U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 1

AMENDED RECORD OF DECISION

DOVER MUNICIPAL LANDFILL
DOVER, NEW HAMPSHIRE

September 30, 2004

TABLE OF CONTENTS
DOVER MUNICIPAL LANDFILL
Amended Record of Decision
September 30, 2004

PART 1: DECLARATION FOR THE AMENDED RECORD OF DECISION

A. SITE NAME AND LOCATION

Dover Municipal Landfill.
Dover, New Hampshire.
NHD980520191
Operable Unit #1, Entire Site.

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents an amendment to the selected remedial action for the Dover Municipal Landfill (the Site), in Dover, New Hampshire, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC § 9601 *et seq.*, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as amended, 40 CFR Part 300. The Director of the Office of Site Remediation and Restoration (OSRR) has been delegated the authority to approve this Amended Record of Decision.

This decision was based on the Administrative Record, which has been developed in accordance with Section 113 (k) of CERCLA, and which is available for review at the Dover Public Library and at the United States Environmental Protection Agency (EPA), Region 1, Office of Site Remediation and Restoration (OSRR) Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix B to this Amended ROD) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

The State of New Hampshire concurs with the selected remedy.

C. RATIONALE FOR AMENDMENT

In 1991 the EPA and the New Hampshire Department of Environmental Services (NHDES) chose a remedy described in a Record of Decision (ROD)(the 1991 ROD) for the Dover Municipal Landfill Superfund Site. The 1991 ROD had two components, Source Control and Management of Migration. The Source Control component consisted of capping the approximately 50-acre landfill with a RCRA C cap, installing a diversion/interceptor trench to capture contaminated leachate emanating from the landfill to prevent it from migrating into the surrounding ground water and addressing arsenic contaminated sediment in a drainage trench and drainage swale. The Management of Migration component addressed two extended ground water contaminant plumes migrating from the landfill that are contaminating a drinking water aquifer and threatening a drinking water reservoir. This component consisted of pumping and treating contaminated ground water from the portion of the aquifer migrating towards the Bellamy Reservoir (the Southern Plume) while allowing the ground water flowing towards the Cocheco River (the Eastern Plume) to naturally degrade.

The landfill cap reached 100% design but neither component of the 1991 ROD was built because, at the request of the responsible parties, a pilot study was performed to determine if an alternative, innovative cleanup approach could replace the Source Control component of the 1991 ROD. Following more than ten-years of additional study at the Site the responsible parties offered an alternative Source Control component for the 1991 ROD that would be less expensive, and would offer greater flexibility in addressing contamination at the Site. The alternative uses an air-sparging trench to act as the Source Control component to halt migration of contamination from the landfill.

The EPA and NHDES believe that the proposed air-sparging trench has the potential to be as protective as the Source Control component of the 1991 ROD and is less expensive. Most significantly, the air-sparging trench has the potential to accelerate the cleanup by decades through its flushing action rather than entombing wastes beneath an impermeable cap that requires perpetual maintenance and operation of wells to lower ground water out of the contaminant mass. Air-sparging will allow the landfill to reach clean closure at which time the aquifer will be restored to drinking water quality and re-use of the site will be allowed without further institutional controls. However, considerable uncertainty remains over the ability of the air-sparging trench to be implemented and to function as designed. Therefore, as an additional measure of protectiveness, the Source Control component of the 1991 ROD will be retained as a contingent remedy.

In addition to changing the Source Control portion of the 1991 ROD, the responsible parties also requested that EPA evaluate a change to the Management of Migration alternative for that portion of the ground water migrating towards the Bellamy Reservoir, the Southern Plume. The 1991 ROD addresses contaminated ground water in the Southern Plume through pump-and-treat. The responsible parties requested that EPA consider amending the 1991 ROD remedy to Monitored Natural Attenuation (MNA). Because present data indicates that MNA is not appropriate for the Southern Plume, active measures proposed in the 1991 ROD are retained to address this portion of the aquifer. Therefore, EPA and NHDES have elected to change only the Source Control component of the 1991 ROD and retain the 1991 Management of Migration component, with some additional assessment and monitoring requirements.

D. ASSESSMENT OF THE SITE

The response action selected in this ROD Amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

E. DESCRIPTION OF THE ROD AS AMENDED

The original, 1991 ROD Source Control component at the landfill consisted of capping the wastes with a RCRA C cap and capturing leachate flowing from the landfill. This ROD Amendment changes the Source Control component and adds some assessment and monitoring requirements to the 1991 Management of Migration component. The major portions of the complete remedy, as amended, include:

- Maintain the existing vegetative cover over the entire landfill. Infiltrating water will mobilize contaminants in the landfill and convey them to an air-sparging trench at the perimeter of the landfill for treatment.

- Identify additional source areas. Areas of high contamination within and adjacent to the landfill will be located and addressed by either excavation or other *ex situ* technology, as appropriate.

- Construction and operation of air-sparging trench. The air-sparging trench will be installed in phases or segments and will follow the perimeter of the landfill. It will capture arsenic, recover volatile organic compounds, and create an environment that will biodegrade tetrahydrofuran. Where contaminant concentrations may exceed the capacity of the trench, the ground water source areas will be addressed through either direct removal or pumping and treating, as appropriate. Extracted ground water will be treated to remove metals through flocculation and organic compounds by carbon treatment.

- Sediment monitoring in Cocheco River for human health and ecological risks, followed by excavation if appropriate.

- If the air-sparging trench is not performing sufficiently to remove the contaminants flowing from the landfill, the original 1991 ROD Source Control component is the contingent remedy which requires capping the landfill with a RCRA C cap. To avoid delay in the event that the contingency is invoked, the original 100% design of the cap will be upgraded simultaneously with the design of the air-sparging trench.

- Removal of arsenic-contaminated sediment from drainage trenches and the drainage swale using cleanup criteria described in the 1991 ROD which is 50 parts per million (ppm).

- Expand on and conduct additional pre-design studies to, among other objectives, define the lateral extent, depth, and mass of the contaminated groundwater in the Southern Plume as well as the location and pumping rates of the proposed extraction wells. Pre-design studies are not to exceed one-year after the beginning of design, as determined by EPA, for the Source Control component.

- Monitored Natural Attenuation (MNA) for contaminated ground water in the Eastern Plume moving toward the Cocheco River, a class B waterway. Five years after implementation of the Source Control component EPA will assess the cleanup progress. If EPA determines that contaminant levels are not declining at an acceptable rate, an active pump and treat system will be implemented to restore ground water in the Eastern Plume.

- Additional wells will be installed to assess and extract contaminated ground water in the Southern Plume moving toward the Bellamy Reservoir, a class A drinking water source. The extracted water will be treated and discharged. The Southern Plume will be restored to drinking water quality as quickly as possible.

- Long-term monitoring of the source area, ground water beneath and surrounding the site, indoor and outdoor air, surface water in the Cocheco River, Bellamy Reservoir and their tributaries as well as wetlands in and around the Site, and sediments in the drainage swale and in the Cocheco River, Bellamy Reservoir and their tributaries.

- Indoor air monitoring for buildings near the Eastern Plume.

- Institutional controls will consist of restrictions prohibiting ground water use both on the site and where any use may affect the migration of the ground water contaminant plumes. Additional controls will be established, as appropriate, 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. In addition, a New Hampshire Groundwater Management Zone will be established and will remain in place until the cleanup is complete.

This Amended ROD will provide a comprehensive approach for this Site that addresses all current and potential future risks caused by the landfill wastes, ground water contamination, and sediment. Principal threat wastes present at the Site include materials in the landfill such as organic compounds and arsenic that migrate into aquifers surrounding the Site and volatile organic compounds in the ground water that may infiltrate existing homes overlying the contaminated aquifers. The remedial measures will prevent further flow of contaminants from the Site in ground water and will restore ground water in the surrounding aquifers to concentrations at or below the drinking water standards through natural processes and active remediation. Once cleanup levels have been attained within the landfill, ground water will have been restored to drinking water standards and the standards of clean closure will apply to the landfill.

F. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Section 404 of the Clean Water Act and Executive Order 11990 (Protection of Wetlands) require a determination that federal actions involving dredging and filling activities or activities in wetlands have the least adverse effects on the environment compared to other alternatives and that mitigation be carried out to the extent practicable. EPA has determined that there is no practicable alternative to the selected Amended ROD remedy which would have less adverse impacts on wetlands. Each of the alternatives had some adverse impact on wetlands, either through excavation or degradation by hazardous materials. Further, these areas have already been adversely impacted by prior activities at the Site. Mitigation activities, such as erosion control, will be performed to minimize necessary impacts and the wetlands will be restored to the extent practicable.

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of materials comprising principal threats through treatment). Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure (ground water and land use restrictions are necessary until cleanup levels are met), a review will be conducted within five years after initiation of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

G. AMENDED ROD DATA CERTIFICATION CHECKLIST

The following information and relevant updates are included in the Decision Summary section of the Amended ROD. Additional information can be found in the Administrative Record for this Site.

1. Chemicals of concern (COCs) and their respective concentrations.

2. Baseline risk represented by the COCs.

3. Cleanup levels established for COCs and the basis for the levels.

4. Current and reasonably anticipated future land and ground water use assumptions used in the baseline risk assessment and the ROD Amendment.

5. Potential land and ground water use that will be available at the Site as a result of the selected remedy.

6. Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected.

7. Decisive factors that led to amending the original 1991 ROD.

7. Decisive factors that led to amending the original 1991 ROD.

H. AUTHORIZING SIGNATURES

This ROD Amendment documents the selected remedy for the Dover Municipal Landfill Superfund Site, Operable Unit #1. This remedy was selected by USEPA with concurrence of the New Hampshire Department of Environmental Services.

U.S. Environmental Protection Agency

By: Susan Studlien — Date: 09/30/04

Susan Studlien, Director
Office of Site Remediation and Restoration
Region 1

PART 2: THE AMENDED RECORD OF DECISION - DECISION SUMMARY

A. SITE NAME, LOCATION, DESCRIPTION, AND RATIONALE FOR AMENDMENT

SITE NAME: The Dover Municipal Landfill, Dover, New Hampshire. CERCLIS ID # NHD980520191.

SITE LOCATION: The Dover Municipal Landfill is situated in southeastern New Hampshire, Strafford County, Dover, New Hampshire. The property lies to the south of Tolend Road where it joins Glen Hill Road. Other landmarks include the Cocheco River that lies less than 1000 feet to the north and east, the Bellamy Reservoir that lies less than 2000 feet to the south, and the Calderwood Municipal Well that lies approximately ½ mile to the north. Although the landfill occupies approximately 50 acres, ground water contamination extends well beyond the landfill boundaries, north and eastward to the Cocheco River and south towards the Bellamy Reservoir. Figure 1 is a locus map of the Site provided on page 3. Public drinking water has been supplied to current area residences along Tolend and Glen Hill Road.

SITE DESCRIPTION: The landfill covers approximately 50 acres and although wastes average 20 feet in thickness, the landfill appears to be a relatively flat area. The landfill is vegetated mostly with meadow grasses; however, poplar and other pioneer tree species are established on the older sections of the landfill. The Site is surrounded by trenches that intercept near-surface leachate emanating from the wastes. The trenches convey leachate, and other runoff, to a drainage swale on the north side of the landfill and, ultimately, to the Cocheco River. The immediate area surrounding the landfill on the east, south, and west appears to be forested with mixed hardwoods, hemlock and other pines. The north side of the landfill is light, rural, residential use with a few homes along Tolend Road and Glen Hill Road. There are a total of 23 houses within a one-quarter mile radius of the Site with an estimated population of 50. All these homes are on Glen Hill Road or Tolend Road.

The landfill consists of mostly municipal waste and received unknown amounts of liquid hazardous wastes consisting of volatile organic compounds (VOCs) as well as other organic and inorganic, hazardous wastes. This has resulted in contaminated ground water underlying and flowing away from the landfill in two plumes of contaminated ground water. One plume flows to the east and discharges to the Cocheco River, the "Eastern Plume." The second plume flows to the south, towards the Bellamy Reservoir, the "Southern Plume." The Cocheco River is a class "B" waterway used for recreational purposes. The Bellamy Reservoir is a class "A" waterway that provides much of the municipal drinking water for Portsmouth, New Hampshire and many smaller communities in southeastern New Hampshire.

The Site is shown in greater detail in Figure 2 on page 4. A more complete description of the Site can be found in Section I of the Revised Focused Feasibility Study Addendum (the EPA Addendum) prepared by the EPA, issued on June 18, 2004, and in Section I of the Revised Focused Feasibility Study (the RFFS) prepared by the Executive Committee of the Group of Work Settling Defendants, Dover Municipal Landfill (the Group), dated January 30, 2004.

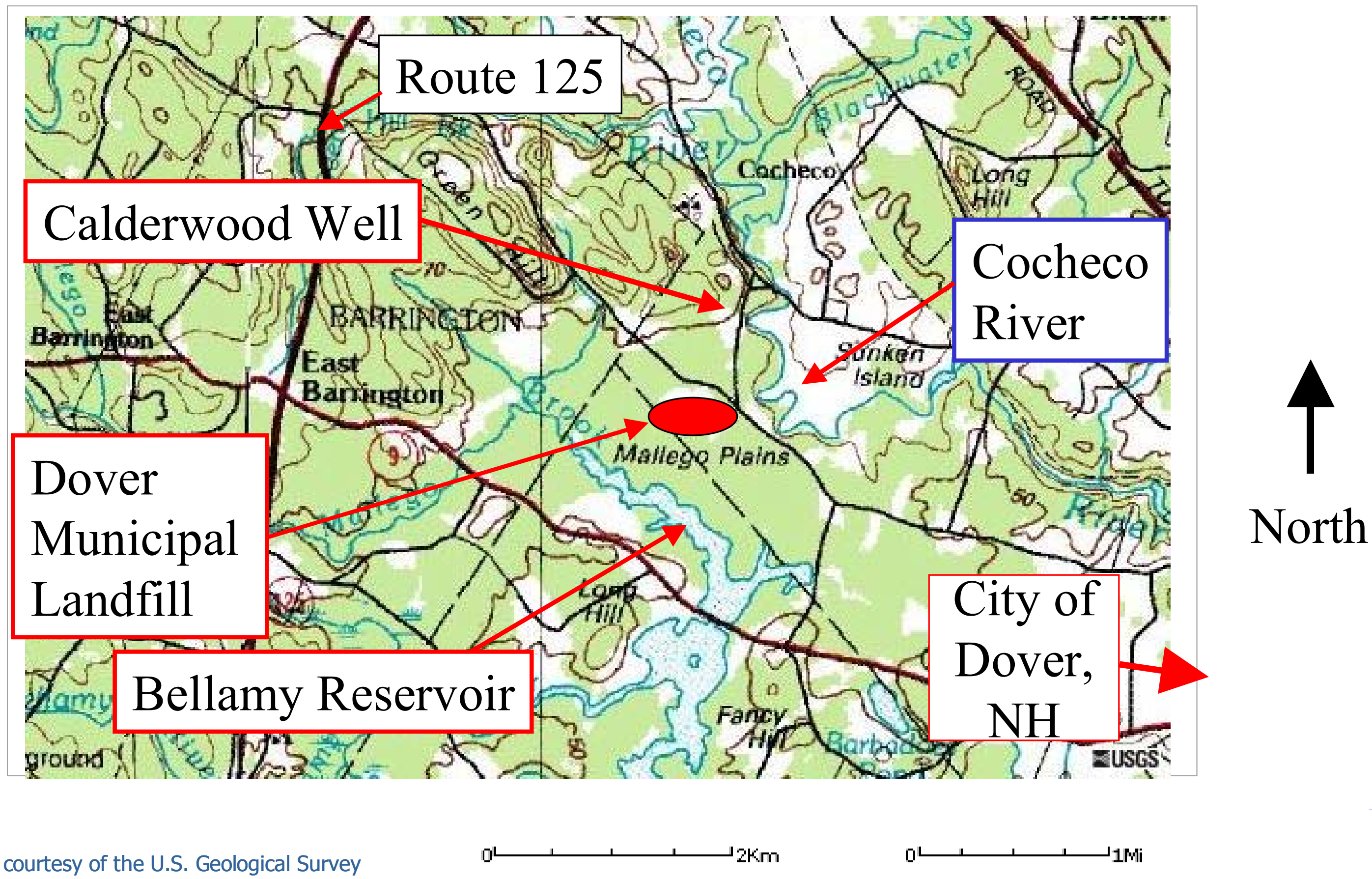

Figure 1: Locus Map of area surrounding the site.

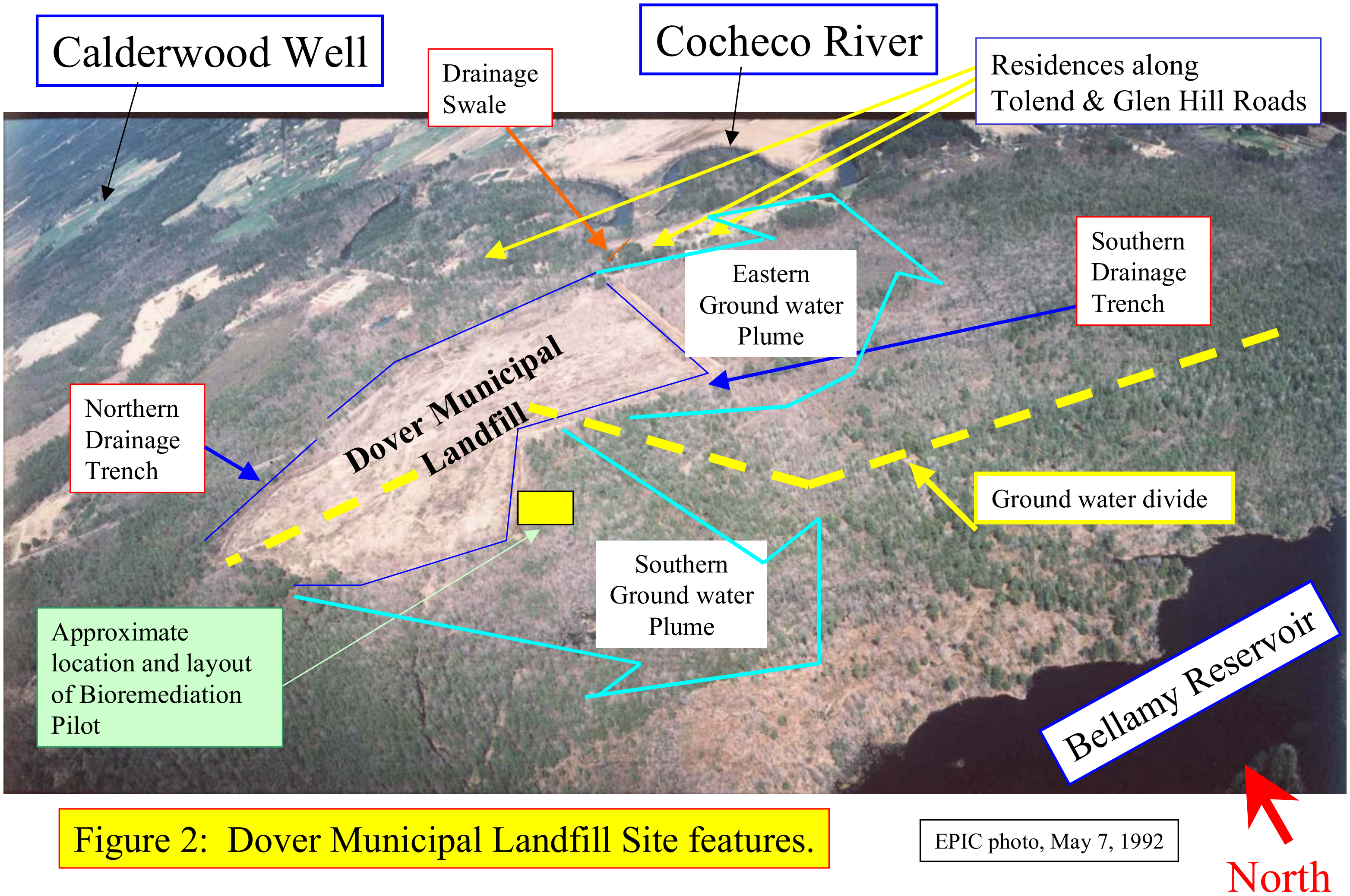

Figure 2: Dover Municipal Landfill Site features.

RATIONALE FOR AMENDMENT: On September 10, 1991 EPA, with the concurrence of NHDES, and in accordance with CERCLA issued the 1991 ROD for the Dover Municipal Landfill Site. The 1991 ROD selected the final remedial action for the Site and established target cleanup goals for sediments and ground water. Specifically, the 1991 ROD required the remediation of the landfill and ground water through Source Control and Management of Migration components, respectively. The Source Control component of the remedy would halt the migration of contaminants from the landfill into the ground water. The Management of Migration component would restore the contaminated ground water in the two plumes.

The Amended ROD uses an air-sparging trench to act as the Source Control component to halt migration of contamination from the landfill.

The decision to amend the Source Control component was based on a number of factors including the following:

With respect to hazardous wastes in the landfill:

- The Source Control component of the 1991 ROD addressed this by covering the wastes, effectively entombing them permanently. Contaminants will very slowly flow out of the wastes and into the surrounding aquifer. The cap needed to accomplish this will require perpetual maintenance.

- The Amended Source Control component will address this by allowing infiltrating water to wash the contaminants out of the landfill and move them towards an air-sparging trench that will either capture or destroy the Site contaminants. The contaminants will be captured and treated more quickly than in the 1991 ROD.

- The Amended Source Control component will potentially meet cleanup levels in ground water decades before, and at less cost than the 1991 ROD Source Control component.

- The Amended Source Control component will allow the landfill to reach clean closure with an appropriate cover in place, allowing reuse of the Site to occur more quickly.

- The Amended Source Control component offers greater flexibility in addressing Site contamination by installing an air-sparging trench that will be segmented to allow differential treatment of contaminated ground water, and, in the event of a contingent remedy, that can be used to extract contaminated ground water.

With respect to contaminants migrating from the landfill and into the surrounding aquifer:

- The Source Control component of the 1991 ROD addressed this by constructing a 25 foot deep ground water interceptor/diversion trench that would intercept contaminants. However, this trench may miss some of the deeper contaminants. These contaminants would be addressed by individual wells, but the low-dispersivity at the Site may allow deeper contaminants to escape untreated.

- The Amended Source Control component will address this by installing an air-sparging trench that will span the entire transmissive portion of the aquifer, keying into the marine clay. No contaminants will be able to go beneath the trench.

With respect to contaminated sediments in the Cocheco River:

- The Source Control component of the 1991 ROD had no provision for contaminated sediments in the Cocheco River.

- The Amended Source Control component will address this by monitoring, testing, and excavating any sediments that show a risk to human health or the environment.

For these reasons, EPA believes the Amended Source Control component to be at least, if not more protective and more cost-effective than the 1991 ROD Source Control component.

The Group also offered an alternative for the Management of Migration component. Following a review of that proposal, EPA declined to consider a change to the 1991 ROD for addressing Site ground water. Therefore, the Management of Migration components from the 1991 ROD were retained and additional assessment and monitoring requirements were added to that component. Only the Source Control component is changed in this Amended ROD. Table 1 summarizes the components of the 1991 ROD remedy and identifies the components that have changed.

Table 1: Amended Remedy Summary and Comparison

1991 ROD Remedy	Amended Remedy
Source Control	
RCRA C cap over 50-acre landfill.	★ Existing vegetation will be maintained. The 1991 ROD 100% remedial design cap for landfill will be updated.
25-foot deep ground water interception trench will intercept contaminated ground water for treatment.	★ Up to 100 foot deep air-sparging trench will trap and recover contaminants within the trench.
Investigations of the landfill surface to detect high concentrations and remove them.	No change. Directly address areas of contamination that the air-sparging trench will not be able to address.
Arsenic-contaminated sediment greater than 50 ppm in drainage trenches surrounding the Site and the drainage swale will be removed. Drainage trenches will be filled. Swale will remain uncovered.	No change.
Management of Migration	
Eastern ground water contaminant plume addressed through monitored natural attenuation to be assessed at 5-Year Review.	No change.
Not assessed in 1991 ROD.	★ Arsenic contaminated sediment in Cocheco River to be removed if further sampling shows threat to human health or the environment.
Southern ground water contaminant plume addressed through pumping and treating.	No change.
Institutional controls will prevent the use of ground water for drinking water or purposes contrary to the remedy.	No change.
Long-term monitoring of ground water, surface water, and sediments will be conducted to ensure that the remedy does not pose a threat to human health or the environment.	★ No change. Indoor air assessments will be conducted pursuant to the new EPA policy. Corrective action will be taken if necessary.
★ Items that are changed from the 1991 ROD.	

This Amended ROD and the documents which form the basis for the Amendment are available at the following Information Repositories:

EPA Records Center
1 Congress Street, Suite 1100
Boston, MA 02114-2023
(617) 918-1453
Hours: 10am - noon and 2pm - 5pm.

New Hampshire Department of Environmental Services
29 Hazen Drive
Concord, NH
1-603-271-3644

Dover Public Library
72 Locust Street
Dover, NH
1-603-743-6050

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

1. HISTORY OF SITE ACTIVITIES

The landfill began operations in 1961 and closed in 1979. The landfill accepted household wastes as well as wastes from local industries that included liquid hazardous wastes. These liquid hazardous wastes consisted of solvents and tanning solutions that included chlorinated solvents. Although disposal practices varied over the operational life of the landfill, in the later years of operation, the liquid hazardous wastes were disposed by pouring them into surface impoundments located in the watertable on the landfill surface.[1,2] In the early 1980's ground water and surface water contamination were found in wells and surface water bodies located both on and off the landfill.

The Site was placed on the National Priorities List on September 8, 1983. Remedial Investigations begun by EPA and completed by a number of the parties that formed the *Executive Committee of the Group of Work Settling Defendants, Dover Municipal Landfill* (the Group) in the late 1980's found pervasive ground water, surface water and air contamination. The Remedial Investigations led to the 1991 ROD. The 1991 ROD selected capping of the landfill, ground water migration mitigation measures (a 25-foot deep ground water interception/diversion trench), natural attenuation of the ground water contamination in the Eastern Plume, and pump-and-treat of the ground water contamination in the Southern Plume. At around the time the 1991 ROD was signed, institutional controls in the form of local ordinances were put in place to prevent the use of ground water and to prevent disturbance of the aquifer marine clay layer. Figure 2 on page 4 shows the current, approximate location of the ground water contaminant plumes and a summary of the Site stratigraphy. After the 1991 ROD was issued, the Group agreed in a 1992 Amended Administrative Order on Consent (AOC) to further characterize the horizontal and vertical extent of the Southern Plume contamination and determine whether the contamination had reached, or would reach, the Bellamy Reservoir.

A Consent Decree to implement the provisions of the 1991 ROD was signed in 1992. However, since the Southern Plume was relatively undefined, rather than move forward with that portion of the remedy, it was agreed that the cleanup of the Southern Plume would be suspended while the Southern Plume Pre-Design Investigation (SP-PDI) was proceeding. Therefore, the Consent Decree demurred on implementing the pump-and-treat remedy in the Southern Plume. The SP-PDI was completed in 1994.

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[1] GeoInsight, Revised Focused Feasibilty Study, January 30, 2004.

[2] USEPA, Environmental Monitoring Systems Laboratory, Site Analysis Dover Landfill, TS-PIC-85010, Las Vegas, NV, March 1985.

The 1994 SP-PDI found a ground water divide that split the Southern Plume into eastern and western components. The eastern component was found to ultimately discharge to the Cocheco River while the western component flowed towards the Bellamy Reservoir. The SP-PDI also found that as the plane of ground water flow deepened, the ground water flow divide moved further westward towards the Bellamy Reservoir. Modeling found that, depending on whether the landfill was capped or not capped, the ground water flow divide shifted 300 feet in a westerly direction causing most of the Southern Plume to flow eastward, away from the Bellamy and towards the Cocheco River.[3]

The 1994 SP-PDI also found that the leading edge of the Southern Plume in the most contaminated portion of the aquifer, the interbedded zone, had not significantly changed from the 1991 Remedial Investigation and was not pervasive. The SP-PDI concluded that discharge is primarily towards the Cocheco River in the interbedded layer and that the contaminated ground water plume in the interbedded aquifer of the Southern Plume would not pose a threat to the Bellamy Reservoir <u>if the landfill were capped</u>. The MODPATH modeling analysis found that even in the no-cap scenario the contaminants in the interbedded zone migrate very slowly and will have only migrated 350 feet beyond the landfill toe at the end of forty years. Also, using modest, but untested assumptions, preliminary analysis of natural attenuation found that concentrations of contaminants in the Southern Plume would be reduced below cleanup levels prior to arriving at the Bellamy Reservoir. Lastly, the installation of a cap would divert additional ground water flow away from the Bellamy and towards the Cocheco River. Based on these findings, the SP-PDI concluded that the Bellamy Reservoir would not be impacted by the Southern Plume and that groundwater extraction and treatment in the Southern Plume was not necessary.[4] EPA did not, however, accept these findings or amend the 1991 ROD to change the remedy for the Southern Plume.

In February 1995 the Group submitted a second Pre-Design Investigation report regarding the capping component of the 1991 ROD, the Source Control Pre-Design Investigation (SC-PDI), as required by the 1992 Consent Decree Scope of Work. The SC-PDI examined the consolidation of the sediments, detailed the elements of capping the landfill, described the details of installing and operating the ground water interceptor/diversion trench, characterized the wetlands, and determined a background concentration for arsenic in ground water at the Site of less than 10

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[3] Pre-Design Study, Southern Plume, Dover Municipal Landfill Site, Dover, New Hampshire. Prepared by SEA Consultants Inc., Cambridge, MA, July 1994.

[4] Pre-Design Study, Southern Plume, Executive Summary, page ix.

parts per billion.[5]

A number of subsequent studies, performed independently by the Group, followed the SC-PDI and were issued in May 1996. These reports further described the hydrogeology of the Site and discussed treatability studies to address ground water contamination using *in situ* bioremediation and air stripping. The results of these studies were offered by the Group as a proposal to seek an alternate remedy to the 1991 ROD remedy for the Southern Plume.[6] EPA reviewed these documents and found several deficiencies in the proposed approaches to *in situ* bioremediation and air-stripping.[7]

The SC-PDI served as the basis of the remedial design for the cap and the ground water interceptor/diversion trench. A 100% remedial design was submitted by the Group in December 1996; however, it was not approved pending consideration of a new approach to Source Control remediation. In 1996, based on communication between the Agencies and the Group, a new, *in situ* bioremediation approach was developed for consideration as an alternative to the Source Control component of the 1991 ROD.

The Group conducted a pilot test of this new, *in situ* bioremediation approach under a 1997 Administrative Order on Consent (1997 AOC). The 1997 AOC held the approval and implementation of the 1996 remedial design of the landfill cap and the 1992 Consent Decree in abeyance until the conclusion of the Bioremediation Pilot Project. Accompanying the 1997 AOC was a Memorandum of Understanding establishing NHDES as the lead agency for oversight of the Bioremediation Pilot Project.

The Bioremediation Pilot Project began in 1997. The project sought to mineralize or immobilize Site contaminants by injecting amendments into the ground water. The Pilot Project concluded in 2001 with the NHDES and EPA determining that this alternative approach had failed to prove superior to the 1991 ROD for the Source Control component. The Pilot Project failed primarily because low values of dispersion in the aquifer prevented the homogeneous and

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[5] Pre-Design Investigation Report, Dover Municipal Landfill, Dover, New Hampshire, Prepared by Golder Associates, Inc., Manchester, New Hampshire, February 1995.

[6] Attachment A, Updated Hydrogeologic Information; Attachment B, Treatability Study Report; Attachment C, Limited Field Sparging Test Summary Report; Attachment D, Treatability Study Work Plan; Attachment E, Focused Feasibility Study; Attachment F, Field Demonstration Work Plan. GeoInsight, Londonderry, New Hampshire, May 17, 1996.

[7] Comment letter from A. F. Beliveau, EPA QA office, to EPA Project Manager Cheryl Sprague, February 13, 1996. Comment letter from Don Draper, EPA Ada Lab, to EPA Project Manager Cheryl Sprague, October 7, 1996.

predictable distribution of amendments needed to ensure the destruction or immobilization of contaminants.[8] The Agencies's analysis of the Bioremediation Pilot Project is contained in Appendix A of the EPA Addendum.

The Agencies believed, however, that the remedy proposed by the Group would be viable if the delivery of the amendments was by a continuous source, such as a porous media trench. The Group proposed using a trench that spanned the aquifer to distribute the amendments which could ensure complete mixing, the primary defect of the original Bioremediation Pilot Project. The Group then prepared a Revised Focused Feasibility Study (RFFS), completed on January 30, 2004. EPA responded to that document not by approving it, but rather by issuing EPA's Addendum on June 18, 2004.

A more detailed description of the Site history can be found in Section 1 of the EPA Addendum and the RFFS.

2. HISTORY OF CERCLA ENFORCEMENT ACTIVITIES

A number of parties formed the *Executive Committee of the Group of Work Settling Defendants, Dover Municipal Landfill* (the Group) and are primarily responsible for investigation and cleanup activities at the Site. A more detailed history of enforcement actions at the Site can be found in Section II.B. of the 1991 ROD.

C. COMMUNITY PARTICIPATION

This Amended ROD meets the criteria for community involvement specified in Sections 300.435(c)(2)(ii)(A) through (H) of the NCP.

Throughout the Site's history, community concern and involvement has varied. In 1991 public comments on EPA's Proposed Plan for Site cleanup were dominated by concerns regarding the cost of the remedy. Most citizens and officials commented that monitoring and institutional controls were sufficient for the Site. Some members of the public and the Water Department of the City of Portsmouth supported the remedy proposed at that time and expressed concern for their surrounding environment and the drinking water reservoir.[9]

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[8] 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.

[9] Record of Decision, Dover Municipal Landfill, U.S. EPA, September 1991. Page 6 of the Responsiveness Summary.

Because of the low population density in the area of the Site, most participation has been by City officials for Dover and Portsmouth, New Hampshire, non-governmental organizations interested in the Cocheco River, and a few residents. Recently, one non-governmental organization, the New Hampshire TAG Force, received a TAG grant from EPA. Below is a brief chronology of recent public outreach efforts:

- In early June 2004 NHDES met at the Site with concerned parties including several local residents and officials of the Cities of Dover and Portsmouth, New Hampshire to discuss EPA's Amended Proposed Plan that was issued on June 18, 2004.

- In mid-June 2004, EPA placed a press release in the local newspaper, *The Foster Daily Democrat*, outlining EPA's intention to amend the 1991 ROD and announcing the date, time and place of a public meeting and public hearing and the availability of supporting documentation and the Amended Proposed Plan.

- Shortly after the press release, EPA sent notice of the public meeting and public hearing and a copy of the Amended Proposed Plan to parties on the mailing list. EPA also sent electronic copies of the Amended Proposed Plan and supporting documentation to City officials, representatives of the New Hampshire TAG Force, and several other interested parties.

- On June 21, 2004, EPA and NHDES held a public informational meeting in the Dover Town Hall to describe the Amended Proposed Plan and EPA's preferred remedy.

- On June 21, 2004, EPA made the administrative record available for public review at EPA's offices in Boston and at the Dover Public Library.

- From June 22nd to July 21st the Agency held a 30 day public comment period to accept written comments on the alternatives presented in the RFFS, EPA's Addendum and the Amended Proposed Plan and on any other documents previously released to the public. Upon request, the public comment period was extended to August 11, 2004.

- On July 19th the Agency held a formal public hearing to discuss the Amended Proposed Plan and to accept any oral comments. A transcript of this meeting and the Agency's response to formal oral and written comments are included in the Responsiveness Summary, which is part of this Record of Decision Amendment.

- Local residents, primarily from the Cocheco River Watershed Association, formed the New Hampshire TAG Force to monitor Site activities, and review the proposal for this Amended ROD. They applied for and have been awarded a TAG grant and have retained a TAG consultant.

Overall, the EPA has kept the community and other interested parties aware of Site activities through press releases, public meetings and informal contacts. Pursuant to Section 300.825(c) of the NCP, EPA updated the Administrative Record in June 2004 to add the documents which EPA relied on to form the basis for the decision to amend the response action for OU#1 at the Dover Site. See Appendix B for the Administrative Record Index.

D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The Dover Municipal Landfill consists of a single operable unit, OU#1, consisting of Source Control and Management of Migration components. This ROD Amendment pertains only to the Source Control component of the remedy with some additional assessment and monitoring requirements for the Management of Migration component.

The Source Control component consists of controlling the source of contamination at the Site, the landfill. The approximately 50-acre landfill contains contaminated materials in both liquid and solid form. The landfill surface has a permeable, vegetated soil cover that prevents contact with the wastes. There are also two drainage trenches dug along the lateral limits of the landfill that are intended to intercept leachate flowing from the landfill. One drainage trench, the southern drainage trench, begins on the western edge of the Site, flows eastward along the southern boundary of the landfill before turning north and eventually flowing into a drainage swale north of Tolend Road. A northern drainage trench also originates on the western side of the landfill; however, flows northward before turning east and eventually discharging into the same drainage swale as the southern drainage trench. The drainage swale flows northward and discharges into the Cocheco River. Actions in the drainage trenches and drainage swale are considered to be a Source Control component.

The Management of Migration component consists of restoring contaminated ground water that is flowing in the aquifers below and surrounding the landfill. It includes contamination that is sorbed to the aquifer materials. Ground water is divided into two plumes of contamination, an Eastern Plume and a Southern Plume. The Eastern Plume has migrated such that sediments in the Cocheco River have been contaminated. Actions taken to address these sediments are considered to be a Management of Migration component.

E. DESCRIPTION OF CHANGES TO THE 1991 ROD

1. DESCRIPTION OF THE 1991 ROD REMEDY

The 1991 ROD remedy consisted of Source Control and Management of Migration components. The Source Control component of the 1991 ROD (SC-7/7A) consisted of:

- Use of on-site material from the perimeter of the landfill to recontour the existing landfill surface to achieve the necessary slope for drainage.
- Construction of a multi-layer RCRA C cap over the re-contoured landfill.
- Construction of a leachate/ground water extraction system and clean ground water diversion system provided by a landfill perimeter interceptor/diversion trench, extraction wells or a combination of the two.
- Operation of an on-site ground water/leachate treatment system with discharge to the Cocheco River (SC-7) or discharge to a POTW (SC-7A).
- Methane gas collection and passive venting.
- Construction of a surface run-on/run-off diversion system with sedimentation and detention basins.
- Limited drainage trench and drainage swale sediment removal and consolidation under the landfill cap.
- Institutional controls to limit Site access and Site use.
- Environmental monitoring.

Further details of the Source Control component are available beginning on page 51 of the 1991 ROD.

The 1991 ROD Management of Migration components (MM-2 and MM-4) included the following elements:

- The use of institutional controls to prohibit the use of ground water and prohibit disturbance of the marine clay layer between the upper and lower aquifers at the

Site (MM-2 and MM-4).

- Implementation of a long-term ground water sampling/monitoring program (MM-2 and MM-4).

- Pre-design studies which include the installation of additional monitoring wells to further define the lateral extent, depth and mass of the contaminated ground water (MM-4).

- One or more pump tests to determine the ability and rate that contaminated ground water can be extracted from the aquifer (MM-4).

- Use of natural attenuation processes to attain ground water cleanup levels in the Eastern Plume (MM-2).

- Installation of several off-site ground water extraction wells in the Southern Plume, connection to an on-site treatment system, extraction and treatment of the ground water and recharge of the treated ground water to the wetlands or discharge to the Cocheco River (MM-4).

Details of the Management of Migration component begin on page 57 of the 1991 ROD.

Cleanup levels were established for contaminated sediments in the drainage trenches that surround the Site and for contaminated groundwater based on ARARs and health-based calculations. The ground water cleanup levels established in the 1991 ROD are shown in Table 11 on page 73.

2. COMPONENTS OF 1991 ROD REMEDY COMPLETED TO DATE

With respect to the Source Control component the City of Dover enacted an ordinance that created a hazardous waste district that prohibits development and use of ground water in the area of the landfill until the cleanup is completed. The Town of Madbury similarly enacted an ordinance creating an overlay district that prohibits the use of ground water. In addition, the capping component of the remedy reached 100% design in 1996 and arsenic-contaminated sediments in the drainage trench and drainage swale were removed in 1997. A ground water / surface water sampling program has been in place for more than ten years and limited pre-design activities in the Southern Plume have been conducted.

3. CHANGES TO THE 1991 ROD REMEDY

This Amendment changes only the Source Control component of the 1991 ROD remedy. In addition, the 1991 Management of Migration component is now expanded to include the assessment of contaminated sediments in the Cocheco River and excavation if necessary. Also, air monitoring of buildings near the Eastern Plume will occur with remedial measures taken if it is shown that vapors from contaminated ground water cause a human health risk.

This ROD Amendment elects to address the source of contamination, the landfill, by leaving the landfill uncapped and installing an air-sparging trench that surrounds the waste area. This replaces the original Source Control component of a RCRA C landfill cap and ground water diversion/interceptor trench. EPA recognizes that the air-sparging trench is innovative and will pose technical challenges; however, the remedy provides for engineering alternatives to address these challenges as well as the contingency that the Source Control component will revert back to the original RCRA C capping requirement in the event that the innovative technology is unsuccessful. To that end, the ROD Amendment requires that the original 100% cap design be updated simultaneously with the design of the air-sparging trench. To better define the technical challenges, the air-sparging trench will be installed in phases to ensure it performs as expected.

To summarize the change to the Source Control component:

- The landfill remains uncapped to allow infiltrating rainwater to travel through the landfill wastes, absorbing contaminants, and then be conveyed to the air-sparging trench.

- Areas of high contamination within and adjacent to the landfill will be located and addressed by either excavation or other *ex situ* technology, as appropriate.

- An air-sparging trench, approximately 3000 feet long by up to 100 feet deep by 3 feet thick will capture arsenic by precipitation, volatile organic compounds (VOCs) by volatization, and aerobically degrade tetrahydrofuran (THF).

- Arsenic precipitate will be removed by excavation at the conclusion of the remedy or if fouling occurs. Other methods of removal may be investigated and used if appropriate.

- VOCs and other volatile gases will be recovered for treatment if emissions exceed regulatory levels and discharged to the atmosphere.

- Down-gradient monitoring will ensure that ground water exiting the air-sparging trench meets cleanup levels and that the remedy is performing as expected.

If it is found during the phased construction or later, that the air-sparging trench is not performing sufficiently to remove the contaminants flowing from the landfill, the Source Control component of the 1991 ROD, SC-7/7A (i.e., capping the landfill), will be the contingency remedy that will be implemented at the Site.

There are also two changes to the Management of Migration component of the 1991 ROD:

1. Sediment in the Cocheco River will be monitored to ensure concentrations of arsenic do not pose a risk to human health and a Tier 2 ecological risk assessment will be performed, followed by a Tier 3 evaluation, if warranted, and removal if necessary.

2. Indoor air vapors will be evaluated in buildings near the Eastern Plume. Corrective action will be taken if necessary.

Also of note is the use of EPA's Monitored Natural Attenuation protocol for the Eastern Plume, the application of EPA's Indoor Air Evaluation Protocol, and the revised arsenic MCL of 10 ppb that will apply to Site ground water.

F. SUMMARY OF SITE CONDITIONS AND CONTAMINATION

Section 1 of the EPA Addendum and Revised Focused Feasibility Study contain a more detailed overview of the previous investigations conducted at the Site. The significant findings of those investigations are summarized below.

1. GENERAL SURFICIAL CHARACTERISTICS

The Site is situated in an area with a low residential density. Figure 2, on page 4, shows that only a few houses line Tolend Road and Glen Hill Road where they run along the Cocheco River. There are a total of 23 houses within a one-quarter mile radius of the Site with an estimated population of 50. All these homes are on Glen Hill Road or Tolend Road. Several of the homes appear to overlie the Eastern Plume. All 23 homes, formerly served by private ground water wells, have been supplied with municipal water since 1981.

The landfill footprint covers approximately 50 acres. The original area of the landfill consisted of woodlands and wetlands that were filled during the operation of the landfill. Perimeter drainage trenches were dug along the landfill boundary during closure activities in 1979 to intercept the flow of leachate from the landfill. Although the perimeter drainage trenches drain to the drainage swale and eventually the Cocheco River, the wetlands surrounding the southern portion of the Site drain to the Bellamy Reservoir. The wetlands to the north of the landfill drain to the northern drainage trench and the Cocheco River. The floodplains of the Cocheco River and the Bellamy Reservoir do not include the landfill.

The landfill surface appears to be a large meadow, covered with grasses and low shrubs such as sumac. In older sections of the landfill, poplar and birch trees have grown. The only structures on top of the landfill consist of a small building approximately 20 by 20 feet that housed portions of the bioremediation pilot project that operated from 1997 to 2001. There are no areas of archaeological or historical importance.

2. CONTAMINATION CHARACTERISTICS

Soils, sediments, air, surface water and ground water were sampled during the remedial investigation performed prior to the 1991 ROD. Subsequent to the 1991 ROD, and based on the previous sampling results, sampling efforts focused on ground water and were later expanded to sediments in the Cocheco River. In ground water, the principal contaminants are VOCs and arsenic. Ground water has been sampled at least twice per year since 1991. In sediment, arsenic is the principal contaminant.

Site conditions have generally remained constant since EPA issued the 1991 ROD with some increasing concentrations of contaminants in the Southern Plume. The contaminated media include the wastes in the landfill, ground water below and surrounding the landfill, and sediments in water bodies that receive contaminated ground water. Below is a discussion of each of the areas of concern at the Site describing the conditions and contamination.

<u>The Landfill</u>

The geology beneath the landfill consists of 100 feet of sedimentary deposits on top of bedrock. Ground water flow from the landfill appears to be confined to the upper forty to fifty feet of those sedimentary deposits. Summarizing the surficial topography, the landfill is approximately twenty-feet thick; however, near Tolend Road the landfill has little topographic expression. The southern edge of the landfill surface falls rapidly ten to twenty feet to an adjacent woodland and wetland. In this area it is apparent that much of the former ground surface beneath the landfill was either wetland or low-lying forested area.

The underlying geology at the Site is comprised of glacio-fluvial deposits. A chronological record of the geology would begin with the bedrock surface, the deepest portion of the described geology, which was lain bare by the glaciers 10,000 years ago. When the glaciers retreated, they left behind outwash deposits. Because of the great weight of the glaciers, the ground surface was depressed below sea level allowing the deposition of a marine clay layer on top of the initial glacial deposits. This was followed by the deposition of additional glacial outwash deposits on top of the marine clay. The original, detailed cross-sections of the Site geology are in the EPA Addendum and in the 1988 Remedial Investigation as Figures 5-6, 5-7 and 5-8.[10]

Although the landfill is covered with a thin veneer of sand and organic matter, contaminants are mobilized by rainwater that infiltrates the landfill and then enters the ground water. Contaminants are then conveyed from the landfill by leachate, contaminating ground water, that then migrates beyond the Site either into the drainage trenches that surround the landfill or into the aquifers that underlie the Site. Contaminated ground water migrating in the aquifers may either discharge to surface water or be extracted by a well.

Contamination in the landfill consists of VOCs such as trichloroethylene (TCE), tetrachloroethylene (PCE), *cis*-1,2 dichloroethylene (1,2 DCE) and vinyl chloride; hydrocarbon compounds present at the Site include benzene and toluene; other organic compounds at the Site include tetrahydrofuran (THF) and ketones. The landfill appears to contain at least two known source areas. The first area is in the northern portion of the Site where ground water with high concentrations of VOCs discharges to the northern drainage trench when the local water table is high. The second area is in the southwestern portion of the Site and consists of high concentrations of THF. Table 2, beginning on page 23, describes the general contaminant concentrations and location in the ground water beneath the landfill and in the surrounding aquifer.

<u>Ground Water</u>

As previously noted, the Site is situated on a ground water divide. The northern and eastern portions of the Site drain to the east and the Cocheco River (the Eastern Plume). The western and southern portions of the Site drain to the south and the Bellamy Reservoir (the Southern Plume). The RFFS used MODFLOW-96 to assess conditions at the site in conjunction with solute transport models Version 2 of the Reactive Transport Model in 3-Dimensions (RT3D) and Version 3.5 of the Modular Three-Dimensional Transport Model (MT3D). The model used Site-specific information and assumptions listed in Appendix N of the RFFS.

Because the ground water gradients are fairly flat to the south, ground water flowing towards the Bellamy travels more slowly than that to the east and the Cocheco River. Contaminant flow in each of the respective aquifers is also restrained by retardation. Inside the landfill, ground water

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[10] *Remedial Investigation, Dover Municipal Landfill, Dover, New Hampshire, Volume II, Tables and Figures.* Prepared for: New Hampshire Department of Environmental Services, Waste Management Division. Prepared by: Goldberg-Zoino & Associates, Inc. and Wehran Engineers. November 1988.

flow is very slow due to the low hydraulic gradient. Contaminants in the Southern Plume travel quite slowly and have travel times of twenty to sixty years to the Bellamy Reservoir. However, in the Eastern Plume, where the gradients are steeper, contaminants take less than ten years to travel from the edge of the landfill to the Cocheco River.[11] Figure 2 on page 4 shows the location of the ground water divide and Eastern and Southern Plumes. The general concentrations in the Eastern and Southern Plumes are shown on Figure 3 on page 28. Ground water flow and contamination is discussed in greater detail in Section 1 of the RFFS and in the EPA Addendum.

Ground water in the area underlying the landfill is labeled as GB, a background aquifer. The landfill is located in the Well Head Protection Area for the Calderwood Well as designated by NHDES.[12] The policy of the State of New Hampshire is that all ground waters are potential drinking water aquifers. Use of the ground water surrounding the landfill is subject to municipal ordinances prohibiting the installation of wells for domestic uses.[13]

<u>Ground water - The Southern Plume</u>

Contaminants in the Southern Plume consist of benzene, vinyl chloride, 1,2 DCE, arsenic and THF, with concentrations of arsenic increasing at the southern toe of the landfill, indicating worsening conditions. Benzene, vinyl chloride, THF and arsenic levels are above the Safe Drinking Water Act MCLs in well SB-B2, located approximately halfway between the toe of the landfill and Bellamy Reservoir - a Class "A" drinking water body. THF exceeds the interim cleanup level (ICL) established in the 1991 ROD and has increased steadily in concentration in well SB-B2 since that time. The landfill lies partially within the Reservoir's watershed. Rising concentrations of these contaminants indicate that a significant potential exists for the discharge of contaminated ground water into the Bellamy Reservoir. This Reservoir serves much of southeastern New Hampshire's drinking water needs. The City of Portsmouth draws 60% of its drinking water from this Reservoir. The City of Dover draws 43% of its drinking water from wells in the Bellamy Reservoir watershed.[14] Within the Reservoir's watershed there are also many municipal drinking water wells that draw from it through induced recharge. The Bellamy Reservoir is discussed further in Appendix B of the EPA Addendum. Contaminant concentrations

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[11] *Revised Focused Feasibility Study, Dover Landfill*, Appendix N, Attachment H. GeoInsight, January 30, 2004.

