UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

DECLARATION FOR THE RECORD OF DECISION

Dover Municipal Landfill
Dover, New Hampshire

STATEMENT OF PURPOSE

This decision document represents the selected remedial action for the Dover Municipal Landfill Site in Dover, New Hampshire, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP), 40 CFR Part 300 et seq., as amended. The Region I Administrator has been delegated the authority to approve this Record Of Decision.

The State of New Hampshire has concurred on the source control and eastern plume management of migration portions of the selected remedy and has reserved a concurrence decision for the southern plume management of migration portion of the selected remedy.

STATEMENT OF BASIS

This decision is based on the Administrative Record which has been developed in accordance with Section 113 (k) of CERCLA and which is available for public review at the Dover Public Library in Dover, New Hampshire and at the Region I Waste Management Division Records Center in Boston, Massachusetts. The Administrative Records Index (Appendix E to the ROD) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to the public health or welfare or to the environment.

DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy for Dover Municipal Landfill Site, which addresses source control and management of migration to meet cleanup goals. The selected remedy is multi-tasked. The remedial measures will protect the drinking water aquifer by minimizing further migration of contaminants to the groundwater and surface water, will eliminate threats posed by direct contact with or ingestion of contaminated soils and wastes at the Site and will prevent the ingestion and direct contact with contaminated groundwater and surface water.

The major components of the selected remedy include

- Recontouring of the existing landfill;
- Consolidation of sediments in the perimeter drainage ditch;
- Limited excavation and consolidation of sediments in the drainage swale and at the confluence to the Cocheco River;
- Capping of the landfill;
- Upgradient groundwater diversion;
- Groundwater/leachate collection and treatment;
- Pre-design studies which include the installation of additional monitoring wells;
- Natural attenuation of the "eastern" plume;
- Groundwater Extraction and treatment of the "southern" plume;
- Long-term environmental monitoring;
- Institutional Controls, where possible.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action and is cost-effective. This remedy satisfies the statutory preference for remedies that utilize treatment as a principle element to reduce toxicity, mobility, or volume of hazardous substances. In addition, this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

As this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Sept. 10 1991
Date

Julie Belaga
Julie Belaga
Regional Administrator
U.S. EPA, Region I

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U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 1

RECORD OF DECISION

DOVER MUNICIPAL LANDFILL SITE
DOVER, NEW HAMPSHIRE

ROD DECISION SUMMARY

Dover Municipal Landfill

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DOVER LANDFILL ROD DECISION SUMMARY
SEPTEMBER 10, 1991

I. SITE NAME, LOCATION AND DESCRIPTION

A. General Description

The Dover Municipal Landfill Site (the Site) is a 55-acre inactive landfill in Dover, Strafford County, New Hampshire. The Site is located in the western corner of Dover, at the intersection of the Dover, Barrington and Madbury town lines. A locus map showing the general location of the Site is included in Appendix A as Figure 1.

About one-half mile north of the Site is the Calderwood Well, which supplies roughly 20 percent of the drinking water to the City of Dover. About 2000 feet south of the Site is the Bellamy Reservoir which provides drinking water for Portsmouth, Newcastle, Newington, Durham, Madbury, Greenland and Rye, New Hampshire. The Cocheco River lies 500 feet east of the Site.

The topography to the north, south and southeast of the Landfill is relatively flat. To the east, the topography is more undulating with a sharp drop in elevation toward the Cocheco River. Wetlands predominate northwest, west and southwest of the Landfill. The Landfill is bordered by Tolend Road and Glen Hill Road on the North, by Tolend Road on the east, and by private property on the southeast and the south. The Site is located in a rural area, although land along the east side of Tolend and Glen Hill Roads has been subdivided for residential use. A number of homes are located along these roads. Recreational uses near the Site include fishing in both the Cocheco River and the Bellamy Reservoir.

Additional information regarding the characteristics of Dover, New Hampshire may be found in Section 2, pages 2-1 and 2-2 of the Remedial Investigation (RI) conducted by the State of New Hampshire's contractor; Wehran Engineers and Scientists (Wehran) and in Section 2, page 2-1 of the Field Element Study conducted by HMM Associates, Inc (HMM), the contractor for the Dover Landfill PRP Steering Committee. Site characteristics, analytical results and remedial alternatives have been presented in the following documents prepared by Wehran and HMM:

Remedial Investigation Report, Dover Municipal Landfill, Dover, New Hampshire., Wehran Engineers and Scientists, November 1988.

Field Elements Study and Supplemental Risk Assessment for the Municipal Landfill, Dover, New Hampshire, Hmm Associates, Inc., February, 1991.

Dover Municipal Landfill Feasibility Study, Dover, New Hampshire, HMM Associates, Inc., February, 1991.

B. Geology and Hydrology of the Site

The geology of the Site area is typical of the southeastern New Hampshire region. Unconsolidated overburden deposits, generally of glacial origin, are underlain by consolidated, usually metamorphic, bedrock. Unconsolidated overburden deposits include a wide variety of grain sizes reflecting historic changes in depositional environment. These deposits appear to divide into two generalized aquifer units, an upper and lower, separated by a clay aquitard that appears to have effectively limited groundwater contamination to the upper aquifer.

The upper aquifer unit contains a sand zone and an underlying finer grained, interbedded zone. The sand zone is composed of fine to medium grained sand with occasional silt and organic matter and traces of clay sized material. The sand unit ranges in thickness from 10 feet (at well B-12L) to 33 feet (MW-105U). The interbedded zone above the clay aquitard (the upper interbedded zone) consists of interbedded silt and clay layers. This unit has lateral and vertical hydraulic conductivities less permeable than the overlying sand, and ranges in thickness from 0 feet (MW-106L) to 70 feet (MW-102U).

The clay aquitard consists of a gray marine clay unit with very low permeability. The clay unit thickness ranges from 12 feet (MW-106L) to 42 feet (MW-105U). The upper surface of the unit is at a higher elevation and near land surface north and west of the Landfill at wells B-13, B-14 and MW-106. The upper surface is irregular and depressions or localized lows may occur in the vicinity of wells B-4, B-6, B-8 and B-2. This unit appears to pinch out in the vicinity of B-14; north of this location the lower and upper aquifers are no longer separated by a low permeability unit.

The lower aquifer unit has three distinct zones, none of which are continuous. Just below the clay zone is the lower interbedded zone which exhibits grain sizes and permeabilities similar to that of the upper interbedded zone. This zone is thickest (up to 50 feet at B-1) north of the Landfill, where it also contains a thick sandy zone. It appears to terminate south and west of the Landfill. Its permeability characteristics appear similar to those of the upper interbedded zone. Beneath the lower interbedded zone is a highly permeable sand and gravel zone. Its thickness is quite variable. At MW-101, next to the Landfill, it is approximately 20 feet thick, while east of this location at B-9 it is approximately 40 feet thick. West or northwest of MW-101 it appears to pinch out (as between B-7 and MW-106). This zone is hydraulically connected to the Calderwood Well, and may provide a significant proportion of the water derived from that well. Beneath the sand and gravel zone is a tightly packed poorly sorted glacial till of low permeability. Where till occurs it lies directly on the bedrock; where till does not occur, the sand and gravel zone lies directly on the bedrock.

The Landfill is underlain by rocks of the Berwick Formation. Rock samples recovered were predominantly unweathered to slightly weathered micaceous quartz-biotite granobels. Sulfides (pyrrholite, massive pyrite) were observed to be common accessory minerals. Other lithologies observed included calc-silicate and carbonaceous phyllitic siltstone.

The bedrock appears to be moderately fractured with occasional highly fractured zones. Fractures generally paralleled bedding and foliation. Orientation of the fractures was generally in a northeast-southwest direction with dip angles moderate to steep toward the north. The depth to bedrock varies from about 23 feet (B-3R) to about 143 feet (B-11R) below land surface. The bedrock high of 130 feet above sea level is at B-3, and it slopes southward and eastward to a known low of about 11 feet below sea level at B-12R.

Groundwater in the upper aquifer moves essentially from an area north of the Landfill south towards the Bellamy Reservoir and east to the Cocheco River. To a lesser degree, groundwater also moves downward through the upper aquifer. Movement of groundwater into the lower aquifer is effectively inhibited by the presence of the marine clay aquitard.

Groundwater movement in the lower aquifer (in the landfill vicinity) moves northeastward under the influence of the pumping of the Calderwood Well. Water levels in the bedrock aquifer suggest upward movement into the lower aquifer and lateral movement towards the Calderwood Well.

Additional information about the Site geology and hydrology can be found in the Remedial Investigation on pages 5-1 through 5-29 and in the Field Element Study on pages 2-26 through 2-28 and pages 3-16 through 3-31.

C. Groundwater Supply

Two public water supplies are located in the vicinity of the landfill, the Calderwood well and the Bellamy Reservoir. The Calderwood well is located one half mile north of the Site. The Calderwood Well is a gravel-pack well approximately 114 feet deep. It is currently pumped at a rate of approximately 400 to 500 gpm or 576,000 to 720,000 gallons per day (GPD).

The Bellamy Reservoir is located approximately 1,700 south-southwest of the landfill and is a drinking water supply for the towns of Portsmouth, Newcastle, Newington, Durham, Madbury, Greenland, and Rye, New Hampshire. The drainage basin for the reservoir comprises approximately 22 square miles. The 420-acre reservoir has an average depth of 6 to 7 feet and an estimated usable storage capacity of 865 million gallons. Two water intakes connected to the City of Portsmouth Water Treatment Facility are located at the reservoir dam on Mill Hill Road, approximately 2 miles to the south of the Site. 2.0 to 2.8 million gallons per day (mgd) of water from the reservoir is treated prior to release into the Portsmouth water supply distribution system.

Residential wells near the Site obtained water from both the lower and upper aquifer. In 1981, contamination was found in the residential wells closest to the Site and situated in the upper aquifer, which also underlies the Landfill. The City of Dover installed a water supply line along Glen Hill and Tolend Roads during 1983, and residents closest to the Site were connected to the main at that time. Additional residential connections, further from the Landfill, continued until the fall of 1989.

A more complete description of the Site can be found in the Remedial Investigation Report on Pages 2-1 through 2-4, 4-3,and 4-4 and in the Field Element Study on pages 2-4 through 2-8.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land Use and Response History

Operation of the Dover Municipal Landfill reportedly began about 1960 and ceased in 1979. The Dover Municipal Landfill accepted wastes, including liquids and sludges from both domestic and industrial sources. The waste materials included, among other things, domestic and industrial sludges, shoe and leather tanning waste products, organic solvents, waste oil, and municipal solid waste. Table 1 found in Appendix B of this ROD provides a list of the types of industrial wastes, compiled from an industrial waste survey taken by The State of New Hampshire in 1976, that were disposed of at the Landfill from 1976-1977. Closure operations at the Site, conducted by the City of Dover, included a sandy-loam cover and surface water/leachate drainage channel construction, and site access control.

Landfill disposal practices varied during operation. They evolved from trenching, to burning, to a fill and cover method in 1962. Fill and cover operations were begun at the eastern portion of the present Landfill area and progressed westward until 1977 where it appears the current areal extent of the Landfill was reached. Disposal continued at the Landfill on top of previously deposited material. Drums of industrial waste were accepted at the Landfill until at least 1975. Since detailed records of each load of refuse brought to the Landfill were not kept, a detailed quantification and characterization of the waste buried cannot be calculated.

Liquid wastes were historically brought to the Landfill and reportedly disposed of by being poured onto the surface of existing refuse. If the wastes were flammable, during the early years of the Landfill's operation they were ignited and burned. Empty containers, such as drums, were crushed and disposed of with the municipal refuse. Some chemical wastes were known to have been disposed of at the Landfill while still in drums.

Landfill closure operations, by the City of Dover, consisting of placing clean fill over the existing material, were completed in March, 1980. One or two years later, the Landfill was closed for the interim as a part of a cooperative effort between the State and the City of Dover, and the drainage ditch was re-excavated around the Landfill consistent with its current configuration for the purpose of intercepting leachate and thereby limiting off-site contaminant migration.

Dover City officials along with the New Hampshire Water Supply and Pollution Control Commission (the Commission has since been incorporated as a Division within the New Hampshire Department of Environmental Services and is herein referred to as the NHDES) initiated a groundwater monitoring program at the Landfill in 1977. In 1980, the monitoring program was expanded to include several residential wells. Contamination was first found in a private residential well near the Landfill in February, 1981.

Subsequent samples, collected by the NHDES, were taken to determine whether the Landfill was the source of the contamination detected in the private water supplies. Surface water sampling and analyses were conducted by the NHDES in March and April, 1977, and by the City of Dover and the City of Portsmouth Water Departments in April, May and September, 1981 and in March, 1982.

The Landfill was evaluated as a potential hazardous waste site by the U.S. Environmental Protection Agency (EPA), ranked, and proposed for the EPA's National Priorities List (NPL) on December 30, 1982. The Site was placed on the NPL on September, 8, 1983. In accordance with the requirements of the National Contingency Plan (NCP), a Remedial Action Master Plan (RAMP) was prepared for the site in 1983. The RAMP included a recommended scope of services for remedial action planning activities at the site, and called for completion of a Remedial Investigation/Feasibility Study.

The Remedial Investigation (RI) for the Dover Municipal Landfill was conducted by the NHDES under a cooperative agreement with the EPA. The NHDES contracted with Wehran Engineers and Scientists to conduct the RI. The Field Element Study (FES), which addresses the data gaps of the RI, and the Feasibility Study (FS) were conducted by a group of Potentially Responsible Parties (PRPs) for the Site under an Administrative Order by Consent with EPA. The PRPs contracted with HMM Associates, Inc. to conduct these activities. The RI was completed in March 1989 and the FES and FS were completed in February 1991.

A more detailed description of the Site history can be found in the Remedial Investigation Report on pages 1-5 through 1-9 and in the Field Element Study on pages 2-1 through 2-8.

B. Enforcement History

In the spring of 1987 the City of Dover and several Dover businesses formed a PRP group and expressed to the Agency an interest in undertaking the Feasibility Study (FS) and filling the data gaps left by the RI. Negotiations between EPA and the PRP group were undertaken in the late summer 1987. After extended neogtiations, the City of Dover and eight businesses signed an Administrative Order by Consent (AO) with EPA and the State of New Hampshire in July 1988. In that Order the PRPs agreed to pay some past costs associated with the RI, to conduct a Field Element Study (FES) to fill data gaps left by the RI, and to conduct the FS. The Order also provided that additional parties could sign-on without renegotiating the terms of the

Order; an additional fourteen (14) PRPs have since signed the Order. The PRPs contracted with HMM Associates, Inc. to conduct these activities. The FES and FS were completed in February 1991.

In late January 1988 the City of Dover and four businesses were sent formal notice of their potential liability for the remediation of the Site. In late March and early April 1991, after an extensive PRP search, general notice was sent to 39 potentially responsible parties, including those PRPs already sent notice. Copies of the Proposed Plan were sent to all noticed parties as well as to public representatives and the news media to provide an opportunity to comment on the EPA's preferred Remedial Alternative. On April 15, 1991 EPA met with the PRPs to discuss their potential liability at the Site. At the request of EPA, the PRPs have been active in forming a new steering committee to consider the performance and financing of the Remedial Design and Remedial Action (RD/RA).

The PRPs have been active in the remedy selection process for this Site. Technical comments presented by PRPs during the public comment period and at the Public Hearing were evaluated, summarized in writing, and the summary and written comments are included in the Administrative Record.

III. COMMUNITY PARTICIPATION

Until April 1991, community concern and involvement at the Site had been relatively low. EPA has kept the community and other interested parties apprised of the Site activities through informational meetings, fact sheets, press releases and public meetings.

During December, 1984, EPA released a community relations plan which outlined a program to address community concerns and keep citizens informed about and involved in activities during remedial activities. On August 9, 1983 EPA and the NHDES held a meeting at the Dover City Hall auditorium to discuss the findings and recommendations of the Remedial Action Master Plan (RAMP). On December 13, 1984, NHDES held an informational meeting in the Dover City Hall auditorium to describe the plans for the Remedial Investigation and Feasibility Study. On March 30, 1989 NHDES and the EPA held an informational meeting in the Dover City Hall auditorium to discuss the results of the Remedial Investigation.

On March 16, 1991, EPA made the Administrative Record available for public review at EPA's offices in Boston and at the Dover Public Library in Dover, New Hampshire. EPA published a notice

-Further contamination of groundwater through the leaching of contaminants from the landfill.

-Direct contact with contaminated soils, sludge, sediments and debris found in the Landfill.

-Ingestion of contaminated soils, sludges, sediments and debris found in the Landfill.

-The off-site migration of contaminants in groundwater.

-Ingestion and direct contact with contaminated groundwaters and surface waters.

Remedial activities at the Site are comprehensive and designed to be a final remedy.

V. SUMMARY OF SITE CHARACTERISTICS

Section 1 of the FS contains an overview of the Remedial Investigation and Field Elements Study. Contamination at the Site is a result of the disposal of hazardous substances in the Landfill and the leaching of contaminants into the surrounding groundwater, surface waters, soils and sediments.

Analysis of soil, groundwater, sediment and surface water from areas in and around the Landfill indicate that the contamination at the Site is found primarily in the groundwater, surface water and sediments. The Landfill itself presents a potential threat as it may conceal containers of hazardous substances.

The most prevalent contaminants identified in groundwater at the Site are Volatile Organic Compounds (VOCs) such as 1,1,1-Trichloroethane (TCA) and degradation products of TCA such as 1,1-Dichloroethylene (DCE) and 1,2-Dichloroethane (DCA); acetone, benzene, toluene, and tetrahydrofuran. Also identified in the groundwater are trichloroethylene (TCE), ethylbenzene, xylenes, tetrachloroethylene, chloroethane, methyl ethyl ketone, methyl isobutyl ketone, vinyl chloride and methylene chloride. Arsenic was the prevalent metal found in the groundwater.

The significant findings of the Remedial Investigation and Field Element Study are summarized below.

A. Soil

Soil investigations were conducted at the Dover Landfill during the Remedial Investigation and also during the Field Elements and brief analysis of the Proposed Plan in Foster's Daily Democrat on March 22, 1991 and made the plan available to the public at the Dover Public Library. The Proposed Plan included notice of a proposed waiver for the Safe Drinking Water Act, Maximum Contaminant Level (SDWA MCL) for arsenic in groundwater.

On March 25, 1991 EPA held an informational meeting at the Horne Street Elementary School to discuss the results of the Remedial Investigation, Field Elements Study and the cleanup alternatives presented in the Feasibility Study, and to present the Agency's Proposed Plan. Also during this meeting, the Agency responded to questions from the public. From March 26, 1991 to May 24, 1991, the Agency held a sixty day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. On April 16, 1991 the Agency held a public meeting to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments from the general public, Dover and Madbury City officials and from representatives of the Dover Landfill Steering Committee along with the Agency's response to comments are included in the attached Responsiveness Summary.

IV. SCOPE AND ROLE OF RESPONSE ACTION

The selected remedy was developed by combining components of different source control and management of migration alternatives to obtain a comprehensive approach for site remediation. In summary, the remedy provides for recontouring the existing landfill surface and construction of a 55-acre multi-layer cap over the landfill to prevent infiltration and promote run-off and the installation of a leachate and contaminated groundwater collection system around the perimeter of the landfill. The contaminated groundwater and leachate would then be treated on-site by a Powdered Activated Carbon Treatment System (PACT™) or equivalent system with discharge to the Cocheco River or pretreatment and discharge to the Dover Publicly Owned Treatment Works (POTW). There will be a limited excavation of the contaminated sediments from the existing drainage swale. These excavated sediments would be placed onto the landfill prior to capping. Natural attenuation processes will be utilized to attain groundwater cleanup levels in the eastern plume while a groundwater extraction and treatment system will be employed to attain cleanup levels in the southern plume.

The remedial action will address the following primary risks and principal threats to human health and the environment posed by the Site:

Study to address specific data gaps. Specifically, Base\Neutral and Acid extractable organic compound (BNA) contamination was detected in the soils between the drainage ditch and well cluster B-13 during the RI. Contamination at these locations was found to be below minimum detection limits during FES investigations.

A limited study of the potential locations of buried drums at the Landfill was conducted as part of the RI using surface geophysics. Test pits (excavations into the waste material) were also conducted. Crushed drums were found in many of the test pits throughout the Landfill. No definable areas of excessively high contamination, highly mobile sludges or large volumes of liquid filled drums (hot spots) were found in any of the test pits in the Landfill. The locations of the test pits can be seen in Figure 2 of Appendix A of this ROD.

Soil samples were obtained from the unsaturated zone within selected test pit excavations on the Landfill during the RI. VOCs were detected in single soil samples obtained from the following test pits:

Test Pit and location at the Landfill	Total VOC Concentration
TP-1 - northern part of the Landfill	475 ug/kg
TP-16- northwestern part of the Landfill	8,410 ug/kg
TP-19- southeastern part of the Landfill	680 ug/kg
TP-20- southwestern part of the Landfill	20,330 ug/kg

Primary VOCs observed, in terms of relative concentration or frequency include:

- ethylbenzene
- toluene
- xylene
- methyl butyl ketone
- acetone
- methyl ethyl ketone

Other soils sampled from the drainage ditch surrounding the Landfill, including the wetlands and the discharge stream, are described in the sediments discussion.

B. Surface Water

The RI included surface water and sediment samples from the perimeter drainage ditch and discharge stream of the wetland areas. Surface water samples did not detect the presence of elevated levels of metals or BNAs. VOC contamination was found in the surface water samples taken from the drainage ditch from sampling locations SW-2 and SW-5. Samples taken during the RI from SW-2 (from the northern and upgradient side of the Landfill) contained total VOC concentrations as high as 1,819 ppb and the SW-5 sample (from the east side of the Landfill) contained 431 ppb. These data indicate that the drainage ditch is a predominant avenue for contaminant movement, including groundwater discharge, flowing from the Landfill and discharging into the Cocheco River.

The perimeter drainage ditch does not completely freeze over in the winter, indicating that exothermic conditions are present as a result of leachate from the Landfill entering the drainage ditch and affecting water quality and temperatures. This condition may also be a contributing factor with regard to the limited vegetative establishment in and around the ditch.

Surface water samples were collected as part of the Field Elements Study from the Cocheco River (a class B waterway), the Bellamy Reservoir (a class A surface water), and the culvert drainage area just northeast of Glen Hill Road as can be seen in Figure 2. The total concentration of VOCs (BNAs and metals were not analyzed) at SW-1 (taken at intersection of drainage culverts) was 50 ppb and at SW-2 (taken at the point of discharge to the Cocheco River) was 153 ppb. Additionally, EPA split samples indicated the presence of a combined total of 19 ppb of vinyl chloride, 1,2-dichloroethane, 1,1,1-trichloroethane, trichloroethene, benzene, 1,1-dichloroethane and ethyl benzene from station SW-2. VOCs identified in the surface water in the drainage ditch included:

- acetone
- 1,2-dichloroethylene
- methylene chloride
- methyl ethyl ketone
- methyl isobutyl ketone
- tetrachloroethylene
- tetrahydrofuran
- toluene
- xylene

Samples from the Bellamy Reservoir indicated no detectable levels of VOC contamination. The sampling of the Cocheco River indicated VOCs at the intersection of the drainage swale and the river (SW-2) and a trace amount of methylene chloride, further downriver.

Surface water samples were also taken as part of the Treatability Study. Surface water samples were analyzed for various parameters such as BOD, COD, TSS, etc. The complete list of parameters analyzed for can be found on Table 1-5 of the FES. Laboratory results for Treatability Study surface water parameters are shown on Table 1-15 of the FES.

C. Sediments

Sediment sampling occurred in four general areas during the RI: the perimeter drainage ditch, the Cocheco River, the Bellamy Reservoir and the wetland locations north and west of the landfill. The highest levels of contamination were found within the perimeter drainage ditch and at the discharge point of the drainage swale into the Cocheco River. VOCs were detected in sediment sample S-5, including methyl ethyl ketone and trichloromethane at concentrations of 1700 and 400 ug/kg, respectively. Cadmium and arsenic were detected above anticipated background levels at stations S-5 and S-7. No VOC or BNA contamination was detected in the Bellamy Reservoir.

Results of the sediment sampling episode in the FES indicate some elevated concentrations of metals, principally arsenic and cadmium. The common range for arsenic in soils across the United States is 1 to 50 ppm, and for cadmium it is 0.01 to 0.70 ppm. Exceedances of the common range for arsenic were found at stations SD-1, SD-3, and SD-6 with concentrations of 51, 210 and 99 ppm, respectively. Each of these samples were collected from the drainage ditch around the Landfill or from the area where the drainage ditch culverts discharge to the swale that runs to the Cocheco River. Exceedances for cadmium were found at stations SD-4, SD-9, SD-10 and SD-16 with concentrations of 1.54, 1.16, 1.41 and 3.31 ppm, respectively.

Both lead and mercury concentrations were elevated in off-site station SD-2, and at station SD-9 located just upstream from where the culvert drainage waters enter the Cocheco River. The lead concentration from SD-16 (just south of Minichiello Brothers), and SD-8 (on the floodplain of the Cocheco River), were also relatively high. With the exception of suspected laboratory contaminants that were detected in four BNA samples, no other contamination was detected in the wetland sediments.

Sediment samples were collected for Total Organic Carbon (TOC) and sediment grain size analysis. Results of the TOC laboratory analysis are shown on Table 1-10 and results of the sediment grain size analysis on Table 1-11 of the FES. Actual laboratory reports of the analysis are shown in Appendix III of the FES. The discussion of sediments in the Remedial Investigation can be found on pages 7-4 through 7-7 and in the Field Element Study on pages 3-56 through 3-64.

D. Air

On September 11, 1990, EPA's Environmental Services Division (ESD) from Lexington, Massachusetts, conducted an eight hour air sampling program at five locations on and around the Dover Landfill site. The air sampling program involved collecting eight-hour ambient air samples on prepared Tenax sorbent cartridges and analyzing these sample cartridges with a gas chromatograph/mass spectrometer (GC/MS) at ESD's facility. The five stations were selected by the EPA based on previously obtained site-specific information and the objectives of this air sampling program, and concentrated in areas of high contamination found in the drainage ditch and swale which discharges to the Cocheco River.

The results, presented in Table 1-12 of the FS, showed low levels of VOCs in the air and were incorporated into the risk assessment (Section 2.0 of the Feasibility Study). The risk assessment evaluated potential health effects to humans from exposure to the contaminants at the concentrations detected.

In conjunction with this air sampling program, the EPA collected surface water/leachate samples from three of the five air sampling locations (locations #1, #3 and #4). The results from the analysis of these surface water samples are listed in Table 1-13 of the FS. The results from the surface water sampling program were evaluated to determine if volatilization of contaminants from the discharge stream was impacting the levels of contaminants in the ambient air on and around the site. The analytical results from the air samples collected from locations not impacted by the leachate in the drainage ditch (stations #2 and #5) and the stations impacted by volatilization of contaminants from the leachate in the drainage ditch (stations #1, #3 and #4) indicate that there is no significant impact to the on-site, ambient air quality from volatilization of contaminants from the leachate in the drainage ditch.

E. Wetlands Analysis

Wetland scientists from HMM Associates carried out a limited field investigation on March 27, 1990 of the wetland resource areas identified within and adjacent to the boundaries of the Dover Landfill. Various reference sources were used in the initial Field Elements Study to identify potential wetland resource areas. These sources included:

- Soil Survey of Strafford County, New Hampshire, March 1973

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Town of Dover, New Hampshire, Strafford County, Community Panel No. 330145 0005B, Effective Date: April 15, 1980

- National Wetland Inventory, Dover West, New Hampshire, April, 1977

- New Hampshire Department of Transportation (NHDOT) Wetlands Map

Further on-site review and verification of the related information indicated that there are four wetland systems in the vicinity of the Dover Landfill. Three of these wetland systems are described as the Bellamy Reservoir, Cocheco River, and the Hoppers System north of the site. The fourth wetland area includes the man-made drainage ditch which extends around the perimeter of the Landfill which is hydraulically connected with the Bellamy Reservoir wetland system. Delineation of the wetland areas are shown on Figure 3. The drainage ditch is not cross-hatched as are the other three areas on Figure 3.

These wetland systems were reviewed for evidence of physical effects on vegetation that could be attributed to the Dover Landfill. The review was limited in scope due to seasonal constraints in that no herbaceous vegetation could yet be seen. However, the woody vegetation exhibited no observable signs of stress-related conditions. With the exception of the drainage ditch and swale to the Cocheco River, the standing pockets of water throughout the systems were relatively clear and exhibited no signs of foaming or discoloration. Thus, there was no visible evidence that these wetland systems have been impacted by the Dover Landfill. The drainage ditch waters were observed to have foam on the water. In addition, although the temperature was such that area water bodies had ice cover, the drainage channels close to the landfill were not frozen. These factors suggest that leachate from the landfill is affecting the water quality and temperature of these surface waters.

F. Groundwater

Groundwater contamination (VOCs, metals, and BNAs) was found at several locations around the Dover Landfill. All three of these contaminant types were encountered in the upper aquifer just downgradient of or near the Landfill. The lower aquifer was not found to contain consistent or reproducible levels of contaminants in current or RI data. Contamination in well OW-1 was detected during the RI on several occasions possibly due to faulty well joints or construction, and therefore the well was abandoned in January 1988. Faulty joint connections were also corrected on well B-2. Figures 4 through 8 show total VOC, BNA and arsenic contaminant concentrations for groundwater for the upper and lower aquifers. "ND" indicates that contaminant levels were below the minimum detection level (MDL) of the instrument performing the analysis.

VOCs - Figure 4 depicts the concentrations of VOC data for groundwater samples collected from the upper aquifer at the Site, and Figure 8 shows the estimated extent of known VOC contamination related to the Landfill from the RI and FES in areas directly influenced by the Landfill. Generally, the November 1989 sampling results suggest that the VOC plume is attributable to hazardous substances in the Landfill and is moving in an east, southeastward direction. Figure 8 presents the estimated limit of contamination in the groundwater. The upper aquifer exhibits semi-radial groundwater flow (see Figure 9) with contamination generated by the Landfill being detected at monitoring well clusters B-2 to the east, toward the Cocheco River; southeast of the Landfill at MW-103, 104, OW-5 and B-6; and along the southern edge of the Landfill at clusters B-8 and B-4. Analytical data collected to date do not indicate that contaminants have migrated as far south as clusters MW-102 or B-10. VOC contamination was found in upper aquifer wells MW-101U, OW-1A, MW-104S, MW-104U, MW-103S, MW-103U, B-2U, B-4U, B-8U and OW-5 during the November, 1989 sampling episode. The highest concentrations of total VOCs for the site were detected at MW-101U (2,174 ppb), B-4U (760 ppb), OW-5 (744 ppb) and OW-1A (733 ppb). These analytical results indicate that the predominant mass of contaminants is migrating to the east/southeast toward the Cocheco River. Contaminants from the northwestern area of the Landfill appear to be flowing toward the Bellamy Reservoir. The estimated location and apparent historical trends for this data are provided on Figure 8. VOCs were found in some private residential wells near the Landfill in 1981. Residents near the Landfill were then connected to the City's water supply. At this time, only two residential wells (RW-3 and RW-21) are still being used for drinking water purposes. Of these two wells, RW-3 is in the lower aquifer, and the depth of RW-21 is unknown.

Residential Wells - Residential wells located in the vicinity of the Dover Landfill were sampled and analyzed for VOCs during numerous sampling episodes of the RI. Results of these analyses are shown on Figure 9. Contaminants were detected in wells RW-8 and RW-9 during the March 1981 sampling episode at 78 ppb and 10 ppb total VOCs respectively; and in wells RW-8, RW-17, RW-18 and RW-21 at 10, 10, 95, and 62 ppb total VOCs respectively, in the May, 1985 sampling episode. No detectable levels of VOC were observed in the residential wells sampled after 1985.

Metals - Arsenic is the only metal with concentrations that exceed State and Federal drinking water standards of 0.05 parts per million (ppm). Concentrations of unfiltered arsenic from the November, 1989 FES sampling event varied widely across the site from 0.021 to 1.3 ppm in areas adjacent to the Landfill exhibiting VOC contamination and 0.003 to 0.09 ppm in areas where VOC contamination was not detected.

Arsenic occurs naturally in the soil matrix at the site and has been observed in other areas of southern New Hampshire. Other studies of New Hampshire groundwater indicate that, where elevated arsenic levels in water supplies are found it may be the result of natural geologic conditions. Arsenic has been found where no VOC contamination has been detected (including upgradient samples) as well as in samples associated with the VOC plume within the upper aquifer emanating from the Landfill. Figure 6 depicts the concentrations of arsenic found in the groundwater samples from the upper aquifer. Arsenic is also found at measurable concentrations in groundwater samples from the lower aquifer at wells B-6L and OW-3A, where VOC contamination had been detected during the RI but below minimum detection levels during the FES.

Filtered and unfiltered groundwater samples were obtained at various wells in the upper aquifer around the Landfill. Results indicate that arsenic is present in both, suggesting that particulate and dissolved forms of arsenic are present in groundwater in the upper aquifer. The particulate arsenic is that component adsorbed to soils or bound within the soil matrix. The presence of arsenic in the unfiltered groundwater samples and in background groundwater and sediment samples, including upgradient locations, suggests that arsenic is a naturally occurring element of the area's geologic formations.

The higher arsenic concentrations found in close proximity to and downgradient of the landfill relative to concentrations found elsewhere in the study area suggests that they are a result of landfilling activities. The waste materials disposed of at the landfill may be the source of the arsenic, or the leachate from the landfill may produce changes in groundwater geochemistry such that native arsenic is being mobilized.

<u>BNAs</u> - BNA contaminants were found in groundwater samples from the upper aquifer in November, 1989 (wells B-13U, OW-5 and MW-104S). Monitoring well B-13 showed low levels of contamination during the RI, but subsequent sampling did not indicate any sources. The area around B-13 is adjacent to a dirt road and is heavily traveled by recreational vehicles. It is possible that this BNA sampling reflected random spills as opposed to the effects of a leachate seep from the Landfill. Therefore, only the shallow wells MW-104S, OW-5, B-6U and B-2U located in a narrow band directly adjacent to the eastern edge of the Landfill are suspected to have BNA contamination derived from the Landfill.

<u>PCBs/Pesticides</u> - Groundwater from the Landfill was not found to contain any PCBs or pesticides from any of the analytical laboratory sampling results from either the upper or lower aquifers.

A complete discussion of site characteristics can also be found in the Remedial Investigation Report on Pages 7-1 through 7-15 and in the Field Element Study on Pages 5-1 through 5-15.

G. GROUNDWATER CONTAMINANT TRANSPORT

The Cocheco River and the Bellamy Reservoir are considered potential receptors of contaminants migrating from the Landfill. Residential wells have already been impacted by the migration of contaminants in the upper aquifer. The Calderwood well is also considered a potential, though less likely, receptor of the contamination form the Landfill.

Contaminants at the Site may enter the groundwater flow regime via percolation of liquid wastes disposed on the ground surface, infiltration of precipitation through contaminated solids, and direct subsurface discharges from leaking drums.

During the RI, VOC, BNA, and metals contamination in groundwater was observed to be most prevalent in the upper aquifer at monitoring well locations within 400 feet or less from the Landfill. Contamination detected in the lower aquifer monitoring wells is not indicative of transport of contamination from the Landfill through the marine clay layer to the lower aquifer. As was stated earlier, the results of contamination in the lower aquifer in well OW-1 may reflect leakage of contaminated groundwater from the upper aquifer through the PVC well pipe joints. This well has since been decommissioned.

The RI groundwater transport model provides an estimate of contaminant migration from the Landfill source area easterly and southeasterly toward the Cocheco River and private residential wells located along Tolend Road, and southerly toward the Bellamy Reservoir. The concentration isopleths depicting the contaminant plume predicted by each model simulation over time are found in the RI as Figures 25 through 30. Modeling results suggest that contaminated groundwater will reach the east bank of the Bellamy Reservoir, south of the Landfill, between approximately 1990 and 2005. Advective transport times are estimated to be on the order of 100 to several hundred years for the transport of contaminants from the upper aquifer through the marine clay layer. Contaminant transport times to the Calderwood well predicted by the model are on the order of 40 to 80 years after contaminant breakthrough to the lower aquifer.

HMM Associates, the contractor performing the FES for the PRP Steering Committee, also developed and utilized a groundwater contaminant transport model. Data during the FES indicated that the primary direction of groundwater flow was east/southeast towards the Cocheco River and that a small flow was south towards the Bellamy Reservoir. Field data during the FES also indicated that groundwater transport velocities may be slower than the RI had predicted. Additional sampling rounds indicate that the contamination has not migrated beyond the non-detect plume estimated by the RI.

The results from the FES groundwater model predicted that through natural attenuation it would take 5 to 7 years for the contamination in the eastern plume to attain groundwater cleanup levels and 10 to 24 years to attain cleanup levels in the southern plume once source control measures were implemented (including capping and leachate/ groundwater collection). Since monitoring well B-8u was installed with an 80 feet screened interval, it is currently unknown whether the contamination is primarily in the upper, unconsolidated layer, hence the 10 year attenuation time frame, or in the lower interbedded layer, which yields a time frame for attenuation of 24 years. The FES groundwater model also predicted that it is not likely that groundwater contamination will reach the Bellamy Reservoir, but if it did, it would do so below the Safe Drinking Water Act MCLs.

VI. SUMMARY OF SITE RISKS

A Risk Assessment (RA) was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site. The public health risk assessment followed a four step process:

1) contaminant identification, which identified those hazardous substances which, 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, 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. The results of the public health risk assessment for the Dover Municipal Landfill Site are discussed below followed by the conclusions of the environmental risk assessment.

Sixteen contaminants of concern, listed in Table 2 found in Appendix B of this Record of Decision were selected for evaluation in the risk assessment. These contaminants constitute a representative subset of the more than 41 contaminants identified at the Site during the Remedial Investigation and Field Element Study. The sixteen contaminants of concern were selected to represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. A summary of the health effects of each of the contaminants of concern can be found in Chapter 4 of the Field Elements Study and Supplemental Risk Assessment (FES).

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively through the development of the following four hypothetical exposure pathways:

- Future potential use of groundwater as drinking water
- Future potential use of Bellamy Reservoir as drinking water
- Incidental ingestion and dermal contact with surface water (Cocheco River and perimeter swale) while swimming or wading
- Ingestion and dermal contact with soil/sediment while swimming or wading

These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. The following is a brief summary of the exposure pathways evaluated. A more thorough description can be found in Chapter 4 of the FES. For each pathway evaluated, an average and a reasonable maximum exposure estimate was generated corresponding to exposure to the average and the maximum concentration detected and estimated exposure in that particular medium.

Groundwater

Groundwater is currently not being used; therefore, only a future use scenario was evaluated. Ingestion of 2 liters per day over a 70-year lifetime was assumed for both average and maximum exposure estimates.

Surface Water - Bellamy Reservoir

This water body, currently used as drinking water supply for seven municipalities, has not yet been contaminated by the Site. Potential future use of the Bellamy Reservoir as a drinking water supply was evaluated. Estimated future contamination concentrations were obtained by predicting, via modeling, the flow of contaminated groundwater. The predicted concentrations were considered to be a reasonable maximum exposure scenario. Ingestion of 2 liters per day over a 70-year lifetime was assumed.

Surface Water - Cocheco River and Landfill Perimeter Swale

Ingestion and dermal contact with surface water while swimming or wading in the Cocheco River and dermal contact while wading in the perimeter swale were evaluated as potential current and future exposure scenarios. The current and future use exposure scenarios were considered to be equivalent. The average exposure estimate for the Cocheco River exposure point was based on the assumption that children aged 6 to 16 swim or wade 12 times per year; the maximum exposure estimate was based on a frequency of 24 times per year. The average and maximum exposure estimate for the perimeter swale exposure point was based on the assumption that the children may wade 12 times per year.

Soil/Sediment Exposure

Ingestion and dermal contact with sediment while wading in the perimeter swale were evaluated as potential current and future use exposure scenarios. The average exposure estimate for both current and future use was based on the assumption that children aged 6 to 16 would wade 30 times per year; the maximum exposure estimate was based on a frequency of 90 times per year.

Lifetime cancer risks were determined for each exposure pathway by multiplying the exposure 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 very 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, that an individual is not likely to have greater than a one in one million chance of developing cancer over 70 years as a result of site-related exposure to the compound at the stated concentration. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

The hazard index was also calculated for each pathway as EPA's measure of the potential for non-carcinogenic health effects. The hazard index is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime and they reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The hazard index is often expressed as a single value (e.g. 0.3) indicating the ratio of the stated exposure as defined to the reference dose value (in this example, the exposure as characterized is approximately one third of an acceptable exposure level for the given compound). The hazard index is only considered additive for compounds that have the same or similar toxic endpoints (for example: the hazard index for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage).

Summary of Baseline Risk Assessment

Tables 3 through 8 of Appendix B of this ROD depict the carcinogenic and non-carcinogenic risk summary for the contaminants of concern in each exposure pathway described above.

Groundwater

The average and reasonable maximum exposure case carcinogenic risks associated with the potential future consumption of groundwater were approximately 2×10^{-2} (2 cancer cases in 100) and 7×10^{-2}, respectively. Arsenic comprised over 90% of the risk for both the average and reasonable maximum worst case scenarios. Vinyl chloride comprised approximately 5% of the risk for both scenarios. Other chemicals which contributed a risk of greater than one in a million were benzene; chloroethane; 1,1 dichloroethylene; 1,2 dichloroethane; methylene chloride; tetrachloroethylene and trichloroethylene.

For non-carcinogenic effects, the average and reasonable maximum exposure case Hazard Indices exceeded one for the toxic endpoints of keratosis (skin discoloration) and liver effects. Arsenic and tetrahydrofuran were the major contaminants for these toxic endpoints, respectively.

The groundwater contaminant concentrations measured during the FES were used in the Baseline Risk Assessment except for two compounds. Data from the RI was used for tetrahydrofuran which was not analyzed for in the FES and 1,2 dichloroethane which was not detected in the FES.

Surface Water - Bellamy Reservoir

The reasonable maximum exposure case carcinogenic risk associated with the potential future consumption of groundwater was approximately 8×10^{-6}. Over 95% of this risk was due to arsenic.

For noncarcinogenic effects, the Hazard Index was well below one.

Surface Water - Cocheco River and Landfill Perimeter Swale

The reasonable maximum exposure case carcinogenic risks associated with exposure to both the Cocheco River and landfill perimeter swale were well below EPA's risk range of 10^{-6} to 10^{-4}.

For noncarcinogenic effects, the Hazard Index was well below one.

Soil/Sediment Exposure

The average and reasonable maximum exposure case carcinogenic risks due to arsenic associated with exposure to the landfill perimeter swale sediments via the ingestion pathway were approximately 1×10^{-6} and 8×10^{-5}, respectively.

For noncarcinogenic effects the Hazard Indices for the average and reasonable maximum exposure scenario were below one.

Summary

In summary, predicted average and maximum carcinogenic health risks of 2×10^{-2} and 7×10^{-2} for the future use of groundwater exceeded EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6}. Arsenic and vinyl chloride were the major contributors to these risks.

A Hazard Index greater than one was predicted for future use of groundwater. Arsenic and tetrahydrofuran were the major contributors to the noncarcinogenic risks with maximum Hazard Indices of 37 and 24, respectively.

Maximum contaminant levels in groundwater exceeded the applicable regulatory standards set or proposed under the Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for the following compounds: arsenic; benzene; 1,1 dichloroethylene; 1,2 dichloroethane; tetrachloroethylene; trichloroethylene and vinyl chloride.

The maximum predicted carcinogenic risk for sediment of $8x10^{-5}$ is within EPA's acceptable risk range (10^{-4} to 10^{-6}).

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, and the environment. Specifically an imminent and substantial threat to public health could result from the contaminated soils, sediments, sludges and debris in the Landfill and from drinking groundwater in proximity to the Landfill.

VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these statutory mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These remedial action objectives were developed to mitigate existing and future potential threats to public health and the environment. These objectives were:

- Prevent the migration of hazardous substances in the landfill to groundwater and surface water and the migration of the groundwater contamination beyond its current extent;

- Reduce risks to human health by preventing exposure to contaminants in groundwater, soils, surface waters, and sediments; and

- Restore contaminated groundwater at and beyond the compliance boundary to State and Federal applicable or relevant and appropriate requirements (ARARs) including drinking water standards, and to a level that is protective of human health and the environment.

B. Technology and Alternative Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a ınge of alternatives were developed for the Site.

With respect to source control, the FS developed a range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances is a principal element. This range included an alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long term management. This range also included alternatives that treat the principal threats posed by the site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; alternative(s) that involve little or no treatment but provide protection through engineering or institutional controls; and a no action alternative.

With respect to ground water response action, the FS developed a limited number of remedial alternatives that attain site specific remediation levels within different time frames using different technologies as well as a no action alternative.

A Treatability Study was conducted by HMM to provide data to evaluate treatment options for the Site, and to reduce cost and performance uncertainties for various treatment options. The study consisted of an additional sampling episode for sediment, surface water and groundwater. The objective of the sampling round was to determine concentrations of a number of indicator parameters. The parameters analyzed represent an engineering assessment of specific chemical constituents that could affect the implementability or effectiveness of a groundwater remedial technology. Groundwater VOC data was used to determine the high and low ends of VOC loading for a treatment process. Groundwater was sampled to generate filtered arsenic data to help determine the amount of dissolved arsenic in the groundwater. Table 1-3 of the FS lists each parameter or set of analytes sampled as part of the Treatability Study and describes the associated criteria and treatment technologies.

Section 2 of the FS identified, assessed and screened technologies based on implementability, effectiveness, and cost. These technologies were combined into source control (SC) and management of migration (MM) alternatives. Section 3 of the FS presented the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e)(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. A limited number of alternatives were then evaluated in Section 4 of the FS.

