional controls to restrict exposure until cleanup goals are achieved through hydraulic controls and off-site disposal of contaminated groundwater to the POTW, addressing localized sources in the landfill, potential extraction and treatment of groundwater in the southern plume, and natural attenuation in the eastern plume. Institutional controls will be maintained until risks identified under these standards are eliminated.**
	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens EPA/630/R-03/003F (March 2005)	**To Be Considered**	**Guidance of assessing cancer risks to children.**	**Not cited in the ROD.**	**Not cited in the AROD.**	**Risks to children due to carcinogens are assessed using these guidelines. The remedy prevents exposure to contaminants though institutional controls to restrict exposure until cleanup goals are achieved through hydraulic controls and off-site disposal of contaminated groundwater to the POTW, addressing localized sources in the landfill, potential extraction and treatment of groundwater in the southern plume, and natural attenuation in the eastern plume. Institutional controls will be maintained until risks identified under these standards are eliminated.**

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
	Health Advisories (EPA Office of Drinking Water)	**To Be Considered**	**Health Advisories are estimates of risk due to consumption of contaminated drinking water; they consider non-carcinogenic effects only. To be considered for contaminants in groundwater that may be used for drinking water where the standard is more conservative than either federal or state statutory or regulatory standards.**	**Not cited in the ROD.**	**Not cited in the AROD.**	**Health advisories will be used to evaluate the non-carcinogenic risk resulting from exposure to certain compounds. The remedy prevents exposure to contaminants though institutional controls to restrict exposure until cleanup goals are achieved through hydraulic controls and off-site disposal of contaminated groundwater to the POTW, addressing localized sources in the landfill, potential extraction and treatment of groundwater in the southern plume, and natural attenuation in the eastern plume. Institutional controls will be maintained until risks identified under these standards are eliminated.**
	NOAA Technical Memorandum NOS OMA 52	To Be Considered	Potential ecological risks evaluated using these thresholds.	Potential ecological risks will be evaluated using these thresholds and sediments in swale and ditch that contain arsenic in excess of 10 ppm will be removed and consolidated under cap or disposed of offsite. Measures will be taken to prevent contaminated sediment from washing into the Cocheco River during excavation.	Potential ecological risks will be evaluated using these thresholds and sediments in swale and ditch that contain arsenic in excess of 10 ppm will be removed and disposed of offsite. Measures will be taken to prevent contaminated sediment from washing into the Cocheco River during excavation.	Potential ecological risks will be evaluated using these thresholds and sediments in swale and ditch that contain arsenic in excess of 10 ppm will be removed and disposed of offsite. Measures will be taken to prevent contaminated sediment from washing into the Cocheco River during excavation.
	Ontario Lowest Effect Levels 1993,1994	To Be Considered	Used to provide a spectrum of ecological risk resulting from exposure to site contaminants for use in ecological risk assessment.	Potential ecological risks will be evaluated using these thresholds.	Potential ecological risks will be evaluated using these thresholds.	Potential ecological risks will be evaluated using these thresholds. The remedial action will address identified risks to ecological receptors.

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
State Requirements	Drinking Water Quality Standards: NH Admin. Code Env-Ws 314 MCLs and MCLGs for Inorganics; NH Admin. Code Env-Ws 315 MCLs and MCLGs for Regulated Organics	Relevant and Appropriate for MCLs and non-zero MCLGs only; MCLGs set as zero are To Be Considered	State MCLs and MCLGs establish maximum contaminant levels permitted in public water supplies and are the basis of State Ambient Groundwater Quality Standards (AGQS) that are applicable to site groundwater. The regulations are generally equivalent to the Federal Safe Drinking Water Act (SDWA).	On- and off-site ground water will attain State MCLs and nonzero State MCLGs when there is no federal more stringent MCL, at the completion of the remedy through capping, lowering of groundwater table under the landfill and extraction and treatment of groundwater in southern plume. Groundwater in eastern plume expected to meet levels through natural attenuation.	On- and off-site ground water will attain State MCLs and nonzero State MCLGs when there is no federal more stringent MCL, at the completion of the remedy. If there remedy is unsuccessful, groundwater will meet cleanup levels through contingent actions.	Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the groundwater remedies are effective in preventing the migration of contaminants and achieving drinking water standards. If not the contingent remedy, capping the landfill, will attain these standards outside of the compliance boundary for the waste management area and institutional controls will prevent exposure to contaminated groundwater within the capped area. Institutional controls will be maintained until risks identified under these standards are eliminated.
	New Hampshire Ambient Groundwater Quality Standards (NH AGQS) (Env-Or 603.03, Table 600-1) **[generally cited as Env–Wm1400 in the ROD and AROD; section renumbered by the State]**	Relevant and Appropriate	Establishes maximum concentration levels for regulated contaminants in groundwater which result from human operations or activities. NH AGQS are equivalent to MCLs for contaminants that have MCLs. NH AGQS have been established for site groundwater contaminants for which no MCLs are established, and are derived to be protective for drinking water uses. The NH AGQS will be used for site contaminants where MCLs are not currently established (e.g. tetrahydrofuran (THF)).	On-and off-site ground water will attain State AGQSs when there is no more stringent MCL or State drinking water standards, at the completion of the remedy. In addition, any treatment system which discharges into surface waters and any activities conducted in the wetlands will be consistent with the maintenance or improvement of groundwater quality. If not the contingent remedy, capping the landfill, will attain these standards outside of the compliance boundary for the waste management area and	On- and off-site ground water will attain State AGQSs when there is no more stringent MCL or State drinking water standards, at the completion of the remedy. If the remedy is unsuccessful, groundwater will meet cleanup levels through contingent actions. In addition, any treatment system which discharges into surface waters and any activities conducted in the wetlands will be consistent with the maintenance or improvement of groundwater quality.	Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the groundwater remedies are effective in preventing the migration of contaminants and achieving drinking water standards. Institutional controls will be maintained until risks identified under these standards are eliminated.
	Groundwater Protection Standards: NH Admin. Code Env-Or 603.01(a) and (b) [generally cited as Env–Wm1400 in the ROD and AROD; section renumbered by the State]	**Applicable**	**Wm-Or 603.01(a) and (b) provide that groundwater shall be suitable for use as drinking water without treatment and shall not contain any regulated contaminant in concentrations greater than ambient groundwater quality standards established in Env-Or 603.03.**	**Not specifically cited in the ROD**	**Not specifically cited in the AROD**	**Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the groundwater remedies are effective in preventing the migration of contaminants and achieving drinking water standards. Institutional controls will be maintained until risks identified under these standards are eliminated.**

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
	Nondegradation of Groundwater to Protect Surface Water: NH Admin. Code Env-Or 603.01(c) [generally cited as Env–Wm1400 in the ROD and AROD; section renumbered by the State]	**Applicable**	**Wm-Or 603.01(c) provides that, unless naturally occurring, groundwater shall not contain any contaminants at concentrations such that groundwater to surface water results in a violation of surface water standards in any surface water body within or adjacent to the site. Env-Or 603.01 (c) therefore incorporates surface water standards set forth at Env-Ws 1700.**	**Not specifically cited in the ROD**	**Not specifically cited in the AROD**	**Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the groundwater remedies are effective in preventing the migration of contaminants and achieving drinking water standards. Institutional controls will be maintained until risks identified under these standards are eliminated.**
State Criteria, Advisories, and Guidance	**New Hampshire Department of Environmental Services Risk Characterization and Management Policy (Section 7.4(5))**	**To be Considered**	**Establishes GW-1 and GW-2 guidelines for contaminants in groundwater. GW-1 values are equal to the NH AGQS values for ambient groundwater. GW-2 values are based on a subsurface vapor intrusion into buildings to calculate indoor air conservative risk assessments, and therefore apply to volatile contaminants only.**	**Not cited in the ROD.**	**Not cited in the AROD.**	**Risks due to groundwater contaminants, particularly from vapor, are assessed using these guidelines. The remedy prevents exposure to contaminants though institutional controls, groundwater remediation, and monitoring of the natural attenuation processes. Institutional controls will be maintained until risks identified under these standards are eliminated.**