[12] Dover Source Water Protection Areas, NHDES, Scale 1:36000 & centered on Calderwood Well, map prepared January 21, 2004.

[13] RFFS, Appendix A, January 30, 2004.

[14] Quantifying the Bellamy River Watershed Hydrologic Budget, prepared for the Town of Madbury by Thomas Fargo, C.G., January 2002.

in the Southern Plume are summarized in Table 2 beginning on page 23 and on Figure 3 on page 28.

Ground water - The Eastern Plume

Contaminants in the Eastern Plume consist primarily of arsenic, benzene and vinyl chloride with minor amounts of TCE, PCE, and THF. While the landfill source has remained unaddressed since the 1991 ROD, there has been no discernable decreasing trend for most of these contaminants, particularly arsenic. The Eastern Plume continues to discharge to the Cocheco River which is a Class "B" water body. The Cocheco River is used for recreation, primarily fishing and boating, it flows through the City of Dover and discharges into Great Bay approximately 7 miles downstream. The Cocheco River is discussed further in Section 2 of the EPA Addendum.

The Calderwood Well lies approximately 1/2 mile north of the landfill. The area of ground water contribution to the Well extends southward to, and beneath, the landfill.[15] However, the Calderwood Well is insulated from the Site by virtue of the geology in that a layer of impervious marine clay, approximately 20 to 40 feet thick, is found between ground water influenced by the landfill and ground water used by the well. Approximately 24% of the City of Dover's drinking water comes from this well.[16]

Contaminant concentrations in the Eastern Plume are summarized in Table 2 beginning on page 23 and on Figure 3 on page 28. The original, detailed cross-sections of the Site geology are in the EPA Addendum and in the 1988 Remedial Investigation as Figures 5-6, 5-7, and 5-8.

[15] Dover Source Water Protection Areas, NHDES, Scale 1:36000 & centered on Calderwood Well, map prepared January 21, 2004.

[16] William Boulanger, Utilities Supervisor, City of Dover Water Supply, personal communication January 6, 2004.

Table 2: The Characteristics of Aquifers at Dover Municipal Landfill
Stratigraphic units are arranged from upper-most to lowest

Stratigraphic Unit	Plume	Contaminant concentrations and characteristics in 2002 Contaminant (ICL)	Average Concentration (ppb)* ± 1 std. dev.	Maximum Concentration (ppb)*	#wells >ICL** / #wells	Stratigraphic thickness (feet above mean sea level) and general description
Landfill	Only a few wells inside the landfill; however, all show contaminants with constant concentrations above the ICLs and few downward trends.					165 - 145 feet above mean sea level (msl). Waste appears very flat.
Upper Sand	Eastern	Benzene (5) Vinyl chloride (2) THF (154) Arsenic (50)	26 ± 28 4 ± 7 65 ± 130 209 ± 82	68 14 260 320	4/4 2/4 1/4 4/4	145 - 135 msl. Sand pinches out to the north and thickens to the east. Sand unit is approximately 30 to 40 feet thick at the Cocheco River.
	Southern	Benzene Vinyl chloride THF Arsenic	24 ± 15 7 ± 11 399 ± 414 117 ± 131	44 25 970 327	4/5 2/5 3/5 3/5	Dips to the south; however, thickness remains about 15 to 20 feet. The upper sand directly contacts the Bellamy Reservoir. The water level in the Reservoir is approximately 135 feet msl.
Upper-Upper Interbedded	Eastern	Benzene Vinyl chloride THF Arsenic	49 ± 18 11 ± 9 88 ± 179 207 ± 233	79 26 540 634	9/9 8/9 2/9 6/9	135 to 115 feet msl under the landfill, pinches out to the north. Dips and thickens to the east. Ground water from the interbedded zone flows into the Cocheco River which is at an elevation of approximately 110 feet msl.
	Southern	Benzene Vinyl chloride THF Arsenic	30 ± 12 1 ± 1 933 ± 827 174 ± 147	44 4 2400 376	7/7 1/7 6/7 5/7	Thickens to the south, lies about 20 feet beneath the surface of the Bellamy Reservoir and discharges through the upper sand into the Reservoir.

Table 2: The Characteristics of Aquifers at Dover Municipal Landfill
Stratigraphic units are arranged from upper-most to lowest

Stratigraphic Unit	Plume	Contaminant concentrations and characteristics in 2002 Contaminant (ICL) / Average Concentration (ppb)* ± 1 std. dev. / Maximum Concentration (ppb)* / #wells >ICL** / #wells	Stratigraphic thickness (feet above mean sea level) and general description
Lower-Upper Interbedded	Eastern	Migration limited by vertical conductivity, low amounts of contamination if any. Arsenic is the only contaminant in concentrations over the ICL of 50. 3 wells out of 5 are over 50 ppb.	The thickness of this unit was included in the upper interbedded strata described above. The reason why no differentiation is that the boundary is very gradational and therefore separating the two units is arbitrary in some locations.
	Southern	Same as Eastern Plume; however 3 of 4 wells are over 50 ppb.	
Marine Clay	115 to 100 feet above msl beneath the landfill. The marine clay strata dips to the southeast where it lies more than 100 feet below the surface. The marine clay actually surfaces to the north of the landfill. Although few wells monitor this interval, this unit is considered to be uncontaminated as it is impermeable to ground water and contaminant flow. Therefore, it is assumed that this unit insulates the underlying aquifers.		
Clay & Silt	100 to 95 feet above msl beneath the landfill.		
Sand & Gravel	95 to 90 feet above msl beneath the landfill. This unit thickens considerable to the north and ultimately is the main aquifer that the Calderwood well draws from ½ mile to the north of the Site. Based on monitoring at the Calderwood well, this aquifer is not contaminated.		
Bedrock	Surface is 90 feet above msl.		

* This data is taken from the May 2002 sampling round.

** The Interim Clean up Level (ICL) is used in this column to indicate the number of wells contaminated above the ICL against the number monitored. For instance, in the first case, the Eastern Plume has benzene that has an average concentration of 26 ppb and a standard deviation of 28, indicating a wide spread of data. The maximum concentration of benzene in the Eastern Plume is 68 ppb. The next column, ">ICL/#wells," is listed as "4/4," which means that of the four wells monitored in the Eastern Plume, all four exceeded the ICL for benzene of 5 ppb.

*** Note that the ICL for arsenic used in this table (50 ppb) is from the 1991 ROD. The arsenic ICL will be changed to 10 ppb as a part of this ROD Amendment.

Air

Indoor air in houses along Tolend Road, which are located directly above the Eastern Plume, may be impacted by VOCs in this ground water plume. Past monitoring has indicated that no indoor air risk was present. However, EPA has issued new guidance containing new risk assessment methodology regarding indoor air which requires that the Site be re-evaluated.

Surface Water and Sediments

The primary receptors of Site contaminants are the surface water bodies surrounding the landfill shown on Figures 1 and 2. Surface water at the Site may be divided into two watersheds, the Cocheco River and Bellamy Reservoir watersheds. The Cocheco River watershed includes the drainage trenches that lie on the perimeter of the landfill, the drainage swale that the drainage trenches flow to, and the Cocheco River. The Bellamy Reservoir watershed includes the wetlands that lie south of the landfill and flow gradually to the Bellamy Reservoir. Surface water is not impacted by Site contaminants in either watershed. No violation of Surface Water Quality Criteria (SWQC) for any VOC, other organic contaminant, or arsenic was found. Sediments in the Cocheco River watershed are contaminated with arsenic. Sediments in the Bellamy Reservoir watershed do not appear to be contaminated.

Surface Water and Sediments - Cocheco River Watershed

Two drainage trenches encircle the landfill to intercept leachate emanating from the landfill (Figure 2 on page 4). On the northwest side of the landfill is the northern drainage trench, a small, shallow ditch that flows first northward, is piped under Tolend Road, and then flows eastward to discharge to the drainage swale and ultimately the Cocheco River. The northern drainage trench is an intermittent stream, flowing during the spring and runoff events. The southern drainage trench originates on the southwest side of the landfill, flows along the southern and eastern perimeter of the landfill and is piped under Tolend Road. The southern drainage trench has a larger flow than the northern drainage trench and contains flow at all times of the year except during extended dry periods. Sediment in the southern drainage trench is orange-red and contains primarily iron with arsenic. The southern drainage trench flows eastward and then north before discharging to the drainage swale.

The drainage swale, also shown on Figure 2, combines the flow of the northern drainage trench with that from the southern drainage trench. The drainage swale, lying north of the landfill and Tolend Road, quickly drops 15 feet, picks up the flow of the northern and southern drainage trenches, and then drops 40 feet over a distance of 400 feet to the Cocheco River in a narrow valley. There is also evidence that contaminated ground water discharges directly to the drainage swale.

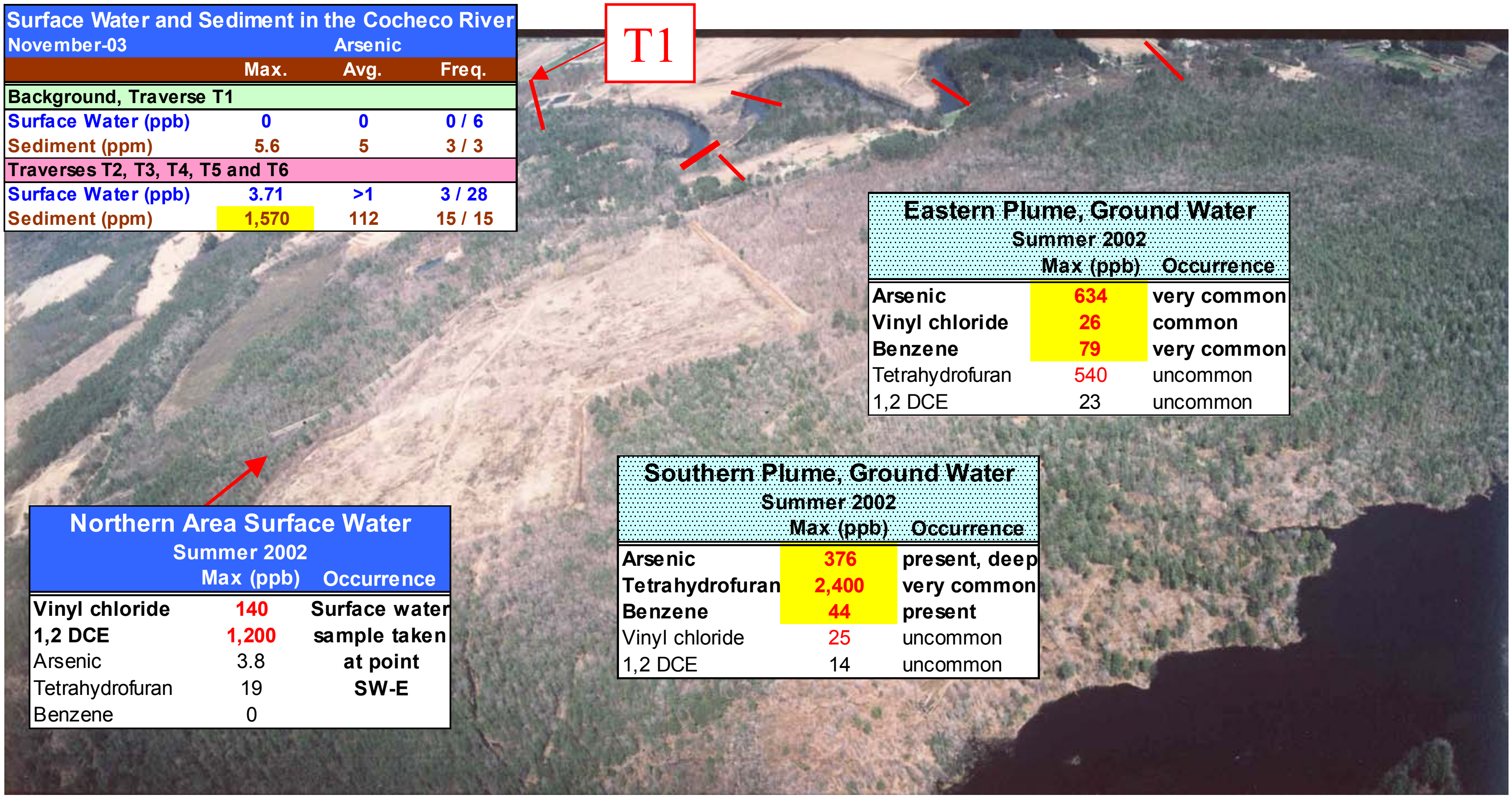
The Cocheco River receives sediment from the swale and ground water from the landfill. Ground water has arsenic concentrations that exceed the SWQC of 340 ppb (acute) and 150 ppb (chronic); however, the ground water discharges into the surface waters of the drainage trench, swale, and Cocheco River in concentrations well below the SWQC acute and chronic concentrations. This occurs because iron is also present in the ground water. The iron combines with oxygen upon discharge to these surface water bodies to form a solid residue that quickly binds the arsenic as well. Therefore, arsenic is contained in the sediments and not present above natural, background concentrations in the surface water. The sediments accumulate in the River bottom at concentrations ranging from 3 to 1500 parts per million (ppm) of arsenic.

Sediment was sampled in the drainage trenches and drainage swale for the 1991 ROD and again beginning in 2000. Sediments were sampled in six transects across the Cocheco River in 2002, with each transect consisting of three sampling stations. The sampling stations were on the bank adjacent to the Site, at mid-stream in the river, and on the far bank of the river. The results of this sampling indicated that there are a few locations of high arsenic concentration. These locations are near where the drainage swale flows into the Cocheco River and along the Cocheco River, in a linear area approximately 50 feet long, where ground water discharges to the river. The areas of high arsenic concentration coincide with high iron concentration and therefore are easily spotted as areas of red-stained sediment. The general concentrations of arsenic-contaminated sediments are shown on Figure 3 on page 28 and more particularly on Table 5 on page 36.

<u>Surface Water and Sediments - Bellamy Reservoir</u>

Surface water in the Bellamy Reservoir watershed was sampled in December 2003. Neither sample contained any VOCs or arsenic above detection limits. No sediments were sampled; however, no areas of orange-red staining were noted that indicated contaminated sediments. A large forested wetland area lies between the landfill and the Reservoir. Ground water sampling in the upper-sand, indicative of conditions in surface water in the wetland areas, does not indicate any contamination. Contaminated ground water in the Southern Plume lies approximately 20 to 40 feet beneath the land surface and is slowly flowing towards the Bellamy Reservoir without impacting intervening wetlands or streams.

Figure 3: Generalized depiction of contamination at the Dover Municipal Landfill. The maximum concentration of contaminants in ground water, surface water, and sediments. The sediment and surface water concentrations in the Cocheco River are listed beginning at transect T1. Subsequent transects, T2 to T6 proceed to the right (eastward) from T1. More information is contained in Section 2 of the EPA Addendum.



Surface Water and Sediment in the Cocheco River			
November-03		Arsenic	
	Max.	Avg.	Freq.
Background, Traverse T1			
Surface Water (ppb)	0	0	0 / 6
Sediment (ppm)	5.6	5	3 / 3
Traverses T2, T3, T4, T5 and T6			
Surface Water (ppb)	3.71	>1	3 / 28
Sediment (ppm)	1,570	112	15 / 15

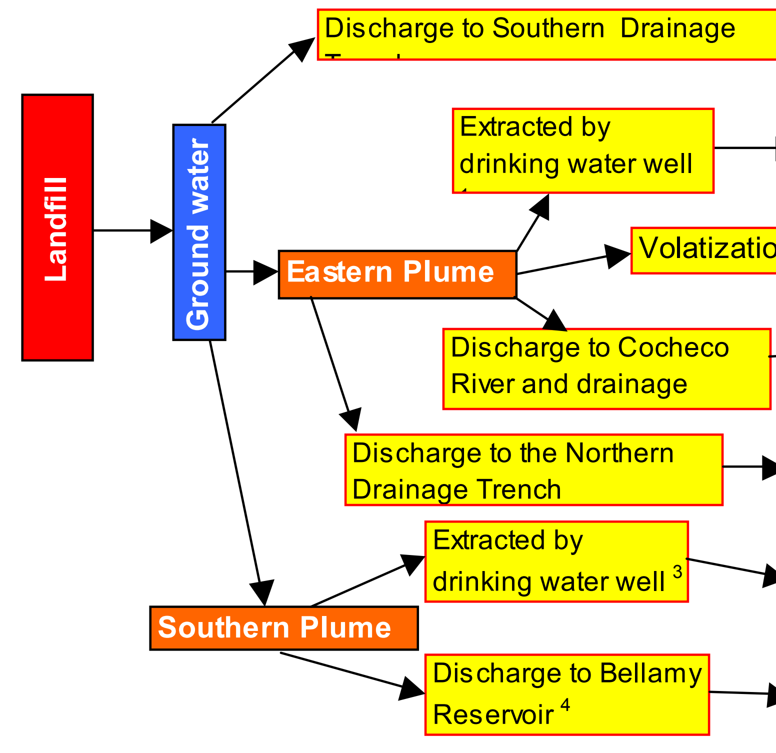
Eastern Plume, Ground Water Summer 2002	Max (ppb)	Occurrence
Arsenic	634	**very common**
Vinyl chloride	26	**common**
Benzene	79	**very common**
Tetrahydrofuran	540	uncommon
1,2 DCE	23	uncommon

Southern Plume, Ground Water Summer 2002	Max (ppb)	Occurrence
Arsenic	376	**present, deep**
Tetrahydrofuran	2,400	**very common**
Benzene	44	**present**
Vinyl chloride	25	uncommon
1,2 DCE	14	uncommon

Northern Area Surface Water Summer 2002	Max (ppb)	Occurrence
Vinyl chloride	140	**Surface water**
1,2 DCE	1,200	**sample taken**
Arsenic	3.8	**at point**
Tetrahydrofuran	19	**SW-E**
Benzene	0	

Table 3 provides a Conceptual Site Model (the "CSM") for the Dover Municipal Landfill that summarizes sources, release mechanisms, pathways and receptors. The CSM is a linear depiction of Site conditions that illustrates what is known about human and environmental exposure through contaminant release and migration to potential receptors. Table 3 shows that contamination emanates from the landfill and is conveyed outward by ground water forming the Eastern Plume and the Southern Plume. There are two minor pathways shown as well, containing leachate that contaminates the sediment in the perimeter drainage trench and at least two known source areas.

TABLE 3: CONCEPTUAL SITE MODEL - DOVER MUNICIPAL LANDFILL



Pathway	Exposure Route	RECEPTOR: HUMAN – Area Residents	RECEPTOR: HUMAN – Site Trespass	RECEPTOR: BIOTA – Terrestrial	RECEPTOR: BIOTA – Aquatic
Sediment	Ingestion		CURRENT	CURRENT	
	Dermal contact		CURRENT	CURRENT	
Drinking water	Ingestion	FUTURE			
	Dermal contact	FUTURE			
Indoor air	Inhalation	CURRENT			
Sediments & Surface Water	Ingestion	CURRENT	CURRENT	CURRENT	CURRENT
	Dermal contact	CURRENT	CURRENT	CURRENT	CURRENT
Sediments & Surface water [2]	Ingestion		CURRENT	CURRENT	CURRENT
	Dermal contact		CURRENT	CURRENT	CURRENT
Drinking water	Ingestion	FUTURE			
	Dermal contact	FUTURE			
Surface water and sediments	Ingestion	FUTURE		FUTURE	FUTURE
	Dermal contact	FUTURE		FUTURE	FUTURE

Footnotes:
#1 and 3 - Public drinking water supply has been in place since 1983. No ground water uses are allowed by municipal restriction.
#2 - Surface water concentrations do not pose a risk; however, indicate the presence of discrete areas of ground water contamination.
#4 - Contaminated ground water is not currently discharging to the Bellamy Reservoir.

Key: Primary Source | Secondary Source | Release Mechanism | Pathway

Ground water is the means by which contaminants are conveyed from the site. No other transport pathway is known.

3. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The area surrounding the Site is sparsely populated residential use. The only residences are along the northeastern side of Tolend Road, overlooking the Cocheco River. The land to the east, south, west and north of the Site consists of hemlock forest with several wetland areas draining away from the landfill. The Bellamy Reservoir lies to the south of the landfill and much of the watershed area either contributes to the Bellamy Reservoir, a Class-A drinking water supply that serves much of southeastern New Hampshire, or is within a well-head protection area for the Calderwood Well that lies ½ mile to the north of the landfill. Much of the land surrounding the landfill is owned by the City of Dover. Activities on top the landfill are restricted by fences and signs posted along Tolend Road.

Current use of the Site and area ground water is restricted by local ordinances which prevent development and the use of ground water while remedial activities are ongoing until the cleanup is completed. Once cleanup is complete, the landfill itself will be covered with an appropriate cap. In the past the City of Dover has expressed an interest in using the landfill surface for recreational facilities or a golf course. Recently there has been some discussion between the City and the State concerning reuse of the landfill as a disposal area. Future development will be limited by the presence of a cap and its location in a well head protection area and proximity to nearby wetlands.

G. SUMMARY OF SITE RISKS

The human health risk assessment was first performed for the 1991 ROD and updated in the 2004 RFFS. See Section 8 of Volume I (a separate document) of the 1989 Remedial Investigation, Section 2.2.2 of the 1991 Feasibility Study,[17] and Section 2 of the 2004 RFFS. A limited ecological risk assessment was performed in 2002 for the RFFS. A summary of those aspects of the human health risk assessment which support the need for remedial action is discussed below followed by a summary of the environmental risk assessment.

1. HUMAN HEALTH RISK ASSESSMENT

The human health risk assessment followed a four step process: 1) hazard identification, which identified those hazardous substances that, given the specifics of the Site, were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates.

[17] Dover Municipal Landfill Feasibility Study, HMM Associates, February 28, 1991.

The 1991 ROD identified a future risk to human health associated with drinking ground water contaminated with arsenic and to a much lesser extent, vinyl chloride. Current exposure to ground water was not a complete pathway in that all property owners are provided with public water. Contact with landfill soil was evaluated but also found to be an incomplete pathway since a soil cover is in place on the landfill and access is partially prevented by fencing. The soil cover prevents only dermal contact with contaminants in the soil but continues to allow precipitation to leach contaminants into the underlying ground water. Exposures to sediment in the Cocheco River and swale were evaluated and found to be within an acceptable risk range for human health via ingestion and dermal absorption, although the risk was borderline (8×10^{-5}). Exposure to surface water in the Cocheco River, Bellamy Reservoir and surrounding waters were within EPA's risk range and did not pose an unacceptable risk. Outdoor air emissions at the landfill were also within normal limits. Indoor air in buildings in areas of the Eastern Plume were previously evaluated using criteria supplied by NHDES and found not to pose a threat.

Carcinogenic Risk

Excess lifetime cancer risks were determined for each exposure pathway by multiplying a daily intake level with the chemical specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. 1×10^{-6} for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater that a one in a million chance of developing cancer over 30 years as a result of Site-related exposure (as defined) to the compound at the stated concentration. All risks estimated represent an "excess lifetime cancer risk" - or the additional cancer risk on top of that which we all face from other causes such as cigarette smoke or exposure to ultraviolet radiation from the sun. The chance of an individual developing cancer from all other (non-Site related) causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for Site related exposure is 10^{-4} to 10^{-6} (i.e., 1/10,000 to 1/1,000,000). Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances. A summary of the cancer toxicity data relevant to the chemicals of concern is presented in Section 2 of the RFFS.

Non-Carcinogenic Risk

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). A HQ<1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. A HI<1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. A HI>1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-cancer HQ = CDI ÷ RfD

where CDI = Chronic Daily Intake and RfD = Reference Dose. CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

Human Health Risk Uncertainty

The non-carcinogenic and carcinogenic risk estimates are subject to numerous uncertainties that may overestimate or underestimate risk. Overall, risks are more likely to be overestimated rather than underestimated. The following bullets summarize the major areas of uncertainty. Please refer to Section 2 of the 2004 RFFS for additional detail.

- Data Quality Issues - no data quality issues have been identified with respect to analysis performed on Site samples.

- RfDs and Cancer potency factors- Several uncertainty factors could be incorporated to address uncertainty resulting from differences between animals and humans, variability among individuals, and other sources.

- Exposure - EPA estimated that exposure to sediment contaminants in the Cocheco River would be limited to 20 days per year due to the steep terrain and difficult access. There are other exposure assumptions that apply to the calculations as well.

Site risks were re-assessed during the preparation of the RFFS using updated toxicity information and exposure assessments. The results of that assessment are presented below.

a. Ground Water

Data from monitoring in summer 2001, fall 2001, and spring 2002 were used to update the ground water risk analysis performed in the RFFS. The risk assumptions used in the 1991 Risk Assessment were changed to conform to present standards and practices. Updated toxicity information was used in these analyses. Table 4, below, summarizes the risk from future ingestion of ground water at the Site.

The primary risk at the Site continues to be future ingestion of ground water. The ground water aquifer is classified as a drinking water aquifer and could be used for drinking water should future development occur in the area. No current risk has existed since the installation of a municipal drinking water system in 1981 and the ordinances were enacted by the City of Dover and the adjoining Town of Madbury in the early 1990's. The primary contaminants in ground water include arsenic and vinyl chloride, which pose 98% and 1% of the total incidental lifetime cancer risk, respectively. Ground water at the Site also contains tetrahydrofuran, benzene and a number of other chlorinated compounds.

Arsenic and THF concentrations have been increasing along the southern edge of the landfill, primarily wells SB-4D and SB-B2, located at the landfill toe and between the landfill and Bellamy Reservoir, respectively. These results indicate contamination in the Southern Plume is increasing and moving towards the Bellamy Reservoir. Further details regarding the increase in contamination in the Southern Plume are contained in Appendix B of the EPA Addendum.

Table 4 below lists both the carcinogenic and non-carcinogenic risks from the relevant contaminants at the Site. Further details are provided in the RFFS and the EPA Addendum to the RFFS.

Table 4: Future Drinking Water Risks in Ground Water at Site[18]

Compound	Scenario	Concentration (ug/l)	Hazard Index	Cancer Risk
Arsenic	Average	180.82	**16.5**	**2.97×10^{-3}**
	Worst-case	654	**59.7**	**1.08×10^{-2}**
Vinyl chloride	Average	4.62	0.0422	7.59×10^{-5}
	Worst-case	26	0.237	**4.27×10^{-4}**
Total, all other Site contaminants	Average	---	0.2428	2.33×10^{-5}
	Worst-case	---	2.633	**1.29×10^{-4}**
Total Drinking Water Risk	Average	---	**16.8**	**3.07×10^{-3}**
	Worst-case	---	**62.6**	**1.13×10^{-2}**

* The bold values are considered by EPA to pose a threat to public health. EPA's acceptable carcinogenic risk range is between 10^{-4} and 10^{-6} and acceptable non-carcinogenic risk is a Hazard Index of 1 or less.

[18] RFFS, Appendix I, Tables 3 & 4.

b. Sediments

The contaminants associated with the Site sediments consist of iron and arsenic. These contaminants originated from the landfill leachate by entering ground water in dissolved form, then discharging to a surface water body and precipitating in solid form. Arsenic contaminated sediments were removed from the southern drainage trench as outlined in the 1991 ROD during the 1997 trench and swale restoration (here the term "trench" refers only to the southern drainage trench).[19] Since the removal of contaminated sediments, however, additional arsenic-contaminated sediment has been deposited in these areas from the breakout of leachate from the landfill. Sediments were sampled in November 2002 from the Cocheco River in six traverses.[20] Sediments were sampled from the landfill drainage trenches and drainage swale in an earlier investigation.[21]

The maximum arsenic concentration found in Cocheco River sediment was 1,520 mg/kg on the bank closest to the landfill at transect T3. With respect to human health, this translated into a human health risk of 5.5×10^{-5}, which although within EPA's acceptable risk range of 10^{-4} and 10^{-6}, is still above EPA's point of departure in considering risk (10^{-6}).[22] The non-cancer Hazard Index was calculated as 0.9, just below EPA's acceptable value of 1.

c. Surface Water

The primary surface water impacts are in the drainage trenches, drainage swale, and Cocheco River. The original human health risk assessments by Wehran and HMM in the 1988 and 1990 Remedial Investigations found no excess carcinogenic or non-carcinogenic risk to the public.[23, 24] In the RFFS, the potential surface water risk was re-calculated using current, approved methods and data gathered during the May 2002 Site sampling round. This re-calculation found that the surface water at, and surrounding the Site, still did not pose a risk to human health.[25] Sampling

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[19] Remedial Action Summary Report for the Trench and Swale (Close-Out Report), GeoInsight, April, 2002.

[20] Ecological Risk Assessment, attached to the RFFS as Appendix I, Attachment I-3.

[21] Trench and Swale Investigation, GeoInsight, 1997.

[22] National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. § 300.430(e)(2)(i)(A)(2).

[23] Field Elements Studyfor the Municipal Landfill, Dover, New Hampshire, HMM Associates, Inc., January 8, 1990.

[24] Remedial Investigation Dover Municipal Landfill, Volume 1. Prepared for New Hampshire Department of Environmental Services by Goldberg-Zoino & Assoc. and Wehran Engineers, November 1988.

[25] RFFS, Section 2, page 2-16 through 17, January 30, 2004.

results performed in streams that are tributaries to the Bellamy Reservoir in December 2003 did not find VOCs or arsenic in surface water.[26]

d. Soil

The landfill cover is visually inspected at least annually. Much of it is now vegetated with grassland plants and appears to be a meadow with various tree species appearing in the northeast corner. The cover remains intact and continues to provide a barrier to dermal contact with contaminated soils. A chainlink fence parallels Tolend Road; however, this fence is not continuous and is only designed to restrict vehicular traffic, not pedestrian access. Although the landfill is easily accessed on foot, there are no exposures to the waste materials at the surface to human or ecological receptors. However, the current soil cover allows precipitation to enter and leach through the waste beneath the cover, contaminating the groundwater.

e. Air

Outside air emissions at the landfill have not exceeded regulatory levels to date. Indoor air exposure to VOCs in buildings in the area of the Eastern Plume have been assessed using criteria developed by NHDES to assess the potential for indoor air impacts from contaminant plumes. There did not appear to be a risk based on those criteria.

2. ECOLOGICAL RISK ASSESSMENT

The 1991 ROD did not have an ecological risk assessment performed to determine the risk to the environment. However, the 1991 ROD did develop criteria, using the National Oceanographic and Atmospheric Administration (NOAA) standards, to identify sediments that may affect aquatic life. The 1991 ROD specified that contaminated sediments containing more than 50 ppm of arsenic would likely affect aquatic life and therefore must be removed.[27]

EPA's protocol for assessing ecological risk is a tiered approach, the first tier, performed as part of the RFFS, consisted of obtaining the whole-sediment contaminant concentrations. Arsenic is the only contaminant at the Site that is present in the appropriate media and in concentrations sufficient to pose a potential ecological risk. For ecological risks, numerical criteria for protective contaminant concentrations in sediments are based on screening levels established by the NOAA for estuarine and marine biota and the Ontario Lowest Effect Levels for freshwater biota, both of which are accepted by EPA and NHDES for use as screening guidance.[28]

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[26] Pers. comm. by fax, Michael Webster to Darryl Luce, February 11, 2004.

[27] 1991 ROD, page 50.

[28] Screening Quick Reference Tables, Version 2, http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html, NOAA. Ontario Lowest Effect Levels 1993, 1994.

Elevated levels of arsenic were found above threshhold sediment levels (and the terrestrial wildlife benchmarks for soil) in the southern drainage trench as well as in three locations on the Cocheco River, with the highest levels at the south central toe of the landfill and in sediments on the eastern bank of the Cocheco River. These levels indicate there is a potential for ecological risk. Because the arsenic concentrations in sediment exceeded the Ontario threshold level of 8.2 micrograms per kilogram (parts per million), the testing will move to the second stage to determine if the arsenic is bio-available for organisms to absorb, as part of the pre-design investigations for the Amended ROD. The results of the ecological sediment sampling in the Cocheco River are presented below:

Table 5: Cocheco River Sediment Arsenic Concentrations

Transect	Position in Transect Concentration in mg/kg or parts per million Far (north) bank	mid-river	Near (south) bank	Average	Standard Deviation
1 - (background)	5.6	4.8	4.6	5.0	0.5
2 - (mouth of swale)	3.2	3.6	**42.9**	16.6	22.8
3 (seep 300 feet downstream of swale)	3.8	7.6	**1520**	511	874
4 (800 feet downstream of swale)	3.7	5.1	4.9	4.6	0.8
5 (seep 2,600 feet downstream of swale)	3.2	**11.8**	**51.7**	22.2	25.9
6 (4000 feet downstream of swale)	3.3	7.3	5.1	5.2	2.0
Average of all Transects	3.8	6.7	**271.5**		
sd of all	0.9	2.9	612		
Average (T2 - T6)	3.4	7.1	**324.9**		
sd (T2 - T6)	0.3	3.1	668.4		

sd = sample standard deviation. Bold values exceed the first tier threshold value of 8.2 ppm.

These are the sediment concentrations in the Cocheco River. Transect 1 is the upstream background value. Succeeding transects are impacted by discharges from ground water and surface water contaminated with arsenic from the site. See Figure 1 in Appendix I of the RFFS or Figure 3 on page 28 for the location of the transects.

The results shown on Table 5 indicate that arsenic is elevated on the landfill side of the River. Arsenic decreases to nearly background concentrations in the middle of the River and are at background concentrations on the far side of the River. The highest concentrations on the landfill (south) side of the River are at points where ground water seeps into the River and decreases within a short distance downstream. The overall concentrations drop further out in the stream and downstream primarily because arsenic is diluted by the sediment load of the River which dwarfs the sediment generated by the discharge from the Site. Concentrations on the north side of the stream are below the first-tier NOAA guidelines.

H. REMEDIATION OBJECTIVES

The 1991 ROD remedy was designed to satisfy remedial action objectives (RAOs) that were developed in the 1991 Feasibility Study based on the results of the risk assessment.[29] This process was summarized and its conclusions begin on page 23 of the 1991 ROD. The change to the Source Control component of the 1991 ROD remedy necessitated revising the RAO's associated with hazardous waste in the landfill. Further, because remedial action has not begun at the site, all RAO's were reviewed in light of the updated risk assessment performed in conjunction with the RFFS and were updated as necessary to ensure all Site risks would be addressed by the amended remedy.

With two exceptions, since issuing the 1991 ROD, Site risks have not significantly changed. These exceptions are:

1. Sampling in the Cocheco River indicates the potential for human health and ecological risk from arsenic in sediment along the banks of the Cocheco River.

2. New guidance indicates the need to re-assess a potential indoor air risk from VOCs volatilizing from the Eastern Plume.

These potential risks were not identified in the original FS and actions to address them were not included in the 1991 ROD. New ecological assessment criteria and new indoor air guidance dictate that these exposures be examined more thoroughly, and RAOs have been added to address these risks. A full list of RAOs for each media is presented below, comparing the RAOs in the 1991 ROD to those in this Amended ROD:

<u>RAOs for Hazardous Wastes in the Landfill</u>

In order to consider a change to the Source Control component of the 1991 ROD remedy, the RAOs for hazardous wastes in the landfill need to be revised to accommodate this change. Additionally, since remedial measures for localized areas of high contaminant concentrations in the landfill are needed to address potential exposure to any wastes just beneath the soil cap, a new RAO for the landfill is required. The 1991 revised RAO's are shown below:

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[29] Dover Municipal Landfill Feasibility Study, Section 2, HMM Associates, Inc., February 28, 1991.

RAOs Identified in the 1991 Feasibility Study

(a) Eliminate or minimize the continued infiltration of surface waters through the contaminated solid waste and into the ground water.

(b) Prevent direct contact with and ingestion of contaminated solid waste materials present in the landfill.

(c) Comply with federal and State ARARs.

For this Amended ROD, the RAOs for the landfill are adjusted as follows:

(a) Facilitate the treatment of contaminants in the landfill and their transport to ground water and subsequent destruction or capture.

(b) Prevent direct contact with and ingestion of contaminated solid waste materials present in the landfill.

(c) Evaluate additional remedial measures for contaminant source areas that may <u>not</u> be adequately or efficiently conveyed to ground water for destruction or capture.

(d) Implement measures to meet clean closure requirements.

(e) Comply with federal and State ARARs.

If the contingent remedy of capping the landfill is necessary, the RAO's from the 1991 Feasibility Study will be retained.

<u>RAOs for Sediments - On-Site.</u>

Although arsenic contaminated sediments were removed from the southern drainage trench and drainage swale in the 1997,[30] any additional arsenic-contaminated sediment that has subsequently been deposited in these areas from the breakout of leachate from the landfill must be removed.

Therefore, the RAOs developed for sediments in the 1991 Feasibility Study are retained:

(a) Eliminate or minimize the potential human exposure to, and environmental impact from, the contaminated sediments located in the landfill drainage trench and at the outlet of the trench discharging to the drainage swale to the Cocheco River.

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[30] Remedial Action Summary Report for the Trench and Swale (Close-Out Report), GeoInsight, April, 2002.

(b) Eliminate or minimize the migration of contaminated sediments from the landfill drainage swale into the Cocheco River and along the banks of the Cocheco River.
(c) Contain or remove contaminated sediments in a manner protective of human health and the environment.

(d) Comply with federal and State ARARs.

<u>RAOs for Ground Water/Surface Water/Leachate - On-Site</u>

These RAOs are retained from the 1991 Feasibility Study:

(a) Contain and control the generation and migration of impacted ground water and leachate on-Site serving as a source of off-Site ground water and potential surface water contamination and impact to the drainage trenches.

(b) Reduce the total mass of contaminants present in ground water and leachate to MCLs or levels protective of human health and the environment prior to discharge.

(c) Comply with federal and State ARARs.

<u>RAOs for Air</u>

The potential exists for the landfill to pose some risk due to VOC or fugitive dust emissions. Although USEPA concluded in 1991 that the carcinogenic and non-carcinogenic risks from outdoor air exposures were within USEPA's acceptable carcinogenic risk range, remedial action objectives were developed to respond to any potential risk. These RAOs have been modified to include indoor air concerns for this ROD Amendment as follows:

(a) Eliminate or minimize risk to human health due to off-gassing of VOCs contained in the surface water currently flowing through the landfill drainage trenches.

(b) Eliminate fugitive dust emissions from the landfill.

(c) Eliminate or minimize the potential risk to human health from migration of VOC vapors from the ground water into the basements of existing homes or future structures should additional development occur in the area.

(d) Comply with federal and State ARARs.

RAOs for Ground Water/Surface Water - Off-Site

Contaminated ground water has migrated in two separate plumes from the Site posing a risk to future drinking water use and potential surface water impacts. The Eastern Plume discharges contaminants to the Cocheco River which, although it does not pose a risk to human health from exposure to the surface water, may pose a risk to human health and ecological receptors through exposure to sediment contamination resulting from Site ground water discharges. The Southern Plume migrates towards the Bellamy Reservoir and may ultimately discharge contaminants to the Reservoir. Therefore, remedial action objectives were developed in the 1991 ROD to respond to these potential threats. These RAOs will be retained for this ROD Amendment, and are as follows:

(a) Eliminate or minimize the levels of contaminants in the ground water and leachate emanating from and down-gradient of the landfill. The off-Site contaminated ground water will be compared to MCLs. If no MCL or non-zero MCLG exist, a target level for treatment of that contaminant will be used. This target level will be established at a level which is protective of human health and the environment.

(b) Eliminate or minimize the threat posed to the public health and surrounding environment by the current extent of the contaminated ground water, including potential indoor air exposures.

(c) Prevent the discharge of impacted ground water from the Site from entering surface water bodies above concentrations that are protective of human health and the environment.

(d) Comply with federal and State ARARs.

Sediments - Off-Site (Cocheco River)

The 1991 Feasibility Study did not identify remedial action objectives for off-Site sediment. However, recent sampling in areas impacted by ground water migrating from the landfill has indicated that human health and ecological impacts are possible. Therefore, new RAOs for sediments in the Cocheco River were established for this ROD Amendment and area as follows:

(a) Eliminate or minimize any impact from arsenic-contaminated sediments in the Cocheco River to human health or ecological receptors.

(b) Comply with federal and State ARARs.

I. DESCRIPTION OF REMEDIAL ALTERNATIVES EVALUATED

Within this section are the four remedial alternatives that were evaluated for this Amended ROD to address the Site contamination. Details of the development of these alternatives are provided in the RFFS and the EPA Addendum.

1. SUMMARY

The outline below summarizes the components of each of the four alternatives considered. A more detailed explanation follows the summary. Since the No-Action Alternative was evaluated in the 1991 ROD and found to fail the threshold criteria, it is only provided in this summary for informational purposes and will not be carried through the rest of the analysis. See pages 26 and 32 of the 1991 ROD.

1. No Action Alternative
    1. SC-1: Source Control, no action with respect to the landfill or leachate generated by it.
    2. MM-1: Management of Migration, no action with respect to the contaminant plumes or their ultimate discharge points, the drainage trenches, drainage swale, Cocheco River, and Bellamy Reservoir.

2. 1991 ROD
    1. SC-7/7A: Source Control, capping of the landfill and interception and treatment of the ground water leachate.
    2. MM-2/4: Management of Migration, has two components: MM-2 is Natural Attenuation of contaminated ground water in the Eastern Plume with a contingency for active treatment. MM-4 consists of pumping and treating the contaminated ground water in the Southern Plume that is migrating towards the Bellamy Reservoir.

3. Proposed Alternative
    1. SC-A: Source Control, the landfill remains uncapped with a soil cover in place and an air-sparging trench captures or degrades all contaminants with a contingency for capping and dewatering.
    2. MM-2: Management of Migration, Monitored Natural Attenuation of the Southern and Eastern Plumes.

4. Proposed Mixed Alternative
    1. SC-A: Source Control, as in the Proposed Alternative, the landfill remains uncapped with a soil cover in place and an air-sparging trench captures or degrades all contaminants with a contingency for capping and dewatering.
    2. MM-2/4: Management of Migration, same as the 1991 ROD Management of Migration.

2. COMMON ACTIVITIES

Several actions are common to all alternatives except the No Action alternative and are therefore not listed in the following summary. These common activities are listed below:

Institutional Controls

Institutional controls preventing the use of groundwater and prohibiting activities that will disturb the marine clay layer beneath the landfill are in place. Additional institutional controls will be required that prohibit altering the landfill such that it creates a risk or interferes with the cleanup.

Pre-Design Investigations

Several Pre-Design Investigations (PDI) are necessary prior to implementation of any of the remedy components. These investigations are needed to ensure that all risks at the Site are addressed in the most efficient and effective manner. The RFFS and the EPA Addendum indicate that there are several data gaps that require further investigation. A description of the PDIs and work needed to implement the amended remedy at the Site and ensure protectiveness are presented in Section K of this Amended ROD.

Monitored Natural Attenuation

The 1991 ROD selected Natural Attenuation (NA) to address the Eastern Plume with a contingency that, assuming source control is implemented and functioning, an active restoration system would be evaluated and implemented if ground water cleanup levels were not attained in 5 to 7 years or if levels significantly increased in that time frame.[31] Two alternatives evaluated for this Amended ROD use Monitored Natural Attenuation (MNA) as a treatment for one or both of the ground water plumes. Since the 1991 ROD, EPA has issued a guidance document formalizing NA as a remedy and also renaming it MNA.[32] The MNA remedy now contains specific protocols to verify and monitor cleanup progress. This guidance has been included in the ARARs section of this Amended ROD; therefore, the Management of Migration portion of the remedy for the Eastern Plume, previously referred to as NA will now be known as MNA and will be implemented consistent with the MNA guidance.

Contingent Remedies

Contingent remedies are developed and proposed to provide a back-up remedy in the event that an innovative remedy or MNA remedy fails. A contingent remedy is an accepted, dependable remedy with proven results and is easily implemented. Contingent remedies are identified within

[31] Record of Decision, 1991, USEPA, page 57.

[32] *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* OSWER Directive 9200.4-17P, April 21, 1999

this Amended ROD, the RFFS, and the EPA Addendum to facilitate rapid implementation of a contingent remedy if any innovative technology fails. All Alternatives proposed in the RFFS and the EPA Addendum have contingent remedies for the components that are outlined below. A more detailed description of the contingencies in the amended remedy are presented in Section K. 2. of this ROD Amendment. An outline of the media and remedial technologies for which contingency remedies are proposed include:

(1) MNA in the Eastern Plume with a contingency for active restoration through ground water pump and treat;

(2) Air-Sparging Trench for Source Control with a contingency for a RCRA C cap and ground water interceptor/diversion trench;

(3) Sediment in the Cocheco River with a contingency for excavation; and

(4) Indoor Air in residences along Tolend Road with a contingency for corrective action.

3. THE 1991 ROD REMEDY

The 1991 ROD consisted of a Source Control component, SC-7/7A, and a Management of Migration remedy for each contaminant plume (MM-2 and MM-4, for the Eastern and Southern Plumes, respectively). The components of the 1991 ROD are summarized in Table 6 and a complete discussion is contained in the 1991 ROD beginning on page 46.

<table>
<tr><th colspan="5">Table 6: 1991 ROD Remedy</th></tr>
<tr><th colspan="5">Source Control Component</th></tr>
<tr><th></th><th>Landfilled Waste</th><th>Leachate from Landfill</th><th>Recovered ground water</th><th>Treated water</th></tr>
<tr><td>SC-7</td><td rowspan="2">Recontour & cap landfill with impermeable liner</td><td rowspan="2">Captured in interceptor / diversion trench</td><td>Treatment on-Site</td><td rowspan="2">Both discharge to the Cocheco River</td></tr>
<tr><td>SC-7A</td><td>Discharged to POTW</td></tr>
<tr><th colspan="5">Management of Migration Component</th></tr>
<tr><td>MM-2</td><td colspan="4">Monitored natural attenuation in the Eastern Plume, to be assessed five years after implementation.</td></tr>
<tr><td>MM-4</td><td colspan="4">Pump-and-treat of Southern Plume.</td></tr>
</table>

Figure 4 on the following page shows the 1991 ROD Remedy schematically. The area of capping and the ground water remediation areas are generally marked. Figures 11 and 12 of the 1991 ROD show the general construction of the cap and interceptor/diversion trench.

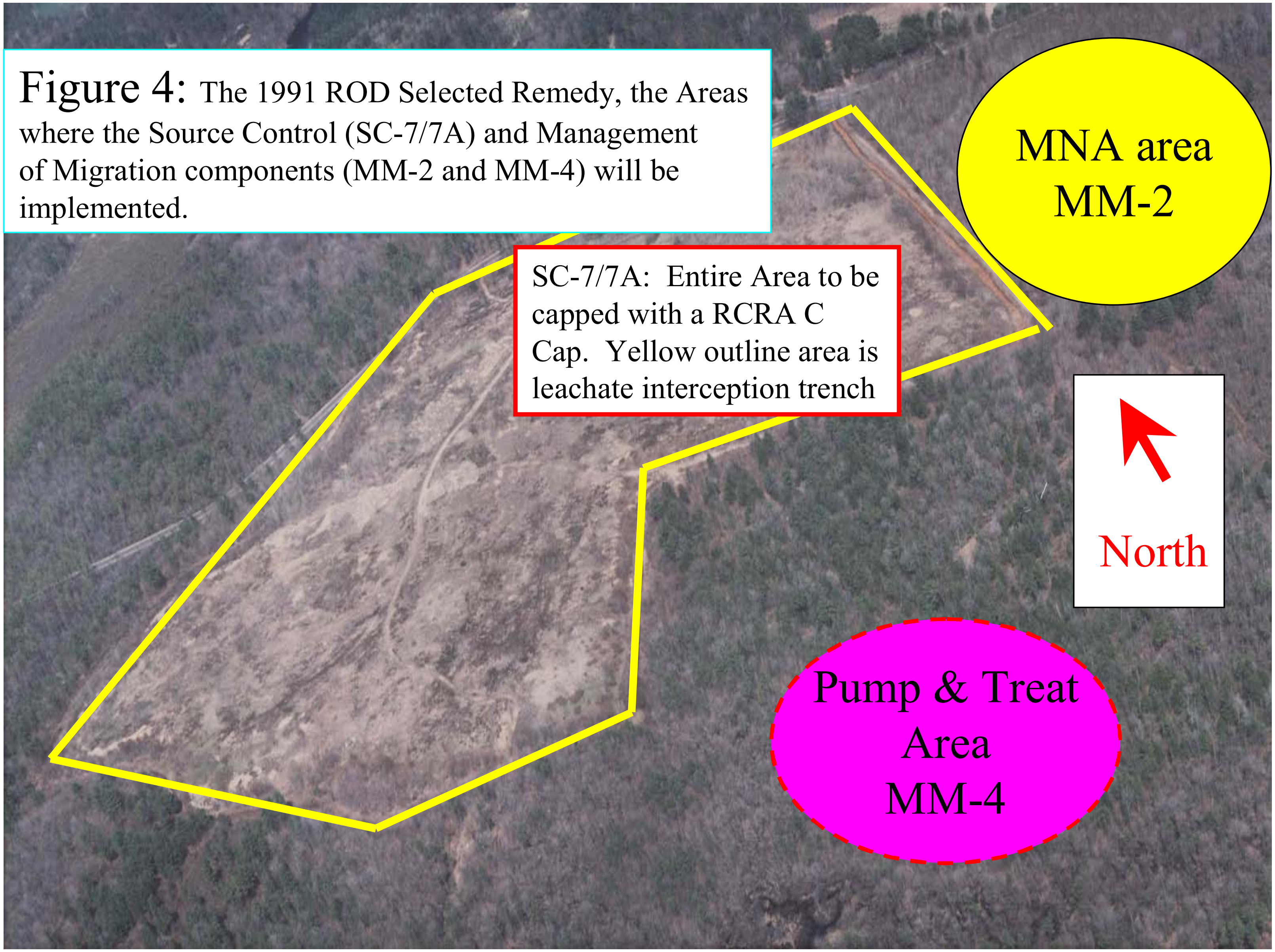

Figure 4: The 1991 ROD Selected Remedy, the Areas where the Source Control (SC-7/7A) and Management of Migration components (MM-2 and MM-4) will be implemented.