In summary, of the approximately 9 source control and 4 management of migration remedial alternatives evaluated and screened in Section 3, 4 source control and 4 management of migration alternatives were retained for detailed analysis in Section 4. Tables 3-1 and 3-2 of Section 3 of the FS identify the 4 source control alternatives and 4 management of migration alternatives that were retained through the screening process, as well as those that were not chosen for detailed analysis.

VIII. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each alternative subject to detailed evaluation. A tabular assessment of each alternative can be found in Tables 3-4 and 3-5 of the Feasibility Study.

A. Source Control (SC) Alternatives Analyzed

Source control alternatives (on-site) were developed for the contaminated soils, sludges, debris and sediments associated with the Landfill as well as the contaminated groundwater located under the Landfill and the contaminated surface water in the perimeter drainage ditch.

The source control alternatives analyzed for the Site include the following alternatives:

- SC-1: No-Action with Long-Term Monitoring;
- SC-2: Limited Action with Long-Term Monitoring/ Access Restriction/ Institutional Controls;
- SC-5/5A: Recontouring of Landfill/ Multi-layer Cap/ Slurry Wall/ Groundwater Recovery System/ Groundwater Treatment/ Discharge to Cocheco River (SC-5) or POTW (SC-5A)/ Geotextile Cover in Drainage Swale/ Erosion Control Blanket; and
- SC-7/7A: Recontouring of Landfill/ Multi-layer Cap/ Interceptor Trench with Internal Landfill Extraction Wells/ Groundwater Treatment/ Discharge to Cocheco River (SC-7) or POTW (SC-7A)/ Selected Sediment Excavation with Consolidation in Landfill.

SC-1: No-Action

This alternative is included in the Feasibility Study, as required by CERCLA, to serve as a basis for comparison with the other source control alternatives being considered.

This alternative would require no remedial action except for long-term monitoring of groundwater, sediments, and surface water. No treatment or containment of disposal areas would occur and no effort would be made to restrict potential exposure to site contaminants. It is possible that a reduction of toxicity of contaminants may occur over time due to natural attenuation, but this may take many decades.

A Site inspection including groundwater and sediment monitoring would be performed four times a year, for 30 years. Samples collected would be analyzed for VOCs, BNAs, and metals. Monitoring data would be evaluated every five years.

This alternative does not meet many ARARs, which include the Safe Drinking Water Act groundwater MCLs, and State and Federal requirements that hazardous waste landfills be capped. In addition, the landfill has a potential for future non-compliance with ARARs such as State and Federal laws protecting the wetlands surrounding the Site and those laws protecting the Class A surface waters of the Bellamy Reservoir.

Estimated Time for Design and Construction: None
Estimated Time for Operation: 30 years, groundwater monitoring
Estimated Capital Cost: None
Estimated Operation and Maintenance Cost (net present worth): $169,000
Estimated Total Cost (net present worth for 30 years at 10% interest):$1,593,400

SC-2: Limited Action

This alternative is similar to SC-1, except that this alternative allows for limited measures to control access to and use of the Site. Warning signs and a fence with barbed wire would be installed to limit any further access to the Site. Institutional controls, such as deed restrictions, and municipal by-laws, where possible, would be implemented to prohibit disturbance of the contaminated source areas and use of the contaminated groundwater.

An inspection and long-term monitoring program similar to alternative SC-1 would be instituted. Also air monitoring would be performed at the Site annually at three locations along the southern, eastern, and northern perimeters of the landfill. Surface water monitoring would be performed at several locations along the perimeter drainage ditch.

While this alternative offers limited protection of human health from the hazards posed by the site, this alternative, like SC-1, provides little or no protection to the environment. In addition, many of the ARARs, such as the SDWA, RCRA, and State hazardous waste regulations, are not met by this alternative. Currently, groundwater contains contaminants which significantly exceed MCLs and the threat to the wetlands and the Bellamy Reservoir remain unchecked.

Estimated Time for Design and Construction: 1 month
Estimated Period for Operation: 30 years, air and groundwater monitoring
Estimated Capital Cost: $44,400
Estimated Operation and Maintenance cost (net present worth): $177,600
Estimated Total Cost (net present worth, for 30 years at @ 10% interest): $1,718,300

SC-5/SC-5A: Recontouring of Landfill/Multi-Layer Cap/Slurry Wall/Groundwater Treatment/Discharge to Cocheco River or POTW:

Alternative SC-5/SC-5A would involve recontouring of the landfill, construction of a multi-layer cap and a slurry wall to contain groundwater migration, on-site groundwater treatment (SC-5) or pretreatment (SC-5A), and final discharge to the Cocheco River (SC-5) or the Publicly Owned Treatment Works (POTW) (SC-5A).

Approximately 300,000 cubic yards of soils and debris from the toe of the side slopes and from the sediments in the drainage ditch would be consolidated into the Landfill to contour features of the Landfill prior to capping. Recontouring of the Landfill may reduce the amount of clean soil, necessary to achieve a maximum allowed slope of 5 percent, from 1,200,000 cubic yards to 850,000 cubic yards.

After the Landfill has been recontoured, backfilled and compacted, a multi-layer cap system will be constructed. The multi-layer cap would consist of a vegetative layer including topsoil and common fill, filter fabric, a drainage layer, a flexible membrane liner and a low permeability soil layer, and a gas (methane) vent layer directly over the buried solid wastes. Figure 10 is a cross-section of a typical multi-layer cap. Alternative SC-5/5A proposed the installation of a 12-inch sand layer as the material to be used for the drainage layer of the multi-layer cap, 2-feet of a compacted soil (with a hydraulic permeability of less than or equal to 10^{-7} cm/sec) in the low permeability layer and a 20 mil flexible membrane liner.

A slurry wall and a groundwater recovery system would be constructed around the perimeter of the landfill down to the clay layer. Construction of the slurry wall may be difficult because the bottom of the slurry wall must be keyed into the marine clay layer, which varies widely in depth and thickness. This method also risks puncturing the protective clay "lens" which may allow contaminated groundwater from the upper aquifer to migrate into the uncontaminated lower aquifer. Installation of the cap, slurry wall and groundwater recovery system eliminates the use of the perimeter drainage ditch as an avenue for contaminant migration, thereby limiting exposures to contaminated surface water and sediments.

The groundwater treatment system would consist of a sequencing batch reactor such as the Powdered Activated Carbon Treatment System (PACT™) or an air stripper, pending pre-design pilot study results. The FS chose the PACT™ system to describe and provide a cost analysis for the FS. In the PACT™ System the contaminated groundwater would first enter an aeration tank to remove VOCs; activated carbon present in the tank would remove non-volatile organic chemicals from the water. The water would then pass through a settling tank where flocculation, coagulation and precipitation processes take place to remove metals and suspended solids. The metals and solids settle at the bottom of the tank in the form of a sludge. If it is a RCRA waste, sludge will be disposed of at a permitted RCRA facility. The water would then pass through a multi-media filter and ultimately be discharged into the Cocheco River. A schematic of the proposed groundwater treatment system is shown in Figure 11 of this Record of Decision.

If discharge to the POTW is utilized, the construction of a pretreatment system may be required to meet the intake requirements of the Dover POTW. The pretreatment process would focus primarily on reducing suspended metals and solids. An approximately 2.5 mile piping system would be constructed to transport the pretreated groundwater to the POTW. The Dover POTW currently has the extra capacity to handle pre-treated water from the Landfill, and the capacity is expected to increase further by 1992 with the start-up of a secondary treatment unit, currently under construction.

This Alternative would also involve the installation of cover material over the drainage swale which drains from Glen Hill Road adjacent to the landfill down into the Cocheco River in order to minimize human and wildlife exposure to the contaminated sediments and minimize the potential migration of contaminated sediments in the surface water flow of the swale.

This alternative meets all ARARs.

SC-5 Cost Estimate (discharge to Cocheco River option):
Estimated Time for Design and Construction: 3-4 years
Estimated Period for Operation:30 years
Estimated Capital Cost: $31,266,600
Estimated Operation and Maintenance Cost (net present worth): $221,400
Estimated Total Cost (net present worth for 30 years at 10% interest): $33,353,600

SC-5A Cost Estimate (discharge to POTW option):
Estimated Time for Design and Construction: 3-4 years
Estimated Period for Operation:30 years
Estimated Capital Cost: $31,334,600
Estimated Operation and Maintenance Cost (net present worth): $206,000
Estimated Total Cost (net present worth for 30 years at 10% interest): $33,267,100

SC-7/7A: Recontouring of Landfill/ Multi-Layer Cap/ Interceptor Trench/ Discharge to Cocheco River or POTW:

Alternative SC-7/SC-7A would involve recontouring of the landfill, construction of a multi-layer cap and an interceptor/diversion trench around the perimeter of the landfill to contain and collect contaminated groundwater and divert clean groundwater, an on-site groundwater treatment (SC-7) or pretreatment (SC-7A), and final discharge to the Cocheco River (SC-7) or the Publicly Owned Treatment Works (POTW) (SC-7A).

This alternative would involve recontouring the existing landfill and construction of a multi-layer cap over the recontoured landfill. Recontouring would involve the excavation of up to 300,000 cubic yards of on-site fill material from the perimeter of the landfill and depositing it on the landfill center to achieve the necessary slope for proper drainage. Approximately 250,000 cubic yards of clean fill would also be required for the minimum 3 percent slope allowed.

The 55-acre multi-layer cap would be constructed after the existing landfill had been recontoured, backfilled, and compacted. The cap would consist of a vegetative layer including topsoil and common fill, a geocomposite drainage layer, a flexible membrane liner, a synthetic low permeability layer, and a gas (methane) vent layer directly over the buried solid wastes. Figure 10 is a cross-section of a typical multi-layer cap. Alternative SC-7/7A proposed the use of a geocomposite as the drainage layer material, a 40 mil flexible membrane liner and a low-permeability bentonitic blanket for the low permeability layer (with a hydraulic permeability of less than or equal to 10^{-7} cm/sec).

A groundwater recovery system would consist of an upgradient groundwater diversion trench to intercept clean groundwater before it flows into the landfill system and a downgradient interceptor trench/extraction well system, or combination system, to collect groundwater/leachate, which currently migrates from the site. The interceptor/diversion trench system would extend around the entire existing landfill perimeter. Inside the trench, a one foot diameter perforated pipe, wrapped in filter fabric, and a drainage net would be connected to a series of manholes. Submersible pumps housed in the manholes would extract collected groundwater. This system would be designed to lower the groundwater table beneath the landfill's refuse. Extraction wells will be placed within the landfill boundaries to lower groundwater below the waste material. Collected contaminated groundwater would be conveyed to an on-site groundwater treatment system with discharge to the Cocheco River or the Dover POTW after pre-treatment. Clean groundwater in the upgradient diversion trench would be diverted to either the surrounding wetland system or the Cocheco River without being mixed with contaminated water. The installation of the cap and the interceptor/diversion trench system eliminates the perimeter drainage ditch as an avenue for contaminant migration and limits potential human and wildlife exposure to Site contaminants.

The actual on-site treatment system(s) that will be used at the site will be determined during pre-design studies and will include a sequencing batch reactor such as the Powered Activated Carbon Treatment System or an air stripper. The FS described the Powered Activated Carbon Treatment System (PACT™), summarized above in

Alternative SC-5/5A.

If the POTW option is utilized, the construction of a pretreatment system which would meet the intake requirements of the Dover POTW, may be required. The pretreatment process would focus primarily on reducing suspended metals and solids. As was described in SC-5/5A, the Dover POTW currently has the extra capacity to handle some pre-treated water from the landfill.

The sediment control component provides for predesign sampling to identify specific areas of sediment deposition along the drainage swale that could contain concentrations of contaminants in excess of the cleanup levels. Based on the physical characteristics of the drainage swale, the extent of contamination is expected to be limited. Contaminated sediments will be removed with little or no heavy equipment; sediments will likely be removed by hand shovel. This method was evaluated because of the difficulties associated with getting heavy equipment into and out of the steep-sloped swale. This approach, will reduce the overall impact to the environment during implementation as compared to using heavy equipment.

This alternative meets all ARARs.

SC-7 Cost Estimate (discharge to Cocheco River option):
Estimated Time for Design and Construction: 3-4 years
Estimated Period for Operation: 30 years
Estimated Capital Cost:$20,014,700
Estimated Operation and Maintenance Cost (net present worth): $239,300
Estimated Total Cost (net present worth for 30 years at 10% interest):$22,273,600

SC-7A Cost Estimate (POTW option):
Estimated Time for Design and Construction: 3-4 years
Estimated Period for Operation: 30 years
Estimated Capital Cost:$20,174,700
Estimated Operation and Maintenance Cost (net present worth): $211,900
Estimated Total Cost (net present worth for 30 years at 10% interest): $22,171,900

B. Management of Migration (MM) Alternatives Analyzed

Management of migration alternatives address contaminants that have migrated beyond the boundaries of the Landfill. At the Dover Site, contaminants have migrated from the Landfill into groundwater east towards the Cocheco River, and also south towards the Bellamy Reservoir. The primary groundwater threat to human health and the environment is in that portion of the groundwater contaminant plume flowing south towards the Bellamy Reservoir.

The Management of Migration alternatives evaluated for the Site include the following alternatives:

MM-1: No Action with Long-Term Monitoring;

MM-2: Limited Action with Long-Term Monitoring/ Institutional Controls;

MM-3: Groundwater Interceptor Trench/ Groundwater Treatment/ Hydraulic Barrier/ Discharge to Wetlands; and

MM-4: Groundwater Extraction Wells/ Groundwater Treatment/ Discharge to Wetlands and Cocheco River.

MM-1 No-Action

This alternative was evaluated in detail in the FS to serve as a baseline for comparison with the other remedial alternatives under consideration. Under the No Action alternative, there would be no removal, containment, or treatment of off-site contaminated groundwater. However, this alternative would require long-term groundwater monitoring, as is described under Alternative SC-1.

This alternative combined with alternatives SC-5/5A or SC-7/7A, would achieve over time the chemical specific ARARs, through natural attenuation. Natural attenuation times frames for the groundwater to attain cleanup levels are 5 to 7 years in the eastern plume (groundwater contamination flowing in the direction of the Cocheco River) and 10 to 24 years in the southern plume (groundwater contamination flowing in the direction of the Bellamy Reservoir), after the implementation of an active source control alternative. However, during this period of natural attenuation, contaminated groundwater east and south of the site poses a threat to human health and the environment. In addition, contaminants may reach the waters of the Bellamy Reservoir.

Estimated Time for Design and Construction: None
Estimated Period of Operation: 30 years
Estimated Capital Cost: None
Estimated Operation and Maintenance Cost (net present worth): $142,800
Estimated Total Cost (net present worth for 30 years at 10% interest): $1,346,500

MM-2: Limited Action:

Management of Migration Alternative MM-2, Limited Action, provides long-term monitoring of the off-site contaminated groundwater for at least 30 years. In addition, under this alternative institutional controls will be employed where possible, limiting Site access, Site use, and preventing the use of groundwater from the upper aquifer for potable and municipal usage. These institutional controls will be implemented regardless of which management of migration alternative (except for no action, MM-1) is implemented. The City of Dover passed a zoning ordinance in February 1991 that restricts the use of groundwater within 1500 feet of the landfill as a potable water supply.

A long-term groundwater sampling and monitoring program will be developed and implemented. This may include the installation of additional wells, including the area of the plume closest to the Bellamy Reservoir. The monitoring will further define groundwater contaminant concentrations and the extent of migration towards the Bellamy Reservoir.

This alternative, coupled with SC-5/5A or SC-7/7A, would achieve over time the chemical specific ARARs through natural attenuation. Natural attenuation times frames for the groundwater to attain cleanup levels are 5 to 7 years in the eastern plume and 10 to 24 years in the southern plume, after the implementation of an active source control alternative. While this alternative provides more protection to humans from contaminated groundwater during natural attenuation, it does nothing to prevent contaminants from reaching the Bellamy Reservoir.

Estimated Time for Design and Construction: 6 months
Estimated Period of Operation: 30 years
Estimated Capital Cost: None
Estimated Operation and Maintenance Cost (net present worth): $176,541
Estimated Total Cost (net present worth for 30 years at 10% interest): $1,673,593

MM-3: Groundwater Interceptor Trench/Recharge Trench/Hydraulic Barrier:

Management of migration alternative MM-3, includes the construction of a groundwater interceptor trench at the leading edge of the groundwater contaminant plume on the southern and southeastern sides of the landfill. Installation of this trench would passively collect contaminated groundwater, which has migrated into the wetlands adjacent to the Landfill, thereby limiting the further spread of the plume. Contaminated groundwater collected by the trench would be pumped to a treatment unit on or adjacent to the Landfill. The treated groundwater would then be recharged downgradient of the trench.

The interceptor trench would be located off-site south and southeast of the Dover Landfill extending laterally approximately 2,200 linear feet. An approximately 4-foot wide by 25-foot deep trench would be excavated and dewatered prior to laying the pipe. The bedding inside the trench would include gravel and a perforated pipe wrapped with filter fabric. After placement of the bedding material, the trench would be backfilled to surface grade. The recharge trench would be located downgradient of the interceptor trench and also extend about 2,200 linear feet. An approximately 2-foot wide by 4-foot deep recharge trench would be excavated and HDPE corrugated, perforated pipe would be installed. Gravel would be placed around the pipe to promote drainage. Groundwater collected by the interceptor trench would be pumped from a manhole via a submersible pump to an on-site groundwater treatment facility. A portion of the treated groundwater would be returned to the management of migration area via the recharge trench. This would minimize localized dewatering of the wetlands which would reduce the adverse impact of this activity. Treated groundwater in excess of that which could be recharged would be discharged to the river. Trench installation would adversely impact wetlands along the southern and southeastern portions of the Landfill. However, once the trench and associated piping have been installed any wetland areas impacted by excavation and installation procedures can be restored. Actual design configuration of the interceptor-recharge system would be dependent upon additional data and analysis obtained during predesign activities.

Groundwater treatment technologies previously identified for the source control alternatives apply as well to this alternative.

The cleanup time frames for this alternative are estimated to be 3 to 5 years for the eastern plume area and 10 to 24 years for the southern plume, after the implementation of an active source control alternative.

Implementation of this alternative in conjunction with a source control alternative which involves treatment would allow all ARARs to be met. Construction of the groundwater interceptor trench and a groundwater recharge trench in the wetlands and the associated treatment system would alter portions of the wetlands. All construction activities associated with the implementation of this alternative will be coordinated with federal and state authorities and meet the substantive legal requirements of federal and state wetland protection laws. Key ARARs include the SDWA MCLs; Executive Orders EO 11988 and 11990 and 40 CFR 6 Appendix A (concerning the protection of wetlands and floodplains); the Clear Water Act; the New Hampshire Criteria and Conditions for Fill and Dredging in Wetlands; and the New Hampshire Rules Relative to Prevention of Pollution from Dredging, Filling, Mining, Transporting and Construction.

Figure 12 presents the conceptual layout for this alternative.

Estimated Period for operation: 10 years
Estimated Capital Cost: $1,452,200
Estimated Operation and Maintenance Cost (net present worth): $78,800
Estimated Total Cost (net present worth for 10 years at 10% interest): $1,936,600

The cost of long-term (semi-annual) monitoring is estimated as follows:

Estimated Period for Operation: 30 years
Estimated Capital Cost: $9,400
Estimated Operation and Maintenance Cost (net present worth): $93,600
Estimated Total Cost (net present worth for 30 years at 10% interest): $892,100

Total cost, MM-3 and long-term monitoring: $ 2,828,700

MM-4: Groundwater Extraction Wells and Treatment System:

Alternative MM-4 is designed to collect and treat contaminated groundwater which has migrated from the landfill in both the southern and eastern directions. It differs from Alternative MM-3 only in that the interceptor trench would be replaced by a series of recovery wells. This alternative would consist of the following: the installation of several groundwater extraction wells at off-site locations on the southern and eastern sides of the site; the on-site treatment of contaminated groundwater; the recharge of the treated water to wetlands downgradient of the wells and/or discharge of the treated water to the Cocheco River. Groundwater collected by the extraction wells would be pumped at a total of approximately 125 gpm to a treatment unit on or adjacent to the Landfill.

The estimated time to achieve cleanup levels is contingent on the aquifer characteristics, retardation, plume mass and areas of extraction. Based on these factors, MM-4 would be located in approximately the same place as MM-3, as shown in Figure 13. The cleanup time frames for this alternative are estimated to be 3 to 5 years for the eastern plume area and less than 10 to 24 years for the southern plume, after the implementation of a source control alternative.

Implementation of this alternative in conjunction with a source control alternative which involves treatment would allow all ARARs to be met. Wetland mitigation measures and restoration efforts would be required in order to comply with the Location Specific ARARs, as discussed for Alternative MM-3. However, this alternative would have less detrimental impact on the wetlands than MM-3. All ARARs will be met.

Estimated Period for Operation: 10 years
Estimated Capital Cost: $1,503,700
Estimated Operation and Maintenance Cost (net present worth): $394,200
Estimated Total Cost (net present worth for 10 years at 10% interest): $3,925,900

The cost of long-term (semi-annual) monitoring is estimated as follows:

Estimated Period for Operation: 30 years
Estimated Capital Cost: $9,400
Estimated Operation and Maintenance Cost (net present worth): $93,600
Estimated Total Cost (net present worth for 30 years at 10% interest): $892,100

Total cost MM-4 and long-term monitoring: $ 4,818,000

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that EPA must consider in its assessment of alternatives. Building upon these specific statutory mandates, the National Contingency Plan articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a Site remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. These criteria and their definitions are as follows:

Threshold Criteria

An alternative must meet the two threshold criteria described below in order 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 ARARS** addresses whether or not a remedy will meet all of the ARARs of other Federal and State environmental laws and/or provide grounds for invoking a waiver.

Primary Balancing Criteria

The following five criteria are used to compare and evaluate the elements of alternatives which have met the threshold criteria to each other.

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 reatment 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 levels 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, as well as present-worth costs.

Modifying Criteria

The modifying criteria are used on 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 publics general response to the alternatives described in the Proposed Plan and RI/FS report.

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. This comparative analysis can be found in Section 4, Tables 4-22 and 4-23 of the Feasibility Study.

The section below presents the nine criteria and a brief narrative summary of the alternatives and the strengths and weaknesses according to the detailed and comparative analysis.

1. **Overall Protection of Human Health and the Environment**
Alternatives SC-7/7A and SC-5/5A would provide overall protection to human health by preventing direct contact, ingestion, and inhalation of site contaminants. These alternatives would provide dermal contact protection from on-site contaminants due to the construction of the multi-layer landfill cap. There were no hot spots found in the landfill that would warrant treatment. Both alternatives minimize the further off-site migration of leachate and contaminated groundwater and provide for treatment of the collected contamination.

Alternatives SC-1 and SC-2, the No Action and Limited Action Alternatives, would not meet this criterion in its entirety. Alternative SC-2 provides for certain protective measures to secure the site from unauthorized entry, and would reduce the potential for direct contact with and possible ingestion of contaminated materials at the site. Inhalation hazards from airborne dust particles or VOC emissions could be a factor if the Landfill were to be disturbed at some point in the future.

Alternatives MM-2, MM-3 and MM-4, would provide overall protection to human health as long as the groundwater is not used as a drinking water source. Off-site groundwater contamination is reduced through natural attenuation as described under MM-1 and MM-2 and by groundwater extraction and treatment as described under alternatives MM-3 and MM-4. MM-3 and MM-4 would provide overall protection to human health and the environment by controlling the migration of contaminated groundwater thereby preventing further contamination of the aquifer and neighboring wetlands. Alternative MM-4 would provide a shorter cleanup time than MM-3, because of increased groundwater extraction rates. Alternative MM-1 (the no action alternative) would provide no protection of human health from groundwater contamination. Neither MM-1 nor MM-2 protect the Class A waters of the Bellamy from contamination during the period of natural attenuation.

2. Compliance with ARARs

Each alternative was evaluated for compliance with ARARs, including chemical-specific, action-specific and location specific ARARs. These alternative specific ARARs are presented in Section 4 of the FS.

With the exception of the no action (SC-1) and the limited action (SC-2) source control alternatives, all of the other source control alternatives would meet all ARARs. SC-1 and SC-2 does not comply with RCRA regulations and the New Hampshire regulations for the design, closure and post closure requirements of the Landfill and General Facility Standards. In addition, SC-1 and SC-2 allow contaminants in excess of MCLs to migrate from the site. Further degradation of the current landfill cover and the leachate trench also poses a threat to the wetlands, the Cocheco River and the Bellamy Reservoir in contravention of Federal and State laws protecting wetlands, flood plains, and Class A drinking water sources. Alternatives SC-7A and SC-5A will have to meet POTW discharge requirements.

All of the management of migration alternatives would over time meet Federal and State ARARs if implemented in conjunction with a preferred source control alternative. However, during the natural attenuation period MM-1 fails to protect human health from groundwater containing contaminants in excess of MCLs south and east of the site. Also, MM-1 fails to protect the Bellamy Reservoir from the migration of the southern plume. Alternative MM-2 includes institutional controls to assist in protecting humans from consumption of contaminated groundwater, yet do nothing in the short term to protect the waters of the Bellamy Reservoir.

Alternative MM-3, and to a lesser extent, alternative MM-4, have significant short-term adverse impacts on the wetlands to the south and east of the Site as a result of construction and monitoring to take place in them. However, they meet the NCP's mandate of groundwater cleanup in a reasonable time. Alternatives MM-3 and MM-4 would have to comply with additional action specific ARARs such as state and federal groundwater discharge limits and other applicable groundwater anti-degradation regulations.

The management of migration alternatives would meet few if any ARARs if implemented without an active source control portion of the remedy. The time frame to attain cleanup levels would increase significantly due to the continued release of contaminants into the groundwater from the Landfill.

In the long term all of the management of migration alternatives achieve compliance with chemical specific ARARs; however, the alternatives differ in the time it takes to achieve compliance.

3. Long-term Effectiveness and Permanence

The No Action (SC-1) and Limited Action (SC-2) alternatives would not be effective or permanent in reducing long-term risk; all of the contaminants will remain at the Site and continue to leach into the groundwater.

Alternative SC-7/7A and alternative SC-5/5A provide effective, long-term reduction in leachate generation, control of landfill gases, and eliminate the potential for dermal contact with untreated wastes. Both alternatives require the construction of a multi-layer (composite) cap on the Landfill that provides long-term minimization of precipitation infiltration, resulting in a reduction in the amount of leachate generated. They also require the construction of a leachate collection system - either a slurry wall or an interceptor trench - both of which provide for long term reduction of clean water entering the Landfill and long term collection of contaminated water leaving the Landfill. Both alternatives provide for treatment of the contaminated leachate and groundwater.

All of the Management of Migration Alternatives, provide an equal degree of long-term effectiveness and permanence, when instituted with an active source control alternative. Alternatives MM-3 and MM-4 employ treatment of contaminated groundwater to meet cleanup levels for VOCs and metals. Alternatives MM-1 and MM-2 do not propose any action to remediate the contaminated groundwater but rely on natural attenuation processes, over time, to attain the groundwater cleanup levels. The primary difference in these alternatives are the times they take to meet clean up levels and the protection they afford in the short run. Both MM-3 and MM-4 provide significantly more protection in the short run to the Bellamy Reservoir.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives SC-1 and SC-2 would not provide a reduction in contaminant toxicity, mobility, or volume through treatment because these alternatives do not provide for treatment. Alternatives SC-7/7A and SC-5/5A are similar in their ability to achieve the cleanup levels for groundwater at and beyond the point of compliance by effectively reducing contaminant toxicity, mobility, and volume through collection and treatment of the groundwater/leachate prior to discharge. Alternatives SC-7/7A and SC-5/5A would reduce the mobility of the contaminants in soil and sediments but would not reduce the volume or toxicity because direct treatment of these materials is not practicable.

Alternatives MM-1 and MM-2 would not provide any reduction in toxicity, mobility, or volume of any groundwater contaminants through treatment. Alternatives MM-3 and MM-4 would reduce toxicity, mobility, and volume through treatment since both alternatives would employ collection and treatment of contaminated groundwater prior to discharge.

5. **Short-term Effectiveness**

Alternatives SC-1 and SC-2 would not have any short term impacts from construction and implementation activities. Alternatives SC-5/5A and SC-7/7A have the potential for release of contaminants during construction activities especially during the recontouring of the landfill and the digging of the trench or slurry wall. However, special engineering precautions would be taken to minimize the potential for air releases of contaminants to ensure protection of workers and area residents during cleanup related construction activities. These measures include interim foam covers, enclosed cabs on backhoes and hydraulic excavators, and dust and odor suppression techniques to control fugitive dust emissions. Additionally, since active measures are being taken to control and intercept the migration of contaminated groundwater/leachate, attainment of groundwater cleanup levels at the compliance boundary will occur sooner than with SC-1 and SC-2.

Some increase in traffic and noise pollution would be expected from activities under SC-5/5A and SC-7/7A, especially from the import of off-site fill needed to construct the cap. Short term effectiveness would be somewhat lower for SC-5A and SC-7A relative to SC-5 and SC-7 due to the construction impacts from the 2.5 mile sewer connecting to the POTW. The total construction periods are estimated to be 3-4 years for SC-5/5A and 2-3 years for SC-7/7A.

Neither MM-1 nor MM-2 poses a threat to human health or the environment as a result of construction or implementation. Alternatives MM-3 and MM-4 would have short-term impacts to adjacent wetlands during construction. Construction of the groundwater recovery wells and recharge system in MM-4, plus associated transmission piping may negatively impact the wetland vegetation in the construction area. An area 10 feet wide and 2,000 feet long would be extensively disturbed in order to install the extraction wells and piping. The construction of the interceptor and recharge trenches under MM-3 require an even larger impact due to construction activities. An access roadway along the perimeter of the trench would be necessary to transport the material for construction as well as providing a staging area for the excavated soils. Both alternatives have the potential to affect the water balance of the wetlands due to pumping and discharge. Recharging of the treated groundwater is expected to minimize the dewatering of the wetlands.

Alternatives MM-1 and MM-2 employ natural attenuation and are expected to attain cleanup levels in the eastern plume in 5 to 7 years and 10 to 24 years in the southern plume after the implementation of an active source control remedy. In the eastern plume, MM-3 and MM-4 offer an improvement over MM-1 and MM-2: 3 to 5 years vs. 5 to 7 years. In the southern plume, because MM-3 relies on the natural flow of groundwater, the time frame for MM-3 clean up will not be a significant improvement over MM-1 and MM-2. The time frame for MM-4 cleanup of the southern plume will depend largely upon the rate that the contaminated groundwater can be extracted from the aquifer; it is expected to be an improvement over the MM-3 time frame. Alternatives MM-3 and MM-4 offer significantly better protection for the Bellamy Reservoir in the short term; contaminants will be prevented from migrating closer to the reservoir by these two alternatives.

6. **Implementability**

Alternatives SC-5/5A, SC-7/7A, MM-2, MM-3, MM-4 are implementable, are well-developed technologies, and have been used successfully at other sites. The recontouring activities present some potential for encountering hazardous waste. Preliminary studies and special construction procedures would be used to minimize this potential. Hot spots, consisting of highly toxic and/or highly mobile material which present a potential principal threat to human health or the environment, once exposed by recontouring would have to be tested, removed, treated and disposed of in an off-site RCRA TSD facility. The multi-layer cap and PACT™ systems of SC-5/5A and SC-7/7A have been installed on many other sites. Obtaining clay of sufficient volumes for the low permeability layer of the cap may be difficult under alternative SC-5/5A.

Sufficient land is available for operation of the groundwater/leachate treatment system and its supporting facilities for SC-5/5A and SC-7/7A. Preliminary bench-scale and pilot-scale testing would have to be performed prior to implementation of the groundwater treatment system. No major technical problems are anticipated.

The interceptor trench/barrier wall of SC-7/7A would require less technical and support equipment resources to install than the slurry wall of SC-5/5A. The design and construction of the sediment cover (SC-5/5A) in the drainage swale down to the Cocheco River would not pose any unique implementation problems. However, the limited excavation provided for in SC-7/7A would be much easier and quicker to implement. Construction activities would have to be scheduled during seasonal low flows to minimize potential impacts on the Cocheco River. The sediment removal activity under SC-7/7A poses no significant implementability problems.

An expansion of the Dover POTW is currently under construction and is expected to be in place by 1992. It should be able to provide adequate treatment capacity for the Site's pre-treated groundwater and leachate as an alternative (SC-5A and SC-7A) to discharging to the Cocheco River.

Alternatives SC-1, SC-2, MM-1 and MM-2 can be accomplished with little difficulty and use well established and reliable monitoring and analytical procedures. However, some of the proposed institutional controls may be difficult to implement.

Alternatives MM-3 and MM-4 are both easily implemented. MM-3's trench construction in wetlands is somewhat more difficult than MM-4's extraction wells. Also, MM-4 would be implemented more easily for a deeper zone of contamination than would the trench.

7. **Cost**
The estimated present worth value of each alternative and the options are as follows:

COST COMPARISON OF SOURCE CONTROL ALTERNATIVES

		Capital Costs	O & M	Present Worth
SC-1	No Action	$ 0	169,000	1,593,400
SC-2	Limited Action	44,400	177,600	1,718,300
SC-5	Recontour/Multi-Layer Cap/ Slurry Wall/ Groundwater Treatment/ Discharge to Cocheco River/ Sediments Cover	31,266,600	221,400	33,353,600
SC-5A	Recontour/Multi-Layer Cap/ Slurry Wall/ Groundwater Treatment/ Discharge to POTW/ Sediments Cover	31,334,600	205,000	33,267,100

SC-7	Recontour/Multi-Layer Cap/ Interceptor/ Diversion Trench/ Groundwater Treatment/ Discharge to Cocheco River/ Sediments Excavation	20,014,800	239,300	22,270,600
SC-7A	Recontour/Multi-Layer Cap/ Interceptor/ Diversion Trench/ Groundwater Treatment/ Discharge to Cocheco River/ Sediments Excavation	20,174,700	211,862	22,171,900

COST COMPARISON OF MANAGEMENT OF MIGRATION ALTERNATIVES

		Capital Costs	O&M Costs ($/Yr)	Long-Term Monitoring	Present Worth
MM-1	No Action	$ 0	142,834	*	1,346,482
MM-2	Limited Action	9,356	176,541	*	1,673,593
MM-3	Groundwater Interceptor Trench/Recharge Trench/ Groundwater Treatment	1,452,154	78,840	892,200	2,828,738
MM-4	Groundwater Extraction Wells and Treatment System	1,503,699	394,200	892,200	4,818,047

* Long-term monitoring costs are included in the capital and O & M costs for these remedies.

8. State Acceptance

The New Hampshire Department of Environmental Services (NHDES) has been involved in the study and oversight of the Site since the late 1970's, as summarized in Section II of this document. The Remedial Investigation was performed as a state lead through a cooperative agreement between the state and EPA. The NHDES has reviewed this document and concurs with the source control and eastern plume management of migration portions of the selected remedy and has reserved a concurrence decision on the southern plume management of migration portion of the selected remedy until pre-design studies have been completed. A copy of the declaration of concurrence is attached as Appendix D.

9. Community Acceptance

The comments received during the public comment period and the and the public hearing on the Proposed Plan and FS are summarized in the attached document entitled "The Responsiveness Summary" (Appendix G). In addition, a summary of the comments appears below.

A large number of comments were submitted by citizens of Dover and Madbury as well as their community leaders and representatives, both at the public hearing and in writing during the public comment period, arguing that the taxpayers of these two towns could not bear the costs of the proposed remedy. Many of these commentors argued that the EPA should take no action other than long term monitoring, while others argued that a less effective cap would suffice. It should be noted that prior to the public comment period, the City of Dover and the Town of Madbury had been issued general notice of potential liability for the cleanup of the Site thus giving rise to the possibility that local taxpayers will bear some portion of the cleanup cost.

One resident from the community wrote that placing a fence around the Site will not protect anyone from possible hazards of the contamination, does not feel residents should be penalized for the PRPs' unwillingness or inability to correct mistakes made in the past, and hopes that EPA takes into consideration the effect of a Limited Action Plan on the people and property values around the Landfill. The Public Works Department of the City of Portsmouth commented on the proposed plan stating it agreed with the EPA's preferred alternative. It also noted that if the Bellamy Reservoir were contaminated, the cost of replacing it would far exceed the cost of the remedial action proposed for the Landfill.

The PRPs submitted seven comments, an alternative to EPA's proposed cleanup plan, and a public health evaluation report. The seven comments are summarized as follows: 1) the PRPs want to see a conditionally phased approach to cleanup the Site; 2) the PRPs do not feel that remediation of the southern plume through groundwater extraction and treatment is justified; 3) the PRPs state that the Proposed Plan did not clearly define the criteria for termination of active on- and off-site groundwater recovery and treatment operations; 4) the PRPs want the compliance boundary at the edges of the Bellamy Reservoir and the Cocheco River to which Site groundwater discharges; 5) the PRPs comment that the EPA preferred multi-layer cap is excessive and that the NHDES minimum design specifications for solid waste landfill caps should be incorporated; 6) the PRPs want a separation of flows between the contaminated groundwater in the interceptor trench and the clean groundwater in the diversion trench; and 7) the PRPs comment that the remediation of the drainage swale sediments to address risk associated with arsenic present in the sediments is overprotective.

The alternative that the PRPs submitted includes phasing the cleanup at the Site. Phase 1 includes the construction of a NHDES solid waste cap over the Landfill. They commented that if this remedial action was sufficient to achieve Site cleanup objectives, further action would not be needed and would not be implemented, and if further action were judged to be needed, additional phases could be sequentially implemented. Phase 2 includes the installation of a groundwater interception trench upgradient of the Landfill; Phase 3 includes the installation of a groundwater interceptor trench downgradient of the Landfill with collection and treatment of intercepted groundwater and Phase 4 includes the installation and operation of an off-site groundwater extraction and treatment system.

The public health evaluation report submitted by the PRPs commented on the methodologies employed by and the uncertainties associated with the baseline risk assessment of the RI.

X. THE SELECTED REMEDY

The remedy selected for the Dover Municipal Landfill Site, source control alternative SC-7/7A and a combination of the management of migration alternatives MM-2 and MM-4, addresses all contamination at the Site.

A. Interim Groundwater Cleanup Levels

Interim cleanup levels have been established for contaminants of concern identified in the baseline risk assessment found to pose an unacceptable risk to either public health or the environment. Interim cleanup levels have been set based on the appropriate ARARs (e.g. Drinking Water MCLGs and MCLs) if available, or other suitable criteria. Periodic assessments of the protection afforded by remedial actions will be made as the remedy is being implemented and at the completion of the remedial action. At the time that all the interim cleanup levels described below have been achieved, a risk assessment shall be performed on the residual groundwater contamination. This risk assessment of the residual groundwater contamination shall follow EPA procedures and will assess the cumulative risks for carcinogens and non-carcinogens posed by consumption of groundwater. If the risks are not within EPA's risk levels for carcinogens and non-carcinogens, then the remedial action will continue until protective levels are attained, or the remedy is otherwise deemed protective.

Because the aquifer at and beyond the compliance boundary for the Site is a Class IIB aquifer, which is a potential source of drinking water, MCLs and non-zero MCLGs established under the Safe Drinking Water Act are ARARs.

Interim cleanup levels for known and probable carcinogenic compounds (Class A and B) have been set at the appropriate MCL given that the MCLGs for these compounds are set at zero. In the absence of an MCLG, an MCL, a proposed drinking water standard or other suitable criteria to be considered (i.e. health advisory, state criteria), a cleanup level was derived for carcinogenic effects based on a 10^{-6} excess cancer risk level considering the ingestion of ground water.

Interim cleanup levels for the Class C, D and E compounds (possible carcinogens, not classified, and no evidence of carcinogenicity) have been set at the MCLG. Interim cleanup levels for compounds in ground water exhibiting non-carcinogenic effects have been set at the MCLG. In the absence of a MCLG or other suitable criteria to be considered, interim cleanup levels for non-carcinogenic effects have been set at a level thought to be without appreciable risk of an adverse effect when exposure occurs over a lifetime.

EPA has determined that the Safe Drinking Water Act (SDWA) MCL for arsenic in groundwater is relevant but not appropriate to this site and therefore is not an ARAR. Since naturally occurring levels of arsenic in the groundwater at and around the site are suspected of being greater than the SDWA MCL for this substance, based on field sampling and relevant literature, it may be technically impracticable for any cleanup technology to reduce arsenic levels below background to the SDWA MCL. Given that the Resource Conservation and Recovery Act (RCRA) regulations establish cleanup levels for arsenic in the groundwater at the same point as the SWDA MCL (50 ug/l) or at background levels, whichever is higher, RCRA sets a more appropriate flexible standard for the arsenic cleanup level for this Site.

Though the interim cleanup level for arsenic is based on the RCRA MCL of 50 ug/l, data has indicated that arsenic occurs naturally in groundwater at the Site. It is the intent of EPA to establish the background level for arsenic in groundwater prior to or during the remedial design. In accordance with RCRA, cleanup levels for arsenic will be set at 50 ug/l or background, whichever is higher. Until background levels for arsenic in groundwater is determined, the interim cleanup level will be set at 50 ug/l.

Table 1 below summarizes the Interim cleanup levels for carcinogenic and non-carcinogenic contaminants of concern identified in ground water.

TABLE 1: INTERIM GROUND WATER CLEANUP LEVELS

Carcinogenic Contaminants of Concern (Class)	Interim Cleanup Level (ppb)	Basis	Level of Risk
Arsenic (A)	50#	MCL[a]	$2.0x^{-04}$[b]
Benzene (A)	5	MCL[c]	$4.1x^{-06}$
1,1 Dichloro-ethylene (C)	7	MCLG	$1.2x^{-04}$
1,2 Dichloro-ethane (B)	5	MCL	$1.3x^{-05}$
Methylene chloride (B)	5	pMCL[d]	$1.1x^{-06}$
Tetrachloro-ethylene (B)	5	MCL	$7.3x^{-06}$
Trichloro-ethylene (B)	5	MCL	$1.6x^{-06}$
Vinyl Chloride (A)	2	MCL	$1.3x^{-04}$
		SUM	$4.8x10^{-4}$

Non-carcinogenic Contaminants Concern	Interim Cleanup Level (ppb)	Basis	Target Endpoint of Toxicity	Hazard Index
Arsenic	50#	MCL	keratosis	1.4
Chloroethane	14000	RfD	developmental	1.0
Tetrahydrofuran	700	RfD[e]	liver	10.0
Acetone	700	NHDPHS[f]	liver	0.2
Methyl Ethyl Ketone	200	HA[g]	fetotoxicity	0.1
Methyl Isobutyl Ketone	350	NHDPHS	liver, kidney	0.2
Toluene	1000	MCL	liver, kidney	0.14

Due to the presence of naturally occurring arsenic at and around the Site, the cleanup levels will be 50 ug/l (MCL) or background, whichever is higher, as determined by the EPA and NHDES during predesign and design activities.

a - Maximum Contaminant Level, Resource Conservation and Recovery Act.

b - The cleanup level for arsenic in groundwater has been set at the MCL of 50 ppb. The carcinogenic risk posed by arsenic at 50 ppb in groundwater will approximate 2 in 1,000. However, in light of recent studies indicating that many skin tumors arising from oral exposure to arsenic are non-lethal and in light of the possibility that the dose-response curve for the skin cancers may be sublinear (in which case the cancer potency factor used to generate risk estimates will be overstated), it is Agency policy to manage these risks downward by as much as a factor of ten. As a result, the carcinogenic risks for arsenic at this Site have been managed as if they were 2 in 10,000. (See EPA memorandum, "Recommended Agency Policy on the Carcinogenic Risk Associated with the Ingestion of Inorganic Arsenic" dated June 21, 1988.)

c - Maximum Contaminant Level, Safe Drinking Water Act

d - Proposed Maximum Contaminant Level

e - A Reference Dose of .002 mg/kg/day was used to derive the interim cleanup level and associated Hazard Index. (See memo from P. Hurst to R. Duwart dated May 3, 1990 - Appendix C) An uncertainty factor of),000 is associated with this RfD. Because of this very high uncertainty factor, a Hazard Index of 10 is considered acceptable.

f - New Hampshire Department of Public Health Services Drinking Water ·riteria

g - EPA Health Advisory

These cleanup levels must be met at the completion of the remedial action at the point of compliance, which in accordance with the NCP, is established at and beyond the edge of the existing waste area. The existing waste area includes the landfill and the leachate trench surrounding it. After construction of the remedy the point of compliance will be the outer wall of the interceptor trench. EPA has estimated that these cleanup levels will be obtained within 5 to 7 years for the eastern plume and in less than 10 to 24 years for attainment in the southern plume after implementation of the source control component.

While these interim cleanup levels are consistent with ARARs (or suitable To Be Considered criteria) for groundwater, a <u>cumulative</u> risk that could be posed by these compounds may exceed EPA's acceptable risk range for remedial action. Consequently, these levels are considered to be <u>interim</u> cleanup levels for groundwater. In addition, once all these levels are achieved for each compound, EPA expects that due to different rates of attenuation for each compound, levels of most will be below these interim cleanup levels. Thus, when all of the interim cleanup levels have been attained, a risk assessment will be performed on residual groundwater contamination to determine whether the remedial action is protective. Remedial actions shall continue until protective concentrations of residual contamination have been achieved or until the remedy is otherwise deemed protective by EPA. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

B. **Sediment Cleanup Levels**

The cleanup level for arsenic, in the sediments of the drainage swale, has been set at a level deemed protective for environmental receptors. The drainage ditch surrounding the Landfill conducts surface water to a drainage swale which empties into the Cocheco River. Arsenic levels in the drainage swale range from 36 ppm at the top of the swale, to 99 ppm at the confluence of the swale with the Cocheco River. Arsenic levels in the sediments of the landfill perimeter drainage ditch were found at 51 and 210 ppm.