Attachment A - Dover Municipal Landfill Superfund Site
Location-specific ARARs

Authority	Requirements	Status	Requirement Synopsis	1991 ROD	2004 AROD	2009 ESD - SC-Ex Alternative
Federal Requirements	Fish and Wildlife Coordination Act (16 U.S.C.. §661 *et seq* .)	Applicable	Any modification of a body of water or wetland requires consultation with the U.S. Fish and Wildlife Service and the appropriate state wildlife agency to develop measures to prevent, mitigate, or compensate for losses of fish and wildlife.	Specified federal agencies will be contacted to help analyze impacts of capping the landfill, filling the perimeter trench and installing and operating the groundwater collection and treatment systems on wildlife in wetlands and the river.	Specified federal agencies will be contacted to help analyze impacts of installing and operating the treatment trench, localized source control actions, the groundwater collection and treatment systems and any other remedial activities on wildlife in wetlands and the river.	Specified federal agencies will be contacted to help analyze impacts of installing and operating the hydraulic control system and discharge pipe connecting to the sewer, localized source control actions, the groundwater collection and treatment systems and any other remedial activities on wildlife in wetlands and the river.
	Protection of Wetlands (40 C.F.R. § 6.302(a); Appendix A)	Applicable	This regulation codifies standards established under Executive Order 11990. Under this requirement, no activity that adversely affects a federal jurisdictional wetland shall be permitted if a practicable alternative with lesser effects is available. Action to avoid, whenever possible, the long- and short-term impacts on wetlands and to preserve and enhance wetlands.	Impacts to wetlands bordering the Site incurred from the installation of the ground water treatment system, interceptor trench, the re-contouring of the landfill and filling of the perimeter ditch will be minimized by including mitigating measures such as silt fences and hay bales during on-site construction activities. Other necessary engineering controls will be used to represent the best practicable approach to remediation with the least environmentally damaging impacts. Impacted wetlands will be restored to the extent practicable.	Impacts to wetlands bordering the Site from installation of the treatment trench, the vertical hydraulic barrier, the groundwater collection and treatment system, from addressing the swale and from the activity of backfilling the perimeter ditch will be minimized by including mitigating measures such as silt fences and hay bales during on-site construction activities. Other necessary engineering controls will be used to represent the best practicable approach to remediation with the least environmentally damaging impacts. Impacted wetlands will be restored to the extent practicable.	**This regulation has been eliminated from 40 C.F.R. Part 6. Compliance with the Wetlands Executive Order is currently a matter to be addressed under the Protectiveness Criterion rather than the ARAR Criterion.**

Authority	Requirements	Status	Requirement Synopsis	1991 ROD	2004 AROD	2009 ESD - SC-Ex Alternative
	Clean Water Act, Section 404 (33 U.S.C.. § 1344); Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 C.F.R. Part 230, 231 and 33 C.F.R. Parts 320-323)	Applicable	Under this requirement, no activity that adversely affects a federal jurisdictional wetland shall be permitted if a practicable alternative with lesser effects is available. Controls discharges of dredged or fill material to protect aquatic ecosystems.	Material excavated from wetlands and water bodies during recontouring of the Landfill, during construction of the on-site treatment system and interceptor trench from addressing the swale and from the activity of filling the perimeter ditch will be performed using the least environmentally damaging, practicable activities. Measures to mitigate damages will be used at all times during construction and operation of the remedy. Wetlands will be restored to the extent practicable.	Material excavated from wetlands and water bodies during construction of the aerobic treatment trench , the vertical hydraulic barrier, the groundwater collection and treatment system, from addressing the swale and from the activity of filling the perimeter ditch will be performed using the least environmentally damaging practicable activities. Measures to mitigate damages will be used at all times during construction and operation of the remedy. Wetlands will be restored to the extent practicable.	Material excavated from wetlands and water bodies during construction of the hydraulic control system, discharge pipe to the City sewer, the groundwater collection and treatment system, from addressing the swale and from the activity of filling the perimeter ditch will be performed using the least environmentally damaging practicable activities. Measures to mitigate damages will be used at all times during construction and operation of the remedy. Wetlands will be restored to the extent practicable. EPA has determined that this alternative is the least damaging practicable alternative to protect wetland resources both on-site and off-site.
	RCRA General Facility Standards - Seismic Standards (40 CFR 264.18(a))	Applicable	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 708.02(7)). Facility siting standards for hazardous waste facilities pertaining to seismic risks.	Construction of any on-site treatment facility will not be located within 200 feet of a fault that has had a displacement in Holocene time.	Construction of any on-site treatment facility will not be located within 200 feet of a fault that has had a displacement in Holocene time.	Construction of any on-site treatment facility will not be located within 200 feet of a fault that has had a displacement in Holocene time.

Authority	Requirements	Status	Requirement Synopsis	1991 ROD	2004 AROD	2009 ESD - SC-Ex Alternative
State Requirements	Criteria and Conditions for Fill and Dredge In Wetlands: RSA Ch. 482-A and NH Admin. Code Env-Wt Parts 300-400, 600, and 700 **[Only En-Wt 300 identified in the ROD and AROD]**	Applicable	These standards regulate filling and other activities in or adjacent to wetlands, and establish criteria for the protection of wetlands from adverse impacts on fish, wildlife, commerce, and public recreation.	**Only En-Wt 300 identified in the ROD and AROD.** Material excavated from wetlands and water bodies during recontouring of the Landfill, during construction of the groundwater treatment system and interceptor trench from addressing the swale and from the activity of filling the perimeter ditch will be performed using the least environmentally damaging, practicable activities. Measures to mitigate damages will be used at all times during construction and operation of the remedy.	**Only En-Wt 300 identified in the ROD and AROD.** Material excavated from wetlands and water bodies during construction of the aerobic treatment trench, the vertical hydraulic barrier, the groundwater treatment system, from addressing the swale and from the activity of filling the perimeter ditch will be performed using the least environmentally damaging practicable activities. Measures to mitigate damages will be used at all times during construction and operation of the remedy.	Material excavated from wetlands and water bodies during construction of the hydraulic control system and discharge pipe to the sewer line, the groundwater treatment system, from addressing the swale and from the activity of filling the perimeter ditch will be performed using the least environmentally damaging practicable activities. Measures to mitigate damages will be used at all times during construction and operation of the remedy. Wetlands will be restored to the extent practicable.
	Wellhead Protection Program	To Be Considered	**Unclear what wellhead protection policy this ROD citation is referring to; see wellhead protection regulations below.**	Criteria for wellhead protection area and any State Plan promulgated pursuant to this regulation will be considered to protect the Calderwood well during implementation of this remedy.	Criteria for wellhead protection area and any State Plan promulgated pursuant to this regulation will be considered to protect the Calderwood well during implementation of this remedy.	**Standards for wellhead protection addressed by regulations cited below.**
	NH Hazardous Waste Rules - Location Requirements, Seismic Standards; Env-Hw 708.02(7)	**Applicable**	**The RCRA program is delegated to the State of New Hampshire. The NH Rules have incorporated by reference the requirements of 40 C.F.R. 264.18(a) regarding facility siting standards for hazardous waste facilities pertaining to seismic risks**	**Not cited in the ROD**	**Not cited in the AROD.**	**Construction of any on-site treatment facility will not be located within 200 feet of a fault that has had a displacement in Holocene time.**

Authority	Requirements	Status	Requirement Synopsis	1991 ROD	2004 AROD	2009 ESD - SC-Ex Alternative
	Wellhead Protection: Small Production Wells for Small Community Water Systems; Env-Dw 301 and Large Production Wells for Community Water Systems; Env-Dw 302	**Relevant and Appropriate**	**Regulations establish wellhead protection areas around new large and small community wellheads. A small community water system means a public water system serving a population of 25-1,000 persons without street hydrant fire protection. A large community water system" means a community water system which serves 1,000 persons or more or any community water system that provides fire protection**	**Not cited in the ROD**	**Not cited in the AROD.**	**Groundwater remediation will be conducted to prevent contamination of any small or large community wells in the vicinity of the Site.**
	Protection of the Purity of The Bellamy Reservoir and Its Watershed; Env-Ws 386.58	**Applicable**	**The purpose of this section is to protect the purity of the water of the Bellamy Reservoir which is the principal drinking water supply for the city of Portsmouth.**	**Not cited in the ROD**	**Not cited in the AROD.**	**Groundwater remediation will be conducted to prevent contamination of the Bellamy Reservoir or any of its tributaries.**
	Native Plant Protection Act; RSA 217A and Res 1100-1108	**Applicable**	**Prohibits damaging plant species listed as endangered within the State.**	**Not cited in the ROD**	**Not cited in the AROD.**	**Listed plant species will be identified and remedial activities will comply with these standards.**