4. THE PROPOSED ALTERNATIVE AND THE MIXED ALTERNATIVE

The RFFS presented two alternatives to the 1991 ROD remedy. Both alternatives proposed to change the Source Control component from installing a cap and ground water interceptor/diversion trench (SC-7/7A) to an air-sparging trench. The difference between the two alternatives was in the Management of Migration component for the Southern Plume. The Alternative Remedy proposed to change the 1991 ROD pump-and-treat component for the Southern Plume to MNA. The Mixed Alternative only proposed changes the Source Control component and retains the Management of Migration components of the 1991 ROD. To clarify the changes, Table 7 is offered.

<table>
<tr><th colspan="4">Table 7: Comparison of Alternatives</th></tr>
<tr><th>Media</th><th>1991 ROD Remedy</th><th>Mixed Alternative Remedy</th><th>Alternative Remedy</th></tr>
<tr><td>Landfill</td><td>Cap (SC-7/7A) and ground water interceptor trench.</td><td colspan="2">Air-sparging trench (SC-A) with contingency for capping (SC-7/7A).</td></tr>
<tr><td>Eastern Ground Water Plume</td><td colspan="3">Monitored natural attenuation (MM-2) with contingency for active treatment.</td></tr>
<tr><td>Southern Ground Water Plume</td><td colspan="2">Pump-and-treat (MM-4)</td><td>Monitored natural attenuation (MM-2)</td></tr>
</table>

Below is a discussion of each component of the Alternative and Mixed Alternative.

<u>Source Control</u>

The Alternative and the Mixed Alternative incorporate the same change to the Source Control component of the 1991 ROD. Rather than capping the landfill and installing a ground water interceptor/diversion trench, the Alternative and Mixed Alternative leave the landfill uncapped, but install an air-sparging trench around the perimeter of the landfill. Areas of high concentrations of contaminants on and around the landfill will be identified and removed. The drainage trenches along the perimeter of the landfill would be filled. The air-sparging trench would be operated and maintained until leachate contaminated above cleanup levels ceases to flow from the landfill and does not contaminate ground water beneath the landfill above levels that pose an unacceptable risk to human health or the environment. The modeled estimate for the cessation of all contaminants, including arsenic, flowing from the landfill is greater than 100 years. The cleanup time of 100 years or more is based on a number of unsupported assumptions that will be verified during pre-design investigations. It is likely that as the air-sparging trench is operated, a more reliable estimate will become available. Excluding arsenic, the time estimated to cleanup the ground water flowing from the landfill is approximately 30 years.[33] See Section K. 2. *Description of Remedial Components* and Section K. 4. *Expected Outcomes* for further discussion of the components of the Source Control component of the Alternative and Mixed Alternative, and the contingent remedy in the event of failure, respectively.

Management of Migration - Site-wide

The Management of Migration components for both the Alternative and Mixed Alternative contain elements not considered in the 1991 ROD. More specifically, sediments in the Cocheco River will be sampled and evaluated to determine if arsenic in those sediments pose a risk to human health or the environment. If it is determined that an unacceptable risk exists, those sediments will be excavated and disposed off-site. Indoor air was also not considered in the 1991 ROD. EPA will assess whether an unacceptable risk exists in buildings near the Eastern Plume using EPA's recent indoor air guidance.

Management of Migration – Southern Plume

The Alternative proposes to change the Management of Migration component for the Southern Plume from pump-and-treat to MNA. However, EPA did not consider this proposal because it was unsupported by Site data. This conclusion is further discussed in the EPA Addendum. A summary of the most significant problems in considering this change are noted below:

- No demonstration was offered showing that the migration of arsenic would stop.
- Arsenic concentrations in several wells on the southern toe of the landfill exceed the ICL and are increasing.
- Contaminants are above levels protective of human health, and rising, in a well half-way between the landfill and the Bellamy Reservoir, a Class A drinking water reservoir that serves much of southeastern New Hampshire.
- No Site-specific evidence has demonstrated conclusively that ground water contaminants in the Southern Plume would attain drinking water quality before discharging to the Bellamy Reservoir.

For these reasons, a change to the Management of Migration portion of the remedy was not considered for this Amended ROD. Therefore, the Mixed Alternative which retains both Management of Migration components selected in the 1991 ROD, is carried forward to the Comparative Analysis in Section J. 2.

Figure 5, on page 48, depicts a schematic layout of the alternative Source Control component of

[33] RFFS, January 30, 2004. Cleanup times in Section 1.

the Alternative and Mixed Alternative. A schematic representation of the air-sparging trench is offered in Figure 6, which directly follows Figure 5.

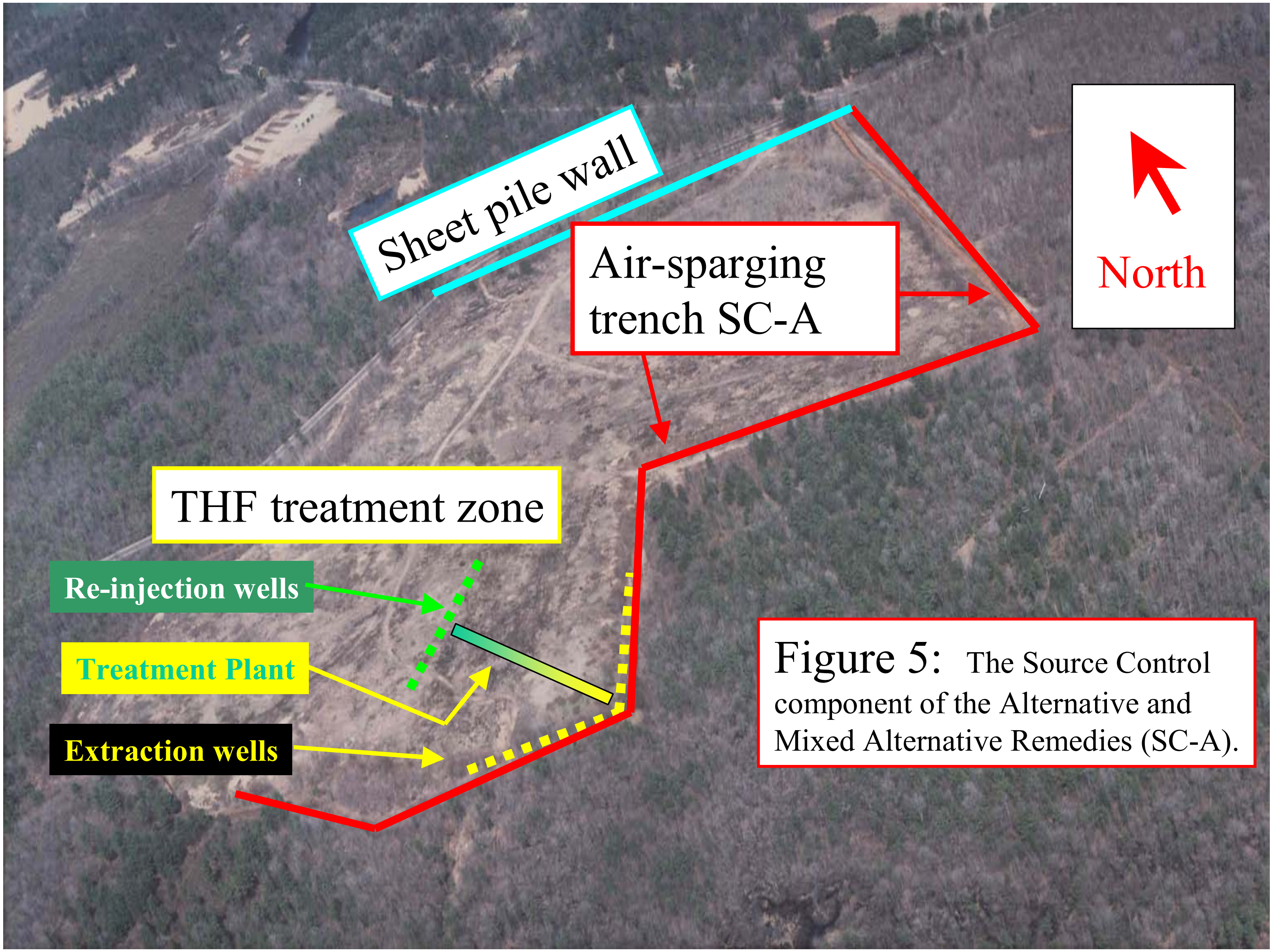

Figure 5: The Source Control component of the Alternative and Mixed Alternative Remedies (SC-A).

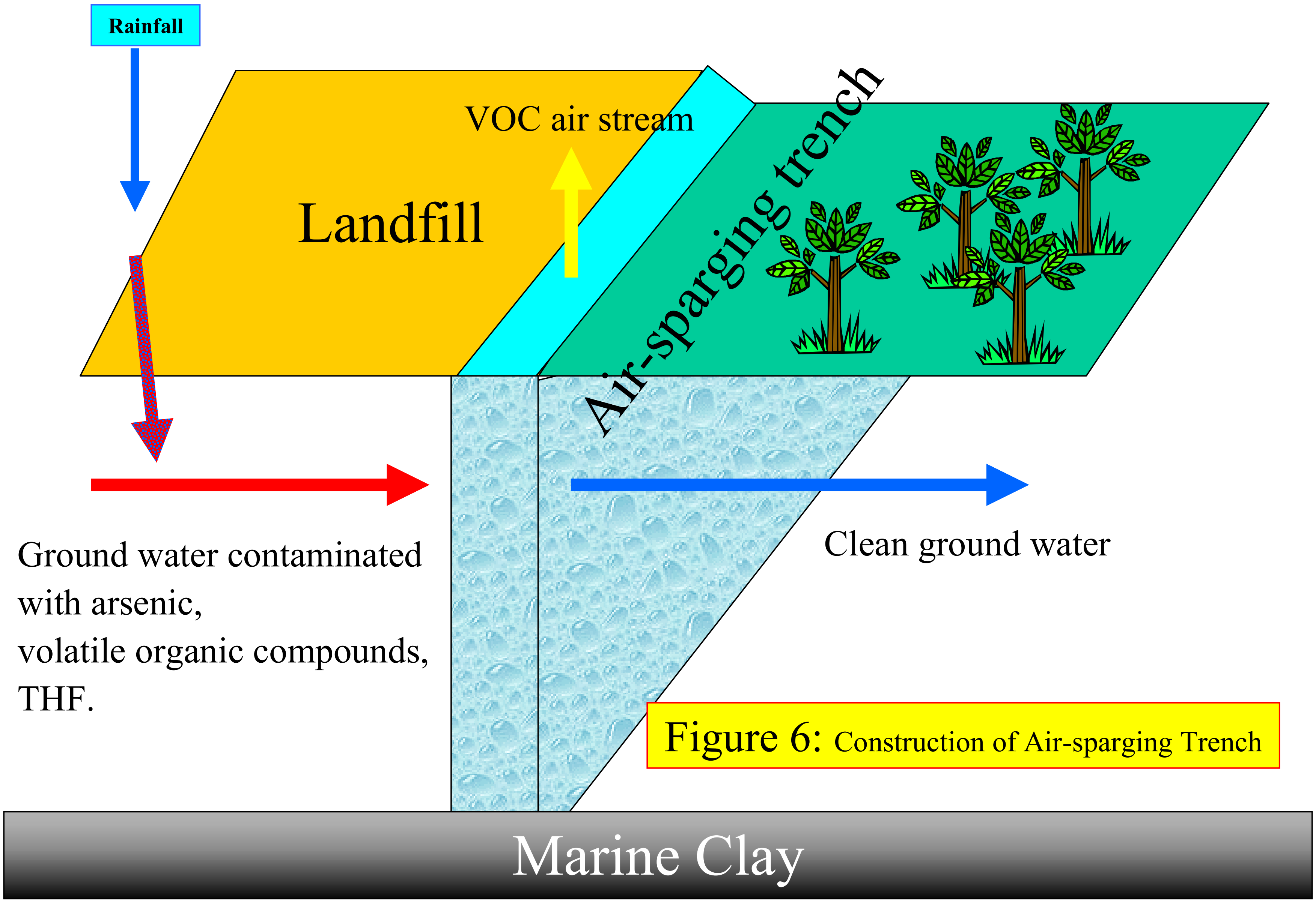

Figure 6: Construction of Air-sparging Trench

J. COMPARATIVE ANALYSIS OF THE 1991 ROD REMEDY AND THE MIXED ALTERNATIVE REMEDY

1. INTRODUCTION

Section l2l(b)(1) of CERCLA presents several factors that, at a minimum, EPA 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.

a. STATUTORY FRAMEWORK

The nine criteria are summarized as follows:

Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP:

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all federal environmental and more stringent state environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked.

Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria:

3. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the Site.

5. **Short term effectiveness** addresses the period of time needed to achieve

protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital and operation & maintenance (O&M) costs on a net present-worth basis.

<u>Modifying Criteria</u>

The modifying criteria are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI/FS and Proposed Plan:

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the public's general response to the alternatives described in the Proposed Plan, RFFS, and the EPA Addendum to the RFFS.

b. AMENDED RECORD OF DECISION COMPONENT DESCRIPTION

Because this is an Amended ROD to the 1991 ROD, only that component which is proposed for change (i.e., the Source Control component) will be carried through the comparison in this section. The Source Control components compared are that of the 1991 ROD, capping, and the Mixed Alternative, an air-sparging trench. Migration of contaminated ground water will only be discussed where those issues reinforce an understanding of the Site cleanup effort.

RAO's for the Source Control component at this Site were developed to address wastes in the landfill as well as the leachate that is migrating from the landfill. Source control also includes the contaminated sediments and impacted surface water in the drainage trenches that surround the landfill as well as any outdoor air impacts. The degree to which the risk posed by each of these characteristics is addressed determines the effectiveness and protectiveness of the Mixed Alternative compared to that of the 1991 ROD.

2. COMPARATIVE ANALYSIS

In the following sections each criterion will be explained and then the 1991 ROD remedy Source Control component will be compared to the Source Control component of the Mixed Alternative to determine which best addresses each criterion and to balance the pros and cons of each as it relates to that criterion. The evaluation will examine the components individually and then pull them together in a synopsis of how the components compare to each other under that criterion. Also, in the discussions, the Management of Migration components will be included, not for evaluation, but rather to fully portray the protectiveness of the entire remedy.

THRESHOLD CRITERIA

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

This criterion addresses whether or not an alternative provides adequate protection and describes how Site risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering or institutional controls. This criterion draws on the assessments conducted under other criteria especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. This criterion also considers whether the alternatives pose any unacceptable short-term or cross-media impacts.

ANALYSIS OF SOURCE CONTROL ALTERNATIVES

The 1991 ROD remedy would place an impermeable, RCRA C cap on the landfill. Sediment containing arsenic in concentrations greater than 50 ppm in the drainage trenches and in the drainage swale would be excavated and consolidated under the cap. Any additional hazardous material excavated during remedial activities would also be contained under the cap. The cap prevents dermal contact and nearly eliminates precipitation from leaching more contaminants from the waste into the ground water and migrating off-site. In addition, an interceptor/diversion trench would be installed around the landfill to capture migrating, contaminated ground water that would be treated before discharge. Cap installation, re-contouring and trench installation involves excavation and trucking in an estimated 165,000 cubic yards of fill that will result in short-term exposures to fugitive emissions as well as increased truck traffic. Engineering controls such as dust suppression would control harmful vapors; and truck routes would be arranged to have the least impact on surrounding areas.

The Mixed Alternative would leave the existing natural cover and wastes undisturbed and would allow precipitation to leach through the landfill waste. However, unlike the No-Action alternative, this alternative consists of an air-sparging trench to treat or capture contaminated ground water migrating from the landfill. The effectiveness of the air-sparging trench in addressing organic VOCs is viable and the basic technology has been used successfully at many sites; however, using this technology to address inorganics such as arsenic remains a concern. Specifically, concerns center around adequate mixing of ground water in the air-sparging trench with respect to stripping and mineral precipitation, and the effect of air flow on the backfill material and hydraulic conductivity. There may also be fouling of the backfill material that would require high maintenance activities and/or contingent measures, some of which are also a concern (i.e. acid washing). There are additional concerns about installation of the air-sparging trench at depths greater than 60 feet as proposed in the RFFS and described in the EPA Addendum. Some portions of the air-sparging trench may need to be installed down to 90 feet. In recognition of these uncertainties, the viability of the technology must be demonstrated through effective operation of a portion of the air-sparging trench in an area where depths approach 90 feet before full-scale installation and operation would be allowed. Assuming success, this alternative would act as a treatment mechanism to control contaminated ground water from migrating off-Site to surface waters thereby preventing continued contamination of off-Site ground water. Clean closure would eventually be attained which would effectively eliminate hazardous contaminants from leaching into ground water at levels that pose a threat to human health and the environment. If unsuccessful, the contingent remedy of the 1991 ROD Source Control component will be implemented.

Truck traffic will increase for a short period of time under the air-sparging alternative to remove the approximately 20,000 cubic yards of excavated material and to bring in an equal amount of porous material for the air-sparging trench backfill as well as general construction equipment.

SYNOPSIS OF OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The 1991 ROD Source Control Component combined with active ground water treatment in the Southern Plume would halt the flow of contaminants to the Bellamy Reservoir. The cap prevents precipitation from carrying contaminants off-Site in the ground water while the diversion trench works to lower the water table out of the waste. An active extraction and treatment system in the Southern Plume prevents contaminated ground water from further degrading the aquifer, speeds restoration of the Southern Plume, and protects the Bellamy Reservoir.

The Mixed Alternative, appears to offer a higher level of protection than the 1991 ROD remedy. The air-sparging trench, if properly functioning, will allow flushing and treatment of hazardous substances in the landfill so that ultimately, residual levels of contaminants left in the landfill will no longer pose a risk to human health or the environment. Clean closure, combined with active pump-and-treat in the Southern Plume permanently eliminates Site risks and restores the aquifer.

Both options include institutional controls to prevent the use of ground water, prohibit the disturbance of the marine clay layer, and prevent the alteration of the landfill surface in such a way as to create human health or ecological risk or to impair the cleanup effort. Both must also include a monitoring and assessment, and if necessary, remediation plans for indoor air exposures and for sediment in the Cocheco River to ensure that levels do not exceed acceptable concentration limits for human health or the environment.

Both the 1991 ROD remedy and the Mixed Alternative also have similar short-term impacts to air and the surrounding community from traffic with air stripping having slightly less impact given the lesser volume of material and equipment needed to implement the remedy. Contaminated air would emit from both the capped landfill in the 1991 ROD remedy and from the air-sparging trench in the Mixed Alternative; however, emissions of contaminated air from both structures can be controlled if necessary. Because there is no present risk posed by either of the Source Control components, nor are there any risks that cannot be controlled by engineering techniques, both the Source Control component of the 1991 ROD and the air-sparging of the Mixed Alternative would be protective of human health and the environment.

COMPLIANCE WITH ARARS

Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not a remedy will meet all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked under CERCLA §121(d)(4). Section 121(d) of CERCLA requires that remedial actions at CERCLA sites at least attain ARARs, unless they are waived.

If an ARAR is not met, the basis for justifying one of the six CERCLA §121 waivers should be discussed. Throughout the RFFS the necessity of considering a waiver for arsenic in ground water is cited several times. The cleanup times for arsenic appear to be, and may very well be, on the order of many decades. However, the modeled cleanup times for arsenic in ground water are subject to a number of assumptions that have not been thoroughly tested and verified. Moreover, the Ground Water and Fate and Transport model provided in Appendix N of the RFFS has not received final approval from the Agencies. Therefore, the estimate of cleanup times made in the RFFS only serve to show the range of cleanup times that may occur with each remedy to better compare the alternatives and are not absolute predictions.

ANALYSIS OF SOURCE CONTROL ALTERNATIVES

The Source Control components are primarily controlled by the New Hampshire Hazardous Waste Regulations which are relevant and appropriate to landfill closure and ground water monitoring. The 1991 ROD incorporates a RCRA C cap, lowering of ground water out of the waste mass and ground water monitoring to ensure the cap is effective in preventing leaching of contamination into the ground water beneath the landfill and preventing off-Site migration. The Mixed Alternative would eventually meet clean closure provisions of the hazardous waste regulations assuming the air-sparging trench is successful in treating contaminated ground water as it leaves the landfill and passes through the trench. As with the 1991 ROD Source Control component, associated ground water monitoring would ensure that the contaminant levels down-gradient of the air-sparging trench are not exceeding ground water cleanup standards. After air-sparging is complete, an appropriate cap in accordance with clean closure regulations will be put in place.

Both alternatives will use best practices to cause the least adverse impacts on wetlands and to restore those areas affected to the extent practicable. Construction of the air-sparging trench may have slightly less impacts on wetlands than the 1991 ROD remedy in that it will temporarily disrupt 2.8 acres and permanently impact 2.2 acres. Also, without a cap, natural water levels are maintained whereas the capping remedy intentionally and permanently lowers the water table out of the waste and in wetlands surrounding the Site. Both the 1991 ROD Source Control component and the Mixed Alternative mitigate wetland damage through re-injection of treated ground water into the landfill (air-sparging) or, in the case of SC-7, discharge to surrounding wetlands (capping or air-sparging). Off-Site discharge to the Dover POTW would negatively impact local wetlands by diverting a significant flow of water out of the watershed of the Bellamy Reservoir. Both options will meet ARARs relating to noise, dust suppression and other potential air emissions through engineering controls.

SYNOPSIS OF COMPLIANCE WITH ARARS

Both the capping and air-sparging remedy would act to eliminate the source of contaminants to ground water in the area. Combining either alternative with MNA in the Eastern Plume is expected to meet ground water ARARs within an acceptable time frame. Although modeling implies that the Eastern Plume will not attain cleanup levels for a significant amount of time, EPA believes that the rate of flow of ground water, coupled with the shift in the ground water environment due to shutting off the landfill source with either the 1991 ROD Source Control component or the Mixed Alternative will yield protective levels in a reasonable time. If it is apparent that cleanup levels will not be attained in a reasonable time in the Eastern Plume, an active Management of Migration remedy will be conducted. The Southern Plume will be addressed through pump-and-treat to bring contaminant concentrations in compliance with ARARs.

Both options meet appropriate discharge or re-injection ARARs through treatment before discharge. Wetlands appear to be disrupted with either choice but both include measures to minimize impacts through the use of best practices and will institute mitigation to the extent practicable through restoration. All air emissions will be monitored Site-wide to ensure air ARARs are not exceeded.

Further, for each alternative, indoor air levels will be monitored consistent with EPA's recently issued indoor air guidance and sediment monitoring will be carried out consistently with NOAA sediment guidance. Both options incorporate action to address any risk found at the site through the monitoring/assessment actions.

Table 1 of Appendix I identifies the ARARs for all alternatives and explains the action to be taken to meet the ARAR.

PRIMARY BALANCING CRITERIA

LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain following remediation and the adequacy and reliability of controls.

ANALYSIS OF SOURCE CONTROL ALTERNATIVES

The 1991 ROD Source Control component would entomb hazardous wastes beneath an impermeable cap, with no bottom liner or leachate collection system, that would be protective as long as it was properly maintained. Waste containment coupled with the ground water interceptor/diversion trench prevents further migration of contaminated ground water off-site to the aquifer and to surface water bodies. There will be permanent impacts on surrounding wetlands; however, these impacts will be mitigated through wetland replication.

Air-sparging in the Mixed Alternative would flush contaminants from the landfill, eventually reducing leachate emanating from the waste to concentration levels in ground water that will not pose a risk to human health or the environment. An appropriate cap would be installed at the completion of the remedy. Implementation of this alternative also results in permanent impacts to the wetlands that can be mitigated.

Both options generate hazardous waste treatment residuals that may require off-site disposal at a hazardous waste facility. Capping would continually generate sludge containing arsenic and organic contaminants in the ground water interceptor/diversion trench. Air-sparging would also generate residual materials in the air-sparging trench consisting primarily of iron with minor amounts of arsenic and could potentially generate substantially more residual waste than the capping should the backfill for the air-sparging trench become fouled with arsenic sludge and excavation and off-Site disposal be required.

The Mixed Alternative appears to offer a higher level of long-term effectiveness than capping in that once air-sparging is complete, the entire 50-acre landfill will achieve clean closure and no hazardous contaminants will be left within the landfill that could pose a risk. While air-sparging may take decades to attain this condition, capping, although potentially constructed in two years, would contain hazardous waste beneath its low-permeability cap for a century or perhaps longer. Additionally, capping requires that the interceptor/diversion trench system be operated for that same extremely long period of time to keep the waste out of the water table.

SYNOPSIS OF LONG-TERM EFFECTIVENESS AND PERMANENCE

The 1991 ROD remedy would retain hazardous materials under the cap for a longer period than the air-sparging alternative and would require continual pumping in the diversion trench to keep the water table out of the waste mass. In addition, the cap will require perpetual maintenance. The Mixed Alternative provides a greater degree of long-term protection in that the landfill will eventually reach clean closure, permanently eliminating the need for cap maintenance or for continuous operation of the ground water interceptor/diversion trench. Alternatively, the air-sparging technology is somewhat speculative when applied to the three processes necessary to address Site contamination. Implementing either alternative will greatly assist the Management of Migration component of the remedy with air-sparging being more beneficial and conducive to movement of the contaminants from the source through its flushing action.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies and addresses the degree to which alternatives employ recycling or treatment, including how treatment is used to address the principal threats posed by the Site. This criterion focuses on the following factors:

- Treatment processes and what they will treat.
- Amount of hazardous materials treated or destroyed and how the principle threat is addressed.
- Degree of expected reduction in toxicity, mobility, or volume (as a percentage).
- The degree to which treatment will be irreversible.
- The type and quantity of residuals that will remain following treatment.
- Does the remedy satisfy the statutory preference for treatment as a principle element.

ANALYSIS OF SOURCE CONTROL ALTERNATIVES

The 1991 ROD Source Control component will reduce mobility by greatly reducing infiltration into the landfill wastes through the impermeable cap. However, contaminants will still reside in the landfill under the cap at the same toxicity and may still migrate, albeit much more slowly, either downward to the marine clay or laterally to the ground water diversion/interception trench where they are slowly captured and treated. Treatment residuals consist of sludge from the leachate collection and treatment system which will be disposed off-site.

The Mixed Alternative will continue to allow contaminants in the landfill to become mobile until they come into contact with the air-sparging trench where these contaminants will be captured and destroyed. Assuming success, air-sparging will permanently reduce the toxicity, mobility and volume of the organic contaminants once the landfill reaches clean closure. The time to achieve this reduction depends on the rate the contaminants are flushed through the landfill and then captured and treated by the air-sparging trench. Removal of arsenic is not as certain in this alternative since the air-sparging trench is an innovative approach for inorganics. The air-sparging trench should reduce the mobility and toxicity of arsenic; however, if fouled, it may require removal of the backfill to clean out the arsenic sludge which must be disposed of off-Site. Alternatively, additional treatment to stabilize the arsenic may be necessary.

SYNOPSIS OF THE REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT

Air-sparging will, if successful, permanently reduce the toxicity, mobility and volume of landfill contaminants once the remedy is complete unlike the 1991 ROD Source Control component which encapsulates and contains the wastes thereby reducing its mobility, but not the toxicity or volume of waste in the landfill. Both options produce treatment residuals with occasional larger volumes from the air-sparging option should the trench foul and excavation be required. Coupling either Source Control component with active ground water treatment, additionally reduces mobility, toxicity and volume of hazardous substances from the ground water in the Southern Plume.

SHORT-TERM EFFECTIVENESS

Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup levels are achieved. The following factors are important:

- Protection of community from exposure to dust, poor air-quality, and transportation impacts.
- Protection of workers during remedial actions.
- Environmental impacts that result from construction and what mitigative measures may be taken.
- Time until the remedial response objectives are met - an estimate, and it may be segmented, i.e. separating the Eastern Plume from the Southern Plume and landfill.

ANALYSIS OF SOURCE CONTROL ALTERNATIVES

The 1991 ROD Source Control component would generate the greatest short-term risk in that fugitive vapors and odors would need to be controlled during the re-contouring of the landfill wastes. Additional risks would be generated by the truck traffic required for the approximately 165,000 cubic yards of material needed to attain sufficient grades for the landfill cap. However, the cap should have an immediate effect in that the waste beneath it would begin to dry out as soon as the pumps in the diversion trench began operating to lower the ground water table out of the waste. Construction would take approximately 2 years.

The Mixed Alternative would leave the landfill surface as is with the existing vegetated soil cover, although periodic maintenance work would be performed to ensure that no wastes were exposed at the surface. Construction of the air-sparging trench would generate far less truck traffic to bring in the estimated 20,000 to 30,000 yards of material needed for the air-sparging trench. Because the air-sparging trench relies principally on natural processes to treat and convey the contaminants to the air-sparging trench, achieving immediate risk reduction would be longer in this alternative than for the capping alternative. Construction time is estimated to be 1.5 to 2.5 years for installation of the air-sparging trench.

Both Source Control remedies pose environmental impacts with capping having slightly more short-term impacts in that 11 acres of wetlands are temporarily disturbed; the air-sparging alternative temporarily disturbs only 2.8 acres. For mitigation, the 1991 ROD remedy would create a wetland area from the re-contoured wastes, whereas, for the air-sparging option would mitigate to the extent practicable. The capping alternative involving discharge of treated water to the City of Dover POTW would have the greatest short-term impact in that a sewer line must be installed, thereby temporarily disrupting wetlands and local roadways. Both capping and air-sparging require that the existing, southern drainage trench be filled in.

SYNOPSIS OF SHORT-TERM EFFECTIVENESS

On balance, the Mixed Alternative has less short-term impacts than the 1991 ROD Source Control component in that the former would involve an order-of-magnitude less truck traffic and less temporary disruption of surrounding wetlands.

IMPLEMENTABILITY

Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option. This criterion involves the following factors:

- Construction, operation, and the technical difficulties and unknowns associated with a technology.
- Reliability of technology focuses on the technical problems associated with implementation that will lead to schedule delay.
- Ease of undertaking additional remedial action.
- Monitoring considers the ability to monitor the effectiveness of the remedy and evaluates the risks of exposure should monitoring be insufficient to detect a failure of the remedy.
- Administrative feasibility are the activities that are necessary to coordinate with other offices and agencies.
- Availability of services and materials such as storage capacity.

ANALYSIS OF SOURCE CONTROL ALTERNATIVES

The 1991 ROD Source Control component is a proven technology that is implementable and reliable in terms of maintaining the cap and the ground water diversion/interception trench. Equipment and materials are readily available.

The air-sparging technology, although a proven technology, has several uncertainties related to the processes occurring in the trench and Site conditions. Therefore, air-sparging is not yet a proven technology with respect to its application at the Dover Landfill. Problems may be encountered during construction, particularly with excavation up to 100 feet into the aquifer and with installing pipes and other material at that depth. Additionally, the trench will be capturing VOCs, will be biodegrading tetrahydrofuran to the extent practicable, and will be capturing arsenic through precipitation with iron. All three processes have never been done simultaneously at any site. Monitoring will therefore be more aggressive for this alternative given the need to ensure that no breakthrough occurs and due to its innovative nature. In the event that air-sparging is unsuccessful, the 1991 ROD Source Control component is included as a contingent remedy. One of the primary components of the 1991 ROD contingency, the ground water interceptor/diversion trench, can be easily converted from the air-sparging trench if needed.

SYNOPSIS OF IMPLEMENTABILITY

Both Source Control alternatives are implementable with the 1991 ROD remedy having a distinct advantage over the Mixed Alternative since it is a proven technology and services, equipment, and installation techniques have been available for many years. Air-sparging will require specialized equipment and services for installing the air-sparging trench to depths of close to 100 feet and the combination of the individual elements of the Mixed Alternative have never been used in similar circumstances to those presented at the landfill. For Management of Migration, there are no issues with implementing MNA or its monitoring component; ground water pump-and-treat is a proven technology and can be readily implemented and adapted. Extraction, treatment and discharge of treated ground water has been performed at many sites without problems.

COST

Cost includes estimated capital and Operation and Maintenance (O&M) costs, as well as present-worth costs. Direct capital costs include those for construction, equipment, land and site development, buildings and services, relocation expenses, and disposal. Indirect costs include those for engineering, licences and permits, startup/shakedown costs, and contingencies. Annual O&M costs include operating labor costs, maintenance materials and labor, auxiliary materials and energy, disposal of treatment residuals, purchased services, administrative costs, insurance, taxes, licensing, maintenance reserve and contingency funds, rehabilitation costs, and periodic Site Reviews.

The details of the costs of the remedial alternatives under consideration have been outlined in Section 5 of the RFFS. A summary of the cost of the Source Control components (as well as the costs for MM-2/4) in 2004 dollars are summarized in the table below:

Table 8: Comparison of Costs of Remedial Alternatives Considered

Remedy	Capital Costs	O&M Costs (annual cost)	Present Worth (30 years @ 7%)
No Action	$0	$123,065	$1,527,119
1991 ROD			

Source Control (SC-7)	$25,907,453	$252,000	$29,034,531
Management of Migration (MM-2/4)	$1,010,431	$368,065	$5,577,765
Total for 1991 ROD	$26,917,884	$620,065	$34,612,296
Mixed Alternative			
Source Control (SC-A)	$12,352,909	$283,500	$15,870,872
Management of Migration (MM-2/4)	$475,761	$245,565	$3,522,987
Total for Proposed Mixed Alternative	$12,828,670	$529,065	$19,393,859

STATE ACCEPTANCE

The New Hampshire Department of Environmental Services has reviewed the alternatives under consideration and concurs with the proposed change from the 1991 ROD to the Mixed Alternative described in this Amendment. A copy of the State concurrence letter is attached as Appendix C.

COMMUNITY ACCEPTANCE

The community expressed many concerns regarding the effectiveness of air-sparging as a Source Control remedy, the delay in implementing a remedy at the Site, and the continued flow of contamination in the Eastern Plume. These concerns and any others are addressed in the Responsiveness Summary, provided as Appendix D, and all comments are included in the Administrative Record for the Site.

3. SUMMARY OF COMPARATIVE ANALYSIS

The Site presents a future risk from consuming contaminated ground water for drinking water and a potential risk to human health and the environment from arsenic-contaminated sediment. Potential indoor air risks have yet to be evaluated in accordance with recent EPA guidance. Contaminated ground water is currently flowing toward the Bellamy Reservoir which could degrade the water body and threaten a drinking water resource that serves much of southeastern New Hampshire. Both ground water plumes continue to degrade the drinking water aquifer at the Site. The origin of the contaminated ground water is leachate flowing from the landfill area. Implementation of a Source Control remedy at the landfill will enable ground water to be restored.

The Source Control component of the 1991 ROD remedy would effectively meet the remedial response objectives. However, the Mixed Alternative will capture and treat or destroy Site contaminants, perhaps decades before the 1991 ROD Source Control component and cost half as much. While the Mixed Alternative is an innovative remedy which raises concerns relative to the implementability of this remedy, EPA believes that air-sparging has the potential to succeed at the Site. Moreover, the Mixed Alternative will be phased during construction to ensure that it operates correctly. If the Mixed Alternative fails to fully treat or destroy contaminants migrating from the landfill, the 1991 ROD selected remedy will be the contingent remedy.

A summary of how each Source Control component compares with the NCP nine evaluation criteria follows on Table 9. This Table is extracted from the Proposed Plan.

Table 9: Comparison of Cleanup Alternatives for the Dover Municipal Landfill

Nine Criteria	Source Control, Landfill Area Only: SC-1 No-Action	SC-7/7A 1991 Selected Remedy	*SC-A Air-sparging Trench
Overall Protection of Human Health and the Environment	Does not meet criterion	Meets or exceeds criterion	Meets or exceeds criterion
Compliance with Applicable or Relevant and Appropriate Requirements	Does not meet criterion No further evaluation	Meets or exceeds criterion	Meets or exceeds criterion
Long-term Effectiveness and Permanence		Meets or exceeds criterion	Meets or exceeds criterion
Reduces Toxicity, Mobility, or Volume through Treatment		Meets or exceeds criterion	Meets or exceeds criterion
Short-term Effectiveness		Partially meets criterion	Partially meets criterion
Implementability		Meets or exceeds criterion	Meets or exceeds criterion / Partially meets criterion (some uncertainty)
Cost (only Source Control Component)	$0	$29 million	$15.8 million
State agency acceptance	State concurs with selection of SC-A		
Community acceptance	Discussed in the Responsiveness Summary.		

* This is an innovative remedy which will require that a contingent remedy is identified.

Key		
	Meets or exceeds criterion	(green pattern)
	Partially meets criterion	(yellow pattern)
	Does not meet criterion	(red pattern)

K. THE SELECTED REMEDY

EPA has selected the Mixed Alternative as providing the best balance between the nine criteria. The selected remedy combines the new Source Control components (SC-A) with the existing Management of Migration components (MM-2/4) into a comprehensive remedy that ensures protectiveness of human health and the environment, attains all federal and state regulations, provides long-term and short-term effectiveness, is implementable, and reduces toxicity, volume, and mobility through treatment.

1. DESCRIPTION OF THE REMEDIAL COMPONENTS

The selected remedy consists of the following components:

Landfill Cover

The present landfill cover consists of a layer of sand and soil over the existing wastes. This natural cover has been in place for over twenty years. In some of the areas the cover has been in place longer, such as the northeast corner. Over the past twenty years the landfill cover has been naturally vegetated with meadow grasses in the central and western portions of the landfill. In the eastern area of the landfill poplars, beeches, birches and sumac have grown up and established wooded areas. This natural cover will be periodically inspected, maintained and augmented where necessary to isolate wastes from trespassers. Areas of erosion or where a lack of organic material prevents vegetative growth will be patched with soil and seeded with annual grass seeds or erosion control matting sufficient to allow native grasses and other forbs to cover the landfill surface. Invasive species will be controlled and not allowed to propagate.

Eliminating Source Areas in and Near the Landfill

The landfill contains areas of high contaminant concentrations (localized sources) that may not be captured or addressed by the air-sparging trench and therefore cause an excess risk to human health or the environment, or violate ARARs. There are currently two known areas of high concentration in or near the landfill that act as localized sources of contamination to ground water and surface water. The first area of high concentration to be addressed is located in the northwest corner of the landfill and manifests itself as high surface water concentrations of volatile organic contaminants such as *cis*-1,2 dichloroethylene and vinyl chloride in an intermittent stream (the northern drainage trench) sampled as SW-E. This contaminated source area will be delineated and removed either through excavation or other *ex situ* techniques.

The second area of high concentration is located in ground water in the southwestern corner of the landfill. The ground water in this area is contaminated principally by THF with concentrations that may overwhelm the treatment capacity of the air-sparing trench . This area will be defined and addressed through a ground water extraction and treatment system designed to attain cleanup levels. Treated ground water will be re-injected into the landfill at an up-gradient location.

During the pre-design investigation for the air-sparging trench, the surface and subsurface area of the landfill will be examined to identify additional areas of high concentrations that may be removed more effectively through localized action or that may breakthrough the air-sparging trench. These areas will either be excavated or addressed by other *ex situ* techniques or, if in ground water, pumped and treated prior to re-injection into an up-gradient portion of the landfill.

Air-Sparging Trench

The air-sparging trench would be installed from the northeast area of the landfill, heading south along the landfill's eastern edge, then turning and following the limit of waste on the southern side of the landfill to the western side of the landfill, a distance of approximately 3,000 to 4,000 linear feet. The depth of the air-sparging trench would be determined by the depth to the marine clay layer where the trench would key into. In some places the trench may be up to 90 feet deep, or more. The objective of the trench is to intercept contaminated ground water from the up-gradient, landfill side of the trench, allow that contaminated ground water to pass though the trench material for treatment, then exit the down-gradient side of the trench at concentrations that do not exceed cleanup levels.

Following the path shown on Figure 5 on page 48, the volume of soil excavation, assuming a three-foot wide treatment zone that spans the upper sand and upper-interbedded aquifers, is approximately 19,000 cubic yards. The air-sparging trench will intercept, capture or destroy contaminants in leachate emanating from the landfill. Although this is similar in nature to the interceptor/diversion trench described on page 54 of the 1991 ROD, its construction, operation, and goals are very different. The air-sparging trench will not serve to extract water for *ex situ* treatment as in the 1991 ROD. Instead, water will be treated in the air-sparging trench to immobilize arsenic, capture VOCs in the air stream and extract them, and to aerobically degrade THF. Air emitted from the air-sparging trench is not expected to require treatment; however, the stacks may be retro-fitted with treatment devices if necessary.[34] For cost purposes, it is estimated that this air-sparging trench will operate for at least 30 years; however, the air-sparging trench must remain operating until the landfill has reached clean closure. There are a number of sub-components to this portion of the remedy:

1. Construction of a hydraulic barrier along the northeast half of the landfill to direct leachate emanating from the landfill through the air-sparging trench. This will divert ground water through the eastern portion of the air-sparging trench that would otherwise flow off-site to the north.

2. The air-sparging trench will be constructed in phases or segments that may be operated independently. As a part of pre-design investigations, EPA and NHDES will select the segment(s) to be constructed first. Although air-sparging will be the primary mode of operation, design flexibility may enable portions of the air-sparging trench to be operated

[34] RFFS, January 30, 2004, page 4-27.

as a ground water extraction trench or, if appropriate, a re-injection trench. Monitoring and maintenance of the air-sparging trench will be required during operation to ensure that potential fouling is identified and corrected quickly. The path of the air-sparging trench will follow the edge of waste at the landfill. The air-sparging trench will be operated as described below:

- As groundwater passes through the trench, air-sparging will capture VOCs such as vinyl chloride, and 1,2 DCE, as well as hydrocarbons such as benzene in the ground water. Captured VOCs and hydrocarbons will be discharged to the atmosphere if they are below regulatory criteria. If not, they will be captured on activated carbon filters for destruction and offsite disposal. Concentrations of contaminants in the ground water exiting the down-gradient side of the air-sparging trench are expected to be at cleanup levels.

- The aerobic environment created by the air-sparging trench will allow micro-organisms to degrade THF. This aerobic environment will also precipitate iron which then combines with arsenic so that arsenic concentrations in ground water should reach cleanup levels before it exits the down-gradient side of the air-sparging trench.

- Should arsenic cause fouling in the trench, it will be removed by excavating the air-sparging trench from the aquifer or removed by other, proven technologies. Arsenic will similarly be removed from the trench at the conclusion of the Source Control component.

See Section K. 4., *Expected Outcomes* for further discussion regarding the air-sparging trench contingency in the event of failure. A schematic representation of the air-sparing trench is offered in Figure 6 on page 49.

Monitoring and Removing Contaminated Sediments

Arsenic-contaminated sediments are located in the landfill drainage trenches and drainage swale as well as in the Cocheco River. Sediments in the drainage trenches and swale above the 50 ppm arsenic cleanup level will be excavated and disposed of at an approved off-site facility. The trench surrounding the landfill will be eventually backfilled, therefore no future monitoring is required. However, the drainage swale may still accumulate arsenic-contaminated sediments; therefore, annual monitoring of the sediments will be required. Should sediment with concentrations exceeding cleanup levels become redeposited, it shall be excavated and disposed of at an approved offsite facility.

Cocheco River sediments will be assessed annually to determine whether or not they pose a risk to human health and the environment. Currently these sediments fall within EPA's risk range for human health but the concentrations were beyond EPA's point of departure for carcinogenic risks and near EPA's threshold for non-carcinogenic risks. For ecological risk, the sampling results did not pass the first tier of the ecological risk assessment making it necessary to move to the next tier, toxicity testing. Therefore, it is appropriate to establish and maintain a sediment sampling program both within the pre-design investigations and in future site environmental monitoring.

MNA in the Eastern Plume

This component of the remedy is retained from the 1991 ROD and the reader is referred to page 56 of the 1991 ROD for a fuller description. However, through this Amended ROD, attenuation of contaminants in this plume will be monitored and otherwise addressed in accordance with EPA's guidance for MNA remedies. Further, should EPA determine that MNA for this plume is unsuccessful, a contingent remedy of pump-and-treat shall be implemented. See Section K. 4. b. (2) of this document for more details of the contingent remedy.

Pump and Treat in the Southern Plume

As with the Eastern Plume, the remedy for the Southern Plume is retained from the 1991 ROD and the reader is referred to page 55 of the 1991 ROD for a fuller description. Pre-design investigations associated with this component are outlined above in this section. Treated ground water will be discharged to area wetlands or the Dover POTW.

Indoor Air

EPA's recent guidance regarding indoor air requires that buildings located in areas near the Eastern Plume be evaluated for VOCs that may pose a risk to human health. This evaluation shall be conducted within 9 months after signing this Amended ROD. A regular monitoring program for indoor air vapors shall be part of a Site-wide monitoring program. Should concentrations exceed protective levels, a contingency for corrective action is outlined in Section K. 4. b. (4) of this document.

Site-wide monitoring program

As part of this component, a Site-wide monitoring program shall be implemented to monitor indoor and outdoor air, soil, sediment, ground water and surface water. There will be two sections of monitoring. First, the existing Environmental Monitoring Plan shall be modified to demonstrate the state of contamination throughout the Site and to detect migration of contaminants. The second section is Remedy Performance Monitoring which will be conducted to assess the performance of the air-sparging trench, natural attenuation in the Eastern Plume, flushing of the landfill, and pump-and-treat in the Southern Plume.

Institutional Controls

To protect the integrity of the remedy and prevent the use of contaminated ground water, institutional controls that prevent the use of ground water, that prevent disturbance of the marine clay layer beneath the aquifer, and that 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, are necessary. Current local ordinances that prohibit these activities should remain in place until the remedy is completed. A state groundwater management zone should also be put in place at the Site.

2. SUMMARY OF THE ESTIMATED REMEDY COSTS

The selected remedy has a total cost estimate of $19.4 million. This cost may be broken down further into the Source Control and Management of Migration components. Additionally, there is the added component for 30 years of operation and maintenance costs. Thirty years is used as a standard because projections past that point become very speculative. Not factored into the cost shown in Table 10 is that the project will be phased to ensure that the remedy is viable. Phasing the remedy may incur additional costs; however, it is more likely to save money since design issues will be addressed using data based on field conditions. Table 10, below outlines the estimated cost of the selected remedy:

Table 10: Estimated Cost of the Selected Remedy			
Component	**Capital Costs**	**O&M Costs (annual cost)**	**Present Worth (30 years @7%)**
Source Control[a]			
Details of Air Sparging	Preparation: $1,048,000 Trench: $6,477,000 Barrier: $2,005,000 Sediment Tox testing:$50,000 Start up: $145,600	Maintenance: $185,000 Utilities: $55,000 Operator & misc.: $43,500	
Source Control (SC-A)	$12.4 million[b]	$283,500	$15.9 million
Management of Migration[c]			
Details of MNA and Pump and Treat	Institutional Controls: $10,000 Southern Plume pump & treat construction $364,615 Long-term monitoring - to be determined after predesign investigations.	Institutional Controls: $20,000 Long-term monitoring: $123,065 Operation and maintenance: $102,500	
Management of Migration (MM-2/4)	$475,761	$245,565	$3.5 million
Total for Selected Remedy	$12.8 million[d]	$529,065	$19.4 million

[a] The detailed costs are shown on Table 5-18, Page 5-111 of the RFFS.
[b] This cost also includes 10% contingency, 5% project managment, 6% remedial design, and 6% for construction management.
[c] The detailed costs are shown on Table 5-18, Page 5-113 of the RFFS.
[d] Costs for pre-design investigations outlined in Section K. 3. are not included in this estimate.
[e] Costs are +50/-30 as set forth in EPA's Feasibility Study guidance.

3. PRE-DESIGN INVESTIGATIONS

Several Pre-Design Investigations (PDI) are needed to fill data gaps identified in the RFFS and the EPA Addendum. Conducting these investigations will ensure that all risks at the Site are addressed in the most efficient and effective manner.

Ground Water Model and Fate and Transport Model PDI: The RFFS contained a Ground Water Model and a Fate and Transport Model which the Agencies have not yet approved and that require modification. Tasks associated with this PDI include collecting field data to determine and verify many of the parameters identified in the models. Because several of the subsequent PDIs listed below require input from these two models, past Agencies' comments deferred for the RFFS as well as any additional Agencies' comments must be addressed prior to conducting additional field investigations associated with the PDIs listed below. The Ground Water and Fate and Transport models will be of maximum importance in designing the air-sparging trench. This PDI will be completed 12 months after this Amended ROD is signed.

Air-Sparging Trench Pre-Construction PDI: This PDI will determine the depth, location and construction methods for the air-sparging trench. A drilling program will determine the structure of the subsurface, the depths to which the trench will need to go, and the nature of the contamination encountered. Based on this and other information, EPA and NHDES will select the number and order of segment(s) to be constructed to demonstrate the viability of the technology. In determining viability, EPA and NHDES will consider factors such as the effectiveness of the trench to immobilize arsenic at its highest concentrations and its effectiveness in attaining cleanup levels of all contaminants emanating from the landfill. This PDI will be completed within 18 months after this Amended ROD is signed.

Southern Plume Pump-and-Treat PDI: Incorporating information from the 1994 PDI for pump and treat in the Southern Plume, this PDI will gather additional field data that will be used to determine, among other things, the placement of extraction wells, the rate at which those wells should operate, and the treatment and discharge of groundwater. This PDI will be completed within 12 months after this Amended ROD is signed.

Northwest Landfill PDI: This investigation will determine the source of high concentrations to surface water sampling point SW-E. It will be completed within 12 months after signing this Amended ROD.

Sediment Assessment PDI: This investigation involves performing the second and, if necessary, third tier of the ecological assessment protocol to determine if arsenic in sediments at the Site are harmful to aquatic life. Subsequent sampling will be performed to ensure that the arsenic and other inorganic contaminants in the sediment do not pose a hazard to human health or the environment. Additional sampling will be conducted for additional elements including mercury, lead and cadmium. This PDI will be completed within 9 months after signing this Amended ROD.

Indoor air assessment PDI: This PDI will be conducted in the area of those residences that overlie or are in close proximity to the Eastern Plume, following EPA's indoor air guidance.[35] This indoor air monitoring will be expanded and included in the Site-wide

[35] Draft *Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (Subsurface Vapor Intrusion Guidance), USEPA, November 26, 2002.