The National Oceanic and Atmospheric Administration (NOAA) has analyzed data collected worldwide using a variety of methods to determine the probable levels where adverse biological effects would occur for most contaminants. The chemical concentrations observed or predicted by the different methods to be associated with biological effects were sorted. The lower 10th percentile (Effects Range Low or ER-L) was identified indicating the low end of the range of chemical concentrations at which an adverse effect was observed or predicted. The median concentration (Effects Range Median or ER-M) was identified as representative of the concentration above which adverse effects were frequently or always observed or predicted among most species. These ER-L or ER-M values are not to be construed as NOAA standards or criteria, but as guidelines by which sediment contamination can be evaluated.

The levels of arsenic found in the sediments in the drainage swale exceed both the NOAA ER-L and ER-M for arsenic. The ER-L is 33 ppm, that is, 10 percent of the available data showed some adverse affect occurred at an arsenic level of 33 ppm. The ER-M is 85 ppm, a concentration at which 50 percent of the data demonstrated an adverse response.

The observed concentrations of arsenic at the site were evaluated in conjunction with the associated physical parameters, specifically total organic carbon (TOC), and grain size, which contribute to the bio-availability of the arsenic; and with the NOAA guidelines. The evaluation indicates that a 33 ppm cleanup level corresponding to the ERL would be conservative cleanup level. A cleanup level of 50 ppm would be justified, and would provide for protection of the environment.

This 50 ppm cleanup level must be met at the completion of the remedial action at and beyond the point of compliance. Thus, the drainage swale east of the Landfill and down to the Cocheco River and the sediments that have accumulated at the convergence of the swale and the river must meet this cleanup level.

C. Description of Remedial Components

The source control portion of the remedy will involve the following key components:

Use of on-site material from the perimeter of the Landfill to recontour the existing Landfill to achieve the necessary slope for drainage;

Construction of a multi-layer cap over the recontoured Landfill;

Construction of a leachate/groundwater extraction system and clean groundwater diversion system provided by a perimeter interceptor trench, extraction wells or a combination of the two;

Installation and operation of an on-site groundwater/leachate treatment system with discharge to the Cocheco River for SC-7 and discharge to POTW for SC-7A;

Methane gas collection and passive venting;

Construction of a surface run-on/run-off diversion system with sedimentation/ detention basins; and

Limited drainage swale sediment removal and consolidation under the Landfill cap.

Recontouring involves the moving of the existing Landfill perimeter soils and debris from the toe of the Landfill side slopes, as well as the perimeter drainage ditch sediment, on top of the Landfill to contour features of the Landfill prior to capping. Recontouring will be done to provide adequate slopes to allow for proper surface water drainage from the waste pile area. Recontouring will also reduce the amount of imported clean fill required to obtain these slopes. Approximately 1,200,000 cubic yards of imported soil will be necessary to cover the 55-acre Landfill if the maximum allowed 5% slope is used. This volume is reduced to approximately 850,000 cubic yards if the

Landfill is recontoured. For a minimum 3% slope, the amount of imported soil could be reduced by another 20-30% from the approximately 550,000 cubic yards. Reductions in the amount of imported soil would translate to a proportionate reduction in truck traffic, congestion, roadway damage, noise and dust. It will also significantly reduce the cost of the cap. The ultimate slope will be determined during design.

During recontouring, waste material at the perimeter of the Landfill would be uncovered and hot spots may be encountered. To minimize this possibility, a preliminary assessment would be performed consisting of geophysics and test pit exploration before the commencement of recontouring activities aimed at limiting the excavation to areas containing predominantly soils, debris, and municipal waste. If, however, hot spots are exposed, the material would be tested and removed, treated, and disposed of off-site in accordance with RCRA and state hazardous waste laws.

The multi-layer cap (also referred to as a composite cap) prevents direct infiltration of precipitation into the Landfill to minimize the subsequent generation of leachate. Figure 10 is a cross-section of a typical multi-layer cap. This multi-layer cap consists of the following layers (from top to bottom):

- Top soil
- Common fill
- Geosynthetic fabric
- Drainage layer
- Composite low permeability layer consisting of a flexible membrane liner over a low-permeability material
- Geosynthetic fabric
- Gas vent layer

The top layer of the multi-layer cap consists of two components: (1) a vegetative top soil, selected to minimize erosion and, to the extent possible, promote drainage off the cover and (2) a soil component comprised of common fill, the surface of which slopes uniformly at least 3 percent but not more than 5 percent.

The drainage layer shall have a minimum hydraulic conductivity of 1 X 10^{-2} cm/sec which will effectively minimize water infiltration into the low-permeability layer. This layer will have a final slope of at least 3 percent after settlement and subsidence to allow the infiltrated water to flow along the low-permeability liner and not collect, or "pool", in any one location along the low-permeability liner. The drainage layer also provides a protective bedding for the flexible membrane liner (FML). There are generally two options for the materials used to construct this layer: (1) 12 inches of soil (coarse sands) or (2) a geocomposite material (geonet between two layers of geotextile) with equivalent performance characteristics. The largest factor in determining the material to be utilized will be the depth of protection needed to prevent the maximum frost penetration of the low-permeability layer. Cycles of freezing and thawing may cause cracking, lessening of density, and loss of strength to the low-permeability layer. If a geocomposite material is utilized as the drainage layer, the thickness of the vegetative layer must be protective such that the maximum depth of frost penetration will not infiltrate the low-permeability layer.

The third layer is the two-component low-permeability layer, lying wholly below the maximum depth of frost penetration, that provides long-term minimization of water infiltration into the underlying wastes. This low-permeability layer consists of a 40-mil (1.0 mm) minimum thickness flexible membrane liner component and a compacted soil component with a minimum thickness of at least 24 inches and a maximum in-place saturated hydraulic conductivity of 1×10^{-7} cm/sec. There are several alternative materials that can be used for the low-permeability layer; clay, a soil/bentonite mixture or a bentonitic blanket. Regardless of which material is used, it must meet the criteria of having a hydraulic conductivity of 1×10^{-7} cm/sec. The criteria for selecting which material to use for the low-permeability layer are availability, implementability, and cost.

A gas vent layer between the Landfill wastes and the low-permeability layer shall be installed. This layer is generally made up of 12 inches of coarse-grained, porous materials (similar those used in the drainage layer) that allow gases emanating from the wastes buried in the landfill to be collected. Vent structures will be installed into this layer, allowing the gases to vent to the atmosphere. These gases shall be tested, and if needed, additional measures, such as, but not limited to, the installation of carbon canisters, will be implemented to reduce odors and VOC emissions.

Filter layers (geotextiles) are likely to be needed above the drainage layer, above the gas vent layer and between any other layers comprised of soils of greatly different particle sizes, to prevent one from migrating into the other. The filters may be constructed of graded soil materials or geosynthetic materials.

This multi-layer cap represents the state-of-the-art in landfill cap design and as such is as a reliable and effective cap as can currently be designed. The cap will be designed to meet or exceed the performance requirements set forth in ARARs including 40 CFR 264.111, 40 CFR 264.310 and the guidance document <u>Final Covers on Hazardous Waste Landfills and Surface Impoundments</u>, July 1989 (EPA/530-SW-89-047) (Technical Guidance) or in a manner to achieve performance equivalent to that of ARARs.

The purpose of the interceptor trench/extraction well system is to actively lower the groundwater table level beneath the Landfill so that the waste material is no longer in contact with the groundwater that may migrate off-site. Figure 14 shows a typical groundwater depression caused by an interceptor trench. The groundwater/leachate recovery system consists of approximately 2,200 feet of interceptor trench installed to approximately 25-feet of depth on the downgradient side of the Landfill, at the historical boundaries of the Landfill, to collect contaminated groundwater. The length of the interceptor trench vertical barrier (impermeable membrane) will extend the full 6,100 feet around the perimeter of the existing (55-acre) Landfill. The actual depth will depend on the results of hydrogeologic and geotechnical engineering studies conducted during predesign. The 25-foot depth represents the approximate point at which the lower permeability interbedded zone begins. Inside the trench, a perforated pipe wrapped with filter fabric and drainage net would be laid and connected to a series of manholes. Submersible pumps with high/low switches will be housed inside the manholes to extract the collected groundwater and leachate.

The upgradient portion of the trench serves as a diversion system for the upgradient clean groundwater. The upgradient groundwater is diverted to prevent clean groundwater from possible contact with the landfill wastes, thus reducing the volume of contaminated groundwater requiring treatment. The clean groundwater flowing into this trench would be diverted to either the wetlands or the Cocheco River without mixing with contaminated groundwater. The determination as to the ultimate discharge location will be made during design.

Extraction wells, alone or in conjunction with the interceptor trench, may be utilized, especially where contaminated groundwater flows from the Landfill at a depth greater than 25 feet. The extraction wells can be placed at points around the Landfill to optimize the extraction of the more highly contaminated areas of the plume. An example of this would be the installation of an extraction well on the edge of the landfill, closest to the monitoring well B-2U. The extraction well will collect not only leachate emanating from under the Landfill, but through draw down, can also "pull back" and extract the contaminated groundwater currently detected in well B-2U. This will prevent this contaminated groundwater from flowing past B-2U and entering into the Cocheco River, or discharging through seeps in the drainage swale and volatilizing into the atmosphere.

Monitoring wells will be installed in the central portion of the Landfill for the following purposes: to determine groundwater contamination levels directly under the Landfill; to detect contaminants that may have pooled under the Landfill and on top of the marine clay layer; and to monitor water table declines within and beneath the Landfill. The installation of extraction wells in the landfill will supplement contaminated groundwater and leachate extraction from under the Landfill and further lower the water table beneath the Landfill. The number and location of these wells will be determined during design.

The implementation of the contaminated groundwater and leachate collection system, the upgradient diversion trench and the installation of extraction wells within the Landfill will be optimized so as to minimize redundant functions of each individual component. In addition the components, as a complete system, will be designed to achieve the objectives of lowering the groundwater beneath the waste materials, preventing clean groundwater from contact with the wastes or increasing the amount of contaminated groundwater requiring treatment, and preventing contaminated groundwater and leachate from exceeding SDWA MCLs at and beyond the compliance boundary.

The groundwater/leachate treatment system selected for the Site must be able to address metals, organics, and potentially high chemical and biochemical oxygen demand levels. A powdered activated carbon treatment system, similar to the PACT™ System, has been selected to treat the contaminated groundwater/leachate. However, if during pre-design pilot studies it is determined that this system will not be as effective or efficient as an air stripping system, preceded by metals precipitation, this alternate treatment system may be employed.

The Powered Activated Carbon Treatment System (PACT™) consists of the following steps. Collected groundwater would first enter an aeration tank to remove VOCs; activated carbon present in the tank would remove non-volatile organic chemicals from the water. The water would then pass through a settling tank where flocculation, coagulation, and precipitation processes takes place to remove metals and suspended solids. Precipitation reduces the solubility of iron, nickel, chromium and other metals so that tiny particles of the metals are produced. Once a precipitate forms, the flocculation tank allows the particles to collide and adhere due to flocculating agents. The heavier metals precipitates and solids then settle at the bottom of the tank in the form of sludge. The sludge will tested to determine if it is a RCRA waste and then disposed of off-site in compliance with ARARs. The water then passes through a multi-media filter before being discharged. The effluent from the groundwater treatment process would have to meet the substantive requirements of NPDES for discharge to the Cocheco River and/or discharge to the wetlands. A schematic of this groundwater treatment system is shown in Figure 11. The design flow for the groundwater/leachate treatment systems is approximately 40 gpm.

The two discharge options available are: 1) discharge to the Cocheco River and 2) discharge to the Dover POTW. The POTW option would require the installation of approximately 2.5 miles of sewer line and at least one lift station. Leachate collected from the groundwater/leachate collection system would be discharged to the local sewer system. Some on-site pretreatment of leachate may be required to meet applicable sewer discharge standards. Table 9 lists the current sewer discharge pretreatment standards for the Dover POTW. At present, the Dover POTW has the extra capacity to handle some pre-treated water from the Landfill, and the capacity is expected to increase further by 1992 with the start-up of the secondary treatment unit, currently under construction. The decision on discharge options will be made during pre-design studies.

The sediment control component provides for predesign sampling to be performed to identify specific areas of sediment deposition along the drainage swale that contain concentrations of contaminants in excess of the arsenic clean-up level. Based on the physical characteristics of the drainage swale, the extent of contamination is expected to be limited. The removal of approximately 300 cubic yards of contaminated sediments is expected to occur through the use of manual labor. However, if the amount of material to be removed is extensive, other mechanical means may have to be employed. The excavated sediments will be deposited back on top of the Landfill prior to the construction of the Landfill cap.

The selected remedy for the management of migration utilizes portions of MM-2 and MM-4 and includes the following elements:

the use of institutional controls, where possible, to prohibit the use of groundwater;

implementation of a long-term groundwater sampling/monitoring program;

pre-design studies which include the installation of additional monitoring wells to further define the lateral extent, depth and mass of the contaminated groundwater;

one or more pump tests to determine the ability and rate that contaminated groundwater can be extracted from the aquifer;

use of natural attenuation processes to attain groundwater clean-up levels in the eastern plume;

installation of several off-site groundwater extraction wells in the southern plume, connection to an on-site treatment system, extraction and treatment of the groundwater and recharge of the treated groundwater to the wetlands or discharge to the Cocheco River.

Institutional controls, where possible, will limit Site access, Site use, prohibit the use of groundwater from the upper aquifer for potable usage and prohibit the disturbance of the marine clay unit between the upper and lower aquifers. These institutional controls include fencing, warning signs, deed restrictions, zoning changes, and other actions which will prohibit the use of contaminated groundwater. The City of Dover has already passed a zoning ordinance restricting the use of groundwater within 1,500 feet of the Landfill as a potable water supply. The Town of Madbury has proposed to take similar action.

The RI and FES investigations indicate that contaminants exceeding MCLs have migrated from the Landfill into the groundwater to the south and the east of the site. Since ARARs are not met in the groundwater at and beyond the point of compliance and the risk to human health is outside the EPA acceptable risk range in this area, sufficient justification exists for instituting active groundwater treatment in both the southern and eastern plumes. However, groundwater modeling has shown that in the eastern plume, natural attenuation processes such as degradation, adsorption, advection and dispersion will effectively cleanup the groundwater within 5 to 7 years after the implementation of the source control portion of this remedy. This being the case, EPA has determined that the NCP's requirement that groundwater be returned to its beneficial uses within a time frame that is reasonable given the circumstances at this Site, will be met by the use of natural attenuation for cleaning up the eastern plume. This determination is in part based on the groundwater modeling information which indicates that active treatment of the eastern plume groundwaters would shorten cleanup times by only a few years.

If the groundwater cleanup levels in the eastern plume have not been attained within the estimated time frame of 5 to 7 years through natural attenuation processes, or if it becomes apparent that there will be a significant increase in the original estimated time frame, then an active restoration system will be evaluated and implemented for the eastern plume.

An active groundwater treatment remedy is selected for the contaminated groundwater in the southern plume, which extends in the direction of the Bellamy Reservoir. While the RI and FES investigations indicate that the groundwaters around the Site, in both the southern and eastern plume directions are in excess of SDWA MCLs, these levels are of particular concern in the southern plume because of their proximity to the Bellamy Reservoir. From the inception of the RI, a primary concern at the Site has been the protection of this reservoir which is a drinking water source for seven municipalities. Data indicates groundwater in the southern plume, containing levels of contaminants significantly above MCLs, has migrated from the Landfill to within approximately 900 feet of the reservoir.

In addition, it is estimated that if these contaminants are left to naturally attenuate, it would take from 10 to 24 years to attain cleanup levels after the implementation of the source control alternative. During such a period of natural attenuation, which may be up to 27 years when the years for construction of the source control measures are taken into account, the groundwater contaminants would continue to exceed ARARs. A 27 year period for cleanup does not constitute a reasonable time-frame for cleanup at this site. Also, during this 27 year period contaminants, if left to naturally attenuate, could reach and pollute the waters of the Bellamy Reservoir. Therefore, a groundwater extraction and treatment system will be implemented to return contaminant levels to MCLs as soon as practicable and to manage the plume so as to prevent it from contaminating the Bellamy Reservoir.

The groundwater extraction system includes a low rate collection of contaminated groundwater which has migrated into the wetlands adjacent and in a southern direction from the Landfill. Extraction wells will be installed at off-site locations and will intercept contaminated groundwater in the direction of flow. Groundwater collected by the extraction wells will collectively be pumped at an approximate total of 50 gpm to a treatment unit on or adjacent to the Landfill. Construction in the wetlands will be required to allow drilling equipment access to new well locations, if necessary, and to install the piping system connecting the extraction wells to the treatment system. Once the extraction system is installed (approximately 6 months) the affected area will be restored.

Groundwater treatment would be similar to that described in the previous source control remedy except for the required treatment capacity. The treated groundwater will be recharged to the wetlands to minimize any potential dewatering that may occur due to the extraction system and/or discharged to the Cocheco River. The effluent from the groundwater treatment process would have to meet the substantive requirements of NPDES for discharge to the Cocheco River and/or discharge to the wetlands.

One or more pump tests will be performed during pre-design studies to determine the ability and rate that contaminated groundwater can be extracted from the aquifer. The actual time frame for attaining cleanup levels in this southern area will depend largely upon the data from this pump test(s) and data from the installation of additional monitoring wells to determine the lateral extent and depth of contamination. However, the time frames are expected to be shorter than the estimated 10 to 24 years expected for natural attenuation.

Periodic review and modification of the design, construction, maintenance and operation of the groundwater extraction and treatment system will be necessary. Performance of the system will be evaluated annually, or more frequently, to determine if EPA's acceptable risk range and standards of the design criteria are being met. If not, adjustment or modification may be necessary. These adjustments or modifications may include relocating or adding extraction wells or alternating pumping rates. Switching from continuous pumping to pulsed pumping may improve the efficiency of contaminant recovery and should be evaluated and necessary modifications undertaken. Should new information regarding the extraction and treatment technology exist, it will be evaluated and applied as appropriate.

After the interim cleanup levels have been met a risk assessment will be performed. If the remedy is determined to be protective, the groundwater extraction and treatment system will be shut down. A groundwater monitoring system will then be utilized to collect information each quarter for three consecutive years to ensure that the cleanup levels have been met and the remedy is protective. If these levels are maintained for three years and the remedy is determined to be protective, a long-term monitoring program for the Site, in accordance with RCRA and New Hampshire Hazardous Waste Rules will be implemented. If the risk assessment indicates that the remedy has not been effective, the performance standards and/or the remedy will be reevaluated.

A long-term groundwater sampling and monitoring program will be initiated during pre-design and continue for three years after attaining groundwater cleanup levels to assess the effectiveness of remediation and to confirm that contaminant concentrations in groundwater attain cleanup levels. If at any time the groundwater monitoring data indicates that the cleanup levels will not be met in the eastern plume within 5 to 7 years after the implementation of the source control remedy then a re-examination will be made of the nature and extent of contamination in this plume and this remedy will be adjusted if appropriate.

The groundwater monitoring program will be developed for the following purposes:

- to evaluate the effectiveness of the source control remediation measures designed to prevent groundwater contaminants in excess of SDWA MCLs to migrate beyond the compliance boundary;

- to monitor the reduction of contaminant concentrations over time in order to insure that groundwater cleanup levels will be achieved in the predicted time frames; and

- to determine the lateral extent of migration of the contaminants in the groundwater in the southern plume.

The details of the groundwater monitoring program will be developed during pre-design and design studies and tailored to the specifics of the Site. Additional groundwater monitoring wells will be installed, as needed, in order to ensure that the objectives of the monitoring program are achieved. Specifically, additional wells will be installed during pre-design to further define the lateral extent and depth of contamination in the southern plume. Selected wells will be monitored quarterly upon initiation of remedial design until completion of the remediation. All samples will be analyzed for Hazardous Substance List VOCs, tetrahydrofuran, and arsenic. Specific wells and analytical parameters may be added or deleted depending on sampling results and observed trends.

Frequent monitoring of treated groundwater recharge to the wetlands or discharge to the Cocheco River shall be implemented, as well as monitoring for the effects of dewatering to limit the impact to the wetlands.

The groundwater modelling employed to determine the relative effectiveness of natural attenuation and extraction/treatment in the southern plume, as well as the models employed to predict the impact of the southern plume on the Bellamy Reservoir relied on a number of assumptions which will be tested during pre-design studies. As noted above, the remedy calls for pre-design studies which include the installation of additional monitoring wells to further define the lateral extent and depth of both contaminant plumes as well as pump tests to confirm assumptions concerning the rate at which contaminated groundwater can be extracted from the upper aquifer. If these studies, and any others determined by EPA to be necessary for further delineation of the nature and extent of the groundwater contaminant plumes, disprove fundamental assumptions employed in the models or produce additional data such that EPA, in consultation with the state, determines that active treatment of the southern plume may not be appropriate and necessary to protect human health and the environment, then EPA, in consultation with the state, and in accordance with the NCP, will re-evaluate the use of active treatment for the southern plume.

These pre-design studies will be initiated as soon as possible and no later than the outset of remedial design/remedial action activities and will take place before or during other remedial design activities for the source control and management of migration components of the remedial action; these studies will not delay any design or implementation activities. These studies and any proposal to alter the remedy based on the findings of these studies must be completed and submitted within fifteen (15) months of commencement of remedial design activities. In accordance with the NCP, any proposal to alter the remedy based on new data must evaluate the chosen remedy against the proposed remedy on the nine criteria set out at 40 CFR 300.430(e)(9)(iii).

Since hazardous substances, pollutants or contaminants will remain at the Site, EPA will review the Site at least once every five years after the initiation of remedial action at the Site to assure that the remedial action continues to protect human health and the environment. EPA will also evaluate risk posed by the Site at the completion of the remedial action.

XI. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Dover Municipal Landfill Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, attains ARARs or invokes an appropriate waiver and is cost effective. The selected remedy also satisfies the statutory preference for treatment which permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element. Additionally, the selected remedy utilizes alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

A. The Selected Remedy is Protective of Human Health and the Environment

The remedy at this Site will permanently reduce the risks posed to human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through removal, treatment, engineering controls, and institutional controls, more specifically, the capping of the Landfill, the limited excavation of contaminated sediments, the collection and treatment of contaminated groundwater and leachate in the Landfill and at the perimeter of the waste management area and the extraction and treatment of off-site contaminated groundwater. The wastes deposited at the Landfill will remain in place. Migration of contaminants to surface water, soils, sediments, and groundwater will be blocked and direct contact with contaminants prevented, thus effectively reducing risks. The pathway for the volatilization of contaminants into the air will be eliminated due to the removal of the perimeter drainage ditch as an avenue for contaminant transport. In addition, the implementation of the cap and groundwater/leachate collection system should eliminate risk resulting from the ingestion and dermal contact with the contaminated surface water and sediments in the perimeter drainage ditch. Leachate and contaminated groundwater (on-site and off-site in the southern plume) will be extracted, treated and either disposed of at the POTW, discharged to the Cocheco River, or recharged back to the wetlands.

The remedial actions, as proposed, will be protective of human health and the environment. Capping of the source area will eliminate further groundwater contamination resulting from soil leaching. Toxicity will be reduced through groundwater treatment until contaminant concentrations are protective of human health. Treatment will also retard the migration of the contaminated plume and halt further contamination of the aquifer. A long-term monitoring program will ensure the remedy remains protective of human health and the environment. The final groundwater cleanup levels will be determined as the result of a risk assessment performed on residual groundwater contamination after all interim cleanup levels have been met. Unless the resultant cumulative risk is within the 10^{-4} to 10^{-6} incremental risk range and the cumulative hazard index for similar target endpoints is below the specified level of concern, remedial actions shall continue, until protective levels are attained. Finally, implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts since the technologies are proven and will be field tested to reduce operational risks, and special engineering precautions will be used to minimize potential for air releases of contaminants.

B. The Selected Remedy Attains ARARs

This remedy will meet or attain all applicable or relevant and appropriate federal and state requirements that apply to the Site. Substantive portions of environmental laws identified as ARARs and those to be considered for the selected remedial action include, among others:

<u>Chemical Specific</u>

Safe Drinking Water Act - Maximum Contaminant Levels (MCLs)
Resource Conservation and Recovery Act, Groundwater Protection MCLs
National Ambient Air Quality Standards (NAAQS)
Clean Water Act Ambient Water Quality Criteria (AWQC's)
New Hampshire Surface Water Quality Standards
New Hampshire Drinking Water Standards
New Hampshire Ambient Air Quality Standards
New Hampshire Toxic Air Pollutant Regulations

Location Specific

Clean Water Act (CWA) (Protection of Waters & Wetlands)
Executive Order 11990 (Protection of Wetlands)
Executive Order 11988 (Floodplains Restrictions)
40 CFR Part 6 Appendix A
RCRA General Facility Standards for Floodplains/Seismic Areas
Fish and Wildlife Coordination Act
New Hampshire Wetlands Regulations
New Hampshire Hazardous Waste Regulations (Facility siting standards)

Action Specific

Resource Conservation and Recovery Act (RCRA)
HSRA (Land Disposal Restrictions of RCRA)
Clean Air Act (NAAQS and NESHAP)
DOT Rules for Transportation of Hazardous Materials
CWA (NPDES and Pretreatment Standards)
New Hampshire Hazardous Waste Rules
New Hampshire Air Regulations for VOCs
New Hampshire Standards for Pretreatment of Wastes Discharged to a POTW
New Hampshire Rules for Transportation of Hazardous Materials
New Hampshire Regulations for Terrain Alteration
New Hampshire Regulations for Fugitive Dust Control

To Be Considered

New Hampshire Protection of Groundwater New Hampshire Groundwater Quality Criteria
New Hampshire Groundwater Discharge Criteria
New Hampshire Wellhead Protection Program
EPA Risk Reference Doses
EPA Carcinogen Assessment Group Potency Factors
NOAA Technical Memorandum NOSDMA52
Federal Groundwater Protection Strategy & Classification Guidelines

Tables 9, 10, 11 and 12, in Appendix B of this ROD, list all ARARs identified for the Site and whether they are applicable, relevant and appropriate or to be considered. Within each table is also presented a brief synopsis of the requirements and the action to be taken to meet them. Section 2 of the FS, Tables 2-8 through 2-11 lists all ARARs identified for the Site for all the alternatives.

1. Chemical Specific

a. Federal and State Drinking Water Standards

It has been determined by the EPA that the groundwater in the upper aquifer beyond the point of compliance could be a drinking water source were it not contaminated by substances originating from the Dover Landfill. The State of New Hampshire has not yet classified groundwater in the area; however, using the Federal guidelines and classification system, the groundwater adjacent to the Site would be classified as a IIB potential drinking water. While Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) promulgated under the Safe Drinking Water Act are not applicable to groundwater, they are relevant and appropriate to groundwater cleanup because the groundwater may be used as a drinking water source. In addition, the NCP requires that usable groundwaters be restored to their beneficial uses whenever practicable. See 40 CFR 300.430(a)(iii)(F).

In accordance with RCRA, cleanup levels for arsenic in the groundwater will be set at 50 ug/l or background, whichever is higher. (The SDWA MCL for arsenic has been deemed relevant but not appropriate and therefore not an ARAR because naturally occurring levels may be higher than the SDWA MCL.) Prior to or during remedial design, EPA and the state will determine the background level of arsenic at this Site to establish the interim cleanup level.

New Hampshire's Protection of Groundwater regulations (Ws 410) do not establish groundwater quality standards, but do establish groundwater criteria. Included in this criteria is the requirement that no person shall cause the groundwater to contain a substance at a level that the state determines may be potentially harmful to human health or to the environment. Because New Hampshire's regulations do not contain a standard level of control as required by § 121(d)(2)(A)(ii) of CERCLA, they will not be an ARAR. They are, however, to be considered (TBCs) and will be met.

This remedy will attain these ARARs as well as those identified in the tables of Appendix E, and will comply with those regulations which have been identified as TBCs by meeting the groundwater cleanup levels at the Site through the groundwater treatment systems and natural attenuation. Capping of the Landfill will decrease infiltration of precipitation through the Landfill, thus reducing the volume of leachate generated. Treating the leachate and contaminated groundwaters will reduce levels of contamination at the Site to the interim cleanup levels identified in this ROD. Treated groundwater will also meet federal standards, state criteria for drinking water, and the discharge requirements to the Cocheco River and/or of the POTW. Where natural attenuation is employed, federal and state standards will be met within the time frame specified.

b. Federal Clean Air Act and New Hampshire Air Pollution Regulations

Federal Primary and Secondary National Ambient Air Quality Standards (NAAQS) exist for emissions of sulfur oxides, carbon monoxide, ozone, nitrogen oxides and lead and particulate matter whereas the National Emission Standards for Hazardous Air Pollutants (NESHAPs) address VOC emissions from specific sources. Threshold Limit Values (TLVs) provide an extensive list of control levels for workplace environments and, while they are based on the exposure of a select population and not generally transferable to the general public, they are used to assess site inhalation risks for soil removal operations.

New Hampshire's air quality regulations parallel the federal regulations. The specific sections set forth in the tables in Appendix E, establish specific standards for particulate matter and ambient air limits for a large number of toxic air pollutants. In addition, New Hampshire has established limits on VOC emissions from certain industries. Also, the state has promulgated fugitive dust control regulations which require that measures be taken to limit dust from construction and other activities.

These federal and state air standards will guide mitigation measures designed to control the release of particulate matter during the recontouring and excavation at the Site. In addition, the federal and state regulations which set standards for VOC emissions from certain industries will be relevant and appropriate to set limits on the emissions from any treatment system used at the Site. Finally, the state fugitive dust control regulations will guide recontouring activities so that dust is kept to a minimum. In each case the best demonstrated technology will be employed to meet the federal and state requirements.

2. Location Specific

a. Federal and State Wetland and Floodplain Protection

The Clean Water Act, along with Executive Order 11990 (Protection of Wetlands) and state wetland protection standards are applicable to that portion of the remedy constructed in or affecting the wetlands surrounding the Site. These rules prohibit activity adversely affecting a wetland if there exists a practicable alternative which is less detrimental. Constructing the management of migration groundwater extraction system in the wetland is necessary because active management and cleanup of the plume is necessary to meet the remediation objectives of the Site and the contaminant plume lies under the wetland.

In the short term, construction will be conducted to avoid or minimize the damage to flora and fauna within the wetland. Additionally, after construction is completed, restoration of the wetlands will occur in two phases. The first phase, implemented at the time of completion of the construction, will consist of restoring the original topography and establishing shallow rooting vegetation. The second phase, initiated at the completion of the remedy, consists of encouraging the original wetland species to reestablish themselves naturally.

After reviewing the Federal Emergency Management Agency, Floodplain Insurance Rate Maps for the City of Dover, EPA has determined that a portion of the Site is located in a 100-year floodplain. Executive Order 11988 (Floodplain Management) is therefore an ARAR for the Site. These regulations govern construction activities which have a negative impact on a floodplain.

The portion of the Site that lies within the 100-year floodplain is the lower portion of the drainage swale, converging with the Cocheco iver. The limited excavation of contaminated sediments in this area is necessary to meet the remedial objectives, and has little or no adverse impact on the floodplain.

EPA's policy on implementing Executive Orders 11990 (wetlands) and 11988 (floodplains) is contained at 40 CFR Part 6 Appendix A. This Appendix sets forth principles and procedures to govern work in wetlands and floodplains so as to minimize the adverse impacts on these valuable natural resources. These orders, as well as EPA's policy, will be implemented in the construction and maintenance of the remedy.

In accordance with 40 CFR Part 6, Appendix A, the EPA has provided an opportunity for public comment on the work to be undertaken in the wetlands and floodplain by issuing a Proposed Plan for remedial action at this Site, holding a public hearing and receiving pubic comments for 60 days prior to this decision. In addition, a Statement of Findings which determine that there are no practicable alternatives to these remedial actions in the wetlands and floodplain is included in Appendix F.

3. Action Specific

a. State and Federal Hazardous Waste Regulations

RCRA regulations and the current State of New Hampshire hazardous waste regulations are relevant and appropriate to the source control and management of migration portions of the remedy. In those limited instances these regulations conflict, the more stringent regulation will be followed.

Prior to January 1991, the State, by promulgating hazardous waste regulations which were as stringent as, or more stringent than, RCRA regulations, had been authorized by EPA to administer and enforce the hazardous waste program in New Hampshire. However, New Hampshire has promulgated an entirely new set of regulations this year. Some of those regulations are less stringent than RCRA regulations. This new state program is still undergoing revisions and has yet to be approved by EPA. As a result, both federal and state hazardous waste regulations existing at the signing of this ROD must be consulted to employ the more stringent requirements.

Since RCRA-type hazardous wastes were disposed of in the Landfill during its operation and it is suspected that full barrels of RCRA-type substances were buried and may still be leaching inside the Landfill, the cap design and construction for this unit will meet both RCRA and New Hampshire hazardous waste standards. In addition, during the recontouring of the Landfill, hot spots may be encountered. The substances in those hot spots must be removed and treated, transported, and disposed of in accordance with RCRA and New Hampshire requirements. Sludge generated by the groundwater treatment unit(s), if determined to be RCRA-type waste, must also be removed from the Site, transported, and disposed of in accordance with RCRA and the state requirements.

The land disposal restrictions of Hazardous and Solid Waste Amendments of RCRA will apply to those RCRA-type hazardous substances removed from the Site, including those hot spot substances and the treatment unit sludges. Land disposal restrictions will not apply to the movement of sediments from the swale to the area of the Landfill to be capped because, among other reasons, this movement does not constitute placement for purposes of the land disposal restrictions. The contaminants in the swale have been caused by and are contiguous to the Landfill, and their movement back to the Landfill constitutes consolidation within the unit.

C. The Selected Remedial Action is Cost-Effective

In the Agency's judgment, the selected remedy, is cost effective:

the remedy affords overall effectiveness proportional to its costs. Once EPA identified alternatives that were protective of human health and the environment and that either attain, or, as appropriate, waive ARARs, EPA evaluated the overall effectiveness of each alternative by assessing the relevant three criteria--long term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short term effectiveness. The relationship of the overall effectiveness of these remedial alternative were determined to be proportional to their costs.

A summary of the costs associated with each of the source control remedies are presented below. All costs are presented in net present costs.

COST COMPARISON OF SOURCE CONTROL ALTERNATIVES

			Capital Costs	O & M	Present Worth
SC-1	No Action	$	0	169,000	1,593,400
SC-2	Limited Action		44,400	177,600	1,718,300
SC-5	Recontour/Multi-Layer Cap/ Slurry Wall/ Groundwater Treatment/ Discharge to Cocheco River/ Sediments Cover		31,266,600	221,400	33,353,600
SC-5A	Recontour/Multi-Layer Cap/ Slurry Wall/ Groundwater Treatment/ Discharge to POTW/ Sediments Cover		31,334,600	205,000	33,267,100
SC-7	Recontour/Multi-Layer Cap/ Interceptor/ Diversion Trench/ Groundwater Treatment/ Discharge to Cocheco River/ Sediments Excavation		20,014,800	239,300	22,270,600

SC-7A	Recontour/Multi-Layer Cap/ Interceptor/ Diversion Trench/ Groundwater Treatment/ Discharge to Cocheco River/ Sediments Excavation	20,174,700	211,862	22,171,900

Two of the above alternatives are protective and attain ARARs: SC-5/5A and SC-7/7A. Comparing these alternatives, EPA's selected remedy, SC-7/7A, combines the most cost-effective remedial alternative components that were evaluated. The remedy provides a degree of protectiveness proportionate to its costs. Alternative SC-5/5A is 50 percent more costly than SC-7/7A without providing a commensurate increase in protectiveness. Alternative SC-7/7A, like SC-5/5A, involves the construction of a cap over the landfill and the installation of a groundwater/leachate collection system, but without threatening the integrity of the marine clay layer. The less expensive alternatives, SC-1 (no-action) and SC-2 (limited action), did not meet all ARARs nor were sufficiently protective of human health and the environment.

A summary of the costs for each of the elements of the selected source control remedy is presented below. All costs are net present worth.

Total Costs of Selected Source Control Remedy

Component of Remedy	Present Worth ($)
Multi-layer Cap	14,079,100
Groundwater/Leachate Collection System	1,347,600
Groundwater Treatment System (PACT™)	1,692,700
Limited Sediment Excavation	7,900
Miscellaneous*	4,215,000
TOTAL[1]	21,342,300

* Miscellaneous includes the following: facilities, a drum removal and disposal contingency should hot spots or drums be encountered during recontouring activities, contractor allowances, contingency allowances and general administration.

[1] The total presented does not include $928,400 included in the FS for long-term groundwater, surface water and sediment monitoring over 30 years. Long-term monitoring costs for these media are included under the costs for management of migration portion of the selected remedy.

A summary of the costs associated with each of the management of migration remedies are presented below. All costs are presented in net present costs.

COST COMPARISON OF MANAGEMENT OF MIGRATION ALTERNATIVES

	Capital Costs	O&M Costs ($/Yr)	Present Worth
MM-1 No Action	$ 0	142,800	1,346,500
MM-2 Limited Action	9,400	176,500	1,673,600
MM-3 Groundwater Interceptor Trench/Recharge Trench/ Groundwater Treatment	1,452,200	78,800	2,828,700*
MM-4 Groundwater Extraction Wells and Treatment System	1,503,700	394,200	4,818,000*

* Present worth costs for MM-3 and MM-4 include an additional $892,147 for long-term groundwater monitoring (30 years) that is not accounted for in columns headed "Capital Costs" and "O & M Costs".

Three of the management of migration alternatives attain ARARs, MM-2, MM-3 and MM-4. Comparing these alternatives, EPA's selected remedy, portions of MM-2 and MM-4, combines the most cost-effective remedial alternative components while also providing sufficient protection to human health and the environment. This portion of the remedy provides a degree of protectiveness proportionate to its costs.

The least expensive alternative, MM-1, no action, would meet ARARs in the long term through attainment of groundwater cleanup levels by natural attenuation processes. It does not provide protection of public health and the environment in the short term because use of the contaminated groundwater would not be restricted and the cleanup time frame is not reasonable. Alternative MM-2, limited action, allows for natural attenuation processes to attain groundwater cleanup levels and includes institutional controls to prevent short term usage of groundwater.

Both MM-3 and MM-4 take active measures to cleanup groundwater and to prevent short term and long term impacts of the contaminant plume on the Bellamy Reservoir. Alternative MM-3 involves a passive collection that intercepts and treats contaminated groundwater. Alternative MM-4 actively extracts and treats contaminated groundwater from the aquifer.

Alternative MM-4, which is 187 percent more costly than MM-2, and 70 percent more costly than MM-3, is expected to attain groundwater cleanup levels in a somewhat shorter time frame than MM-2 and MM-3, due to active extraction and treatment. The time frames to attain groundwater cleanup levels in the eastern plume are approximately 5 to 7 years for MM-2, and 3-4 years for MM-3 and MM-4. Since the time frames to achieve the cleanup levels are not significantly different, and because during this time frame the eastern plume contamination is not expected to affect a current drinking water receptor, the EPA selection of natural attenuation (MM-2) for the eastern plume is most cost effective while providing adequate protection of human health and the environment.

The time frames to attain groundwater cleanup levels in the southern plume are approximately 10 to 24 years for MM-2, and less than the 10 to 24 years for MM-3 and MM-4. The FS simulations of the time frames to achieve MCLs for the MM-4 alternative did not take into account the increased hydraulic gradients and groundwater velocities resulting from the greater drawdown created by the extraction wells. The increased groundwater velocities near the extraction wells may result in a remediation time frame somewhat less than that for alternative MM-3. The actual effect of the extraction wells under MM-4 on increasing the groundwater velocities will be a function of the pump rate and aquifer drawdown created by the extraction wells.

In addition to shortening the cleanup time, MM-4 provides immediate protection to the Bellamy Reservoir from the southern contaminant plume. The plume has moved to within 900 feet of the reservoir and, if left to naturally attenuate, contaminants could reach the class A waters of the reservoir. Because of the levels of current groundwater contamination in the southern plume, the time frame for allowing natural attenuation to clean up this plume, and the threat to this important drinking water resource, the costs associated with employing an extraction well/treatment system to remediate the southern plume are justified.

A summary of the costs for each of the elements of the selected management of migration remedy are presented below. All costs are net present worth.

TOTAL COSTS OF SELECTED MANAGEMENT OF MIGRATION REMEDY

PORTION OF REMEDY	PRESENT WORTH COST ($)
I. Capital Costs	
a. Fencing, Gates, Signs	63,300
b. Groundwater Extraction Wells	9,000
c. Groundwater Treatment System (PACT™ System, pipe line and discharge)	671,500
d. Miscellaneous*	379,200
II. Annual Operation and Maintenance (@ $157,680 per year, for 10 years)	968,800
III. Long-term Groundwater Monitoring (@ $76,600) per year for 30 years)	721,600
TOTAL	2,813,400

* Miscellaneous includes the following: miscellaneous facilities (Site trailers, etc.), institutional control administration costs, contractor allowances, engineering, contingency allowances, and general administration.

The costs, taken from alternatives SC-2 and MM-2 in the FS, for the fencing, gates and signs were summed to obtain the costs presented in the above table. The long-term monitoring costs associated with the selected remedy were calculated by EPA using the long-term monitoring of groundwater, surface water and sediments as shown in the FS for SC-2 and MM-2. Specifically long-term monitoring costs include the costs for quarterly sampling of 12 wells (as estimated by SC-2 in the FS) for VOCs, metals and tetrahydrofuran as well as the associated labor, data validation, report writing and administration costs. The actual number of wells sampled, which may be greater than twelve, and the location of these wells will be determined during design.

Note that at the request of EPA, HMM Associates, the FS contractor, submitted an analysis of the costs for the extraction and treatment of a) the eastern plume and b) the southern plume. The costs from this analysis, available in the Administrative Record, have been used to compile the cost table above. A detailed accounting of costs for each source control and management of migration alternative is contained in Section 4 of the FS.

While analyzed separately in this document, the source control and management of migration portions of this remedy are interdependent. Source control measures are necessary for, among other things, the prevention of future contaminant migration into the eastern and southern plumes and the management of migration measures are needed to protect the Bellamy Reservoir from the existing southern plume contaminants and any expansion of that plume during the design and implementation of this remedy.

TOTAL ESTIMATED COST: $24,155,700

D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4)implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of trade-offs among the alternatives.

The selected source control alternative SC-7/7A, is similar to SC-5/5A in its long-term effectiveness, permanence, short term effectiveness, and reduction of toxicity, mobility and volume of contaminants through treatment. The selected alternative is far superior to SC-5/5A in the areas of implementability and cost. Alternative SC-5/5A costs 50 percent more than SC-7/7A without providing a corresponding increase in protection. Alternative SC-5/5A also requires the securing of the slurry wall into the marine clay layer which separates the upper contaminated aquifer from the lower drinking water aquifer. This would be a difficult procedure and could affect the integrity of the clay layer. SC-7/7A provides for an interceptor trench/extraction well system which will not affect the clay layer. In addition, the limited sediment excavation of SC-7/7A is easier and quicker to implement, less expensive, and provides a more permanent remedy than the swale cover examined in SC-5/5A.

Alternatives SC-1 and SC-2 are far less protective than both SC-5/5A and SC-7/7A for the long-term. Both alternatives SC-1 and SC-2 do not prevent the migration of contaminants into the groundwater nor do they provide for the reduction of mobility, toxicity or volume through treatment of the contaminants in the groundwater. Natural attenuation processes, acting in the groundwater, may eventually result in the attainment of groundwater cleanup levels, but this would take many decades.

Alternative MM-2 and selected elements of MM-4 were chosen as the management of migration portion of the remedy because of the combined long-term effectiveness and permanence and ability to reduce toxicity, mobility and volume of contaminants through capture and treatment was the most efficient of all alternatives in light of implementability and cost concerns. The principal elements of the remedy consist of extracting groundwater in the southern plume, which has migrated from the Landfill toward the Bellamy Reservoir, and treating the groundwater through the use of a PACT™ process or an air stripper, prior to discharging it to the Cocheco River and/or recharging it back to the wetlands to off-set dewatering. The PACT™ process and the air stripper are proven techniques which provide permanent solutions for contaminated groundwater and have been used successfully at other cleanup sites. Groundwater in the eastern plume is expected to attain groundwater cleanup levels through natural attenuation in a reasonable time frame (5 to 7 years) after implementation of the source control remedy; unlike the southern plume, the eastern plume does not threaten a current drinking water source during the period natural attenuation is to attain groundwater cleanup levels.

Alternative MM-3 is similar to MM-4 in long-term effectiveness and permanence and its ability to reduce toxicity, mobility and volume of contaminants through capture and treatment and also in implementability and costs. However, when short term impacts are considered, MM-4 provides greater protection to the wetlands during installation. In addition, because MM-4 actively extracts the contaminated groundwater, where MM-3 relies on the natural flow of groundwater, cleanup time frames are expected to be faster for MM-4.

Alternative MM-1 is similar to MM-2 in long-term effectiveness, permanence and cost. MM-2 is selected because it provides greater protection of public health and the environment through institutional controls. These controls are especially important to prevent ground water consumption in the short term.

E. The Selected Remedy Satisfies the Preference for Treatment Which Permanently and Significantly reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The principal element of the selected source control portion of the remedy is the containment of wastes in the Landfill. The principal element of the selected management of migration portion of the remedy is groundwater extraction and treatment. These elements address the primary threat at the Site, contamination of the groundwater with VOCs, tetrahydrofuran and metals (arsenic). The selected remedy satisfies the statutory preference for treatment as a principal element by minimizing leachate from the Landfill, collecting and treating leachate and the contaminated groundwater migrating from the Landfill, and actively extracting and treating the contaminated groundwater posing a potential threat to the nearby drinking water supply reservoir. Treatment is not used for the cleanup of the Landfill because treatment of this large volume of heterogeneous waste is not practical or cost-effective in comparison with capping the waste in place.