Authority	Requirements	Status	Requirement Synopsis	1991 ROD	2004 AROD	2009 ESD - SC-Ex Alternative
	Terrain alteration adjacent to surface waters; RSA 485:17, Env-Ws 415 and Env-Wq 1500	**Applicable**	**The purpose of these rules is to protect surface water quality from degradation resulting from any activity which significantly alters terrain or occurs in or on the border of the surface waters of the state. The permanent methods for protecting water quality described include: vegetated filter strips, grassed swales, detention ponds, wet ponds, constructed wetlands, infiltration trenches, infiltration basins and water quality inlets.**	**Cited as an Action-Specific ARAR in the ROD;** Erosion and surface water runoff controls will be used during re-contouring and capping of the Landfill and during any on-site construction and/or remediation activities.	**Cited as an Action-Specific ARAR in the AROD;** Erosion and surface water runoff controls will be used during sediment excavation and ditch backfilling and during any other remedial activities	**Activities performed in association with the implementation of the remedy, including installation and operation of the hydraulic control system and discharge pipeline to the sewer, will be compliant with these standards and will result in the least adverse impact to surface waters/wetlands. If the contingent remedy of capping the landfill is implemented these standards will be applied. Engineering controls (e.g. siltation controls, erosion controls) will be implemented during remedial activities to minimize harm to surface waters/wetlands. Excavated material, including well drillings, will be stockpiled and dewatered outside of wetland areas prior to off-site disposal. Wetlands would be restored (using suitable soil and vegetation) where altered temporarily by the remedy.**

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
Federal Requirements	Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901 *et seq.,* Standards for identification and listing of hazardous waste, 40 C.F.R. Part 261	Applicable to excavated material and material generated by treatment processes; Relevant and appropriate to material in the landfill	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 400). These provisions have been adopted by the State.	Materials excavated during remedy implementation and materials generated by treatment processes will be analyzed by appropriate test methods and, if applicable, managed in accordance with the substantive requirements of the State hazardous waste regulations.	Materials excavated during remedy implementation, including treatment trench and vertical hydraulic barrier installation and materials generated by treatment processes will be analyzed by appropriate test methods and, if applicable, managed in accordance with the substantive requirements of the State hazardous waste regulations.	Any wastes generated by remedial activity will be analyzed by appropriate test methods. If found to be hazardous wastes, then they will be managed in accordance with the substantive requirements of the State hazardous waste regulations. Wastes that may be generated include investigation derived waste from monitoring activities and contaminated media produced during the operation and maintenance of the hydraulic control system.
Federal Requirements	RCRA, Standards applicable to generators of hazardous wastes, 40 C.F.R. Part 262	Applicable	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 500). These provisions have been adopted by the State.	Material generated during well and interceptor trench installation, excavation activities and treatment residuals will be tested and, if hazardous, either consolidated under the RCRA C cap or sent offsite for disposal.	Material generated during well, treatment trench, and barrier excavation activities and treatment residuals will be tested and, if hazardous, sent offsite for disposal at a licensed facility.	If remedial activity generates hazardous wastes, then they will be managed in accordance with the substantive requirements of the State hazardous waste regulations.
Federal Requirements	RCRA, Standards for owners and operators of hazardous waste treatment, storage, and disposal facilities, 40 C.F.R. Part 264	Applicable for hazardous wastes generated from the remedial action; Relevant and Appropriate for hazardous wastes undisturbed in the landfill	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 700).	The specific portions of the State regulations that are ARARs for this alternative are identified in the state action-specific section.	The specific portions of the State regulations that are ARARs for this alternative are identified in the state action-specific section.	If any hazardous waste is generated from remedial activities it will be treated, stored, and disposed of under these standards. As a contingent remedy, if the hydraulic control is not effective the landfill will be capped and meet closure/post-closure requirements under these standards.
Federal Requirements	RCRA - Air Emission Standards for Process Vents, 40 CFR Part 264 Subpart AA	Applicable	Process vents that treat hazardous waste that have total organic concentrations of 10 ppm or greater. This section of RCRA has not be delegated to the State.	If process vents are used in connection with groundwater extraction recovery wells or other treatment processes, air emission controls will be implemented if the applicability threshold is met.	If process vents are used in connection with the treatment trench, groundwater extraction recovery wells or other treatment processes, air emission controls will be implemented if the applicability threshold is met.	If process vents are used in connection with the hydraulic control or other remedial processes, air emission controls will be implemented if the applicability threshold is met.
Federal Requirements	RCRA - Air Emission Standards for Equipment Leaks, 40 CFR Part 264 Subpart BB	Applicable	Air emissions standards for equipment that contains or contacts RCRA waste with organic concentrations of at least 10% by weight. This section of RCRA has not been delegated to the State.	If equipment covered by this standard is used in the remedial action, and handles hazardous substances at concentrations that meet this rule's threshold, then air emission controls will be implemented.	If equipment covered by this standard is used in the remedial action, and handles hazardous substances at concentrations that meet this rule's threshold, then air emission controls will be implemented.	If equipment covered by this standard is used in the remedial action, and handles hazardous substances at concentrations that meet this rule's threshold, then air emission controls will be implemented.
Federal Requirements	RCRA - Air Emission Standards for Tanks, Surface Impoundments and Containers, 40 CFR Part 265 Subpart CC	Applicable	Air emissions standards for treatment, storage, and disposal facilities with VOC concentrations of 100 ppmw or greater	If tanks, surface impoundments or containers are used in the remedial action and meet the applicability threshold, then air emission controls will be implemented.	If tanks, surface impoundments or containers are used in the remedial action and meet the applicability threshold, then air emission controls will be implemented.	If tanks, surface impoundments or containers are used in the remedial action and meet the applicability threshold, then air emission controls will be implemented.

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
Federal Requirements	Clean Water Act (CWA), Section 402 - National Pollution Discharge Elimination System standards, 33 U.S.C. § 1342; 40 C.F.R. 122-124, 131, 136	Applicable	These standards address water discharges which may be directed to surface water.	On-site discharges shall meet the substantive discharge standards	On-site discharges shall meet the substantive discharge standards	If a discharge from the remedial action is directed to surface water the discharge will be treated, if necessary, so that these standards will be achieved. Monitoring will be performed to determine whether operation and maintenance of the remedy could potentially affect nearby surface water bodies, in accordance with Env-Or-607 (see below).
Federal Requirements	**CWA. National Recommended Water Quality Criteria ("NRWQC"), 40 C.F.R. § 122.44**	**Relevant and Appropriate**	**These regulations establish water quality standards for protection of human health and aquatic life.**	**Not cited in the ROD**	**Not cited in the AROD**	**Used to establish monitoring standards for surface waters and sediments. Surface water and sediment will be monitored annually to determine whether this alternative is effective in protecting areas from the migration of contaminants from the landfill.**
Federal Requirements	**CWA, Phase II Stormwater Standards, 40 C.F.R. 9, 122, 123 and 124**	**Applicable if over one acre is disturbed; Relevant and Appropriate if less than one acre is disturbed**	**Storm-water control standards for construction projects between one and five acres**	**Not cited in the ROD**	**Not cited in the AROD**	**Any remedial action that exposes soil will meet these standards to control stormwater runoff and prevent erosion.**
Federal Requirements	**CWA, General Pretreatment Regulations for Existing and New Sources of Pollution, 40 C.F.R. 403**	**Applicable**	**Pretreatment standards for discharges to a POTW. POTW must be in compliance with its NPDES permit in order for a remedy to discharge to the POTW under the CERCLA Off-Site Rule**	**Not cited in the ROD**	**Not cited in the AROD**	**Groundwater removed from the hydraulic control system will be treated, if necessary, to meet these standards before discharge to the City's POTW.**
Federal Requirements	**CWA, Underground Injection Control, 40 C.F.R. 144,146,147**	**Applicable**	**Standards for discharge treated groundwater back into the ground.**	**Not cited in the ROD**	**Not cited in the AROD**	**The treated groundwater from the THF treatment system will meet these standards before being reinjected into the ground.**
Federal Requirements	**Clean Air Act (CAA), Air Emissions from Municipal Solid Waste Landfills, 40 C.F.R. Part 60, Subpart WWW**	**Relevant and Appropriate**	**Standards for air emissions of non-methane organic compounds (MNOCs) from municipal solid waste landfills greater than 2.5 Mg in design capacity and emitting 50 Mg/yr or more of NMOC.**	**Not cited in the ROD**	**Not cited in the AROD**	**If the landfill is capped under the contingent remedy emissions of MNOCs will be managed to meet these standards.**
Federal Requirements	**CAA, National Emission Standards for Hazardous Air Pollutants (NESHAPS), 40 C.F.R. Part 61**	**Applicable**	**Emissions of 189 designated hazardous air pollutants (HAP) are addressed under these standards. Includes requirements for dust control.**	**Not cited in the ROD**	**Not cited in the AROD**	**Air emissions (including dust) of any of HAP during the remedial action, including the contingent landfill capping remedy, will meet these standards.**
Federal Requirements	OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, 67 Federal Register 71169 (Nov. 29, 2002), http://www.epa.gov/osw/hazard/correctiveaction/eis/vapor/complete.pdf	To Be Considered	Used to evaluate potential l risks associated with indoor air at residences near the Site.	Potential risks associated with indoor air at residences near the Site will be evaluated, monitored and corrected, consistent with this guidance.	Potential risks associated with indoor air at residences near the Site will be evaluated, monitored and corrected, consistent with this guidance.	Potential risks associated with indoor air at residences near the Site will be evaluated, monitored and corrected, consistent with this guidance.