EMP. The first assessment for this PDI will be completed within 9 months after signing this Amended ROD.

Eastern Plume MNA PDI: This PDI will be conducted to determine the rates at which natural attenuation of the contaminants is occurring in order to formulate a long-term monitoring program in accordance with EPA's guidance for monitored natural attenuation.[36] This PDI will be completed within 18 months after signing this Amended ROD.

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. Areas to be sampled include near SW-E (in the northern drainage trench), near the head of the drainage swale and at the bottom of the drainage swale. This PDI must begin at the start of remedial action and must be completed upon EPA's determination that construction is complete.

4. EXPECTED OUTCOMES OF THE SELECTED REMEDY

The selected remedy has several unknowns driven principally by the behavior of inorganic elements and the hydrogeology surrounding the site. The implementation of the Source Control component will alter the geochemistry and hydrogeology of the surrounding aquifer. The geochemistry will be altered by injecting oxygen into an oxygen depleted ground water environment. The primary effect will be the precipitation of iron which will absorb other inorganic elements including arsenic. The intention of the air-sparging trench is to precipitate the iron and other inorganic compounds inside the trench. Precipitating these compounds in the trench is necessary so that they may be removed when either the remedy is complete or if the precipitate compromises the function of the remedy. Precipitation outside the trench is not allowable because once the air-sparging trench ceases operation, the anaerobic environment in the aquifer will cause the precipitate to re-dissolve, potentially generating a high-concentration arsenic plume.

a. CLEANUP LEVELS

(1) INTERIM GROUND WATER CLEANUP LEVELS

Interim ground water cleanup levels were established in the 1991 ROD based on SDWA MCLs, non-zero MCLGs if an MCL does not exist, and more stringent state drinking water standards. Currently, the State of New Hampshire AGQSs are the same as or less stringent than federal drinking water standards; however, if those standards are revised to more stringent levels, the selected remedy would be reviewed for protectiveness in light of any new standard. Because the

[36] *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* OSWER Directive 9200.4-17P, April 21, 1999, page 24.

Amended ROD addresses ground water that is in a drinking water aquifer, these interim cleanup levels (ICLs) have been identified as chemical specific ARARs. Reviewing the1991 ground water ICLs in light of the more current applicable or relevant and appropriate standards finds that only arsenic will change. Therefore, the cleanup level for arsenic will change from 50 ug/l to 10 ug/l for ground water cleanup in the selected remedy. Table 11, on the following page, sets out the interim ground water cleanup levels as established for the Amended ROD. As explained on pages 47 and 50 of the 1991 ROD, interim cleanup levels remain in place for the duration of the cleanup. Once the cleanup is complete, final ground water cleanup levels will be established.

Table 11: Ground Water Cleanup Levels and comparison to May 2002 results **(bold values indicate change from 1991 ROD)**				
		May 2002[37]		
Constituent	**1991 ICL (ug/l)**	**# wells > ICL out of 58 wells**	**Maximum (ug/l)**	**Proposed ICL (ug/l)**
Arsenic	50	27 / 45*	634	**10**
Vinyl chloride	2	13	26	2
Benzene	5	29	79	5
Trichloroethene	5	4	17	5
Tetrachloroethene	5	0	5	5
Methylene chloride	5	2	8	5
1,1 DCE	7	0	0.9	7
1,2 DCA	5	0	3	5
cis-1,2 DCE	70	0	14	70
Chloroethane	14000	0	10	14000
Tetrahydrofuran	154	12	2,400	154
Acetone	700	0	88	700
MEK	200	0	8	200
MIBK	350	0	17	350
Toluene	1000	0	310	1000

* 27 of the 58 wells exceed the old cleanup level of 50 ppb, 45 of 58 exceed the new cleanup level of 10 ppb. These data are extracted from the May 2002 sampling round, the latest data at the time of the initial RFFS submittal.

(2) SEDIMENT RESPONSE AND CLEANUP LEVELS

Sediment cleanup levels are derived from NOAA benchmark standards and health-based risk calculations for environmental and human health standards, respectively. Arsenic- contaminated sediments exist in the drainage trenches, drainage swale, and the Cocheco River. The drainage trenches will be covered (following removal of sediment containing arsenic greater than 50 ppm)

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37 Summary of Summer 2002 EMP Event, Dover Municipal Landfill, GeoInsight, Westford, MA, November 15, 2002.

with soil under the Amended ROD. The swale will remain uncovered although it may have further alterations based on an existing Operations and Maintenance Plan. The Cocheco River is used for boating and fishing. Based on these considerations, sediments in the Cocheco River have different cleanup standards than those for the drainage trenches or drainage swale.

In the drainage trenches and drainage swale, the 1991 ROD set sediment cleanup levels for arsenic-contaminated sediment based on standards that NOAA had selected at that time (50 ppm) for ecological receptors. This level was reviewed during the preparation of EPA's Addendum and was reconfirmed to be protective of ecological receptors. Therefore, this Amended ROD retains the 50 ppm arsenic cleanup level for the sediments in the drainage trenches and drainage swale. This cleanup level is retained in the drainage trenches because of the continuing presence of burrowing animals that may access deeper sediments as well as to protect other ecological receptors. In addition, leaving sediments 50 ppm or greater in the drainage trenches may result in arsenic becoming dissolved and re-mobilized, thus acting as a continuing source of arsenic to the ground water. The drainage swale will not be covered, leaving sediments available to animals and other ecological receptors as well as acting as a continuing source to ground water. Any sediment in the drainage trenches or the drainage swale that exceed 50 ppm will be excavated and disposed off-Site. With regard to human health risks,the drainage trench no longer provides an exposure pathway; sediments in the drainage swale fall within EPA's acceptable risk range, but continued monitoring will occur to ensure protectiveness.

In the Cocheco River, arsenic-contaminated sediments that exceed either the three-tier environmental protocol or exceed human health based criteria, shall be removed from the stream and disposed off-Site. With regard to ecological risk, sediments in the Cocheco River will be assessed through two methods: whole sediment analysis and toxicity testing. If sediments are shown to have concentrations that exceed human health risk standards through whole sediment analysis, those sediments will be removed. Those same sediments will be tested through toxicity testing for ecological risk using organisms found in the river (Tier 2 testing). If unacceptable impacts are found, the assessment will move to the third tier of testing, ecosystem assessment. If that assessment is unsatisfactory, those sediments will be removed and disposed off-site in accordance with the State of New Hampshire regulations.

b. CONTINGENT REMEDIES

Contingent remedies have been selected for a number of components of the selected remedy. More specifically, contingent remedies are offered for each of the following components:

(1) AIR-SPARGING TRENCH

EPA recognizes that the air-sparging trench is an innovative approach that, although it poses an opportunity to clean up the landfill quicker, also poses some risks of failure. Concern is generated by the depth of the air-sparging trench, up to 100 feet in places, and the complexity of the processes that will occur within it. The air-sparging trench will recover VOCs, degrade THF, and precipitate arsenic for later recovery. No system has previously attempted all three simultaneously. Therefore, the air-sparging trench will require a contingency remedy. The contingency remedy will be that presented in the 1991 ROD for Source Control which consists of capping the landfill with a RCRA C cap and intercepting contaminated ground water at the landfill boundary (i.e., the 1991 ROD alternative SC-7/7A). The following criteria, at a minimum, have been established to evaluate and implement a contingent remedy for the air-sparging trench:

- One year after completing the construction of any phase or segment of the air-sparging trench, should that portion of the air-sparging trench or any other portion of the air-sparging trench fail to immobilize, capture or destroy site contaminants and these contaminants exit the down-gradient side of the air-sparging trench at concentrations that exceed cleanup criteria, regardless of form (dissolved or particulate), the 1991 ROD Source Control component (SC-7/7A) will be implemented.

- If, at any time, operation of the air-sparging trench creates conditions that EPA believes will increase, or not decrease risk at the site, and those conditions are not corrected in what EPA believes to be a reasonable time, the 1991 ROD Source Control component (SC-7/7A) will be implemented. These conditions may include either unfavorable alterations of site hydrogeology or geochemistry, the production of recalcitrant daughter products that generate higher risk, or the creation of any physical hazards.

Monitoring of the air-sparging trench will include clustered wells that for each segment span the treatment zone vertically and are spaced at intervals that EPA believes are sufficient to determine the effective operation of the air-sparging trench. These clusters of wells will be positioned from inside the landfill to the air-sparging trench and to the down-gradient side of the air-sparging trench along the flow path of contaminated ground water. Monitoring will be performed at periodic intervals that EPA believes will provide performance data for each segment and will include both ground water and solid media samples from the air-sparging trench and aquifer. A separate monitoring program will be required to determine if clean-closure requirements have been met at the completion of cleanup.

(2) GROUND WATER CONTAMINATION - EASTERN PLUME

Although this contingent remedy was included as a component of the 1991 ROD, it is repeated and provided further definition here. Because MNA is a component of the Amended ROD, it requires an evaluation five years after construction complete to determine its effectiveness in reducing contaminant concentrations. In addition, a contingent remedy is identified in the event concentration levels are not declining as anticipated.[38] Such a contingent remedy is necessary for the Eastern Plume. The following criteria, at a minimum, have been established to evaluate and implement a contingent remedy for MNA (MM-2):

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[38] *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* OSWER Directive 9200.4-17P, April 21, 1999, page 24.

- Five years after EPA determines that construction of the Source Control component is complete, the MNA component for the Eastern Plume, will be assessed by EPA to determine if ground water cleanup has progressed sufficiently to indicate that ground water cleanup levels will be attained in a reasonable time-frame.[39]

- Every five years, thereafter, the MNA remedy for the Eastern Plume will be assessed by EPA to determine if ground water cleanup has progressed sufficiently to indicate that ground water cleanup levels will be attained in a reasonable time-frame.

- If EPA determines at any time that cleanup levels will not be attained in a reasonable time-frame and that a waiver is not justified, a pump-and-treat remedy (MM-4) will be implemented.

The contingent pump-and-treat remedy in the Eastern Plume will extract contaminated ground water, treat it to clean up levels, and discharge it to the Cocheco River. As part of the ground water monitoring program, the monitoring well network surrounding the landfill will be augmented and optimized to determine the extent, laterally and vertically, of ground water contamination. This will include the use of the existing monitoring network as well as the establishment of additional monitoring wells both on the landfill and in the area surrounding the landfill.

(3) COCHECO RIVER SEDIMENT

If further sampling, performed under either the pre-design investigations or future environmental monitoring, demonstrates that sediment in the drainage swale or Cocheco River generates a risk to either human health or the environment, that sediment must be excavated from the drainage swale or Cocheco River and disposed off-site in accordance with State of New Hampshire regulations.

(4) INDOOR AIR

If further sampling, consistent with EPA's Indoor Air Guidance, demonstrates that an indoor air risk exists from contaminants at the Site, appropriate actions will be taken to eliminate that risk.[40]

c. CLEAN CLOSURE OF THE LANDFILL

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[39] *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* OSWER Directive 9200.4-17P, April 21, 1999.

[40] Draft *Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (Subsurface Vapor Intrusion Guidance), USEPA, November 26, 2002.

At the conclusion of the remedy it is expected that hazardous waste in the landfill will no longer leach contaminants into the ground water surrounding and beneath the landfill that pose a risk to either human health or the environment and that no further cleanup actions with respect to the Site will be required.[41] Further activities at the landfill at that time will be subject to State of New Hampshire regulations.

L. STATUTORY DETERMINATIONS

The remedial action selected herein for implementation at the Dover Municipal Landfill is consistent with CERCLA and, to the extent practicable, the NCP.

1. THE SELECTED REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will be protective of human health and the environment. Current exposure to contaminated ground water will be prevented through institutional controls. Long-term monitoring of the ground water will allow EPA to track the concentrations present in the Eastern and Southern Plumes. Water quality data will be used by EPA to demonstrate that the plumes are not expanding and that concentrations are declining. Excavating contaminated sediment and then filling in the existing northern and southern drainage trenches prevents direct contact with the contaminated leachate and sediment. Any short-term risks to human health or the environment during implementation of the selected remedy are controllable through engineering techniques. The potential exposure to Site workers and area residents to air emissions during the installation of new monitoring wells, extraction wells, or the air-sparging trench will be monitored to ensure ambient air levels are not exceeded.

Air-sparging of ground water is expected to reduce (and eventually eliminate) the concentration of contaminants from ground water flowing into the surrounding aquifers. Operation of a pump-and-treat ground water system, in conjunction with the Source Control component, will eventually restore the aquifer south of the landfill to drinking water quality and also protect the Bellamy Reservoir from becoming impacted by the landfill contamination. Similarly, the use of monitored natural attenuation, in concert with the other Source Control components, will eventually restore the aquifer to the east of the Site to drinking water quality.

2. THE SELECTED REMEDY ATTAINS OR APPROPRIATELY WAIVES ARARs

ARARs for the Site were identified during the development of the 1991 ROD. As part of the evaluation of alternatives for this Amended ROD, not only were new ARARs associated with the proposed alternatives identified, but a review of the previous ARARs was conducted. A complete

[41] Risk-Based Clean Closure. USEPA, Elizabeth Cotsworth, Acting Director, Office of Solid Waste, March 16, 1998.

list of ARARs is presented in Appendix A of this Amended ROD.

Section 300.430 (e) of the National Contingency Plan (NCP) requires that on-site remedial actions at CERCLA sites must meet ARARs under federal or state environmental or facility siting laws unless there are grounds for invoking a waiver. A waiver is required if ARARs cannot be achieved. Other federal and state advisories, criteria, or guidance, as appropriate (to be considered "TBCs"), should be considered in formulating the remedial action.

ARARs are promulgated, enforceable federal and state environmental or public health requirements. There are two categories of requirements: "applicable" or "relevant and appropriate". CERCLA does not allow a regulation to be considered as both "applicable" and "relevant and appropriate." These categories are defined below:

Applicable Requirements - Section 300.5 of the NCP defines applicable requirements as "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site".

Relevant and Appropriate Requirements - Section 300.5 of the NCP defines relevant and appropriate requirements as "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site."

To be considered (TBCs) are non-promulgated criteria, advisories, and guidance issued by the federal or state governments. Along with ARARs, TBCs may be used to develop interim action limits necessary to protect human health and the environment.

ARARs and TBCs are divided into three categories: chemical-specific, location-specific, and action-specific. This section briefly summarizes the most significant chemical, location and action specific ARARs for the remedy.

a. CHEMICAL-SPECIFIC ARARs

Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the determination of numerical values that establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. In general, chemical-specific requirements are set for a single chemical or a closely related group of chemicals. These requirements do not consider the mixture of chemicals. A summary of chemical specific ARARs is presented in Table 1B of Appendix A.

The Safe Drinking Water Act Maximum Contaminant Levels (MCLs) are chemical-specific ARARs that govern the quality of drinking water provided by a public water supply. Because the aquifer at the Site is classified as a potential drinking water source, MCLs are relevant and appropriate requirements in establishing interim ground water levels. In addition, if New Hampshire Drinking Water Quality Standards or New Hampshire Groundwater Protection Standards include a more stringent standard for a site contaminant than the federal MCL, it would become the interim cleanup level for groundwater. As explained above, interim cleanup levels remain in place for the duration of the cleanup. Once the cleanup is complete, final groundwater cleanup levels will be established.

b. LOCATION-SPECIFIC ARARs

Location-specific ARARs are restrictions placed on the concentrations of hazardous substances, or the conduct of activities solely because they are in specific areas. The general types of location-specific ARARs that may be applied to the Dover Municipal Landfill Site are briefly described below and are presented in Table 1C of Appendix A.

Several federal and state ARARs regulate activities that may be conducted in wetlands. These regulations and requirements are applicable to the cleanup because wetlands surround the Site to the west, south and east. The Wetlands Executive Order (E.O. 11990) incorporated into 40 CFR Part 6, Appendix A, require that wetlands be protected and preserved, and that adverse impacts be minimized. In accordance with this Order, EPA specifically solicited public comments on the expected adverse impacts to area wetlands and the proposed mitigation measures. After considering those comments, EPA has determined that no practicable alternative exists that would not disturb the area wetlands since contamination has migrated there and that the selected remedy provides the least amount of disruption to the wetlands. Measures to mitigate impacts include the use of silt fences and hay bales during construction activities and discharge of treated water back into wetlands to maintain water levels. Disturbed wetlands will be restored. Section 404 of the Clean Water Act and State wetland protection regulations are also applicable requirements which restrict activities that adversely affect wetlands and waterways.

Additional location-specific ARARs include the Fish and Wildlife Coordination Act, which requires that any federal agency proposing to modify a wetland or body of water must consult with the U.S. Fish and Wildlife Service.

c. ACTION-SPECIFIC ARARs

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are generally focused on actions taken to remediate, handle, treat, transport, or dispose of hazardous wastes. These action-specific requirements do not in themselves determine the remedial alternative; rather, they indicate how a selected alternative must be implemented. The general types of action-specific ARARs that may be applied to the Site are briefly described below and are presented in Table 1A of Appendix A.

Because the Site contains hazardous waste, RCRA Hazardous Waste regulations apply to certain actions taken onsite. The base RCRA program has been delegated to New Hampshire; therefore, the state and any more stringent federal hazardous regulations governing such activities as waste identification, generator and owner/operator standards, landfill closure, groundwater monitoring, air emissions from process vents, equipment, tanks, and containers apply to the Site.

In particular, the selected remedy must meet the clean closure requirements of RCRA. This means that at the completion of the air-sparging treatment, contaminants remaining in the landfill will not leach concentrations into the groundwater (including groundwater beneath the landfill) that pose a risk to human health or the environment. An appropriate cap must then be placed on the landfill. Should the capping contingency be implemented, hazardous waste landfill closure regulations will apply to the site. During remediation, State groundwater regulations require that a groundwater management zone be delineated and remain in place until cleanup levels are attained.

The New Hampshire Department of Environmental Services has classified the Cocheco River as a Class B river and the Bellamy Reservoir as a Class A, drinking water reservoir. While cleaning up surface water is not a remedial action objective, the New Hampshire Surface Water Quality Criteria (SWQC), although not identified as chemical specific cleanup standards, will be relevant and appropriate when measuring the performance and effectiveness of the air-sparging trench as well as other activities affecting surface waters.

Additionally, other guidelines that need to be considered when conducting the selected remedy are set out in EPA's Monitored Natural Attenuation guidance and Indoor Air Vapor guidance.

3. THE SELECTED REMEDIAL ACTION IS COST-EFFECTIVE

The selected remedy is cost-effective since it provides overall effectiveness proportional to its cost. The selected remedy, the Mixed Alternative, which is estimated to cost $19.4 million, as compared to the original, 1991 ROD at $34.6 million, will treat or remove contamination from the ground water as effectively, if not more so, than the 1991 ROD. The selected remedy will further ensure that the Bellamy Reservoir is protected and will restore ground water more quickly than estimated in the 1991 ROD.

4. THE SELECTED REMEDY DOES UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy provides a permanent solution and alternative treatment and resource recovery technologies to the maximum extent practicable for the ground water plume and Source Control component. Protection is also provided through institutional controls and long-term monitoring. Extrapolations of ground water monitoring data indicate that the Eastern Plume will continue to reduce in size and concentration toward drinking water quality after the Source Control component has been implemented. Interpretation existing data indicates that the aquifer in the Southern Plume will be prevented from discharging into the Bellamy Reservoir and will achieve drinking water standards for many of the contaminants except arsenic in about twenty years. However, arsenic concentrations will need to be monitored carefully over this period.

5. THE SELECTED REMEDY SATISFIES THE PREFERENCE FOR TREATMENT AS A PRINCIPLE ELEMENT

The selected remedy treats contaminated ground water flowing from the landfill into the surrounding aquifers to concentrations protective of human health and the environment. Contaminated ground water in the Southern Plume will be pumped-and-treated to restore the aquifer to drinking water standards. Contaminated ground water in the Eastern Plume will be restored by monitored natural attenuation to drinking water standards. If, after five years, EPA determines that MNA has failed in the Eastern Plume, an active ground water remedy will be employed to restore this portion of the aquifer.

6. FIVE YEAR REVIEWS

Because this Amended ROD will result in contaminants remaining on-site until clean closure is achieved and the aquifer restored, EPA will review the Site at least once every five years after construction is complete at the Site to assure that the remedial action continues to be protective of human health and the environment.

M. DOCUMENTATION OF NO SIGNIFICANT CHANGES

The Proposed Plan to Amend the 1991 ROD was released for public comment in June 2004. The proposed change called for attaining protectiveness of human health through institutional controls, long-term monitoring, construction of an air-sparging trench (with a contingency for capping), and restoration of ground water through both monitored natural attenuation and pump-and-treat. The Amended Proposed Plan also included excavating contaminated sediment from, and then covering, the existing landfill drainage trenches. It also requires an environmental monitoring program, a contingency remedy of pump-and-treat for the Eastern Plume, and five-year reviews.

EPA has determined that, based on comments received during the public comment period which concluded on August 11, 2004, no significant change is needed to the Amended Proposed Plan. EPA has prepared a Responsiveness Summary to address the comments received during the public comment period. The Responsiveness Summary is attached as Appendix D.

N. STATE ROLE

The New Hampshire Department of Environmental Services has reviewed the proposed remedy change for the Site and concurs with the selected remedy described in Section K of this Amended ROD. A copy of the State concurrence letter is attached as Appendix C.

O. REFERENCES

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Golder Associates, December 1996. Dover Landfill Final (100%) Design Report.

GeoInsight, November 15, 2002. Summary of Summer 2002 EMP Event, Dover Municipal Landfill.

USEPA, March 16, 1998. Risk-Based Clean Closure memorandum from Elizabeth Cotsworth, Acting Director, Office of Solid Waste.

USEPA, Environmental Monitoring Systems Laboratory, Las Vegas, NV., March 1985, Site Analysis Dover Landfill, TS-PIC-85010.

Attachment 1: ARARs as they apply to Site Conditions

The Attached Tables, in Order:

Table 1A: Action-Specific ARARs
Table 1B: Chemical-Specific ARARs
Table 1C: Location-Specific ARARs

Table 1A: Potential Action-Specific ARARs

Requirement	Authority	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
FEDERAL - 40 CFR Part 261 RCRA Standards for identification and listing of hazardous waste	Federal Regulatory Requirement	AR for treatment processes RAR to material in landfill	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations. These provisions of the federal regulations have been adopted by the State.	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 the substantive requirements of the State hazardous waste regulations.
FEDERAL - 40 CFR Part 262 RCRA Standards Applicable to Generators of Hazardous Wastes	Federal Regulatory Requirement	AR	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations. These provisions of the federal regulation have been adopted by the State.	If remedial treatment or excavation generates hazardous wastes, then they will be managed in accordance with the substantive requirements of the State hazardous waste regulations.
FEDERAL - 40 CFR Part 264 RCRA Standards for Owners and Operators of Hazardous Waste TSDF Facilities	Federal Regulatory Requirement	RAR for landfill and RAR for treatment processes	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations. The relevant and appropriate provisions of 40 CFR Part 264 are incorporated by reference.	The specific portions of the State regulations that are relevant and appropriate to the remedial alternatives for the landfill such as closure and groundwater monitoring requirements and applicable for the treatment processes will be identified in Section 5 tables.
FEDERAL - 40 CFR Part 264 Subpart AA RCRA - Air Emission Standards for Process Vents	Federal Regulatory Requirement	AR	Establishes air emission standards for process vents, closed-vent systems, and control devices at hazardous waste facilities; and apply to distillation, fractionation, thin-film evaporation, solvent extraction, and air or steam stripping operations that "manage hazardous wastes with organic concentrations of at least 10 ppmv."[1]	If process vents are used in remedial action, air emission controls will be implemented if the applicability threshold is met.
FEDERAL - 40 CFR Part 264 Subpart BB RCRA - Air Emission Standards for Equipment Leaks	Federal Regulatory Requirement	AR	Establishes air emission standards for equipment leaks at hazardous waste facilities where equipment "contains or contacts hazardous wastes with organic concentrations of at least 10 percent by weight."[1]	If equipment covered by this standard is used in the remedial action and handles hazardous substance at concentrations that meet this rule's threshold, then air emission controls will be implemented.
FEDERAL - 40 CFR Part 264 Subpart CC RCRA - Air Emission Standards for Tanks, Surface Impoundments and Containers	Federal Regulatory Requirement	AR	Establishes air emission standards for facilities that treat store or dispose hazardous wastes in tanks, surface impoundments, or containers.[1]	If tanks, containers, or surface impoundments are used in the remedial action and meet the applicability threshold, then air emission controls will be implemented

~~1.~~[1]Because New Hampshire has not yet adopted regulations incorporating 40 CFR 264, subparts AA - CC, the Federal regulations are the source for these ARARs.

Table 1A: Potential Action-Specific ARARs

Requirement	Authority	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
STATE - Env-Wm 403.6 Identification and Listing of Hazardous Wastes; Toxicity Characteristic	State Regulatory Requirement	AR	These requirements list particular hazardous waste and identify the maximum concentrations of contaminants for which the waste would be a RCRA characteristic waste because of its toxicity. The analytical test set out in Appendix II of 40 CFR Part 261 is referred to as the Toxicity Characteristic Leaching Procedure (TCLP).	Excavated materials from the Site and material generated by treatment processes will be analyzed to determine whether they are listed or characteristic hazardous waste under RCRA. Materials that are listed waste or exceed TCLP hazardous waste thresholds will be disposed off-site in a RCRA Subtitle C TSDF. Non-hazardous materials will be used as backfill or disposed appropriately.
STATE - Env-Wm 500 Requirements for Hazardous Waste Generators [formerly He-P Ch. 1905.06]	State Regulatory Requirement	AR	Requires determination as to whether waste materials are hazardous and, if so, requirements for managing such materials on site prior to shipment off site.	If remedial treatment or excavation generates hazardous waste that must be shipped off-site, then it will be managed on-site in accordance with the substantive provisions of these regulations prior to off-site shipment.
STATE - Env-Wm 700 Requirements for Owners and Operators of Hazardous Waste Facilities /Hazardous Waste Transfer Facilities [formerly He-P Ch. 1905.08]	State Regulatory Requirement	RAR	Establishes requirements for owners or operators of hazardous waste sites or treatment facilities (federal requirements 40 CFR Parts 264 are incorporated by reference).	The specific portions of these regulations that are relevant to the remedial alternative(s) will be identified and addressed in Section 5 tables.
STATE - Env-Wm 702.10 – 702.13 Groundwater Monitoring [formerly He-P Ch. 1905.08(d)(6)a,b]	State Regulatory Requirement	RAR	Establishes requirements for installation and operation of ground water monitoring network capable of detecting potential migration of hazardous waste or constituents and requires corrective action when necessary. Relevant and appropriate for COCs in ground water.	Remedial alternatives will include ground water monitoring systems that meet the substantive elements of this relevant and appropriate requirement and detect and correct contaminant groundwater releases.
STATE - Env-Wm 708.02(a)(12) Closure and Post-Closure Disposal Units	State Regulatory Requirement	RAR	Incorporates by reference 40 CFR 264.110 - .120 (subpart G). Landfill must be closed in a manner that controls, minimizes or eliminates the potential for land filled COCs to threaten human health and the environment. Closure design must also minimize maintenance of the Site. After the Landfill is closed and waste is left in place, regular monitoring and maintenance must be performed for at least 30 years.	Source control remedy will comply with the substantive requirements of these regulations for landfills with waste left in place or for clean closure.
STATE - Env-Wm 708.03 (d)(1) Use and Management of Containers	State Regulatory Requirement	AR	Establishes requirements for the condition of containers, compatibility of hazardous waste stored in containers, and the management, inspection, and closure of containers. Incorporates by reference 40 CFR 264.170-.179 (Subpart I).	If excavated materials or any other materials generated from the remedy are hazardous waste and are managed in containers, then the containers will be managed to meet the substantive portion of this requirement.

Table 1A: Potential Action-Specific ARARs

Requirement	Authority	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
STATE - Env-Wm 708.03(d)(2) Tanks	State Regulatory Requirement	AR	Tanks or tank systems used to temporarily store hazardous liquids or as part of a treatment system for hazardous liquids or sludges must be designed, installed and operated in accordance with the RCRA Standards. Incorporates by reference 40 CFR 264.140 - .198 (subpart J).	If a tank or tank system is used for storing or treating hazardous wastes as part of Site remediation, it must be constructed with secondary containment and a leak detection system, and comply with monitoring and inspection requirements.
STATE – Env-Wm 708.03(d)(4) Waste Piles [formerly He-P Ch. 1905.08(f)(l)(d)]	State Regulatory Requirement	AR	General design and operation requirements for temporary storage of hazardous soils and/or sludges. Locations must have an impermeable liner and materials stored in piles must be free of standing liquid. Incorporates by reference 264.250-259 (subpart L).	If hazardous waste piles are included in the remedial alternative selected for the Landfill, then these requirements must be met.
STATE - Env-Wm 1403 Ground Water Management and Ground Water Release Detection Permits	State Regulatory Requirement	AR	Prohibits discharge of hazardous waste to ground water, or any discharge of ground water that would result in a violation of surface water quality in adjacent surface waters. Also, ground water cannot be altered so as to make it unsuitable for drinking. Establishes groundwater management zones (GMZ).	Ground water monitoring and treatment will be required to attain State AGQSs. Any ground water discharges from treatment systems, including the treatment trench, must meet the applicable standards. A GMZ will be established at the site and will remain in place until cleanup goals have been attained throughout the GMZ.
STATE – RSA 485-A:17 and NH Admin. Code Env-Ws 415 Terrain Alteration	State Regulatory Requirement	AR	Establishes criteria to control erosion and run-off for any activity that significantly alters the terrain.	Any action taken at the Site that will disturb an area of more than 100,000 contiguous square feet must comply with these criteria.
STATE – NH Admin. Code Env-A Part 1002 Fugitive Dust Control	State Regulatory Requirement	AR	Requires precautions to prevent, abate and control fugitive dust during specified activities, including excavation, construction and bulk hauling.	Precautions to control fugitive dust emissions will be required both during and after Site remediation.
STATE - Env-Ws 1500 New Hampshire Ground Water Discharge Permit and Registration Rules	State Regulatory Requirement	AR	These regulations established substantive requirements for discharges to ground water, including prohibited discharges (Env-Ws 1503.04), compliance criteria (Env-Ws 1504.03), water quality sampling (Env-Ws 1507.01).	If water is discharged into the Landfill, into the surrounding area, or to ground water, then such discharges will receive appropriate treatment to comply with the substantive requirements of this ARAR.

Table 1A: Potential Action-Specific ARARs

Requirement	Authority	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
STATE - Env-A300 Ambient Air Quality Standards	State Regulatory Requirement	AR	Establishes primary and secondary level for eight air contaminants: • particulate matter • sulfur dioxide • carbon dioxide • nitrogen dioxide • ozone • hydrocarbons • fluorides • lead Seven of the primary and secondary standards established under this State standard are adopted from the federal NAAQS.	These air contaminant levels will be used to establish target levels for air releases from the Site and site remediation activities.
STATE - Env-A 1300 Toxic Air Pollutants	State Regulatory Requirement	AR	Establishes ambient air limits for 74 chemicals. These ambient air limits (AALs) are levels at, or below, which ambient air concentrations of respective air contaminant will not adversely affect human health.	Releases of contaminants to the air from any source on Site will not exceed applicable AALs. Air emission controls will be implemented if needed to prevent any detected exceedences.
STATE - Env-Ws 904 Pretreatment Standards	State Regulatory Requirement	AR	Provides standards for indirect discharge of pollutants to POTWs.	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 impacts the sludge produced, the groundwater shall be pretreated either on site or at the POTW before entering the system.
STATE – Chapter We 600 Standards for construction, maintenance and abandonment of wells	State Regulatory Requirement	AR	These regulations apply to the construction, maintenance and abandonment of wells.	Wells will be constructed, maintained, relocated and/ or abandoned according to these regulations.
FEDERAL - 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/correctiveation/cis/vapor.htm	Federal guidance	TBC	This draft guidance establishes a methodology for assessing indoor air risks to human health.	Potential risks associated with indoor air at residences near the Site will be evaluated and monitored consistent with this guidance.
FEDERAL – EPA Guidance: Risk-Based Clean Closure, March 16, 1998	Federal Guidance	TBC	This guidance describes risk-based clean closure at RCRA hazardous waste units.	Remedial alternatives involving clean closure will be closed consistent with this guidance.

Table 1A: Potential Action-Specific ARARs

Requirement	Authority	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
FEDERAL – Technical Guidance for Final Covers on Hazardous Waste Landfills and Surface Impoundments: EPA/530-SW-047; July, 1989	Federal Guidance	TBC	This guidance sets out criteria for hazardous waste landfill covers	Remedial alternatives involving RCRA C caps will be implemented consistent with this guidance.
FEDERAL– Technical Memorandum – EPA Region 1 from Dennis Gagne and Yoon-Jean Choi to Office of Site Remediation and Restoration (February 5, 2001) http://www.epa.gov/region1/superfund/resource/C524.pdf	Federal Guidance	TBC	This guidance sets out criteria for alternative hazardous waste landfill covers.	Remedial alternatives involving RCRA C caps may consider this guidance.
FEDERAL – Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. OSWER Directive 9200.4-17P, April 21, 1999.	Federal Guidance	TBC	This guidance sets criteria for evaluating monitored natural attenuation as a remedy at, among others, Superfund sites.	Remedial alternatives that incorporate monitored natural attenuation for groundwater will demonstrate the effectiveness of this alternative for addressing groundwater in an acceptable amount of time consistent with this guidance.
State – Surface Water Quality Standards, Env-Ws 1708	State Regulatory Requirement	Relevant and Appropriate	Standards for protection against degradation of surface water (check this). Standards and criteria based on federal ambient water quality criteria for protection of human health and aquatic life.	Standards will be used to measure the performance and effectiveness of remedial alternatives in preventing contaminated groundwater and surface runoff and discharges from degrading nearby surface waters.
Federal – CWA Section 402, National Pollutant Discharge Elimination System (NPDES)	Federal Regulatory Requirement	AR	Contains discharge limitations, monitoring requirements, and best management practices. Substantive requirements under NPDES are written such that state and federal ambient water quality criteria (AWQC) are met.	On-site discharges shall meet the substantive discharge standards.

Table 1B: Potential Chemical Specific ARARs

Media	Requirement	Authority	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Ground Water	STATE – Env–Wm 1400 Ground Water Protection Standards	State Regulatory Requirement	AR	New Hampshire AGQSs are standards that apply to all ground water in the State, consistent with the Legislature's designation of all ground water as a potential water supply.	Groundwater will attain State AGQSs, MCLs, non-zero MCLGs when there is no MCL or State drinking water standards, whichever is more stringent, at the completion of the remedy.
Ground Water	Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.14). Revised MCLs (40 CFR 141.61-141.62) and non-zero Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50-141.51)	Federal Regulatory Requirement	RAR (MCLs and non-zero MCLGs); TBC (MCLGs)	MCLs have been promulgated for a number of common organic and inorganic contaminants to regulate the concentration of contaminants in public drinking water supply systems. MCLs are relevant and appropriate for Site ground water because ground water in the Site vicinity may be used for drinking water. MCLGs are non-enforceable health goals for public water systems.	Ground water will attain State AGQSs , MCLs, non-zero MCLGs when there is no MCL or State drinking water standards, whichever is more stringent at the completion of the remedy.
Ground Water	New Hampshire Drinking Water Quality Standards (Env-Ws 316, 317, 319)	State Regulatory Requirement	RAR (MCLs and non-zero); TBC (MCLGs)	State MCLs and MCLGs establish maximum contaminant levels permitted in public water supplies and are the basis of State AGQSs that are applicable to site ground water. Secondary Maximum Contaminant Levels (MCLs) apply to contaminants that primarily affect the aesthetic quality of drinking water. The regulations are generally equivalent to the Federal SDWA. State drinking water quality standards are relevant and appropriate for Site ground water because ground water in the Site vicinity may be used for drinking water.	Ground water will attain State AGQSs, MCLs, non-zero MCLGs when there is no MCL or State drinking water standards, whichever is more stringent, at completion of the remedy.
Ground Water Surface Water Indoor Air	FEDERAL – USEPA Risk RfDs	Federal Regulatory Requirement	TBC	RfDs are dose levels developed by the USEPA for non-carcinogenic effects.	USEPA RfDs will be used to characterize risks due to exposure to contaminants in ground water and other media.
Ground Water Surface Water Indoor Air	FEDERAL – USEPA Carcinogen Group Potency Factors	Federal Regulatory Requirement	TBC	Potency Factors are developed by the USEPA from Health Assessments or evaluation by the Carcinogen Effects Assessments Group.	USEPA Carcinogenic Potency Factors will be used to compute the individual incremental cancer risk resulting from exposure to site contaminants.
Sediment	Ontario Lowest Effect Levels 1993, 1994	Guidance	TBC	Establishes lowest effect levels for freshwater biota for various contaminants	Used to provide a spectrum of individual incremental cancer risk resulting from exposure to site contaminants for use in ecological risk assessment.

Table 1B: Potential Chemical Specific ARARs

Media	Requirement	Authority	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Sediment	FEDERAL – NOAA Technical Memorandum NOS OMA 52	Federal Guidance	TBC	Ecotoxicity thresholds for various contaminants in sediments and their potential biological effects on biota exposed to the contaminants.	Thresholds for soil and sediments concentrations may be used in an ecological risk assessment.

Table 1C: Potential Location-Specific ARARs

Media	Requirement	Authority	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Wetlands	FEDERAL – CWA Section 404; 40 CFR Part 230:33 CFR Parts 320-330	Federal Regulatory Requirement	AR	These codes establish requirements for the discharge of dredged or fill material into water bodies or wetlands. The regulations prohibit the discharge of dredged or fill material "if there is a practicable alternative…which would issue less impact on the aquatic ecosystem."	Remedial actions that will result in filling of water bodies or wetlands around the Site must comply with the substantive portions of these requirements. Filling the perimeter ditch is the least environmentally damaging, practicable activity because it will minimize contact with contaminated sediments, prevent sediment re-contamination, and allow ground water to migrate to collection and treatment systems for permanent treatment.
Wetlands	Federal Executive Orders 11990 Protection of Wetlands FEDERAL – 40 CFR Part 6 Appendix A	Federal Regulatory Requirement	AR	Federal agencies are required to avoid the destruction or modification of wetlands, and direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Where avoidance of wetlands cannot be achieved, the proposed action includes all practicable means to limit impact to wetlands that may result from such activity.	Remedial actions will use all practicable means to avoid destruction or modification of wetlands surrounding Site. Remedial alternatives represent the best practicable approach to remediation with the least environmentally damaging impacts.
Land	FEDERAL – RCRA General Facility Standards 40 CFR 264.18(a) Seismic Standards	Federal Regulatory Requirement	AR	Construction of new hazardous waste treatment, storage or disposal facilities is prohibited within 200 feet of a fault that has had a displacement in Holocene time.	Construction of any on-site treatment facility will consider this location standard in design.
Wetlands	FEDERAL – 16 USC 661 et. seq., Fish and Wildlife Coordination Act	Federal Regulatory Requirement	AR	Requires actions to be taken to avoid adverse effects, minimize potential harm to fish or wildlife, and to preserve natural and beneficial uses of the land.	Relevant federal agencies must be contacted to help analyze impacts of remedial action on wildlife in wetlands and river.
Wetlands	STATE – RSA 482-A and Env–Wt 300 New Hampshire Criteria and Conditions for Fill and Dredging in Wetlands	State Regulatory Requirement	AR	Any activity in or adjacent to wetlands, including filling and dredging, must meet these criteria for wetlands protection.	Any remedial activities affecting the wetlands will meet the substantive requirements of this State statute and its regulations. Filling perimeter ditches is the least environmentally damaging activity because it will minimize contact with contaminated sediments, prevent sediment recontamination, and allow groundwater to migrate to collection and treatment systems for permanent treatment.
Ground Water	STATE – Wellhead Protection Program	State Guidance	TBC	Provides criteria for wellhead protection area delineation and identification of contamination sources to be excluded from this area.	These provisions will be considered relative to protection of the Calderwood Well.

Attachment 2: ARARs as they apply to Each Alternative

<u>The Attached Tables, in Order:</u>

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
FEDERAL - 40 CFR Part 261 RCRA Standards for identification and listing of hazardous waste	Applicable Used to evaluate site risk	Applicable to excavated material and material generated by treatment processes Relevant and appropriate to material in landfill 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.	Applicable to excavated material and material generated by treatment processes Relevant and appropriate to material in landfill 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.	Applicable to excavated material and material generated by treatment processes Relevant and appropriate to material in landfill 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.
FEDERAL - 40 CFR Part 262 RCRA Standards Applicable to Generators of Hazardous Wastes	Not an ARAR	Applicable 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.	Applicable 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.	Applicable 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.

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
FEDERAL - 40 CFR Part 264 RCRA Standards for Owners and Operators of Hazardous Waste TSDF Facilities (See state action specific ARARs for specific sections)	Not an ARAR	Applicable for treatment processes Relevant and appropriate for landfill The specific portions of the State regulations that are ARARs for this alternative are identified in the state action-specific section.	Applicable for treatment processes Relevant and appropriate for landfill The specific portions of the state regulations that are ARARs for this alternative are identified in the state action-specific section. .	Applicable for treatment processes Relevant and appropriate for landfill The specific portions of the state regulations that are ARARs for this alternative are identified in the state action-specific section..
FEDERAL - 40 CFR Part 264 Subpart AA RCRA - Air Emission Standards for Process Vents	Not an ARAR.	Applicable 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.	Applicable 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.	Applicable 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.
FEDERAL - 40 CFR Part 264 Subpart BB RCRA - Air Emission Standards for Equipment Leaks	Not an ARAR.	Applicable 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.	Applicable 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.	Applicable 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.

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
FEDERAL - 40 CFR Part 265 Subpart CC RCRA - Air Emission Standards for Tanks, Surface Impoundments and Containers	Not an ARAR.	Applicable If tanks, surface impoundments or containers are used in the remedial action and meet the applicability threshold, then air emission controls will be implemented.	Applicable If tanks, surface impoundments or containers are used in the remedial action and meet the applicability threshold, then air emission controls will be implemented.	Applicable If tanks, surface impoundments or containers are used in the remedial action and meet the applicability threshold, then air emission controls will be implemented.
FEDERAL – CWA Section 402, National Pollutant Discharge Elimination System (NPDES)	Not an ARAR	Applicable On-site discharges shall meet the substantive discharge standards	Applicable If re-injection of treated ground water to landfill becomes infeasible, any onsite discharges shall meet the substantive requirements of these standards.	Applicable On-site discharges shall meet the substantive discharge standards

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
STATE - Env-Wm 403.6 Identification and Listing of Hazardous Wastes; Toxicity Characteristic	Applicable Used to evaluate site risk.	Applicable to excavated material and material generated by treatment processes Relevant and Appropriate to material in landfill 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.	Applicable to excavated material and material generated by treatment processes Relevant and Appropriate to material in landfill 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.	Applicable to excavated material and material generated by treatment processes Relevant and appropriate to material in landfill 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.

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
STATE - Env-Wm 500 Requirements for Hazardous Waste Generators [formerly He-P Ch 1905.06]	Not an ARAR	Applicable 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.	Applicable 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 this regulation.	Applicable 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.
STATE – Env-Wm 700 Requirements for Owners and Operators of Hazardous Waste Facilities /Hazardous Waste Transfer Facilities [formerly He-P Ch 1905.08]	Not an ARAR	Applicable for treatment processes Relevant and Appropriate for landfill This regulation establishes requirements for owners and operators of hazardous waste sites or treatment facilities. Specific sections are ARARs as described below	Applicable for treatment processes Relevant and Appropriate for landfill This regulation establishes requirements for owners and operators of hazardous waste sites or treatment facilities. Specific sections are ARARs as described below.	Applicable for treatment processes Relevant and Appropriate for landfill This regulation establishes requirements for owners and operators of hazardous waste sites or treatment facilities. Specific sections are ARARs as described below.

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
STATE – Env-Wm 702.10 – 702.13 Groundwater Monitoring [formerly He-P Ch. 1905.08(d)(6) a,b]	Not an ARAR .	Relevant and Appropriate 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.	Relevant and Appropriate 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.	Relevant and Appropriate 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.
STATE - Env-Wm 708.)02(a)(12) Closure and Post-Closure Disposal Units	Not an ARAR .	Relevant and Appropriate 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.	Relevant and Appropriate Landfill must meet clean closure standards at the completion of the remedy.	Relevant and Appropriate Landfill must meet clean closure standards at the completion of the remedy.
STATE - Env-Wm 708.03 (d)(1) Use and Management of Containers	Not an ARAR	Applicable 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.	Applicable 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.	Applicable 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.

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
STATE - Env-Wm 708.03(d)(2) Tanks	Not an ARAR.	Applicable 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.	Applicable 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.	Applicable 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.
STATE – Env-Wm 708.03(d)(4) Waste Piles [formerly He-P Ch. 1905.08 (f)(1)(d)]	Not an ARAR	Applicable 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.	Applicable 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.	Applicable 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.

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
STATE – Env-Wm 1403 Ground Water Management and Ground Water Release Detection Permits	Not an ARAR	Applicable Extracted ground water 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 ground water 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.	Applicable Ground water re-injected into landfill and ground water discharged to wetlands or that ultimately discharges to surface water shall be treated to meet AGWC 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.	Applicable Ground water re-injected into landfill and ground water 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.
STATE – RSA 485-A:17 and NH Admin. Code Env-Ws 415 Terrain Alteration	Not an ARAR	Applicable 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.	Applicable Erosion and surface water runoff controls will be used during sediment excavation and ditch backfilling and during any other remedial activities	Applicable Erosion and surface water runoff controls will be used during sediment excavation and ditch backfilling and during any other remedial activities

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
STATE – NH Admin. Code Env-A Part 1002 Fugitive Dust Control	Not an ARAR.	Applicable Measure to prevent, abate and control fugitive dust will be used during periods of re-contouring of the Landfill and cap construction and during any other activities which produce fugitive dust	Applicable The regulation will be met by maintenance of the soil protective cover and the use of dust suppressants during excavation activities.	Applicable The regulation will be met by maintenance of the soil protective cover and the use of dust suppressants during excavation activities.
STATE - Env-Ws 1500 New Hampshire Ground Water Discharge Permit and Registration Rules	Not an ARAR.	Applicable Any ground water re-injected into the landfill or discharged onsite or into surrounding wetlands will receive appropriate treatment to comply with the substantive requirements of this ARAR.	Applicable Ground water re-injected into the Landfill, or discharged onsite or into surrounding wetlands will receive appropriate treatment to comply with the substantive requirements of this ARAR.	Applicable Ground water re-injected into the Landfill or discharged onsite or into surrounding wetlands will receive appropriate treatment to comply with the substantive requirements of this ARAR.
STATE – Surface Water Quality Standards, Env-WS 1708	Not an ARAR	Relevant and Appropriate 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.	Relevant and Appropriate Standards will be used to measure the performance and effectiveness of the treatment trench and source ground water containment systems and discharges, erosion control and surface runoff measures from degrading nearby surface waters.	Relevant and Appropriate Standards will be used to measure the performance and effectiveness of the treatment trench and source ground water containment systems and discharges, erosion control and surface runoff measures from degrading nearby surface waters

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
STATE - Env-A300 Ambient Air Quality Standards	Not an ARAR.	Applicable Air contaminants, especially particulate matter emissions generated during on-site activities will be controlled, to ensure that the appropriate regulatory standards are met.	Applicable Air contaminants, especially particulate matter emissions generated during on-site activities will be controlled, to ensure that the appropriate regulatory standards are met.	Applicable Air contaminants, especially particulate matter emissions generated during on-site activities will be controlled, to ensure that the appropriate regulatory standards are met.
STATE - Env-A 1300 Toxic Air Pollutants	Not an ARAR	Applicable Releases of contaminants to the air from any source on Site will be monitored to ensure levels do not exceed ambient air levels.	Applicable Releases of contaminants to the air from any source on Site will be monitored to ensure levels do not exceed the respective AAL.	Applicable Releases of contaminants to the air from any source on Site will be monitored to ensure levels do not exceed the respective AAL.

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
STATE – Env-Ws 904 Pretreatment Standards	Not an ARAR	Applicable 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	Not an ARAR
STATE – Chapter We 600 Standards for construction, maintenance and abandonment of wells	Not an ARAR	Applicable All wells will be constructed, maintained, relocated and/or abandoned according to these regulations	Applicable All wells will be constructed, maintained, relocated and/or abandoned according to these regulations.	Applicable All wells will be constructed, maintained, relocated and/or abandoned according to these regulations.
FEDERAL - 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/correctiveation/cis/vapor.htm	TBC Used to evaluate potential l risks associated with indoor air at residences near the	TBC Potential risks associated with indoor air at residences near the Site will be evaluated, monitored and corrected, consistent with this guidance.	TBC Potential risks associated with indoor air at residences near the Site will be evaluated, monitored and corrected, consistent with this guidance.	TBC Potential risks associated with indoor air at residences near the Site will be evaluated, monitored and corrected, consistent with this guidance.

Table 2A. Action-Specific ARARs

Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
FEDERAL – Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. OSWER Directive 9200.4-17P, April 21, 1999.	No an ARAR	TBC Contaminant levels in Eastern Plume shall be monitored consistent with this guidance.	TBC MNA evaluations for the Eastern and Southern Plumes shall be performed consistent with this guidance as well as monitoring.	TBC Contaminant levels in Eastern Plume shall be monitored consistent with this guidance.
FEDERAL – EPA Guidance: Risk-Based Clean Closure, March 16, 1998	Not an ARAR	Not an ARAR	TBC Landfill will be closed consistent with this guidance at the completion of the remedy.	TBC Landfill will be closed consistent with this guidance at the completion of the remedy.
FEDERAL – EPA Guidance: Technical Guidance for Final Covers on Haz. Waste Landfills and Surface Impoundments: EPA/530-SW-047; July, 1989.	Not an ARAR	TBC RCRA C cap shall be constructed consistent with this guidance	TBC An appropriate cover will be placed on the landfill once clean closure is achieved.	TBC An appropriate cover will be placed on the landfill once clean closure is achieved.
FEDERAL – Technical Memorandum – EPA Region 1 from Dennis Gagne and Yoon-Jean Choi to Office of Site Remediation and Restoration (February 5, 2001) http://www.epa.gov/region1/superfund/resource/C524.pdf	Not an ARAR	TBC This guidance may be considered when construcing the RCRA C cap.	TBC An appropriate cover will be placed on the landfill once clean closure is achieved.	TBC An appropriate cover will be placed on the landfill once clean closure is achieved.