XII. DOCUMENTATION OF NO SIGNIFICANT CHANGES

No significant changes from the Proposed Plan have been made to the selected remedies as detailed in the Record of Decision. Minor changes from the Proposed Plan to the Record of Decision include incorporating an arsenic cleanup level for sediments which is protective of the environment rather than simply protective of human health. In addition, accounting errors have been corrected and long-term monitoring full HSL analysis was deemed inappropriate. These corrections reduced the cost of the selected remedy by approximately $1.7 million. Minor changes also include some changes in the ARAR tables to better reflect the actions to be taken at the Site to meet these ARARs and some alterations in the status of the ARARs to accommodate site specific features. Also, EPA has determined that the SDWA MCL for arsenic in the groundwater is not appropriate for this Site and therefore not an ARAR. The RCRA MCL for arsenic will control the setting of this cleanup level.

The selected remedy provides for the limited excavation of contaminated sediments in the drainage swale for the protection of the environment, specifically due to the presence of arsenic in the sediments. An arsenic cleanup level in sediment has been set at 50 ppm, based on Site exceedances of the NOAA Effects Range Low of 33 ppm, and taking into consideration the Effects Range Median of 85 ppm and site-specific data (TOC and grain size). This level is considered protective for fish, waterfowl and other biota inhabiting the Cocheco River. The proposed plan stated a cleanup level for arsenic in sediments for the protection of human health. Since the risks via ingestion and dermal contact with these sediments are within EPA's acceptable risk standards, protection for human health was not justified.

In the Proposed Plan the estimated total cost for the preferred remedy was $25.9 million. The estimated total cost of the remedy in this Record of Decision is $24.2 million. The reduction in costs is in part based on the correction of accounting and overestimated long-term monitoring costs. In combining alternatives to obtain the selected remedy long-term monitoring costs were double counted. Long-term monitoring costs associated with SC-7/7A and MM-4 have been deducted because they are also included in the costs associated with MM-2. In addition, MM-2 included costs for full HSL analysis of groundwater, which has been deemed inappropriate by the EPA because there is no indication that pesticides, poly-chlorinated biphenyls (PCBs) or base-neutral and acid extractable organic compounds (BNAs) are contaminants of concern at this Site.

The SDWA MCL for arsenic in groundwater has been determined to be relevant but not appropriate to this Site and therefore not an ARAR as a result of the possibility of naturally occurring background levels which may exceed the SDWA MCL. The RCRA groundwater cleanup level for arsenic remains both relevant and appropriate because it sets cleanup at 50 ug/l, or background, whichever is higher.

Other minor changes in ARARs may be found in the tables in Appendix E of this ROD Decision Summary.

III. STATE ROLE

The New Hampshire Department of Environmental Services has reviewed the various alternatives and has indicated its support for portions of the selected remedy. The State has also reviewed the Remedial Investigation, Risk Assessment and Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State Environmental laws and regulations. The New Hampshire Department of Environmental Services concurs with the source control and eastern plume management of migration portions of the selected remedy for the Dover Municipal Landfill Site and has reserved a concurrence decision on the southern plume management of migration portion of the selected remedy until pre-design studies have been completed. A copy of the declaration of concurrence is attached as Appendix D.

Appendix A

FIGURES

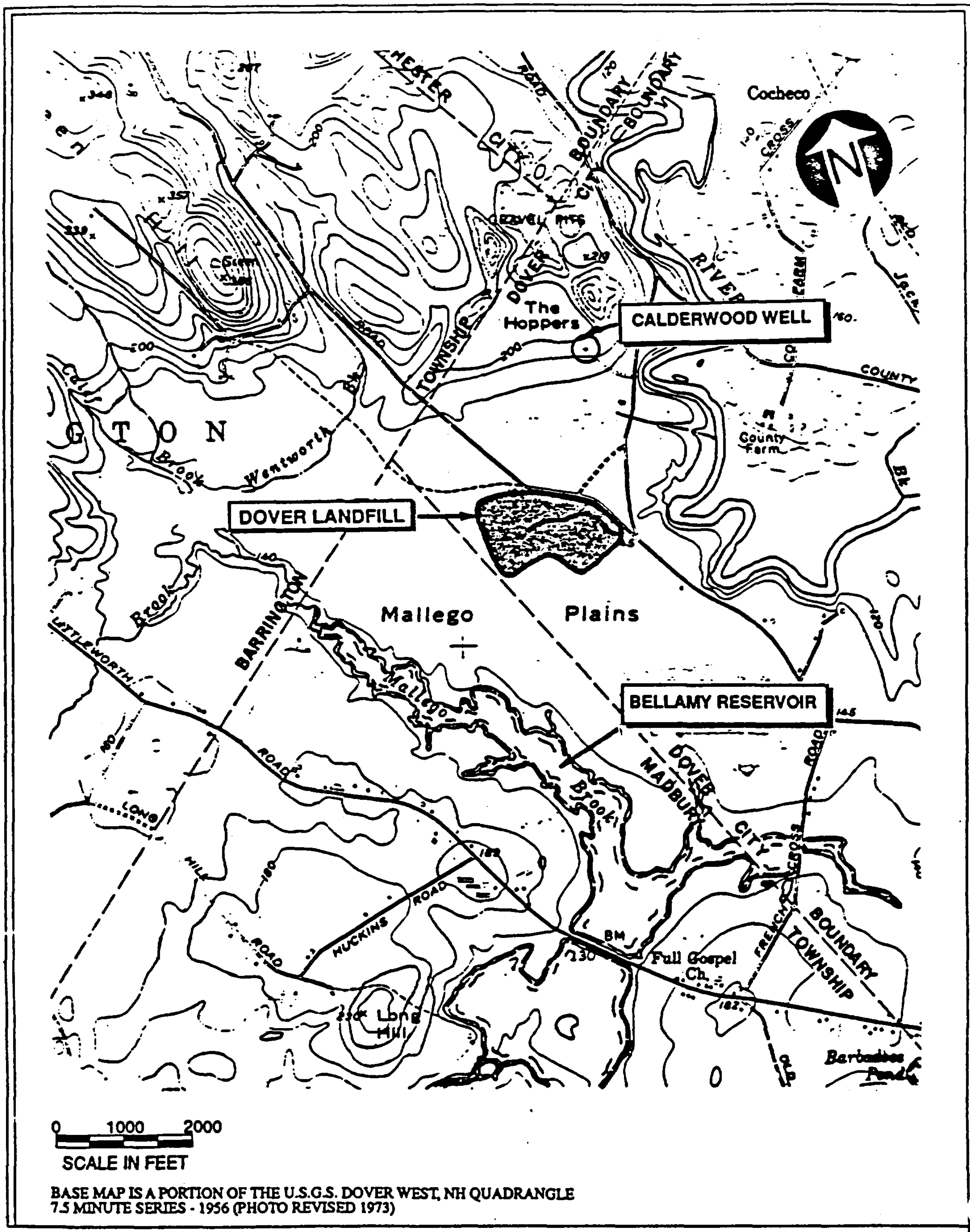


FIGURE 1
LOCATION OF DOVER LANDFILL SITE

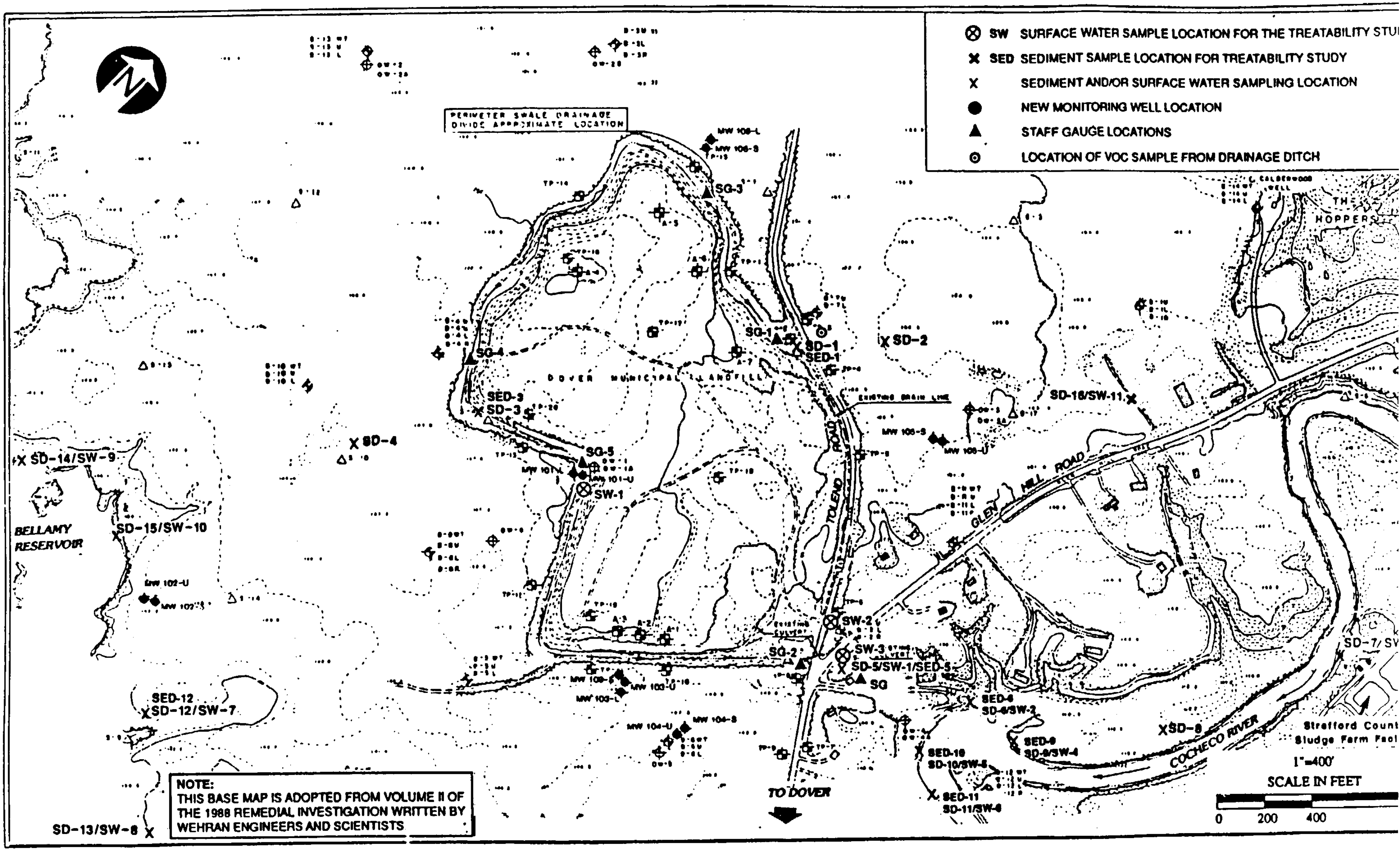


FIGURE 2
WETLANDS STUDY SAMPLING LOCATIONS FOR SEDIMENT AND SURFACE WATER

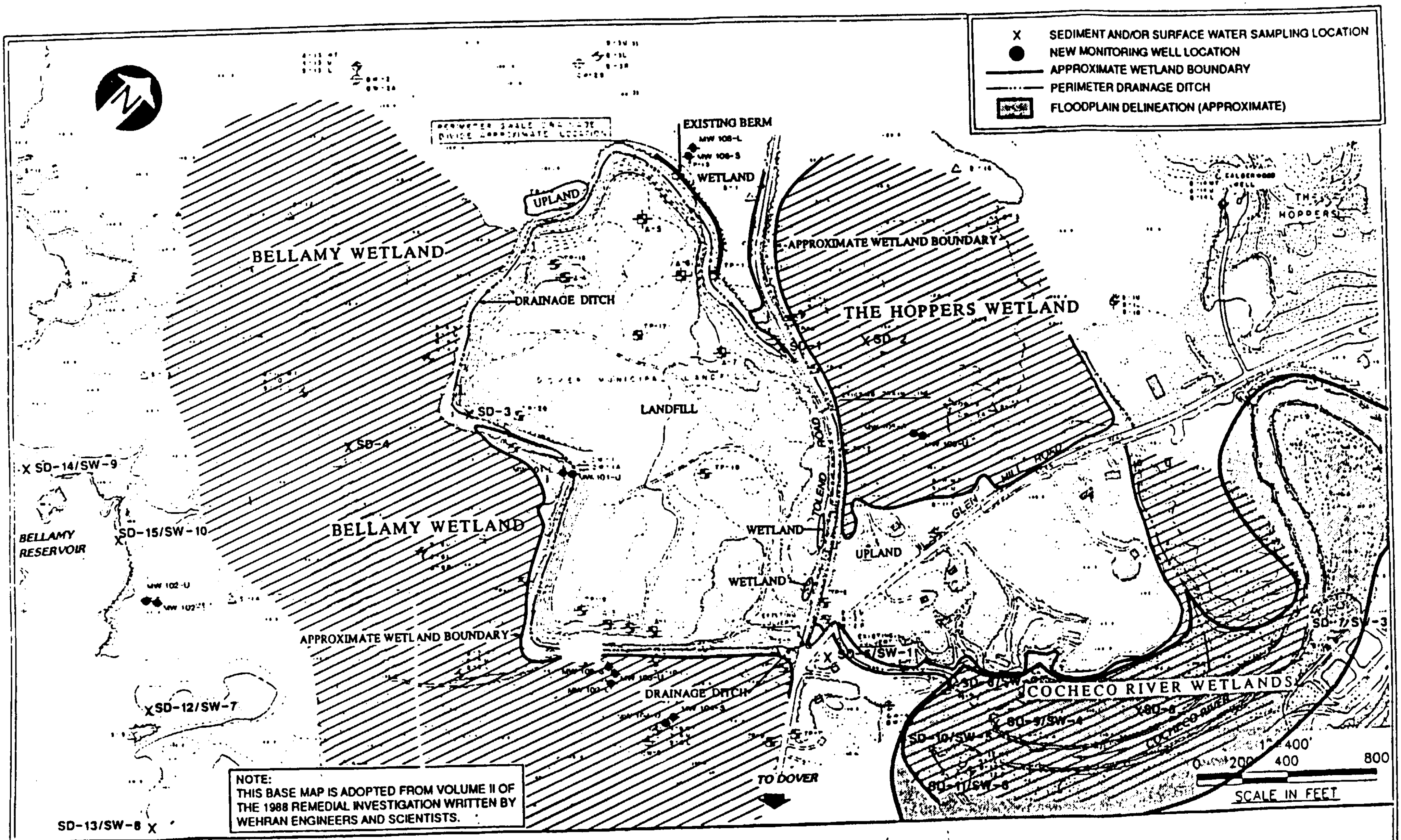


FIGURE 3

WETLANDS AND FLOOD PLAIN DELINEATION

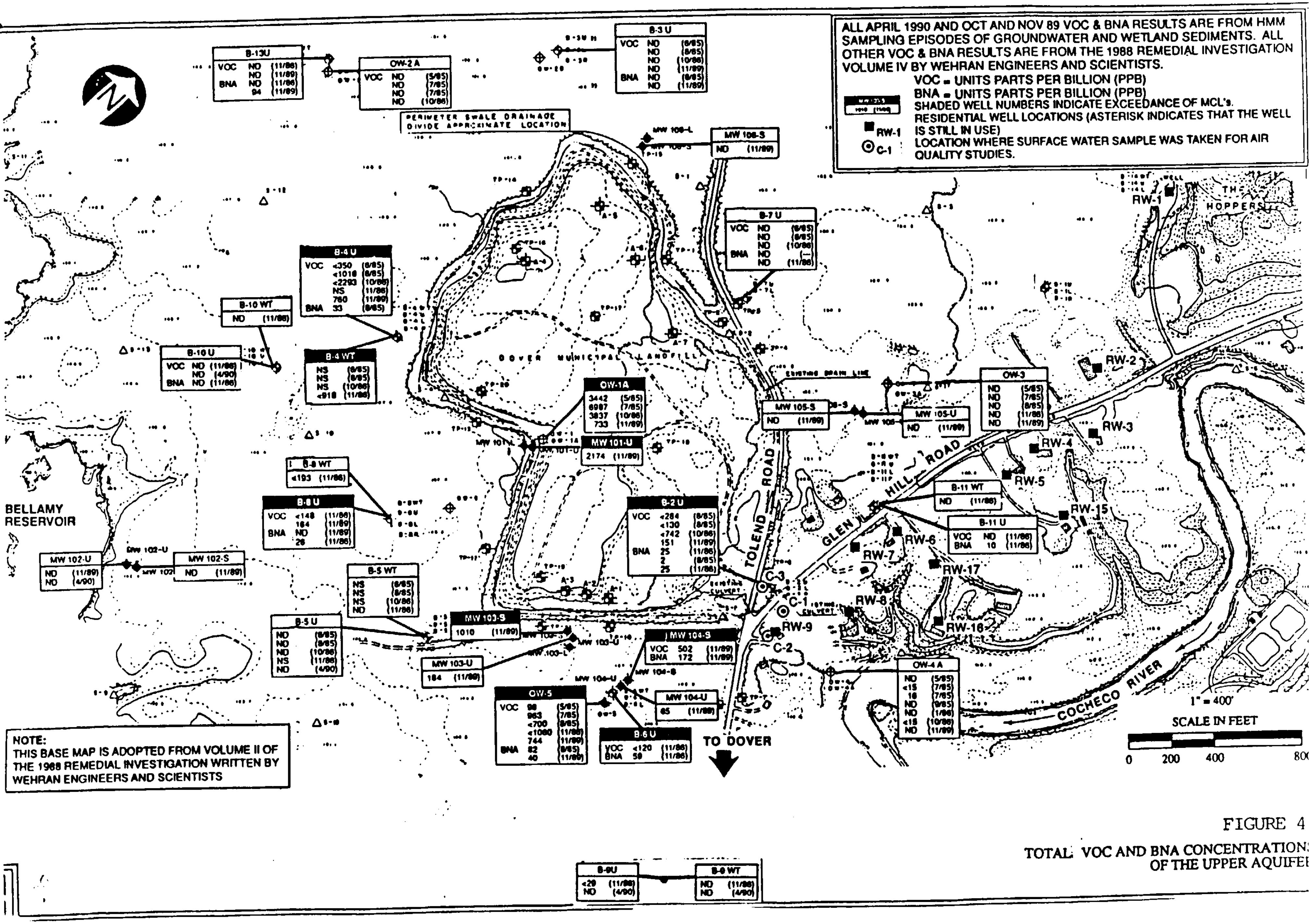


FIGURE 4

TOTAL VOC AND BNA CONCENTRATIONS OF THE UPPER AQUIFER

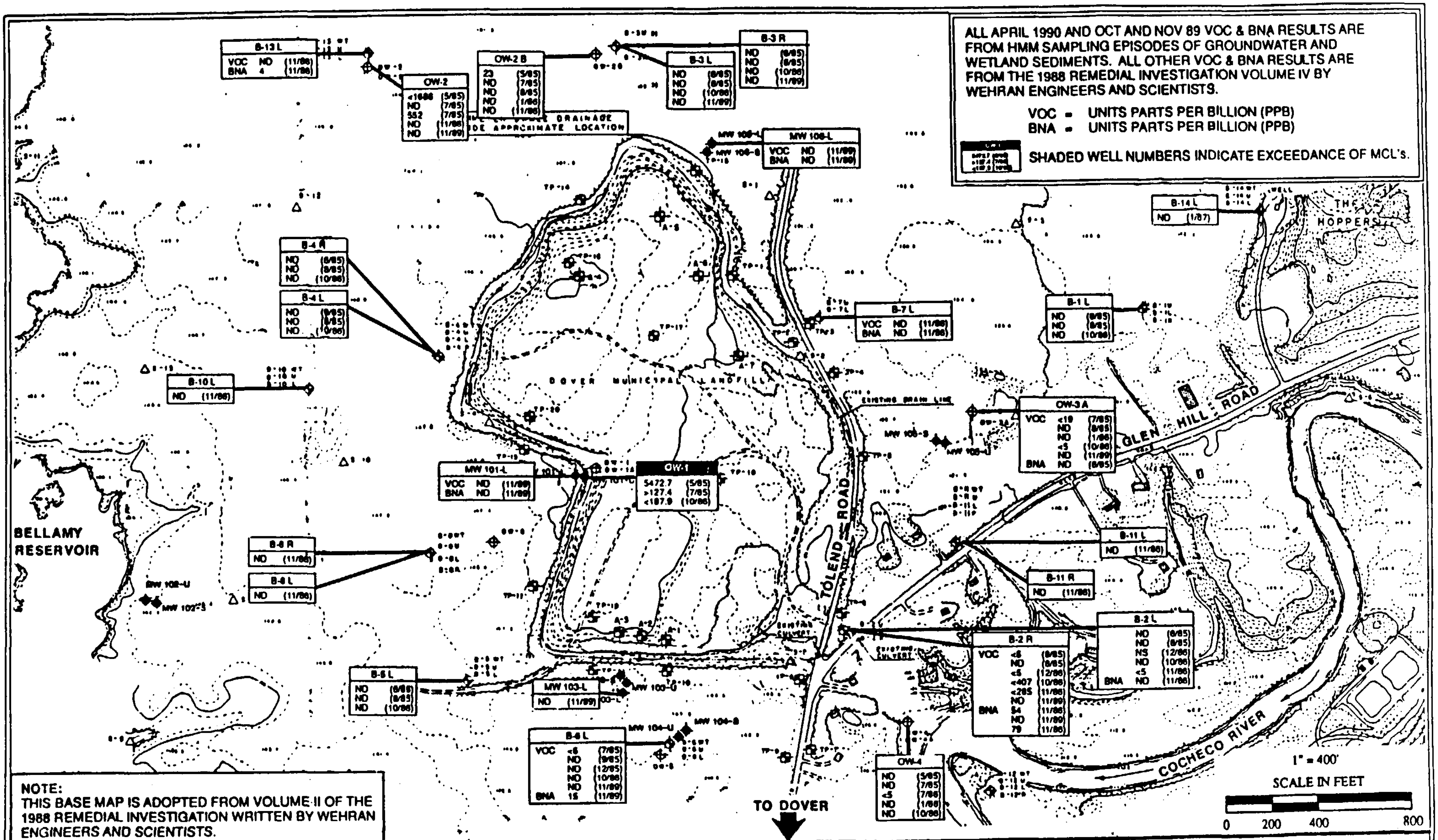


FIGURE 5
TOTAL VOC AND BNA CONCENTRATIONS OF THE LOWER AQUIFER

5

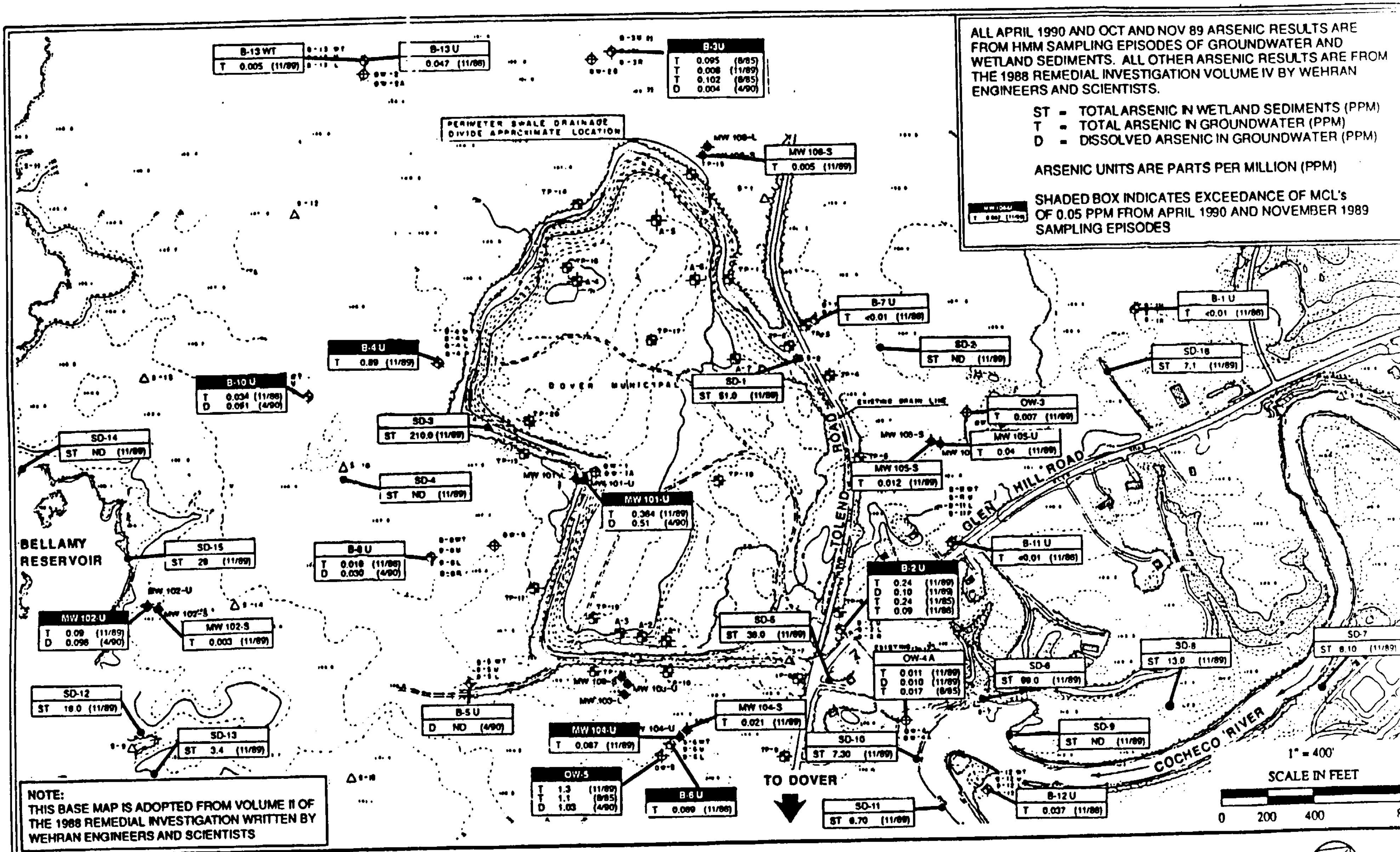
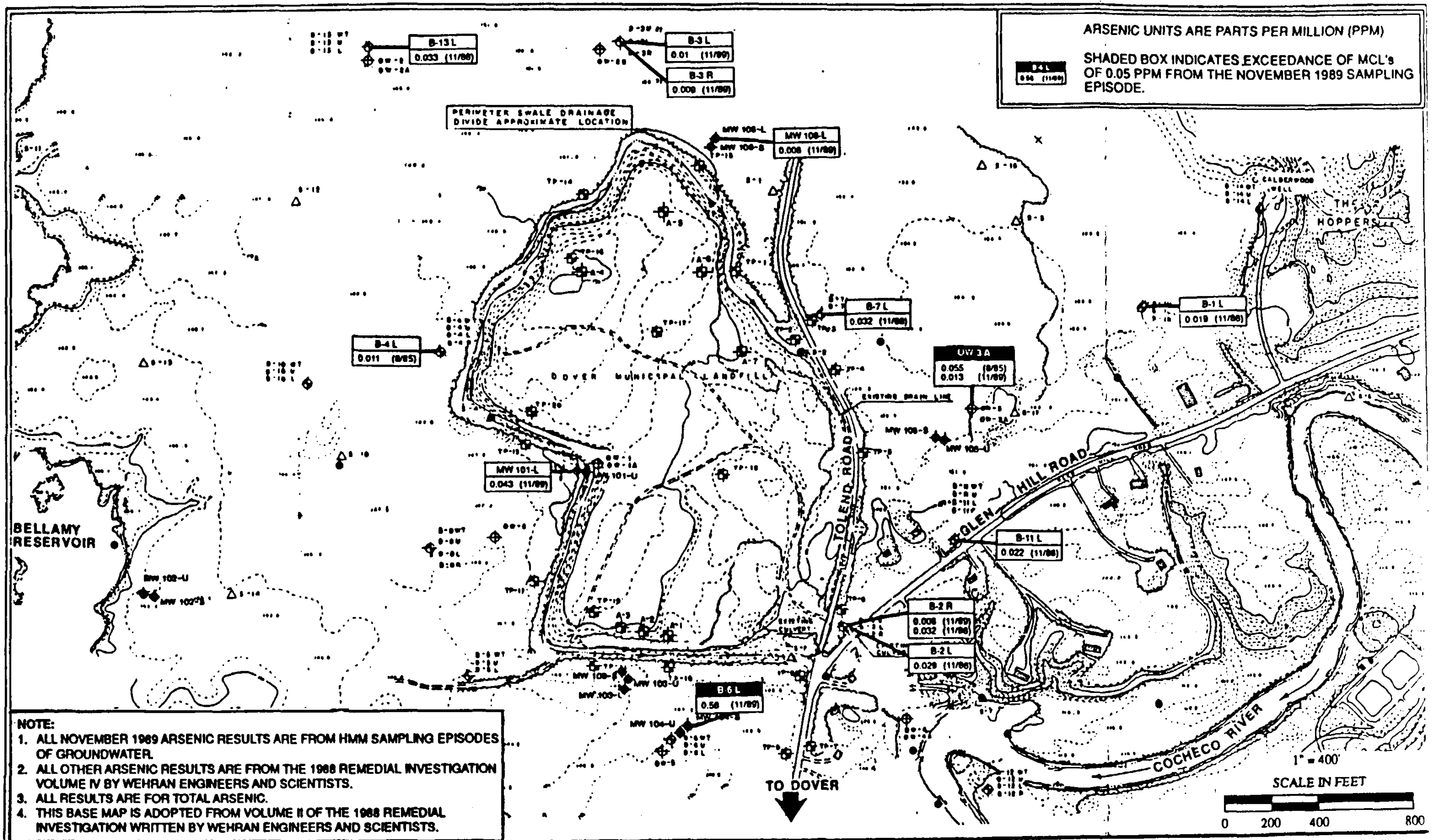


FIGURE 6

ARSENIC CONCENTRATIONS FROM THE UPPER AQUIFER AND WETLAND SEDIMENTS

hm m



NOTE:
1. ALL NOVEMBER 1989 ARSENIC RESULTS ARE FROM HMM SAMPLING EPISODES OF GROUNDWATER.
2. ALL OTHER ARSENIC RESULTS ARE FROM THE 1988 REMEDIAL INVESTIGATION VOLUME IV BY WEHRAN ENGINEERS AND SCIENTISTS.
3. ALL RESULTS ARE FOR TOTAL ARSENIC.
4. THIS BASE MAP IS ADOPTED FROM VOLUME II OF THE 1988 REMEDIAL INVESTIGATION WRITTEN BY WEHRAN ENGINEERS AND SCIENTISTS.

FIGURE 7

ARSENIC CONCENTRATIONS FROM THE LOWER AQUIFER

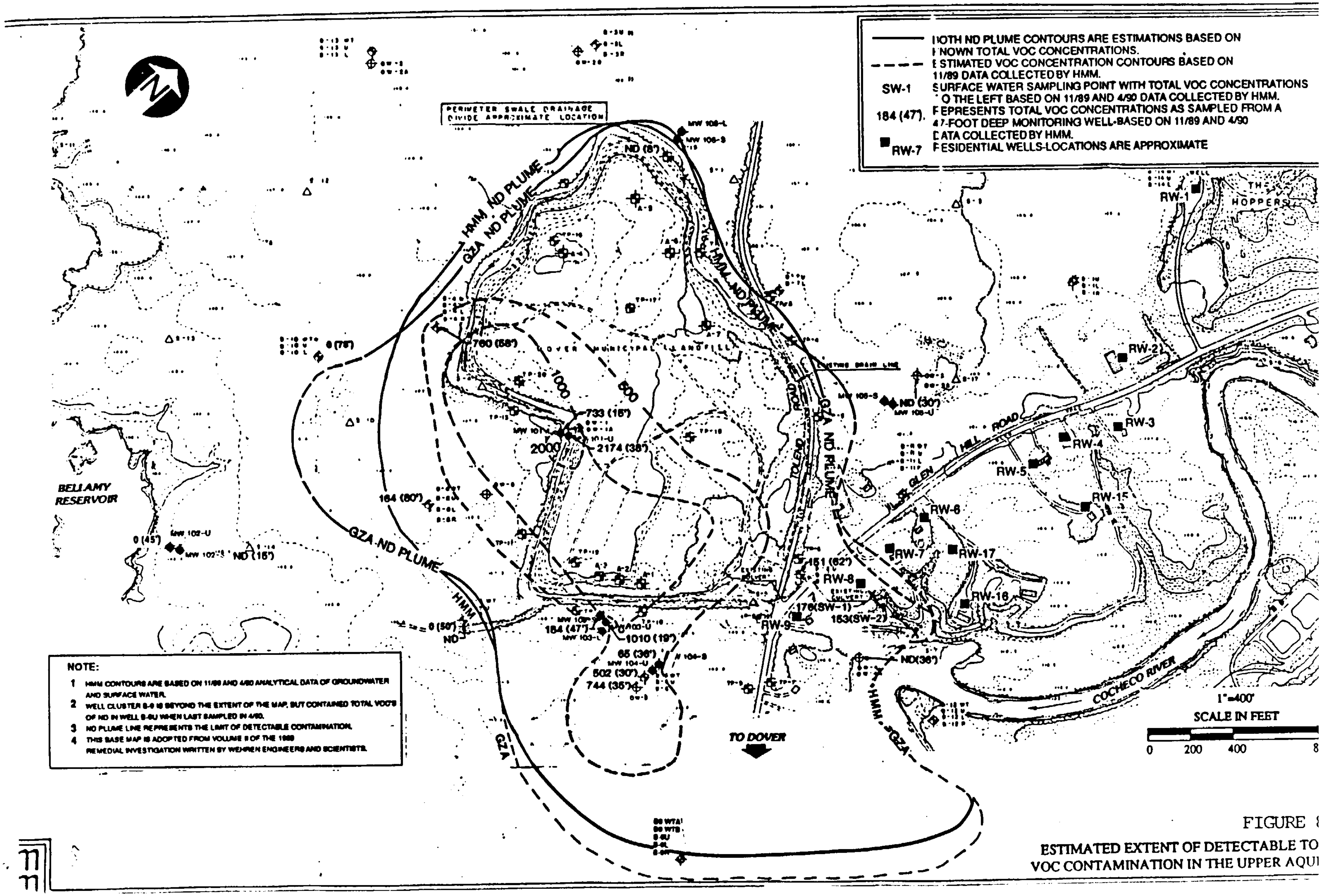


FIGURE 8

ESTIMATED EXTENT OF DETECTABLE TO[TAL]
VOC CONTAMINATION IN THE UPPER AQU[IFER]

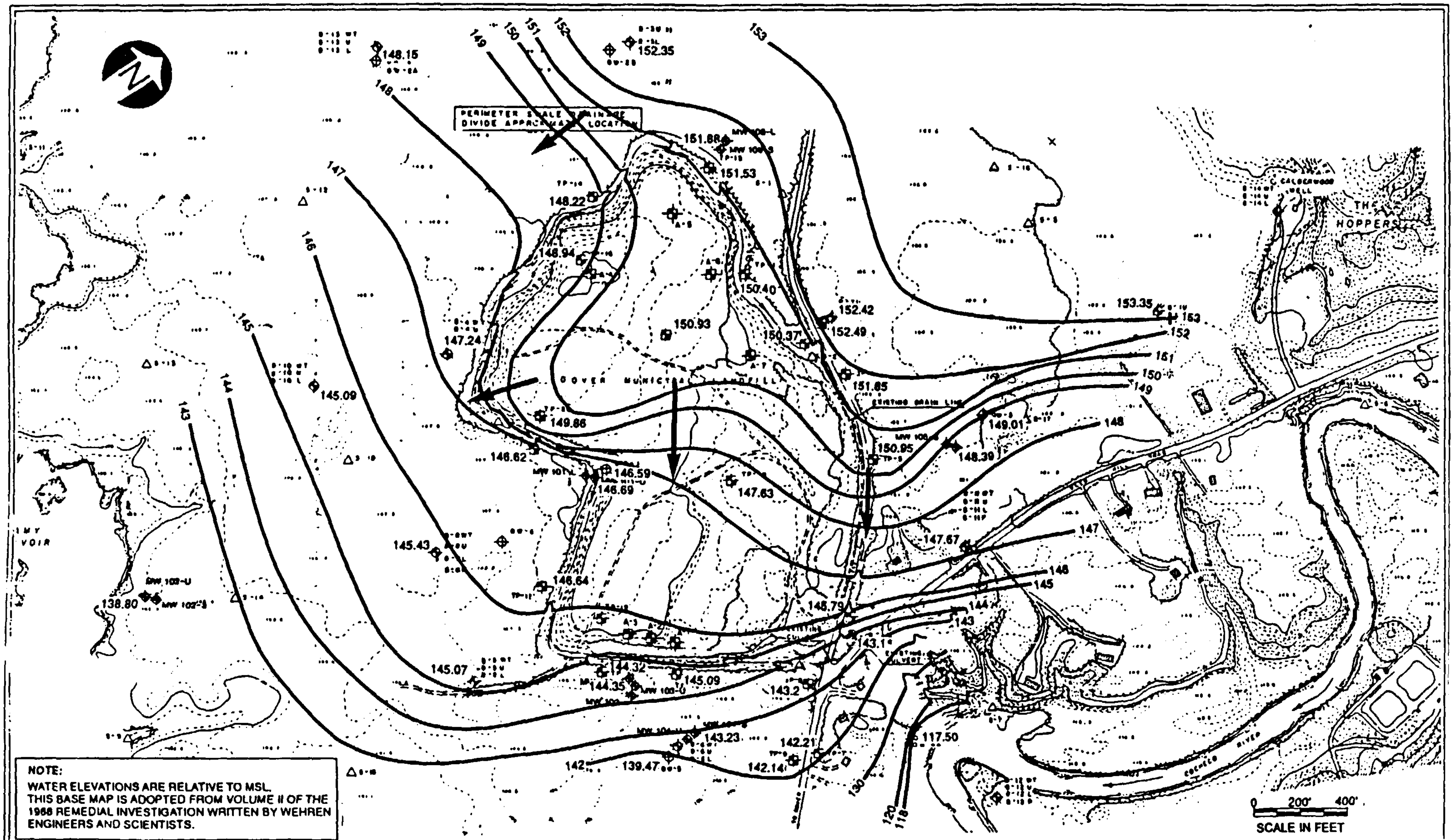


FIGURE 9

WATER ELEVATION CONTOUR MAP

MARCH, 1990 U R AQUIFER

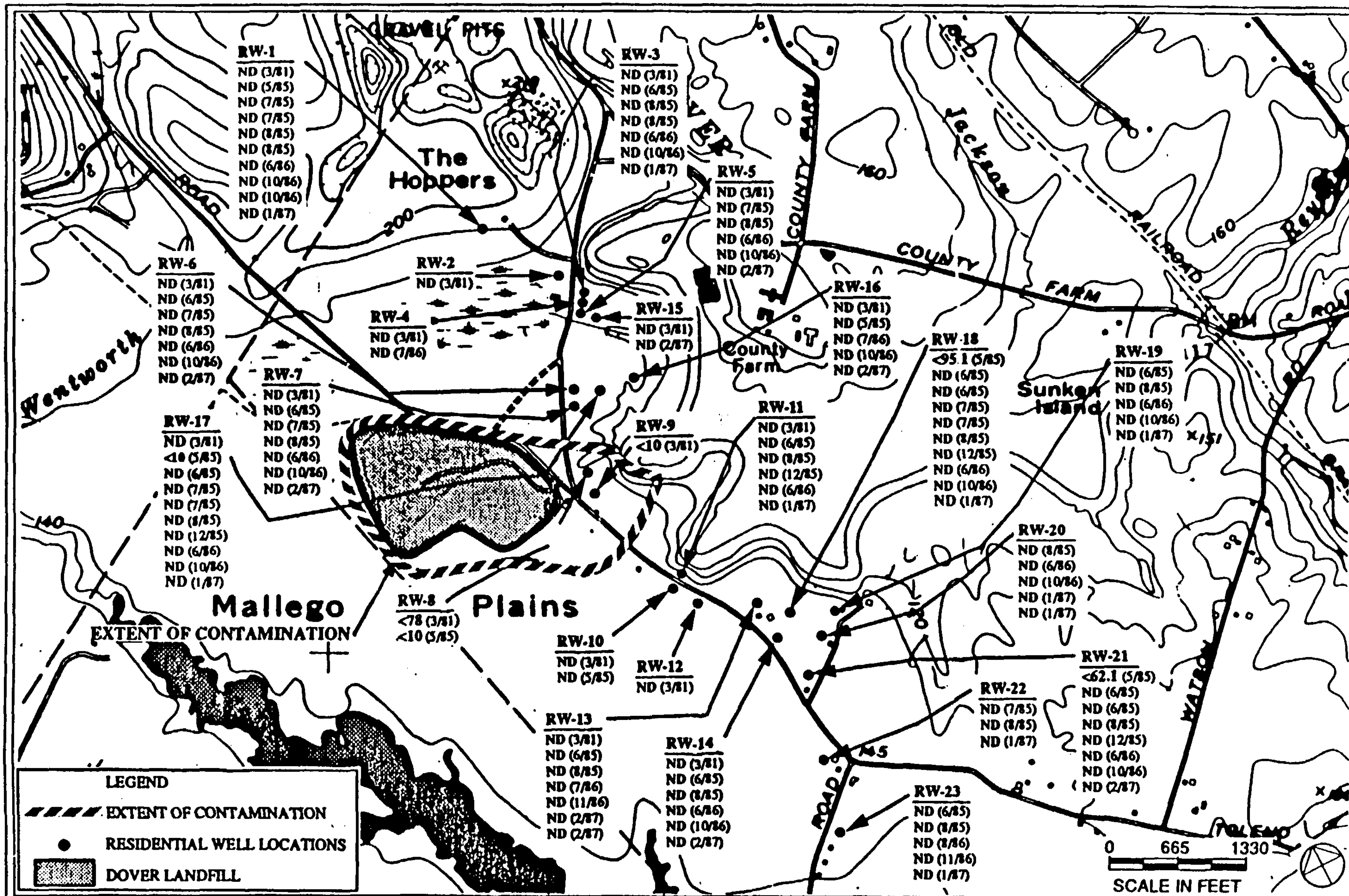
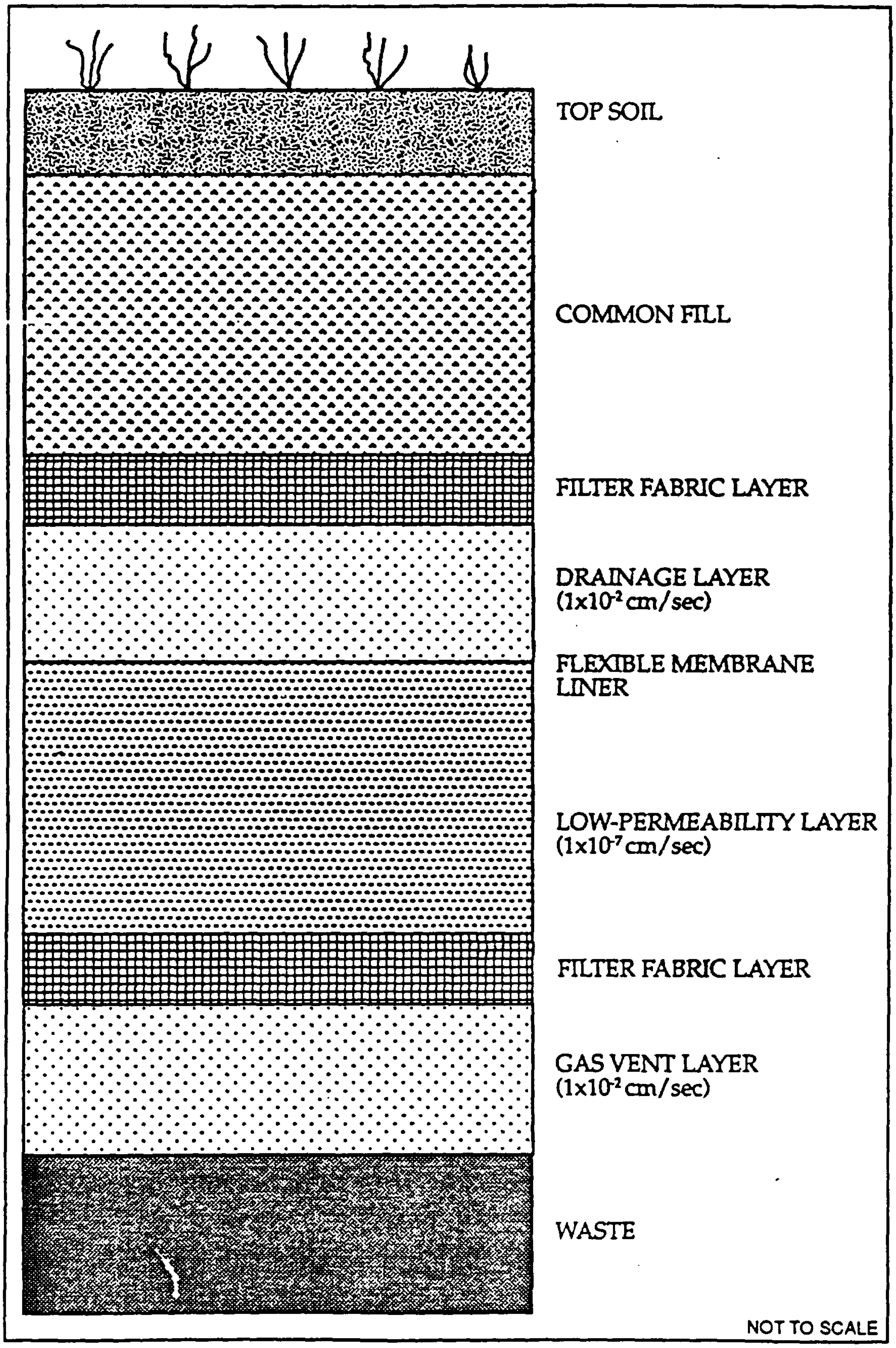