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
	Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. OSWER Directive 9200.4-17P, April 21, 1999. http://www.epa.gov/swerust1/directiv/d9200417.pdf	To Be Considered	Used to evaluate the monitored naturall attenuation component of the remedy.	Contaminant levels in Eastern Plume shall be monitored consistent with this guidance.	Contaminant levels in Eastern Plume shall be monitored consistent with this guidance.	Contaminant levels in Eastern Plume shall be monitored until they naturally attenuate below risk levels, consistent with this guidance.
	EPA Guidance: Risk-Based Clean Closure, March 16, 1998 http://www.epa.gov/osw/hazard/correctiveaction/resources/guidance/risk/cclosfnl.pdf	To Be Considered	Used to evaluate the clean closure of the landfill at the completion of the remedy.	Not cited in the ROD	Landfill will be closed consistent with this guidance at the completion of the remedy.	Landfill will be closed consistent with this guidance at the completion of the remedy. If clean closure cannot be achieved, the landfill will be capped based on RCRA C standards under the contingent remedy..
	Technical Guidance for Final Covers on Haz. Waste Landfills and Surface Impoundments: EPA/530-SW-047; July, 1989.	To Be Considered	Used to develop landfill covers on hazardous waste landfills.	RCRA C cap shall be constructed consistent with this guidance	An appropriate cover will be placed on the landfill once clean closure is achieved.	An appropriate cover will be placed on the landfill once clean closure is achieved. If clean closure cannot be a achieved as a contingent remedy a RCRA C cap will be constructed consistent with the guidance.
	Technical Memorandum – Revised Alternative Cap Design Guidance Proposed for Unlined, Hazardous Waste Landfills in the EPA Region I, Office of Site Remediation and Restoration (February 5, 2001) http://www.epa.gov/region1/cleanup/resource/guidance/C524.pdf	To Be Considered	Guidance on developing alternative landfill cap designs.	This guidance may be considered when constructing the RCRA C cap.	An appropriate cover will be placed on the landfill once clean closure is achieved.	Guidance on developing alternative landfill cap designs. If clean closure cannot be achieved, this guidance may be considered when constructing the RCRA C cap under the contingent remedy..
State Requirements	Identification and Listing of Hazardous Wastes, N.H. Admin. Code Env-Wm 400, Toxicity Characteristic	Applicable to excavated material and material generated by treatment processes Relevant and Appropriate to material in landfill	These standards list particular hazardous wastes and identify the maximum concentration of contaminants for which the waste would be a RCRA characteristic waste. The analytical test set out in Appendix II of 40 C.F.R.. Part 261 is referred to as the Toxicity Characteristic Leaching Procedure (TCLP). The federal requirements 40 C.F.R. Part 261 are incorporated by reference.	Excavated material and material generated by treatment processes will be analyzed by appropriate test methods. If found to be hazardous wastes, then they will be managed in accordance with substantive requirements of state hazardous waste regulations.	Material excavated during remedy implementation including treatment trench and vertical hydraulic barrier installation and material generated by treatment processes will be analyzed by appropriate test methods and, if applicable, managed in accordance with the substantive requirements of the state hazardous waste regulations.	Material excavated during remedy implementation including hydraulic control system installation and material generated by treatment processes will be analyzed by appropriate test methods and, if applicable, managed in accordance with the substantive requirements of the state hazardous waste regulations. Non-hazardous materials will be disposed appropriately.
	Requirements for Hazardous Waste Generators, N.H.. Admin. Code Env-Wm 500 [formerly He-P Ch. 1905.06]: including Part 507 Storage Requirements; Part 513 Emergency/Remedial Actions	Applicable	Requires determination as to whether waste materials are hazardous and, if so, requirements for managing such materials on site prior to shipment off site. The federal requirements 40 C.F.R. Part 262 are incorporated by reference.	Excavated hazardous material will be consolidated under the RCRA C cap or stockpiled in accordance with these regulations and disposed of offsite at RCRA C facility. Residual hazardous waste from treatment processes, such as spent carbon filters will be disposed of offsite at an appropriate facility.	Material generated during well, trench and barrier installation activities and treatment residuals will be tested and if hazardous sent offsite for disposal at a licensed facility. Stockpiled material will comply with the substantive standards of the regulation.	If remedial activity generates hazardous wastes, then they will be managed in accordance with the substantive requirements of these regulations.

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
	Requirements for Owners and Operators of Hazardous Waste Facilities/Hazardous Waste Transfer Facilities, N.H. Admin. Code Env-Wm 700 [formerly He-P Ch. 1905.08]	Applicable for treatment facilities; Relevant and Appropriate for the Landfill	This regulation establishes requirements for owners or operators of hazardous waste sites. Part 708 incorporates by reference the federal requirements under 40 C.F.R. Part 264, including but not limited to Subpart G (closure/post closure), Subpart I (containers), Subpart J (tanks), Subpart N (landfills). Specific subsections are listed below.	This regulation establishes requirements for owners and operators of hazardous waste sites or treatment facilities. Specific sections are ARARs as described below.	This regulation establishes requirements for owners and operators of hazardous waste sites or treatment facilities. Specific sections are ARARs as described below.	This regulation establishes requirements for owners and operators of hazardous waste sites or treatment facilities. Specific sections are ARARs as described below.
	Hazardous Waste Facility, Groundwater Monitoring [formerly He-P Ch. 1905.08(d)(6) a,b], Env-Wm 702.10 – 702.13	Relevant and Appropriate	Standard require groundwater monitoring of hazardous waste facilities.	A groundwater monitoring system will be installed and operated that is capable of detecting potential migration of hazardous waste and constituents from the landfill and in offsite plumes and requires corrective action when necessary.	A groundwater monitoring system will be installed and operated that is capable of detecting potential migration of hazardous waste and constituents from the landfill and in offsite plumes and requires corrective action when necessary.	A groundwater monitoring system will be installed and operated that is capable of detecting potential migration of hazardous waste and constituents from the landfill and in offsite plumes and will be operated as long as any contamination exceeding CERCLA risk level is in place..
	Hazardous Waste Facility Closure and Post-Closure Disposal Units, Env-Wm 708.02(a)(12)	Relevant and Appropriate	Closure and post-closure standards for hazardous waste facilities.	The landfill will be covered with a RCRA C cap that meets the requirements of this regulation for closure with hazardous waste left in place.	Landfill must meet clean closure standards at the completion of the remedy.	Landfill must meet clean closure standards at the completion of the remedy.
	Hazardous Waste Facility - Use and Management of Containers, Env-Wm 708.03 (d)(1)	Applicable	Standards for the management of containers containing hazardous waste. Incorporates by reference the standards of 40 CFR Part 264, Subpart I	If re-grading materials or any other materials generated from implementing the remedy are hazardous waste and are managed in containers, then the containers will be managed to meet the substantive portion of this requirement.	If excavated materials or any other materials generated from implementing the remedy are hazardous waste and are managed in containers, then the containers will be managed to meet the substantive portion of this requirement.	If excavated materials or any other materials generated from implementing the remedy are hazardous waste and are managed in containers, then the containers will be managed to meet the substantive portion of this requirement.
	Hazardous Waste Facility - Tanks, Env-Wm 708.03(d)(2)	Applicable	Standards for the management of tanks containing hazardous waste. Incorporates by reference the standards of 40 CFR Part 264, Subpart J	If a tank or tank system is used for storing or treating hazardous wastes as part of Site remediation, it will be constructed with secondary containment and a leak detection system and comply with all other substantive requirements including monitoring and inspection requirements.	If a tank or tank system is used for storing or treating hazardous wastes as part of Site remediation, it will be constructed with secondary containment and a leak detection system and comply with all other substantive requirements including monitoring and inspection requirements.	If a tank or tank system is used for storing or treating hazardous wastes as part of Site remediation, it will be constructed with secondary containment and a leak detection system and comply with all other substantive requirements including monitoring and inspection requirements.
	Hazardous Waste Facility - Waste Piles [formerly He-P Ch. 1905.08 (f)(1)(d)], Env-Wm 708.03(d)(4)	Applicable	Standards for the use of waste piles for hazardous waste. Incorporates by reference the standards of 40 CFR Part 264, Subpart L.	If during sediment or soil excavation or re-contouring of the Landfill boundaries, COC-impacted soils or debris or dewatered sediment is uncovered and must be temporarily stored on-site as a waste pile, it must be erected, operated, and closed in substantive compliance with the section.	If temporary on-site storage of hazardous soils or materials is required, a structure will be designed, built, and operated in accordance with the specific requirements of this section.	If temporary on-site storage of hazardous soils or materials is required, a structure will be designed, built, and operated in accordance with the specific requirements of this section.
	Hazardous Waste Facility - Landfills, Env-Wm 708.03(d)(6)	**Relevant and Appropriate**	**Standards for the use of hazardous waste landfills. Incorporates by reference the standards of 40 CFR Part 264, Subpart N.**	**Not specifically cited in the ROD.** The landfill will be covered with a RCRA C cap that meets the requirements of this regulation for closure of a hazardous waste landfill.	**Not specifically cited in the AROD.** The remedy will achieve clean closure of the landfill.	**The remedy will achieve clean closure of the landfill. If clean closure cannot be achieved a RCRA C cap will be constructed and maintain under these standards under the contingent remedy.**