Table 2B. Chemical-Specific ARARs

Media	Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
Ground Water	STATE – Env–Wm1400 Ground Water Protection Standards	Applicable AGQSs used to calculate site groundwater risk.	Applicable On-and off-site ground water will attain State AGQSs, MCLs, non-zero MCLGs when there is no MCL or State drinking water standards, whichever is more stringent, 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 ground water quality.	Applicable On- and off-site ground water will attain State AGWSs, MCLs, non-zero MCLGs when there is no MCL or State drinking water standards whichever is more stringent, at the completion of the remedy. If the remedy is unsuccessful, ground water 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 ground water quality.	Applicable On- and off-site ground water will attain State AGWSs, MCLs, non-zero MCLGs when there is no MCL or State drinking water standards whichever is more stringent, at the completion of the remedy. If the remedy is unsuccessful, ground water 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 ground water quality.
Ground Water	FEDERAL - Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.14). Revised MCLs (40 CFR 141.61-141.62) and non-zero Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50-141.51)	Relevant and Appropriate MCL/MCLGs used to calculate site risk.	Relevant and Appropriate On-and off-site ground water will attain State AGQSs, MCLs, non-zero 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.	Relevant and Appropriate - On- and off-site ground water will attain State AGQSs, MCLs, non-zero 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 natural attenuation in the plumes. Otherwise, the contingencies of capping the landfill and active treatment of groundwater will meet cleanup levels in groundwater at the completion of the remedy.	Relevant and Appropriate On and off-site ground water will attain State AGQSs, MCLs, non-zero 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.

Table 2B. Chemical-Specific ARARs

Media	Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
Ground Water	New Hampshire Drinking Water Quality Standards (Env-Ws 316, 317, 319)	Relevant and Appropriate MCLs/MCLGs used to calculate site risk. AGQSs are the same as these standards.	Relevant and Appropriate On- and off-site ground water will attain State AGQSs, MCLs, non-zero 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 extraction and treatment of groundwater in southern plume. Groundwater in eastern plume expected to meet levels through natural attenuation.	Relevant and Appropriate On- and off-site ground water will attain State AGQSs, MCLs, non-zero MCLGs when there is no MCL or State drinking water standards whichever is more stringent at the completion of the remedy. If the remedy is unsuccessful, groundwater will meet cleanup levels through contingent actions.	Relevant and Appropriate On and off-site ground water will attain State AGQSs, MCLs, non-zero MCLGs when there is no MCL or State drinking water standards whichever is more stringent at the completion of the remedy. If the remedy is unsuccessful, groundwater will meet cleanup levels through contingent actions.,
Ground Water Surface Water Indoor Air	FEDERAL – USEPA Risk Reference Doses (RfDs)	TBC RfDs will be used to characterize risks associated with residual COC concentrations.	TBC RfDs will be used to characterize risks associated with residual COC concentrations.	TBC RfDs will be used to characterize risks associated with residual COC concentrations.	TBC RfDs will be used to characterize risks associated with residual contaminant concentrations.
Ground Water Surface Water Indoor Air	FEDERAL – USEPA Carcinogen Group Potency Factors	TBC CPFs will be used to characterize risks associated with residual COC concentrations.	TBC CPFs will be used to characterize risks associated with residual COC concentrations.	TBC CPFs will be used to characterize risks associated with residual COC concentrations.	TBC CPFs will be used to characterize risks associated with residual contaminant concentrations.

Table 2B. Chemical-Specific ARARs

Media	Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
Sediment Soil	FEDERAL – NOAA Technical Memorandum NOS OMA 52	TBC Potential ecological risks evaluated using these thresholds.	TBC 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.	TBC 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.	TBC 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.
Sediment	Ontario Lowest Effect Levels 1993, 1994	TBC Used to provide a spectrum of individual incremental cancer risk resulting from exposure to site contaminants for use in ecological risk assessment.	TBC Used to provide a spectrum of individual incremental cancer risk resulting from exposure to site contaminants for use in ecological risk assessment.	TBC Used to provide a spectrum of individual incremental cancer risk resulting from exposure to site contaminants for use in ecological risk assessment.	TBC Used to provide a spectrum of individual incremental cancer risk resulting from exposure to site contaminants for use in ecological risk assessment.

Table 2C. Location Specific ARARs

Media	Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
Wetlands	FEDERAL – CWA Section 404; 40 CFR Part 230:33 CFR Parts 320-330	Not an ARAR .	Applicable Material excavated from wetlands and water bodies during re-contouring 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.	Applicable Material excavated from wetlands and water bodies during construction of the aerobic treatment trench , the vertical hydraulic barrier , 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.	Applicable 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.
Wetlands	Federal Executive Orders 11990 Protection of Wetlands FEDERAL – 40 CFR Part 6 Appendix A	Not an ARAR .	Applicable 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.	Applicable 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.	Applicable 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.

Table 2C. Location Specific ARARs

Media	Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
Land	FEDERAL – RCRA General Facility Standards 40 CFR 264.18(a) Seismic Standards	Not an ARAR	Applicable 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.	Applicable 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.	Applicable 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.
Wetlands	FEDERAL – 16 USC 661 et. seq., Fish and Wildlife Coordination Act	Not an ARAR.	Applicable 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.	Applicable Specified federal agencies will be contacted to help analyze impacts of installing and operating the treatment trench, localized source control actions and any other remedial activities on wildlife in wetlands and the river.	Applicable 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.
Wetlands	STATE – RSA 482-A and Env–Wt 300 - 400, 600, New Hampshire Criteria and Conditions for Fill and Dredging in Wetlands	Not an ARAR	Applicable Material excavated from wetlands and water bodies during re-contouring 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. Wetlands will be restored to the extent practicable.	Applicable Material excavated from wetlands and water bodies during construction of the aerobic treatment trench , the vertical hydraulic barrier , 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. .	Applicable 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. Wetlands will be restored to the extent practicable.

Table 2C. Location Specific ARARs

Media	Requirement	No Action Alternative	1991 ROD Remedy	Alternative Remedy	Mixed Alternative Remedy
Ground Water	STATE – Wellhead Protection Program	TBC The No Action Alternative does not comply with State Plan	TBC 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.	TBC 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.	TBC 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

Appendix B: Administrative Record Index

DOVER MUNICIPAL LANDFILL
ENTIRE SITE
ADMINISTRATIVE RECORD FILE
DOVER ROD AMENDMENT

3. REMEDIAL INVESTIGATION (RI)

1. LETTER: COMMENTS ON THE RFFS RISK ASSESSMENT
   TO: DARRYL LUCE, US EPA REGION 1
   AUTHOR: ANDREW J HOFFMAN, NH DEPT OF ENVIRONMENTAL SERVICES
   DOC ID: 214515 05/21/2004

2. LETTER: RESPONSE TO COMMENTS ON THE RFFS RISK ASSESSMENT
   TO: ANDREW J HOFFMAN, NH DEPT OF ENVIRONMENTAL SERVICES
   AUTHOR: DARRYL LUCE, US EPA REGION 1
   DOC ID: 214516 06/18/2004

4. FEASIBILITY STUDY (FS)

1. REPORT: REVISED FOCUSED FEASIBILITY STUDY (FS) REPORT
   AUTHOR: GEOINSIGHT INC
   US EPA REGION 1
   DOC ID: 204932 01/30/2004

2. MEMO : DOVER SEDIMENT NUMBERS
   TO: CYNTHIA CATRI, US EPA REGION 1
   AUTHOR: DARRYL LUCE, US EPA REGION 1
   DOC ID: 214514 05/18/2004

3. FACT SHEET: AMENDED PROPOSED PLAN
   AUTHOR: US EPA REGION 1
   DOC ID: 209846 06/01/2004

4. REPORT: FOCUSED FEASIBILITY STUDY (FS) ADDENDUM
   AUTHOR: US EPA REGION 1
   DOC ID: 210486 06/18/2004

5. RECORD OF DECISION (ROD)

1. RECORD OF DECISION: RECORD OF DECISION (ROD) AMENDMENT
   AUTHOR: US EPA REGION 1
   DOC ID: 214517 09/30/2004

DOVER MUNICIPAL LANDFILL
ENTIRE SITE
ADMINISTRATIVE RECORD FILE
DOVER ROD AMENDMENT

13. COMMUNITY RELATIONS

1. FACT SHEET: INVITATION TO PUBLIC INFORMATION MEETING AND PUBLIC HEARING ON THE PROPOSED CLEANUP PLAN
AUTHOR: US EPA REGION 1
DOC ID: 210473 06/21/2004

Appendix C: State Concurrence Letter

The State of New Hampshire

Department of Environmental Services

Michael P. Nolin
Commissioner

September 29, 2004

Susan Studlien, Director
Office of Site Remediation and Restoration
EPA - New England, Region I
1 Congress Street, Suite 1100
Boston, MA 02114-2023

RE: Amended Record of Decision for the Dover Municipal Landfill Superfund Site

SUBJECT: Declaration of Concurrence

Dear Ms. Studlien:

The New Hampshire Department of Environmental Services (Department) has reviewed the Amended Record of Decision (AROD), dated September 30, 2004, for the Dover Municipal Landfill Superfund Site (Site) in Dover, New Hampshire. The United States Environmental Protection Agency (EPA) prepared the AROD 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 AROD 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 Amendment

On September 10, 1991, EPA issued the original ROD (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 have offered an alternative remedy which appears to be as protective as the 1991 ROD remedy.

Overview of the Record of Decision

In the 1991 ROD, EPA selected SC-7/7A as the source control component of the remedy and MM-2 and MM-4 as the management of migration component of the remedy for the Eastern and Southern Plumes, respectively.

The SC-7/7A component includes construction of: (1) a multi-layered cap including limited drainage swale sediment removal with consolidation under the cap; (2) groundwater extraction

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system and clean groundwater diversion system; (3) on-site groundwater treatment system with discharge to the Cocheco River for SC-7 or discharge to a POTW for SC-7A; (4) methane gas collection with passive venting; and (5) construction of a surface run-on/run-off diversion system with sedimentation and detention basins.

The management of migration component of the remedy includes: (1) MM-2 Monitored Natural Attenuation for the Eastern Plume, which discharges to the Cocheco River; and (2) MM-4 pump-and-treat of the Southern Plume, which migrates toward the Bellamy Reservoir.

Cleanup levels for the 1991 ROD were established for sediments and groundwater.

Overview of the Amended Record of Decision

The Amended ROD will change the source control remedy of the 1991 ROD from a RCRA-C landfill cap with groundwater diversion and capture to a remedy that instead will leave the landfill uncapped and install an air-sparging trench that parallels the downgradient landfill toe. Although the air-sparging trench is innovative and poses many technical challenges, the air-sparging remedy also offers the opportunity to accelerate cleanup of the wastes contained in the landfill, rather than entombing the wastes as in the 1991 ROD, potentially resulting in substantial cost savings.

The management of migration remedy remains as listed in the 1991 ROD, with one exception: arsenic-contaminated sediments that have collected in the Cocheco River, as a result of ongoing surface water and groundwater discharges, will be assessed and removed if necessary.

There are a number of technical challenges that will be posed during the design, construction and the verification phase of the amended source control remedy. To better define the technical challenges, the remedy will be installed in phases to provide opportunities for design alterations and to ensure it meets performance criteria prior to being implemented full-scale.

The air-sparging trench will capture arsenic by precipitation, volatile organic compounds (VOCs) by volatilization, and aerobically degrade tetrahydrofuran (THF) that is not volatilized. Arsenic precipitate will be removed by excavation, acid washing, or other appropriate method. VOCs and other volatile gases will be recovered for treatment, if appropriate, or discharged to the atmosphere. Stringent down-gradient monitoring will ensure that the remedy is performing as expected.

If it is found, during the phased construction of the air-sparge trench or later, that the remedy is not performing sufficiently to remove and contain the contaminants flowing from the landfill, the 1991 ROD remedy will be implemented as the contingent remedy. The 1996 Remedial Design will be followed in constructing the contingency remedy with modifications as directed by, or approved by, EPA and the State.

The Department has several concerns with the technical challenges of implementing the selected remedy. However, the Department believes that these issues may be resolved through the phased implementation (pilot study) of the selected remedy.

Given the delay in executing a full-scale source control remedy was a primary public concern identified during the public comment period for the amended remedy, EPA should be thorough and precise when establishing performance criteria, contingent remedy triggers and schedule for implementation of the phased remedy.

Justification for the Selected Remedy

The Department believes that the proposed source control alternative has the potential to be as protective as the 1991 ROD remedy, may offer greater flexibility in addressing contamination at the site, and could be less expensive. However, considering the uncertainty in the ability of the alternative to be implemented and to function as designed, execution of the remedy will be phased and the source control component of the 1991 ROD will be retained as the contingent remedy. 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 incremental 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 and the contingent 1991 ROD remedy is $19.3 million and $32.5 million, respectively. The cleanup will be performed under a negotiated consent decree with the PRPs.

State Concurrence

The Department, in reviewing the AROD, 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 groundwater, surface water and soil 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 Amended ROD.

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,

Anthony P. Giunta, P.G.
Director
Waste Management Division

cc: Darryl Luce, USEPA
Jennifer Patterson, Esq., NHDOJ
Frederick J. McGarry, P.E., DEE, NHDES
Carl W. Baxter, P.E., NHDES
Richard Pease, P.E., NHDES
Andrew Hoffman, P.E., NHDES

Appendix D: Responsiveness Summary

Attachment 1: Response to comments
Attachment 2: Transcript of Public Hearing on July 19, 2004
Attachment 3: Comment Letters

Attachment 1: Response to comments

United States
Environmental Protection Agency
Region I

Appendix D
Responsiveness Summary
Dover Municipal Landfill Site
Dover, New Hampshire

September 30, 2004

TABLE OF CONTENTS

INTRODUCTION

EPA is proposing to change the remedy for the Dover Municipal Landfill selected in 1991. Following almost ten years of additional study, EPA has selected a remedy to replace a portion of the 1991 Record of Decision (ROD). EPA presented this remedy in a Proposed Plan during a Public Information Meeting at Dover City Hall on the evening of June 21, 2004. EPA then held a Public Hearing on July 19, 2004 to take public comment on the Proposed Plan. In addition, the EPA held a 50-day public comment period on the Proposed Plan from June 22, 2004 to August 11, 2004.

The basis of the Proposed Plan was the January 30, 2004 Revised Focused Feasibility Study (RFFS) prepared by the consultants for the Potentially Responsible Parties (PRPs). EPA provided a review and interpretation of the RFFS in EPA's June 18, 2004 Addendum (the "EPA Addendum"). EPA considered all of the previous documents provided to support the 1991 ROD and the documents produced by the PRPs prior to the RFFS. All documents EPA considered in the deliberative process have been placed in the Administrative Record for review. The Administrative Record, which is a collection of all the documents considered by EPA to choose the remedy for the Site, is available at the EPA on 1 Congress Street in Boston, MA, at the Dover Public Library on 72 Locust Street in Dover, NH, and at the New Hampshire Department of Environmental Services (NHDES) on 29 Hazen Drive in Concord, NH.

The purpose of this Responsiveness Summary is to document EPA responses to the questions and comments raised during the public comment period. EPA considered all of the comments in this document before selecting a final remedial alternative to address contamination at the Site.

Although much of the site history is provided in the Amended ROD and other site documents, a short description is provided below.

SITE HISTORY

The 50-acre landfill began operations in 1960 on the western outskirts of the City of Dover near the Town lines of Madbury and Barrington. The landfill accepted municipal and industrial wastes, some of which was hazardous. In 1977 the Cities of Dover and Portsmouth, along with the precursor agency of NHDES, began to investigate the area surrounding the landfill due to the proximity of the Bellamy Reservoir as well as other public and private water supplies. Based on those investigations a public water supply line was extended to residences on Tolend and Glen Hill Roads. In 1983 the landfill was designated a Superfund site. NHDES under a cooperative agreement with EPA, began a Remedial Investigation (RI) and Feasibility Study (FS) in 1984. A number of potentially responsible parties formed the *Executive Committee of the Group of Work Settling Defendants, Dover Municipal Landfill* (the "Group") to take over investigations at the site. In 1988 the Group agreed to perform a Field Elements Study (FES) that would fill data gaps in the RI and FS.

Based on the RI/FS and the FES, EPA selected a remedy for the site in a 1991 Record of Decision (1991 ROD). The Group signed a Consent Decree to perform a significant portion of that remedy in 1992 and began pre-design studies to complete the design of the remedy called for in the 1991 ROD. In 1996 the 100% Remedial Design for the landfill cap was submitted to the Agencies for review. During this time period the Group also conducted additional investigations regarding alternative remedies to the 1991 ROD and presented the results of these investigations to EPA and NHDES. Based on this information, the Group, EPA and the State signed an Administrative Order on Consent (AOC) in 1997 allowing a pilot test of one of the alternatives, *in situ* bioremediation. Concurrent with the AOC, EPA and the NHDES signed a Memorandum of Understanding (MOU) allowing NHDES to be the lead Agency in overseeing the conduct of the bioremediation pilot.

Following four years of conducting the bioremediation pilot, NHDES, with EPA's concurrence, issued a letter to the Group stating that the bioremediation pilot would not be considered for implementation at the site except under certain constraints. Specifically, the the letter stated that the proposed system could only move forward if the amendments necessary for *in situ* bioremediation's operation were delivered throughout the entire formation, that is through a treatment trench (air-sparging). After considering this requirement, the Group proposed an air-sparging trench that, although different from the original bioremediation proposal, was still sufficiently similar in concept to allow consideration by EPA.

EPA, with NHDES' concurrence, examined the air-sparging trench proposal and found that it should be evaluated against the 1991 Source Control component of the 1991 ROD. EPA, along with NHDES, evaluated that Source Control component and outlined its findings in the Proposed Plan. EPA ultimately selected the air-sparging trench proposal for Source Control in this ROD Amendment.

HISTORY OF COMMUNITY INVOLVEMENT

In 1983 EPA began engaging the public on first the investigation and then, later, the cleanup plan for the Site. The meetings culminated in a April 16, 1991 Public Hearing. The summation of the public's involvement and reaction to the 1991 ROD are contained in Appendix G to the 1991 ROD. Overall, the predominant sentiment was one of concern over the cost of the remedy. The Water Department of the City of Portsmouth supported the 1991 ROD.

Since 1991 EPA has met with various municipal representatives in managing the Site. In addition, EPA and NHDES have met informally with members of the public and the Cocheco River Watershed Association. EPA and NHDES personnel along with members of the public canoed the Cocheco River and viewed portions of it affected by the site in Summer 2002. Also, EPA helped the Cocheco River Watershed Association obtain a Technical Assistance Grant (TAG) from EPA to allow an independent review of the data. When it became apparent in 2003 that the 1991 ROD may be amended, EPA began planning and then held the Public Meeting in June 2004. The Public Meeting was followed by a Public Hearing in Dover City Hall on July 19, 2004 soliciting the comments that are discussed further in this document.

OVERVIEW OF REMEDIAL ALTERNATIVES CONSIDERED FOR THE DOVER MUNICIPAL LANDFILL

In considering alternatives to amend an existing ROD, EPA typically compares the original selected remedy against only the No-Action Remedy and the proposed alternative(s). In this instance, EPA did examine the Source Control component of the 1991 ROD (SC-7/7A) against that of the No-Action Remedy (SC-1) and found the No-Action Remedy to be unprotective. EPA then evaluated the 1991 ROD against two other alternatives.

The remedy for the Dover Municipal Landfill is divided into two components, a Source Control component and a Management of Migration component. The purpose of the Source Control Component is to halt the migration of contaminants away from the landfill, the source. The purpose of the Management of Migration component is to cleanup contaminants that have migrated away from the source, principally the contaminated ground water.

The first alternative, called the Mixed Alternative Remedy, combines the proposed Source Control alternative of an air sparging trench, (SC-A), and retains the Management of Migration remedy, monitored natural attenuation (MM-2) for the Eastern Plume and pump and treat (MM-4) for the Southern Plume that was presented in the 1991 ROD. In this alternative, the most critical change is in the Source Control. Where the 1991 Remedy sought to **immobilize** contaminants in the landfill via capping, this alternative seeks to **mobilize** contaminants in the landfill so they may be conveyed to a treatment trench.

The second alternative, called the Alternative Remedy, proposed to amend both the Source Control component and the Management of Migration component in the Southern Plume which addresses contaminated ground water migrating towards the Bellamy Reservoir. While the 1991 Remedy called for pumping-and-treating the ground water in the Southern Plume, this alternative proposed to change the remedy to Monitored Natural Attenuation in the Southern Plume. This change was to be coupled with the changed Source Control Alternative. Only Monitored Natural Attenuation in the Eastern Plume was to be retained from the 1991 ROD.

EPA evaluated the alternatives to the 1991 ROD remedy and selected the Source Control component change from capping the landfill to treating the source contaminants through an air sparging trench as described in the Mixed Alternative Remedy. EPA also considered the proposed Management of Migration change in the Southern Plume and decided that the lack of information, coupled with the proximity of a significant regional drinking water resource, the Bellamy Reservoir, reinforced the reasons to proceed with a pump-and-treat remedy. Therefore, the Management of Migration component in the 1991 ROD for the Southern Plume, remains the same with Monitored Natural Attenuation in the Eastern Plume.

EPA's PREFERRED ALTERNATIVE

The only portion of the 1991 ROD that is changing is the Source Control component of the remedy. The ground water remedy in the Southern and Eastern Plumes is not changing. The change in the Source Control component is that instead of an impermeable cap and a 25-foot deep ground water diversion/interceptor trench surrounding the site, an air-sparging trench will surround the Site. Whereas in the 1991 ROD the 25-foot deep trench only served to recover and treat contaminated ground water, the air-sparging trench (SC-A) will remove, capture or destroy contaminants in the trench, allowing ground water to recharge back into area wetlands. Moreover, instead of being 25-feet deep, the air-sparging trench will span the aquifer to key into a low-permeability marine clay that underlies the site at depths up to 100 feet. An element not in the 1991 ROD that is included in the ROD Amendment is a provision to remove sediments from the Cocheco River that pose a threat to human health or the environment and evaluate indoor air vapors in buildings near the Eastern Plume.

In summary, there were three key elements to the 1991 ROD Remedy:

1. An impermeable cap over the entire landfill with a trench surrounding the waste to capture leachate flowing from the wastes and de-water the landfill (SC-7/7A).
2. Monitored Natural Attenuation of the contaminants in the ground water contaminant plume flowing to the Cocheco River (MM-2).
3. Pump-and-treat the contaminants in the ground water contaminant plume flowing to the Bellamy Reservoir (MM-4).

In this ROD amendment, EPA proposes to only change the Source Control component SC-7/7A. The other two components (MM-2 & 4) of the 1991 ROD will be implemented.

SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

Comments received at the Public Hearing and contained in letters from the public, non-governmental organizations, public officials, and the Group are summarized below. EPA recognizes that the discussion at the Public Meeting was limited due to time constraints and the necessity of covering a number of items. This Responsiveness Summary is intended to further respond to the issues raised.

As the comments received from private citizens, non-governmental organizations and the

Portsmouth Water Supply were similar, they have been presented together in the section "Comments Provided by the Pubic, Non-Governmental Organizations and the City of Portsmouth Water Supply and EPA's Responses." Each party that commented on the Proposed Plan is listed below. In parentheses next to each name are the comment numbers where a response to their comments can be reviewed. The transcript of the public hearing and individual comment letters are included as Attachments 1 and 2 to this Responsiveness Summary, respectively.

The Group, coordinated by the City of Dover, submitted comments through their consultant GeoInsight. These comments are included under "Summary of Potentially Responsible Party Comments and EPA's Responses" beginning on page 15. The comments submitted by the PRP Group are included in Attachment 2.

Comments Provided by Private Citizens

Private Citizens that provided comments at the Public Hearing on July 19, 2004 include:

Brian Stern for Loretta B. Chase, Dover resident (1, 41)
Tom Fargo, Dover resident (1, 3, 4, 5, 32, 52)
Doug Bogen, Portsmouth resident, Clean Water Action (1, 11, 23, 24, 33, 39, 41, 46)
Katherine Duncan, Dover resident (29)
Brian Stern, Dover resident (1, 3, 4, 6, 8, 9, 10, 18, 20, 22, 24, 39, 40, 41, 44, 46, 47, 50)
Mike Hodgens, Portsmouth resident (1, 29)

Private Citizens that provided written comments include:

Robert Engel (1)
Caryn Duncan (1)
Katherine Ann Duncan (22,41)
Thomas Fargo (3, 4, 5, 6, 16, 32, 37, 52)
Brian & Nancy Limberger (1, 23, 38)
Mary Parker (1, 14, 23, 38)
David Hayes (1, 23, 38)
K. Ian Daniel (1, 23, 38)
Allen G. Barbi (1, 23, 38)
Richard Auclair (1, 14, 23, 38)
Kathryn Daniel (1, 23, 38)
Joan Landry (1, 23, 38)
Carol Straton (1, 28)
Mandy Bowden (1)
Ernest Bowden (1)
Catherine Pease (1, 28)
Laurrie Malizia (1, 23, 38)
Mario Malizia (1, 23, 38)
Keith A. Foley (1, 14)
Anonymous (1, 23, 38)
Mark Gemas (1, 14, 24, 38)
Lorie Gemas (1, 14, 24, 38)
Elizabeth Barbi (1, 23, 38)
Katherine Frick-Wold (1, 23, 38)
John Wold (1, 23, 38)
Linda Grivori (1, 23, 38)
Vicki A. Lueeht (1, 23, 38)
David Forbes (1, 23, 38)
Paula Forbes (1, 23, 38)
Heather Cronin (1, 23, 38)
David Cronin (1, 23, 38)
William McCann (1, 14, 23, 38)
Rebekah Brooks (1, 23, 38)
Henry Cronin (1, 23, 38)
Marie Trindade (25)
Art Corte (1, 14)
Audrey Covert (1, 14, 23, 38)
Dorothy Buell (1, 23)
Richard Minnon (41)
Loretta B. Chase (1, 38, 41)

Comments Provided by Non-Governmental Organizations

The non-governmental organizations that provided comments included:
Clean Water Action (1, 2, 14, 22, 37, 41, 46)
New Hampshire TAG Force (1, 2, 3, 7, 8, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20, 22, 26, 27, 30, 34, 37, 40, 41, 42, 46, 48, 49, 50, 51, 52)

Summary of Comments Provided by the Public, Non-Governmental Organizations and the City of Portsmouth Water Supply:

Generally, the public expressed doubts about EPA's selected remedy. A few citizens expressed support for the proposed amendment, but issued the caveat: 'only if the remedy is implemented in a timely manner.' By far the public's largest concern was that in all this time, nothing has happened at the site to abate contamination. This concern and others are conveyed below. The comments have been summarized and collected into appropriate categories. The main categories are:

- Implementability.
- Time.
- Cost.
- Public Safety.
- Contingency Remedy.
- Public Notice.
- Contamination.
    - Ground Water Contamination
    - Surface Water Contamination
    - Sediment Contamination
    - Indoor Air Contamination
- Nuisances

Comments and EPA's Responses

Implementability

These comments address the public's concern that the amended remedy may fail to address contamination at the site.

Comment 1: Air sparging is an un-proven technology and very complicated. If it fails it may worsen the situation with respect to contamination. Because there is a drinking water reservoir nearby, this site should not be used to test innovative remedies.

EPA's Response: Air-sparging has been proven in many applications for removing the majority of contaminants found at the site. However, these comments are correct in that the air-sparging technology has not been applied to a municipal landfill setting to perform all the functions proposed (e.g., sparging of volatile organic compounds (VOCs), iron and arsenic precipitation, and enhanced bioremediation). A discussion of air-sparging is provided in Appendix L in the RFFS.

Acknowledging the uncertainty of employing a full-scale version of the air-sparging trench, EPA required that the project be phased to ensure its efficiency, and that monitoring of the performance be quite rigorous. If the air-sparging technology proves ineffective, EPA will require that the landfill be capped, as described in the Source Control component of the 1991 ROD Remedy.

In the event that the air-sparging trench fails, the pump-and-treat remedy in the Southern Plume would control any further escaping contaminants that are migrating in the Southern Plume toward the Bellamy Reservoir. However, a successful air-sparging remedy is expected to be less expensive, yet has the potential to clean the landfill faster than capping and decrease the potential for contaminants to escape capture or treatment.

Comment 2: Air-sparging needs extensive testing.

EPA's Response: EPA agrees but also recognizes that air-sparging is not a completely unknown technology. It has been used at many sites to remediate ground water as outlined in Appendix L of the RFFS.

However, given the combination of contaminants to be treated by the air-sparging technology at this site, EPA is requiring that the air-sparging trench be implemented in segments. EPA will also select the locations where the segments will be placed, factoring contaminant concentrations and depth to the marine clay layer in order to test the constructability and implementation of the trench. In addition, rigorous monitoring will evaluate the merits of air-sparging with respect to site-specific characteristics (e.g., inorganic precipitation and success of its removal, impacts of oxygen demand on hydraulic parameters in the trench and surrounding aquifer).

Comment 3: The function of the air-sparging trench can be compromised by the iron precipitate that will form in the air-sparging wall causing its ultimate failure. Removal of the iron precipitate will be necessary and potentially very difficult. Also, under some conditions, the arsenic could be mobilized in one large "slug." Therefore, the conditions in the air-sparging trench will need to be closely monitored and arsenic should not be left in place. How frequently will the iron and arsenic need to be cleaned from the trench?

EPA's Response: EPA was also very concerned with these issues when this remedy was proposed. Consequently, EPA requested that the Group collect additional information concerning arsenic fouling in the wall, various technologies to address fouling, and to model the results. The results of the modeling are presented in Appendix K of the RFFS. In addition to this modeling, the remedy will include extensive monitoring of both the treated water and the solid matrix (both the native aquifer materials and the porous material in the air-sparging trench). Currently, the method for removing arsenic from the trench is to excavate the trench. The modeling in Appendix K indicates that excavating arsenic from the trench will need to be done only one time. However, monitoring and further field investigations may indicate that either additional excavation is necessary or that alternative cleaning methods, such as acid-washing, may be used. Operation and monitoring of the air-sparging trench will ensure that arsenic is captured only inside the air-sparging trench and is not re-released to the surrounding aquifer. If it is shown that arsenic is not captured and retained in the trench, the contingency remedy will be implemented.

Comment 4: Converting the air-sparging trench into a ground water extraction trench may be confounded by variable gradients along the length of the trench. The result could be hydrologic short-circuiting allowing contaminants to be conveyed and to break-out into areas that were previously uncontaminated. Not capping the landfill and converting the trench to a ground water extraction system will recover much more water.

EPA's Response: If the air-sparging trench is converted to recover ground water, the landfill will also be capped. Hydrologic short-circuiting is a valid concern in both a vertical and horizontal sense. The current proposal is to segment the trenches to prevent this. In the RFFS the segments shown are schematic and dependent upon the results of the pre-design investigation and the preliminary phases of construction. The construction and operation of the air-sparging trench will be phased so that any problems can be identified and resolved prior to the full construction of the trench. In a manner similar to concerns regarding clogging of the trench with iron-arsenic precipitate, the problem of hydrologic short-circuiting underscores the need to conduct careful monitoring of the implementation and operation of the air-sparging trench.

Comment 5: The air-sparging trench should be re-located to a position along Tolend Road. Re-positioning the trench into this location would better address the eastern ground water contaminant plume and eliminate contaminant discharges to the Cocheco River, would improve the constructability and maintenance of the air-sparging trench and shorten the length of the trench.

EPA's Response: EPA recognizes the utility of this idea; however, RCRA Source Control remedies must be conducted at the limit of waste, in this case the edge of the landfill. In addition, the selected remedy, as outlined in the Amended ROD, better protects ground water. Moving the trench away from the edge of the landfill unnecessarily increases the distance the contaminants must migrate to arrive at the air-sparging wall.

Comment 6: The EPA admits that there are many unknowns and many Pre-design investigations that need to be done. Rather than go forward with a plan based on guesswork and relying on a contingent remedy, why not move forward with the 1991 ROD?

EPA's Response: The 1991 ROD Source Control remedy has its share of unknowns and guesswork as well and EPA believes that the proposed remedy has several advantages over the 1991 ROD. Key among these advantages is the fact that wastes are actively removed from the landfill as opposed to interring them in the landfill over many years. Another advantage is that the air-sparging trench will span the entire aquifer and treat all of the contaminants, rather than only the upper 25 feet of the aquifer. Air-sparging will decrease the amount of time contaminants are allowed to remain in the landfill, providing fewer opportunities for contaminants to migrate through the marine clay. Lastly, it will cost less in the long-run.

Comment 7: The trench may create hydrologic short-circuiting. How will the trench be abandoned to ensure that short-circuiting does not occur? Will the trench create unexpected hydraulic conditions that will cause ground water to migrate in a direction not desired?

EPA's Response: At the conclusion of the remedy the ground water will not contain contaminants above concentrations that pose a risk to human health or the environment. The arsenic-contaminated media in the trench will be removed, disposed of appropriately, and the trench will be backfilled with a material similar to the surrounding aquifer or allowed to collapse in on itself. The end result should create a ground water environment similar to that which existed before the landfill. This response does not answer the question about whether or not the trench will create unexpected hydraulic conditions.

Comment 8: How will EPA and NHDES determine if the trench is performing as expected? What will be the layout of sensors and monitoring wells? How will "failure" be determined?

EPA's Response: The specific details of the monitoring network and technique will be decided after conferring with national experts, including those at EPA's Ada Oklahoma lab and at the University of New Hampshire and after evaluating the results of the pre-design investigation. In general, a monitoring outline will include both ground water and solid phase monitoring of the treatment trench and the aquifer both up-gradient and down-gradient of the air-sparing trench. Likewise, the specific determination of "failure" will be arrived at after additional study and consultation with experts on this technology. However, a general definition of failure means that the treatment trench does not reduce all site contaminants to cleanup levels within the treatment wall such that ground water on the down-gradient side of the trench meets cleanup levels during and after operation of the air-sparging trench and the landfill does not reach clean closure.

Comment 9: Monitored Natural Attenuation (MNA) is not an appropriate remedy for the eastern ground water contaminant plume. MNA was determined to be an inappropriate remedy for the Southern Plume based on the lack of information showing that it had a probability that it would be successful. Conditions have not been cited to indicate that MNA will be a successful remedy in the Eastern Plume. The cost to implement a pump-and-treat remedy in this area is incremental compared to an MNA remedy.

EPA's Response: EPA does consider Monitored Natural Attenuation (MNA) to be an appropriate remedy for the Eastern Plume. In the Eastern Plume the Source Control portion of the remedy is expected to stop contaminants from entering the ground water, the geochemical changes expected in the aquifer coupled with the relatively fast ground water flow rates are expected to reduce contaminant concentrations rapidly. The contaminant mass in the Eastern Plume is also relatively small, the Cocheco River, the eastern boundary of the plume, lies less than 800 feet away. Modeling in 1991 found that MNA would attain cleanup levels in approximately the same time-frame as pump-and-treat. To confirm the relatively fast reduction in contaminants, five years after the Source Control Remedy has been implemented, EPA will evaluate such factors as decreasing contaminant trends and geochemical conditions in the aquifer matrix to ensure the restoration of ground water in the Eastern Plume. If these findings demonstrate that MNA is not working effectively to restore the aquifer in a reasonable amount of time, the contingent remedy of pump-and-treat may be implemented. These five-year reviews will continue as long as contamination exists at the Site above levels that are protective of human health and the environment.

Pump-and-treat was selected to address the Southern Plume because ground water flows relatively slowly in this aquifer, and it is expected that anaerobic conditions will prevail through much of the aquifer despite the operation of the air-sparging trench. Anaerobic conditions in the southern portion of the aquifer do not lend themselves to degradation of the contaminants present (arsenic, benzene, tetrahydrofuran, and vinyl chloride) in that plume. Given that, along with the fact that Site contaminant concentrations appear to be increasing in the Southern Plume for arsenic and tetrahydrofuran, and the proximity of the Bellamy Reservoir, a Class "A" Reservoir that serves the drinking water needs of a good portion of southeastern New Hampshire, a pump-and-treat remedy was retained.

Implement the 1991 ROD remedy now and cap the landfill

Comment 10: The Proposed Plan represents in its assessment of short term risks that the amount of material excavated for the trench is minimal compared to the fill necessary for the cap. Yet the amount of fill necessary for the trench will be double, approximately 40,000 cubic yards, rather than what was stated in the Proposed Plan (19,000 cubic yards). Therefore, the true comparison should be 40,000 cubic yards for SC-A instead of 19,000 cubic yards. When compared to SC-7/7A this becomes a more comparable number next to the necessary 165,000 cubic yards.

EPA's Response: While EPA still stands by its estimate of 19,000 cubic yards, even accepting the double amount of 40,000 cubic yards, that volume represents only about one-quarter of the amount of fill necessary to implement the 1991 ROD remedy. That results in 75% more truck traffic and worker exposure to dust, equipment accidents and exposure to some amount of contamination during handling.

Comment 11: Clean closure of the landfill will require just as much fill to attain grades and therefore, the cost savings will disappear. An additional problem is that short-term risks may be greater in that when clean closure is performed the truck traffic and dust issues will be the same as now, yet the population in the area will likely have increased. Therefore, it is better to build the cap now.

EPA's Response: Once the landfill reaches clean closure, that is the hazardous wastes in the landfill are no longer leaching concentrations of contaminants to ground water that pose a risk to human health or the environment, state regulations for solid waste landfill closure will dictate the type and grade of cap necessary for the landfill.

Comment 12: EPA forments misconceptions regarding SC-A such as:

- **SC-7/7A would cost more due to recontouring, 150,000 yards of fill, and construction of a RCRA type "C" cap. Yet, closing the landfill will still require bringing in fill to attain similar grades.**
- **SC-7/7A will entomb the waste so that it never "goes away." This is inaccurate in that biodegradation and other mechanisms will gradually reduce concentrations.**

- **SC-A will wash all of the contaminants out of the waste leaving a benign pile of rubble. This too is inaccurate as flushing over a very long time would be required to do this.**

Based on the preceding, SC-A offers no advantage over SC-7/7A. Therefore, why did the PRPs and the Agencies abandon the SC-7/7A remedy? EPA should construct SC-7/7A as proposed in the 1991 ROD.

EPA's Response: See Comments 10 and 11 for a response to the issue raised in the first bullet.

With regard to capping the landfill, although it is true that biodegradation will occur under the cap, not all site contaminants are amenable to this process. Benzene is unlikely to degrade under the cap and arsenic will not degrade. Volatile organic compounds found in the landfill will degrade but the bio-degraded endpoint for most VOCs is typically vinyl chloride which is a known human carcinogen. EPA finds this to be an unacceptable result, nor would the remedy be protective.

EPA agrees that a long period of flushing will be required to clean the landfill; however, capping will leave wastes in-place over a greater length of time.

Comment 13: There will be fewer challenges by implementing the 1991 ROD rather than moving forward with the proposed amendment.

EPA's Response: While the Alternative Source Control component does pose challenges, a side-by-side evaluation of the Alternative Source Control component and the 1991 Source Control component against the criteria set out in the National Contingency Plan (NCP) reveals that the challenges are comparable to those presented in the 1991 ROD. A detailed evaluation can be found in the Comparative Analysis of the ROD Amendment, the RFFS, and the EPA Addendum. In addition, if the alternative Source Control remedy works as proposed, the cost benefits will be greater than those offered by the 1991 ROD remedy.

Time

Comment 14: Implementing a remedy at the site has been delayed too long.

EPA's Response: EPA agrees and expects the Amended remedy to be implemented quickly. In fact, EPA believes that the past 10 years of ground water sampling and previous pre-design investigations provide an excellent baseline of data from which to launch the required future pre-design studies and hasten the remedial design and construction. While there are still some data gaps to fill in, it is not anticipated that the necessary pre-design studies will be completed within one year of issuing this ROD Amendment.

Comment 15: Extensive testing of air-sparging will add more delay and cost to a project that has been long-delayed.

EPA's Response: Although testing the air-sparging technology will take additional time and resources, EPA believes that this investment will ensure that a functional remedy is deployed and that it works effectively and efficiently. See also Comment 14.

Comment 16: There appears to be a conflict regarding the cleanup times with various documents citing 20 or 30 years and 75 or 100 years.

EPA's Response: A detailed discussion of cleanup times is provided in Appendix N of the RFFS and is summarized in the Addendum. There are three areas of cleanup: the area within the landfill, the Eastern Plume, and the Southern Plume. With respect to this Amended Record of Decision, the important element is the time-frame for the cleanup of the landfill area. A comparison of just SC-7/7A and SC-A follows:

	Cleanup Times in Years for the Landfill area	
Contaminant	**1991 ROD (SC-7/7A)**	**Amended ROD (SC-A)**
Arsenic	> 100	92 to > 100
Vinyl chloride	19 to >100	23 to 28
Benzene	10 to 19	24 to 65
1,2 c-DCE	9 to 11	9 to 13
Tetrahydrofuran	10 to 11	9 to 13

While it appears that cleanup times are similar for all compounds, this similarity is due to the assumptions inherent in the model. The data in the above table only consider the time to cleanup the ground water in the aquifer under the landfill. For example, the chart depicts that it is quicker to clean up benzene in the aquifer with the 1991 ROD than the Amended ROD. However, this is artificial, the model assumed that the loading rate (the amount of benzene that leaks from the landfill wastes) is lower under the 1991 ROD than the Amended ROD. This is true only if the ground water impact of the long-term contribution of the contaminants under the cap are discounted. But this long-term impact cannot be discounted as a continuing source to ground water as long as contaminants remain in the landfill. In fact, the flushing action of the ROD Amendment remedy will cause all of the contaminants to move into the ground water and through the treatment wall much more quickly than the 1991 ROD would send the contaminants for treatment in the leachate diversion/interceptor trench via gravity drainage.

It should be noted that these time-frames are derived from a model and that the assumptions in the model drive much of the results. EPA believes that assumptions and data for this model will be greatly improved through pre-design investigations, preliminary results of the first phases of the Source Control remedy, and the implementation of pump-and-treat in the Southern Plume.

Comment 17: The EPA and NHDES should accelerate the testing and implementation of the Management of Migration remedy MM-4 in the Southern Plume to have it operating as soon as possible.

EPA's Response: EPA agrees and will work with the Group to ensure that this is done as quickly as possible and that pre-design investigations are conducted quickly, efficiently and are completed within one year of issuing this ROD Amendment.

Comment 18: The time to get a remedy going will be considerable. Work may not begin at the site until 2008 and won't be completed until at least 2010. If MNA in the Eastern Plume is determined to not be working, active remediation would not begin until 2017, 34 years after the site was listed on the NPL. Please consider the speed that the remedies can be implemented.

EPA's Response: EPA is cognizant of the considerable time-frame of this project but does not agree that active remediation would not begin until 2017. Instead, EPA expects portions of the air-sparging trench to be constructed by late 2006. See Comments 14, 15 and 17 for further discussion of time frames.

Comment 34: Why is 75 years cleanup time for arsenic in the Eastern Plume acceptable to EPA? Historically, "reasonable time frames" have been twenty to thirty years. Should not something be done to expedite the removal of arsenic from ground water?

EPA's Response: There is no specific number of years that can be defined as acceptable for Superfund cleanups. Reasonable time frames vary from site to site depending on the specific site conditions. For the Dover Landfill site, factors to be considered include the rate of contaminant decrease over the first five to seven years after the source control component is operating, levels of sediment contaminant concentrations in the Cocheco River, and restoraton rate of the ground water aquifer. Should this evaluation or any successive evaluation by EPA find that MNA is not successfully addressing ground water contamination, the pump-and-treat contingency will be implemented.

Comment 20: The present plan presents contingencies that open the door for further delay through appeals. The triggering mechanisms for the contingent remedies are not well-defined.

EPA's Response: The Proposed Plan functions as an overview for the remedy and does not contain the level of detail the comment is seeking regarding triggering mechanisms for the contingent remedies. Some details appear in the RFFS, EPA's Addendum and the Amended ROD that incorporate significantly more detail concerning these triggers. In addition, EPA will also write a very specific scope of work that will further direct when the contingencies will be implemented.

EPA must also point out that CERCLA does not allow appeals of EPA's decisions documents. Moreover, this remedy will be conducted by the Group through a Consent Decree (with the attached scope of work).

Comment 21: The proposed remedy, SC-A + MM-2/4, should not be delayed by any pre-design activities.

EPA's Response: Pre-design investigations are required to effectively design and employ a remedy and to identify the means to monitor its future performance. Because there has been substantial sampling and monitoring of this Site for the past ten years, EPA does not anticipate that these pre-design studies will require more than a year to complete once the Amended ROD is issued. EPA will endeavor to move these items forward as fast as possible.

<u>Cost</u>

Comment 22: The proposed remedy has a long time-frame for cleanup. The time-frame exceeds that for the cost estimate by more than double and such a long operation will pose an undue burden on future populations.

EPA's Response: EPA agrees that any remedy for this Site will continue into the future for some time, but believes that the selected remedy offers some time-saving advantage over the 1991 ROD. The nature of remedial activities at large, uncontrolled landfills inherently requires a considerable time-frame to attain cleanup goals but, unlike the amended remedy, the original 1991 ROD remedy also has significant long-term costs that will be incurred over a potentially greater time-frame If the selected remedy is successful, all future maintenance and monitoring costs may be eliminated or greatly reduced over that of the 1991 ROD.

Comment 23: The proposed remedy considers financial impact above public health and environmental impacts.

EPA's Response: Any remedy considered by EPA must first meet the baseline requirement of protecting human health and the environment. Although cost must be considered by EPA, it is a modifying criteria which is evaluated only after the baseline criteria are met. Based on EPA's analysis, SC-A, the amended ROD's Source Control component, is equally if not more protective of human health and the environment as SC-7/7A, the 1991 ROD Source Control component. In accordance with the NCP, when several remedial alternatives are equally protective, cost considerations can be used as a balancing criteria in the selection of a remedial alternative.

Comment 24: If the air-sparging trench is unsuccessful, the landfill will still need to be capped and any cost savings from the trench will be gone. Carefully examine the costs against the benefits and drawbacks.

EPA's Response: EPA is quite aware of this possibility and has incorporated the phased implementation of trench segments as a way to not only minimize the cost risk but also ensure protectiveness along the way.

Comment 25: Superfund monies should be spent on this site to complete it.

EPA's Response: Superfund monies can only be spent on the site if there are no PRPs or if the PRPs refuse to do the work. Even in those cases, there is no guarantee that Superfund monies will be available in any given year to fund a site cleanup. At this site there is a PRP Group that signed a Consent Decree with EPA to implement and finance a significant portion of the 1991 remedy. While that Consent Decree must be revised to include this Amended ROD, EPA believes that this Group will also sign the revised Consent Decree to implement and finance the amended remedy.

Comment 26: Are the costs of clean closure, the proposed pre-design activities, the design, and agency oversight included in the costs? Is the cost of operating the blower for potentially 75 years also factored into the costs?

EPA's Response: The short answer to this question is yes. However, these costs are not absolutes, but intended to compare the estimates known for each alternative. The costs estimated include remedial design, remedial action, oversight and 30 years of operation and maintenance of the selected remedy. Because all the tasks involved of each of these phases of the remedy are known only in general terms at the writing of the ROD, a percentage factor is applied to the overall capital cost of the remedial action to determine design, oversight (and O&M) costs. Operation and maintenance costs are only carried out to 30 years based on the speculative value of time and performance beyond 30 years.

Comment 27: EPA should implement pump-and-treat in this area as soon as possible using Superfund resources.

EPA's Response: See response to Comment No. 25.

Public Safety

Comment 28: Any new clean up action should not cause further environmental damage or have an adverse effect on public health.

EPA's Response: Agreed. As part of its evaluation of the alternatives, EPA is required, as a threshold matter to determine that the selected remedy is protective of human health and the environment.

Comment 29: When will it be safe to swim in the Cocheco River? What is the risk for people who swim in the Bellamy Reservoir?

EPA's Response: Currently, there are no restrictions on swimming in the Cocheco River because of contamination from the Landfill. However, there are a limited number of isolated areas along the south bank of the River that have elevated arsenic concentrations in the sediment, posing a border-line long-term risk to potential waders and/or swimmers who come in contact with the sediment in that area.

EPA calculates risk based on the exposure of the most sensitive populations using the maximum concentrations found at the site. In the case of the Cocheco River, the contaminant that poses nearly all the risk is arsenic which is found in both surface water and sediment. In the surface water, concentrations are at approximately the same normal concentrations found in any stream in New Hampshire. Therefore, surface water in the River (and in surface water adjacent to, and down-stream of the Site) poses no greater risk from arsenic or other Site contaminants and is safe for swimming. For sediments, however, arsenic concentrations are significantly elevated in areas adjacent to the River and in other parts of the Site.

EPA performed a risk calculation that determined that if a child were to climb down the steep hill and swim in the river, get sediment (mud) over portions of their body and accidentally eat 100 mg of mud in the area with the highest concentrations of arsenic during every exposure period, that over their lifetime they would not be at an excess risk of cancer or non-cancer problems that EPA believes is significant. However, EPA did note that the risks were borderline (just under) results that could be significant, therefore EPA believes that it is appropriate to continue monitoring in this area. The Amended ROD includes a requirement that sediments in the Cocheco River be periodically monitored to ensure these risks do not increase, and, should that happen, the Amended ROD requires that the sediment be removed.

The Bellamy Reservoir is a Class A water body used as a drinking water source for the greater seacoast area. Consequently, there is a swimming ban in this water body. However, it must be stated that there is currently no evidence of impacts to the Reservoir from landfill contaminants and, therefore, would pose no additional risk to a swimmer.

Comment 30: Indoor air samples should be collected to evaluate potential impacts to homes above the Eastern Plume. The air-sparging trench will concentrate VOC vapors and potentially create an indoor air risk.

EPA's Response: Previous sampling, which followed guidelines that NHDES developed, indicated that there were no impacts from the Site on indoor air in homes along Tolend Road. EPA recently issued draft indoor air vapor guidance and will be re-assessing those homes near the Eastern Plume in the near future. With respect to the air-sparging trench the comment is correct that VOCs will be concentrated; however, emissions from the trench will be monitored and managed to ensure that indoor or outdoor air action levels are not exceeded.

Contingency Remedy

Comment 31: The Source Control Component of the 1991 ROD remedy should be continually updated to facilitate timely implementation as a contingency alternative.