FIGURE 10

EXPANDED EXTENT OF CONTAMINATION PLUME AND RESIDENTIAL WELL WATER QUALITY

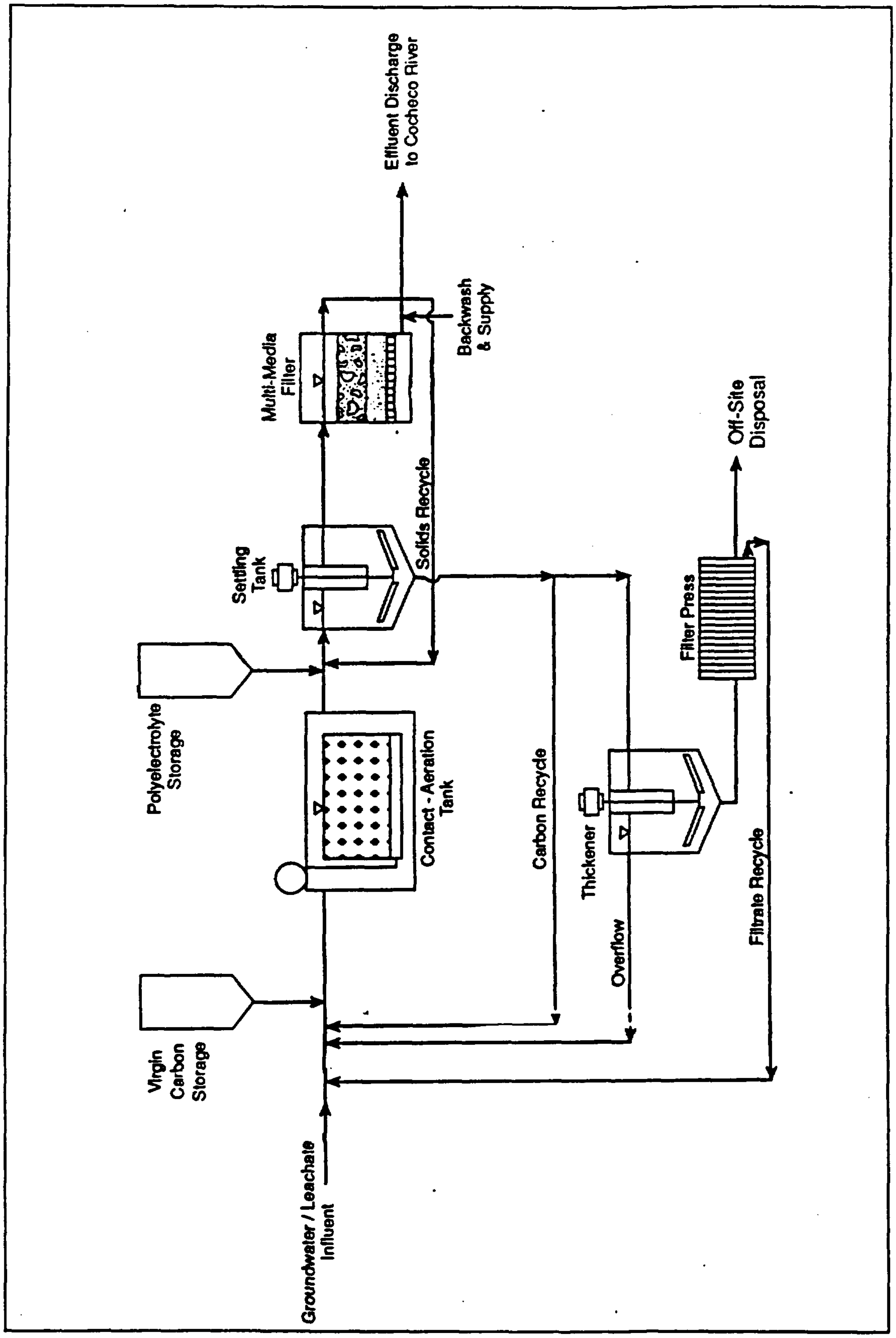
FIGURE 11

Typical Multi-layer Cap Cross Section



A91-167/C

FIGURE 12
Proposed Groundwater/Leachate Treatment
General Process Diagram



A91-167/B

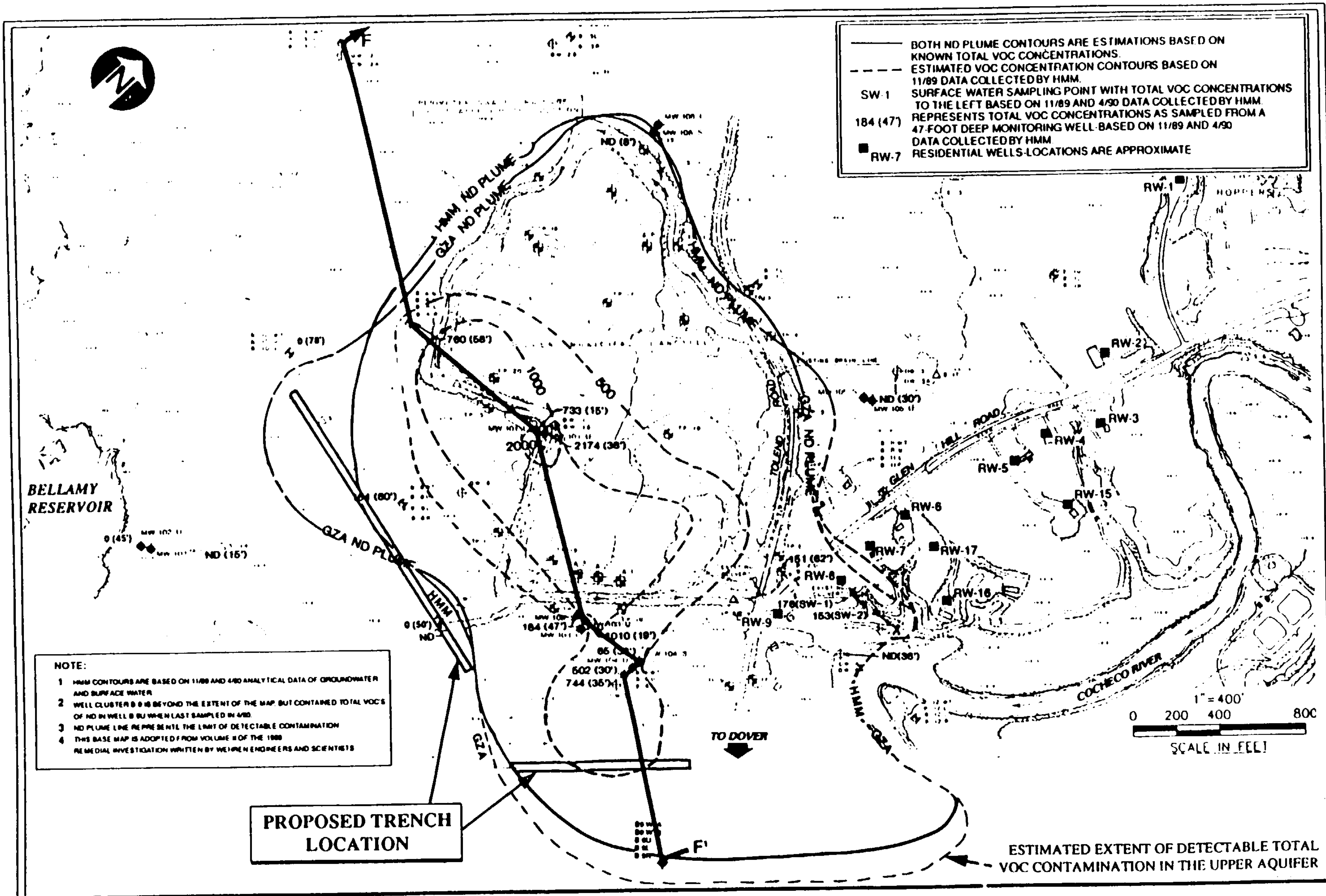


FIGURE 13
MM-3: CONCEPTUAL (OFF-SITE) GROUNDWATER INTERCEPTOR TRENCH LOCATION MAP

hm m

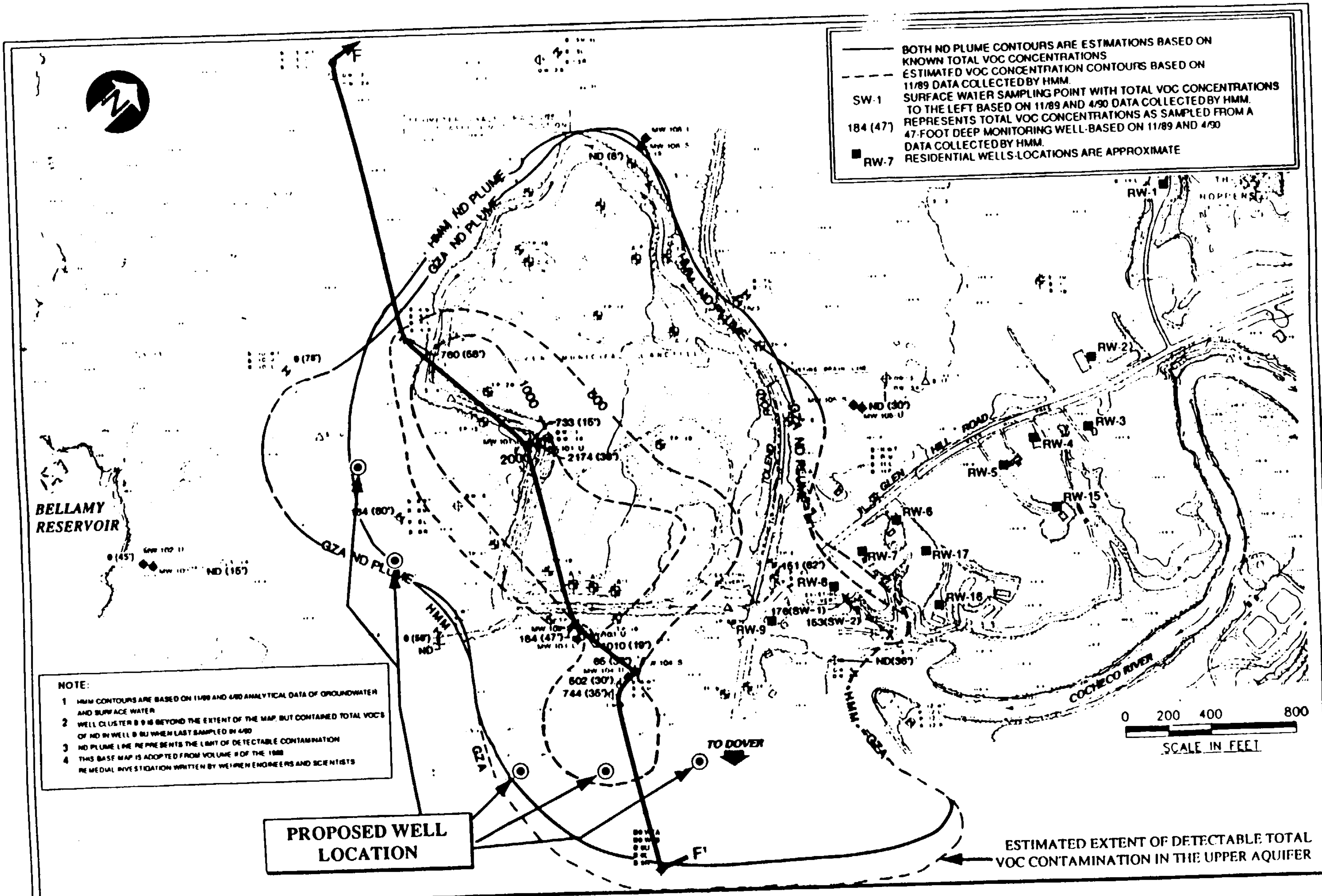


FIGURE 14
MM-4: CONCEPTUAL (OFF-SITE) GROUNDWATER EXTRACTION WELL LOCATION MAP

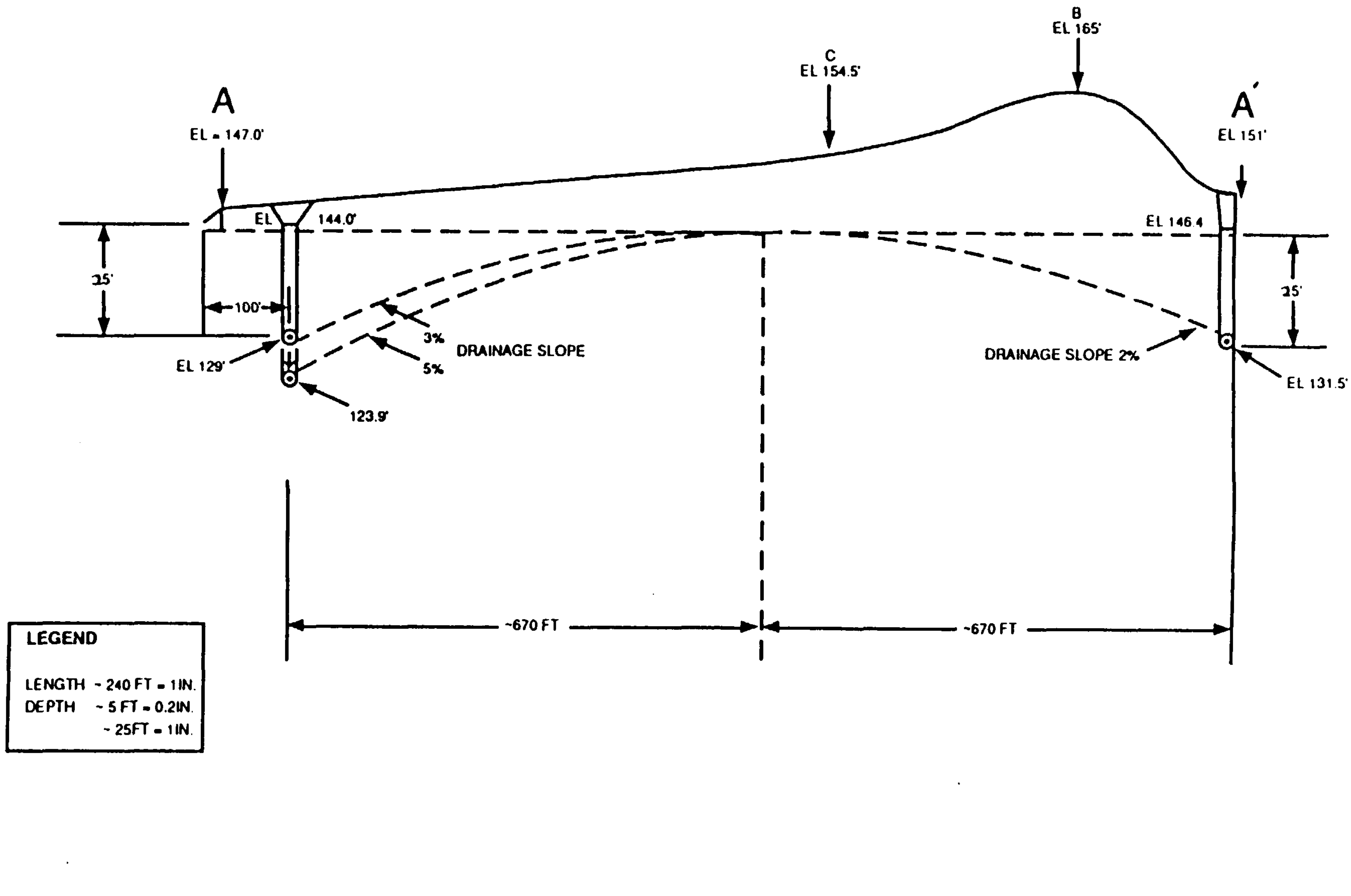


FIGURE 15
CONCEPTUAL GROUNDWATER DEPRESSION
INTERCEPTOR TRENCH

Appendix B

TABLES

TABLE 1
INDUSTRIAL WASTE SURVEY (1976-1977)
DOVER MUNICIPAL LANDFILL

Waste Material	Quantity/Year	Waste Material	Quantity/Year
Plastics	144 yd. & 57,200 lb.	Oil	6,260 gal.
Urethane foam	1,860 gal.	Ink	10 lb.
Paper	3,468 yd^3 & 30 tons	Lacquer	12 gal.**
Cardboard	1,548 yd^3 & 18 tons	Film developer	30 gal.**
Varnish	132 gal.	Hypocleaning agent	32.5 gal.**
Hydraulic oil	300 gal.	Glacial acetic acid	2 gal.**
Synthetic plastic	3,120 yd^3	Color stabilizer	15 gal.**
Leather trimmings	4,160 yd^3	Paper developer	6 gal.**
Fiberboard	1,872 yd^3	Kerosene	208 gal.
Wood	5 yd.	Wooden boxes	520 yd^3
Paint sludge	169,380 gal.	"Crepe trimming"	1,040 yd^3
Cement sludge	3 yd^3	Polyurethane foam	104 yd^3
Paint filters	16,432 ft^2	"PVC box filter"	12 yd^3
Plastersol	2,860*	Fabricated plastic	1,560 yd^3
Solvents	1,100 gal.	Galvanized steel	78 yd^3
MEK (Methyl Ethyl Ketone)	Unknown	Polyethylene	130,000 lb.
Triethanolamine	Unknown	Fiberglass	1,200 lb.
Isopropyl Alcohol	Unknown	Sawdust	204 yd^3
Diethylene glycol	Unknown	"Leather trim"	91.25 ton
Anhydrous butadiol	Unknown	"Chrome leather shavings	3,650 yd^3
Urethane elastomer	Unknown	"Chrome trim"	104 yd^3
Cutting Oil	500 gal.	Tanning sludge	78,000*
"Turco Vitroclean"	30 gal.	"Chem tan H"	156 lb.
"Turco 4432"	30 gal.	Leather scraps	5,200 yd^3
"Turco 4368"	30 gal.	Degreaser	600 gal.
"Witch Oil"	Unknown	Toluene	2,860 gal.
"Black Passiwater"	Unknown	Plating rinse	130 gal.
Xylol toluol	Unknown	Plating filter media	780 lb.
Spent hydrochloric acid	540 gal.	Paint thinner	Unknown
Tin	104 yd^3	Spent hydrofluoric acid	180 gal.
Emulsifier sludge	52 yd^3	Spent nitric acid	360 gal.
"Cellular crepee"	416 yd^3	Caustic soda	12,000 lb.
Latex cement sludge	130 yd^3	Mold wax	240 lb.
Leather	180 yd^3	Mold material	862 tons
Rubber	360 yd^3	Dust collection sludge	45,375 gal.

Notes:

1. Table 1 has been compiled from the "Remedial Action Master Plan, Dover Municipal Landfill, Dover, New Hampshire" prepared by NUS Corporation of Pittsburgh, Pennsylvania in September, 1983.

2. A total of 6,468 drums per year were noted in this New

Hampshire waste survey as being produced by these industries.

*	Unit not given
**	Sent to Dover Wastewater Treatment Plant. Ultimate disposal of wastewater sludge was the Dover Municipal Landfill.
"..."	Waste names obtained directly from New Hampshire survey.
Unknown	Exact composition unknown. Amounts produced per year were not listed in New Hampshire survey.

TABLE 2

Contaminants of Concern	Maximum Concentration ppb (ug/L)	Frequency of Detection RI (Wehran, 1988)	FES (HMM, 1991)
Acetone	130	6/10	3/10
Arsenic	1300	3/4	5/5
Benzene	80	6/10	6/10
Cadmium	0	ND	
Chloroethane	38	ND	2/10
1,1-Dichloroethylene	13	2/10	1/10
1,2-Dichloroethane	76.3	3/10	ND
Mercury	0	ND	1/5
Methylene Chloride	360	ND	1/10
Methyl Ethyl Ketone	230	6/10	2/10
Methyl Isobutyl Ketone	360	8/10	4/10
Tetrachloroethylene	6	1/10	1/10
Tetrahydrofuran	1707.5	9/10	NA
Toluene	470	9/10	9/10
Trichloroethylene	11	1/10	1/10
Vinyl Chloride	62	1/10	3/10

The table lists the maximum value of contamination found in selected monitoring wells during the FES activities except for two compounds. Data from the RI was used for tetrahydrofuran which was not analyzed for in the FES and 1,2-dichloroethane which was not detected in the FES.

TABLE -3

RISK ESTIMATES FOR USE OF GROUNDWATER IN THE AREA OF FUTURE DEVELOPMENT

Groundwater - Future Development
Ingestion of Drinking Water, Most-Probable Case

Compound	CONC MED ppm	2 LIT/ DAY	BODY WT kg	EXP CALC mg/kg/day	RfD VALUES mg/kg/day	CARCIN POTENCY (mg/kg/day)-1	RfD CALC	CARCIN CALC
Acetone	0.0235	2	70	6.71E-04	1.00E-01	NA	0.007	0.00E+00
Arsenic	0.3535	2	70	1.01E-02	1.00E-03	1.75E+00	10.100	1.77E-02
Benzene	0.0233	2	70	6.66E-04	NA	2.90E-02	0.000	1.93E-05
Cadmium	0	2	70	0.00E+00	5.00E-04	NA	0.000	0.00E+00
Chloroethane	0.006	2	70	1.71E-04	NA	1.30E-02	0.000	2.23E-06
1,1-Dichloroethylene	0.0013	2	70	3.71E-05	9.00E-03	6.00E-01	0.004	2.23E-05
1,2-Dichloroethane	0.0157	2	70	4.49E-04	NA	9.10E-02	0.000	4.08E-05
Mercury	0	2	70	0.00E+00	1.40E-03	NA	0.000	0.00E+00
Methylene Chloride	0.036	2	70	1.03E-03	6.00E-02	7.50E-03	0.017	7.71E-06
Methyl Ethyl Ketone	0.035	2	70	1.00E-03	5.00E-02	NA	0.020	0.00E+00
Methyl Isobutyl Ketone	0.0698	2	70	1.99E-03	5.00E-02	NA	0.040	0.00E+00
Tetrachloroethylene	0.0006	2	70	1.71E-05	1.00E-02	5.10E-02	0.002	8.74E-07
Tetrahydrofuran	0.429	2	70	1.23E-02	2.00E-03	NA	6.129	0.00E+00
Toluene	0.1094	2	70	3.13E-03	3.00E-01	NA	0.010	0.00E+00
Trichloroethylene	0.0011	2	70	3.14E-05	NA	1.10E-02	0.000	3.46E-07
Vinyl chloride	0.0131	2	70	3.74E-04	NA	2.30E+00	0.000	8.61E-04
Revised Risk							16.33	1.86E-02

Groundwater - Future Development
Ingestion of Drinking Water, Worst-Case

Compound	CONC MED ppm	2 LIT/ DAY	BODY WT kg	EXP CALC mg/kg/day	RfD VALUES mg/kg/day	CARCIN POTENCY (mg/kg/day)-1	RfD CALC	CARCIN CALC
Acetone	0.13	2	70	3.71E-03	1.00E-01	NA	0.037	0.00E+00
Arsenic	1.3	2	70	3.71E-02	1.00E-03	1.75E+00	37.143	6.50E-02
Benzene	0.08	2	70	2.29E-03	NA	2.90E-02	0.000	6.63E-05
Cadmium	0	2	70	0.00E+00	5.00E-04	NA	0.000	0.00E+00
Chloroethane	0.038	2	70	1.09E-03	NA	1.30E-02	0.000	1.41E-05
1,1-Dichloroethylene	0.013	2	70	3.71E-04	9.00E-03	6.00E-01	0.041	2.23E-04
1,2-Dichloroethane	0.0763	2	70	2.18E-03	NA	9.10E-02	0.000	1.98E-04
Mercury	0	2	70	0.00E+00	1.40E-03	NA	0.000	0.00E+00
Methylene Chloride	0.36	2	70	1.03E-02	6.00E-02	7.50E-03	0.171	7.71E-05
Methyl Ethyl Ketone	0.23	2	70	6.57E-03	5.00E-02	NA	0.131	0.00E+00
Methyl Isobutyl Ketone	0.36	2	70	1.03E-02	5.00E-02	NA	0.206	0.00E+00
Tetrachloroethylene	0.006	2	70	1.71E-04	1.00E-02	5.10E-02	0.017	8.74E-06
Tetrahydrofuran	1.7075	2	70	4.88E-02	2.00E-03	NA	24.393	0.00E+00
Toluene	0.47	2	70	1.34E-02	3.00E-01	NA	0.045	0.00E+00
Trichloroethylene	0.011	2	70	3.14E-04	NA	1.10E-02	0.000	3.46E-06
Vinyl chloride	0.062	2	70	1.77E-03	NA	2.30E+00	0.000	4.07E-03
Revised Risk							62.18	6.97E-02

NOTES:
Most-Probable Case utilizes the average contaminant concentration from all wells exhibiting VOC contamination in the FES .
Worst-Case utilizes the maximum contaminant concentration detected from wells exhibiting VOC contamination in the FES.
Exp Calc = Average Daily Dose of contaminant
RfD Value = Reference Dose for particular contaminant
Carcin Potency = Carcinogenic Potency of the particular contaminant, now known as the slope factor
RfD Calc = Non-Carcinogenic Risk Estimate
Carcin Calc = Carcinogenic Risk Estimate
NA = Not Available

TABLE 4
RISK ESTIMATES FOR FUTURE USE OF BELLAMY RESERVOIR

Surface Water - Bellamy Reservoir
Ingestion of Drinking Water
Most-Probable and Worst-Case

Compound	CONC MED ppm	2 LIT/ DAY	BODY WT kg	EXP CALC mg/kg/day	RfD VALUES mg/kg/day	CARCIN POTENCY (mg/kg/day)-1	RfD CALC	CARCIN CALC
Acetone	1.07E-04	2	70	3.06E-06	1.00E-01	NA	3.06E-05	0.00E+00
Arsenic	1.52E-04	2	70	4.34E-06	1.00E-03	1.75E+00	4.34E-03	7.60E-06
Benzene	8.90E-05	2	70	2.54E-06	NA	2.90E-02	0.00E+00	7.37E-08
Cadmium	0.00E+00	2	70	0.00E+00	5.00E-04	NA	0.00E+00	0.00E+00
Chloroethane	6.46E-05	2	70	1.85E-06	NA	1.30E-02	0.00E+00	2.40E-08
1,1-Dichloroethylene	0.00E+00	2	70	0.00E+00	9.00E-03	6.00E-01	0.00E+00	0.00E+00
1,2-Dichloroethane	8.60E-05	2	70	2.46E-06	NA	9.10E-02	0.00E+00	2.24E-07
Mercury	1.10E-06	2	70	3.14E-08	1.40E-03	NA	2.24E-05	0.00E+00
Methylene Chloride	0.00E+00	2	70	0.00E+00	6.00E-02	7.50E-03	0.00E+00	0.00E+00
Methyl Ethyl Ketone	1.60E-04	2	70	4.57E-06	5.00E-02	NA	9.14E-05	0.00E+00
Methyl Isobutyl Ketone	1.80E-03	2	70	5.14E-05	5.00E-02	NA	1.03E-03	0.00E+00
Tetrachloroethylene	0.00E+00	2	70	0.00E+00	1.00E-02	5.10E-02	0.00E+00	0.00E+00
Tetrahydrofuran	2.94E-03	2	70	8.40E-05	2.00E-03	NA	4.20E-02	0.00E+00
Toluene	3.56E-03	2	70	1.02E-04	3.00E-01	NA	3.39E-04	0.00E+00
ichloroethylene	0.00E+00	2	70	0.00E+00	NA	1.10E-02	0.00E+00	0.00E+00
Vinyl chloride	0.00E+00	2	70	0.00E+00	NA	2.30E+00	0.00E+00	0.00E+00
Revised Risk							4.79E-02	7.92E-06

NOTES:
Most-Probable Case and Worst-Case utilize the same contaminant concentration.
Exp Calc = Average Daily Dose of contaminant
RfD Value = Reference Dose for particular contaminant
Carcin Potency = Carcinogenic Potency of the particular contaminant, now known as the slope factor
RfD Calc = Non-Carcinogenic Risk Estimate
Carcin Calc = Carcinogenic Risk Estimate
NA = Not Available

TABLE -5
RISK ESTIMATES FOR INGESTION OF SURFACE WATER - COCHECO RIVER

rface Water - Cocheco River
gestion of Surface Water, Most Probable Case

ompound	CONC MED ppm	WATER INGEST L/event	# EVNT/ YEAR	TKF	365 DAYS YEAR	BODY WT kg	EXPOS DAY mg/kg/day	EXPOSE LIFE mg/kg/day	RfD VALUES mg/kg/day	CARCIN POTENCY (mg/kg/day)-1	RfD CALC	CARCIN CALC
cetone	5.99E-05	0.05	12	1	365	40	2.46E-09	3.51E-10	1.00E-01	NA	2.46E-08	0.00E+00
rsenic	6.00E-05	0.05	12	1	365	40	2.47E-09	3.52E-10	1.00E-03	1.75E+00	2.47E-06	6.16E-10
enzene	3.50E-05	0.05	12	1	365	40	1.44E-09	2.05E-10	NA	2.90E-02	0.00E+00	5.96E-12
admium	0	0.05	12	1	365	40	0.00E+00	0.00E+00	5.00E-04	NA	0.00E+00	0.00E+00
hloroethane	3.61E-05	0.05	12	1	365	40	1.48E-09	2.12E-10	NA	1.30E-02	0.00E+00	2.76E-12
,1-Dichloroethylene	0	0.05	12	1	365	40	0.00E+00	0.00E+00	9.00E-03	6.00E-01	0.00E+00	0.00E+00
,2-Dichloroethane	4.80E-05	0.05	12	1	365	40	1.97E-09	2.82E-10	NA	9.10E-02	0.00E+00	2.56E-11
ercury	4.00E-07	0.05	12	1	365	40	1.64E-11	2.35E-12	1.40E-03	NA	1.17E-08	0.00E+00
ethylene Chloride	0	0.05	12	1	365	40	0.00E+00	0.00E+00	6.00E-02	7.50E-03	0.00E+00	0.00E+00
ethyl Ethyl Ketone	9.00E-05	0.05	12	1	365	40	3.70E-09	5.28E-10	5.00E-02	NA	7.40E-08	0.00E+00
yl Isobutyl Keton	1.01E-03	0.05	12	1	365	40	4.15E-08	5.93E-09	5.00E-02	NA	8.30E-07	0.00E+00
trachloroethylene	0	0.05	12	1	365	40	0.00E+00	0.00E+00	1.00E-02	5.10E-02	0.00E+00	0.00E+00
Tetrahydrofuran	1.64E-03	0.05	12	1	365	40	6.74E-08	9.63E-09	2.00E-03	NA	3.37E-05	0.00E+00
Toluene	1.40E-03	0.05	12	1	365	40	5.75E-08	8.22E-09	3.00E-01	NA	1.92E-07	0.00E+00
Trichloroethylene	0	0.05	12	1	365	40	0.00E+00	0.00E+00	NA	1.10E-02	0.00E+00	0.00E+00
Vinyl chloride	0	0.05	12	1	365	40	0.00E+00	0.00E+00	NA	2.30E+00	0.00E+00	0.00E+00
Revised Risk											3.73E-05	6.51E-10

Surface Water - Cocheco River
Ingestion of Surface Water, Worst-Case

Compound	CONC MED ppm	WATER INGEST L/event	# EVNT/ YEAR	TKF	365 DAYS YEAR	BODY WT kg	EXPOS DAY mg/kg/day	EXPOSE LIFE mg/kg/day	RfD VALUES mg/kg/day	CARCIN POTENCY (mg/kg/day)-1	RfD CALC	CARCIN CALC
Acetone	5.99E-05	0.1	24	1	365	40	9.84E-09	1.41E-09	1.00E-01	NA	9.84E-08	0.00E+00
Arsenic	6.00E-05	0.1	24	1	365	40	9.86E-09	1.41E-09	1.00E-03	1.75E+00	9.86E-06	2.47E-09
Benzene	3.50E-05	0.1	24	1	365	40	5.75E-09	8.22E-10	NA	2.90E-02	0.00E+00	2.38E-11
Cadmium	0	0.1	24	1	365	40	0.00E+00	0.00E+00	5.00E-04	NA	0.00E+00	0.00E+00
Chloroethane	3.61E-05	0.1	24	1	365	40	5.93E-09	8.48E-10	NA	1.30E-02	0.00E+00	1.10E-11
1,1-Dichloroethylene	0	0.1	24	1	365	40	0.00E+00	0.00E+00	9.00E-03	6.00E-01	0.00E+00	0.00E+00
1,2-Dichloroethane	4.80E-05	0.1	24	1	365	40	7.89E-09	1.13E-09	NA	9.10E-02	0.00E+00	1.0[illegible]
Mercury	4.00E-07	0.1	24	1	365	40	6.58E-11	9.39E-12	1.40E-03	NA	4.70E-08	0.00E+00
Methylene Chloride	0	0.1	24	1	365	40	0.00E+00	0.00E+00	6.00E-02	7.50E-03	0.00E+00	0.00E+00
Methyl Ethyl Ketone	9.00E-05	0.1	24	1	365	40	1.48E-08	2.11E-09	5.00E-02	NA	2.96E-07	0.00E+00
Methyl Isobutyl Keton	1.01E-03	0.1	24	1	365	40	1.66E-07	2.37E-08	5.00E-02	NA	3.32E-06	0.00E+00
Tetrachloroethylene	0	0.1	24	1	365	40	0.00E+00	0.00E+00	1.00E-02	5.10E-02	0.00E+00	0.00E+00
Tetrahydrofuran	1.64E-03	0.1	24	1	365	40	2.70E-07	3.85E-08	2.00E-03	NA	1.35E-04	0.00E+00
Toluene	1.40E-03	0.1	24	1	365	40	2.30E-07	3.29E-08	3.00E-01	NA	7.67E-07	0.00E+00
Trichloroethylene	0	0.1	24	1	365	40	0.00E+00	0.00E+00	NA	1.10E-02	0.00E+00	0.00E+00
Vinyl chloride	0	0.1	24	1	365	40	0.00E+00	0.00E+00	NA	2.30E+00	0.00E+00	0.00E+00
Revised Risk											1.49E-04	2.60E-09

TABLE -6

RISK ESTIMATES FOR DERMAL CONTACT WITH SURFACE WATER - COCHECO RIVER

Surface Water - Cocheco River
Dermal Contact with Surface Water, Most Probable Case

Compounds	CONC MED ppm	1L/ 1000 cm^3	SKIN AREA cm2	HRS/ EVNT	PERM CONS cm/hr	# EVNT YR	365 DAYS YEAR	BDY WT kg	EXPOS DAY mg/kg/day	EXPOSE LIFE mg/kg/day	RfD VALUES mg/kg/day	CARC POTEN mg/kg/day-1	RfD CALC	CARCIN CALC
Acetone	5.99E-05	0.001	10000	1	8E-04	12	365	40	3.94E-10	5.62E-11	1.00E-01	NA	3.94E-09	0.00E+0C
Arsenic	6.00E-05	0.001	10000	1	8E-04	12	365	40	3.95E-10	5.64E-11	1.00E-03	1.75E+00	3.95E-07	9.86E-11
Benzene	3.50E-05	0.001	10000	1	0.041	12	365	40	1.18E-08	1.68E-09	NA	2.90E-02	0.00E+00	4.89E-11
Cadmium	0	0.001	10000	1	8E-04	12	365	40	0.00E+00	0.00E+00	5.00E-04	NA	0.00E+00	0.00E+00
Chloroethane	3.61E-05	0.001	10000	1	8E-04	12	365	40	2.37E-10	3.39E-11	NA	1.30E-02	0.00E+00	4.41E-13
1,1-Dichloroethyle	0	0.001	10000	1	8E-04	12	365	40	0.00E+00	0.00E+00	9.00E-03	6.00E-01	0.00E+00	0.00E+0C
1,2-Dichloroethane	4.80E-05	0.001	10000	1	8E-04	12	365	40	3.16E-10	4.51E-11	NA	9.10E-02	0.00E+00	4.10E-12
Mercury	4.00E-07	0.001	10000	1	8E-04	12	365	40	2.63E-12	3.76E-13	1.40E-03	NA	1.88E-09	0.00E+00
Methylene Chloride	0	0.001	10000	1	8E-04	12	365	40	0.00E+00	0.00E+00	6.00E-02	7.50E-03	0.00E+00	0.00E+00
Methyl Ethyl Keton	9.00E-05	0.001	10000	1	8E-04	12	365	40	5.92E-10	8.45E-11	5.00E-02	NA	1.18E-08	0.00E+00
Methyl Isobutyl Ke	1.01E-03	0.001	10000	1	8E-04	12	365	40	6.64E-09	9.49E-10	5.00E-02	NA	1.33E-07	0.00E+00
Tetrachloroethylen	0	0.001	10000	1	8E-04	12	365	40	0.00E+00	0.00E+00	1.00E-02	5.10E-02	0.00E+00	0.00E+00
Tetrahydrofuran	1.64E-03	0.001	10000	1	8E-04	12	365	40	1.08E-08	1.54E-09	2.00E-03	NA	5.39E-06	0.00E+00
Toluene	1.40E-03	0.001	10000	1	9E-04	12	365	40	1.04E-08	1.48E-09	3.00E-01	NA	3.45E-08	0.00E+00
Trichloroethylene	0	0.001	10000	1	8E-04	12	365	40	0.00E+00	0.00E+00	NA	1.10E-02	0.00E+00	0.00E+0C
Vinyl chloride	0	0.001	10000	1	8E-04	12	365	40	0.00E+00	0.00E+00	NA	2.30E+00	0.00E+00	0.00E+0C
Revised Risk													5.97E-06	1.52E-1C

Surface Water - Cocheco River
Dermal Contact with Surface Water, Worst-Case

Compounds	CONC MED ppm	1L/ 1000 cm^3	SKIN AREA cm2	HRS/ EVNT	PERM CONS cm/hr	# EVNT YR	365 DAYS YEAR	BODY WT kg	EXPOS DAY mg/kg/day	EXPOSE LIFE mg/kg/day	RfD VALUES mg/kg/day	CARC POTEN mg/kg/day-1	RfD CALC	CARCIN CALC
Acetone	5.99E-05	0.001	10000	2	8E-04	24	365	40	1.57E-09	2.25E-10	1.00E-01	NA	1.57E-08	0.00E+0C
Arsenic	6.00E-05	0.001	10000	2	8E-04	24	365	40	1.58E-09	2.25E-10	1.00E-03	1.75E+00	1.58E-06	3.95E-1C
Benzene	3.50E-05	0.001	10000	2	0.041	24	365	40	4.72E-08	6.74E-09	NA	2.90E-02	0.00E+00	1.95E-1C
Cadmium	0	0.001	10000	2	8E-04	24	365	40	0.00E+00	0.00E+00	5.00E-04	NA	0.00E+00	0.00E+0C
Chloroethane	3.61E-05	0.001	10000	2	8E-04	24	365	40	9.49E-10	1.36E-10	NA	1.30E-02	0.00E+00	1.76E-12
1,1-Dichloroethyle	0	0.001	10000	2	8E-04	24	365	40	0.00E+00	0.00E+00	9.00E-03	6.00E-01	0.00E+00	0.00E+00
1,2-Dichloroethane	4.80E-05	0.001	10000	2	8E-04	24	365	40	1.26E-09	1.80E-10	NA	9.10E-02	0.00E+00	1.64E-11
Mercury	4.00E-07	0.001	10000	2	8E-04	24	365	40	1.05E-11	1.50E-12	1.40E-03	NA	7.51E-09	0.00E+00
Methylene Chloride	0	0.001	10000	2	8E-04	24	365	40	0.00E+00	0.00E+00	6.00E-02	7.50E-03	0.00E+00	0.00E+00
Methyl Ethyl Keton	9.00E-05	0.001	10000	2	8E-04	24	365	40	2.37E-09	3.38E-10	5.00E-02	NA	4.73E-08	0.00E+00
Methyl Isob. Ket.	1.01E-03	0.001	10000	2	8E-04	24	365	40	2.66E-08	3.79E-09	5.00E-02	NA	5.31E-07	0.00E+00
Tetrachloroethylen	0	0.001	10000	2	8E-04	24	365	40	0.00E+00	0.00E+00	1.00E-02	5.10E-02	0.00E+00	0.00E+0C
Tetrahydrofuran	1.64E-03	0.001	10000	2	8E-04	24	365	40	4.31E-08	6.16E-09	2.00E-03	NA	2.16E-05	0.00E+0C
Toluene	1.40E-03	0.001	10000	2	9E-04	24	365	40	4.14E-08	5.92E-09	3.00E-01	NA	1.38E-07	0.00E+0C
Trichloroethylene	0	0.001	10000	2	8E-04	24	365	40	0.00E+00	0.00E+00	NA	1.10E-02	0.00E+00	0.00E+0C
Vinyl chloride	0	0.001	10000	2	8E-04	24	365	40	0.00E+00	0.00E+00	NA	2.30E+00	0.00E+00	0.00E+0C
Revised Risk													2.39E-05	6.08E-1C

TABLE -7

RISK ESTIMATES FOR DERMAL CONTACT WITH SURFACE WATER - SWALE

-·ace Water - Swale
erma. Contact, Most Probable Case

Compounds	CONC -MED ppm	1L/ 1000 cm^3	SKIN AREA cm2	HR/ EVT	PERM CONS cm/hr	# EVNT YR	365 DAYS YEAR	BDY WT kg	EXPOS DAY mg/kg/day	EXPOSE LIFE mg/kg/day	RfD VALUES mg/kg/day	CARC POTEN mg/kg/day-1	RfD CALC	CARCIN CALC
Acetone	0.0026	0.001	1800	1	8E-04	12	365	40	3.08E-09	4.40E-10	1.00E-01	NA	3.08E-08	0.00E+00
Arsenic	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	1.00E-03	1.75E+00	0.00E+00	0.00E+00
Benzene	0.0042	0.001	1800	1	0.041	12	365	40	2.55E-07	3.64E-08	NA	2.90E-02	0.00E+00	1.06E-09
Cadmium	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	5.00E-04	NA	0.00E+00	0.00E+00
Chloroethane	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	NA	1.30E-02	0.00E+00	0.00E+00
1,1-Dichloroethyle	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	9.00E-03	6.00E-01	0.00E+00	-0.00E+00
1,2-Dichloroethane	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	NA	9.10E-02	0.00E+00	0.00E+00
Mercury	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	1.40E-03	NA	0.00E+00	0.00E+00
Methylene Chloride	0.0031	0.001	1800	1	8E-04	12	365	40	3.67E-09	5.24E-10	6.00E-02	7.50E-03	6.12E-08	3.93E-12
Methyl Ethyl Keton	0.169	0.001	1800	1	8E-04	12	365	40	2.00E-07	2.86E-08	5.00E-02	NA	4.00E-06	0.00E+00
Methyl Iso. Ket.	0.0556	0.001	1800	1	8E-04	12	365	40	6.58E-08	9.40E-09	5.00E-02	NA	1.32E-06	0.00E+00
Tetrachloroethylen	0.001	0.001	1800	1	8E-04	12	365	40	1.18E-09	1.69E-10	1.00E-02	5.10E-02	1.18E-07	8.62E-12
Tetrahydrofuran	0.0273	0.001	1800	1	8E-04	12	365	40	3.23E-08	4.62E-09	2.00E-03	NA	1.62E-05	0.00E+00
Toluene	0.0314	0.001	1800	1	9E-04	12	365	40	4.18E-08	5.97E-09	3.00E-01	NA	1.39E-07	0.00E+00
Trichloroethylene	0.0065	0.001	1800	1	8E-04	12	365	40	7.69E-09	1.10E-09	NA	1.10E-02	0.00E+00	1.21E-11
Vinyl chloride	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	NA	2.30E+00	0.00E+00	0.00E+00
Revised Risk													2.18E-05	1.08E-09

Sur Water - Swale
Derma. Contact, Worst-Case

Compounds	CONC MED ppm	1L/ 1000 cm^3	SKIN AREA cm2	HR/ EVT	PERM CONS cm/hr	# EVNT YR	365 DAYS YEAR	BDY WT kg	EXPOS DAY mg/kg/day	EXPOSE LIFE mg/kg/day	RfD VALUES mg/kg/day	CARC POTEN mg/kg/day-1	RfD CALC	CARCIN CALC
Acetone	0.028	0.001	1800	1	8E-04	12	365	40	3.31E-08	4.73E-09	1.00E-01	NA	3.31E-07	0.00E+00
Arsenic	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	1.00E-03	1.75E+00	0.00E+00	0.00E+00
Benzene	0.013	0.001	1800	1	0.041	12	365	40	7.89E-07	1.13E-07	NA	2.90E-02	0.00E+00	3.27E-09
Cadmium	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	5.00E-04	NA	0.00E+00	0.00E+00
Chloroethane	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	NA	1.30E-02	0.00E+00	0.00E+00
1,1-Dichloroethyle	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	9.00E-03	6.00E-01	0.00E+00	0.00E+00
1,2-Dichloroethane	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	NA	9.10E-02	0.00E+00	0.00E+00
Mercury	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	1.40E-03	NA	0.00E+00	0.00E+00
Methylene Chloride	0.025	0.001	1800	1	8E-04	12	365	40	2.96E-08	4.23E-09	6.00E-02	7.50E-03	4.93E-07	3.17E-11
Methyl Ethyl Keton	0.784	0.001	1800	1	8E-04	12	365	40	9.28E-07	1.33E-07	5.00E-02	NA	1.86E-05	0.00E+00
Methyl Iso. Ket.	0.2138	0.001	1800	1	8E-04	12	365	40	2.53E-07	3.61E-08	5.00E-02	NA	5.06E-06	0.00E+00
Tetrachloroethylen	0.011	0.001	1800	1	8E-04	12	365	40	1.30E-08	1.86E-09	1.00E-02	5.10E-02	1.30E-06	9.49E-11
Tetrahydrofuran	0.074	0.001	1800	1	8E-04	12	365	40	8.76E-08	1.25E-08	2.00E-03	NA	4.38E-05	0.00E+00
Toluene	0.152	0.001	1800	1	9E-04	12	365	40	2.02E-07	2.89E-08	3.00E-01	NA	6.75E-07	0.00E+00
Trichloroethylene	0.0389	0.001	1800	1	8E-04	12	365	40	4.60E-08	6.58E-09	NA	1.10E-02	0.00E+00	7.23E-11
Vinyl chloride	0	0.001	1800	1	8E-04	12	365	40	0.00E+00	0.00E+00	NA	2.30E+00	0.00E+00	0.00E+00
Revised Risk													7.02E-05	3.47E-09