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
	Contaminated Site Management, NH Admin. Code Env-Or 600: Part 607, Groundwater Management Permits; Part 608, Activity and Use Restrictions; Part 610, Monitoring; Part 611, Contaminated Soils	**Applicable**	**Env-Or Part 607 provides for establishment of institutional controls to control use of groundwater that exceeds AGQS, requires monitoring of the groundwater quality, requires implementation of measures to restore the groundwater quality, and requires an evaluation of the effectiveness of the measures. Part 608 establishes standards for setting institutional controls to protect human health and components of the remedy. Part 610 establishes standards for monitoring groundwater, including requirements and criteria for constructing, developing, and decommissioning monitoring wells. Part 611 establishes standards for managing contaminated soils.**	**Not cited in the ROD**	**Not cited in the AROD**	**Institutional controls will be established to protect against use of contaminated groundwater. Activity and use restrictions will be established to prevent human exposure to contaminated groundwater and protect components of the remedy. Groundwater monitoring will be required until State groundwater standards are achieved (monitoring will be continued if additional Federal groundwater standards still need to be achieved). Groundwater monitoring and extraction wells will be installed, operated, and decommissioned under these standards. Contaminated soils generated from installation of the hydraulic control system and any other remedial activity will be managed in compliance with these standards.**
	Ground Water Management and Ground Water Release Detection Permits, **Env-Or 700 [generally cited as Env–Wm1403 in the ROD and AROD; section renumbered by the State]**	Applicable	Establishes groundwater management standards.	**Cited as Env–Wm1403 in the ROD.** Extracted groundwater in and around landfill and from plumes will be treated to meet AGQC before discharge to wetlands or Cocheco River to avoid degrading surface water. A groundwater management zone (GMZ) and monitoring program will be established at the site and will remain in place until cleanup goals have been attained throughout the GMZ.	**Cited as Env–Wm1403 in the AROD.** Groundwater re-injected into landfill and groundwater discharged to wetlands or that ultimately discharges to surface water shall be treated to meet AGQC and shall not degrade surface water. A GMZ and a monitoring program will be established at the site and will remain in place until cleanup goals have been attained throughout the GMZ.	Groundwater re-injected into landfill and groundwater discharged to wetlands or that ultimately discharges to surface water shall be treated to meet AGQC and shall not degrade surface water. A GMZ and a monitoring program will be established at the site and will remain in place until cleanup goals have been attained throughout the GMZ.
	Underground Injection Control Requirements, Env-Ws 384	**Applicable**	**The purpose of these rules is to establish standards, criteria, and procedures for underground injection to wells to prevent pollution and protect groundwater as specified in 40 CFR 9, 144, 145, and 146.**	**Not cited in the ROD**	**Not cited in the AROD**	**The treated groundwater from the THF treatment system will meet these standards before being reinjected into the ground.**
	Standards for Pretreatment of Industrial Wastewater, Env-Ws 904	Applicable	Pretreatment standards for discharges to a POTW. POTW must be in compliance with its NPDES permit in order for a remedy to discharge to the POTW.	SC-7A will comply with the substantive requirements of this regulation. If levels of contaminant concentrations in groundwater to be discharged to the POTW interfere with the performance of the system, or would cause the POTW to violate water quality standards, or adversely impact the sludge produced, the groundwater shall be pretreated either on site or at the POTW before entering the system.	Not an ARAR	Groundwater removed from the hydraulic control system will be treated, if necessary, to meet these standards before discharge to the City's POTW.
	Ground Water Discharge Permit and Registration Rules, Env-Wq 402 **[Cited in the ROD and AROD as Env-Ws 1500]**	Applicable	These regulations establish substantive requirements for discharges to groundwater, including prohibited discharges (Env-Wq 402.07), water quality sampling (Env-Wz+D31q 402.08), and compliance criteria (Env-Wq 402.22).	**Cited in the ROD as Env-Ws 1500.** Any ground water reinjected into the landfill or discharged onsite or into surrounding wetlands will receive appropriate treatment to comply with the substantive requirements of this ARAR.	**Cited in the AROD as Env-Ws 1500.** Ground water re-injected into the Landfill will receive appropriate treatment to comply with the substantive requirements of this ARAR.	If the operation and maintenance of the remedy requires discharge to groundwater, these standards will be complied with.

Authority	Requirement	Status	Requirement Synopsis	1991 ROD	2004 Amended ROD	2009 ESD - SC-Ex Alternative
	Surface Water Quality Regulations, **Env-Ws 1700 [only Env-Ws 1708 cited in the ROD and AROD]**	**Applicable**	**These rules establish water quality standards for the state's surface waters. Water quality criteria for toxic substances are established. See Part Env-Ws 1703 Water Quality Standards, Env-Ws 1704 Alternative Site Specific Criteria, and Env-Ws 1708 Anti-Degradation. These rules are applicable to point or non-point discharge(s) of pollutants to surface waters**	**Only Env-Ws 1708 cited in the ROD.** Standards will be used to measure the performance and effectiveness of the cap, the ground water extraction and treatment processes and discharges, erosion control and surface runoff measures from degrading nearby surface waters.	**Only Env-Ws 1708 cited in the AROD.** Standards will be used to measure the performance and effectiveness of the treatment trench and source groundwater containment systems and discharges, erosion control and surface runoff measures from degrading nearby surface waters.	**If a discharge from the remedial action is directed to surface water the discharge will be treated, if necessary, so that these standards will be achieved. Monitoring will be performed to determine whether operation and maintenance of the remedy could potentially affect nearby surface water bodies, in accordance with Env-Or-607.**
	Standards for Construction, Maintenance and Abandonment of Wells, NH Admin. Code Env-We 600	Applicable	This provision requires that wells be constructed, maintained, relocated, and/or abandoned according to these regulations.	All wells will be constructed, maintained, relocated and/or abandoned according to these regulations	All wells will be constructed, maintained, relocated and/or abandoned according to these regulations	All wells will be constructed, maintained, relocated and/or abandoned according to these regulations
	Ambient Air Quality Standards, Env-A300	Applicable	The purpose of this chapter is to establish ambient air quality standards for various types of pollutants emitted in or transported into the State of New Hampshire pursuant to section 109 of the Clean Air Act (Act), 40 CFR 53, and 40 CFR 50, as amended. These standards are intended to be protective of the public health and public welfare in accordance with RSA 125-C:1.	Air contaminants, especially particulate matter emissions generated during on-site activities will be controlled, to ensure that the appropriate regulatory standards are met.	Air contaminants, especially particulate matter emissions generated during on-site activities will be controlled, to ensure that the appropriate regulatory standards are met.	Air contaminants, especially particulate matter emissions generated during on-site activities will be controlled, to ensure that the appropriate regulatory standards are met.
	Standards Applicable to Certain New or Modified Facilities and Sources of Hazardous Air Pollutants, Env-A 500	**Applicable**	**The purpose of this chapter is to establish state standards to regulate: (a) Certain new or modified facilities in accordance with authority delegated by the EPA under §111(c) of the Clean Air Act; and (b) Certain sources of hazardous air pollutants in accordance with authority delegated by the EPA under §112 of the Clean Air Act.**	**Not cited in the ROD**	**Not cited in the AROD**	**Air emissions (including dust) of any of HAP during the remedial action, including the contingent landfill capping remedy, will meet these standards.**
	Fugitive Dust, N.H. Admin. Code Env-A Part 1002	Applicable	Requires precautions to prevent, abate and control fugitive dust during specified activities, including excavation, maintenance, and construction.	Measure to prevent, abate and control fugitive dust will be used during periods of recontouring of the Landfill and cap construction and during any other activities which produce fugitive dust.	The regulation will be met by maintenance of the soil protective cover and the use of dust suppressants during excavation activities.	Precautions to control fugitive dust emissions will be required during site remediation activities that could generate dust.
	Regulated Toxic Air Pollutants, NH Admin. Code Env-A Part 1400 **[cited as Env-A Part 1300 in the ROD and AROD]**	Applicable	This regulation identifies toxic air pollutants to be regulated. These pollutants are also listed by EPA in 40 CFR 261. High, moderate and low Toxicity Classifications are established. Air toxics in these classifications are regulated when they occur in	Releases of contaminants to the air from any source on Site will be monitored to ensure levels do not exceed the respective ambient air levels.	Releases of contaminants to the air from any source on Site will be monitored to ensure levels do not exceed the respective ambient air levels.	If there are remedial processes that result in releases of contaminants into the air, air quality standards will be complied with during remedial activities.