EPA's Response: EPA fully agrees with this comment and has incorporated into the Amended remedy a requirement that the 100% cap design completed in 1996 for the 1991 ROD remedy be updated simultaneously with the design of the air-sparging trench. Should the capping contingency become a reality, the updated design will allow implementation with little delay.

Public Notice

Comment 32: If contaminated sediments are going to be excavated in the Cocheco River the local Conservation Commission should be allowed to review and comment on the plan.

EPA's Response: While CERCLA gives only the State a review and comment role in implementing Superfund remedies, it is EPA's practice to periodically meet with local Conservation Commissions within the affected areas to keep the Commission aware of the remedial activities. EPA fully anticipates this practice will continue at the Dover Landfill Site.

Comment 33: Consider a separate public meeting for Portsmouth residents. Also, summer is a difficult time to schedule these meetings.

EPA's Response: Although summer may be a difficult time for all interested parties to attend a public meeting, the 50-day public comment period provided another avenue for submitting comments. Typically, EPA holds public meetings in the community where a site is situated, however, EPA is willing to consider holding any future public hearings in both communities.

Comment 34: The public should be appraised of the anticipated impacts to wetlands caused by the remedial alternatives. The public should be informed of, and provided an opportunity to review and comment on pre-design studies.

EPA's Response: EPA and NHDES will work with the local Conservation Commission to keep the public informed of potential wetland alterations. EPA also periodically issues fact sheets and holds occasional public informational meetings to keep area residents aware of site cleanup activities.

Comment 35: The Department of Public Works, City of Portsmouth, should be kept informed of water quality data and project schedules regarding the Southern Plume and Bellamy Reservoir.

EPA's Response: EPA is more than willing to share confirmed data concerning water quality and upcoming work with the City. In fact, EPA believes the City may routinely gather information that may be useful to the monitoring work envisioned for the remedy and looks forward to discussing this mutual information sharing.

Comment 36: Provisions should be made with respect to notifying the City of Portsmouth and general public if contamination is found in the Bellamy Reservoir or if contamination appears likely. A program should be devised that educates the public about risk and safety from potential contamination of the Bellamy Reservoir.

EPA's Response: EPA informs the community about activities at the site via the updates to the site mailing list and periodic press releases. Regarding imminent threats, a Health and Safety Plan will be developed for the Site that will notify hospitals and public water supplies if contamination threatens a drinking water resource or other exposure route.

Contamination

Ground Water Contamination

General

Comment 37: Contaminants will continue to flow to both the Cocheco River and the Bellamy Reservoir under this plan.

EPA's Response: The Source Control Remedy will halt the flow of contaminants from the landfill and into the Eastern and Southern Plumes. Therefore, only those contaminants remaining in the extended plumes when the Source Control construction is complete will continue migrating. Remaining contaminants in the Eastern Plume will continue to discharge to the Cocheco River. However, the Eastern Plume has been modeled to attain cleanup levels in approximately 5 to 7 years and if not, the need to implement the contingent active remediation system will be assessed. Contaminants flowing towards the Bellamy Reservoir (Southern Plume) will be intercepted with the pump and treat system component of the remedy for this plume

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Comment 38: No contaminants from the landfill should discharge into either the Cocheco River or the Bellamy Reservoir. Ground water in contaminant plumes should be restored to end the contamination.

EPA's Response: See response to Comments 9, 16, and 37.

Comment 39: TCE has been linked to increased incidences of non-Hodgkins lymphompa in the area surrounding the Pease Air Force Base. Pease is also a Superfund site with many operable units. TCE is also found at the Dover site. Arsenic, although naturally found in New Hampshire, has a standard that, although low, (10 ug/kg), is a compromise and may not be found to be protective of human health in the future and the standard decreased further. Regardless, these contaminants are not wanted in increased concentrations in the watershed.

EPA's Response: Arsenic is a principal contaminant of concern in ground water at the Dover Site. Because the ground water aquifer is a potential drinking water aquifer Safe Drinking Water Act Maximum Contaminant Levels (MCLs) have been identified as relevant and appropriate chemical specific standards. The MCL for arsenic in drinking water is 10 ug/kg. Through past studies at the Site naturally occurring levels of arsenic, or background levels, have been determined to also be 10 ug/kg. Since future ingestion of ground water is the primary risk at the Site, the interim ground water cleanup level for arsenic is set at 10 ug/kg.

Comment 40: The Agencies must be careful that the ground-work for a technical impracticability waiver is not being lain by the PRPs with respect to arsenic in ground water.

EPA's Response: EPA has a very specific protocol for establishing a technical impracticability waiver under CERCLA §121(d)(4)(C). EPA's "Guidance for Evaluating the Technical Impracticability of Groundwater Restoration", dated September, 1993, points out that restoration of contaminated ground water is one of the primary objectives of the Superfund program. In general a party must demonstrate and document a complex assessment of site specific characterizations of the technical impracticability of restoring groundwater before EPA will even consider suspending remediation. EPA has not reviewed any data from this site to date that would justify a technical impracticability waiver.

Eastern Plume

Comment 41: Contamination of the Cocheco River is being allowed to proceed under this remedy. The Cocheco River is a recreational resource that should not be allowed to be further polluted. EPA already knows that arsenic is leaching into the Cocheco River, so why is there only a contingency plan and no action?

EPA's Response: EPA disagrees that there is only a contingency plan and no action planned for the Eastern Plume which discharges to the Cocheco River. Monitored Natural Attenuation is a viable remedy that was selected in the 1991 ROD for this area and is retained in the Amended ROD.

The product of the current discharge is an iron-rich sediment that contains a small amount of arsenic (maximum concentration is 1,520 mg arsenic / kg of sediment). This does not pose a human health risk based on EPA's risk assessment. See Comment No. 29 regarding risk calculations and considerations. State regulations included as an ARAR for the Site require remedial action should a ground water discharge cause a violation of surface water quality standards. Currently, the discharge of ground water to the Cocheco River is not causing a violation of surface water quality standards.

Once the Source Control component of the selected remedy is implemented, it is expected to immediately halt the flow of additional contaminants from the landfill to the Cocheco River and profoundly change the geochemistry of the Eastern Plume. A ground water model has shown that once the Eastern Plume is cut-off from the source, it will be restored within 5 to 7 years. EPA's contingent remedy is based on this 5 to 7 year period.

Southern Plume

Comment 42: With respect to the Southern Plume the following is needed:

- **Additional monitoring wells are needed to provide a complete vertical profile.**
- **Additional analysis is required.**
- **The nature of the marine clay must be determined.**
- **Sediments in the Bellamy Reservoir should also be sampled in at least two locations annually.**
- **Well cluster MW-102 should be sampled.**
- **Ground water flow and geology in the Southern Plume needs to be better characterized.**

EPA's Response: EPA agrees and notes that these are all part of the pre-design investigations that EPA is requiring of the Group. Although sediment sampling in the Bellamy Reservoir was not considered; it may be valid and will be evaluated for inclusion in these studies.

Comment 43: The City of Portsmouth is interested in reviewing and commenting on monitoring in the Southern Plume.

EPA's Response: See response to Comment No. 35.

Surface Water Contamination

Comment 44: The Cocheco River is a regional resource that Dover and neighboring communities have spent much money and effort to restore for aesthetic benefits among other reasons. The Cocheco River is a TMDL listed river with dissolved oxygen demand as the reason. The Cocheco River receives the lion's share of contaminants from the site and this will increase the dissolved oxygen demand, further down-grading the conditions in the river.

EPA's Response: The oxygen demand of the ground water and surface water has not been measured in the vicinity of the Cocheco River impacted by the landfill. This measurement may be a valid measurement to collect along with nutrient values, when evaluating arsenic-contaminated sediments. The operation of the air-sparging trench may provide sufficient oxygen to reduce the oxygen demand of the ground water entering the River. Although EPA cannot respond to a low dissolved oxygen issue in the Cocheco, the State has independent authority under State water laws to address this issue.

Comment 45: In the event the Bellamy Reservoir becomes contaminated with Site contaminants, provisions should be made to either treat affected water or provide for an alternative source, including reserving financial resources for the City of Portsmouth to ensure water quality.

EPA's Response: CERCLA does not provide for or authorize separate funding to ensure an alternative source of water is available in the event of contamination. What CERCLA does provide for is the ability of EPA to take emergency action in the event of a situation that presents an imminent and substantial endangerment to the public health or welfare. These situations are evaluated when they arise and the decision whether or not to take action is made at that time.

Sediment Contamination

Comment 46: Arsenic concentrations in the Cocheco River are unacceptable.

EPA's Response: See response to Comment No. 41.

Comment 47: Why doesn't EPA analyze for other sediment contaminants at the site such as lead, mercury or cadmium?

EPA's Response: EPA based the Environmental Monitoring Plan on previous results that showed low levels of other metals, including lead, mercury, cadmium, and chromium, in sediments surrounding the site. These results are discussed in Section 7 of the Wehran Remedial Investigation done for NHDES. EPA acknowledges that more recent sampling has revealed additional data concerning site characteristics and contaminants that the Environmental Monitoring Plan does not address. As part of Remedial Design and Remedial Action this Plan will be updated to include new information.

Comment 48: There are many locations of testing that exceed the first tier for sediment sampling, yet have not been sampled under the second tier protocol.

EPA's Response: This type of sampling is expensive and can provide confounding results if not set up correctly. EPA is waiting to conduct this sampling after the Group prepares and EPA approves a work plan, which will occur during the pre-design activities.

Comment 49: Arsenic contaminated sediments on the "...landfill side of the Cocheco River exceed the threshold cancer risk of 10^{-4} and NOAA freshwater screening levels. Human health risks posed by arsenic concentrations in Cocheco River sediment are already bordering acceptable risk ranges established by EPA." Therefore, it is likely that a second or third level of ecological assessment must be completed. The ultimate result will be that

EPA will require the removal of impacted sediments. Rather than remove the sediments, why not eliminate the source and instead conduct air-sparging adjacent to Tolend Road?

EPA's Response: EPA believes the commentor is confused and possibly misread the available information. Based on a review of the data, the human health risk posed by arsenic-contaminated sediments is lower than the threshold value of 10^{-4}, in fact it is at 10^{-5} which is within EPA's cancer risk range; albeit borderline. The commentor correctly stated that a second tier ecological assessment must be completed; however, neither of these findings lead to the hard conclusion that removal of arsenic-contaminated sediment is inevitable. Continued monitoring and further ecological assessment are required before any removal can occur.

With regard to removing the source, the air-sparging trench technology was selected to do just that. The location of the air-sparging trench at the edge of the waste area will address the contamination close to the source. One reason for this is to minimize the length of travel a contaminant must traverse before being captured or destroyed. In addition, in accordance with wetland ARARs, impacts to surrounding wetlands must be as minimal as possible. The area along Tolend Road is identified on map 8-1 of Appendix A of the RFFS as being a "Palustrine Forested Wetland." Moving the air-sparging trench further away, towards Tolend Road, is at odds with wetlands regulations that favor remedies with the least adverse impacts on wetlands and allows contaminants to migrate further through the aquifer.

Comment 50: Sediments have been accumulating in the river and washing downstream. Is there any plan to identify downstream sediment collection areas and sample them now and in the future? What will be the ultimate concentrations we can expect in sediments in the Cocheco River? What will be the ultimate fate of the arsenic-contaminated sediments?

EPA's Response: The sediments generated by the site are minuscule when compared to the overall load of sediments in the Cocheco River. The ultimate concentrations of sediments down stream will be close to, or at, the natural, regional background values for arsenic. For instance, consider sampling transect T6 which is less than 400 feet down stream of where arsenic discharges to the stream and is entrained into the sediment. There were three sampling points at T6, the far (north) bank, the middle of the channel, and the near bank (closest to the site). The concentrations were, 3.3 ppm (parts per million), 7.3 ppm, and 5.1 ppm for the far, middle and near banks respectively. This compares well with the T1 transect which is upstream of the site and unaffected by the site. The concentration of arsenic in sediments at T1 are 5.6 ppm, 4.8 ppm and 4.6 ppm, for the far, middle and near channel respectively. The natural sediment load of the river is far greater than what is contributed by the site.

Indoor Air Contamination

Comment 51: The Agencies admit the impacts to indoor air are unknown and "The potential impact to indoor air pollution from the volatile organic compounds has not been assessed."

EPA's Response: Indoor air impacts have been assessed under State protocols for evaluating in door air in the absence of a federal protocol. That evaluation found no unacceptable concentrations of indoor air vapors due to site contaminants. EPA found no fault with this protocol; however, has recently developed its own protocol and will assess indoor air under that strategy during pre-design activities.

Nuisance

Comment 52: The proposed remedy does not collect and treat gases recovered during air-sparging. This poses the potential for odor problems.

EPA's Response: This is a valid concern. As part of the pre-design, EPA will evaluate collecting and treating gases recovered during air-sparging.

Comment 53: Noise from the pumps doing air-sparging and other operations may pose a nuisance to surrounding residences.

EPA's Response: EPA will endeavor to ensure that remedial pumping stations are sited away from residences and that excess sound is muffled to the best extent possible.

SUMMARY OF POTENTIALLY RESPONSIBLE PARTY COMMENTS

Implementability

Comment 54: The layout of the air-sparging trench, as depicted by EPA, is flawed in that it does not account for distinct properties in the aquifer underlying the landfill and the differing hydraulic properties of the aquifer. The layout of the trench should be subject to the findings of pre-design studies and flexible to site conditions. For instance, one option that may have several advantages would be to re-position the air-sparging trench treating the Eastern Plume to a line along Tolend Road. The layout of the air-sparging wall should be designed with all site conditions considered.

EPA's Response: The position of the air-sparging trench shown on the figures in the RFFS and Addendum are schematic in nature and do not represent even the approximate final design. The final design will be based on site conditions, the analysis of EPA and State experts, and in consideration of applicable laws and regulations. CERCLA typically requires compliance boundaries to be set at the edge of waste management areas, here the landfill. At Dover, because the goal is clean closure and complete aquifer restoration even beneath the landfill, a compliance boundary does not exist; however, it is EPA's policy to control contamination as close to the source as possible. See the response to comment No. 49.

Contingent Remedy

Comment 55: Although a contingent remedy is necessary with respect to the operation of the air-sparging trench, the need to cap the landfill with a RCRA type "C" cap in the event of a failure of the trench is not apparent. Consider, as a contingency in the event of the failure of the sparging trench, simply converting the trench into a leachate recovery device.

EPA's Response: The capping contingency was presented in the Proposed Plan and fully vetted by the public; to reformulate the contingent remedy would require issuing another decision document by the Agency. EPA received considerable public comment concerning the long delay in implementing a remedy at this Site and is not inclined at this time to entertain any further changes to the remedy.

Comment 56: Currently, the landfill surface is being examined by the City of Dover as an area for future disposal of dredge spoils, lightly contaminated soil or possibly municipal solid waste. This reuse would be consistent with the 1991 ROD in that it would serve as the fill to attain the necessary grades for the cap. The City of Dover would like to examine this concept during considerations of the ROD amendment.

EPA's Response: EPA believes that re-use of the landfill for additional landfill operations would be inconsistent with the ROD Amendment's goal of attaining clean closure and aquifer restoration within a reasonable amount of time. The Agency is always available to discuss possible future uses of the Site with any party.

Source Control at the Landfill

Comment 57: In investigating localized source areas it is suggested that specific methods not be limited to those cited in the Addendum.

EPA's Response: EPA is receptive to proven methods that will efficiently and effectively identify and remediate the localized source areas. Proven methods, different than those suggested in EPA's Addendum, must be offered in a timely manner for evaluation and inclusion in the amended Consent Decree and Scope of Work (SOW) and to be detailed in Work Plans.

Ground Water Contamination

General

Comment 58: Arsenic in ground water at the site is most likely natural arsenic released from the aquifer matrix by the conditions in the ground water and therefore may never attain ICLs. Additional study is required to determine the origin and behavior of arsenic in ground water surrounding the landfill.

EPA's Response: See response to Comment No. 16, 19, and 39. EPA recognizes that there are background levels of arsenic at the Site that have been determined to be at 10 ug/kg. It is also noted that there have been no investigations to determine the origin or behavior of arsenic at the site and while that information may be of interest, EPA is not convinced it is a necessary investigation for this remedial action. What is clear is that arsenic is a site related contaminant that poses a risk to human health and the environment and it must be addressed.

Comment 59: EPA's Addendum that supports the Proposed Plan refers to dispersivity at the site being low. The Agencies have drawn conclusions from this assumption regarding the geometry and behavior of ground water contaminant plumes at the site. Specifically, this has led to the paradigm that plumes in this area are narrow and highly concentrated. The EPA's justification for low dispersivity values was not provided in the Addendum or in any previous correspondence. It is recommended that further evaluation of dispersion be included in further work at the site.

EPA's Response: EPA disagrees and notes that on July 13, 2001 in Portsmouth, New Hampshire, NHDES provided a spreadsheet to the Group and its consultants demonstrating that dispersivity at the site may be quite low. An additional copy of that spreadsheet is available. In addition, there were several conversations during the monthly meetings regarding "hockey puck" plumes of contamination. The concept of a narrow contaminant plume was the basis of the April 23, 2002 NHDES letter that advanced the necessity of a treatment trench rather than discreet injection points to address such plumes. Since that time, the Group has not demonstrated that this concept was invalid. EPA is always willing to evaluate further evidence; however, further investigations on this issue will not be entertained if they result in delays to implementation of the remedial action.

Southern Plume

Comment 60: The information that EPA based its decision on to not consider MNA (MM-2) in the Southern Plume was flawed from two standpoints. First, EPA considered wells that were not in the Southern Plume. Considering the data in Table 1 of Appendix B of the Addendum, as revised, "...underscores the need for additional information regarding

conditions in the Southern Plume...." Second, EPA does not fully understand the potential anaerobic degradation pathways for vinyl chloride, benzene and tetrahydrofuran. The scientific literature contains several instances of anaerobic biodegradation; however, the rates at the site need to be investigated.

EPA's Response: EPA based its decision not to consider a MNA remedy on the lack of solid, site-specific, scientific support that natural processes are functioning effectively in the Southern Plume to reduce all contaminants to concentrations protective of human health and the environment. Due to the lack of field data, and the scarcity of monitoring points, EPA elected to retain the remedy selected in 1991. EPA fully understands contaminant degradation pathways; however, the Group has failed to demonstrate their effectiveness at this site in attaining cleanup levels.

Comment 61: EPA should retain the flexibility to utilize MNA in the Southern Plume with pump-and-treat as a contingent remedy. If pre-design investigations indicate that pump-and-treat is required, EPA should retain flexibility in how any remedy is employed. One consideration is that any water extracted and treated from the Southern Plume be combined with the ground water extracted in the southwest corner of the landfill and piped to the City of Dover publicly owned treatment works.

EPA's Response: As previously stated, EPA has fully vetted the alternatives publicly and has selected the current remedy. Any significant change would require a further decision document. While EPA will remain flexible in considering all options contained in the 1991 ROD with respect to how the contaminated ground water from the Southern Plume is treated and discharged, EPA will not allow any further investigations to delay the implementation of either the Source Control or Management of Migration components at the Site. The Group has had the opportunity to demonstrate MNA in the Southern Plume using field data. Since the 1991 ROD, EPA and NHDES have allowed the Group great latitude in investigating alternative cleanup technologies. Since the 1997 AOC, EPA and NHDES have had nationally recognized experts in MNA available to evaluate any such data that the Group might present, however no formal investigation has been offered in the past seven years.

Comment 62: EPA did not apply a correct understanding of the ground water modeling to the Southern Plume. The end result was the Agencies predicted an impact on the Bellamy Reservoir that is not consistent with the results of the model. Using the model and literature degradation rates, there were no simulated impacts on the Bellamy Reservoir from either vinyl chloride, benzene, *cis*-1,2 dichloroethylene, or tetrahydrofuran during the 100-year modeled time-frame. Therefore, impacts to the reservoir are unlikely.

EPA's Response: EPA based its decision to retain the 1991 Management of Migration component for the Southern Plume on contaminant data trends observed in ground water.

Models provide good estimates of probability; however this modeling with its use of literature values and inherent assumptions, did not convince EPA that MNA was a more effective remedy than pump-and-treat. Despite more than ten years of field work at the site, no field evidence demonstrated that MNA in the Southern Plume would be an effective remedy.

Sediment Contamination

Comment 63: Sediment monitoring need not be included in the Environmental Monitoring Plan as an annual event over the duration of the remedy. Further assessment of sediment in the Cocheco is required under the tiered ecological assessment. The second tier of testing should be followed, if warranted by field data, in conjunction with the five-year reviews of remedy performance.

EPA's Response: Environmental monitoring is currently performed semi-annually to ensure that the remedy is protective of human health and the environment. Based on the results of current and future risk analysis and the length of time that no action has been taken to control contaminants, EPA anticipates updating the Environmental Monitoring Plan (EMP). The 2002 sediment sampling results demonstrated that although sediment concentrations did not exceed human health standards, there were concentrations above EPA's point of departure in considering risk. Therefore, a reassessment of the risks to human health posed by elevated arsenic in sediment, possibly in conjunction with exposure to other contaminants of concern, will be performed during pre-design activities and will become a part of the EMP. Ground water, surface water, and sediments will be sampled under the new EMP at least annually for the first five years after the Amended ROD is issued. After five years, it may be appropriate to lessen the frequency of sampling. For ecological risks, the second tier testing will be performed during pre-design studies as well and will move to a third tier assessment if necessary. Sediment testing for ecological risks shall also occur annually for the five years at which time the frequency can be reevaluated. Accordingly, the EMP will be modified to ensure protectiveness.

Soil and Sediment Disposal

Comment 64: Soil and sediment excavated from the landfill during the construction of the amended remedy, SC-A & MM-2/4 should be managed according to the provisions of the NHDES Risk Characterization and Management Policy and the contaminated soil reuse provisions of the State's Solid Waste Rules (Env-Wm 2603.05). The Proposed Plan indicates that the more than 19,000 cubic yards of soil excavated from the trench will be disposed off-site. Following the Solid Waste Rules reuse of contaminated soil and allowing disposal on-site, consistent with those rules, will diminish short-term risks and lower costs.

EPA's Response: Given the landfill is not currently active, nor does it exist under the State's Rules, applicability of the RCMP and Env-Wm 2603.05 may prove problematic. Pre-design investigations will make a final determination on this issue. If determined applicable, a goal of the pre-design investigation will be to evaluate representative soil samples from the proposed alignment cross-section and assess the results under the State's Solid Waste Rules and RCMP criteria.

ATTACHMENT 1

Appendix D: Responsiveness Summary

Transcript of the July 19, 2004 Public Hearing

UNITED STATES OF AMERICA

ENVIRONMENTAL PROTECTION AGENCY

BOSTON REGION

In the Matter of:

PUBLIC HEARING:

RE: AMENDED PROPOSED PLAN
DOVER MUNICIPAL LANDFILL SUPERFUND SITE
DOVER, NEW HAMPSHIRE

Dover City Hall Auditorium
228 Central Avenue
Dover, New Hampshire

Monday
July 19, 2004

The above entitled matter came on for hearing, pursuant to Notice at 7:00 p.m.

BEFORE:

MIKE JASINSKI, Chief, NH/RI Superfund Section
DARRYL LUCE, Remedial Project Manager
U.S. Environmental Protection Agency
Region 1, New England
Office of Site Remediation & Restoration
One Congress St., Suite 1100
Boston, MA 02114-2023

ANDREA HOFFMAN, Project Manager
New Hampshire Department of Environmental Services

~~ORIGINAL~~
Copy

I N D E X

SPEAKERS: PAGE

P R O C E E D I N G S

(7:00 p.m.)

MR. JASINSKI: I have some white cards here. I am going to start the public comments now. I'm going to go through these one by one, and then we'll, if someone wants to come up later, please, raise your hand, and I'll call your name, and we can go from there.

Again, please, state your name and your relationship to the Dover Landfill Superfund Site. The first card I have is from a Loretta Chase, if she could come up and --

MR. STERN: Ms. Chase is not able to come up to the stage. She's, it's very short, and she asked me to present it.

MR. JASINSKI: If you could, Brian, if you could for her--

MR. STERN: Okay--

MR. JASINSKI: --state your name and who you're speaking for and then the comment.

MR. STERN: Okay. My name is Brian Stern, and I'm speaking for Loretta B. Chase, and she wrote these comments: "Brian Stern has my permission to present these comments. They are my personal comments. I am particularly concerned with the Eastern Plume and its effect on the Cocheco River.

"Until a biological assessment is completed, appropriate decision for a remedy cannot be made. The health of the river is important, and the New Hampshire Department of Environmental Services has laws to protect it. DES should be given full support. Major efforts to improve the river upstream and downstream in the Cocheco are underway. This is another way to add to that effort."

Those are the comments, and she asks a question: "How well is sparging understood?"

So, she had written those. I'd like to submit those written comments.

MR. JASINSKI: Thank you, Brian.

The next card I have is from a Tom Fargo, a Dover resident. Mr. Fargo?

MR. FARGO: Good evening. My name is Tom Fargo. I'm a Dover resident. I'm also Chairman of the Conversation Commission, and back in the early nineties, I was associated professionally with the predesign investigation at the Dover Municipal Landfill, so I'm quite familiar with the issues out there regarding source control and management of migration.

I've gone to the presentation. I've read through the, the last presentation. I've read through the proposed revised remedy, and I'm very concerned about the ability of the air-sparging trench to work over a period of time.

I'm concerned that there'd be a significant amount of precipitation of iron and arsenic co-precipitate in there that would actually cause clogging in the interstices of the backfill material causing it to not operate over the period of time that it's desired to operate.

I'm concerned because once these precipitates form, the only way that I see to really get them out is either to use some sort of acid, which would remobilize, potentially remobilize, these materials, or excavate them out, which could have serious cost implications associated with it.

I'm also -- Darryl, can you go back to the red line that shows the air-sparging trench on the map? Okay. The air-sparging trench is shown on the map here. I'm quite familiar with the ground water flow patterns out there, and I recognize that the air-sparging system is primarily geared toward controlling the contaminants as opposed to controlling the hydrology or the hydraulics of the site. In other words, if you stop all the contaminants at the waste boundary, then you don't have to worry about where the water flows past that boundary area.

I'm familiar with the hydraulic controls which were proposed previously. In fact, I did a lot of the design work associated with the ground water extraction system, and I know that the downgrading area is here, and here are the primary sources for contaminants --

The hydraulic control remedy was primarily to control in this area here and, also, in this area here. This leg of the trench is actually along the hydraulic gradient. The ground water flow path goes in this direction.

What I'm concerned about primarily is that there is a difference in the hydraulics along this section of the trench versus this section of this trench. In this area here, hydraulic gradients are upward, in other words, from the lower units in the upper interbedded and upper sand units, from the lower -- from interbedded sand layers here upward in the upward sands, and in this area, the hydraulic gradients are downward.

What I'm concerned about is that there'd be short circuiting here because of the issues, in terms of the hydraulics anyway, because these trench segments, if they're all connected, would allow flow to go in places where it wouldn't necessarily want, where you wouldn't necessarily want to have it there.

So I suggest that, if the air-sparging is going to take place, that these are segmented in a way that there can't be short circuiting from one place to another.

I'm also concerned about air-sparging from more planning related issues. You say that you'd only be collecting up the air that's coming up through the trench if it has concerns, if you have concerns regarding the VOC levels in it. I know, from personal experience, that the leachate out here has an awful odor to it and that the neighbors are not going to be happy if this odor is emanating from your air-sparging system here. In fact, many neighbors are very concerned about odors associated with an operating landfill not too far away from here, and this would be a double whammy for them that I don't think they'd really appreciate.

The other aspect of this is I'm not sure how loud these blowers are going to be or how loud the system is going to be because it's operating, you know, you're blowing air, and you have these things, and I'm not sure whether the noise factor will be taken into consideration as well.

I'd like to repeat a comment I made back at the last meeting, and that is that if these Eastern Plume is going to have associated with it some of the excavation in the Cocheco River area to address some of the remnant arsenic contamination that might be there, that this be done through the normal DES permit process which would allow the Conservation Commission to have input on how to manage the excavation process that would be taking place to address those contaminants over there.

I think that the local watershed community, watershed protection community, would like to make sure that any work that's done within the river is done in a way that addresses mobilization of the materials and restoration of the areas that are being addressed.

Thank you.

MR. JASINSKI: Thanks, Tom.

The next person I have is Doug Bogen. I hope I said that right. Clean Water Action, Portsmouth.

MR. BOGEN: Right. My name is Doug Bogen. I'm the New Hampshire Program Director for Clean Water Action, which is a national organization with regional offices in Portsmouth, and I'm also a Portsmouth resident, and we have over 3,000 members in the state.

I'm speaking in their behalf, and we have, in fact, almost 1,000 members that are in the communities that are potentially affected by this situation with the Dover Landfill, the potential for contamination to the water supply in the Bellamy Reservoir, so I really want to speak for those people, and I want to provide a little bit of background to this issue beyond what has been presented in the last couple of meetings.

You know, from the perspective of Portsmouth, we're really surrounded by a number of Superfund sites. To the west of us, we have the Coakley Landfill, which is fairly similar situation. It was the City Municipal Landfill, became a Superfund Site around the same time. It is further along in the cleanup. They are putting a cap on it. It has been consolidated, but it did also threaten the Portsmouth water supply. We have a number of wells that are down gradient of it in Greenland.

To the east of us, there's the Portsmouth Naval Shipyard, which is also a Superfund Site, although we are divided by the Piscataqua River, but, again, another major toxic waste site in the area, and then just immediately to the north of us is the Pease Air Base Superfund Site, which is actually a couple dozen different sites, and I wanted to focus on that one a little bit more because there was a public health assessment done for that site a number of years back, back in 1999, in fact, and I provided some comments to that assessment.

They did determine that there was an increase in elevation of two types of cancer. The one relevant to this situation here is non-Hodgkins lymphoma, which is associated with exposure to volatile organic chemicals like trichloroethylene or TCE, which is also found at the Dover Landfill site.

Pease Air Base did contaminate their water supply, which is also a portion of the City of Portsmouth's water supply, back in the 1970s. This assessment did determine that even though there was a two and a half times more non-Hodgkins lymphomas in the local population, that that they could study, it did not constitute an increased risk. They didn't think it was statistically significant. Interestingly, they didn't actually sample or look for data from the people that lived on the base that were drinking most of the water.

But I probably mention all this because of the fact that we're talking about Portsmouth's water supply here, and we don't want to have, 20 years from now, to be doing an assessment of what happened, you know, due to another insult to our water supply.

We also already have arsenic in our water supply. It is naturally found in New Hampshire. I'm sure most people don't realize that, at one point before, I guess, New Hampshire was called the Granite State, it was actually called the Arsenic State. They used to mine arsenic. You know, it's good rat poison. And we do naturally have arsenic in our water supply.

I believe up to, last report I saw was somewhere in the order of four parts per billion, the higher levels that have been measured in Portsmouth's tap water. We don't need any more. The fact is, there's really no safe level of arsenic. Folks should know that the current standard, the one going into effect in 2006, was a compromise, ten parts per billion, does not correspond to what EPA normally takes as an acceptable risk to public health for cancer effects.

There are other effects from arsenic as well that are still becoming understood, so this is a serious issue, and we really don't want to see any more arsenic going into our water supply.

In this regard, with folks in Portsmouth, I think it is of concern that I don't think people in Portsmouth are as aware of this issue as perhaps folks in Dover, and I realize we're kind of late in the process here, but I would like to ask, at least, that you consider holding a separate hearing in Portsmouth, given that the City of Portsmouth and surrounding communities are potentially affected with their water supply, that it's not just Dover residents that need to be concerned, and there ought to be a greater opportunity for Portsmouth residents to be informed and comment on this.

I do appreciate that you've extended the time frame for comments on this a few more weeks, but given that we are still in mid summer, I think it is pretty tough for a lot of folks to focus on if they even happen to be in town this month.

I do want to mention a few specific concerns over the proposed plan. The Clean Water Action, we're all for innovation, new technologies, but there are, as has been said before, there are many uncertainties with this sparging technology. It needs to be watched very carefully. It really, you know, opens a lot of questions as to whether this will serve as a substitute for doing the, you know, the old remedy, the cap, and we are really concerned about that issue of trying to supplant that previous plan.

The issue of building a cap or not is of most concern to us. It's not clear whether the site will ever really be clean. We understand it's certain a benefit to try to reduce the contaminants in the ground water, reduce the contaminants in the soil as much as possible, but it still needs to be recognized that we're unlikely to get all of the pollution out of there, and I think you say in your proposal that you will need to have some sort of cap. I recognize it probably won't be the full RCRA cap, but still, you're going to have to do something with the site when you get down with the ground water treatment.

This plan appears to put cost concerns above human health and environmental concerns, and that concerns us. Really, human health concerns have to be foremost, and we recognize that, you know, City of Dover is very concerned about what it will eventually cost them and the other parties, but we really need to be considering the number of people that are potentially at risk here. We need to be taking their concerns foremost.

We shouldn't give people really a false sense of confidence that they can avoid, in the case of the City of Dover, that they can avoid these costs. It may just turn out that ten years from now, we'll have to spend more. I mean, I notice back in 1990, it was, I think, $24,000,000, or something in that order, for the cap, and now it's $32,000,000. I wonder, in 2010, if it's going to be $40,000,000 or $50,000,000 for the cap, which may eventually need to be done anyway, so we shouldn't just assume that we're going to avoid that cost.

Lastly, I'd just like to mention the Cocheco River contamination appears to be problematic. It's a great concern. There's these questions raised about how much we know about it and what needs to be done about it, and it hasn't really been fully investigated, and that, even though it isn't, you know, somebody's drinking water supply, it's certainly environmentally, in terms of recreational exposure, it's a great concern that we are seeing arsenic ending up in the river there, and it does appear that that needs to warrant further attention.

I will be submitting written comments before the deadline, but I appreciate your time tonight. Thank you.

MR. JASINSKI: Thank you, Doug.

Next comment, I have Katie Duncan.

MS. DUNCAN: I am Katie Duncan. I live in Dover. I'm a student from Woodman Park School. Here's my question. At the last meeting, I asked the question: When will it be safe to swim in the river?

It seems you did not know, and I don't feel that you have given me a clear answer. I would like to know the answer to my question.

MR. JASINSKI: Thank you, Katie. You'll have to wait for that answer. Sorry.

Next one I have, last white card I do have this evening is from Brian Stern, personally.

MR. STERN: Thank you. My name is Brian Stern. I'm from Dover. I am also an incorporator of a group called the New Hampshire Tag Force, a nonprofit organization that has been incorporated to obtain a tag grant from the EPA, and we have obtained that grant. We've not yet done our study so that my comments, personally, do not reflect the comments of the New Hampshire Tag force. We will be separately providing written comments before the comment period.

I'd like to thank the EPA for extending the comment period, and I'd like to thank them for the tag grant. It's a great program that allows citizens the resources to be able to hire experts to be able to provide thought out comments, which they otherwise could not do. It recognizes that citizens just do not have the wherewithal to address these complicated issues.

I have a lot of issues to address, and I think I want to somewhat do it backwards and address the cost issue first. I almost feel as if I'm in a position of saving the PRPs from themselves, and I think that the State and the EPA should not also be feeling a need to satisfy the PRP's request for a less cost technology when there are so many questions about it and then to cover it, put in a contingency backup plan that states, in the event of failure, the contingency plan will kick in. It will be a very expensive experiment, one that the citizens of Dover, who is the primary PRP, could not afford.

So I think that the low cost, the lower cost plan that's being proposed is not necessarily the lowest cost plan, and cost is a factor that the EPA and the State considers in choosing a technology so I think I have a concern for the cost of this plan because that cost includes the contingency.

I also have a concern that the contingency will create an enormous amount of delay and additional cost over litigation and determinations of when that contingency kicks in and what is the wording to trigger those contingencies. There is wording in the documents such as "if it fails," and how is that determined or "if there is a risk," and how is that determined or "if it does not meet the safety standard that are required," is one of the, I've seen those sort of words at some point.

I'm uncomfortable if the air-sparging trench works to an extent where it brings it down below the threshold level of risk, but it still allows for contaminants to the environment, whether it be the Bellamy River, the air or the Cocheco River.

So your trigger point for that contingency is, I don't think, very well thought out, and it certainly is not air tight, and it's going to be subject to a lengthy process to determine when that contingency will kick in. It will cause additional delay, a lot of expense to the participating parties and the government in determining when that contingency kicks in, and I think that it's set for failure of that contingency is, if it's still above acceptable levels, and it just reduces them below those levels, but is still not a risk that we would want to accept.

I echo Doug Bogen's and the Clean Water Action's comments that ten parts per billion of arsenic is a compromise today that may not be the compromise later. I don't recognize that as an acceptable level for arsenic, particularly, with the high background level which that national standard does not recognize and is not individualized to New Hampshire so I'm concerned about that.

I have concern about the list of additional studies to be completed, and there is a large list of those. The plan and the addendum recognize a whole host of unknowns about this site, and I have concern that the remedy is being picked without adequate knowledge of that site.

We can look in hindsight and point blame, but, certainly, it is a shame that, after so much time, we have inadequate information about the site, but that inadequate information goes to that there has not been an assessment of the risk to human health from multiple pathways of exposure, whether it's individually or combined. That risk to human health has not yet been assessed from this site, and we're choosing a remedy.

The risk to the environment has not been assessed. The government and the PRPs do not even know what the level of contaminants are that's heading to the Bellamy Reservoir or to the Cocheco River, and these are, this is the government's own words, in their own document: "The potential impact to indoor air pollution from the volatile organic compounds has not been assessed." That's, again, by the government's own admission.

The nature and the source of the contamination has not been studied. There's a question whether the arsenic is native or whether it's been a contamination to the site, and that has not been studied. That's also with some other contaminants, and I've not seen the documents, but I'm not very comfortable yet with the way it's been addressed for lead and mercury and cadmium and whatever other metals are there.

There is criticism in the addendum that there is only one well, I believe, between the site boundary and the Bellamy Reservoir, and there's 800 feet between that well and the Bellamy, which has not been tested for the contamination of the Bellamy Reservoir.

The documents say that the government does not know the extent of the Southern Plume and what it will take to intercept it; yet, we're proposing a plan, and the plan has all these predesign studies to be done.

The Cocheco River has many locations of testing that are exceeding the first tier of criteria; yet, they have not, the government has not proceeded to study those, the next level of criteria. Yet, the plan says we'll just monitor and naturally attenuate at the same time that these studies already show that the contamination is there.

There are more issues in terms of the studies that still need to be done, which is recognizing the document before a plan is done, so I have a concern with that.

Oh, let me, let me add a couple more in terms of the studies that have been done. There's no study as to what the level of arsenic will achieve in the sediments. There's been no study of that. There's been no study of how the sediment in the Cocheco River watershed have been dispersed, how level the, how far widely dispersed the contaminants have been.

I was thinking about this since the last meeting, that the comment is that the level of arsenic at the boundary, near the boundary of the landfill where it leaches into the river are at low levels. Well, so we don't have to address them. They're going to constantly be at low levels and, by that logic, will never be addressed. The contaminants come in, in a slow drip and wash away, and they constantly stay at a low level.

I was thinking about that. Where are they going to go? Where are they going? There is a question to what extent they'll be suspended in the water even on a temporary basis, what amount is going to wash over the dam and go downstream into the Piscataqua watershed, but, most certainly, they'll be accumulating behind the dam, the first dam, at Watson Road, and there's been no study of the sediments at the Watson Road.

There's a ready made study to see what has been accumulated. I'm not sure how much it's going to tell us because we don't even know at this point how long the sediments have been leaching into the Cocheco River or at what rate, nor do we know at this point the volume of contaminants between the boundary of the landfill and the river.

How much has moved off site that still is in that area, and how long that will take for a constant low-level washing into the river? And where will they go? How will they be distributed? How will they accumulate? And what will happen in a 100 year flood to those contaminants that accumulate in high level behind the dam, if that is where they go, in fact?

MR. JASINSKI: If you would summarize your concerns right now, I'd appreciate it.

MR. STERN: Well, I have quite a number--

MR. JASINSKI: Maybe we can give somebody else--

MR. STERN: --of points that I would not be able to summarize those points. That's the end of the list of the studies. I'd like to move on to some other areas that I have.

MR. JASINSKI: If you could, quickly.

MR. STERN: I'll try to move through each of them.

MR. JASINSKI: Yes.

MR. STERN: It was decided for the Southern Plume going to the Bellamy that monitored natural attenuation would not work, that the conditions for monitored natural attenuation don't exist at the site, so I am concerned that how that remedy then works for the Eastern Plume. When it's been determined that it does not work and the conditions are not right for monitoring natural attenuation for the Bellamy area, why does it work for the Cocheco?

I have a concern that the PRPs have raised and will raise a challenge to this remedy that there isn't practicability to achieve it, that there is natural arsenic and that they cannot clean it up because it will just be a continual flow of arsenic. As much as there's water getting in because there's no cap, there will forever be arsenic.

If that argument is the case, and that is potentially the case, and that's recognized in the EPA documents that the source of the arsenic may be natural, it may be added, it may be the combination of them, if that's the case, and there is some practicability potentially recognized by the government that the, this plan doesn't work because it needs to be capped, if that argument of practicability is a concern.

I understand there's going to be some experimentation with this sparge wall in terms of it being built in sections and seeing how it works, and I'm concerned about the time frame that that is going to take. I have concern about whether the sparge trench will work at all. I don't understand the system to have been so widely used as has been represented. I have concern about that. I also have concern that it is novel in addressing, both, arsenic and tetrahydrofuran, and it is novel in that regard, as well as the removal of the arsenic. That's an issue.

I think the recapturing of the precipitate is going to be a problematic issue that, even if the acid wash to remobilize the precipitate works, in general, I believe you're going to have a very high concentration of arsenic, and not all of that remobilized precipitate will be captured, and you'll be sending high concentration shots downstream.

So even if it pretty much well works, I think you're going to have very highly concentrated arsenic in the precipitate that, in the removal process, if the removal process works as expected, is still not going to be perfect, and that will create a problem, but I also have a concern that, to remobilize and remove it, itself, is going to be a problem.

I have a concern with the clogging, as Tom Fargo mentioned. I also have problems or concerns with channeling of air and channeling of water and how those are going to be monitored to see that they are working.

I also have a concern about the long-term operation of the sparging trench, and I have concerns that it is referenced in the plan as a, both, 20 year and a 30 year operation; yet, the addendum states that it will take 75 to 100 years, depending on the Cocheco River and the Bellamy, 75 to 100 years of cleanup before the contaminant is addressed.

So I'm concerned between the conflict in the documents between 20 or 30 versus 75 or 100, and I am concerned with the socioeconomic time frame as to what is going to be a socioeconomic environment, whether it's 30 years or 100 years from now. Are we going to be asking some body or some entity or something to continue the operation of this for such a long period of time?

It's too far out to say that we'll be able to continue to do this at that time frame. Who knows what the social, political and economic environment is going to be that far out for this type of technology? It should be addressed at this point.

MR. JASINSKI: Brian--

MR. STERN: Yes--

MR. JASINSKI: --let me stop you right there. Hold on.

Is there anybody else who wants to make a statement? Because I'll, I want to defer to others, too.

You can come back.

MR. STERN: Thank you. I appreciate that.

MR. JASINSKI: But does anybody else want to make --

No, Brian, if you've got more to say, that's fine.

But does anyone else want to make a statement? Because I want to give everybody an opportunity to night. So, sir?

And then, Brian, you can come back.

MR.. HODGENS: I'll be very brief.

MR. JASINSKI: I'm just going to give everybody else a chance.

MR. HODGENS: My name is Mike Hodgens, and I'm a Portsmouth resident, but I'm a commercial diver, and I've dived in these waters for like the last 15 years, and my season's from April, mid April, until mid November, and I'm in the water pretty much every day, and my concerns are, you know, what's leaching out there? What am I swimming in? And how is it affecting me and people in the business that I'm in?

And my concern, my other concerns, are the drinking water in Portsmouth, and it just seems like it's very risky to take these steps not knowing how the results are going to be when you have another method of capping that could, you know, makes more sense to me than these suggestions.

MR. JASINSKI: Thank you very much.

Anybody else before Brian continues?

(No response.)

MR. JASINSKI: Brian?

MR. STERN: Thank you. I'm sorry. I didn't know you wanted to just take a break.

MR. JASINSKI: No. I want to give everybody--

MR. STERN: Sure--

MR. JASINSKI: --an opportunity. That's all I'm trying to do.

MR. STERN: Sure. Yeah. I try not to--

MR. JASINSKI: I didn't want to hold somebody up.

MR. STERN: I try not to repeat myself and--

MR. JASINSKI: Okay--

MR. STERN: --and go through these, and thank you for the opportunity.

The trench, I believe, is estimated to have about 20,000 cubic yards of material to be excavated, and I assume that much to replace it, and I don't know if all the excavated material would be trucked off site, but if it's the amount of excavation, the amount of replacement being 40,000 yards, I believe the cap is 165,000 yards so that the order of magnitude between them may not be as much as is represented as a concern.

Certainly, there is more. There's a big difference between 40,000 and 165,000 yards, but it's not like 10,000 yards to 165,000 yards.

Darryl Luce, of the EPA, was kind enough to respond to me in writing to a question that I posed at the last meeting which was: How much would it cost to pump and treat the Eastern Plume to the Cocheco River?

And the EPA can characterize that, their response, better than I can, but I believe the bottom line on it was 2,000,000 to 3,500,000. If it's at the lower end, it's not that much more than the monitoring and natural attenuation, which is, if I remember right, close to $2,000,000 in itself, so we're not talking about that much of a premium of cost to also pump and treat the Eastern Plume to the Cocheco River because it is recognized that there already will be in place the pumping technology for the Bellamy Reservoir, so there's only an incremental cost of adding additional pumping and treating, and there is a large cost to monitoring a natural attenuation. It's not a cheap, inexpensive item.

So I think that needs to be considered. I don't think it really has been considered by evidence that the EPA needed to do the look into that, and I do appreciate that they did look into those costs, but I think that is something to consider for this plan.

The last comment I'd like to make is about the Cocheco River, and I have said some of these, and this is one area where I may overlap on it, but I'd like to consolidate them in this area.

My concern is that there will be a constant low-level drip of contaminants into the river, and that's not acceptable. We're talking about a major watershed to this area, major contributory to the Great Bay. There are enormous amounts of efforts being made regionally to clean up the Great Bay and the Piscataqua River basin.

The local communities have been hit really hard with the bills for sewage treatment plants, Dover, Rochester, Farmington, Somersworth. We're spending millions of dollars to dredge the Cocheco River in Downtown Dover. We're dealing with contaminants at the Portsmouth Naval Shipyard. We're looking to develop the waterfront. We're asking people to use it and model it and create an economic viability depending upon the river; yet, we'd overlook this aspect of it.

Loretta Chase's comments were appropriate that this is an opportunity to join in that effort, not to avoid it. It's inappropriate to be looking at a short term horizon for the cleanup of this river and use of this river and then allow constant low-level drip for the next 50 to 100 years.

The river, I believe, is what's called TMDL listed, which says that the river's biologically challenged based on oxygen demand. This is oxygen challenged river, and when these contaminants come out from under the ground, they will demand all of the oxygen of that river and will further degrade it, and I believe that the listing of that river should not allow that to occur. I know that sounds very technical, but this is a large part. The health of the river is dependent upon the oxygen in that river.

The greatest level, the greatest volume of contaminants and the steepest gradient go towards the Cocheco River. That's where they're heading. There is a smaller portion going to the Bellamy. I don't say that to ignore the Bellamy. They need to both be addressed, but it is recognized that that is where the greatest volume is, going to the Cocheco River. That should not be ignored.

I understand that the arsenic moves slower than the ground water, that it moves from grain to grain, and it takes many flushings of the ground water through the area to leach out the contaminants, so if it takes ten years to flush through, and we believe it takes longer than that, it takes ten flushings, that's 100 years, so we're easily looking at 100 years plus for this. Those studies have not been done about it except to the extent that we do know that the contaminants are there.

I would just like to close with a couple of quotes, and that is the concern for further sampling of the Cocheco River if it's determined that it generates a risk to either human health or the environment, the contingency plan will kick in.

You already know that arsenic is leaching into the river. You already know that, so why is there a contingency plan?

I just flipped to another page that says that the air-sparging trench should be built with design flexibility to enable portions of the trench to be operated either as an extraction trench or a reinjection trench or, as the design trench as it is, for the sparging.

I don't know that that can be done either. Can a sparging trench be built that's going to also act as an extraction trench? I don't see that. I haven't seen, I haven't read everything yet, but I haven't seen that addressed. I see it as an imposed requirement, but I don't hear the technological or haven't seen the technological feasibility of that being done yet.

I'm going to submit written comments so I'll leave it at that, and I really do thank you. Katie had written a letter to you, Mr. Luce, that we did not get to mail. It echoes some of her comments following the last meeting that she didn't feel she got such a good answer to when she could swim in the river, and I'd like to submit Katie's letter to you for the record.

MR. JASINSKI: Thanks.

MR. STERN: Thank you. She even drew you a picture. Thank you.

MR. JASINSKI: Okay. Before I close the hearing, I want to make sure there are no other individual or otherwise comments.

Sir, again?

UNKNOWN: Back for extra innings, I thought I might as well.

MR. JASINSKI: It's not a requirement.

UNKNOWN: Okay. Sorry. I've been listening to a lot of comments regarding the Eastern Plume and management of the migration over there, and one concept I'd like to bring up is, I know it's been battered around before, but if the concern is for the contaminants which have already left beyond the solid waste boundary here that are now sort of lurking in this area that an active remedial system could be in place, say, along the southern boundary of Tolend Road in this area here, sort of a cutoff, essentially, what I'm suggesting is, or asking a question.

Has it been fully assessed whether you could, basically, establish a ground water management zone in this area, continue to watch your natural attenuation, but address the contaminants which are going to the river by placing an air-sparging trench along this section of the site which would allow much easier access to that area.

I also know that the top of the clay is much closer to the surface here than it is down in this area so that the actual saturated thickness that you'd have to address is much, much less in that area. This would allow more rapid cleaning up of this continuing source of contaminant which would potentially go to the river. It would sort of leave it behind, but it would address the river contamination at a much more expedient manner. It potentially is less costly and easier to get in there and address these issues related to precipitate forming within the air-sparging trench.

So I'm asking the question, Can this be more fully assessed addressing the contamination at this location as opposed to along the solid waste boundary?