TABLE -8

RISK ESTIMATES FOR INGESTION AND DERMAL CONTACT

WITH SEDIMENTS - SWALE

Sediment - Swale
Soil Ingestion and Dermal Contact, Most-Probable Case

Compounds	CONC MED ppm	SOIL INGEST mg/event	SKIN AREA cm2/evnt	EXP events/ year	SOIL CONT mg/cm2	TKF-DA 10%	TKF-DA 100%	1.00E+06 mg/kg	BDY WT kg	365 DAYS YEAR	INGEST CALC mg/kg/day	DERMAL CALC mg/kg/day	LIFE INGEST mg/kg/day	LIFE DERMAL mg/kg/day	RfD VALUES mg/kg/day	CARCIN POTEN mg/kg/day-1
Acetone	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	1.00E-01	NA
Arsenic	79.5	50	1000	30	0.51	0.01	0.5	1.00E+06	40	365	4.08E-06	8.33E-07	5.83E-07	1.19E-07	1.00E-03	1.75E+00
Benzene	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	2.90E-02
Cadmium	7.6	50	1000	30	0.51	0.17	1	1.00E+06	40	365	7.81E-07	1.35E-06	1.12E-07	1.934E-07	5.00E-04	NA
Chloroethane	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	1.30E-02
1,1-Dichloroethylene	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	9.00E-03	6.00E-01
1,2-Dichloroethane	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	9.10E-02
Mercury	0.01	50	1000	30	0.51	0.1	1	1.00E+06	40	365	1.03E-09	1.05E-09	1.47E-10	1.497E-10	1.40E-03	NA
Methylene Chloride	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	6.00E-02	7.50E-03
Methyl Ethyl Ketone	0.283	50	1000	30	0.51	0.25	1	1.00E+06	40	365	2.91E-08	7.41E-08	4.15E-09	1.059E-08	5.00E-02	NA
Methyl Isobutyl Keton	0	50	1000	30	0.51	0.2[illegible]	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	5.00E-02	NA
Tetrachloroethylene	0	50	1000	30	0.51	0.[illegible]	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	1.00E-02	5.10E-02
Tetrahydrofuran	0	50	1000	30	0.51	0.[illegible]	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	2.00E-03	NA
Toluene	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	3.00E-01	NA
Trichloroethylene	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	1.10E-02
Vinyl chloride	0	50	1000	30	0.51	0.25	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	2.30E+00

Compounds	INGEST RfD CALC	INGEST CAR CAL	DERMAL RfD CALC	DERMAL CAR CAL
Acetone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	4.08E-03	1.02E-06	8.33E-04	2.08E-07
Benzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	1.56E-03	0.00E+00	2.71E-03	0.00E+00
Chloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	7.34E-07	0.00E+00	7.49E-07	0.00E+00
Methylene Chloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl Ethyl Ketone	5.82E-07	0.00E+00	1.48E-06	0.00E+00
Methyl Isobutyl Keton	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tetrahydrofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl chloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Revised Risk	5.65E-03	1.02E-06	3.54E-03	2.08E-07

TABLE -8 (Cont'd)

RISK ESTIMATES FOR INGESTION AND DERMAL CONTACT WITH SEDIMENTS - SWALE

Sediment - Swale
Soil Ingestion and Dermal Contact, Worst-Case

Compounds	CONC MED ppm	SOIL INGEST mg/event	SKIN AREA cm2/evnt	EXP events/ year	SOIL CONT mg/cm2	TKF-DA 10%	TKF-DA 100%	1.00E+06 mg/kg	BDY WT kg	365 DAYS YEAR	INGEST CALC mg/kg/day	DERMAL CALC mg/kg/day	LIFE INGEST mg/kg/day	LIFE DERMAL mg/kg/day	RfD VALUES mg/kg/day	CARCIN POTEN mg/kg/day-1
Acetone	0	250	4000	90	1.5	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	1.00E-01	NA
Arsenic	210 (140)	250	4000	90	0.51	0.05	1	1.00E+06	40	365	2.16E-04	8.80E-05	3.08E-05	1.258E-05	1.00E-03	1.75E+00
Benzene	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	2.90E-02
Cadmium	12	250	4000	90	0.51	0.8	1	1.00E+06	40	365	1.85E-05	1.21E-04	2.64E-06	1.725E-05	5.00E-04	NA
Chloroethane	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	1.30E-02
1,1-Dichloroethylene	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	9.00E-03	6.00E-01
1,2-Dichloroethane	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	9.10E-02
Mercury	0.02	250	4000	90	0.51	0.5	1	1.00E+06	40	365	3.08E-08	1.26E-07	4.40E-09	1.796E-08	1.40E-03	NA
Methylene Chloride	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	6.00E-02	7.50E-03
Methyl Ethyl Ketone	1.7	250	4000	90	0.51	0.5	1	1.00E+06	40	365	2.62E-06	1.07E-05	3.74E-07	1.527E-06	5.00E-02	NA
Methyl Isobutyl Keton	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	5.00E-02	NA
Tetrachloroethylene	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	1.00E-02	5.10E-02
Tetrahydrofuran	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	2.00E-03	NA
Toluene	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	3.00E-01	NA
Trichloroethylene	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	1.10E-02
Vinyl chloride	0	250	4000	90	0.51	0.5	1	1.00E+06	40	365	0.00E+00	0.00E+00	0	0	NA	2.30E+00

Compounds	INGEST RfD CALC	INGEST CAR CAL	DERMAL RfD CALC	DERMAL CAR CAL
Acetone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	→ 2.16E-01	5.39E-05	8.80E-02	2.20E-05 ←
Benzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	3.70E-02	0.00E+00	2.41E-01	0.00E+00
Chloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	2.20E-05	0.00E+00	8.98E-05	0.00E+00
Methylene Chloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl Ethyl Ketone	5.24E-05	0.00E+00	2.14E-04	0.00E+00
Methyl Isobutyl Keton	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tetrahydrofuran	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl chloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Revised Risk	2.53E-01	5.39E-05	3.30E-01	2.20E-05

TABLE 9
CURRENT PROPOSED (DRAFT) INDUSTRIAL DISCHARGE PRETREATMENT REQUIREMENTS FOR THE DOVER WASTEWATER TREATMENT FACILITY[1]

Parameter (Units)	Discharge Limit - Industrial Discharge
Physical Parameters	
Flow	Determined on a case-by-case basis, and contingent upon sewer line capacity
pH	6.5 - 11.0
Temperature (°F/°C)	150/65
Color	No deeply staining dyes
Chemical Parameters	
Total Solids (mg/l) - Avg./Max.	1,200/3,000
Total Volatile Solids (% of total)	---
Total Suspended Solids (mg/l) - Avg./Max.	400/847
Total Dissolved Solids (mg/l) - Avg./Max.	600/1,500
Settable Solids (mg/l)	30
Acidity	---
Alkalinity (mg/l as $CaCO_3$)	75
5-Day BOD (mg/l)	300 (BOD - 791 mg/l)
COD	---
Oil and Grease (mg/l)	100
Petroleum Soils in Wastewater (mg/l)	25
Chloride as C1 (mg/l)	500
Sulfate as 904 (mg/l)	250
Sulfites (mg/l)	2.0
Sulfide as 9 (mg/l)	0.1
Arsenic (mg/l)	.400
Beryllium (mg/l)	2.0
Boron (mg/l)	0.1
Cadmium (mg/l)	0.020
Chromium (Total) (mg/l)	4.03
Chromium (Hexavalent) (mg/l)	1.75
Copper (mg/l)	0.2
Lead (mg/l)	.606
Mercury (mg/l)	0.004
Nickel (mg/l)	1.07
Selenium (mg/l)	8.55
Silver (mg/l)	.713
Chlorides (mg/l)	500
Cyanides (mg/l)	.363
Phenols (mg/l)	182
Total Toxic Organics (mg/l)	5.0
Zinc (mg/l)	4.33

1. Proposed Pretreatment Standards are draft as of April, 1990, (updated based on new operating permits as of November, 1991).

APPENDIX C

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE
CINCINNATI, OHIO 45268

May 3, 1990

SUBJECT: Provisional RfD for Tetrahydrofuran (THF)

FROM: Pei-Fung Hurst
Biologist
Chemical Mixtures Assessment Branch

TO: Rodger Duart
U.S EPA
Region I

THRU: W. Bruce Peirano
Acting Chief
Chemical Mixture Assessment Branch

This memo is a draft response to your request for an oral assessment of the toxicity of tetrahydrofuran (THF) for the Mottolo NPL site. Although an oral RfD for THF was prepared and presented to the RfD Work Group on 01/28/87, it was not verified and was placed under review until a complete translation of the critical study (Katahira, 1982), published in Japanese, could be obtained. (An inhalation RfD for THF, based upon this same study, has been verified on 1/19/90.) Consequentially, ECAO has obtained a full translation of the Katahira (1982) study and based an interim oral RfD for THF of 0.002 mg/kg/day upon this data. Below is a summary of the Katahira (1982) study and oral RfD computations.

Male SD rats (11-12/group) were exposed to 0, 100, 200, 1000 or 5000 ppm (0, 295, 590,2449, or 14,744 mg/m^3) 4 hr/day, 5 day/week for 12 weeks. Rats exposed to 100 or 200 ppm had no effects other than redness about the eyes and nose. Increased levels of SGOT, indicative of liver damage, were observed in the rats exposed to 1000 ppm. Rats exposed to 5000 ppm had marked local irritation (edema or opacity of the cornea, salivation, discharge or bleeding from the nose), morphologically defined damage to the respiratory mucosa, significant alterations in blood counts and blood sugar, increased levels of SGOT, SGPT, and bilirubin and CNS effects (clonic muscle spasms, coma, cataleptoid posture). The rise in SGOT levels was dose related. Although a statistically significant increase in SGOT levels in rats exposed to 200 ppm is indicated in a table presented in the publication, the author only notes that increased serum enzyme changes were observed in the two highest exposure levels. There were no changes in relative or absolute organ weights and no histopathological alterations in the brain, lungs, liver, spleen, kidneys or femur were detected in the exposed animals. Thus, the NOAEL for liver effects is 200 ppm, which is equivalent to an oral dose of 22 mg/kg/day. Application of an uncertainty factor of 10,000 (10 for use of a subchronic study; 10 for interspecies extrapolation. 10 for intraspecies variability, and 10 to account for the limited database) to the NOAEL yields an oral RfD of 0.002 mg/kg/day.

Conversion factors: 4 hr/24 hr, 5 day/7 day, 0.223 mg/m^3 rat inhalation rate, 0.35 kg rat body weight, 0.5 absorption factor (i.e. 590 mg/m^3 x 4 hr/24 hr x 5 day/7 day x 0.223 m^3/day x 1/0.35 kg x 0.5 = 22.4 mg/kg/day.

Although, this study did not find definitive evidence of liver damage, other studies have shown that the liver is a target organ. Katahira (1982) cites that other studies have reported liver damage in cats and rats following inhalation, intravenous, or intramedullary injection (Lehmann and Flury, 1943; Okhumra, 1958; Jochmann, 1961).

Liver effects (centrilobular cytomegaly) were observed in mice exposed to 5000 ppm THF 6 hr/day, 5 day/week for 13 weeks. Liver effects were not observed in rats in this study; however, acanthosis and supportive inflammation of the forestomach was observed in rats exposed to 5000 ppm (Grumbien, 1988)

Critical Studies:

Katahira, T. 1982. [Experimental studies on the toxicity of tetrahydrofuran]. Osaka Shiritsu Daugaku Igaku Zasshi 31;221-239. (Japanese)

Grumbein, S. 1988. 13-Week subchronic toxicity test by inhalation of tetrahydrofuran in Fisher 344 rats and B6C3F1 mice. Pathology Working Group Chairperson's Report. Submitted to National Toxicology Program, Research Triangle Park, NC.

Please note that the number derived is an interim number and ECAO is seeking further review of this assessment. We will forward any additional information to you as soon as it is available. Should you desire any additional information, do not hesitate to call me at FTS 684-7300

cc: C. DeRosa (ECAO-Cin)
S. Levinson (Region I)
B. Means (OS-230)
T. O'Bryan (OS-230)
S. Sokol (Balson Environmental Consulting)

U.S. ENVIRONMENTAL PROTECTION AGENCY
J.F.K. FEDERAL BUILDING
BOSTON, MA 02203

Date: December 21, 1990

Subj: Mottolo Site Feasibility Study

From: Maureen R. McClelland, Environmental Scientist
Ground Water Management and Water Supply Branch

To: Roger Duwart, R.P.M.
New Hampshire

I have reviewed the Mottolo Site Feasibility Study and have the following comments for clarification/revision.

I. In regards to setting a TCL for tetrahydrafuran: The US EPA approach to analyzing systemic toxicity data follow general format set forth by NRC in its description of the risk assessment process. The determination of the presence of risk and potential magnitude is made during the risk assessment process which consists of hazard identification, dose response assessment and risk characterization.

In general the Rfd is an estimate with uncertainty spanning perhaps an order of magnitude of a daily exposure to the human population including sensitive subgroups that are likely to be without an appreciable risk of deleterious effects during a lifetime.

Having been appraised by the risk assessor that a potential risk exists, the risk manager considers control options available under existing statutes and other relevant non risk factors (e.g. benefits to be gained and costs to be incurred). All of these considerations go into the determination of a TCL.

Therefore, use of a conservative, oral Rfd of 2.0×10^{-2} mg/kg/day calculated with an uncertainty factor of 1,000 (adjusted one order of magnitude) results in a action level of 0.77 mg/l for THF, a level considered to be protective of public health.

II. pg.2-12 ...within the EPA acceptable hazard index range of 1 to 10.

Comments: The EPA does not use a range of 1 to 10 for the hazard index. EPA policy is a hazard index less than or equal to one is acceptable.

APPENDIX D

State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES
WASTE MANAGEMENT DIVISION
6 Hazen Drive, Concord, NH 03301-6509
603-271-2900
TTY/TDD 225-4033

ROBERT W. VARNEY
COMMISSIONER

PHILIP J. O'BRIEN, Ph.D
DIRECTOR

MICHAEL A. SILLS, Ph.D., P.E.
CHIEF ENGINEER

September 9, 1991

Julie Belaga
Regional Administrator
USEPA, Region I
JFK Federal Building
Boston, MA 02203

**Re: Record of Decision
Dover Landfill Site
Dover, New Hampshire**

Dear Administrator Belaga:

The New Hampshire Department of Environmental Services (DES) acting as agent for the State of New Hampshire has reviewed the above referenced draft Record of Decision and offers the following comments:

Source Control:

DES concurs with the source control measures selected by EPA including capping, installation of an upgradient groundwater diversion trench and the construction of a source leachate extraction and treatment system. These elements are consistent with DES policy.

Cap:

DES concurs with EPA's selection of a double impermeable layer cap in this instance. Such a cap reflects state of the art engineering practice required to insure cap integrity and longevity both of which are of critical importance due to (a) the presence of relatively high concentrations of hazardous contaminants; (b) the proximity of potential receptors; and, (c) the critical assumption of cap integrity as it relates to the proposed control of migration methods to be commented upon below.

Eastern Contaminant Plume Management:

DES concurs with EPA's decision to allow for natural attenuation of the eastern plume which is migrating toward the Cocheco River. This remedy affords protection of the Cocheco in that New Hampshire surface water quality standards will be met.

Environmental Services
Waste Management Division

Southern Contaminant Plume Management:

DES is reserving it concurrence on that portion of the remedy which addresses the southern plume until the pre-design studies as described on page 60 of the ROD are completed.

Sincerely,

Philip J. O'Brien, Ph.D.
Director
Waste Management Division

Robert W. Varney
Commissioner
Department of Environmental Services

PJO/kki/WPP#151

cc: Carl W. Baxter, P.E., NHDES-WMEB
Richard H. Pease, P.E., NHDES-WMEB
Paul Currier, P.E., NHDES-WSPCD
Jeffrey A. Meyers, Esq., NHDOJ-AGO
Daniel Coughlin, P.E., USEPA, Region I
Cheryl Sprague, USEPA, Region I

APPENDIX E

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
STATE - NH Admin. Code ENV-Ws 403 Wastewater Discharge Permits	Relevant and Appropriate	Establishes effluent monitoring system for all industrial wastewater discharges to surface waters and sets general standards for maintaining water quality.	While no permits will be required under these regulations, discharge of water from the treatment systems will meet the general substantive standards of this regulation. In addition, all discharges will be monitored in accordance with this regulation.
STATE - NH Admin. Code ENV-A Part 1002 Fugitive Dust Control	Applicable	Requires precautions to prevent, abate and control fugitive dust during specified activities, including excavation, construction and bulk hauling.	Mitigative measures will be taken to control fugitive dust released during recontouring and other remedial activities.
STATE - NH Admin. Code ENV-A Part 1204 Control of VOC Emissions	Relevant and Appropriate	Specifies VOC emission control methods and establishes limitations on VOC emissions for various industries.	Any air emissions from the capped Landfill or the TSD facility will be controlled in accordance with current requirements. No emissions of VOC's above current state standards will be allowed.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
STATE - NH Admin. Code Saf-C-600 NH Department of Safety Rules for Transport of Hazardous Materials	Applicable	Identifies procedures for properly identifying, handling and shipping hazardous materials, identifies notification and manifesting procedures which must be followed.	Any on-site hazardous waste which must be shipped off-site will be packaged, labelled and shipped in accordance with this requirement.
STATE - NH Admin. Code ENV - Ws 410.05 Groundwater Protection	TBC	Prohibits discharge of hazardous waste to groundwater, or any discharge to groundwater that would result in a violation of surface water quality in adjacent surface waters. Also, groundwater cannot be altered so as to make it unsuitable for drinking.	State groundwater protection standards will be attained at and beyond the point of compliance at the completion of the remedy. In addition, any treatment system which discharges into surface waters and any activities conducted in the wetlands will be consistent with the maintenance or improvement of groundwater quality at and beyond the point of compliance. All remedial activities affecting the groundwater and surface water will be conducted so as to protect the Class A waters of the Bellamy Reservoir.
STATE - RSA 485-A:12 and NH Admin. Code ENV-Ws Parts 430-437 Surface Water Classification	Applicable	Prohibits the disposal of wastes in any manner that would lower the quality of surface water below the minimum requirements of its surface water classification.	Discharges into the Cocheco River and wetlands from the treatment systems will meet the most stringent criteria associated with the classifications of these water bodies. In addition, all remedial activities will be consistent with protecting the Class A waters of the Bellamy Reservoir.
STATE - RSA 495-A:17 and NH Admin. Code ENV-Ws 415 Terrain Alteration	Applicable	Establishes criteria for any activity that significantly alters the terrain.	Criteria identified in this regulation will be addressed during recontouring and capping of the Landfill and during any on-site construction and/or remediation activities. Mitigative measures will be employed to minimize impacts to the wetlands. Once all construction activities have been completed all impacted wetlands will be restored to their original state or an area of equal dimensions will be created on adjacent land.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
STATE - RSA 485-A:5 WS Part 904 Standards for Pretreatment of Wastes Discharged to Publically Owned Treatment Works (POTW)	Applicable	Sets general pretreatment standards for discharge to a POTW.	Any discharges to the POTW from treatment facilities will comply with these general pretreatment standards as well as any local POTW pretreatment standards.
STATE - NH Admin. Code Chapter ENV-A 800 Testing and Monitoring Procedures	Applicable	Identifies procedures which must be followed for the testing of air emissions from stationary sources.	If the on-site TSD facility emits air contaminants, appropriate testing will be conducted to determine the levels of these contaminants.
STATE - NH Admin. Code Chapter ENV-A 900 Owner or Operator Obligations	Applicable	Owners or operators of sources which discharge air pollutants in measureable levels must retain records of the operation of the source feed stock input to the source and all available emission data. Section 902 of the regulation identifies instances (temporary failure of air pollution equipment) when the owner or operator of an air pollutant discharge source may be allowed to temporarily exceed the air discharge limits established by the State Air Board. Section 903 of the regulation requires that the owner or operator of a source which has had a compliance schedule established for their source (schedule set by State Air Board to bring air discharges from source in line with permit requirements), must comply with the schedule.	Provided that data indicates that pollutants may be readily calculated or estimated, records of air discharges from the various on-site sources will be collected and maintained in accordance with this regulation. Air pollution control device process upsets will be recorded in accordance with the appropriate requirements.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
STATE - He-P Ch. 1905.08(d)(6) a, b Monitoring of Hazardous Waste Treatment Facilities	Relevant and Appropriate	Requirements for installation and operation of one or more of the following monitoring systems: • Groundwater monitoring network. • Air emission monitoring network. • Leachate monitoring network.	Periodic monitoring of groundwater and surface water will be required in order to determine changes in site conditions and the migration of the contaminant plume. Air monitoring for workers' health and safety will be conducted during these periodic monitoring rounds.
STATE - He-P Ch. 1905.08(f)(2)(a) Additional Technical Standards - Treatment Standards	Relevant and Appropriate	General requirements for selection of treatment methods. Treatment method must accomplish one or more of the following objectives: • Render the waste non-hazardous; • Render the waste safe for handling and transport; • Make the waste amenable for recovery or reuse; • Render the waste more amenable to long-term storage or; • Reduce the volume of the hazardous waste.	These state hazardous waste treatment standards will govern the selection of the treatment technology to be determined during remedial design; that technology will comply with one or more of these standards.
STATE - He-P Ch. 1905.08 (f)(2)(c) Storage Standards	Applicable	Establishes requirements to ensure that handling and storage minimize danger to human health and the environment.	Any on-site storage of hazardous waste will be temporary in nature and will comply with all federal and state standards. Waste not treated on-site will be shipped to an off-site RCRA-approved TSD facility.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Standards for Owners and Operators of Hazardous Waste Facilities (Cont'd)		• Procedures to be followed for conducting analysis of waste to be handled or treated at the site. • Procedures for waste handling, storage, and inspection. • General closure requirements. • Environmental and health standards to be met for facility workers. • Contingency plan to address possible accidents or releases of contaminants from the site. • Groundwater monitoring requirements to be followed during active portion and closure period of facility or site. • Necessary response actions to be taken in the event of a spill. - Public notification plan. - Technical standards for waste treatment facilities. - Requirements for surface impoundments. - Requirements for waste piles. The requirements in Federal regulations 40 CFR Parts 264 and 265 are incorporated by reference.	
STATE - He-P Ch. 1905.08(d)(5) Transfer of Ownership or Relinquishment of Property Rights	Relevant and Appropriate	Requires approval of State prior to transfer of any ownership or operation permit for a hazardous waste facility. Owner or operator must also ensure that all future, property owners are aware of former uses of site and any associated problems.	NHDES should be consulted prior to the transfer of ownership of the site. In addition, all future owners must be made aware of the wastes which remain at the site and any restrictions necessary to preserve the integrity of the contained waste.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
STATE - He-P Ch. 1905 New Hampshire Hazardous Waste Rules	Relevant and Appropriate	General requirements for treatment, storage and disposal of hazardous waste and closure of hazardous waste facilities.	Site activities will meet the substantive standards set out in these regulations.
STATE - He-P Ch. 1905.04 Manifesting Requirements	Applicable	General requirements for manifesting and documenting all off-site shipments of hazardous materials.	Any off-site shipment of hazardous waste will be manifested in accordance with these requirements.
STATE - He-P Ch. 1905.05 Packaging and Labelling Requirements	Applicable	Identifies requirements for packaging and labelling of all hazardous materials to be shipped off-site.	Any hazardous waste shipped off-site will be packaged and labelled in accordance with these regulations.
STATE - He-P Ch. 1905.06 Standards for Generators	Relevant and Appropriate	General definitions and requirements for generators of hazardous wastes. Outlines procedures to determine whether a person is a generator. Defines requirements for obtaining a generator's ID number and record-keeping procedures which must be followed.	These standards are relevant to all 'hot spot' wastes uncovered during recontouring and all sludges and filters generated by the treatment facilities. The substantive requirements of this regulation will be followed in handling, identifying, transporting and disposing of these wastes.
STATE - He-P Ch. 1905.08 Standards for Owners and Operators of Hazardous Waste Facilities	Relevant and Appropriate	General requirements for owners or operators of hazardous waste site or treatment facilities. Requirements include: • Security measures to minimize access to the facility or site. • Training requirements for employees at the site. • Design standards for hazardous waste treatment facilities.	All remedial activities will comply with the substantive provisions of state hazardous waste regulations. If any state standards under this regulation are more stringent than RCRA standards, then the more stringent state standard will control. Since this regulation addresses and incorporates by reference many of the RCRA hazardous waste regulations, see the actions to be taken for specific RCRA regulations listed above.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
FEDERAL - DOT 49 CFR Part 107 49 CFR Parts 171-179 Department of Transportation Regulation for Transport of Hazardous Materials	Applicable	Requirements for handling labelling, manifesting and transporting hazardous waste.	Hazardous wastes generated from the on-site TSD facility or from "hot spots" encountered during the Landfill recontouring will be shipped off-site. These off-site shipments will comply with handling, labelling, packaging, and transport requirements covered by this regulation.
FEDERAL - EPA Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Program (December, 1987)	To be Considered	Provides technical guidance on the development of local limits. EPA's General Pretreatment Regulations require the establishment of local limits for POTWs with federally approved pretreatment programs.	Discharges to the local POTW will meet the applicable limits imposed on discharges to the sewer system.
FEDERAL - Permit Applicants Guidance Manual for the General Facility Standards of 40 CFR 264 (SW-968, October 1983)	To be Considered	Guidelines for determining the necessary requirements and standards which a proposed RCRA facility must meet prior to the facility obtaining an operating permit.	The substantive requirements identified in this guidance, as necessary to obtain a permit, will be addressed by this alternative but a permit need not be obtained prior to construction and operation of this facility.
FEDERAL - Guidance Manual for POTW Pretreatment Program Development (Oct. 1983)	To be Considered	Provides information necessary for local POTWs to develop approved pre-treatment program. The manual delineates what data and information must be submitted to EPA in order to obtain regulatory approval of the program.	Guidance will be used to evaluate whether site-generated waste water is compatible with the local POTW. Discharges to Dover POTW will meet applicable pre-treatment requirements.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
FEDERAL - CWA 40 CFR Part 122, 124, 125 National Pollutant Discharge Elimination System	Relevant and Appropriate	NPDES is the national program for issuing, monitoring, and enforcing permits for direct discharges into waters of the United States.	Discharges from the treatment systems, except in the case of discharges to the Dover POTW, are considered on-site discharges for the purpose of these regulations. No NPDES permit will be required for discharges to the Cocheco River and to the surrounding wetlands. However, all substantive requirements of the NPDES program must be met including the effluent standards (whether water quality based or technology based), the monitoring & testing requirements, and standard and special conditions for discharge. Discharges from the treatment system to the Dover POTW are considered off-site activities for purposes of this and other regulations. Therefore both the substantive and administrative provisions of this regulation must be met if discharge to the POTW is chosen during the remedial design.
FEDERAL - CWA 40 CFR Part 403 EPA Pretreatment Standards	Relevant and Appropriate	General guidelines to be followed in establishing pretreatment effluent discharge limits for pollutants which will be discharged to a publicly owned treatment works.	Discharges from the treatment system to the Dover POTW are considered off-site activities for purposes of this and other regulations. Therefore both the substantive and administrative provisions of this regulation must be met if discharge to the POTW is chosen during the remedial design.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
FEDERAL : RCRA 40 CFR Part 268 Land Disposal Restrictions	Relevant and Appropriate	Identifies hazardous waste types and specific EPA hazardous waste codes which must meet specified standards prior to placement or disposal of the waste in a land unit. Land Ban also specifies treatment processes to be used to meet goals.	This requirement is relevant and appropriate only to the extent that Land Ban hazardous materials are discovered on-site and moved outside the area of contamination. Any "hot spot" uncovered during recontouring of the landfill would have to be sent to an off-site RCRA TSD Facility. If the waste falls within one of the regulated waste codes under the Land Ban, then treatment of the waste to a point where the waste may be disposed of in an off-site RCRA land disposal unit, would be necessary. Any hazardous sludges or wastes generated during the treatment of containated groundwater will be tested to determine that all requirements established under the land ban regulation are complied with prior to any off-site disposal in a RCRA approved land disposal unit.
FEDERAL - RCRA - 40 CFR 264.170 - 178 (Subpart I) Use and Management of Containers	Relevant and Appropriate	Identifies requirements for the use and management of containers holding hazardous substances.	Any containers holding liquids which are uncovered by recontouring will meet the requirements of this regulation. In addition any containers used to store treatment sludges, 'hot spot' waste, or treatment filters will meet the standards of this regulation.
FEDERAL - RCRA - 40 CFR 264.1030 - 1036 and 264.1050 - 1064 (Subparts AA and BB) Standards for Air Emissions for Process Vents and Equipement Leaks	Relevant and Appropriate	These two subparts set standards for air emissions from treatment systems.	The design and maintenance of all components of the treatment systems will comply with the standards set out in these regulations
FEDERAL CAA - National Ambient Air Quality Standards 40 CFR Part 50	Applicable	Maximum primary and secondary 24-hour concentrations for particulate matter.	Mitigative measures to reduce generation of dust or particulate matter will be employed during all site activities.
FEDERAL - CAA ---- NESHAP 40 CFR 61, S[illegible]	Relevant and Appropriate	Sets National Emission Standards for Vinyl Chloride	Any on-site treatment processes such as air strippers must meet the relevant standard.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
FEDERAL - RCRA 40 CFR Part 264.70 - 264.77 (Subpart E) Manifest System, Recordkeeping and Reporting	Relevant and Appropriate	Regulations apply to owners and operators of both on-site and off-site facilities. Requirement identifies procedures to be followed in filling out, filing and submitting hazardous waste manifests for all shipments of hazardous waste sent from and received by a facility.	All hazardous materials generated by the treatment systems or 'hot spots' uncovered by recontouring, must be evaluated, manifested, packaged, labeled and recorded in accordance with these regulations prior to shipment off-site.
FEDERAL - RCRA 40 CFR Part 264.10-264.18 (Subpart B) General Facility Standards	Relevant and Appropriate	This subpart applies to all owners and operators of hazardous waste facilities. The subpart identifies procedures which must be followed for the operation and maintenance of a hazardous waste TSD facility. General areas covered under this subpart are: • Security requirements for TSD facilities. • General facility inspection requirements. • Personnel training requirements. • Procedures to prevent mixing of incompatible wastes. • Siting requirements for a TSD facility.	Only those portions of this subpart addressing security, inspection, personnel training, and precautions for handing incompatible wastes are relevant and appropriate to this remedy. All site operations, including the construction and operation of the treatment facilities will comply with the substantive requirements of these portions of this subpart.
FEDERAL - RCRA 40 CFR Part 264.30-37 (Subpart C) Preparedness and Prevention	Relevant and Appropriate	Identifies requirements which must be met during design, construction, and operation of TSD facilities to minimize possibility of fires, explosions or unplanned releases of waste.	All site operations, including the construction and operation of the treatment facilities, will be undertaken only after the substantive provisions of the preparedness and prevention regulations are in place.
FEDERAL - RCRA 40 CFR Part 264.50-264.56 (Subpart D) Contingency Plan and Emergency Procedures	Relevant and Appropriate	Identifies the requirements which must be addressed in a contingency plan. Each TSD facility must have a contingency plan which identifies all procedures to be followed in the event of fire, explosion or a planned release from a facility.	A contingency plan will be developed and implemented for the operation of the treatment facilities, for any recontouring activities, and for all other remedial activities. All on-site activities will comply with all emergency plans and procedures.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
FEDERAL - RCRA 40 CFR Sections 264.190 - 198 (Subpart J) Requirements for the design, installation and operation of any tanks or tank systems which are used to store or treat hazardous liquids or sludges.	Relevant and Appropriate	Regulates tanks or tank systems which are to be 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.	Tanks or tank systems used to temporarily store hazardous materials that have been generated by site treatment systems or uncovered as 'hot spots' during recontouring, will meet all substantive requirements of these regulations.
FEDERAL - RCRA 40 CFR Sections 264.220 -264.230 (Subpart K) Design, operation and closure of surface impoundments.	Relevant and Appropriate	General requirements for surface impoundments. Requirements include design standards, operational requirements, monitoring and record keeping requirements and closure requirements.	If surface impoundments are used to temporarily store 'hot spot' materials, treatment sludges, or treatment filters, then these impoundments will comply with all substantive provisions of these regulations. Those surface impoundment regulations relating to closure and post-closure care are also relevant and appropriate to the cap design and leachate treatment portions of this remedy.
FEDERAL - RCRA 40 CFR Sections 264.250 - 264.259 (Subpart L) Design and operation procedures for waste piles which are used to temporarily store hazardous soils or sludges.	Relevant and Appropriate	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.	If waste piles are used to temporarily store 'hot spot' materials, treatment sludges, or treatment filters, then these piles will comply with all substantive provisions of these regulations.
FEDERAL - RCRA 40 CFR Part 262 (Subpart E) Standards Applicable to Generators of Hazardous Waste	Relevant and Appropriate	Establishes requirements applicable to generation of hazardous wastes.	All hazardous materials generated by the treatment systems or 'hot spots' uncovered by recontouring, must be tested, manifested, packaged, labeled and recorded in accordance with these regulations prior to shipment off-site.
FEDERAL - RCRA 40 CFR Part 263.10 - 263.22 (Subparts A and B) Standards Applicable to Transporters of Hazardous Waste	Relevant and Appropriate	Identifies manifesting procedures to be followed for all shipments of hazardous waste.	Off-site shipments of hazardous waste or materials will be properly manifested and logged. Transporters will comply with these regulations.

ACTION-SPECIFIC ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
FEDERAL - RCRA 40 CFR Sections 264.90-264.101 (Subpart F) Releases from Solid Waste Management Units. Identifies procedures to be followed to ensure that groundwater standards are met.	Relevant and Appropriate	General facility requirements for groundwater monitoring at affected facilities and general requirements for corrective action programs if required at regulated facilities.	A comprehensive groundwater monitoring system, designed to detect and measure groundwater contamination at and beyond the point of compliance, will meet the substantive standards of this regulation.
FEDERAL - RCRA 40 CFR Sections 264.110 - 264.120, (Subpart G) Closure and Post Closure Requirements for closure/post closure of a landfill. Groundwater monitoring and reporting requirements for a period of 30 years from the date of closure.	Relevant and Appropriate	Sets general standards for closing landfills. Requires owners/operators of landfills to develop closure and post-closure plans. In addition, the regulations set forth post-closure requirements such as groundwater monitoring for a period of 30 years after closure.	Implementation of this alternative would comply with the requirements of this alternative in the following manners: • Design of the cap will minimize the need for future maintenance. • Capping the Landfill would minimize to the extent necessary to protect human health and environment from physical exposure to the wastes on-site and continued fuguitive air emissions from the Landfill. Also, construction of the cap would minimize future on-site maintenance. • Collection and treatment of the contaminated groundwater from within and around the perimeter of the Landfill would minimize to the extent necessary the risk to human health and the environment from contaminated groundwater currently migrating off-site. Monitoring of the off-site groundwater will be conducted in accordance with this regulation

LOCATION-SPECIFIC ARARs

Media	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Wetlands/ Floodplains/ Rivers/ Reservoirs	State - RSA 482-A NH Admin. Code ENV - Wt 300 New Hampshire Criteria and Conditions for Fill and Dredging in Wetlands	Applicable	Sets general standards and criteria for filling, dredging and construction in or near wetlands.	Any remedial activities affecting the wetlands will meet the substantive requirements of this state statute and its related regulations.
Wetlands/ Floodplains/ Rivers/ Reservoirs	State - ENV-Ws Part 415, RSA 485:A-17 NH Rules Relative to Prevention of Pollution from Dredging, Filling, Mining, Transporting, Construction	Relevant and Appropriate	Controls activities which invlove dredging in or around surface water bodies.	Any dredging or filling activities affecting the Bellamy Reservoir or the Cocheco River, including the dredging of the sediments in the swale, must meet the substantive requirements of this regulation.
Groundwater	State - Wellhead Protection Program	To be Considered	Sets general criteria for wellhead protection area delineation and identification of contamination sources to be excluded from protection areas.	State Plan will be considered to protect the Calderwood well.

LOCATION-SPECIFIC ARARs

Media	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Wetlands/ Floodplains/ Rivers/ Reservoirs	Federal - 16 USC 661 et. seq., Fish and Wildlife Coordination Act	Applicable	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.	Discharges from the treatment system(s) will be conducted in such a manner as to minimize adverse impacts on fish and wildlife. Federal and state agencies listed in this statute should be consulted during remedial design if any adverse impacts are anticipated.
Groundwater	Federal - Groundwater Protection Strategy	To be Considered	EPA's groundwater protection strategy [as identified in Groundwater Protection Strategy. EPA Office of Groundwater Protection, August, 1984], includes the following components: state. • Assessing the problems that may exist from unaddressed sources of contamination-in particular, leaking storage tanks, surface impoundments, and landfills; • Issuing guidelines for EPA decisions affecting groundwater protection and cleanup; and strengthening EPA's organization for groundwater management at the headquarters and regional levels, and strengthening EPA's cooperation with Federal and State agencies.	Groundwater at and beyond the point of compliance will be restored to its beneficial use by the remedy through a combination of capping, leachate collection and treatment, natural attenuation in the eastern plume and the collection and treatment of contaminated groundwater in the southern plume.
Groundwater	Federal - Groundwater Classification Guidelines	To be Considered	Classifies groundwater by its potential beneficial uses such as special groundwater (Class I) which are groundwaters that are "highly vulnerable to contamination because of the hydrological characteristics of the areas in which it occurs, and characterized by either of the following factors: • The groundwater is irreplaceable; no reasonable alternative source of drinking water is available to substantial populations. • The groundwater is ecologically vital; the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat."	These guidelines will be consulted in evaluating the success of the remedy and the speed with which groundwater is cleaned up.

LOCATION-SPECIFIC ARARs

Media	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Wetlands/ Floodplains/ Rivers/ Reservoirs	Federal - Clean Water Act (CWA) Section 404; 40 CFR Part 230:33 CFR Parts 320-330	Applicable	Requirements under these codes prohibit the discharge of dredged or fill material into water bodies or wetlands without complying with the procedures identified under the permitting requirements for this code.	The substantive wetland dredge and fill requirements of the CWA will be met in all activities in and around the wetlands. No fil material from the recontouring of the Landfi from the construction of the interceptor trench/extraction well system, or from the construction of the leachate treatment plant will be placed in the wetlands surrounding t site. In addition, construction and maintenan of the off-site groundwater treatment system/extraction wells will be conducted to have the most limited impact on the wetland All material dug from the wetlands will be tested to determine whether it contains RCR wastes; if so, that material will be disposed In accordance with RCRA requirements including the land ban regulations. That cle fill which is not redeposited in the excavatio will not be deposited in the wetlands. Wetlands will be restored to their natural sta at the completion of the remedy, to the exte technically practicable. Neither the procedura or permitting requirements of this statute nee to be met.
Wetlands/ Floodplains/ Rivers/ Reservoirs	Federal Executive Orders 11988 & 11990 Floodplain Management and Protection of Wetlands Federal - 40 CFR Part 6 Appendix A	Applicable	Federal agencies are required to preserve and enhance the natural and beneficial values of wetlands and floodplains.	Measures to mitigate damage to the wetlands will be employed at all times during the construction and operation of the remedy. After the construction of the management of migration element of the remedy, measures will be undertaken to restore the wetlands.
Wetlands/ Floodplains/ Rivers/ Reservoirs	Federal - General Facility Standards 40 CFR 264.18(a) - Seismic Standards	Relevant and Appropriate	New treatment, storage or disposal of hazardous waste prohibited with 200 feet of a fault which has had a displacement in Holocene time.	Any groundwater/leachate treatment facility will be located in accordance with this requirement.
Wetlands/ Floodplains/ Rivers/ Reservoirs	Federal - General Facility Standards 40 CFR 264.18(b)	Relevant and Appropriate	Facility where RCRA hazardous waste will be treated, stored or disposed of that lies within a 100 year floodplain must be designed, constructed, operated and maintained to prevent the washout of any hazardous waste in the event of a 100 year flood.	Any groundwater/leachate treatment facility, i located in a floodplain, will be designed and constructed in accordance with these regulations.

CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

MEDIA: AIR

Pollutant	National Ambient Air Quality Standards (40 CFR 50)(ug/m^3)/(ppm)	Ambient Air Standards (NH Admin Code - Chpt 300 - Part 303)(ug/m^3)	Toxic Air Contaminant Levels (NH Admin. Code ENV-A-1300 ((ug/m3)
Carbon Monoxide (CO)	40000 (1-hour average)/35 (1 hour average) 10000 (8-hour average)9 (8 hour average)	40000 (1 hour average) 10000 (8 hour average)[b]	
Lead (Pb)	1.5 (3 months)	1.5 (annual)	
Nitrogen Dioxide (NO_2)	100 (annual)/0.05 (annual)	100 (annual)	
Ozone (O_3)	235 (1-hour)/0.12 (1 hour)	235 (1 hour)	
Particulate Matter (PM-10)	150 (24-hour)/ NA 50 (annual)/ NA	150 (24 hour)[a] 50 (annual)	
Sulfur Dioxide (SO_2)	1300 (3-hour)/0.5 (3 hour) 365 (24-hour)/0.14 (24 hour) 80 (annual)/0.036 (annual)	1300 (3 hour) 365 (24 hour) 80 (annual)	
Hydrocarbon (HC)		160 (3 hour)	
Acetone			17800
Arsenic			0.48
Barium			1.7
Benzene			71
Beryllium			0.0048
Cadmium			0.024
Chromium			0.12
Cobalt			0.167
Copper			0.33
Dichloromethane			417
Hydrogen Sulfide			46.7
Methyl ethyl ketone			1967
Methyl isobutyl ketone			2050
Toluene			1500
1,1,1 Trichloroethane			6333
Trichloroethylene			643
Tetrachloroethylene			810
Xylene			1450
Vinyl Chloride			24
Zinc			50

a This maximum 24-hr level may not be exceeded more than once per year.
b This maximum 8-hr level may not be exceeded more than once per year.
NA Not Applicable.

CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

MEDIA: SURFACE WATER
CLEAN WATER ACT (CWA) - WATER QUALITY CRITERIA

Chemical: Potential Chemicals of Concern	For Protection of Human Health: Water and Fish Ingestion (ug/l)	For Protection of Human Health: Fish Consumption Only (ug/l)	For Protection of Aquatic Life: Freshwater Acute/ Chronic (ug/l)
Volatile Organic Compounds			
Acetone	-	-	-
Benzene	0.66	40	5,300/-(b)
Chloroethane	-	-	-
Dichloroethylene	0.033	-	-
1,1-Dichloroethylene	3100	1.85	11,600/-(b)
1,2-Dichloroethane	0.94	243	11,800/20,000-(b)
Ethylbenzene	1400	3,250	32,000/-(b)
Methylene Chloride	-	-	-
Methyl Ethyl Ketone	-	-	-
Methyl Isobutyl Ketone	-	-	-
Tetrachloroethylene	0.80	8.85	5,280/840(b)
Toluene	14000	424,000	17,500/-(b)
Trichloroethylene	2.7	80.7	45,000/21,900
1,1,1-Trichloroethane	18000	1,030,000	-
Tetrahydrofuran	-	-	-
Vinyl Chloride	2	2	-
Acid & Base/Neutral Extractable Organics			
Anthracene	-	-	-
Benzo(a)anthracene	-	-	-
Benzo(a)fluoranthracene	-	-	-
Benzo(a)pyrene	-	-	-
Bis(2-ethylhexyl) phthalate	-	-	-
Chrysene	-	-	-
Di(ethylhexyl)phthalate	-	-	-
Diethylphthalate	350000	3,980/-(b)	-
Fluoranthene	42	-	-
Fluorene	-	-	-
Phenanthrene	-	-	-
Pyrene	-	-	-
Metals			
Antimony	150	-	-
Arsenic	0.0022	-	850/48(b)(c)(e)
Beryllium	0.0068	-	-
Cadmium	10	-	0.64/10.32(f)
Chromium	170(g)	3,433,000(b)	1,700/210(g)
Copper	-	-	4/3(f)
Cyanide	200	5	22/5.2
Lead	50	-	11/.41(f)
Mercury	0.14	0.146	2.4/0.012
Nickel	1.3 x 10^{-7}	100	363/40(f)
Selenium	10	-	-
Silver	50	-	0.25(f)/0.12(f)(h)
Thallium	13	-	-
Zinc	-	-	30/27(f)

a - Proposed MCLG or MCL (1988)(53 FR 31516).
b - Lowest Observed Effect Level (LOEL).
c - Proposed MCLGs 50 FR 46936 (November 13, 1985).
d - Value shown is for di-2-ethyl hexyl phthalate.
e - Value shown is for (pent) arsenic. (Tri) arsenic is 360/190 ppb.
f - Hardness dependable criteria (20 mg/l used). Values calculated using formulas listed in EPA Quality Criteria for Water, 1986. EPA 440/5-86-001.
g - Chromium +3.
h - Value shown corresponds to a hardness of 100 mg/l as C_aCO_3. EPA Quality Criteria for Water (1986) does not present a means (formula) to calculate a new value using a hardness of 20 mg/l as C_aCO_3.

CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

MEDIA: GROUNDWATER

Chemical	Safe Drinking Water Act Maximum Contaminant Levels (MCLs)(ug/l) State NH Admin. Code WS 302 Federal 40 CFR 141	Safe Drinking Water Act Maximum Contaminant Levels Goals (MCLGs (ug/l) Federal 40 CFR 141	Resource Conservation and Recovery Act (RCRA) Maximum Contaminant Levels Federal 40 CFR 264.94 (ug/l)	DPHS - Health Based - GW Standards State WS 410.05(e)(ug/l)
Potential Chemicals of Concern				
Volatile Organic Compounds				
Acetone	-	-	-	700
Benzene	5	0[a]	-	-
Chloroethane	-	-	-	-
Dichloroethylene	-	7	-	7
1,1-Dichloroethylene	7	7	-	-
1,2-Dichloroethane	5	0	-	-
Ethylbenzene	-	700	-	680
Methylene Chloride	5	5	-	5
Methyl Ethyl Ketone	-	-	-	170
Methyl Isobutyl Ketone	-	-	-	350
Tetrachloroethylene	5	0(c)	-	.68
Toluene	-	1,000(f)	-	-
Trichloroethylene	5	0	-	-
1,1,1-Trichloroethane	200	200	-	-
Tetrahydrofuran	-	-	-	154
Vinyl Chloride	2	0	-	-
Acid & Base/Neutral Extractable Organics				
Anthracene	-	-	-	-
Benzo(a)anthracene	-	-	-	-
Benzo(a)fluoranthracene	-	-	-	-
Benzo(a)pyrene	0.2(a)	0	-	.003
Bis (2-ethylhexyl) phthalate	-	-	-	50,000
Chrysene	-	-	-	-
Di(ethylhexyl)phthalate	4(a)	0	-	-
Diethylphthalate	-	-	-	1,800,000
Fluoranthene	-	-	-	54
Fluorene	-	-	-	-
Phenanthrene	-	-	-	-
Pyrene	-	-	-	-
Metals				
Antimony	10/5(e)	3	-	-
Arsenic	50	0(c)	50	-
Beryllium	1	0	-	-
Cadmium	10	5(c)	10	-
Chromium	50	50	50	50(100)(d)
Copper	1,300(a)	1,300(a)	-	-
Cyanide	200	200	-	200
Lead	50/5(a)	20(c) (0(a))	50	-
Mercury	2	2	2	-
Nickel	100	100	10	-
Selenium	10	50	50	-
Silver	50	-	-	-
Thallium	2/1(e)	0.5	-	-
Zinc	-	-	-	-

a Proposed MCLG or MCL (1988)(53 FR 31516).
b Lowest Observed Effect Level (LOEL).
c Proposed MCLGs 50 FR 46936 (November 13, 1985).
d Value is for Chromium both in trivalent (III) and hexavalent (VI) form. Value in parentheses is for total combined Chromium III and Chromium VI.
e Alternative MCL options proposed 55 FR 30370 (July 25, 1990).
f Federal Register (January 30, 1991), Vol. 56 pg 3526

CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

Media	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Sediments	Federal - NOAA Technical Memorandum NOS OMA 52	To be Considered	Reference doses for various contaminants in sediments and their potential biological effects on biota exposed to the contaminants.	All sediments in the drainage swale which contain arsenic in excess of 50 ppm will bc removed from the swale and consolidated under the landfill cap. Measures will be tal to prevent contaminated sediment from washing into the Cocheco River during excavation.
Air	Federal - CAA - National Ambient Air Quality Standards (NAAQS) (40 CFR 50.1 - 50.12)	Relevant and Appropriate	NAAQS define levels of primary and secondary levels for six common air contaminants (sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide and lead).	The Best Available Technology will be usec to limit the emission of hazardous airborne substances during recontouring, excavation, groundwater treatment and any gas collectioı and treatment. Those chemical-specific standards set out in these regulations will be met by this technology.
Air	State - NH Admin. Code ENV-A:300 Ambient Air Quality Standards	Relevant and Appropriate	Establishes primary and secondary ambient air levels for eight air contaminants: • Particulate matter • Sulfur dioxide • Carbon monoxide • Nitrogen dioxide • Ozone • Hydrocarbons • Fluorides • Lead Seven of the primary and secondary standards established under this state standard are adopted from the Federal NAAQS.	The Best Available Technology will be employed to ensure that air emissions generated by remedial activities comply with the standards set out in this regulation.
Air	State - NH Admin. Code ENV-A 1300 Toxic Air Pollutants	Applicable	Establish ambient air limits for 74 chemicals. These ambient air limits (AALs) are levels at, or below, which ambient air concentrations of a respective air contaminant will not adversely affect human health.	Releases of contaminants to the air from any source on site will not exceed the respective AAL.

CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

Media	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Groundwater	State - NH Revised Statutes Ch. 485 Drinking Water Standards	Relevant and Appropriate	Sets forth procedures for protection of drinking water supplies by establishing and adopting (under RSA 541-A) drinking water rules and primary drinking water standards. Statute also allows secondary drinking water rules to be adopted which are necessary to protect the public welfare. Maximum Contaminant Levels (MCLs) which are established under this statute shall be no less stringent than the most recent National Primary Drinking Water Standards which are in effect.	Groundwater at and beyond the point of compliance will attain state MCLs at the completion of the remedy. These levels will be obtained by the capture and treatment of leachate emanating from the landfill and contaminated groundwater in the southern plume. In the eastern plume, groundwater will reach MCLs through natural attenuation within 5 to 7 years.
Groundwater	State - ENV-Ws 410.05 Groundwater Protection Standards	To be Considered	Allowable limits for contaminants in groundwater are based upon New Hampshire Division of Public Health Services (health-based standards) and Federal MCLs, MCLGs and other relevant standards. Groundwater nondegradation requirements incorporate the surface water quality standards at ENV-Ws 432.	State groundwater protection standards will be attained at and beyond the point of compliance at the completion of the remedy. In addition, any treatment system which discharges into surface waters and any activities conducted in the wetlands will be consistent with the maintenance or improvement of groundwater quality at and beyond the point of compliance.
Groundwater	State - ENV-Ws-410.05(e)	To be Considered	Stipulation that groundwater shall not contain any substance in a concentration which the Water Supply and Pollution Control Commission determines is harmful to human health or the environment. Regulation states that Primary (health-based) Maximum Contaminant Levels (MCLs) will be used to regulate groundwater contaminants.	State groundwater protection standards will be attained at and beyond the point of compliance at the completion of the remedy. In addition, any treatment system which discharges into surface waters and any activities conducted in the wetlands will be consistent with the maintenance or improvement of groundwater quality at and beyond the point of compliance.
Groundwater	State - Admin. Code Part WS 315-319 Primary and Secondary Standards	Relevant and Appropriate	NH MCLs establish levels of contaminants allowable in water supplies. They are generally equivalent to SDWA MCLs.	At the completion of the remedy state MCLs will be met at and beyond the point of compliance.
Surface Water	Federal - CWA - Ambient Water Quality Criteria (AWQC) - Protection of Freshwater Aquatic Life, Human Health, Fish Consumption	Relevant and Appropriate	AWQC are developed under the Clean Water Act (CWA) as guidelines from which states develop water quality standards. A more stringent AWQC for aquatic life may be found relevant and appropriate rather than an MCL, when protection of aquatic organisms is being considered at a site.	Any treated water discharged into the Cocheco River or the wetlands surrounding the site must meet AWQCs.
Surface Water	State - RSA 485A:8 NH Admin. Code ENV-Ws Part 432 Surface Water Quality Standards	Applicable	Surface water classification standards for Class B waters, and potentially Class A waters, are applicable to the site. New Hampshire Surface Water Quality standards are essentially the same as federal ambient water quality criteria.	Discharges into the Cocheco River and wetlands from the treatment systems will meet the most stringent criteria associated with the classifications of these water bodies. In addition, all remedial activities will be consistent with protecting the Class A waters of the Bellamy Reservoir.

CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

Media	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Groundwater	Federal - SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)	Relevant and Appropriate	Standards; (abbreviated as MCLs - Maximum Contaminant Levels), which have been adopted as enforceable standards for public drinking water systems.	Groundwater at and beyond the point of compliance will attain MCLs at the completion of the remedy. These levels will be obtained by the capture and treatment of leachate emanating from the landfill and contaminated groundwater in the southern plume. In the eastern plume, groundwater will reach MCLs through natural attenuation within 5 to 7 years. Note that the SDWA MCL for arsenic in the groundwater has been determined to be relevant but not appropriate and therefore is not an ARAR. Instead, the RCRA concentration limits found at 40 CFR 264.94 will control.
Groundwater	Federal - RCRA Maximum Concentration Limits 40 CFR Part 264.94	Relevant and Appropriate	Standards; (MCLs-Maximum Concentrations Limits), for 14-toxic compounds. MCLs have been adopted as part of RCRA groundwater protection standards. These groundwater protection standards are equal to MCLs established under the National Primary Drinking Water Standards, based on 1962 Public Health Service Regulations under the Safe Drinking Water Act (SDWA).	Groundwater at and beyond the point of compliance will attain MCLs at the completion of the remedy. These levels will be obtained by the capture and treatment of leachate emanating from the landfill and contaminated groundwater in the southern plume. In the eastern plume, groundwater will reach MCLs through natural attenuation within 5 to 7 years. In addition, prior to or during remedial design, EPA and the state will determine whether background levels of arsenic in the groundwater exceed 50 ppm. If so, the cleanup standard will be set at background levels.
Groundwater	Federal - SDWA Maximum Contaminant Level Goals (40 CFR 141.50-141.51)	To be Considered	MCLGs-Non-enforceable health goals for public water systems. Maximum Contaminant Level Goals (MCLGs) are set at levels that would result in no known or anticipated adverse health effects with an adequate margin of safety.	At the completion of the remedy groundwater at and beyond the point of compliance will attain non-zero MCLGs for those substances which have no MCL. These levels will be obtained by the capture and treatment of leachate emanating from the landfill and contaminated groundwater in the southern plume. In the eastern plume, groundwater will reach these non-zero MCLGs through natural attenuation within 5 to 7 years.

APPENDIX F

STATEMENT OF FINDINGS
CONCERNING REMEDIAL ACTIVITIES
IN WETLANDS AND FLOODPLAIN

1. The remedy chosen for this Site includes excavation and construction activities in the wetlands to the south of the Site and may include limited excavation of sediments in the floodplain at the point where the drainage swale meets the Cocheco River.

<u>Activities in the Wetlands</u>

2. The installation of a groundwater extraction and treatment system for the management and cleanup of the Site's southern contaminant plume will require the placement of several extraction wells as well as the construction of a water transport system to convey the contaminated water to an on-site treatment facility. These activities will require that truck access through the wetlands be secured so that the wells can be drilled and the piping can be placed. In addition, these activities will require drilling and placement of wells in the wetlands and the excavation of trenches in the wetlands in which the transport pipes will be placed.

3. The remedial design of this extraction and treatment system will be guided by the principles set forth in 40 CFR Part 6, Appendix A and Executive Order 11990, as well as state wetlands law. The design will minimize the disturbance of the wetlands and its natural and beneficial uses. Mitigative measures will be taken during the construction and operation of this system so as to minimize adverse impacts on the wetlands.

4. A two phase wetland restoration plan will be undertaken, the first phase commencing at the completion of construction and the second phase commencing at the completion of the groundwater treatment. This plan will restore the wetland topography and vegetation to the extent practicable, or, if necessary, establish new wetlands of similar size in a nearby area.

5. The construction of this groundwater extraction system in the wetlands is the only practicable means for treating the contaminated groundwater in the southern plume. As documented in the ROD Decision Summary, groundwater modelling has indicated that extraction and treatment of this plume are necessary to attain ARARs at and beyond the point of compliance in a reasonable time, as well as to manage the contaminants in the short term so that they are prevented from continuing to migrate towards the Class A waters of the Bellamy Reservoir.

6. Alternative methods for contaminant cleanup in the southern plume would have a greater impact on the wetlands or would be ineffective in meeting the reasons for initiating the active

treatment of this contaminant plume. The alternative method for treating this groundwater evaluated in the Feasibility Study, the construction of an interceptor trench, would have a greater detrimental impact on the wetlands.

7. There are no alternative sites for establishing an active management of migration of the southern plume as the plume is directly under these wetlands.

8. The design, construction and operation of these remedial activities will meet state wetland protection requirements.

Activities in the Floodplain

9. If testing of the swale sediments where the swale meets the Cocheco River indicate that arsenic levels are above 50 ppm, then limited manual excavation will be undertaken to remove contaminated sediments. It is expected that this procedure will be conducted manually - without the assistance of heavy equipment - and that it will take no more than a few days.

10. This limited excavation will have minimal or no short term adverse impact on the floodplain area and it will have no long term adverse impacts.

11. The remedial activities in this area will be guided by the principles set forth in 40 CFR Part 6, Appendix A and Executive Order 11988, as well as state law protecting floodplains. Mitigative measures will be taken during the excavation of sediments in this area to protect the floodplain and its natural and beneficial uses as well as to prevent contaminants from washing into the Cocheco River.

12. No practicable alternative exists for meeting the remediation goals. As documented in the ROD Decision Summary, EPA has determined the clean-up of arsenic in the swale sediments is necessary to protect the environment. As documented in the Administrative Record and in the ROD Decision Summary, arsenic levels in sediments above 50 ppm pose a threat to the biota in the area.

13. Other clean-up/capping alternatives evaluated in the Feasibility Study are either ineffective in meeting remediation goals or will have a greater adverse impact on the floodplains while also providing less protection to the environment in the long term.

14. Since the sediments in questions are deposited in a floodplain area, the action cannot take place outside of the floodplain.

15. The remedial activities in the floodplain will comply with state floodplain protection laws.

APPENDIX G

United States
Environmental Protection Agency
Region I

RESPONSIVENESS SUMMARY

DOVER MUNICIPAL LANDFILL SITE

DOVER, NEW HAMPSHIRE

SEPTEMBER 10, 1991

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DOVER MUNICIPAL LANDFILL RESPONSIVENESS SUMMARY

PREFACE

The U.S. Environmental Protection Agency (EPA) held a 60-day comment period from March 26, 1991 to May 24, 1991 to provide an opportunity for the public to comment on the Remedial Investigation (RI), the Field Element Study (FES), the Feasibility Study (FS), the Proposed Plan and other documents developed for the Dover Landfill Superfund Site (the Site) in Dover, New Hampshire. The FS examined and evaluated various options, called remedial alternatives, to address contamination at the Site. EPA made a preliminary recommendation of its Preferred Alternative for site remediation in the Proposed Plan issued on March 15, 1991, before the start of the public comment period. All documents on which the preferred remedy was based were placed in the Administrative Record for review. The Administrative Record is a collection of all the documents considered by EPA to choose the remedy for the Site. It was made available at the EPA Records Center at 90 Canal Street in Boston, Massachusetts and at the Dover Public Library, 72 Locust Street, Dover, New Hampshire.

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.

This Responsiveness Summary is organized into the following sections:

I. **Overview of Remedial Alternatives Considered in the Feasibility Study and Proposed Plan, including the Preferred Alternative** - This section briefly outlines the remedial alternatives evaluated in the FS and the Proposed Plan, including EPA's Preferred Alternative.

II. **Site History and Background on Community Involvement and Concerns** - This section provides a brief Site history and a general overview of community interests and concerns regarding the Site.

III. **Summary of Comments Received During the Public Comment Period and EPA Responses** - This section summarizes and provides EPA's responses to the oral and written comments received from the public during the public comment period. In Part I, the comments received from citizens are presented. Part II summarizes comments received from Potentially Responsible Parties (PRPs).

IV. **Remaining Concerns** - This section summarizes comments raised during the public comment period that cannot be fully addressed at this stage of the Superfund process but which continue to be of concern during the design and implementation of EPA's selected remedy for the Site. EPA responds to these comments and will address these concerns during the Remedial Design and Remedial Action (RD/RA) phase of the cleanup process.

In addition, two attachments are included in this Responsiveness Summary. Attachment A provides a list of the community participation activities that EPA and the New Hampshire Department of Environmental Services (NHDES) have conducted to date at the Site. Attachment B contains a copy of the transcript from the informal public hearing held on April 16, 1991 in Dover, New Hampshire. The comments submitted by the citizens and the PRPs are available in the Administrative Record.

I. OVERVIEW OF REMEDIAL ALTERNATIVES CONSIDERED IN THE FEASIBILITY STUDY AND PROPOSED PLAN

Using information gathered during the Remedial Investigation, the Field Elements Study and the Risk Assessments (RI Risk Assessment and FS Supplemental Risk Assessment), EPA identified several cleanup objectives for the Site.

The primary cleanup objective is to reduce the risks to public health and the environment posed by exposure to the source of contamination onsite and to groundwater contamination that has already or may in the future migrate off-site. Cleanup levels for groundwater and sediments are set at levels that EPA considers to be protective of public health and the environment.

After identifying the cleanup objectives, EPA developed and evaluated potential cleanup alternatives, called remedial alternatives. The FS describes the remedial alternatives considered to address the contaminants of concern and the media in which they pose a threat. The FS also describes the criteria EPA used to narrow the range of alternatives to 4 potential source control (SC) remedial alternatives and 4 potential management of migration (MM) remedial alternatives.

The cleanup plan selected by EPA to address Site contamination includes consolidation of the drainage ditch and drainage swale sediments and recontouring the Landfill followed by capping with a multi-layer cap and extraction and treatment of the contaminated groundwater and leachate. During remedial design, EPA will determine whether the treated contaminated groundwater will be discharged to the Cocheco River or Dover Publicly Owned Treatment Works (POTW). The selected remedy also restores contaminated groundwater at and beyond the point of compliance to cleanup levels through natural attenuation, in the eastern plume, and by active extraction and treatment of the contaminated groundwater in the southern plume. A monitoring program will be implemented during pre-design to further define the lateral extent and depth of contamination in the groundwater. In addition, the cleanup plan will rely on institutional controls to prevent any use of groundwater until contaminant concentrations have decreased to safe levels. A long-term monitoring program will also be implemented during pre-design and will continue until EPA determines that the remedy is considered protective. The estimated net present worth of the remedy is $24.2 million.

All of the remedial alternatives considered for implementation at this Site can be found in the ROD Decision Summary, the Proposed Plan and the Feasibility Study.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Site History

The Dover Municipal Landfill is located on a 55-acre parcel of land on Tolend Road in Dover, New Hampshire, near the Madbury and Barrington Town lines. The Bellamy Reservoir, which supplies drinking water for the towns of Portsmouth, Newcastle, Newington, Durham, Madbury, Greenland and Rye, is located 2000 feet south of the Site; and the Calderwood Well, which supplies drinking water for the City of Dover, is located approximately 2000 feet northeast of the Landfill. The Cocheco River is located approximately 500 feet east of the Landfill.

The Landfill was in use from 1960 to 1979. Wastes were disposed at the Landfill from both industrial and municipal sources. Flammable waste was reportedly dispersed across the Landfill surface and, at times, burned. A trench and cover method was used during most of the Landfill operation to dispose of the wastes. In September 1977, the New Hampshire Department of Environmental Services (NHDES) (formerly the Water Supply and Pollution Control Commission, or WSPCC) ordered landfill operators to stop accepting chemical waste for disposal. In 1980, the Town of Dover began capping procedures to close the Landfill and, in 1982, the City of Dover and NHDES closed the facility and re-excavated the firebreak ditch around the Landfill to intercept leachate.

In 1977, the Cities of Dover and Portsmouth, along with the NHDES began studying the Landfill because of its proximity to public and private water supplies. Study results indicated that ground water and surface water in the area of the Landfill contained elevated concentrations of organic and inorganic contaminants. Private drinking water wells in the vicinity of the Landfill were found to be contaminated with volatile organic compounds (VOCs). After further testing, state officials determined that the source of ground water contamination was the Dover Municipal Landfill. In 1981, an alternate water supply was provided for residents with affected wells. Residences along both Glen Hill and Tolend Roads have also tied onto this water supply line.

In 1983, the Site was evaluated by the EPA for possible inclusion on the National Priorities List (NPL). Because of the concentrations of contaminants present in sediments, surface water, and ground water, and because of the contaminants' proximity to drinking water sources, the Landfill was ranked and placed on the NPL. In 1984, the NHDES, under a cooperative agreement with EPA, initiated a Remedial Investigation (RI) of the Landfill. In 1988, a group of Potentially Responsible Parties (PRPs) signed an Administrative Order by Consent with the EPA to perform a Field Elements Study (FES), addressing data gaps of the RI, and a Feasibility Study (FS).

The RI and the FES confirmed the presence of VOCs and metals in groundwater and sediments, and VOCs in the drainage ditch surface water. A risk assessment conducted to evaluate potential risks to public health the environment revealed increased carcinogenic and noncarcinogenic risks to human health if contaminated groundwater is consumed.

History of Community Involvement

EPA has conducted public meetings and has released fact sheets and press releases to keep the public informed of Site activities since 1984. In general, community concern about the Dover Landfill has been relatively low. However, community interest and concern increased following the release of EPA's preferred cleanup plan and the issuance of notice of potential liability for Site cleanup to the City of Dover and the Town of Madbury.

The first public meeting concerning the Dover Municipal Landfill was held on August 9, 1983. EPA and NHDES jointly discussed the findings and recommendations of the Remedial Action Master Plan (RAMP). In December 1984, EPA released a community relations plan which included a summary of the Site's history and contamination and described field activities expected to be conducted at the Site. Also in December of 1984, NHDES held a public meeting to inform the citizens about the upcoming activities of the RI/FS. After the completion of the RI/FS (March 1989), EPA and NHDES held another public meeting to discuss the results of sampling at the Site.
In March 1991, EPA and NHDES made the Administrative Record of the Site available for public review, released the Proposed Plan to the public and published a public notice and brief analysis of the Proposed Plan in Foster's Daily Democrat. The Proposed Plan was placed in the information repository at the Dover Public Library.

On March 25, 1991, EPA and NHDES held a meeting to discuss the FS results, the cleanup alternatives, and the Proposed Plan. Approximately 50 community members, including local officials and the news media attended the meeting. Questions asked or comments made at the meeting were related to the following issues: remedial costs, availability of Federal and State aid for the City of Dover, rate of plume migration, landfill cap characteristics, and PRP liability.

Public Reaction to EPA's Preferred Alternative

The concerns voiced by citizens, local officials, and PRPs at the April 16, 1991 public hearing and in the comments received by EPA relate primarily to the cost of the Preferred Alternative. Community members expressed fear that because the City of Dover and the Town of Madbury had been issued general notice of potential liability, that there would be a substantial increase in taxes. Many of these community members argued that an increase in taxes of the magnitude necessary to pay for the Preferred Alternative would drive businesses and residents away from the City of Dover and the Town of Madbury. Most citizens, officials, and PRPs who commented on the EPA's Proposed Plan said that a less costly solution - such as monitoring and institutional controls - would be sufficient to protect human health from the threats posed by the site.

Other members of the public supported EPA's Proposed Plan, including the Water Department of the City of Portsmouth, which draws drinking water from the Bellamy Reservoir.

III. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

This Responsiveness Summary addresses comments received by EPA during the public comment period (March 26 to May 24, 1991). Twenty-one individuals (including representatives from the cities of Dover and Portsmouth and Town of Madbury, members of the Dover PRP Steering Committee, and area residents) addressed EPA's Preferred Alternative during the public hearing. Eight sets of written comments were received by EPA during the public comment period (including comments from area residents, the Dover City Manager, a Dover City Councilman, the Mayor of the City of Dover, the City of Portsmouth Public Works Department, the Town of Madbury, and the Dover PRP Group). A citizen's petition was also received.

Part I - Citizens, and Local Officials Comments

Comment 1: The majority of the comments received addressed the inability of the City of Dover to pay its share of the proposed $26 million cleanup cost. Twenty-two individuals commented that the Preferred Alternative would be too costly. Each comment emphasized the fact that local residents and industries are already experiencing economic difficulties and that the cost of EPA's Preferred Alternative is more than the City's taxpayers could possibly afford. The following specific issues related to the cost of remediation were raised by various individuals:

- The City of Dover has been allocated over 60 percent of the clean-up costs by the PRP Steering Committee and it's $16 million share of the cost for the implementation of the Preferred Alternative exceeds the City's $13 million borrowing limit (City Manager, State Treasurer).

- The total cost in capital for the Preferred Alternative would be $3000 per Dover household (City Manager).

- Other financial demands on taxpayers currently include the cost for the water and wastewater treatment plant, education, fire and police protection, solid waste disposal, street repair, and public health services.

- Cities/towns are being forced to seek less costly means to achieve goals in a bad economy; it was requested that EPA do the same (Dover School Department Representative).

- Businesses do not have enough money to spend on cleanup. EPA should consider the fiscal impact on the community as well as the environmental impact. The cost of cleanup will have a devastating effect on the ability to compete and gain industries in Dover (Chamber of Commerce, Economic Commission, and Dover Industrial Development Authority representatives).

- Area taxpayers and businesses will also be affected by the costs to remediate the nearby Coakley and Somersworth Landfills. The total amount of money to clean up all sites was estimated at $70 million (Town of Madbury's Attorney).

- The harm to be caused by the taxes necessary to fund the Preferred Alternative outweighs the harm potentially caused by the effects of the contaminated drinking water (one resident and former City Council member).

<u>EPA Response:</u> In selecting the remedy for the Dover Site, several aspects of the costs associated with this remedy were evaluated in detail including, among others, the cost-effectiveness of the remedy when compared with other alternatives and the total short and long term costs of each alternative, including the remedy, compared with the level of protection offered by each alternative. As a result of

these evaluations EPA has determined that the selected remedy is cost-effective and that it complies with all statutory and regulatory mandates which address cost-effectiveness.

It should be noted that while the cost of each remedial alternative evaluated by EPA was an important factor in determining a remedy for this Site, cost is neither the only nor the most important criterion in EPA's analysis. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan (NCP) and related EPA Guidance, cost was one of a number of factors used to evaluate potential remedial actions at several stages in the remedy selection process. First, a large number of technology process options which could be implemented at the Site were evaluated for their effectiveness, implementability, and cost. Secondly, a range of alternatives which combined the various technology process options to address all media and contaminants of concern were evaluated on the same three criteria, including estimated cost. Thirdly, a detailed analysis of several select alternatives was undertaken; this analysis was performed using the nine criteria set out in the NCP, one of which is cost. (These nine criteria appear in Section IX of the ROD Decision Summary and at 40 CFR 300.430(e)(9)(iii).) Lastly, the selected remedy - which in this case combined portions of several source control and management of migration alternatives and which cut more than $1.6 million from the proposed remedy - was evaluated on the same nine criteria, including cost.

As to the weight accorded cost-effectiveness in this multi-staged evaluation, the NCP and related EPA Guidance define cost as one of five primary balancing criteria to be considered only after the first two threshold criteria have been satisfied. Those threshold criteria include overall protection of the human health and the environment and compliance with all federal and state laws which are applicable or relevant and appropriate (ARARs) to this Site. In essence, any alternative which does not meet these threshold criteria cannot be selected as the remedy.

In this case the threshold requirement that the remedy meet all ARARs is particularly significant because ARARs establish the basic design criteria for major portions of the remedy, such as the multi-layer cap. For example, the multi-layer cap accounts for approximately 70 percent of the total costs of the remedy. Thus the threshold costs - those that cannot be avoided if the EPA is to comply with its statutory and regulatory mandate - account for a very large portion of the total costs.

While the cost-effectiveness of the remedy has been thoroughly analyzed in the remedy selection process as set out above, neither the Superfund statute nor applicable regulations allow the economic climate of southern New Hampshire or the financial well-being of those who will ultimately bear the burden of the remedial costs to be a factor in the selection process. CERCLA's statutory mandate as well as the strictures of the NCP require that cleanup standards be established through an analysis of the risk to human health and the environment and the applicable or relevant and appropriate environmental laws. Cleanup levels are set without regard for who will be named as a Potentially Responsible Party and who will ultimately bear the costs of remedial action. EPA cannot establish different cleanup levels, comply with fewer ARARs or select a less protective remedy at a site as a result of who will be liable for the cleanup costs.

In this instance, the City of Dover and the Town of Madbury were issued general notice of potential liability because, on EPA's analysis they qualify under CERCLA Section 107 as generator, transporter, and/or owners/operators with respect to the Site. EPA has issued 37 notices of potential liability to Potentially Responsible Parties (PRPs). These PRPs include local industries, municipalities and individuals. The liability for the total costs for the implementation of the selected remedy is joint and several - that is, all parties are liable for the total costs of the remedy.

As liability for the cleanup is joint and several, the share of the costs to be borne by the taxpayers of Dover and Madbury will depend on any agreement these towns reach with the other PRPs at the Site. The City of Dover has been an active participant in the PRP Steering Committee which calculated the internal PRP allocation of costs to date.

Comment 2: Six individuals questioned why the Preferred Alternative was selected if the groundwater contaminant plume already appears to be receding and conditions appear to be improving as a result of the installation of the cover material and drainage trench when the Landfill was closed. Specific related issues raised include the following, listed as comments a through d.

EPA Response: Based on the extensive scientific study of the Site, EPA has concluded that the contaminant plume is not receding and that the original cover material and firebreak trench have been, and continue to be, ineffective at protecting the human health and the environment. Site studies have shown that total VOC concentrations in some wells have decreased, however these same studies have indicated that in other wells, total volatile organic compounds (VOC) concentrations have increased. Chemical concentration fluctuations are typically observed in contaminated groundwaters at hazardous waste sites. Figure 5-2 of the FES compares the HMM ND (non-detect) plume (FES) and the GZA ND Plume (RI). It is apparent from those interpretations that the lateral extent of the plume has not significantly changed from the Remedial Investigation to the Field Element Study. While contaminant concentration data for certain compounds in off-site wells, such as trichloroethylene and 1,2-Dichloroethane indicate a decrease in concentrations, other compounds such as vinyl chloride and methylene chloride indicate an increase in concentrations. Further, vinyl chloride, which was only found at trace levels in the RI, was detected in three wells during the FES at up to 31 times the Safe Drinking Water Act Maximum Contaminant Level (SDWA MCL).

As to the effectiveness of the closure activities in the early 1980s, the cover material placed on the Landfill consisted of sandy loam which provided only limited protection from dermal contact with contaminants and little or no hydraulic barrier which would prevent precipitation from infiltrating through the Landfill as this material is porous in nature. At present, much of this cover has eroded away, exposing some Landfill wastes. Only sparse vegetative growth covers the majority of the Landfill. Therefore, the cover currently does not preclude rainwater from infiltrating the Landfill resulting in the migration of contaminants into the groundwater, south and east of the Landfill.

In addition, the Landfill was constructed using standard fill and cover techniques, without any definitive drainage system or leachate collection systems. As a fire preventive measure, the Landfill was surrounded by a "firebreak" trench. The drainage trench was constructed by re-excavating to a shallow depth and berming the excavated materials to one side. The trench currently intersects the groundwater table during seasonal high groundwater level conditions and collects and conducts contaminated Landfill leachate and surface water runoff to the Cocheco River. At certain times of the year, the drainage ditch is dry; it is believed that during that time, contaminated groundwater flows under the trench and migrates into the groundwater around the Landfill.

That the landfill was closed in the early 1980s in accordance with state standards, as asserted by one commenter, is not dispositive of the selection of a remedy at this site. CERCLA charges EPA with cleaning up Superfund sites so that they address the current and future threat to human health and the environment and meet all applicable or relevant and appropriate environmental laws. There is no 'grandfathering' of past ineffective remedial measures. In addition, EPA takes no position with respect to whether these past remedial measures were consistent with applicable state laws.

Comment a: The Mayor and the Attorney for the City of Dover expressed concern that the disturbance of the existing Landfill cover would probably do more damage to the environment and cause greater risk to human health than would occur if it were left untouched.

EPA Response: While it is possible that there may be some short-term, adverse impacts to the environment as a result of the recontouring of the Landfill, in the long-term the proper closure of this Landfill will provide far greater protection to human and health and the environment than the current Landfill cover and drainage trench.

The recontouring activities include consolidation of the existing Landfill perimeter soils and debris from the toe of the Landfill side slopes, as well as the drainage ditch sediments, on top of the Landfill prior to capping. The recontouring of the Landfill is to provide adequate slopes to allow proper drainage and to minimize the amount of imported clean fill required to achieve the necessary slopes (a significant reduction in cost is obtained by limiting the amount of clean fill necessary).

Before recontouring can begin, a preliminary assessment will be performed consisting of surface geophysics and test pit explorations to ensure that excavation is limited to areas containing predominately soils, debris and municipal waste. However, it is possible even with these precautionary measures that the excavation in the Landfill could expose some hazardous substances in various forms such as barrels, sludges, etc., and some releases could occur. Therefore, EPA will require that extreme care be exercised during excavation in the Landfill and that contingency measures such as dust and odor suppressant foam be developed and implemented as necessary. Any hot spots or full drums encountered will be tested and removed, treated and disposed of in an off-site RCRA TSD facility.

In addition, continuous air monitoring will be conducted to detect unacceptable exposure levels to workers and area residents from inhalation of fugitive dust, organic vapors, and emissions generated during Site work.

Comment b: Two Dover City Council members questioned the appropriateness of using data collected seven years ago as the basis for the choice of the Preferred Alternative. These council members believed that contaminant levels have decreased. They suggested that actions be taken only if the public health is definitely threatened.

EPA Response: The statement that the remedy is being selected on data which is seven years old is inaccurate. Data collection at this Site commenced in the early 1980s and has continued up until this year. The last round of sampling - performed by NHDES - occurred in the spring of 1991, shortly before the issuance of the Proposed Plan. All of this data has been analyzed to determine whether remedial action is necessary and whether the remedy will be protective of human health and the environment.

Remedial action is taken at a Superfund site on the basis of unacceptable risk as well as the failure of the site to comply with all ARARs. The risk calculation in this case is based on that data collected in 1989 and 1990 by HMM in the Field Elements Study, as well as some portions of the data collected by Wehran Engineers in 1985 and 1986. Some of this data was confirmed as recently as several months ago. As discussed in the ROD and supported in the Administrative Record, all of this data indicated that there remain unacceptable risks to human health from this Site.

All of the data collected, including that collected in 1991, indicates that, among other things, off-site groundwater contains levels of contaminants above limits set by the Safe Drinking Water Act MCLs which are an ARAR for this Site. This exceedence of ARARs, confirmed by data taken just a few months ago, is another reason for the selected remedial action.

The comment that contaminant levels have decreased has been addressed in more detail in a EPA's response to comment number 2. In essence, while total VOC concentrations in certain well locations and some individual contaminant concentrations have decreased others have increased. The extent of the plume configuration does not appear to be receding. In addition, there is no indication that the risks associated with the Site has lessened.

Comment d: One resident did not understand the need for remediation since no one has seen any dead animals or birds and since there are plenty of shrubs and trees growing around the Site. He believes that the land will refurbish itself.

EPA Response: The lack of dead animals and the presence of trees and shrubs does not indicate the lack of contamination at the Site. The Site presents both current and future risks to humans, flora and fauna through contaminated groundwater, surface water, soils and sediments. Groundwater contamination, although not visible to the human eye, is a substantial threat at the Site. The contaminated groundwater and the threat it presents will continue if the source of this contamination is not controlled.

Additionally, contaminated sediments in the drainage swale present a threat to aquatic inhabitants of the Cocheco River and to a lesser extent, a threat to humans. The same is true of the perimeter drainage ditch which is a visible source of surface water contamination. Many wild animals, such as deer and raccoon, drink from this water, and are therefore exposed to the contaminants present in the water. Frogs in this drainage ditch are exposed to the contaminants in the sediments and surface water. Humans may also be exposed to these contaminant pathways.

As to the comment that this Site will 'refurbish' itself without remedial action, all sampling and modelling indicate that it would take decades for natural processes to make this Site safe and to return the natural resources of this area to their beneficial uses. As set out in the Feasibility Study, taking no action at this Site is to allow the contaminants to remain and spread for generations.

Comment 3: Representatives of the City of Dover and Town of Madbury, and other concerned citizens and officials recommend that a less costly alternative be considered. Specifically, these individuals recommended that EPA consider the following actions before finalization of the Preferred Alternative:

- implementation of a limited action proposal such as Alternative SC-2;
- damming and mounding of water in the Bellamy Reservoir to reverse further flow toward the reservoir and creating the equivalent of a hydraulic control in that area;
- defer implementation of the Management of Migration alternative; and
- delete any requirements to install an upgradient interceptor trench, or at least separate its flow from the downgradient trench.

These individuals note that the above options would be less costly. They also believe that since institutional controls have been implemented, a public water supply has been provided and the contaminant plume appears to be receding, these options would be sufficient in protection of public health and the environment.

EPA Response: While EPA agrees that implementing a limited action remedy such as that proposed in these comments would be less costly in the short-term than implementing the selected remedy, a similar limited action plan was reviewed in detail in the remedy selection process and rejected. The analysis of such a limited action can be found in the Feasibility Study and summaries of the analysis can be found in the Proposed Plan and in the ROD Decision Summary. In essence, such a plan would be inconsistent with the intent of CERCLA and with the NCP insofar as it fails to comply with ARARs, it fails to provide adequate protection to human health and the environment, it fails to provide a long-term solution, and it fails to reduce toxicity, mobility or volume through treatment. In particular, the heavy reliance on institutional controls for a long-term solution is inconsistent with the NCP where active remedial measures are practical. In addition, the failure to return the off-site groundwaters to their beneficial uses in a reasonable time is also inconsistent with the NCP.

EPA does not agree that raising the water level of the Bellamy Reservoir will reverse further flow toward the reservoir, although it may decrease the hydraulic gradient between the Landfill and the reservoir thereby reducing the groundwater velocity. This action does nothing to ameliorate the problem of the continued movement of contamination from the Landfill.

In addition, such an action, implemented without addressing the source of contamination, suffers from many of the same problems as long-term reliance on institutional controls that are listed above. In particular, it fails to prevent the formation of contaminated Landfill leachate and the future migration of the contaminants away from the Landfill. It also does not clean up the contaminated groundwater between the Landfill and the reservoir. In sum, such an action would be in contravention of CERCLA and inconsistent with the NCP in that it not only fails to satisfy the threshold criteria necessary for the selection of a remedial action but also meets few of the objectives for remediating this Site.

EPA has analyzed in detail the deferral of the management of migration portion of this remedy. As set out in the ROD, an active management of migration remedy has been chosen for the southern plume so as to clean-up the groundwater in a shorter time frame than that for natural attenuation and to manage the plume so it does not reach the Class A waters of the Bellamy Reservoir. In addition, deferring the management of migration portion of this remedy so that it may be re-evaluated after the cap has been placed, allows groundwater risks to remain for an extended period and fails to institute any short term protection for the Bellamy reservoir.

EPA agrees that there should be a separation of flows between the upgradient diversion portion of the trench and the downgradient interceptor trench. This was not made clear in the Proposed Plan. The function of the upgradient trench, included in the selected remedy, is to divert clean groundwater from any contact with the waste materials, thereby reducing the volume of contaminated groundwater requiring treatment. The clean groundwater will be diverted to the Cocheco River or as necessary, recharged back to the wetlands to prevent dewatering of the surrounding wetlands.

<u>Comment 4:</u> A resident suggested that grading the Landfill, diverting surface water away from the Landfill, and vegetating the Landfill surface should be sufficient in controlling and naturally abating the contamination.

EPA Response: The selected remedy as described in the ROD includes grading the Landfill, directing surface water away from the Landfill and establishing vegetation on the Landfill surface. As noted in the responses above and in the extensive analysis of this Site contained in the Administrative Record, these actions alone are not sufficient for the protection of human health and the environment and do not meet the ARARs for the Site. In essence, this proposal is little different than the no-action remedy evaluated in the Feasibility Study and rejected in the remedy selection process; it fails to meet not only the threshold criteria (protectiveness and satisfying ARARs) but also fails to provide long-term protection and to employ treatment as part of the solution to the contaminant threat.

Comment 5: A Dover resident questioned why the Dover Landfill was singled out for cleanup when thousands of other Sites are more contaminated.

EPA Response: The basis for this Site's proposal and then placement on the National Priorities List (NPL) can be found in the Hazardous Ranking Package and those studies on which these documents are based; all of these materials are contained in the Administrative Record. In essence, this Site was placed on the NPL after the discovery that contaminants from the Landfill had polluted residential wells adjacent to the Site, that contaminants were flowing from the Site directly into the Cocheco River and that two municipal drinking water sources, the Calderwood Well and the Bellamy Reservoir, were in close proximity to the Site.

The Dover Municipal Landfill was proposed for the NPL on December 30, 1982, was ranked and listed on the NPL on September 8, 1983. The activities leading to its placement on the NPL include studies of the Landfill and its impact on the surrounding area performed by the NHDES and the Cities of Dover and Portsmouth. These studies were conducted as a result of the concern that Landfill contaminants were in close proximity to the Calderwood Well and the Bellamy Reservoir. These studies indicated that although the Bellamy Reservoir and the Calderwood Well had not yet been contaminated by the Landfill, residential wells and the Cocheco River were being polluted. Residential wells near the Landfill were found to be contaminated with VOCs in 1981. The Cocheco River was being contaminated by leachate, generated by the Landfill, and discharging via a local stream (swale) to the river.

In 1982, the City of Dover informed the EPA of its concerns about the Site. EPA performed a preliminary assessment and site investigation of the Site, which then led to the development of a Hazardous Ranking Package and the ultimate proposal for and placement of the Site on the NPL.

For a comparison with other sites considered for the NPL, the public should consult EPA's Superfund Inventory called CERCLIS, which contains the preliminary assessments and site investigation reports of other "sites," which after evaluation, either did not require the generation of a Hazardous Ranking Package, or if a Hazardous Ranking Package was required, the "scoring" for that particular site did not meet the criteria for proposal on the NPL.

Comment 7: A City of Dover Councilman felt that during the public meeting EPA downplayed the danger to public health and safety posed by the Site. He questioned why remediation is necessary if the risks are not great.

EPA Response: EPA disagrees that the risks to public health and the environment have been "downplayed" by EPA. The immediate threat to public health from the Dover Municipal Landfill Site was removed from the Site when residents were supplied with a public water line in 1982. The baseline risk assessment (performed initially during the RI and supplemented in the FES) estimated current and potential exposures and risks to public health from several exposure pathways, using current data and assuming no remediation will take place in the future (no-action). EPA has identified the estimated risks for the Site, from the various exposure pathways, and these risks indicate that the primary threat of exposure is from future use (i.e., drinking) the contaminated groundwater around the Site. The risk assessment do not set clean-up levels for remediation, but is intended to be used as a basis for the evaluation of various alternatives proposed for the cleanup of the Site.

Comment 8: A City of Dover Councilman stated that a clay barrier many feet thick prevents water from reaching the bedrock from where the city wells draw their water. He concluded that this factor along with the fact the Bellamy Reservoir has not been affected calls for modifications to the Preferred Alternative.

EPA Response: EPA assumes that the "bedrock from where the City wells draw their water" is referring to the lower hydrogeologic unit comprised of sandy gravels and dense till, rather than the actual bedrock unit. EPA agrees that the marine clay unit, which underlies the Site and separates the upper and lower hydrogeologic units, inhibits the contaminated groundwaters in the upper hydrogeologic unit from reaching the groundwaters in the lower hydrogeologic unit. Data has also indicated, to date, that the Bellamy Reservoir has not yet been contaminated by the groundwater migrating from the Landfill. Each of these factors has been taken into consideration in the selection of the remedy for this Site.

However, as discussed in detail in the Feasibility Study and in the ROD, these factors do not change the fact that the groundwater in the upper aquifer has contaminant levels exceeding those considered safe for drinking and thus the Site ARARs are not met. In addition, in accordance with the NCP and related EPA Guidance the remedy at this Site is based in part on the future risk related to the groundwater contamination in the upper aquifer. Again the facts cited in this comment do not address this risk.

In essence, this comment takes the position that if there is no threat to the current municipal drinking water sources, then the remedy should be less protective. The NCP and related EPA Guidance take the contrary view; all risks related to a Site, including risks associated with future private consumption of contaminated groundwater, must be addressed in the remedial action. A remedy which does not address the contaminants in the upper aquifer fails to satisfy even the threshold criteria required by the NCP.

<u>Comment 9:</u> The City of Portsmouth Public Works Department submitted a comment in support of EPA's Preferred Alternative because the "cleanup plan is taking the necessary steps to correct the problem and protect the Bellamy Reservoir". It was stated that since over thirty-thousand residents are served by the Bellamy Reservoir, this water supply should be protected. The City of Portsmouth also noted that the "reservoir would be difficult, if not impossible, to replace at a cost much higher than it would be to clean up the landfill that threatens it".

<u>EPA Response:</u> Each element of the selected remedy will be consistent with protecting the Class A waters of the Bellamy Reservoir. The remedy requires active groundwater treatment in the southern plume as well as the management of the plume so that it does not reach the reservoir. This active treatment of the southern plume will only be foregone if new

evidence reveals that the plume poses no threat to the Bellamy Reservoir.

Comment 10: Two area residents commented that they hope EPA will not relax necessary requirements based solely on the cost or financial impact to the PRPs. These residents are concerned about what effect no action or limited actions will have on their property value. They do not feel that placing a fence and warning signs around the Landfill protects either the public or the environment from possible hazards. Hunters, bikers, and four-wheel vehicles still use the Site and deer feed and drink from the land around the Landfill. These residents do not believe that they should be penalized for the PRPs unwillingness or inability to correct mistakes made in the past.