JUNE 2009 EXPLANATION OF SIGNIFICANT DIFFERENCES

ATTACHMENT B

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES CONCURRENCE LETTER

The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES
Thomas S. Burack, Commissioner

June 30, 2009

James T. Owens III, Director
Office of Site Remediation and Restoration
EPA - New England, Region I
1 Congress Street, Suite 1100
Boston, MA 02114-2023

RE: Declaration for the Explanation of Significant Differences
Dover Municipal Landfill Superfund Site
#198803019 Project #1781

SUBJECT: Declaration of Concurrence

Dear Mr. Owens:

The New Hampshire Department of Environmental Services (Department) has reviewed the Declaration for the Explanation of Significant Differences (ESD), dated June 2009, for the Dover Municipal Landfill Superfund Site (Site) in Dover, New Hampshire. The United States Environmental Protection Agency (EPA) prepared this ESD in accordance with the provisions of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986. The ESD addresses the remedial actions necessary under CERCLA, as amended, to manage potential threats to human health and the environment at the Site.

Rational for the ESD

On September 10, 1991, EPA issued the original Record of Decision (1991 ROD) for the Site. The 1991 ROD called for the remediation of the landfill and groundwater through source control and management of migration. Neither component of the 1991 ROD remedy were built because, at the request of the potentially responsible parties (PRPs), a pilot study was performed to determine if an alternative remedy (enhanced bioremediation) could replace the source control component of the 1991 ROD remedy. Following years of additional study at the site, the PRPs offered an alternative source control remedy that was determined to be as protective as the 1991 ROD remedy, resulting in the 2004 Amended ROD (2004 AROD).

The 2004 AROD selected a Source Control (SC) remedy employing, among other measures, an air-sparging trench located at the down-gradient perimeter of the landfill that would intercept and treat leachate and impacted groundwater *in situ*. The subject ESD seeks to change that SC component to actively capture contaminated groundwater at the toe of the landfill and treat it off-site at the Dover publicly-owned treatment works (Dover POTW).

The change from an Air-Sparging Trench (alternative SC-A) to Hydraulic Control (alternative SC-

Ex) is sought because the pre-design investigations (PDIs) highlighted a number of concerns with SC-A and a number of advantages to SC-Ex. The 2004 AROD identified several issues of uncertainty regarding the construction and operation of the Air-Sparging Trench component of Alternative SC-A that EPA and the Department considered sufficient to warrant specification of optimization, or, failing that, contingency measures.[1] Information developed during the PDIs indicated that the performance of the Air-Sparging Trench may be compromised by conditions at the Site. These uncertainties coupled with the information from the PDIs cast considerable concern regarding the Air-Sparging Trench being able to capture or destroy contaminants emitted by the landfill and yield clean groundwater on the down-gradient side of the trench.

Justification for the Selected Remedy

The Department believes that the proposed source control alternative will be as protective as the 2004 AROD remedy, may offer greater flexibility in addressing contamination at the site, and will be less expensive. The selected remedy has the potential to reduce human health risk levels such that they do not exceed EPA's acceptable risk range of 10^{-4} to 10^{-6}, or New Hampshire's target risk goal of 10^{-5}, for cumulative carcinogenic risk, and such that the non-carcinogenic hazard is below a level of concern and will not exceed a hazard index of one. Furthermore, it will reduce contaminant concentrations to levels that are consistent with Applicable or Relevant and Appropriate Requirements and To Be Considered criteria.

The estimated net present worth of the selected remedy, SC-Ex, and the 2004 AROD remedy, SC-A, is $8.8 million and $22.5 million, respectively. The cleanup will be performed under the existing executed consent decree with the PRPs.

State Concurrence

The Department, in reviewing the ESD, has determined that the selected remedy is consistent with the Department's requirements for a remedial action plan and meets all of the criteria for remedial action plan approval. The selected remedy establishes a remedial action that, as proposed, will remove, treat or contain the contamination source to prevent the additional release of contaminants to soil, groundwater and nearby surface water bodies and manages the health hazard associated with direct exposure to the contaminant source. The selected remedy will also contain contaminated groundwater within the limits of a Groundwater Management Zone and restore groundwater quality to meet the State's Ambient Groundwater Quality Standards. Ultimately, the proposed remedial action will provide protection of human health and the environment. Therefore, the Department, acting on behalf of the State of New Hampshire, concurs with the selected remedy, as described in the ESD.

[1] 2004 AROD, pp. 74 – 75.

In striving to maximize the effectiveness of limited public and private resources, the Department continues to seek reasonable and practical solutions to the complex challenges associated with contaminated site cleanups. The partnership and dedication of EPA and the Department will speed up the achievement of our mutual environmental goals at this Site. As always, the Department stands ready to provide the guidance and assistance that EPA may require to take the actions necessary to fully protect human health and the environment in a cost-effective manner.

Sincerely,

Michael J. Wimsatt, P.G.
Director
Waste Management Division

cc: Darryl Luce, USEPA
Peter Roth, NHDOJ
Frederick J. McGarry, NHDES
Carl W. Baxter, NHDES
Richard Pease, NHDES
Andrew Hoffman, NHDES

JUNE 2009 EXPLANATION OF SIGNIFICANT DIFFERENCES

ATTACHMENT C

RESPONSIVENESS SUMMARY TO PUBLIC COMMENTS

RESPONSIVENESS SUMMARY TO COMMENTS REGARDING THE PROPOSED EXPLANATION OF SIGNIFICANT DIFFERENCES FOR THE DOVER MUNICIPAL LANDFILL SUPERFUND SITE

June 2009

SUMMARY

Comments were received from the Work Settling Defendants (the "Group") and the New Hampshire TAG Force, consisting of a small group of citizens funded by a Technical Assistance Grant through EPA. No negative comments were received regarding the proposed change from the air-sparging trench component of SC-A to a ground water extraction and treatment remedy as proposed in SC-Ex.

INTRODUCTION

Community Acceptance is one of the modifying criteria of the nine criteria that EPA considers when selecting a remedy or a change to an existing remedy. Typically, an Explanation of Significant Differences (ESD) does not merit a public meeting or formal comment period. However, in this instance, EPA considered past public involvement at the Dover Municipal Landfill Superfund Site (the "Site") which indicated a need to discuss and offer public comment on the proposed change noted above.

EPA first circulated a draft ESD to members of the public and the Work Settling Defendants (the "Group") prior to the start of the public comment period. Following distribution of that draft, EPA held a public meeting beginning at 7 p.m. on April 27th, 2009. EPA announced at that meeting that a 30-day comment period would begin the following day during which EPA would accept comments on the change proposed in the ESD.