I know it means writing off and leaving material in this area, but that area is owned by the City of Dover. It can be controlled administratively, so I'm throwing that out.

Thank you.

MR. JASINSKI: Thank you.

MR. STERN: May I take about 15 seconds?

MR. JASINSKI: Fifteen seconds.

MR. STERN: Yes. You know, I just want to say that I like the concept of removing contaminants and dealing with them rather than leaving them in place, and I think that's a good idea in a broad scope of things, but I think it's just that the problem with knowing the effectiveness of it, whether that's really going to work, is my concern, but I don't want to go with that being unsaid.

The idea of addressing them is a great idea, although it doesn't address them where they've already moved off site to the Cocheco, but I do think that's a good idea. I'm just not sure that it's working or that we know it's going to work.

Thank you.

MR. JASINSKI: I guess, as they say, last call?

(No response.)

MR. JASINSKI: Anybody else?

(No response.)

MR. JASINSKI: I guess that will close the formal hearing for this evening. We appreciate all your comments, thorough, detailed, personal or otherwise. We'll get back to you as far as a request to have a hearing in Portsmouth.

I will remind you the public comment period will end on August 11th, not three days from today. Your comments are accepted to Darryl's attention either at luce.darryl@epa.gov by e-mail or send them directly to him, and I think his address and such are in the Proposed Plan.

Thank you very much for enduring the lack of air conditioning and the stifled room, and thank you very much again. We'll be here for a while. Thank you.

(Whereupon, at 8:20 p.m., July 19, 2004, the above matter was concluded.)

CERTIFICATE OF REPORTER AND TRANSCRIBER

This is to certify that the attached proceedings in the Matter of:

RE: AMENDED PROPOSED PLAN

DOVER MUNICIPAL LANDFILL SUPERFUND SITE

DOVER, NEW HAMPSHIRE

Place: Dover, New Hampshire

Date: July 19, 2004

were held as herein appears, and that this is the true, accurate and complete transcript prepared from the notes and/or recordings taken of the above entitled proceeding.

Suzanne French
Reporter

July 19, 2004
Date

Susan Hayes
Transcriber

August 2, 2004
Date

ATTACHMENT 2

Appendix D: Responsiveness Summary

Comment Letters Received

7 Tideview Dr
Dover, NH 03820
(603) 749-0833
bob@engel.com

August 6, 2004

Darryl Luce
United States Environmental Protection Agency
1 Congress St, Suite 1100 (HBO)
Boston, MA 02114

Dear Mr. Luce:

Please reconsider your plan to cap the Tolend Road Superfund site in Dover, New Hampshire and intercept migrating contaminants through use of a sparging trench. I feel that this is an unproven remedy that would have catastrophic consequences if it fails to perform as anticipated.

The Dover municipal landfill is located in close proximity to reservoirs and aquifers serving several communities. Failure of abatement procedures would create costly problems, both in terms of human suffering and financial damage. The solution chosen must be completely proven or must have a very high degree of success.

The plan ultimately chosen by the EPA must utilize technology and engineering practices that have been successful in other similar situations. Please do not use Dover to test new abatement processes; the risks are much too great.

Sincerely,

Robert R. Engel

Robert R. Engel

CARYN DUNCAN <CDUNCAN_CARYN@msn.com>

08/11/2004 12:36 PM

To: Darryl Luce/R1/USEPA/US@EPA
cc:
Subject: comment on plan for Dover, NH landfill

<?xml:namespace prefix="v" /><?xml:namespace prefix="o" />
Mr. Luce,

I would like to comment on the proposed EPA action plan for the Dover Municipal Landfill Superfund site on Tolend Road. I am concerned about the contaminated ground water that is flows toward the Cocheco River and the Bellamy Reservoir. I agree that there needs to be action taken to control this. However I feel that the action plan of the air-sparging trench system should not be used because of unknown fact of its effectiveness until it is completed and the reliability over a long term time span. I feel a plan needs to be implemented that will be effective upon completion without having to rely on a back up plan. I feel that this situation needs to be addressed immediately so that the flow of contaminants are stopped from leaching into the water.

Caryn Duncan
39 St. Thomas St.
Dover, NH 03820

Dear, Mr. ~~Government~~ Luce,

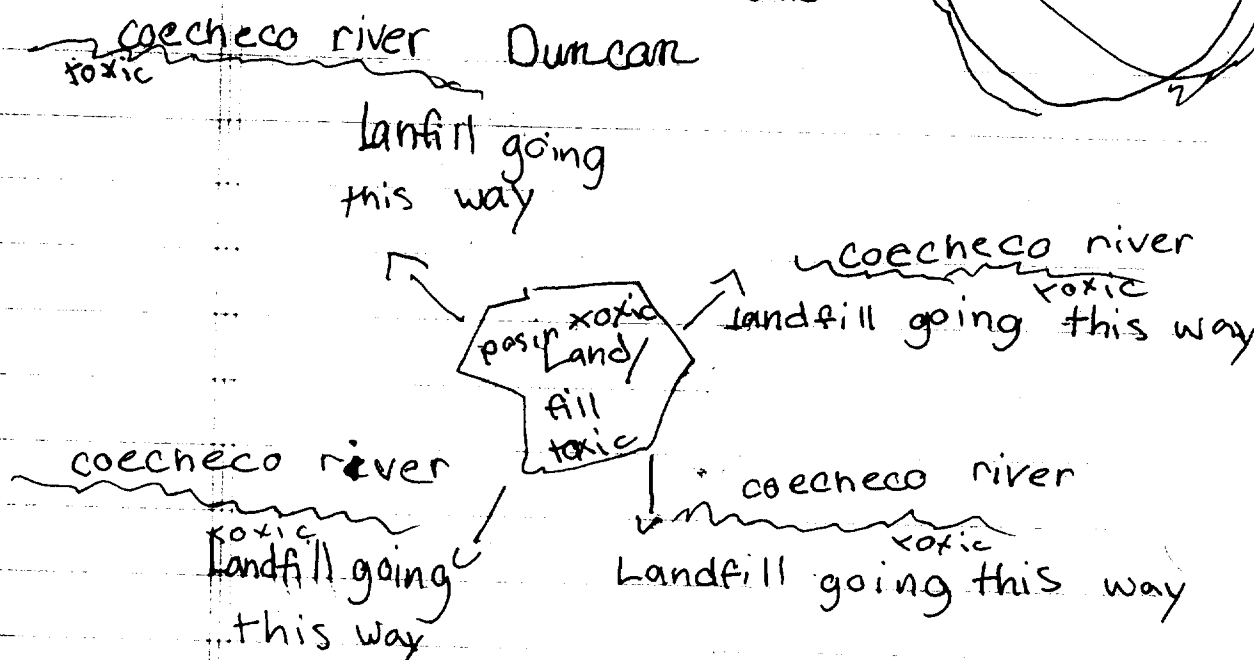
You didn't give ~~quite~~ such a good answer to my question. I didn't get it. why are changes 100 years. it can be a huge risk.

From

Katherine

Ann

Duncan



PS. land fill is spaced around the coecheco river. toxic is going in to ground and leading to coecheco river!

Tom Fargo
<tomfargo@ttlc.net>
08/10/2004 04:12 PM

To: Darryl Luce/R1/USEPA/US@EPA
cc: "Peschel, Dean" <dean.peschel@ci.dover.nh.us>, Lorie Chase <lorie.chase@unh.edu>
Subject: Dover Municipal Landfill

Darryl,

The letter attached below has also been sent through the mail. It is postmarked today, August 10, 2004. Please include my comments in the record regarding the Amended Proposed Plan for the Dover Municipal Landfill.

August 10, 2004

Mr. Darryl Luce
U.S. Environmental Protection Agency
1 Congress Street, Suite 1100 (HBO)
Boston, MA 02114

RE: Comments to the Amended Proposed Plan, Dover Municipal Landfill

Dear Mr. Luce:

The purpose of this letter is to document the questions and comments I provided regarding the above-referenced project, during the public hearing held on July 19, 2004 in the Dover City Hall Auditorium.

As I stated at the public hearing, I am a resident of Dover. I am also the Chairman of the Dover Conservation Commission; although the comments I provide herein do not reflect positions endorsed by the Commission. I have also participated in the Pre-Design Investigations of the Dover Municipal Landfill, during the early 1990's, as a Senior Staff Hydrogeologist for the consulting firm Caswell, Eichler & Hill, Inc. My familiarity with the landfill site stems from my involvement with field investigations (geophysical surveys, subsurface boring inspections, monitoring well installations and hydrologic testing) and data analysis (including the development and testing of the EPA-approved groundwater flow and contaminant transport numerical model).

Comment 1; RE: Efficacy and Maintenance of the Proposed Treatment Trench

My first comment on the amended proposed plan regards the long-term efficacy of the proposed treatment trench. The proposed air injection system will cause the formation of an iron precipitate, that will also contain arsenic, within the trench backfill. My concern is that this solid precipitate material will rapidly clog the interstitial spaces within the trench backfill. This could then lead to formation of air escape passageways within the treatment trench that would "pipe" the sparging air to the surface. Such piping of the sparging air would reduce the effectiveness of the groundwater treatment system. In order to maintain the capacity of the system to treat of the contaminated groundwater, the iron-arsenic precipitate in the trench will need to be removed periodically. Re-excavation of the trench to remove the precipitate and replace the backfill would be very costly and would also produce a large amount of potential RCRA hazardous waste. Acid flushing might be used to remove the precipitate in-situ, but the acid could mobilize a slug of dissolved arsenic into the downgradient groundwater. At the June 21st public information meeting, I asked if bench scale tests have been performed to evaluate the rate of iron-arsenic precipitate formation relative to the available interstitial volume in the treatment trench and the effective life of the system. I suggest that even if the results of this analysis are favorable, the proposed treatment trench will essentially be filled with the iron-arsenic precipitate at the end of the remediation period. Once the artificial oxidizing conditions revert to ambient anoxic conditions, the arsenic in the trench will start to be remobilized and will provide a continuing source of contamination to downgradient groundwater and the Cochecho River, unless it is removed by re-excavation or acid flushing. The use of air sparging technology to remove arsenic from the contaminated groundwater is not like the removal and enhanced bioremediation of chlorinated and non-chlorinated organic compounds in the groundwater. The arsenic will remain in the ground, concentrated within the treatment trench backfill. It shouldn't be simply left in place.

Comment 2; RE: Convertibility of the Treatment Trench to a Groundwater Extraction System

The amended proposed plan, as described at the June 21st public information meeting, includes an alternative to convert the treatment trench to a groundwater extraction system, should the proposed air sparging system fail to meet treatment expectations. At the July 19th public hearing I cautioned that such a conversion might not be easily accomplished. The use of treatment trench technology is based on the remedial approach that the system will remove or enhance the destruction of specific contaminants of concern below their respective clean up level concentrations. The use of groundwater extraction technology (so-called pump and treat methods) is based on a remedial approach that is intended to hydraulically capture all groundwater flowing past the solid waste boundary. The Pre-Design Investigations, that I participated in, designed a landfill cap and groundwater extraction system that followed the hydraulic control approach as required by the 1991 Record of Decision (ROD).

My specific concerns, as expressed at the July 19th public hearing, regarded the variable vertical hydraulic gradients along the alignment proposed for the treatment trench. Based on data in the Pre-Design Investigation report, I know that along the southern boundary of the landfill the ambient hydraulic gradients are upward from the various levels of the upper interbedded zone to the upper sand zone. In fact in places the hydraulic head within the semi-confined upper interbedded zone is above the land surface. (This may influence the constructability of the treatment trench in this area.) Conversely, where the treatment trench is proposed along the northeastern boundary of the landfill, the vertical hydraulic gradients are downward. Unless the treatment trench is segmented, or separations are installed to limit the vertical and horizontal movement of groundwater within the trench, the system might not be converted to an effective groundwater extraction system. There may be areas along the solid waste boundary where hydraulic control can not be achieved. There might also be areas where preferential groundwater flow paths may develop within the trench allowing contaminated groundwater to "break out" into previously uncontaminated areas. The proposed treatment trench includes portions of the landfill perimeter where groundwater flow is parallel to the alignment of the trench. This might not be a significant problem in a contaminant-removal remedial approach, but it could compromise the alternative hydraulic control remedy.

The possibility of changing the remedial approach back to hydraulic control (pump and treat as required by the original 1991 ROD) also presents potential problems with the amount of pumping potentially necessary to control the source at the solid waste boundary. Without a cap to limit precipitation recharge through the landfill, the converted treatment trench-groundwater extraction system would need to capture several times the approximate 26 gallons per minute of contaminated groundwater estimated in the design the 1991 ROD remedy. This could present problems regarding the treatment and discharge of the extracted groundwater. (One possible treatment option that didn't exist when the Pre-Design Investigation was completed in 1995 is the recently upgraded City of Rochester wastewater treatment plant. This plant currently accepts up to 70,000 gallons per day of pre-treated leachate from the nearby Waste Management landfill facility on Rochester Neck Road.)

Comment 3; RE: Odor and Noise Control Associated With the Amended Proposed Plan

The amended proposed plan, as described at the July 19th public hearing, does not include the collection and treatment of the air discharged from the treatment trench, unless contaminants of concern are present at concentrations above air discharge limits. If provisions are not made to collect and treat the gas emissions, I am concerned that nuisance odors will become a problem. I know from personal experience that the leachate from the Dover Municipal Landfill can produce offensive odors. The neighboring residential area already suffers with odor problems emanating from the nearby Waste Management, Inc. facility. Waste Management has recently promised the Rochester Planning Board that it is pursuing an aggressive program to address its odor problems. It would not be fair to the nearby residents to subject them to another source of offensive odors that could last for at least 30 years, as outlined in the amended proposed plan.

In addition to the odor issues, I also noted a potential problem with noise from the air pumps. The pumps are likely to operate 24 – 7 – 365. If the blowers are not properly insulated for sound, their noise (even if it's below hazardous levels) could be considered a public nuisance.

Comment 4; RE: Potential Excavation of Contaminated Sediment from the Cochecho River

Page 5 of the EPA's handout from the June 21st public information meeting states that:
"Groundwater discharge to the Cocheco River does cause sediment concentration levels to exceed screening levels for an ecologic risk; therefore, further assessment and monitoring will be performed to clearly characterize any risk and, if necessary, **sediment will be excavated**."

At the June 21st meeting, and again at the July 19th public hearing, I requested that if such excavation of the river bed sediment is to take place, that the NHDES permit process will be followed; and that in accordance with NHDES administrative rules, the Dover Conservation Commission will be allowed to review and comment on the dredging and restoration plan.

Comment 5; RE: Alternative Placement of Treatment Trench

During the July 19th public hearing, several people expressed their concern regarding the time that it will take to limit the current discharge of contaminants from the Eastern Plume to the Cochecho River. In a follow-up question I asked if an alternative placement of the treatment trench had been fully evaluated. I suggested that the proposed treatment trench could be repositioned to an alignment parallel to and along the southern side Tolend Road. This configuration would be a more pragmatic and effective approach to the issues of concern raised during the hearing. In this location, contaminants already present beyond the solid waste boundary in the Eastern Plume area would be intercepted before they discharge to the Cochecho River. Administrative protections, such as a groundwater management zone, could be established to limit land uses within the Eastern Plume area, located between the solid waste boundary and the repositioned treatment trench location. This area, for the most part, is currently owned by the City of Dover and is designated as the Hazardous Waste Landfill District by Dover Zoning Ordinance 170-28.5 that was: "*designed to alert the public and prohibit development activities in* *areas potentially affected by the storage of hazardous waste until such time as a final cleanup and proper closure of the site can be completed*".

The relocation of the treatment trench could also improve the constructability and maintenance of the proposed amended remedy. As currently proposed, the total length of the treatment trench along the southern and eastern boundaries of the landfill will be on the order of 3,000 linear feet. The relocation of the treatment trench to an alignment parallel to Tolend Road could shorten its total length to perhaps 1,500 feet. At the Tolend Road alignment, the saturated thickness (the vertical distance between the top of the water table and the top of the marine clay layer) is much less, ranging from approximately 60 feet at the northeast corner of the landfill to less than 30 feet at the B-9 monitoring well cluster location. The shorter and shallower excavation required for the treatment trench would greatly decrease the volume of waste generated during its construction. Periodic maintenance of the treatment trench would cost less if the acid washing isn't appropriate and the trench needed to be re-excavated (see Comment 1, above). Along the Tolend Road alignment the vertical hydraulic gradients are all downward and none of the hydraulic head levels above the land surface.

The Cochecho River would benefit as the groundwater seeps from the Eastern Plume that currently discharge to the river would be cleaned more quickly. The EPA's and DES's concerns regarding indoor air quality in residences north of Tolend Road would be permanently addressed as the groundwater beneath these residences would also be cleaned sooner.

I look forward to receiving an explanation as to why the alternative remedy for the Eastern Plume area, suggested above, has apparently not been fully evaluated.

If you have any questions about my comments, please feel free to contact me at: (603) 743-4290; or by e-mail: tomfargo@ttlc.net

Sincerely,

Thomas R. Fargo

cc: Dean Peschel, Dover Environmental Program Director
Lorie Chase, Cocheco River Watershed Coalition

Brian & Nancy Limberger <limberger@comcast.net>

08/06/2004 08:42 PM

To: Darryl Luce/R1/USEPA/US@EPA
cc:
Subject: NH TAG Force Contributor

I was canvassed tonight by Sarah of the Clean Water Action of New England. I live in Dover, New Hampshire, and she informed me of the ongoing contamination of our reservoir and river here in Dover which accommodates several towns in the area with drinking water.
I was appalled. I donated $120. What is going on here??? I blame it on this administration and the lack of awareness and concern for the environment to line the pockets of their friends. Don't get me started.

I was asked to write to the EPA to:

Consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.

Do not use local residents as guinea pigs for untested clean-up technologies without adequate safeguards.

Fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Parker
99 Belknap St
Dover, NH 03820

To: Darryl Luce, US EPA

Dear Mr Luce,

I am a Dover resident and thus very concerned about the cleanup of the Dover Municipal Landfill.

I urge you to put public health impacts above financial concerns in choosing a cleanup plan for the site.

I urge you not to use local residents as guinea pigs for untested clean-up technologies without adequate safeguards.

I urge you to fully address limitations of contamination to the Cocheco River, as well as the reservoir.

Hopefully the clean-up remedy chosen will expedite to cease pollutants to the residents in the area. It was put on the EPA's Superfund list in 1983! This problem has been going on too long.

Sincerely, Mary Parker

David Hayes
202 Central Ave.
Dover, NH 03820

8/5/04

Dear Mr. Darryl Luce,

I Am writing you to express my concern about the hazardous waste Site in Dover, NH. As a Resident of Dover I am Asking that you consider the following

- public health and environmental impacts above financial concerns in choosing a cleanup Remedy for the site.

- Don't use Local residents as guinea pig for untested clean up technologies without adequate safeguards

- Fully address limitations of Contaminations to the Cocheco River, as well as the Reservoir.

thank you for your consideration;
David Hayes

Darryl Luce, US EPA
1 Congress St., Suite 1100 (HBQ)
Boston, MA
02114

Please consider public health and environment impact above financial concerns in choosing a cleanup remedy for the site. Please do not use local residents guinea pigs for untested clean up technologies without adequate safeguards. Please fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Thank You,
Sincerely,

K. Ian Daniel

6 August 2004

13 Arbor Drive
Dover NH 03820-4501

Darryl Luce, US EPA
1 Congress St. Suite 1100 (HBO)
Boston MA 02114

Dear Mr. Luce:

PLEASE!

~Consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.

~Do NOT use local residents as guinea pigs for untested clean up technologies without adequate safeguards!

~Fully address limitation of contamination to the Cocheco River as well as the reservoir.

I Thank You….and your children's children will think you are a hero!

Sincerely,

Allen G. Barbi
Taxpayer and active Voter

To: Darryl Luce
US EPA
1 Congress St.
Suite 1100 (HBO)
Boston, MA 02114

Dear Mr. Luce,

I am writing out of deep concern regarding the Tolend Road Landfill, also known as the Dover Municipal Landfill, located in Dover, New Hampshire This site has been on the EPA's Superfund list for far too long causing great known and unknown risks to the surrounding towns that rely on the bodies of water located near the site.

I understand that a new "experimental" technique, called a "Sparging Trench" has been proposed for remediation of the site. According to the EPA there is a high degree of uncertainty that this technique will work and the alternate plan is to cap the site, a plan that was originally proposed over 12 years ago. Not only is there a high degree of uncertainty that this technique will even work, but it also fails to address the contaminants that have already migrated off site into the Cocheco River and Bellamy Resevoir which supplies a minimum of eight surrounding communities with their drinking water.

How many times will experimental projects be conducted and fail before action is taken to correctly adjust the site? How many lives will it take and what long term damage will continue to take place while we experiment? Experimental projects have failed in the past and once again, the EPA is skirting it's responsibilities to protect the public in an attempt to save short term money.

The EPA has been aware of this site since 1981 and this site has been on the Superfund list since 1983. I would suggest that after twenty years something should have been done to permanently address this situation. Now is the time to take the steps that will be effective in removing the threat to the surrounding communities. Do not allow the residents of Dover and the surrounding communities to continue being used as "test agents" in order to save money. I urge you to place the environmental impacts and the health of the citizens of Dover above financial concerns. Your responsibility is to correct the contaminations which have taken place on this particular Superfund site and nothing less than known, proven and effective methods in removing the contaminants is acceptable. The Sparging Trench is another band-aide thrown on a deep wound that requires surgery. I urge you to take the effective steps to address this issue once and for all.

Sincerely,

Richard Auclair
99 Belknap St.
Dover, NH 03820
(603) 749-3166

Darryl Luce, US EPA
1 Congress St., Suite 1100 (HBQ)
Boston, MA
02114

Please consider public health and environment impact above financial concerns in choosing a cleanup remedy for the site. Please do not use local residents guinea pigs for untested clean up technologies without adequate safeguards. Please fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Thank You,
Sincerely,

Kathryn Ann Bedrosian Daniel

Mr. & Mrs. Adrien Landry
184 Locust St
Dover NH 03820

TO THE EPA,

WHEN CHOOSING A CLEANUP REMEDY, FOR THE HAZARDOUS WASTE SITE IN DOVER, N.H., PLEASE CONSIDER PUBLIC HEALTH & ENVIRONMENTAL IMPACTS ABOVE FINANCIAL CONCERNS.

DO NOT USE LOCAL RESIDENTS AS GUINEA PIGS FOR UNTESTED CLEAN UP TECHNOLOGIES WITHOUT USING ADEQUATE SAFEGUARDS.

DO NOT FAIL TO FULLY ADDRESS LIMITATION OF CONTAMINATION TO THE COCHECO RIVER, AS WELL AS TO THE RESERVOIR,

THANK YOU,
Joan M. Landry

8-5-04

Dear Mr. Luce,

Please take the people of Dover into account before accepting a new techique for which there is uncertainty as to whether it will work to clean up the contamination of the Tolend Road "Superfund Site."

Please ask for the use of technology that will clean up this hazard without further environmental damage.

Thank you.

Sincerely,

Carol Straton
Dover, N.H.

Dear Mr. Darryl Luce:

I am writing this letter to you on behalf of myself, my husband and most importantly, my children. We are long time residents of Dover, NH and we are extremely concerned with the future of the landfill here and what long-term effects it could have on our family if it were to go improperly treated. It is my understanding that a decision was made in 1991 by the EPA requiring that the site be capped and the ground water be pumped and treated. It is also my understanding that this decision was amended in 1996 to try a novel bioremediation pilot project that was unsuccessful and tossed aside. It has now come time once again for the EPA to make a decision on how to protect the water that is pumped into my home, which my children drink.

I am asking you to do the responsible thing and protect our water with the solution that works and not with one that might work, because we are the ones who will have to pay the ultimate price. Ask yourselves this question: If your child were extremely ill and there was an operation that could be performed that would bring him or her back to normal health and a slightly less expensive procedure that might bring him or her back to normal health. Which would you choose?

We are reaching out to you because you are our voice. Please hear our cries.

Respectfully Yours,
Mandy Bowden
Mandy Bowden
8/5/04

Dear Mr. Darryl Luce:

I am writing this letter to you on behalf of myself, my wife and most importantly, my children. We are long time residents of Dover, NH and we are extremely concerned with the future of the landfill here and what long-term effects it could have on our family if it were to go improperly treated. It is my understanding that a decision was made in 1991 by the EPA requiring that the site be capped and the ground water be pumped and treated. It is also my understanding that this decision was amended in 1996 to try a novel bioremediation pilot project that was unsuccessful and tossed aside. It has now come time once again for the EPA to make a decision on how to protect the water that is pumped into my home, which my children drink.

I am asking you to do the responsible thing and protect our water with the solution that works and not with one that might work, because we are the ones who will have to pay the ultimate price. Ask yourselves this question: If your child were extremely ill and there was an operation that could be performed that would bring him or her back to normal health and a slightly less expensive procedure that might bring him or her back to normal health. Which would you choose?

We are reaching out to you because you are our voice. Please hear our cries.

Respectfully Yours,
Ernest Bowden

Ernest Bowden
8/5/04

Cathy Pease
2 Hemlock Circle
Dover, NH 03820

August 6, 2004

Public Comments

Dear Mr. Luce,

I have some concerns about the proposed plan for a Superfund site in Dover. I am in favor of keeping costs down, but I also value safety, public health, common sense and good judgment. Please take the necessary time to evaluate the effectiveness of these proposals (i.e. - will this technique work? has it been tried?). Also, please consider and determine that whatever is built will not have an adverse effect on our community especially with regard to public health. Thank you.

Cathy Pease

Darryl Luce, US EPA
1 Congress St., Ste. 1100 (HBO)
Boston, MA 02114

August 6, 2004

Dear Mr. Luce:

Please consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the hazardous waste site in Dover, NH.

Don't use local residents and guests as guinea pigs for untested clean up technologies without adequate safeguards.

Fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Think about taking a swim in the Cocheco River with your loved ones and pets.

Please protect us.

Thank you.

Laurrie Malizia, AS

lam

Darryl Luce, US EPA
1 Congress St., Ste. 1100 (HBO)
Boston, MA 02114

August 6, 2004

Dear Mr. Luce:

Please consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the hazardous waste site in Dover, NH.

Don't use local residents and guests as guinea pigs for untested clean up technologies without adequate safeguards.

Fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Think about taking a swim in the Cocheco River with your loved ones and pets.

Please protect us.

Thank you.

Mario Malizia, DBA

lam

To whomever gives a shit,

I wouldnt want your job, seeing as nobody obviously works there. I got a great Idea!! Clean up the mess!!! Wow!!! everyone get off their high salary asses and grab a frikin mop, or are you all just waiting another 23 years for us to drink the problem away, look, Im coming down hard on you cause I do care about the water my family drinks, as you should as well.

And forget all that "experiment" crap Its too costly, do that on your own dollar., Or... create your own mess and see if it works, or give me your job, Ill make some waves, and all of the weenies who push pencils would be pushinng shovels.

seriously its not hard to figure out, noone wants to work, and after 23 years it is painfully obvious.

No hard feelings,

[signature]

Darryl Luce, USEPA

Please,

1) consider public health and enviromental impacts above financial concerns in choosing a clean-up remedy for the site.

2) Don't use local residents as guinea pigs for untested clean up technologies without adequate safeguards

3) Fully address limitations of contamination to the Cocheco River, as well as the resivoir.

Thank You,

Order No. 033-3[illegible]

August 6, 2004

Mark Gemas
3 Shadow Drive
Dover, NH 03820

Mr. Darryl Luce, US EPA
1 Congress Street Suite 1100 (HBO)
Boston, MA

Dear Mr. Luce,

It has recently come to my attention that the Tolend Road Superfund Site in my community has still not been cleaned up, after contaminants were found in adjacent drinking water wells in 1981. This site was placed on the Superfund List over 20 years and has gone through at least one pilot project that was unsuccessful, and is being considered for another proposed plan that the EPA itself has declared to be uncertain of the outcome of this particular technique. As a resident of this rapidly growing community, I am asking you not to use local residents as guinea pigs for untested clean up technologies without adequate safeguards.

Before any more projects are started to clean up this area that affects the drinking water of at least eight surrounding towns, please consider the public health and environmental impacts above financial concerns in choosing a cleanup remedy for this site. I realize the estimated cost of the proposed trench is $15.8 million compared to the $29 million it would cost to cap the site. The capping of was originally proposed over ten years ago, but if the trench doesn't work, the $29 million will still have to be paid (plus how much more it would cost in the future by the time the trench is completed).

I also understand that a large volume of the contaminants has already migrated off site and there is no way to control or capture this with the proposed trench. As a concerned citizen, taxpayer and resident of this community, I expect the EPA to fully address the limitation of contamination to the Cocheco River, as well as the Bellamy Reservoir.

I still cannot fathom why it has taken over 20 years to get this area cleaned up!! Please restore my faith that those placed in the position to do what is right and just for the community, the environment, and its citizens will do just that, and not base their decisions solely on the cost of an experimental treatment versus what has been proven to work.

Sincerely,

August 6, 2004

Lorie Gemas
3 Shadow Drive
Dover, NH 03820

Mr. Darryl Luce, US EPA
1 Congress Street Suite 1100 (HBO)
Boston, MA

Dear Mr. Luce,

It has recently come to my attention that the Tolend Road Superfund Site in my community has still not been cleaned up, after contaminants were found in adjacent drinking water wells in 1981. This site was placed on the Superfund List over 20 years and has gone through at least one pilot project that was unsuccessful, and is being considered for another proposed plan that the EPA itself has declared to be uncertain of the outcome of this particular technique. As a resident of this rapidly growing community, I am asking you not to use local residents as guinea pigs for untested clean up technologies without adequate safeguards.

Before any more projects are started to clean up this area that affects the drinking water of at least eight surrounding towns, please consider the public health and environmental impacts above financial concerns in choosing a cleanup remedy for this site. I realize the estimated cost of the proposed trench is $15.8 million compared to the $29 million it would cost to cap the site. The capping of was originally proposed over ten years ago, but if the trench doesn't work, the $29 million will still have to be paid (plus how much more it would cost in the future by the time the trench is completed).

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I still cannot fathom why it has taken over 20 years to get this area cleaned up!! Please restore my faith that those placed in the position to do what is right and just for the community, the environment, and its citizens will do just that, and not base their decisions solely on the cost of an experimental treatment versus what has been proven to work.

Sincerely,

Lorie Gemas

6 August 2004

13 Arbor Drive
Dover NH 03820-4501

Darryl Luce, US EPA
1 Congress St. Suite 1100 (HBO)
Boston MA 02114

Dear Mr. Luce:

PLEASE!

~Consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.

~Do NOT use local residents as guinea pigs for untested clean up technologies without adequate safeguards!

~Fully address limitation of contamination to the Cocheco River as well as the reservoir.

I Thank You....and your children's children will think you are a hero!

Sincerely,

Elizabeth Ann Barbi

Elizabeth Ann Barbi

August 6th, 2004

Darryl Luce, US EPA
1 Congress St. Suite 1100 (HBO)
Boston, MA 02114

Tell EPA to:

1. Consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.
2. Don't use local residents as guinea pigs for untested cleanup technologies without adequate safeguards.
3. Fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Sincerely,

Katherine Frick-Wold

Katherine Frick-Wold
34 Tideview Drive
Dover, NH 03820

August 6th, 2004

Darryl Luce, US EPA
1 Congress St. Suite 1100 (HBO)
Boston, MA 02114

Tell EPA to:

1. Consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.
2. Don't use local residents as guinea pigs for untested cleanup technologies without adequate safeguards.
3. Fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Sincerely,

John Wold
34 Tideview Drive
Dover, NH 03820

Darryl Luce, USEPA
1 Congress St. Suite 1100 (HBO)
Boston, MA 02114

Mr Luce,

Please consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.

Don't use the local residents as guinea pigs for untested clean up technologies without adequate safeguards.

Fully address limitation of contamination to the Cocheco River, as well as the reservoirs.

Respectfully

Linda J. Grivois
24 Tideview Dr.
Dover, NH 03820

August 5, 2004

Darryl Luce, US EPA
1 Congress Street
Suite 1100 (HBO)
Boston, MA 02114

Dear Mr. Luce:

I support Clean Water Action. Please consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the Dover Superfund site. Don't us local residents a guinea pigs for untested clean up technologies without adequate safeguards. EPA must fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Sincerely,

Vicki A. [illegible]

August 5, 2004

Mr. Luce:

In regards to the Tolend Rd. Superfund site in Dover, NH, please:

Consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.

Don't use local residents as guinea pigs for untested clean up technologies without adequate safeguards.

Fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Sincerely,

David Forbes 138 Locust St Dover NH

David Forbes

August 5, 2004

Mr. Luce:

In regards to the Tolend Rd. Superfund site in Dover, NH, please:

Consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.

Don't use local residents as guinea pigs for untested clean up technologies without adequate safeguards.

Fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Sincerely,

Paula Forbes 188 Locust St Dover NH

Paula Forbes

Darryl Luce, US EPA
1 Congress Street, Suite 1100 (HBO)
Boston, MA 02114

Dear Sir;

I am writing as a citizen of Dover, New Hampshire and I feel like I need to make my opinion heard on the matter of the Bellamy Reservoir in Dover.

I would hope that the EPA would consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for this site. This site should not be used for untested clean up technologies especially without adequate safeguards in place. It's also very important that contamination of the Cocheco River, as well as the reservoir, is limited.

The city of Dover has been working for a long and hard time to recover from the financial and environmental impact of being an industrial center. Mills have been refurbished to be used as office space, the downtown has been revitalized and a plan to dredge the river to open it to pleasure crafts has just gotten funding.

Sincerely,
Heather Cronin

Darryl Luce, US EPA
1 Congress Street, Suite 1100 (HBO)
Boston, MA 02114

Dear Sir;

I am writing as a citizen of Dover, New Hampshire and I feel like I need to make my opinion heard on the matter of the Bellamy Reservoir in Dover.

I would hope that the EPA would consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for this site. This site should not be used for untested clean up technologies especially without adequate safequards in place. It's also very important that contamination of the Cocheco River, as well as the reservoir, is limited.

The city of Dover has been working for a long and hard time to recover from the financial and environmental impact of being an industrial center. Mills have been refurbished to be used as office space, the downtown has been revitalized and a plan to dredge the river to open it to pleasure crafts has just gotten funding.

Sincerely,
David Cronin

August 5, 2004

Darryl Luce
US EPA
1 Congress St., Suite 1100
Boston, MA 02114

Dover Municipal Landfill, Superfund Site

Dear Mr. Luce:

I have been reading about the EPA proposal to dig trenches at the Tolend Road Superfund Site. The apparent "selling point" is that it will cost the City less money. However, will it protect the Bellamy River Reservoir and the Cocheco River from contaminants? From what I have seen I am afraid the answer is no.

We need a plan that protects the public health and environmental concerns this site has generated. As a taxpayer I am concerned about the impact of these trenches. Apparently the cost of this untested process is in excess of $15 million, I would urge you to rethink this a good with a proven tested process, even if it does cost more. We need to know that the contaminates will be effectively contained. Don't make Dover resident's guinea pigs for this untested process. This process has been going on for over twenty years, it time to take decisive action, not experiment with untested theories without adequate safeguards.

I would urge that you not make the Tolend Road Superfund Site an experiment. I urge that EPA use proven tested methods to clean up the plume of contaminates headed toward the Bellamy and Cocheco Rivers.

Sincerely,

Bill McCann

Bill McCann
20 Fisher Street
Dover, NH 03820-3943

Darryl Luce, US EPA
1 Congress St; Suite 1100 (HBO)
Boston, MA 02114

Dear Mr. Darryl Luce:

We are concerned Dover citizens who want to remind you of the importance of cleaning up the contamination in the Cocheco River. I ask you to please consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.

In the process of the clean up, do not use residents as guinea pigs for untested clean up technologies without adequate safeguards.

We also want you to fully address limitation of contamination to the Cocheco River, as well as the reservoir.

Thank you for your time.

Sincerely,

Rebekah Brooks
Matthew Lister
93 Henry Law Ave
Apt 72
Dover NH 03820

Darryl Luce, US EPA
1 Congress Street, Suite 1100 (HBO)
Boston, MA 02114

Dear Sir;

I am writing as a citizen of Dover, New Hampshire and I feel like I need to make my opinion heard on the matter of the Bellamy Reservoir in Dover.

I would hope that the EPA would consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for this site. This site should not be used for untested clean up technologies especially without adequate safequards in place. It's also very important that contamination of the Cocheco River, as well as the reservoir, is limited.

The city of Dover has been working for a long and hard time to recover from the financial and environmental impact of being an industrial center. Mills have been refurbished to be used as office space, the downtown has been revitalized and a plan to dredge the river to open it to pleasure crafts has just gotten funding.

Sincerely,
Henry Cronin

I feel that the super fund money for projects like Tolend land-fill should have been included in the annual fund. This is typical Bush cut the money in projects that are needed but spend it elsewhere. Instead of going it alone in the middle east he should have waited longer and get more help from major countries. But he's proud of what he done and spend billions. It's about time he concentrates on domestic problems. He spent the surplus and has us in a deficit. Hundreds of men are dieing and being wounded to secure the oil for the oil barons of this nation including Bush and his father.

The money for this project should be allocated. Our congressional represantatives should be fighting for us but they just go along with the administration.

I personally am disgusted with the way this administation is operating.

Marie Trindade
3 Arbor Dr.
Dover, NH 03820

Action alert:

I am extremely desappointed in the fact That it has taken so long for approprat action to be taken on hazard waste in N.H. Dover especially for I live here. there must be a workable way to clean up the contaminants. People are depending on your help. (EPA) We are not guinea pigs. Clean up the siste now in the Cochico River + Bellamy River.

Audrey L Covet

06 August 2004

19 Birch Drive
Dover, NH 03820
March 3, 2003

Darryl Luce, US EPA
1 Congress St., Suite 1100 (HBO)
Boston, MA 02114

Dear Mr. Luce,

I am writing to express concern over the EPA plan to spend $15.8 million dollars on an experimental fix, "sparging", on the Dover Municipal Landfill, also known as as the Tolend Road Superfund Site. The Dover Municipal Landfill was closed in 1980 and has been Superfund site since 1983. The fact that the landfill qualified as a Superfund site indicates that it is serious enough to warrant a tried and true remedy. The citizens of surrounding communities have lived with this hazard far too long.

Please consider the health and environmental issues surrounding this issue above financial concerns when choosing a course of action for the Tolend Road Superfund Site. I understand that you have a responsibility to your agency but please do not forget that your first responsibility should be the safety of the people who depend on you to act in our best interest. We are entitled to safe drinking water and clean rivers. As an agent of the EPA, you have the power to ensure that we are not used as a test site. I trust that when deciding this issue, your first concern will be what is best for the residents of surrounding communities and the environment we live in not the budget.

Sincerely,

Dorothy Buell

Dorothy Buell

Send us Your Comments

You may provide EPA with your written comments about the Amended Proposed Plan for the Dover Municipal Landfill Site. You can use the form below to send written comments. Please mail this form and any additional written comments, postmarked no later than July 22, 2004 to:

Darryl Luce

U.S. EPA

1 Congress St., Suite 1100 (HBO)

Boston MA 02114-2023

fax: 617-918-1291

e-mail: luce.darryl@epa.gov

Brian Stern has my permission to present these comments. They are my personal comments. I am particularly concerned with the Eastern Plume and its effect on the Cocheco River. Until a biological assessment is completed appropriate decisions for a remedy cannot be made. The health of the river is important and the NH DES has laws to protect it. DES should be given full support. Major efforts to improve the river upstream & downstream in the Cocheco are underway. This is another way to add to that effort.

How well is sparging understood?

Comments Submitted by: Loretta B. Chase (attach additional sheets as needed)

July 19, 2004

Art Corte
**<acorte@comcast.net
>**

06/22/2004 08:48 AM

To: Darryl Luce/R1/USEPA/US@EPA
cc:
Subject: Dover landfill remediation

I support the amended proposed plan presented last night (SC-A and MM-4)on condition that the entire project not be undertaken at once. As the sparging wall technique proposed has not been proven effective for Dover's particular conditions, its efficacy should be confirmed by building a section of the proposed wall and monitoring its effectiveness before committing to building the entire wall.

As the owner of two houses located in the middle of the Eastern plume, I am anxious that some remedial action get taken, this remediation study has been going on for years, the time has come to see some action

Arthur B. Corte
81 Glenhill Road
Dover NH 03820
603 749 4366

CLEAN WATER ACTION
Our Water, Our Health, Our Future

CLEAN WATER ACTION

NATIONAL OFFICE
4455 Connecticut Avenue,
Washington, DC 20008-2328
(202) 895-0420

NEW HAMPSHIRE OFFICE
163 Court Street
Portsmouth, NH 03801
Phone (603) 430-9565, Fax (603) 430-9708
e-mail: portcwa@cleanwater.org

Darryl Luce,
US EPA, Region 1
1 Congress St., Suite 1100 (HBO)
Boston, MA 02114

Re: Dover Municipal Landfill Superfund Site – Amended proposed Plan

Dear Mr. Luce,

On behalf of Clean Water Action's 3,000 New Hampshire members, including over 1000 in communities where drinking water could be potentially impacted by contaminants by this site, I would like to submit the following comments on your proposed plan.

In general, we are very concerned about the uncertainties inherent in the unorthodox proposal for this site to forgo capping the landfill and relying on unproven technology to capture most of the groundwater pollutants leaching from the site. We have already seen a decade of delay in fully addressing this site due to previous experimentation. Given the uncertain movement of the southern plume threatening drinking water supplies, it does not appear that we can afford to wait another decade or more to find out if the current proposed alternative is working or not.

While Clean Water Action supports in principle the use of technological innovations to actually clean up toxic sites, there remain too many uncertainties associated with this plan and with the use of a sparging trench in particular. It appears that more research needs to be conducted prior to adopting this remedy to really determine its likelihood of success. The long timeframe assumed for this alternative is also troubling, given the difficulties of projecting responsibility for the process, maintenance and thoroughness of results so far into the future.

We are also very concerned with the lesser amount of attention given to addressing the eastern plume impacting the Cocheco River. While drinking water protection is of course a higher priority with this site, it appears that effort to reduce and clean up the pollutants impacting the river are getting short shrift in this plan. It is simply unacceptable to allow continued arsenic contamination given the levels already measured in sediments and groundwater in the vicinity. Like many of our local waterways, the Cocheco River has received increased attention in recent years toward cleaning up past pollution as well as making it more accessible for recreation. It is a vital resource for the community that must not be allowed to be further polluted.

While I am not able to provide a further detailed critique of your proposed plan, I would like to add our support to the comments submitted by the NH TAG Force/Brian Stern. In closing, I would ask that you fully consider public health and environmental impacts above financial concerns in choosing a cleanup remedy for the site.

Thank you for your attention to these comments.

Respectfully Submitted,

Doug Bogen
NH Program Director
Clean Water Action

Brian Stern
<Brian@sternlawoffic
e.com>
08/11/2004 04:56 PM

To: ahoffman@des.state.nh.us, Darryl Luce/R1/USEPA/US@EPA
cc:
Subject: Tolend Road, Dover, NH, Municipal Landfill Superfund Site

Mr. Andrew Hoffman
NH Dept. of Environmental Services
6 Hazen Drive
Concord, NH 03302-0095

Darryl Luce, Regional Project Director
U.S. EPA Region 1(MBO)
One Congress St.
Boston, MA 02114-2023

Dear Messrs. Hoffman and Luce:

Attached are the final comments of the NH TAG Force with reference to the Dover, NH, Municipal Landfill.

Sincerely yours,

Brian T. Stern

Comments on FSSA - final revision Aug 11 (2).doc

COMMENTS ON THE FOCUSED FEASIBILITY STUDY ADDENDUM
DOVER LANDFILL NPL SITE
DOVER, NH

Submitted by:
NH TAG Force Group
August 11, 2004

INTRODUCTION

The City of Dover Municipal Landfill was closed in 1979 because it was known at that time that industrial waste and other noxious materials were emanating from the fill. Two and one half decades later, the debate on the most effective and cost-effective method of remediation and closure continues. This debate continues even though a remedy was approved by the Agencies (NHDES and USEPA) in 1991 and a 100-percent design was completed in 1996.

Upon review of the recently completed Focussed Feasibility Study (FFS), prepared by the Work Settling Defendants or PRPs, as well as the Focussed Feasibility Study Addendum (FFSA), prepared by the EPA, salient questions for both parties remain. These questions are presented below.

Governmental agencies have imposed enormous costs on surrounding communities to improve the water quality of the Cocheco River. This has affected sewage treatment plants and other point and non-point sources. Dover in particular is actively pursuing and promoting the Cocheco River as a focal point for downtown revitalization and recreational activity. Millions are being spent on dredging the Cocheco River, justified by the removal of contaminants. There is a large population base moving into the Seacoast area and populating areas along the River. The river is widely used for fishing and, potentially, for swimming.

It appears that NHDEP and EPA are prematurely proposing a remedy in the FFSA. The Agencies admit in the document that there are numerous remaining unknowns regarding site conditions and potential future impacts, and that a host of pre-design studies will be needed to determine if the proposed remedy (Mixed Alternative) will achieve its objectives. Accordingly, we suggest that a plan be implemented based upon what is known, proven, and reliable. We object to a plan that is based on guesswork and conjecture and requires a substantial contingency plan in event of failure. The proposed plan has a combination of unproven technologies, further delays, inattention to the Cocheco River, and the potential for greatly increased costs if a contingency plan is triggered. The combination of these shortcomings must be considered in the final remedy selection.

Following is a discussion of issues raised by the NH TAG Force, by topic, related to the proposed remedy. Also included are questions to which we would like a response from the NHDEP and EPA.

SOURCE CONTROL

The currently proposed source control remedy, SC-A, proposes an earthen (permeable) cover and a deep (up to 100 foot) perimeter sparge trench. The use of the sparge trench for the combined purpose of recovery of VOCs, the attenuation of THF, and precipitation of arsenic has never been proven. The previous remedy put forth in the 1991 ROD (as described in the 1996 100% Design Report), included installation of a RCRA "C" cap, the installation of interception trenches (to only 25 feet) and extraction wells (into the interbedded zone), and either on-site treatment and disposal (preferred) or off-site treatment and disposal. This was identified as source control remedy SC-7/7A.

In the Agencies' comparison of SC-A and SC-7/7A, the following issues were raised as the most critical:

- SC-7/7A would cost more due to waste recontouring (minimal) and 150,000 (+/-) CY of imported fill, and the construction of a RCRA "C" cap.
- SC-7/7A will entomb the waste so that it never "goes away".
- SC-A will "wash" all of the contaminants out of the waste, leaving a benign pile of rubble.

The NHDES and RCRA will require, at the conclusion of the currently proposed remediation at the site (SC-A), that a clean landfill closure be completed. This will, in all likelihood, be a RCRA "D" cap, which will have the same fill requirements as the "C" cap to get to appropriate grades. The problem with capping the Dover landfill is not due to its size; it is its flatness. Caps are required to maintain minimum slopes regardless of whether they are "C" or "D". The same amount of fill (150,000 CY) will be required to close out the SC-A remedy (albeit far in the future) with the same noise, dust and safety issues as today, but with more people and homes in the area. **Are these costs and risks included in the assessment of SC-A?**

The full costs of the sparge trench in comparison to costs of a cap appear not to be considered. SC-7/7A was completely designed in 1996 and had a schedule for completion in late 1998. **Are the costs associated with intervening activities (1996-2004); proposed pre-design activities: 30, 60, 90, and 100-percent design activities; legal work; and related agency oversight included in the cost for SC-A? Are the full design costs for the trench included in comparison to the cost for a cap design that has already been paid for and completed?**

Regarding the entombment of waste, this is not an altogether unheard-of approach to waste management. Natural degradation of the waste will continue to occur. As the decay progresses, waste fluids will be squeezed out of the refuse and collected by the remediation system. The agencies should consider a combination of the best parts of each remedy is applied.

Under the currently proposed remedy (SC-A) the site will not be available for re-use. If the site is capped, there is potential for re-use of the land.

When the concept of the bioremediation approach supplanted the SC-7/7A approach in 1996, the engineers and the Agencies were discussing the possibility of developing a "leaky" cap for use with the SC-7/7A groundwater collection and treatment system. In this way, the waste would be rinsed (as touted in the SC-A remedy) and the groundwater will be collected and treated in a proven (and currently mostly designed) manner. The entombment issue goes away, as does the fear of the failure of the untried treatment remedy. As noted earlier, the cost and nuisance of landfill closure (cover) is required regardless of the approach. The only significant difference in cost is the geomembrane. **Why did the PRPs and the Agencies abandon the SC-7/7A remedy?**

What is the expected frequency on which the precipated iron and arsenic will be cleaned from the sparge trench? What technology will be used and what are the potential concerns with it? There is a long list of trench problems: clogging, channeling of water and air, ability to recapture precipitate, acid washing and mobilizing a highly concentrated arsenic wastes. Blowers will be required for estimated 75 years. The noise will be unabated 24 hours a day for 365 days per year for 75 years. **Is the cost of running, maintaining, and replacing the blowers calculated?**

There is concern that the trench will have to be maintained for at least 75 years, and probably longer. We object to plan that relies upon uncertain social, economic and political factors to complete the clean up.

The cost for the trench seems to be based on twenty 20 years of operation, while contaminants are expected to persist at levels above clean-up criteria for 75 to one hundred years.

If sparging trench is installed and later found to be ineffective in achieving cleanup criteria, what is the anticipated cost to implement the contingent source control remedy, that being conversion of the sparging trench to a ground water collection trench and capping of the landfill? **If not and SC-A fails, how will it be abandoned?**

The existing deep trench (not part of the 7/7A remedy) will create potentially problematic short circuits between the soil stratigraphic layers. **Will the trench be backfilled with materials attempting to mimic the glacial deposition?** This might be very difficult, especially after extracting the existing matrix from within the trench. The shallow collection trench and wells of the 7/7A remedy were proposed for the same footprint as the sparge trench. **Will the replacement system be placed in-board or out-board of the abandoned trench?** There maybe hydraulic influences associated with the abandoned trench.

How are you going to set up sensors and monitor whether the trench works? What will be considered effective?

There are two distinct plumes of underground water, with different pressures. Their flows are not fully understood and may change over time. Concern exists that the trench for the sparge wall will alter ground water flow patterns, including "short-circuiting". As a result of the trench, the flow can shift in a greater amount to the Bellamy Reservoir, toward the Cocheco, or in a third direction not yet considered in the clean up plan.