During the public meeting EPA presented the details of the change and fielded a number of questions and comments. Although some questions centered on the details of the operation of the proposed change, there were no negative comments regarding changing the air-sparging trench component of SC-A to a ground water extraction and treatment remedy as proposed in SC-Ex. A number of additional concerns were expressed about several other topics regarding the landfill; however, few were relevant to the proposed change.

COMMENTS OFFERED BY THE WORK SETTLING DEFENDANTS (the "GROUP")

The Group offered a marked-up version of the draft ESD that provided primarily suggested language changes, some of which were incorporated into the final document. The Group also noted that they are a proponent of the proposed change and therefore offered no negative comments.

COMMENTS OFFERED BY THE NEW HAMPSHIRE TAG FORCE

The New Hampshire TAG Force, funded through a Technical Assistance Grant by EPA and paid for by the Group, provided a number of comments through its technical advisor Thomas P. Woodard, of Woodard Environmental Associates (WEA), LLC of Kittery, Maine. These comments ranged across two primary topics; (1) sediment, and (2) the Eastern Plume Monitored Natural Attenuation (MNA) remedy. Although the concerns raised regarding sediment are not relevant to the ESD, EPA will address those comments herein. WEA did not express apprehension regarding the change proposed by the ESD and in-fact their second discussion point, the Eastern Plume MNA remedy, focuses on the benefits of the proposed change. A third comment questions the premise of the ESD regarding conditions at the Site, stating that the conditions at the Site should not have surprised either the Group or EPA, but again does not question the feasibility or benefits of changing the remedy as proposed by the ESD. The full comment letter sent by WEA is provided in Attachment C. A summary of the points offered and EPA's response follows:

(1). Sediment:

WEA expressed concerns that impacts to sediments in the Cocheco River have been improperly assessed in the past. WEA provided a table highlighting what they believed were errors in sediment sampling in the Cocheco River in the past, especially with regard to toxicity evaluations using test organisms.

EPA currently believes that past sediment sampling at and near the Site has been sufficient to support the determination that no unacceptable risk to human health and the environment exists within the Cocheco River as a result of the Site. However, the Natural Resource Trustees have raised some issues with the methodology to assess toxicity in GeoInsight's August 16, 2006 Focused EcoToxicity Report. Testing of sediments follows a tiered approach that first examines the sediment concentrations of the contaminants and then if those threshold values are exceeded, testing moves to the next stage where organisms are tested. In this particular instance, initial sediment sampling performed in 2002 did not follow protocols that are in effect now and only looked at the very upper, floc, layer of the sediment rather than the entire bioactive zone. Subsequent sampling in 2005 was conducted according to acceptable protocols. However, one of the toxicological tests ended after 10-days rather than the full 28-days requested by the Trustees. At that time EPA and NHDES ecological risk assessors believed the 10-day test was sufficient based on the results presented. However, the Natural Resource Trustees disagreed with that decision and questioned some of the results.

EPA has since forged an agreement with the Group and Natural Resource Trustees to re-sample the original stations for arsenic and test it only for chemistry. That sample collection began on June 23, 2009. As part of that collection effort, the Group collected sufficient sediment for toxicity tests should arsenic exceed the Threshold Effects Concentration (TEC), 9.79 mg/kg. If the concentration of arsenic exceeds the TEC the Group will submit the collected sediment for additional toxicity sampling. If the

concentration of arsenic is below the TEC no further toxicity testing will occur. The results of the June 2009 sampling will be released once final.

WEA also expressed concerns regarding the contribution of the Site to the arsenic concentrations currently found in the Cocheco River sediments, and whether there is a potential for these sediments to accumulate further downstream.

EPA notes that the Cocheco River is host to several additional sources of arsenic, both historic and current. EPA believes that the overall contribution of arsenic to the river from the Site is small; however, additional testing is expected to be performed in the future to better quantify this assertion.

(2.) Eastern Plume Monitored Natural Attenuation (MNA):

WEA requested that EPA make the Eastern Plume Monitored Natural Attenuation Work Plan public so that comments may be offered.

EPA has had a draft Work Plan (2006) from the Group that describes the methodology by which the Group expects to assess MNA in the contaminated groundwater that flows eastward and discharges to the Cocheco River. The TAG has asked that this be made available to the public for review and comment. EPA has not released that document to the public since the draft Work Plan has not yet had at least one Agency review. This is to ensure that misconceptions and inaccuracies be minimized prior to release to the TAG or general public. In addition, EPA does not want to release the draft 2006 Eastern Plume MNA Work Plan because it does not incorporate such items as EPA's Inorganic MNA guidance issued in 2007 or data from the Pre-Design Investigations that was performed since the draft 2006 Work Plan was submitted. Once the Group prepares a revised Eastern Plume MNA Work Plan and the Agencies have had time to review this plan, EPA will release the document to the public.

WEA also asked to review the groundwater model to assess the effects on the Eastern Plume MNA effort. The groundwater model at the Site is continually updated as additional data is collected. An updated version is being requested and will be released to the public once available.

The comment offered by WEA that the Eastern Plume MNA may be better augmented by pump-and-treat in this area is a valid suggestion and is one of the arguments in favor of implementing the proposed change in the ESD. If the ESD is approved, this component will be considered during the remedial design.

CONCLUSION

No party expressed reservations over changing the source control component of the 2004 AROD to groundwater extraction and treatment, SC-Ex, from the air-sparging trench, SC-A. Comments during the meeting and in written comments submitted to EPA voiced support for this change.

Woodard Environmental Associates LLC
Environmental Engineering & Consulting

May 27, 2009

Brian T. Stern, Esq.
New Hampshire T.A.G. Force
86 Locust Street
Dover, New Hampshire 03820

RE: Comments on Proposed Explanation of Significant Differences
Dover Municipal Landfill Superfund Site, Dover, New Hampshire
April 2009

Dear Attorney Stern:

Woodard Environmental Associates LLC (WEA) has completed a technical review of the report referenced above prepared by the USEPA and presented at a public meeting held on April 27, 2009. We have developed a number of comments on the report, which are presented below. As you are aware, the document presents the bases for a change in the remedial strategy selected for source control at the perimeter of the landfill. The 2004 Amended Record of Decision (AROD) specified the construction of an air sparging trench along the downgradient perimeter of the landfill to capture and treat contaminants in groundwater *in situ* prior to migrating outside of the footprint of the landfill. Since that time, the parties have decided to abandon this approach, due primarily to technical and cost considerations, and implement a groundwater extraction system consisting of a series of extraction wells with pneumatic pumps that will deliver extracted water containing contaminants to the Dover wastewater treatment system. There will be no on-site treatment or discharge of groundwater on the site.

Following are WEA comments on the proposed Explanation of Significant Differences (ESD) report provided by the USEPA.

- Page 4, C. Sediment Assessment PDI (predesign investigation)

The ESD report states that "sampling found that biota were not impacted by arsenic -containing sediments in the Cocheco River". WEA has reviewed the 2006 report prepared by GeoInsight, Inc, entitled *Draft Focused Ecotoxicity and Human Health Assessment Activities – Cocheco River* (EcoTox) and is of the opinion that the findings of this report do not support the statement referenced above contained in the ESD document. The primary conclusion reached by WEA upon review of the EcoTox report is that the study does not directly and accurately address whether sediments that were originally determined to have elevated arsenic levels still do or whether sediments in this area are potentially

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harmful to ecological receptors. Therefore, the conclusions in the report that indicate an absence of ecological risk based on the sampling data are misleading. WEA belives that additional sediment and boita sampling should be conducted in the Cocheco River, in accordance with USEPA guidance for such sampling, to appropriately assess human health and ecological risks posed by sediments impacted with arsenic and other landfill-related contaminants, which are primarily volatile organic compounds that have relatively short residence time in surface water. To our knowledge, there has never been an assessment of whether contaminated sediments have been transmitted downstream from the site, and if so whether they have accumulated to significant levels at downstream areas. The USEPA has indicated that additional sediment sampling is scheduled to be conducted in early June 2009. On May 21, 2009, the USEPA provided a Draft Sampling and Analysis Plan (SAP) to the NH TAG Force Group for review for the river sampling to be conducted next month. This propsed study includes downstream sampling locations. WEA and the NH TAG Force group will provide comments on the SAP to the USEPA within the next several days.

- Page 5, C. Eastern Plume MNA (monitored natural attenuation) PDI

The ESD report indicates that this PDI report has been submitted by the Group but that the Agencies are not going to review this document until the entire source control remedy (groundwater extraction along downgradient landfill perimeter) is operating. WEA understands that this report is in draft form and has not been reviewed by the USEPA and NHDES. However, WEA and the NH TAG Force group requests an opportunity to review this report at this time . It seems prudent to review the report and be prepared to incorporate any pertinent information contained in this report into the design and construction of the source control measure, as appropriate. For example, if the PDI report suggests that MNA may not be the best remedy for the eastern plume, it would be best to know that now, so there is the opportunity to implement other measures at the time the new source control remedy in being constructed. The USEPA now believes that groundwater flow in both the southern and eastern plumes converges and ultimately discharges to the Cocheco River. The USEPA justifies the ESD in part based upon this new finding. If this finding is true, it would constitute a significant change and may represent a significant increase in risk to human health and the environment from contaminants entering the river. The impoved understanding of groundwater flow should influence the design of the source control remedy and perhaps contraindicate continued MNA.

We believe it is necessary and appropriate to install a small number of groundwater extraction wells in the eastern plume, between the river and the landfill perimeter. Extraction wells in this area would significantly reduce the volume of contaminants that would otherwise migrate in groundwater and discharge to the Cocheco River over the next few years until operation of the new source control remedy delivers “clean” groundwater to the Cocheco River. Wells in this area would to a degree also create a reverse gradient to capture contaminants that have migrated further downgradient and accordingly, stem the continued flow of contaminants into the river. In addition, any cycling or pulsing of the extraction pumps installed as part of the new source control remedy may allow for precipitated arsenic

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to become redissolved in groundwater, resulting slugs of arsenic downstream, which could be captured by these additional extraction wells in the Eastern Plume.

The incremental cost to install these extraction wells while the source control groundwater extraction system is being constructed, in comparison to the overall source control remedy cost, would be very minor. And, there would be very limited additional costs to operate these extra wells and treat the groundwater extracted from them.

- Page 5, C. Groundwater Model and Fate and Transport Model PDI

It is our understanding that this PDI report has not been issued final by the USEPA. However, WEA requests that this report be made available for review in the near future so that we can assess the potential volume of contaminants that could discharge to the Cocheco River over the next several years from the eastern plume if MNA remains the remedy of choice. This information would be important in assessing whether it would be appropriate to install additional groundwater extraction wells in the eastern plume to limit futher impacts to the Cocheco River.

- Page 8, D. Current Site Conditions and Contaminants – first paragraph

The meaning of the penultimate sentence in the first paragraph is unclear and should be revised to covey its intended message.

- Page 8, D. Current Site Conditions and Contaminants – second paragraph

The ESD report states that the primary contaminant in the Eastern Plume is arsenic, which has been reported in groundwater as high as 628 parts per billion. Other contaminants include benzene, vinyl chloride and tetrahydrofuran. As arsenic is the primary contaminant of concern, it does not seem appropriate to employ monitored natural attenuation (MNA) as the remedy of choice for the Eastern Plume. WEA and the NH TAG Force group recommends that additional groundwater extraction wells be installed within the Eastern Plume to remove arsenic containing groundwater prior to its discharging to the Cocheco River, especially now given that groundwater extraction will be employed for source control at the landfill perimeter.

- Page 8, D. Current Site Conditions and Contaminants – last two paragraphs

WEA and the NH TAG Force group is concerned about the continued conveyance and discharge of contaminants, primarily arsenic, from the drainage ditches along the landfill perimeter, to the Cocheco River. The ESD report indicates that the northwest landfill hot spot remedy (air sparge and vacuum extraction) should ultimately improve conditions in the northern ditch. This will be assessed through future monitoring once the remedy is in place. With respect to the southern ditch, the ESD report indicates the action level for arsenic in this ditch is 50 part per million, and that when this level is detected

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the sediments are removed from the ditch. WEA and the NH TAG Force group would like to see data on the on-going mass loading of arsenic to the Cocheco River from this drainage feature to determine if the current program of removing sediments with arsenic above 50 PPM is sufficiently protective of the quality of the Cocheco River. We request that any recent, yet unpublished sampling data from this drainage course be provided for review as soon as possible.

- Page 7, III. Basis for this ESD, A. Stratigraphy.

WEA and the NH TAG Force group have a difficult time believing that the responding parties were not aware until recently that portions of the contaminated aquifer are very heterogeneous and that most of the contaminants are in the interbedded portions of the aquifer. With all the extensive studies that have been conducted at this site over the years, the information cited in this section of the ESD should been common knowledge, and known well in advance of the decision to adopt the air sparging trench as the source control remedy.

- Page 9, Table 1 -Dover Municipal Landfill Comparison of Remedies

Eastern Plume – the NH TAG Force group requests that the USEPA consider the installation of a small number of wells in the eastern plume, during the implementation of the SC-Ex remedy (groundwater extraction source control), so as to limit to the extent possible future discharges of arsenic and other landfill contaminants to the Cocheco River. This would be consistent with the Southern Plume remedy currently in place.

Sediment in Ditches & Swale – Table 1 indicates that a Cocheco River sediment investigation was added as part of the 2004 Amended ROD. Some testing was performed and is described in the EcoTox report referenced above. The USEPA as also indicated a follow-up sediment sampling program will be performed in the Cocheco River during June 2009. The NH TAG Force group was recently (May 21) provided a copy of the sampling protocol and is reviewing it at this time. The group would like an opportunity to comment on the sampling plan prior to its implementation, to avoid the shortcomings of the last sampling event, which are discussed further below. Following is a table that compares the last two major sediment/biota sampling programs conducted in the Cocheco River in relation to this site, and presents WEA comments on these programs as well as suggestions for future sampling events.

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Original Study (Envirogen)	Geoinsight	Comment
Collected samples from discrete locations. Conducted limited compositing but only with samples collected in a limited area	Collected samples (up to 57 discrete cores) over large area (on transects 60-75' long and 6' up to wide) and composited	Geoinsight essentially diluted any potential arsenic hot spots by their sampling strategy. Typically, regualtory agencies would require that they precisely revisit stations where elevated levels of arsenic had previously been documented and collect samples from bioactive zone [probably about 2-3" (5-7cm)], then do step-out sampling from those areas. The bioassay should have been conducted only after sediment chemistry was completed (you can retain bioassay samples for eight + weeks) and samples exceeding screening levels were found. Geoinsight indicated in their summary (Section 6.3) that differences in results between the two studies were likely due to different depths but failed to document what the actual bioactive depth was. This could have been done with some fairly simple
Only analyzed the top 1" (~2.5cm)	Depths sampled were 3 to 14 " (8-35 cm).	

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		observations.
Results indicated 4 or 18 samples exceeded 8.2 µg/g arsenic LEL. Highest was >1500 µg/g.	All samples ND for arsenic	Because of dilution it is not surprising that results were ND.
N/A	Only acute (they say sub-chronic) 10-day bioassays were conducted using composited sediments from above depths.	Because of dilution it is not surprising that results generally indicated no significant mortality. EPA recommends using sediments from top 2" (~5cm) or bioactive zone. Following the above recommended approach, for those samples that exceeded LEL, chronic bioassays should have been conducted. This would include a 28-day *Hyalella* and *Chironomid* life cycle (~ 30 days or so) test. Regulatory agancies typically want chronic tests rather than acute tests because they are more sensitive.

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N/A	Based upon sampling regime they failed to characterize nature and extent. There is an implicit (and unstated) argument that their sampling regime evaluates exposure to a population of benthic organisms spread out over a wider area. Even considering this, however, their deeper samples included sediment to which benthic organisms are not exposed. If the majority of contaminants are in top 2" as appears to be the case here, this results in understating potential effects.	Use of an argument that it is the exposure of population over a wide area that is the threshold for ecological risk is OK. However, this is typically a risk management decision (not risk assessment) that comes after one accurately characterizes nature and extent.

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General Comment – It will be important during the construction of the SC-Ex as well as the Northwest Corner remedy that runoff is controlled and contained so that impacted sediment and water is not allow to flow towards the Cocheco River. Such controls are standard for these types of remedial actions.

I trust that the foregoing is helpful. Please feel free to forward this letter to the USEPA and NHDES for consideration. I look forward to supporting the NH TAG Force with future phases of this project. Please feel free to contact me with any questions or comments.

Sincerely,

Thomas P. Woodard, LSP