The wall can be moved eastward to capture contaminants that have already migrated off site toward the Cocheco. This will address a problem currently ignored (the Eastern Plume – see below).

SOUTHERN PLUME

Page 12 of the FFSA indicates that the Agencies are concerned that the "current nature and extent of contamination in the Southern Plume is generally unknown and appears to be worsening."

The well reportedly most down gradient of the landfill in the Southern Plume, well SB-B2, is highly contaminated with benzene, THF and vinyl chloride, and concentrations are rising. Well SB-B2 is located roughly 500 feet from the landfill and 1000 feet from the Bellamy Reservoir. Further downgradient wells do exist (the SB-D cluster, the SB-GW-3 cluster, and OW-1), but, according to the EPA do not fall along the same flowline or monitor the same horizon as SB-B2 (located in the upper portion of the upper interbedded zone). The observed localized variability of groundwater quality data and the elevated levels at the SB-B2 location suggest that a more detailed understanding of the hydraulics and water quality of the Southern plume should be considered.

The Agencies should direct the PRPs to proceed with appropriate pre-design studies as soon as possible and implement the extraction and treatment system. **Is it possible to accelerate the testing and implementation of Management of Migration remedy MM-4, regardless of action on other issues at the site?**

Once new wells are installed, the hydraulic and water quality data gleaned from the studies can be used to properly design and monitor an appropriate remedy, if subsequently deemed necessary.

Immediate implementation of source control of the Southern Plume is necessary. If there is any challenge or delay anticipated in the PRPs implementing source control cleanup of the Southern Plume (pump and treat), then Superfund resources should be expended to implement it. If the intent to use Superfund money is considered, the PRPs may reconsider advancing remediation of the Plume in order to retain control. The Agencies should utilize whatever measures available to force the PRP group to aggressively implement the Southern Plume remedy.

EASTERN PLUME

Failing to cut off the source of arsenic (or arsenic-mobilizing characteristics) from the Eastern Plume has allowed arsenic in groundwater to remain at high levels (generally 10 to 50 times the standard) within the Eastern Plume. As no drinking water supplies are currently allowed within the plume area, the primary exposure to the risks associated with arsenic are upon discharge to the Cocheco River and the so-called "swale". Once in the river or swale, the arsenic immediately precipitates into solid form and becomes a sediment issue.

Page 12 of the FFSA indicates that the Agencies believe that " there is no discernable, decreasing trend for arsenic in the Eastern Plume that shows cleanup levels being approached in a reasonable timeframe. The entire mass of arsenic currently in this plume will discharge to the Cochecho River. Additional arsenic that migrates offsite between now and implementation of the Source Control remedy will also leach into the river.

Samples have been collected and analyzed and have revealed that sediments on the landfill side of the Cocheco already exceed the threshold cancer risk of 10^{-4} and NOAA freshwater screening levels. Human health risks posed by arsenic concentrations in Cochecho River sediment are already bordering acceptable risk ranges established by EPA. This has already been characterized sufficiently to know it must be addressed. It is certain that there will be future accretion of arsenic in sediment over the next 50 to 100 years

Based on these observations, a second, and perhaps third, level of ecological assessment will be completed, based on the failure to "pass" the first tier assessment. We feel that the discharge of arsenic into the Cocheco River creates unacceptable ecological and human health risks.
We believe that the future studies that are being required will determine that the contaminants represent a risk to human health and the environment (as measured during PDIs or routine future monitoring). We believe the Agencies will require the PRPs to remove the impacted sediments.

Sediments in the Cocheco will have to be removed. Under the current plan periodic removals will be necessary. It appears much better to eliminate the source of continue contaminants rather than have to periodically track and remove sediments, particularly when they may not be able to be tracked.

Sediments will continually discharge into the river. However, contaminants can be resuspended in the water and distributed to areas of greater risk. Most certainly, the sediment in the river can be expected to wash downstream. This is certain to have already occurred. Accordingly, the level of contaminants in the sediment adjacent to the site will continue to be near the threshold levels, yet it is inappropriate to consider just the local sediment. The Agencies must consider that a constant flow of contaminants is entering the ecosystem and mobilizing over a wider area. These contaminants may concentrate in areas such as behind the first dam. However, this is not certain. During flood stages every year, silt is deposited on adjacent farmlands, such as the County Farm, that was recently put in to a conservation easement. This is the first county land to have been put into a conservation easement. Wherever contaminants are deposited they may be easily redistributed with flood stages and distributed to areas of higher risk. **Is there any plan to identify such downstream sediment collection areas and sample them now and in the future?**

Monitored natural attenuation is not an appropriate selection for the Eastern Plume management of migration remedy. MNA is determined as inappropriate for the Southern Plume. Conditions do not exist as the site for MNA. Yet, MNA is proposed for the Eastern Plume. The proposed plan for the Cocheco River is more akin to no action.

In the 1996 100-percent design documents, a form of MNA was recommended for the Eastern Plume. This was likely based on the assumption that a proven methodology for arsenic and VOC collection and treatment was to be installed as early as 1998. Under the current plan, if not successful in the implementation of the SC-A remedy, it may be another ten years before a proven remedy is installed. By then, arsenic concentrations in Cocheco sediments may far exceed standards and require remediation. It is possible to cost effectively implement a pump-and-treat system within the Eastern Plume in the near term that could reduce the concentrations of arsenic seeping into the Cocheco. The EPA in an e-mail dated June 29, 2004 to the NH TAG Force opined that it would cost little more to pump and treat the Eastern Plume than the cost of MNS. **Would then Agencies consider a plan to further characterize the hydraulics and water quality of the Eastern Plume and develop a contingency plan to ameliorate potential impacts to the Cocheco sediments and to enhance cleanup of the groundwater within the plume? We request that the discharges into the Cochecho River be addressed now, as part of this plan. We request that pump and treat be implemented now, without delay, using superfund resources, for the Eastern Plume.**

There seems to be no concern for the aesthetic impacts and noxious odors from the seeps into the river. It should be noted that the river is being promoted as a recreational resource.

AIR QUALITY

Indoor air samples should be collected to evaluate potential impacts to homes above the Eastern Plume. Will the continued migration of the plume potentially create conditions for VOCs in groundwater worse that presently exist? There should be no further delay in assessing indoor air quality in residences above the Eastern Plume, if there is any possibility of impacts. MNA cannot be selected for the Eastern Plume so long as the potential for indoor air impacts have not been assessed.

The sparge trench is also likely to concentrate VOC vapors and pose and additional risk of indoor air pollution, or an additional cost to capture and remove the off-gases. The sparge trench will also create odors. The agencies must also consider the existing background odors from the nearby Turnkey landfill operated by Waste Management.

What is the likelihood of the sparging trench mobilizing noxious odors from beneath the landfill cover and being discharged to ambient air?

OTHER ISSUES

The area of localized groundwater contamination in the NW corner of the landfill should be investigated not as part of pre-design studies, but as part of the overall characterization of the landfill impacts.

The public should be presented with detailed information on anticipated impacts to wetlands caused by the remedial alternatives, as well as conceptual mitigation measures.

If a plan is selected that requires additional pre-design study, the public requests an opportunity for review and comment in the future.

TIMING

The Work Settling Defendants (the PRPs) will be allowed one year to complete their PDIs (fall 2005). It will then take the Agencies the better part of a year to make comments (summer 2006). The PRPs will then take at least a year preparing design documents (summer 2007), which will take a minimum of six months to approve (winter 2007/2008). Work will begin in the spring (spring 2008) and will take (according to the FFSA) 2.5 years (fall 2010). After three years, the system will be evaluated for efficacy (fall 2013). If the proposed system does not work, implementation of SC-7/7A will be required. This will take (according to the Agencies) two years (fall 2015). This is 17 years after the design start-up date of the original SC-7/7A. We ask the EPA and DES to consider the relative speed by which the alternative remedies can be implemented. The speed of implementation impacts both risk factors from contaminants and the present value of dollars as opposed to anticipated inflated costs.

The FFSA indicates that clean-up levels will not be met for arsenic in the Eastern Plume for 75 years, based on current modeling. See page 36 of Addendum. Why is this timeframe acceptable to the Agencies? Historically, "reasonable time frames" have been twenty or thirty years. Should not something be done to accelerate the removal of arsenic from groundwater in this area?

The agencies must avoid anticipated challenges to the Plan. The Agencies have not approved modeling results done by the PRP, which modeling indicates that arsenic may not be remediated to acceptable levels in ground water under the Proposed and Proposed Mixed Alternatives, and therefore opens the door for a potential request for a "**technical impracticability waiver**". We object to this plan that anticipates an objection/appeal based upon technical impracticability waiver. We object to this plan that presents contingencies to which the agencies can anticipate an objection or appeal by the PRP's. **Why would the Agencies propose a plan to which they can anticipate objections/appeals and further delay the process?** The original ROD went through the entire process with full comment period. The PRP's were given an opportunity with an alternative bio-remediation plan, which has failed. There would be fewer challenges to re-implementing the original ROD.

The trigger mechanism for the contingency is not well defined and simply posturing this case for further litigation, delays and additional costs.

CONCLUSIONS

Arsenic results in Cocheco River sediments exceed first tier ecological risk characterization criteria at four sampling locations. The potential for human health and ecological risks from arsenic in sediments along the banks of the Cocheco River has been identified. **Therefore, we**

strongly urge the Agencies to now without further delay to abate the ongoing discharges of contaminants to the Cocheco.

Page 29 of the FFSA states " the RFFS does not contain or reference an MNA analysis, either with or without the air-sparging trench, that properly demonstrates that the toxicity, mobility, or volume of all site ground water contaminants have been or will be sufficiently reduced to levels that are protective of human health or the environment in a reasonable amount of time". Natural attenuation did not even work with the assistance of biodemediation. That effort failed. There is no decreasing trend in the pollution. **It is therefore unreasonable to propose MNA for the Eastern Plume!**

MNA is determined as inappropriate for the Southern Plume. Conditions do not exist as the site for MNA. Yet, MNA is proposed for the Eastern Plume. The proposed plan for the Cocheco River is more akin to no action.

There is significant concern over the Agencies level of certainty regarding performance of the sparging trench. It is a very costly endeavor and the technology has not been proven at the proposed depths and in providing three types of treatment simultaneously: VOC removal, arsenic precipitation, and enhancement of natural degradation of THF. We are concerned that for the proposed remedy there is no basis for experience or proven success. The proposed plan needs extensive pre-design work, long delays before implementation, will have to be phased in to see how it works, requires a contingency back up plan, and is likely subject to challenges by the PRP. **Accordingly, we strongly suggest a cap or leaky cap with groundwater extraction and treatment, with a high probability of success (regardless of shifting site characteristics) and that is already designed.**

The cap with a collection trench will eliminate uncertainty, eliminate a contingency plan, speed up the cleanup, reduce likelihood of challenges, and cost less if a closure cap is needed anyway, and cost less if a contingency is triggered.

The Agencies should proceed with all possible speed to characterize the Southern Plume and develop an appropriate remedy. It may not be necessary to delay in the implementation of this while the source control remedy is being finalized.

In summary, the Agencies should abandon the proposed SC-A source control remedy and implement the SC-7/7A remedy proposed in the 1991 ROD. Further, active remediation of the Eastern Plume should be implemented to abate contaminant discharges to the Cocheco River and reduce the potential for adverse indoor impacts. Lastly, the Agencies should expedite the characterization and remediation of the Southern Plume as a valuable water resource is in significant danger.

PUBLIC WORKS DEPARTMENT

CITY OF PORTSMOUTH
680 Peverly Hill Road
Portsmouth N.H. 03801
(603) 427-1530 FAX (603) 427-1539

August 10, 2004

Mr. Darryl Luce
Remedial Project Manager
United States Environmental Protection Agency
Region 1, Office of Site Remediation and Restoration
One Congress Street, Suite 1100
Boston, Massachusetts 02114-2023

Re: **Draft Revised Focused Feasibility Study**
Dover Municipal Landfill Superfund Site
Tolend Road – Dover, New Hampshire
Review Comments

Dear Mr. Luce:

The City of Portsmouth is pleased to offer the attached comments to the Draft Revised Focused Feasibility Study (RFFS), prepared by GeoInsight, Inc., dated January 30, 2004, for the Dover Municipal Landfill Superfund Site (landfill). These comments were prepared with the assistance of our consulting engineer Weston and Sampson. The City of Portsmouth owns and operates the Portsmouth Water System. The Bellamy Reservoir, located to the south of the landfill, supplies over 50% of the drinking water to that system. The Portsmouth Water System is a regional water system that serves customers in Madbury, Durham, Dover, Newington, Portsmouth, Greenland, New Castle, and Rye, New Hampshire. The presence of contamination in close proximity to this drinking water source is of serious concern to the City of Portsmouth.

If you have any questions or require additional information please call me at 766-1416.

Respectfully submitted,
City of Portsmouth

Peter Rice, P.E.
City Engineer, Water/Sewer Divisions

PHR/phr

cc: Steve Parkinson, P.E., Director of Public Works
David Allen, P.E., Deputy Director of Public Works
John J. Boisvert, P.E., Weston and Sampson Engineers

1057 Darryl Luce comment cover letterc 7-19-04.doc

Weston & Sampson
ENGINEERS, INC.

MEMORANDUM

TO: David S. Allen, P.E., Deputy Public Works Director

FROM: John J. Boisvert, P.E.

DATE: August 10, 2004

SUBJECT: Tolend Road Landfill – Revised Focused Feasibility Study Comments

CC: Peter Rice, P.E. City Engineer, Water and Sewer Divisions
George D. Naslas, P.G., LSP, Weston & Sampson

Background

The RFFS provides a history and background of the Tolend Road Landfill. The landfill lies geographically between the Cocheco River and the Bellamy Reservoir. The landfill lies on the watershed divide and over the groundwater flow divide identified in the RFFS. Contamination at the landfill consists of chlorinated solvents, petroleum based compounds and dissolved contaminants (e.g. minerals). Based on the RFFS, and previous efforts, two groundwater contamination plumes emanate from the landfill. One plume is migrating north and east towards the Cocheco River and the other is migrating south in the direction of the Bellamy Reservoir. The southern plume is of primary concern to the Portsmouth Water System and is the focus of our review of the RFFS as it may threaten a regional drinking water source. New Hampshire groundwater quality criteria/standards as cited in Env-Wm 1403.03(a) state "groundwater shall be suitable for use as drinking water without treatment.

Geologic and Southern Plume Characterization

At this time we believe the southern plume has not been adequately characterized. A significant data gap exists in the monitoring well network used to characterize the hydrogeology south of the landfill. The aerial and vertical extent of the plume and its migration towards the Bellamy Reservoir are not fully understood. To close these data gaps and that the treat posed by the southern plume to the Bellamy Reservoir, the City of Portsmouth requests that the following be required at a minimum:

- Additional monitoring wells are required to evaluate contaminant migration (horizontal) information gaps and additional clustered monitoring wells are required to provide a more complete vertical profile of water quality between the landfill and the Bellamy Reservoir. This same concern has been identified in the RFFS on page 1-25.
- The placement of well screens should intersect the interfaces of the identified geologic strata. Of particular importance would be the clay/sand boundary and the bedrock overburden boundary.

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- There seems to have been a reliance on previous investigations to characterize the presence and extent of the clay layer, additional site specific work is necessary based on the limited information provided.
- The structural condition of the clay must be evaluated and reported in order to determine whether or not it is "impermeable" or could it contain desecration cracks, fissures, or interbedded sand/silt lenses, rendering it less than impermeable. These structural features, if present could present a mechanism for contaminant migration.
- The response (sampling/monitoring/reporting) protocols when contamination is identified in monitoring wells or surface water must be clearly defined in a standard monitoring plan or standard operating procedure. The plan should identify the following:
  - The resample protocol when contamination is discovered.
  - If contamination appears in a shallow well, deeper wells adjacent to the discovery should be sampled at the time of resample.
  - The down gradient monitoring wells to be sampled, and when.
  - The laboratory turn around time for reporting and the notification requirements to the Portsmouth Water System and the public.
- It does not appear that Bellamy Reservoir sediments have been sampled and analyzed in recent history (e.g. not within the last 10 years). We recommend that this be an annual requirement at two locations along the northern shore of the reservoir.
- Well cluster MW-102 is on the shore of the Bellamy Reservoir and could act as the final sentry well, yet sampling (e.g. seasonal) is not performed in the well cluster next to this important drinking water source. Regardless of its distance from detected contamination this well cluster should be sampled biannually at a minimum.
- Along the Bellamy Reservoir, there has been a less than adequate characterization and discussion of groundwater flow into the reservoir. Additional piezometers and monitoring wells are needed along the reservoir to monitor potential contaminant migration into the reservoir. This assessment would help ensure that groundwater flow to the reservoir is adequately characterized and monitored.

Air Sparging Trench Technology

The application of air sparging technology in a deep and relatively long trench is a new application for this technology and not well documented in the literature under similar site conditions. The pursuit of this technology would not be advisable without a contingency plan in place should it be determined that the technology is not appropriate and fails to achieve the predicted performance. It is our understanding that the 1991 ROD remedy is 100 % designed and ready for implementation if the proposed solution is determined to be inappropriate for this application.

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Contingency Planning and Communication

Given the sensitivity of the Bellamy Reservoir and the necessity to ensure that public health is protected, open communication with the Portsmouth Water System managers is required. We understand a passive drain will be installed in the trench as a contingency however, the effectiveness could be significantly reduced if the trench is fouled by mineral deposition and bacterial growth. As the water system operator, the City of Portsmouth in order to make decisions to protect human health, must be provided information as it becomes available regarding the south plume including:

- Water quality data especially when preliminary laboratory data suggest an imminent risk to the Bellamy Reservoir or when it is detected where it previously was not.
- Project schedule updates.
- Notification of project changes including but not limited to alterations of monitoring frequency, changes in project management (contacts), technical changes and schedule changes.
- We recommend that a backup contingency plan is in place assuming the failure of the proposed system or its abandonment during the predesign/design phase of the project.

In addition the City of Portsmouth should recommend that a public notification and education plan be developed as part of a contingency plan should contamination pose a threat to the Bellamy Reservoir or be detected in the Bellamy Reservoir. The plan should include the following:

- Clear notification requirements and procedures with respect to the Portsmouth Water System and the general public.
- A program to address public concerns over their drinking water quality and safety.
- A plan to implement additional treatment at the Portsmouth Water System's Madbury Water Treatment Facility if necessary or provisions for an alternative source of water to the Portsmouth Water System.
- Reserved financial resources to assist the Portsmouth Water System in ensuring drinking water quality should the Bellamy Reservoir be impacted.

Summary Comments

- The installation of additional monitoring wells should be initiated immediately to fill data gaps and adequately characterize the geology south of the Landfill and the southern plume.
- Existing wells, recently gone unsampled, in the southern plume should be sampled immediately or during the next scheduled sampling period. It is our understanding that this has recently taken place. The Portsmouth Water System should request that the monitoring results be provided and that monitoring continues until additional wells, necessary to fill data gaps, are installed.

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- The City of Portsmouth should request the opportunity to review and comment on the proposed additional monitoring program in conjunction with the recent data.
- As additional data is collected and evaluated, delay of the remediation may be an unintended consequence. The Portsmouth Water System should be very concerned that for each day, month, or year that a remedial solution is not in place, the risk to one of the most important regional drinking water sources increases.
- There may be a tendency to delay implementation, reassess the remedial technology, or not consider alternative more flexible technologies, during the period when new information and monitoring data is being collected. We do not believe that the need to further characterize the geology south of the Landfill and the southern plume should cause any delay in moving forward with the pre-design and design of Alternative Remedy (SC-A + MM-2/4) at this time.
- However, based on the concerns raised above regarding the air sparging trench technology, we feel the 1991 ROD remedy should continue to be updated to facilitate timely implementation as a contingency alternative.

If you have any questions regarding our comments please feel free to call George Naslas or me at (603) 431-3937. Thank you for this opportunity.

"Peschel, Dean"
<dean.peschel@ci.do
ver.nh.us>

08/11/2004 12:23 PM

To: Darryl Luce/R1/USEPA/US@EPA
cc:
Subject: comments on EPA Proposed Closure Plan and Addendum for Tolend Lan dfill

Hi Darryl,
Attached are the comments from the Dover PRP Group to the EPA Proposed Closure Plan and Addendum for Tolend Landfill. I will send a hard copy by mail as well.
Thanks. Look forward to begin working on the project again.

Dean Peschel

Environmental Projects Manager

288 Central Avenue

Dover, NH 03820-4169

t: 603.516.6094 f: 603.516.6463 mailto:dean.peschel@ci.dover.nh.us http://www.ci.dover.nh.us

Dover: First in New Hampshire, First with you! PRP comments to proposed plan.doc

"Peschel, Dean" <dean.peschel@ci.dover.nh.us>

08/18/2004 10:25 AM

To: Darryl Luce/R1/USEPA/US@EPA
cc: "Andrew Hoffman (ahoffman@des.state.nh.us)" <ahoffman@des.state.nh.us>
Subject: final-md

Hi Darryl,
I sent you comments from the group that were not the final version. One of our consultants pointed this out to me this morning. I inadvertantly sent the next to last version as our comments. I have attached the final version that I should have sent to you. My apologies for this error.

Dean Peschel

Environmental Projects Manager

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Dover: First in New Hampshire, First with you! final-md.doc

COMMENTS ON THE PROPOSED PLAN FOR REMEDIATION OF THE DOVER MUNICIPAL LANDFILL SUPERFUND SITE DOVER, NEW HAMPSHIRE

INTRODUCTION

The Executive Committee of the Group of Work Settling Defendants (the Group)[1] for the Dover Municipal Landfill Superfund Site (the Site) appreciates the consideration by the U.S. Environmental Protection Agency (USEPA) and New Hampshire Department of Environmental Services (NHDES) of the Revised Focus Feasibility Study (RFFS) and the Proposed Plan for an amended Record of Decision (ROD) for the Site. The remedy described in the Proposed Plan is clearly protective of human health and the environment, which the Group agrees is a necessary predicate to proceeding with the amendment of the ROD. Moreover, the Proposed Plan will provide a more permanent and efficient remedy for Site conditions than the remedy called for by the 1991 ROD. The Proposed Plan will facilitate the *treatment* and *destruction* of contaminants of concern, rather than allowing for those contaminates to remain untreated beneath an impermeable cap for decades if not centuries.

The Proposed Plan employs an innovative application of a combination of technologies that are well-proven at the field scale. Accordingly, any design issues specific to this project can be resolved based upon analytical methods that are commonly used in the application of the technologies involved.

While fully supporting the determination by EPA and DES to amend a portion of the ROD, the Group offers these comments on the Proposed Plan in an effort to clarify certain of its elements and to suggest refinement of the approach to its implementation.

ARSENIC ISSUES

The Group believes that 'background' or natural arsenic released from the formation due to anaerobic ground water contributes substantially to the arsenic measured at the Site. In this case, ICLs will likely never be achieved upgradient of the treatment trench despite the remediation of the disposed waste. Therefore, an understanding of naturally occurring arsenic concentrations is key to setting remedial goals.

As discussed in the RFFS and USEPA's addendum, arsenic poses the majority of the risk at the Site (typically 95 percent or more, depending upon the exposure scenario considered). Analyses presented in the RFFS suggest that arsenic is likely to remain

[1] City of Dover, Davidson/Textron now Collins & Aikman, Clarostat Mfg, Wentworth Douglass Hospital, BFI now Allied Waste, Eastern Air Devices, Moore Business Forms, Melville Corp.

above Interim Cleanup Levels (ICLs) for a very long time (75 or more years, depending upon the remedial scenario considered). In light of these considerations, the Group recommends that the evaluation of background arsenic concentrations in ground water documented in the Golder Pre-Design Investigation (PDI) be expanded to address conditions in the individual strata identified at the Site. Conceptually, the Group suggests an approach that will identify monitoring wells screened in each stratum in the areas of the Southern and Eastern Plumes that are not impacted by leachate or other contaminants associated with the Landfill and analyze COC concentrations (including arsenic) and geochemical conditions in ground water samples collected from these wells to identify background arsenic concentrations. Geochemical and contaminant data obtained in conjunction with the Environmental Monitoring Program (EMP) can be used in this evaluation, along with suitable statistical techniques. If warranted, supplementary geochemical and contaminant data can be obtained during pre-design of the remedy. As mentioned in the RFFS and acknowledged in USEPA's addendum, the Group performed an initial analysis along these lines, which has not been approved by USEPA, but that may provide a suitable starting point for an augmented assessment of background arsenic concentrations in ground water, subject to review and approval by USEPA of the methodology to be employed (see TZD Technical Memorandum-Issues Summary titled "Dissolved Arsenic Background Conditions in Ground Water" dated September 11, 2001 developed and submitted to the Agencies for the September 21, 2001 TZD meeting).

EMP Sediment Monitoring

The Group does not concur with the Agencies that sediment monitoring in the Cocheco River should be part of the EMP monitoring. As reported in Section 2.0 of the RFFS, concentrations of arsenic in sediment exceeded a screening threshold concentration at which adverse effects on benthic organisms are theoretically possible. Based upon this finding and consistent with a tiered approach to evaluating potential ecological risks, the Proposed Plan requires testing of the bioavailability of the arsenic in Cocheco River sediment to confirm whether adverse impacts on benthic organisms are, in fact, occurring. In addition, however, the Proposed Plan seems to require continued monitoring of sediment quality over the duration of the remedy. The Group recommends that the second tier testing approach be followed, if warranted by field data, in conjunction with the five-year reviews of remedy performance.

SOUTHERN PLUME REMEDY

The Proposed Plan, as described in the RFFS Addendum, employs a pump and treat remedy for the Southern Plume. The Group is dedicated to protecting the water supply in the Bellamy Reservoir. At this time, however, the incomplete characterization of the Southern Plume severely limits the ability to analyze the remedy selected for this portion of the Site. Augmentation of the monitoring network in this area is warranted to better define the boundaries of the Southern Plume. Also, analyses are required to confirm proposed ground water extraction rates for this area and to assess the potential effectiveness of extracting ground water in terms of capturing ground water flow and influencing COC distribution and migration.

The Group offers several clarifications to Table 1 in Appendix B of the RFFS Addendum (Table 1 of the RFFS Addendum was a summary of the results of statistical analyses of historical ground water quality data for wells located within the Southern Plume). Based upon the ground water flow divide between the Southern and Eastern Plumes (see, for example, Figure 1-2 and Table 1-11 of the RFFS), wells SB-C2, SC-8US, SC-8UUI, SC-8LUI, SC-9US, and MW-101U are not located in the Southern Plume. Therefore, these wells were removed from the table. The concentrations of benzene at wells SB-B1 and SC-11US have never been above the ICL; therefore, these data should have been shaded in blue, consistent with USEPA's color key. In addition, Table 1 in Appendix B of the RFFS Addendum used November 2001 data for arsenic, VC and THF at well SB-4D; these numbers were revised to reflect the May 2002 data, which was used for the rest of the table. Also, VC was not detected at well SC-11US in May 2002, and therefore, that datum was changed to 0. Table 1R below incorporates these corrections. As revised, Table 1R underscores the need for additional information regarding conditions in the Southern Plume to facilitate remedy decision making.

Table 1R
Southern Plume

red= increasing trend, yellow = no trend, green = decreasing trend, blue = always below ICLs

Contaminated Ground water Location	Well	Screened Interval (bgs, feet)	Strata Location	concentration (ug/L) in May '02			
				As	**VC**	**Ben**	**THF**
Landfill Wells	SC12US	34 to 39	US	**162**	**0.9**	**31**	**690**
	SC12UUI	44 to 49	UUI	**198**	[redacted]	[redacted]	**1400**
Landfill Toe Wells	SC-11US	4.5 to 4.9	US	[redacted]	[redacted]	[redacted]	[redacted]
	SC18US	14 to 19	US	**53**	[redacted]	[redacted]	[redacted]
	SC10US	5 to 20	US	[redacted]	[redacted]	[redacted]	[redacted]
	SC-11UUI	16 to 21	UUI	[redacted]	[redacted]	[redacted]	[redacted]
	SC18UUI	24 to 29	UUI	**66**	[redacted]	[redacted]	[redacted]
	SC10UUI	24 to 29	UUI	**43**	[redacted]	[redacted]	[redacted]
	SB4D	34 to 44	UUI	[redacted]	[redacted]	**30**	[redacted]
	SC10LUI	43 to 48	LUI	[redacted]	[redacted]	[redacted]	**37**
Southern Plume Wells	B8WT	1 to 10.5	US	[redacted]	**6**	**4**	**250**
	SB-B1	5 to 15	US	[redacted]	[redacted]	[redacted]	[redacted]
	SB-B2	34 to 44	UUI	[redacted]	[redacted]	[redacted]	[redacted]

Source: RFFS, April 30, 2003.

Another factor that apparently has influenced the Agencies proposal for a pump and treat remedy for the Southern Plume is a misunderstanding of the potential degradation pathways for several of the key contaminants of concern:

1. Vinyl chloride (VC) degradation under anaerobic conditions is very well documented in the scientific literature (see literature references and pathway in Figure 1-7 in the RFFS), and is a common pathway in the subsurface at the Site as evidenced by the coincidence of vinyl chloride and ethene. Ethene is the anaerobic daughter product of vinyl chloride degradation and as illustrated in the tables in Appendix G of the RFFS, ethene was detected at all locations where significant concentrations of vinyl chloride were measured. This anaerobic pathway for degradation of vinyl chloride at the Site was also confirmed in microcosm studies cited in the RFFS (Envirogen, 1995).

2. Benzene also degrades under anaerobic conditions in subsurface aquifers (Grbić-Galić and T.M. Vogel, 1987; Edwards and Grbić-Galić, 1992; Lovley et al; 1995; Harwood and Gibson, 1997; Weiner and Lovley, 1998; Rooney-Varga et al., 1999; Burland and Edwards, 1999; Anderson and Lovley, 2000). However, the daughter products of anaerobic benzene degradation are not as distinct as that of vinyl chloride and cannot be distinguished from other components of landfill leachate.

3. Tetrahydrofuran is also known to degrade anaerobically (discussion and citations in Section 4.3 of the RFFS), and the anaerobic sequestration of arsenic is also well documented in the scientific literature (as discussed with citations in Section 4.5.1 of the RFFS).

Therefore, the scientific literature supports the RFFS conclusion that there are attenuation mechanisms for these contaminants of concern under the anaerobic conditions encountered in the Eastern and Southern Plumes. However, the rate at which degradation is occurring in these plumes needs to be investigated. The planned investigation of natural attenuation is discussed below.

The Group recommends that the Agencies retain the flexibility to analyze the potential utility of monitored natural attenuation (MNA) for the Southern Plume based upon the results of pre-design characterization and analyses. A MNA remedy allows for the retention of a pump and treat remedy as a contingent measure.

An outline of a Southern Plume Characterization Workplan submitted by the Group was revised to address comments received in a January 13, 2004 letter from Mr. Darryl Luce of USEPA. The Group recommends that the general approach outlined in this workplan be used as a basis for identifying pre-design activities and methods. In addition, the first draft of the Southern Plume Characterization Workplan submitted to the Agencies incorporated a plan for assessing MNA concurrently with the assessment of the lateral extent, depth and mass of the contaminated ground water in the Southern Plume. In his comments, Mr. Luce requested that the Group submit a separate workplan for the MNA investigation. In accordance with Mr. Luce's comments, this workplan will be prepared based upon comments provided and references cited in Appendix G of the RFFS.

If pre-design investigations indicate that a pump and treat remedy is warranted for remediation in the Southern Plume, the Group recommends that the Agencies retain flexibility in the design process to allow value engineering analyses of the most efficient combination of remedial approaches and technologies for ground water extracted from the Southern Plume, and, possibly, from within the western-most lobe of the Landfill to address a possible THF hotspot. For example, one of the variations on the proposed remedy that the Group would like to investigate during pre-design would be to deliver the water pumped from the Southern Plume, combine it with the ground water extracted in the southwest corner of the Landfill and pipe this ground water to the City of Dover publicly-owned treatment works (POTW).

MODELING ISSUES

One of the assertions in the RFFS Addendum was that the modeling completed for the RFFS was inaccurate because contaminants measured at SB-B2 in the Southern Plume since 1993 were not predicted by the model. This misunderstanding has led the Agencies to predict impact on the Bellamy by Site COCs not predicted by the modeling. This section will clarify this issue for the Agencies so that the model can be used to reasonably compare alternatives and aid in the remedy design.

The Group acknowledges that USEPA and NHDES elected to defer resolution of certain issues involving modeling of ground water flow and contaminant fate and transport in the final draft of the RFFS, and that resolution of these issues and acceptance of the model by the agencies will be a key aspect of remedial design. Nevertheless, the model simulations presented in the RFFS provided a suitable initial approximation of Site conditions for comparison of remedial alternatives at a feasibility study level. In this context, the Group offers comments regarding certain model-related issues raised in the RFFS Addendum that it believes are important in consideration of the Proposed Plan at this stage in the Superfund remedial process.

Hydraulic modeling completed during the RFFS (and described in detail in Appendix N of the RFFS) included particle track evaluations to identify expected ground water flow paths and to estimate travel times for ground water in the area of the Southern Plume. The RFFS Addendum concluded that contaminant migration in the area of the Southern Plume is much faster than simulated, or that contaminants were released within the Landfill well before 1979 (Page 13, Section 2.0 of the RFFS Addendum). This conclusion was reportedly based upon review of historical ground water quality data associated with well SB-B2 and Figure H-15 of the RFFS (Attachment H of Appendix N; a model-simulated particle track that originated from the southern tip of the western lobe of the Landfill, designated particle track "D"). In plan view, particle track "D" traverses the general vicinity of well SB-B2. In cross section, particle track "D" travels within the lower portion of model layer 3, which is monitored by the screened interval for well SB-B2 (34 to 44 feet below ground surface).

The distance from the southwestern toe of the Landfill to the Bellamy Reservoir is approximately 1,500 feet. Well SB-B2 is located approximately 550 feet from the southwestern toe of the Landfill (approximately one-third of the distance from the Landfill to the reservoir). Particle tracking results indicated that the time for Particle D to travel from the Landfill to the Bellamy Reservoir was 54 years (Table 4-3, Appendix N of the RFFS). Therefore, the approximate ground water travel time from the toe of the Landfill to the zone monitored by well SB-B2 is 18 years (i.e., one-third of 54 years).

Volatile organic compounds (VOCs) were detected in ground water samples obtained from well SB-B2 as early as 1993 (i.e., the start of the EMP). Based upon the information obtained from the particle track evaluation, VOCs detected in well SB-B2 in 1993 would have required approximately 18 years to migrate from the Landfill, assuming unretarded migration at the rate of ground water flow, indicating a release in approximately 1975, which was during the Landfill's operating period from 1960 until 1979. It is important to note that the particle track simulations provided an estimate of the approximate travel times associated with advective ground water movement alone. In geologic settings similar to those observed at the Landfill, the migration of VOCs is slowed (i.e., retarded) by physical processes in the subsurface, such as adsorption. To evaluate possible transport times associated with individual dissolved VOCs in ground water, a retardation factor was applied to the particle track estimates. VOCs detected in ground water samples from well SB-B2 at concentrations above ICLs during historical EMP events (1993 through 2002) have included benzene (6 to 33 micrograms per liter (μg/L)), vinyl chloride (<1 to 4 μg/L), and tetrahydrofuran (240 to 2,400 μg/L).

The compounds with the highest and lowest partitioning coefficients (K_d) were selected to estimate retarded travel times from the Landfill to well SB-B2 (benzene - K_d of 0.059 cm^3/g, and vinyl chloride - K_d of 0.019 cm^3/g). Retardation factors of 1.39 and 1.13 were calculated for benzene and vinyl chloride, respectively, using parameters consistent with those applied during the RFFS modeling effort (Table 10A of Appendix N of the RFFS). Based upon these retardation factors, estimated travel times for benzene and vinyl chloride to reach SB-B2 from the Landfill are 25 and 20 years, respectively.

As previously indicated, the Landfill was active from 1960 through 1979. Therefore the maximum time for contaminant migration to the first detection at SB-B2 is approximately 33 years (1960 to 1993). The estimated travel time for benzene from the toe of the Landfill to well SB-B2 (25 years) is less than the maximum possible travel time of 33 years, indicating that the release of benzene to ground water within the Landfill could have occurred as early as 1968. Similarly, the estimated travel time for vinyl chloride from the toe of the Landfill to SB-B2 is 20 years. Therefore, the generation of vinyl chloride by the anaerobic reductive dechlorination of TCE and PCE within the Landfill could have occurred as early as 1973. Based upon these estimates of travel time, simulated VOC migration in the Southern Plume (assuming advective flow and retardation) is reasonably consistent with VOC detections at well SB-B2.

Figure 1 presents a timeline of the operational history of the Landfill and the estimated ranges of travel times for ground water and representative VOCs in the Southern Plume in the vicinity of well SB- B2.

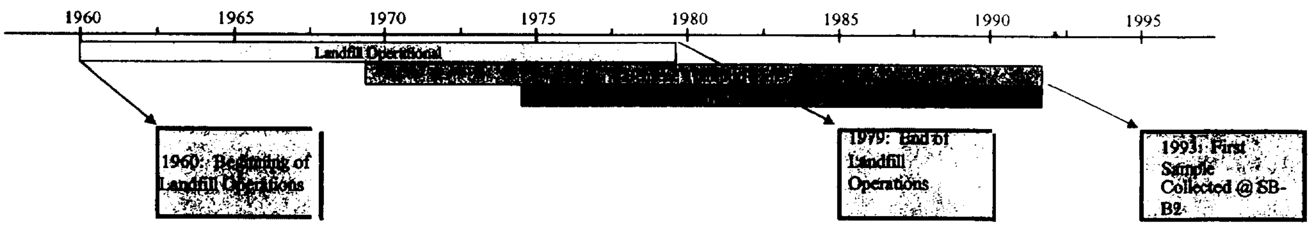

FIGURE 1: Landfill Operation and Contaminant Transport Timeline for Benzene and Vinyl Chloride.

The RFFS Addendum concluded that, under the Alternative Remedy management of migration scenario (i.e., monitored natural attenuation), vinyl chloride, benzene, and tetrahydrofuran will eventually be discharged to the Bellamy Reservoir (page 54, Section 5.5). As acknowledged in a preceding paragraph in the RFFS Addendum, analyses completed during the RFFS do not support this conclusion.

Simulated ground water elevations in the Southern Plume correlated exceptionally well to the average observed ground water elevations (i.e., the model calibration data set). The average difference between observed and modeled average ground water elevations for the portion of the model occupied by the Southern Plume and area to the west and southwest of the Landfill was approximately 0.7 feet (8 inches; based upon data included in Table 3 of the Appendix N of the RFFS). These data indicate that the model provided a very close approximation of hydraulic conditions between the Landfill and the Bellamy Reservoir.

During the RFFS, the model was used to evaluate possible transport of VOCs in the Southern Plume after source control remedial measures were implemented. These simulations assumed that additional VOCs would not migrate past the toe of the Landfill after the source control measures became operational. Recent EMP monitoring results were used to develop VOC contour maps to represent the current shape and concentration distribution of VOCs within the Southern Plume (Attachment J of Appendix N). These "plume maps" were input to the model and simulations were completed to evaluate plume migration over time. Within the Southern Plume, the simulations were focused upon evaluating whether VOCs would travel to and eventually discharge to the Bellamy

Reservoir.

Tables 12a through 12e in Appendix N of the RFFS summarize the results of fate and transport modeling associated with the Southern Plume. These results are shown in plan view in Attachment L of Appendix N of the RFFS.

Tables 12b through 12e present the fate and transport simulations for benzene, tetrahydrofuran, cis-1,2-dichloroethylene, and vinyl chloride. For each of the four organic COCs, a management of migration simulation was conducted for the Alternative Remedy using a minimum literature degradation rate. In all instances, there were no simulated impacts to the Bellamy Reservoir within the 100 year modeled timeframe (i.e., the simulated plumes attenuated to below MCLs before they reached the north banks of the Bellamy Reservoir).

DIPSERSION

The RFFS Addendum included representations that dispersivity at the Site is low. Based upon this assumption, the agencies have made conclusions regarding the expected configuration and geometry of contaminant "plumes," and, in particular, they have conceptualized leachate conditions at the Site to consist of narrow concentrated plumes. As discussed in the RFFS, the fluoride tracer test completed during the TZD was not adequate to provide reliable estimates of Site-specific values of dispersivity. In addition, the Group is not aware of other evaluations or investigations that have been completed for the Site that established or estimated a Site-specific value of dispersivity. The agencies justification for selecting a low dispersivity value for independent evaluations completed for the Site was not included in the RFFS Addendum and was not previously provided in correspondence associated with the TZD Project. There are potentially wide-ranging implications to a conclusion that dispersivity at the Site is low that can affect a number of aspects of remedial design and establishment of practical ground water monitoring networks.

Consideration of dispersion is expected to be a component of technical evaluations completed during remedial design activities, including monitoring requirements, hydraulic considerations, and trench design and configuration. Values of dispersivity for fate and transport/hydraulic evaluations and remedial design are almost always derived from published literature for highly detailed research tests. This approach (i.e., relying upon literature values) was used to complete the fate and transport modeling during the RFFS as is consistent with the approach used at most other Superfund Sites. The Group recommends that further evaluation of dispersion be included in subsequent pre-design activities and that representative values for the Site be evaluated, discussed, and selected prior to the completion of remedial design.

SC-A: EXISTING LANDFILL COVER AND TRENCH TREATMENT SYSTEM

Based upon the Group's review of the RFFS Addendum, it offers several clarifications and recommendations regarding the Proposed Plan for a source remedy. Specifically, the Group's comments on the localized source identification approach, trench configuration; the contingent remedy; excavated soils disposition; and constructability and implementability issues identified by USEPA and NHDES. Also, the Group notes that page 45 of the Addendum states that "[a] ground water diversion trench would also be installed upgradient of the landfill;" however, this element was not part of SC-A as described in the RFFS, although it was a component of the 1991 ROD remedy.

Localized Source Identification Approach

The Group concurs with the Proposed Plan's intent to identify localized sources of contaminants at the northwest corner of the Landfill in the vicinity of surface water station SW-E and at the southwestern lobe of the Landfill where a localized area of relatively elevated THF concentrations has been identified. The RFFS addendum identifies soil gas surveys and test pit investigations as the methods to be used to accomplish these investigations; however, the Group recommends that the agencies defer decisions regarding the specific methods to be used for these investigations until the pre-design stage of the remedial action, allowing consideration of the use of other techniques such as geoprobe sampling and field gas chromatography investigations of shallow ground water.

Constructability and Implementability

In several sections within the RFFS Addendum and during the public meetings on June 21st and July 19th, 2004, concerns were raised regarding the constructability and implementability of the treatment trench. With respect to the constructability of the proposed treatment trench, the Group recommends that the Agencies refer concerned individuals to Appendix L-1 of the RFFS, which contains information on the viability of deep trench construction that was developed based on direct communications with qualified trench construction contractors regarding specific conditions at the Dover Landfill Site. Further, the Agencies may wish to refer to the experiences with successful construction of remedial trenches to depths of approximately 80 feet and 110 feet for the Cardinal Landfill and Savage Well Superfund sites, respectively. In addition, the Somersworth Landfill PRB trench was constructed using the same technology being proposed for Dover Landfill; that trench is 915 feet long and 47 feet in depth.

With respect to implementability, the concerns raised are focused on the ability of the trench to treat the COCs and on the potential of an unacceptable reduction in hydraulic conductivity (termed "clogging" in the Addendum) of the trench media as a result of both mineral precipitation and biomass growth. In completing the RFFS, considerable research was performed on these issues and relevant literature on similar operating systems is presented in Appendix L-2 of the RFFS. In addition, calculations were performed to evaluate potentially unacceptable reductions in hydraulic conductivity of the trench media (Appendices K-1 through K-4 of the RFFS). A comprehensive analysis of treatment effectiveness was performed using both literature references and calculations based upon experience at other sites (Appendix J of the RFFS on stripping of VOCs and Appendix K-5 of the RFFS on arsenic immobilization). The Group recommends that the Agencies refer individuals to the referenced appendices when considering issues regarding treatment trench implementability.

Trench Configuration

The Group does not concur with the Agencies on the placement of the treatment wall (a.k.a. treatment trench) pictured in Figure 4 of the RFFS Addendum. If the Group will be required to construct a treatment trench at the Landfill toe, then the Group should have flexibility in the RD/RA to optimize the system design. For instance, the Landfill includes an Eastern Lobe and Western Lobe that have different historical use and associated ground water impacts. The Eastern Lobe is the oldest portion of the Landfill, was created during a period when burning of waste material was the primary disposal method, and is located in an area where ground water flow velocities are higher. The Western Lobe is the youngest portion of the Landfill, was created during a period when burning was not predominantly practiced, and is in an area where ground water flow velocities are slower. Because of the differences in conditions associated with these two lobes of the Landfill, these areas can be considered two distinct "solid waste units." Examples of the design optimization may include the use of sheet pile barriers along flow paths that are predominantly parallel to ground water flow (e.g. between monitor wells SC-9 and SC-8), effectively separating the two solid waste units. Not only would this serve to optimize the trench design, performance characteristics and system cost, but also would result in a movement of the ground water divide towards the west with an associated reduction in impacted ground water flow towards the Bellamy Reservoir.

Another option for the source control component of the remedy is construction of the trench along Tolend Road; essentially moving the point of compliance from the toe of the Landfill to the property boundary at Tolend Road. This is an option that has merit for several reasons: 1) It would allay the fears expressed by the public that contaminants that are already past the toe of the Landfill pose a threat to the Cocheco River. The Cocheco is a more valuable resource than the limited use aquifer that lies between the toe of the Landfill and Tolend Road; 2) This area between the Landfill toe and Tolend Road is owned by the City, there is no potential for development, and even if development were desired, the aquifer yield cannot sustain residential wells; 3) From a regulatory standpoint, the point of compliance can be moved to the property line because contaminant mass exists outside the limits of the Landfill, essentially constituting waste management units that are separate from the Landfill; and 4) A conservation easement could be put in place between the toe of the Landfill and the trench at Tolend Road. Instead of the trench at the toe of the Landfill, this option for the source control remedy would require that the Landfill be maintained with the current vegetated permeable cap to allow flushing of the contaminants downgradient to the trench. With this option, any contaminants that might be threatening the Bellamy in the Southern Plume could be pumped and treated by delivery to injection galleries upgradient of the treatment trench at Tolend Road.

The Group concurs with the Agencies (Appendix C of the RFFS Addendum) that the ground water flow and fate and transport model is an important tool for remedy design and that relevant data collected during the PDI will be used to support final model development.

Excavated Soil Disposition

The RFFS Addendum appears to assume that approximately 19,000 cubic yards of soil excavated from the Site to construct the treatment trench will be removed from the Site (e.g., page 45, 2nd full paragraph). To mitigate potential short-term impacts associated with construction of the remedy (i.e., vehicle traffic on local roads), and to avoid large and unnecessary disposal costs of approximately $1.2 MM (essentially paying another landfill for its daily cover), the Group recommends that soil excavated during construction of the treatment trench be managed consistent with the provisions of the NHDES Risk Characterization and Management Policy and the contaminated soil reuse provisions of the State's Solid Waste Rules (Env-Wm 2603.05). The RCMP establishes cleanup guidelines for soil that consider both potential risk resulting from direct exposure and potential impacts on ground water quality (Section 7.5, RCMP, NHDES, January 1998, as revised). The pertinent sections of the Solid Waste Rules govern reuse of contaminated soil. Under the provisions of the RCMP and these rules, it most probably will be practicable to place the excavated soil on top of the Landfill to provide additional permeable cover.

Contingent Remedy

The Agencies recommend on page 35 of the Addendum that "If air sparging, THF degradation, or arsenic capture fails, or clean closure cannot be achieved at the Landfill, the contingent remedy will be the 1991 ROD remedy". The Group recognizes and concurs with the requirement for a contingent remedy but would recommend that the agencies reconsider the content of the contingent remedy. Both the Group, in the RFFS (Section 5.8), and the Agencies, in the Addendum (Section 5.3), recognize the potential benefits to maintaining the current cover on the Landfill during the active source remedy phase of the project, in particular with respect to expected COC clean-up timeframe and remedy cost. At other landfills, the installation of a RCRA cap has not significantly decreased the amount of leachate generation, and has the added detrimental effect of increasing the amount of time for complete elimination of the contamination by entombing the waste and decreasing the flushing which serves to deliver the contaminants to the treatment system. It is further recognized that the Agencies uncertainties with respect to the proposed remedy exist within the performance of the treatment trench. Based on these recognized benefits and these uncertainties, the Group proposed in the RFFS and the Agencies reiterated in the Addendum (page 34), that the design of the trench would incorporate the flexibility to convert the trench to a leachate collection system. Conversion of the trench to a leachate collection system, without the addition of a landfill RCRA-C cap, would preserve the treatment features of the remedy as contrasted with containment, and would serve to maintain the advantages of COC treatment time and remedy cost while providing an appropriate contingent remedy for the proposed trench performance.

The Group has informed the USEPA and NHDES that it is investigating reuse of the Landfill as a disposal facility for dredge spoils, lightly contaminated soil or possibly municipal solid waste. The reuse approach would be generally consistent with the 1991 ROD remedy as currently designed. Conceptually, the portion of the Landfill surface that is not reused would be covered with a cap consisting of sub-grade layer, overlain by a gas venting layer, overlain by a low permeability cap layer, overlain by a drainage layer, overlain by a protective layer and a vegetative support layer. The new landfill cell would include a liner system composed of a sub-grade layer, overlain by a low permeability soil liner layer or geocomposite clay layer, a secondary flexible membrane liner and a drainage layer, overlain by the primary flexible membrane liner and drainage layer. These systems would prevent infiltration through the waste mass of the existing Landfill. A downgradient collection system would capture leachate and impacted ground water migrating from beneath the Landfill for off-site treatment at the City of Dover POTW. Importantly, the reuse concept would generate funds for the City to offset the considerable costs of remediation, substantially mitigating the potentially large adverse impact on City finances.

The City has met with NHDES to identify threshold issues to be addressed in pursuing the reuse concept. NHDES issued a letter dated January 12, 2004 in which it identified the key issues to be addressed. The City responded to this letter by identifying its approach to addressing these issues by letter on June 11, 2004, and at this juncture, is seeking a meeting with USEPA to discuss the reuse concept at the Site. The City is available to meet with USEPA at the earliest opportunity so that this concept can be appropriately considered in the ROD amendment process.

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