EPA Response: The selected remedy employs a combination of waste containment, capture and treatment, and natural attenuation that satisfies all statutory and regulatory requirements. The remedy is also consistent with this comment, in that it takes active measures to protect human health and the environment; neither no-action nor limited action were chosen for this Site.

Comment 11: A petition signed by Dover and Madbury citizens urges EPA to adopt a "reasonable and economically feasible" plan for the cleanup of the Dover Landfill. The petition recommends continued monitoring and installation of a new cap only if conditions worsen. It is also recommended that additional actions should be placed in only as necessary to correct worsening conditions.

EPA Response: The cost-effectiveness of the remedy is addressed in the response to Comment 1 as well as in the ROD. The limited action proposed - monitoring and staged implementation of remedial actions only if Site conditions worsen - is inconsistent with the NCP in that it fails to satisfy not only the threshold requirements for remedial action but does not meet the site-specific remedial objectives set out in the Feasibility Study and summarized in the ROD. In addition, the response to Comment 3 is equally relevant to this comment.

Part II Summary of Potentially Responsible Party Comments

Balsam Environmental Consultants, Inc. (Balsam) submitted written comments on behalf of the Dover Landfill PRP Group.

Balsam commented that certain elements of the Proposed Plan are overly protective of human health or are "environmentally or technically impracticable." The Balsam comments are summarized below.

Comment 1: Balsam recommends that EPA select a "sequential and phased" remedy for the Site instead of implementing all of the components of the Proposed Plan simultaneously. Balsam proposes the following four sequential phases.

> **Phase I:** Construction of a properly designed cap over the Landfill, installation of a ground water and surface water monitoring system, and implementation of access and institutional controls.
>
> **Phase II:** Construction of an interceptor trench upgradient of the Landfill with discharge of collected clean ground water to the Cocheco River through an NPDES-permitted outfall.
>
> **Phase III:** Installation of an interceptor trench downgradient of the Landfill, with treatment of collected ground water.
>
> **Phase IV:** Installation and operation of an offsite ground water extraction and treatment system.

Balsam proposes that if results of ground water monitoring reveal that Site cleanup objectives have not been achieved after the completion of each phase, additional phases would be implemented sequentially. Balsam contends that such an approach would be consistent with the National Contingency Plan 40 CFR 430(a)(ii)(A) and satisfies the nine criteria for evaluation outlined in 40 CFR 300.430(e)(a)(iii). Furthermore, Balsam contends that a phased remedial program is appropriate for the Dover Landfill Site because "significant" risks to human health and the environment are not currently posed by the Site and future risks are not "significant" because of institutional controls; therefore, Balsam takes the position that the additional time that may be associated with completion of its proposed remedial program should not result in increased adverse impact to human health.

Balsam also states that it would be premature to implement onsite hydraulic controls and active ground water remediation without a more complete understanding of the current hydrogeologic conditions at the Site. Balsam recommends that implementation of the hydraulic control and management of migration elements of the Preferred Alternative be deferred until better evaluation of the post-cover system installation ground water flow regime is developed, and associated changes in ground water flow and plume migration direction have been monitored in the field.

EPA Response: EPA has reviewed the Balsam proposal in detail and determined that it fails to meet not only the threshold criteria for the selection of remedial action, protection of the human health and the environment and compliance with ARARs, but fails to compare favorably with the selected remedy when evaluated against the five primary balancing criteria. The following response summarizes a number of important faults EPA has found with the Balsam proposal. In addition, one particularly important shortcoming of this proposal is addressed in detail.

In sum, the proposal fails to meet the threshold criteria for selecting a remedial action because: the proposal fails to satisfy many ARARs including groundwater clean-up levels established by Safe Drinking Water Act and the Resource Conservation and Recovery Act (RCRA), the federal and state hazardous waste laws requiring complete containment of hazardous wastes, and the federal and state laws protecting surface waters; the proposal fails to prevent the generation of contaminated leachate from the Landfill and the migration of this leachate into the surrounding groundwater and surface water, in contravention to ARARs and cleanup objectives; the proposal fails to provide sufficient protection to the Bellamy Reservoir in the short-term and long-term; the proposal does not provide for groundwater cleanup in a reasonable time frame; the proposal does not adequately address the long-term risks posed by the contaminant plumes; the proposal fails to address contaminated sediments in the drainage swale; and, by its nature, the proposal is not a permanent solution. In addition, reviewing this proposal in light of the five primary balancing criteria, among other problems with this proposal are the following: the proposal employs treatment as a last measure, contrary to the NCP's bias towards treatment of hazardous wastes; the phased approached may not be cost-effective if early remedial measures do not meet cleanup levels; a phased approach will generate substantially more administrative problems, and transaction costs will increase as well; risks may increase substantially if leachate is allowed to continue to migrate from the Site; the proposal conflicts with the NCP's mandate that institutional controls are to be used for long-term solution only where other means are not practical for cleaning up the contamination; and the phased approach may significantly delay the ultimate cleanup of this Site.

Of particular concern is the failure of the Balsam proposal to include a leachate collection and treatment system at the outset of the remedy. As described below, this proposal would allow continued contaminant migration from the Site, threatening human health and the environment and failing to meet many of the ARARs, in the hope that a limited remedial action will eventually meet cleanup objectives. Such a 'wait-and-see' approach to remedy implementation provides little assurance of either short term or long term protection from the Site.

At the Dover Site, substantial amounts of waste material currently lie beneath the water table and remain saturated during all or major portions of the year. The leachate from these saturated wastes coupled with the leachate produced by rainwater infiltrating through wastes above the groundwater table is the source of the contaminated groundwater downgradient of the Dover Landfill. While the cap alone will minimize or prohibit the amount of rainwater infiltrating through the waste, it will not abate the continued migration of contamination from the Landfill associated with normal groundwater flow.

The installation of an effective capping system is expected to somewhat alter the current hydraulic conditions within the Landfill and thereby influence local groundwater flow and direction characteristics; it will not decrease the amount of hazardous substances that are currently in the contaminant plumes and beneath the Landfill proper. Leachate that has been generated within the waste mass can also be expected to continue to move outward until such time as the waste mass is effectively de-watered (recharge being denied by installation of the cap). Portions of the waste mass may continue to remain beneath the water table unless the now relaxed groundwater mound falls permanently below the bottom of the wastes. Thus, the remedy's interceptor system will provide for collection of leachate until such time as the benefits of capping the landfill become fully effective or in the event that wastes remain beneath the water table collection will continue until leachate concentrations fall to and remain within acceptable limits.

Modeling conducted during the FS estimated cleanup levels will be attained within 5 to 7 years in the eastern plume and within 10 to 24 years in the southern plume provided source control measures are implemented including cap and the leachate/groundwater collection system around the Landfill. Without the leachate/groundwater collection system, contamination from within the Landfill or already in the aquifer will continue to migrate offsite thus increasing estimated times to attain cleanup levels in the eastern and southern plumes. Given these circumstances, ARARs would not be met in either plume at or beyond the compliance boundary within a reasonable time frame as required by the NCP and certainly not within the time frame which could be attained using active measures to control the migration of leachate/groundwater from the Landfill. A phased approach to instituting source control measures thus builds into the cleanup of the Site long periods during which contaminants may migrate off the Site and increase the threat to human health and further harm the environment.

Based on the above conclusions it is EPA's opinion that employing a "wait and see" method of remedy implementation does nothing to diminish, and could magnify, potential risks to human health and the environment.

EPA agrees that additional data must be gathered during pre-design and design to allow for the proper design and construction of the groundwater/leachate collection system. EPA also agrees that the groundwater/leachate flow patterns may change somewhat after the installation of the cap. However, EPA has not concluded that the resultant change will be significant. Further, EPA has concluded that the groundwater/leachate collection system can be appropriately designed in conjunction with the cap design. EPA acknowledges that, after implementation of both systems, some fine tuning of the collection system may be required to optimize its effectiveness. However, this is not considered unusual and can be provided for in the design.

Finally, the time to design and install the cap, to then wait until the groundwater flow regime under and around the landfill to stabilize, and to then design and construct the groundwater/leachate collection treatment system would take a substantial number of years, possibly in excess of ten. Only after this lengthy period would the groundwater remediation process begin. In the meantime contaminants would continue to migrate from the Landfill in the groundwater and surface water. EPA does not consider this approach to be consistent with the NCP in that the groundwater will not be returned to its beneficial use in a reasonable time frame, and the contaminated leachate entering the local surface waters would violate ARARs.

Comment 2: Balsam comments that the remediation of the southern plume through groundwater extraction and treatment does not appear justified. Balsam bases this opinion on the following factors: 1) EPA has concluded that the Bellamy Reservoir will not be significantly affected by contaminated ground water; 2) installation of an engineered cap over the Site will both significantly improve ground water quality and modify the existing hydrogeologic regime, both of which will serve to mitigate the southern plume; 3) ground water in the area will not be utilized due to institutional controls implemented by the City of Dover; and 4) closer examination of the risk assessment, which indicates that the majority of the potential future risk associated with the southern plume is attributed to arsenic, reveals that risks may be overestimated.

EPA Response: The possibility that the Class A waters of the Bellamy may be contaminated by the southern contaminant plume is one of several reasons for including the active treatment of this plume as part of the Proposed Plan and the overall remedy for this Site. EPA has determined that, to date, the plume has not had an adverse impact on the waters of the Bellamy; this does not mean that future contamination will not occur. As noted below, groundwater sampling and modelling has indicated that contaminants in the southern plume are moving towards the reservoir. In addition, natural attenuation will take from 10 to 24 years to improve groundwater quality to cleanup levels after the source control measures are put into place. Without active plume management these contaminants may reach the Bellamy during this lengthy period. More importantly, as discussed in the ROD, active plume extraction and treatment is justified even if the contaminants posed no threat to the Bellamy; the fact that groundwater contaminants exceed MCLs in an area that could be used for drinking water is sufficient justification for employing active treatment and management of this plume.

As to the second basis for Balsam's opinion, EPA acknowledges that an effective cap over the Landfill may alter the ground water flow characteristics in the area of the southerly plume. However, there is little support for the position that a cap alone will cause a significant improvement in ground water quality in the downgradient plume. Even if an effective cap is installed on the Landfill, it is likely that groundwater will still flow in a southerly, downgradient direction. As indicated from Table 3-2 in the FES report entitled Elevation Information for HMM Installed Monitoring Wells, groundwater elevation in the upper unconfined aquifer ranges from one to five feet below surface grade. Therefore, it is assumed that some of the disposed waste deposited in the Landfill exists in the saturated zone. Accordingly, as indicated in a groundwater contour map of the Landfill area (Figure 3-6 in the FES), ground water could flow in a southerly, downgradient direction underneath the Landfill, through the existing industrial and municipal waste. This scenario would likely cause a continued migration and expansion of the VOC plume in a southern direction towards the Bellamy Reservoir. The cap will reduce the vertical flow of water through the waste but not the horizontal flow through the waste in the saturated zone.

In addition to allowing leachate to continue to flow beyond the Landfill boundaries, the cap would have little or no impact on the contaminants that have already migrated within at least 900 feet of the reservoir. While the flow may be somewhat retarded by a cap, those contaminants will continue to pollute the groundwater at and beyond the point of compliance and will continue to flow towards the reservoir.

It should also be noted that the calculation of the natural attenuation time frames for the eastern and southern plumes, by HMM, assumed that an active source control alternative had been installed and that further migration of contaminated groundwater and leachate had been eliminated. The natural attenuation time frames were estimated to be 5 to 7 years for the eastern plume and 10 to 24 years in the southern plume. These estimated time frames will increase if leachate and contaminated groundwaters are allowed to continue to migrate from the Landfill.

As noted in response to prior comments and in the ROD, institutional controls, if they are implemented, will provide protection from contaminated groundwater in the short-term. However, the NCP requires that such controls be used as a long-term measure only when other alternatives are not practical. In sum, the proposal that institutional controls be used for an indefinite period while Landfill leachate continues to contaminate groundwater is inconsistent with the NCP.

Balsam's position that the risk attributable to arsenic in the groundwater is overestimated is addressed in detail in EPA's responses to the Public Health Evaluation submitted by Environmental Standards, Inc. for the Dover PRP Steering Committee (comment c). In addition, the reasonable maximum risk for vinyl chloride, found at 31 times the drinking water standard in the southern plume, exceeds EPA's acceptable risk range.

Comment 3: Balsam states that EPA has not established criteria for the termination of the proposed groundwater recovery and treatment systems. Specifically, Balsam states that EPA does not discuss target cleanup levels (TCLs) or specific points of compliance that would be used to terminate recovery and treatment operations. Balsam recommends that these criteria should include attainment of TCLs in defined monitoring wells for a defined period of time. Balsam further recommends that, in determining TCLs, EPA should consider documented operational limitations of the ground water recovery and treatment system. Balsam notes that the use of Maximum Contaminant Level Goals (MCLGs) as a TCL is infeasible when the MCLG is zero, citing the preamble to the NCP.

EPA Response: EPA has set interim groundwater cleanup levels in the ROD which must be met before completion of the remedial action at and beyond the point of compliance. In accordance with the NCP, the point of compliance is established at the edge of the waste management area. When the interim cleanup levels have been attained in all monitoring wells at and beyond the point of compliance, a risk assessment will be performed on residual groundwater contamination to determine whether the remedial action is protective. Remedial actions shall continue until protective concentrations of residual contamination have been achieved or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for the ROD and shall be considered the ultimate performance standards for the remedial action. The groundwater monitoring system will then be utilized to collect information for three years to ensure that the protective residual levels remain and the remedy is protective. The details of the groundwater monitoring program, such as number and location of monitoring wells and parameters, will be determined during remedial design.

EPA has also determined that until Site-specific data indicates that groundwater cleanup levels will not be met, it is inappropriate to include provisions which allow treatment to be terminated prior to the attainment of these levels. There is currently no Site-specific information that leads EPA to believe that the cleanup levels cannot be attained through extraction and treatment.

As noted in the ROD, interim cleanup levels for known and probable carcinogenic compounds (Class A and B) have been set at the appropriate MCL given that the MCLGs for these compounds are set at zero.

Comment 4: Balsam proposes that the compliance boundary for Site cleanup be established at the shore of the Bellamy Reservoir and at the banks of the Cocheco River. Balsam submits that the area bounded by the Landfill to the north, and the Bellamy and Cocheco to the south and east, would be established as a non-attainment zone. Balsam asserts that such a non-attainment zone is consistent with current New Hampshire groundwater policy which, it claims, is to be incorporated into New Hampshire's groundwater regulations at an undetermined point in the future. Balsam also commented that such a proposal is justified because institutional controls can be used to prevent the extraction of drinking water from this area, a City water supply can be provided in this area, and the source control measures will help eliminate the contaminant plume. A similar comment was also submitted by counsel for the City of Dover at the public hearing.

EPA Response: EPA has considered the above comment and determined that the establishment of a compliance boundary at the shores of the Bellamy and the banks of the Cocheco would be inconsistent with the NCP, insufficiently protective of the human health and the environment, and contrary to ARARs and the EPA's Groundwater Protection Strategy. In addition, a review of the current New Hampshire regulation which addresses this issue (Ws 410.13) but which is not an ARAR, indicates that even if it were an ARAR, the proposed compliance boundary would meet neither the letter nor the spirit of that regulation. Finally, the policy to which commenters refer is neither specified in their comment nor could be an ARAR as it is not an enforceable promulgated state regulation.

In accordance with the NCP, groundwater remediation levels will be attained at and beyond the edge of the waste management area. In this case the waste management area includes the Landfill and the perimeter drainage ditch. At the completion of construction of the source control portion of the remedy, the compliance boundary will be set at the outer edge of the interceptor trench; contaminants at and beyond that point must meet cleanup levels. While the NCP allows for site-specific exceptions to this general policy, at the current time no site-specific factors indicate that such an exception is appropriate.

In addition to being inconsistent with the NCP, the establishment of a zone of non-compliance beyond the edge of waste management area would be contrary with both federal and state ARARs controlling the protection of groundwater and surface water. Such a proposal, if accepted, would institutionalize the pollution of a potential drinking water resource and could allow the Class A waters of the Bellamy to be contaminated before any remedial action was taken. In addition, if groundwater remains contaminated in this area, an unacceptable risk to human health would also remain.

Finally, an examination of the current state regulation controlling compliance boundaries, from which the comment draws support but which is not an ARAR for this Site, indicates that the boundary should be set at the closer of: the property boundary, 500 feet from the waste material, or a distance set in a permit. In this case, a compliance boundary at the edge of the Bellamy Reservoir and Cocheco River would far exceed that set by this regulation because the property lines for this Site fall far short of those surface water bodies. In addition, it appears contrary to the letter and spirit of this state regulation for contamination to remain in groundwater beneath privately owned properties surrounding the Site.

As to the unspecified pending changes to New Hampshire regulations, in accordance with the NCP, ARARs are "frozen" at the time that the ROD is issued unless a later-identified ARAR is necessary to ensure that the remedy is protective of human health and the environment. The non-attainment area policy to which Balsam refers will not attain ARAR status by the time the ROD is issued, and, being less stringent than existing requirements, will not later be necessary to ensure protectiveness; it is therefore not an ARAR for this Site.

Related issues raised in Balsam's comment, such as the use of institutional controls, the nature of the groundwater flow, and the movement of the plume are addressed in other EPA responses.

Comment 5: Balsam states that EPA's preferred RCRA cap construction is overprotective. Balsam believes RCRA requirements are not applicable to the Dover Landfill Site cap because disposal activities ceased before the effective date of RCRA. Balsam recommends that EPA consider a five-layer capping system with a single hydraulic barrier, consistent with NHDES requirements: a soil cover layer, a sand buffer layer, a low permeability layer, a layer of free draining sand, and a layer of topsoil. Balsam notes that EPA has selected caps of similar design at other solid waste landfill Superfund sites in Region I.

EPA Response: EPA and the NHDES have reviewed Balsam's single barrier cap for use at this Site and rejected it. The single barrier cap fails to satisfy ARARs and does not provide adequate protection to human health and the environment. In addition it does not compare favorably with the selected remedy when evaluated on the five balancing criteria set out in the NCP and summarized in the ROD. EPA has determined that the selection of the multi-layer cap is consistent with the NCP and all relevant Guidance.

The NHDES cap, as proposed by Balsam for use at this Site and described above, was designed by the State of New Hampshire for closure of solid waste landfills in that state; the design requirements are the minimum engineering requirements for solid waste landfill caps. While this Site received large quantities of municipal solid waste during its operation, it also received substantial amounts of industrial wastes which would be considered hazardous (and regulated by RCRA) if disposed today. These wastes were not RCRA wastes at the time of disposal only because the regulatory and statutory requirements of RCRA were not in place at that time. These RCRA-type industrial wastes are now the source of contamination migrating from the Landfill into the surrounding groundwater.

Since significant quantities of RCRA-type wastes have been disposed in the Landfill and continue to pose a threat to human health and the environment, federal and state hazardous waste regulations have been deemed relevant and appropriate to the cleanup of this Site. The state solid waste laws are not ARARs for this Site. The cap will be designed to meet or exceed, among other standards, the performance requirements set forth in the state and federal ARARs including 40 CFR 264.111, 40 CFR 264.310 and the guidance document Final Covers on Hazardous Waste Landfills and Surface Impoundments, July 1989 (EPA/ 530-SW-89-047) (Technical Guidance). In addition, the use of a RCRA-type cap is consistent with EPA Guidance concerning the selection of remedies at municipal landfill sites; the Guidance manual Conducting Remedial Investigations/ Feasibility Studies for CERCLA Municipal Landfill Site, February 1991, EPA/540/P-91/000 (OSWER Directive 9355.3-11), recommends that a composite-barrier cap (multi-layer) is to be used when a landfill contains RCRA listed wastes, wastes sufficiently similar to RCRA listed waste, or RCRA characteristic waste.

In addition to compliance with ARARs, the multi-layer cap was selected for the Dover Landfill because infiltration is a primary concern due to the high annual precipitation in New Hampshire. The multi-layer cap provides an additional "barrier" layer, which reduces the rate of infiltration more than a single-barrier cap, such as the NHDES solid waste closure cap. The multi-layer cap is the best available cap, designed to provide maximum, long-term protection from infiltration due to precipitation.

Comment 6: Balsam submits that installation of a ground water interceptor trench around the entire perimeter of the Landfill, proposed by EPA, does not provide for segregation of upgradient ground water, which is presumed clean, from downgradient ground water. Balsam states that clean upgradient ground water would be conveyed for on-site treatment prior to discharge to the Cocheco River or the Dover POTW. Balsam believes that upgradient ground water should be conveyed directly to the Cocheco River and discharged. Balsam also states that the efficiency and effectiveness of the treatment process is greatly reduced when impacted ground water becomes diluted.

EPA Response: Although not clearly indicated in the FS, the upgradient portion of the "interceptor trench" will collect and divert clean groundwater around the Landfill. This point is clarified in the ROD.

Comment 7: Balsam comments that the remediation of drainage swale sediments to address risk associated with arsenic present in the sediments is overprotective. Balsam states that the risks associated with direct contact and ingestion of swale sediments are within EPA's acceptable risk range. Balsam concludes that remediation of the drainage swale sediments does not appear to be warranted.

EPA Response: While EPA agrees that cleanup of the contaminated swale sediments is not necessary for the protection of human health because the risks associated with ingestion and dermal contact with these sediments falls within the accepted risk range, cleanup of the arsenic in the swale is necessary for the protection of the environment. EPA, in conjunction with NOAA, have determined that a cleanup level for arsenic in the sediments should be set at 50 ppm for the protection of aquatic biota.

Comment 8: One PRP commented that $2 million have already been spent on trying to determine the best cleanup alternative for the Site and not one "shovel-full of dirt" has been removed. The PRP felt money was being spent "capriciously" and that less money should be spent on the Preferred Alternative.

EPA Response: The NCP and related EPA Guidance outline the process which EPA must follow in conducting Remedial Investigations and Feasibility Studies. While such a process may seem expensive and cumbersome, it is aimed at ensuring that the best remedy is chosen at each site while also creating national consistency in the proper selection of remedies for Superfund sites.

Following the issuance of the Record of Decision for the remediation of this Site, the design of the remedy will be undertaken. Once the design is completed, the construction of the remedy will commence. It is estimated that the design and construction will take approximately four years to complete.

RISK ASSESSMENT

The Dover Landfill PRP Group submitted a report titled "An Updated Public Health Evaluation of the Dover, New Hampshire Municipal Landfill Superfund Site" dated May 18, 1991 and prepared by Environmental Standards, Inc. (ESI Report).

The EPA has evaluated this report as it did other public comments and considered it in selecting a remedy at this Site. Since the report was not submitted in comment format and did not specify particular areas of the HMM risk assessment with which it disagreed, it is particularly difficult for EPA to "respond" to the report. While this Responsiveness Summary does not provide a forum for EPA's detailed evaluation of the ESI Report, as noted below, efforts have been made to address major differences in the HMM risk assessment and the ESI assessment, and to highlight portions of the ESI Report with which EPA does not agree.

In sum, after a complete review of the ESI Report, EPA is not persuaded that, as ESI concludes, the Site poses no risk outside EPA's acceptable risk range. In EPA's view, the ESI Report does not comply with Regional risk assessment standards, at times employs collections of data which are not justifiable, considers factors which the Region determines to be inappropriate, and makes assumptions inconsistent with Regional policy.

General Comments & Responses:

Comment a: ESI provided risk analysis for three separate groundwater data sets:

1) RI data set, utilizing data from the most highly contaminated well (Well B-2U) as a basis of hypothetical long term exposure

2) the 95th percent upper confidence interval of the mean concentrations of the RI and FES data sets combined, and

3) the average concentrations of the most recent and validated data (FES data)

EPA Response: EPA determined it was not appropriate to use only the RI data set or the combined RI and FES data set because these data sets do not represent the most current chemical concentration levels (e.g, latest sampling results) found at the Site. EPA determined that the risk analyses for data sets 1 and 2 were not relevant because the estimated risks derived from those data sets would not reflect the risks associated with the current concentration levels found at the Site. EPA agrees that the use of data set 3, FES data, was appropriate to conduct the risk assessment. For the above reason, many of the responses which follow address ESI's risk assessment on data set 3.

EPA's risk assessment data set used average and maximum concentrations from the data collected during the Field Element Study by HMM Associates, except for two compounds: 1,2-dichloroethane which was not detected during the FES and tetrahydrofuran, which was not analyzed for during the FES. Data for these two compounds was taken from the RI. The supplemental risk assessment in the FES presented the average (most-probable) and maximum (worst-case) risks using the FES data except for the two compounds as noted above.

Comment b: ESI submitted this report to provide a summary of the methodologies and results of an independent risk assessment of the Dover Landfill utilizing the most current guidelines and data obtained during the RI and FES.

EPA Response: Region 1 policy, and the policy in effect when the risk assessment for the Dover Municipal Landfill was initiated was to calculate average and reasonable worst case risk estimates based on average and maximum observed concentrations. This approach was consistent with EPA Regional Policy and National EPA Policy at the time the risk assessment was initiated. Furthermore, it has remained consistent with current Regional Policy despite changes to the National Policy.

Reasonable Maximum Exposure
Recent EPA national risk guidance (RAGS) recommends calculating one risk estimate using the 95% upper confidence limit on the mean concentration corresponding to a reasonable maximum exposure estimate. The authors of this guidance have not yet provided sufficient information to employ that portion of the guidance related to the 95% upper confidence limit in a nationally consistent manner. Furthermore, the recent national guidance is simply that - guidance. Current Region I risk assessment policy is consistent with the NCP which requires the evaluation of the Reasonable Maximum Exposure. Region I, therefore, has

chosen to follow its consistent policy of using average and reasonable worst case risk assessments until such time as a nationally consistent methodology is developed. Furthermore, in the case of the Dover Risk Assessment, not only were EPA's average and reasonable worst case risk estimates in excess of EPA's acceptable risk range, but a 95% upper confidence level of the mean concentration as computed by ESI (following the recent National EPA Policy) also appears to exceed the acceptable risk range. The average and maximum cumulative risks, from the HMM FES Supplemental Risk Assessment (and thus EPA's risk assessment), are 1.86×10^{-2} and 6.97×10^{-2}, respectively.

Exposure Parameters
EPA's risk assessment prepared by HMM was submitted on February 11, 1991 and presented both average and maximum risks. Exposure parameters used in this assessment were consistent with Region I policy and National Superfund Policy, applicable at that time, and the Office of Drinking Water which uses a 70 year exposure period to derive MCLs. Some of EPA's parameters differ from those used by ESI. For example, EPA assumed a 70-year vs. 30-year exposure duration for groundwater ingestion, and assumed that 100% vs. 75% of groundwater ingestion occurs at home. Furthermore, the use of ESI parameters would not have resulted in significant decreases in EPA's risk estimates.

Exposure Pathways
ESI has also included two exposure pathways in the quantitative risk assessment which EPA did not: inhalation and dermal absorption during household use of groundwater. Currently Region I only evaluates these pathways qualitatively because there is no consensus either in Region or in Headquarters on how to quantitate the risks from these exposure pathways. If EPA had evaluated these pathways quantitatively, the total risks would have been even greater (by perhaps a factor of 2).

ESI's Missing Compound
EPA Regional policy as well as the national guidance state that risks for all classes of carcinogens should be added. ES omitted the one class C compound from the cumulative risk, 1,1-dichloroethylene. EPA calculated a risk range of 2.2×10^{-5} to 2.2×10^{-4} for this compound which factored into EPA's cumulative risk estimate.

Specific Comments & Responses:

Comment c: ESI States that elevated arsenic levels were found in groundwater samples at the Site, in wells which are clearly upgradient of possible Site influence, and in other wells where no VOCs or other markers of landfill impacts were evident. ESI also states that New Hampshire is known to have high concentrations of arsenic in pristine groundwaters. ESI states "According to EPA's guidelines, it may be appropriate to eliminate this element from the risk assessment." In addition, ESI states that very few samples were filtered and that by limiting water analysis to unfiltered arsenic, "this aspect of the investigation was rendered meaningless". ESI states that arsenic data does not appear to correlate with the levels of contamination by VOCs, therefore no conclusion can be drawn with respect to landfill influence on arsenic in the shallow aquifer at this Site.

EPA Response: EPA agrees that there may be elevated levels of arsenic in the groundwater around the Site. EPA does not agree that arsenic should be eliminated from the baseline risk assessment when background levels of arsenic in the groundwater has not been readily identified at this Site. Given the high concentrations of arsenic found at the Site, EPA does not anticipate that once the background level is determined, that it will significantly alter EPA's risk assessment. EPA's approach to evaluating risks at a site, is that all risks for the Site, whether background, site related, or both be included in the baseline risk assessment.

Data indicate that for VOCs, the four most contaminated, shallow aquifer wells during the RI: OW-1A, B-4U, OW-5U, and B-2U respectively, are also the four most contaminated wells for arsenic according to FES data. EPA notes that although well OW-1A was not sampled for arsenic during the FES, MW-101, located approximately 20 feet north was sampled for arsenic and high concentrations of arsenic were found. In addition, well MW-101 had the highest total VOC concentrations during the FES.

The higher levels of arsenic found on-site (up to 1300 ppb) suggest a potential influence of the Landfill Leachate (i.e., VOC, organic acids, sulfides, iron, etc.) in the groundwater on the mobility of naturally occurring arsenic. In addition, arsenic may have been disposed of at the

Landfill due to its presence in typical municipal wastewater sludge and industrial wastes.

The national guidance (RAGS) states that while filtration of groundwater samples provides useful information for understanding chemical transport within an aquifer, the use of filtered samples for estimating exposure may underestimate chemical concentrations in water from an unfiltered tap. Therefore, data from unfiltered samples should be used to estimate exposure concentrations.

The ROD states that a background level for arsenic will be determined by the EPA and the NHDES after the pre-design sampling results have been evaluated. EPA will set the cleanup level for arsenic in groundwater to the RCRA MCL of 50 ug/l or background, whichever is determined to be higher. The cleanup level will be set for total arsenic in groundwater (unfiltered) because this is representative of the residential use of groundwater for a drinking water supply.

<u>Comment d</u>: ESI states that the baseline risk assessment is based on the unrealistic assumption that contaminated off-site groundwater will be consumed and utilized on a daily basis. The reason stated is because at present: 1) private residences that could be impacted by the Site are connected to the municipal water supply; and 2) an ordinance prohibiting the installation or use of a well for any purpose within 1500 feet of the Landfill was added to the City of Dover Code (116-7.1). ESI did, however, calculate risks for the ingestion, inhalation and dermal adsorption of off-site groundwaters.

<u>EPA Response</u>: The NCP states that the role of the baseline risk assessment is to address the current and future risk associated with a site in the absence of any remedial action or control, including institutional controls. EPA addressed the use of institutional controls as a component of remedial action in comment number 3.

<u>Comment e</u>: ESI presented an evaluation of potential pathways considered as part of the RI risk assessment and supplemental risk assessment (FES) and their associate risks, including the exposure to contaminated swale sediments. ESI concluded that contamination present in off-site groundwater represented the only significant potential concern at the Dover Landfill.

EPA Response: EPA agrees that the primary risk is the ingestion of the off-site contaminated groundwater. Based on the risk assessment performed by HMM for the Supplemental Risk Assessment, and as stated in the ROD, the risks from other exposure pathways are within EPA's risk management goal of 10^{-4} to 10^{-6}. Because EPA did not consider these additional pathways a primary threat, EPA did not critically evaluate ESI's assumptions given that ESI's conclusion was consistent with that of EPA.

Comment f: ESI lists the chemicals regarded as compounds posing the only significant potential concern at this Site. These compounds include: arsenic, benzene, methylene chloride, tetrachloroethylene, trichloroethene and vinyl chloride.

EPA Response: EPA agrees that these compounds present a potential concern at the Site, however, this list is not complete. In addition to the compounds listed by ESI, HMM lists ten chemicals of concern. EPA has determined that these ten compounds are also concern. In particular, tetrahydrofuran, 1,1-dichloroethene and 1,2-dichloroethane pose significant risks.

Comment g: ESI developed "provisional" RfDs values for various chemical compounds, where EPA has not published oral and/or inhalation RfD values in IRIS or HEAST for noncarcinogenic toxicity endpoints.

EPA Response: ESI developed "provisional" RfDs for benzene, tetrachloroethylene, trichloroethylene and vinyl chloride. EPA did not attempt to quantitatively evaluate the noncarcinogenic effects of these compounds because the overriding concern is for the carcinogenic effects. The Hazard Indices for these compounds, as derived by ESI, are 0.44, 0.0062, 0.0099, and 0.29 respectively. EPA determined that those Hazard Indices for noncarcinogenic effects for those particular compounds were insignificant when compared to the Hazard Indices evaluated for arsenic (37) and tetrahydrofuran (24) as presented in the FES Supplemental Risk Assessment.

Comment h: ESI quotes the conclusion of the EPA's Risk Assessment Council review of the Risk Assessment Forum's proposal for quantifying risks associated with oral exposure to arsenic at Superfund Sites. This quote states that the "qualities and uncertainties could, in a specific risk management situation, modify one's concern downward as much as an order of magnitude". ESI states that the risk assessment(s) utilized the findings and all the recommendations of the Science Advisory Board's review of the arsenic issues develop provisional slope factors for quantifying increased risks resulting from ingestion of inorganic arsenic.

<u>EPA Response</u>: ESI has factored in the so-called risk management factor into the derivation of the cancer potency factor for daily intakes of 2.86 x 10-3 or less. EPA does not include this risk management factor in calculating the risk <u>assessment</u>, but, rather uses it as a risk <u>management</u> factor in determining cleanup levels for a Site. The use of this risk management factor in estimating risks would result in the risk estimate being decreased by a magnitude of order (ten-fold).

<u>Comment i</u>: ESI states "An MCL of 0.005 mg/l and an MCLG of zero concentration in drinking water has been proposed" for tetrachloroethylene. In addition, ESI lists an MCL for toluene at 2000 ug/l and a Drinking Water Equivalent Level (DWEL) for methylene chloride at 2000 ug/l. These values were presented in Tables comparing chemical concentration levels found at the Site and MCLs or other advisories.

<u>EPA Response</u>: The MCL for tetrachloroethylene at 5 ug/l and the MCLG at zero has been finalized. The MCL for toluene has been finalized at 1000 ug/l. EPA used the proposed MCL (5 ug/l) and MCLG (zero) for methylene chloride to set cleanup levels rather than the DWEL.

<u>Comment j</u>: ESI reports that the combined hazard indices for the three data sets, used in their report, showed consistency and ranged from 0.9 to 1.2. ESI states that a value marginally exceeding unity does not indicate a health hazard.

<u>EPA Response</u>: Although ESI concludes that the noncarcinogenic effects of contaminants are not of concern, EPA's assessment indicated a concern with noncarcinogenic effects of arsenic and tetrahydrofuran; the maximum Hazard Indices being 37 and 24, respectively.

<u>Comment k</u>: ESI developed and presented a "provisional" oral RfD for chloroethane in appendix H of their report (pRfD of 33 mg/kg/day). The Hazard Index for chloroethane was determined by ESI to be 0.00071 for noncarcinogenic effects.

EPA Response: EPA's Environmental Criteria and Assessment Office recently provided the Regional Office with an interim oral reference dose for Chloroethane of 0.4 mg/kg/day. This oral RfD was derived through extrapolation of the inhalation reference concentration verified by EPA in December 1990. The principle toxicological study for the reference concentration was a developmental inhalation study conducted by Scortichini, et. al., 1986. The noncarcinogenic effects of chloroethane, as presented by EPA in the ROD Decision Summary, is a Hazard Index of 1.0.

IV. REMAINING CONCERNS

Issues raised during the public comment period that will continue to be of concern as the RD/RA phase of site remediation gets underway are listed below. EPA will continue to address these issues as more information becomes available during the RD/RA.

1. Area residents and local officials will wish to be kept informed of the results of site monitoring. Potential contamination of bedrock wells and the Bellamy Reservoir will likely remain a concern.

2. Community members will want assurances that the most cost effective measures are taken through the entire remedial process.

Community interest in the Site may rise due to remedial activity at neighboring Sites such as Somersworth Sanitary Landfill and the Coakley Landfill.

ATTACHMENT A

LIST OF FORMAL COMMUNITY RELATIONS ACTIVITIES CONDUCTED TO DATE AT THE DOVER LANDFILL SUPERFUND SITE

9 August 1983	Meeting held by EPA and the NHDES at the Dover City Hall to discuss the findings and recommendations of the Remedial Action Master Plan (RAMP).
December 1984	Community Relations Plan issued for the Dover Landfill Site.
13 December 1984	Informational meeting held by NHDES at Dover City Hall to describe plans for the RI/FS.
30 March 1989	Informational meeting held by EPA and NHDES at Dover City Hall to discuss results of the RI.
15 March 1991	EPA Proposed Plan published.
16 March 1991	Administrative Record made available for public review at the EPA office in Boston and at the Dover Public Library.
16 March 1991	EPA press release issued regarding the Proposed Plan, the public meeting and hearing, and the opening of the comment period.
22 March 1991	EPA published a public notice in the Foster's Daily Democrat announcing the availability of the Feasibility Study, Administrative Record; and Proposed Plan; the public comment period; and the scheduled meeting and hearing.
25 March 1991	Informal meeting held by EPA at the Horne Street Elementary School to discuss the results of the RI and FES, and to present cleanup alternatives and EPA's Proposed Plan.
26 March 1991-24 May 1991	Public comment period on EPA's Proposed Plan.
16 April 1991	Informal hearing held by EPA on Proposed Plan.

28 June 1991 — EPA Responsiveness Summary issued for Record of Decision on EPA's Preferred Alternative for the Dover Landfill Site.

ATTACHMENT B

TRANSCRIPT OF THE APRIL 16, 1991
INFORMAL PUBLIC HEARING

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

Dover Municipal Landfill Superfund Site

Dover, New Hampshire

DOVER PUBLIC HEARING

April 16, 1991

7:55 p.m.

Moderator: Dan Coughlin,

Chief N.H. Superfund

Nancy D. Lowney

Certified Court Reporter

I-N-D-E-X

(Meeting opened 7:55 p.m.)

DAN COUGHLIN: My apologies for the inconvenience of making you sit around for a half hour or so. Our stenographer, as I told you, called at the last minute and said they couldn't make it. I appreciate your indulgence.

My name is Dan Coughlin. I'm Chief of the New Hampshire Superfund section We're here tonight to conduct a public hearing for the Remedial Action Proposed Plan Feasibility Study for the remediation of the Dover Municipal Landfill Superfund site.

With me tonight up front are Cheryl Sprague, Remedial Project Manager for EPA, and Carl Baxter representing the Department of Environmental Services.

Before we start let me just give you a quick format on how we'll conduct the meeting. Cheryl will first give you a very quick discussion on the Proposed Plan itself. We've mailed out numerous copies of those Proposed Plans. If you don't have one and would like one, we have some up over here by Doug, who is from our Human Relations office. And then we will go into the comments.

After, we'll hear the comments in the order in which you find them. I think we have about twelve of them. I would reserve the right to ask to limit the comments to about ten minutes. If you think it's going to run more than ten minutes, please summarize your comments and give us a text, full text afterwards, and we'll make sure that text gets in the record.

All the comments tonight will be transcribed. Transcriptions will be available, and also be responded to in the Responsiveness Summary, which is part of the Agency's Record of Decision which is our over-al. decision document for remediation of the site.

The comment period ends May 24th, so if you're going to submit written comments, and we would recommend that you do or encourage you to do so, please make sure they're postmarked by May 24th when you send them into us.

At the end of the comments I will close the public hearing and we will be available to answer questions up front here if anybody has anything they would like to discuss with me. And then we'll go home.

Again, I thank you for your putting up with us in our not having any stenographer. We'll do the best we can.

Okay. Any questions on the format?

I call on Cheryl.

CHERYL SPRAGUE: Thank you.

My name is Cheryl Sprague. I'm Remedial Project Manager for the Dover Landfill Superfund site.

On March 25th we held a public meeting at the Horne Street elementary school. Mr. Richard Pease, from the New Hampshire Department of Environmental Services, described t. . activities during the remedial investigation. At this meeting Mr. Rick Cote, of H.M. and M. Associates, the potential responsible party's contractor, presented the alternatives that were retained for detailed analysis and feasibility study. And I presented the EPA's Preferred Alternative.

Tonight I would like to briefly describe the Preferred Alternative, and then we'll open the floor to solicit your comments.

The Dover Landfill is situated at the

intersection of Glen Hill and Tolend Road in Dover. It is a 55-acre landfill that operated from 1960 to 1979, and accepted both municipal and industrial waste.

The Feasibility Study developed alternatives that pertained to either source control or management of migration. Source control for this site refers to the landfill, the perimeter drainage's sediment, the drainage swale sediment and the groundwater and leachate directly under the landfill.

The management of migration refers to the contaminated groundwater when it's migrated away from the landfill. We refer to this as the eastern plume and the southern plume.

The EPA Preferred Alternative for source control includes recontouring the existing landfill and placing a 55-acre multi-layer cap over the landfill. There will be construction of a groundwater and leachate collection system, which includes the installation of interceptor trench/extraction wells or a combination of the two around the perimeter of the landfill to intercept and collect the leachate.

There will be use of an on-site powdered activated carbon treatment system or an equivalent system to treat the groundwater and leachate with discharge to the Cocheco River, or we will have pretreatment with discharge to the Dover Publicly Owned Treatment Works.

There will also be limited excavation of the sediments in the drainage swale with deposition back onto the landfill prior to capping.

The multi-media cap consists of the following layers. There will be a vegetative topsoil, a common fill layer, a drainage layer, a flexible membrane, low permeability layer. That makes up the multi-media portion. And a gas ventilation layer covering the waste.

The preferred alternative on the Management of Migration includes the use of institutional controls, where possible, to prohibit the use of groundwater, site use and site access. There will be an implementation of a long-term groundwater monitoring program. There will also be the implementing of pre-design studies which would include the installation of additional monitoring wells to further define the lateral extent and depth of contamination. We will be conducting one or more pump tests to determine the ability and rate that the contaminated groundwater can be extracted from the aquifer. There will be the attainment of the target cleanup levels in the eastern plume for natural attenuation processes such as adsorption, dispersion and degradation.

There will also be the installation of groundwater extraction wells in the southern plume with an on-site treatment system, either a powdered activated carbon treatment system or an equivalent system, with recharge back to the wetlands and or discharge to the Cocheco River.

The cost for these preferred alternatives is approximately 26 million dollars. A large portion of these costs is due to the need to import large volumes of fill material needed to construct the 55-acre cap.

That concludes the presentation. I will now turn it back to Dan to open for any comments.

DAN COUGHLIN: Okay. Thank you, Cheryl.

The first comments, John Peltonen,

attorney representing the city of Dover.

JOHN PELTONEN: Good evening, ladies and gentlemen. For the record, my name is John Peltonen and I'm an attorney and I'm legal counsel to the city of Dover in this matter.

And I want to thank you for this opportunity to speak on behalf of the City, and remind you that in the order of sign-up this evening my remarks will be followed by his Honor, George Maglaras', mayor of the city of Dover, and his remarks in turn will be followed by those of Mr. David Wright, who is the city manager.

First and foremost, the City recognizes that it has two principal obligations in this matter. One is to protect the public health and the environment. And in that regard the City has undertaken several tasks to assure that public health is assured and is safe.

The second obligation and of equal importance is to protect the public fisc, that is, the public treasury. And the City has a great concern with the expenditure of tens of millions of dollars in view of the minimal if any risk which confronts us, especially since we feel that risk otherwise can be controlled.

We would urge on behalf of the City that the Agency consider instituting a limited action proposal alternative along the lines perhaps of SC-2, holding in abeyance implementation of any other remedy, because this would provide overtime protection to human health since there will be no exposure pathways for ingestion of groundwater, ingestion of soils, or inhalation of airborne contaminants.

This site was covered with a vegetative cover in 1979, pursuant to then existing regulations. Institutional controls in effect and which can be put into effect can prevent the disturbance of that cover and prevent access to it to prevent ingestion or inhalation.

The City already has provided public water and has enacted a restrictive use ordinance to prevent the use of the ground water in that area.

In fact, from the moment that site was permitted by the State as a dump site, as a landfill, the use of that aquifer for drinking purposes was doomed from that point on in the early '60s.

Institutional controls can be instituted at the Bellamy to keep the water dammed and mounded, reversing further flow in that direction and creating the equivalent of a hydraulic control in that area.

And the compliance boundary can and should be extended out to at least the five hundred foot level beyond the waste pile, consistent with New Hampshire water supply regulations, WS, part 410.

Evidence already suggests that the plume is retracting, probably as a result of the cover materials already over the site and the drainage ditch that was installed around the site in the mid 1980s. Nothing more has been done on the site with regard to remediation since that time, and it appears conditions are improving.

Before we spend 26 million dollars we must give a limited alternative a chance, so that we can monitor that plume. We are of the opinion that it presents no realistic threat to health since the actions already taken, combined with a limited action alternative, will eliminate exposure pathways. In fact, we would urge you to consider that construction of the remedy with its necessary disturbance of the site will create much greater risk to residents and to the workers than would compliance with a limited action alternative. And this factor must be weighed in the analysis.

Now, we understand the Agency's need to avoid the time and expense of performing another RIFS and a ROD five years from now. And what we recommend is to include SC-7A with modifications, which I will discuss, but defer its implementation, because we believe that limited action with institutional controls over time will prove to be all we need to protect human health and the environment.

With regard to the proposed plan which we urge you to hold in abeyance, clearly the Management of Migration component is not necessary, at least not now. The plume to the Bellamy appears to be retracting. Contaminants from the landfill probably will not reach the Bellamy reservoir and we should permit a time to continue monitoring that area. We believe we will be proven right, and at least implementation should be deferred to permit that monitoring.

Consideration should be given to deleting any requirement to install an up-gradient interceptor trench, or at least to separate its flow from that in the down-gradient trench, thereby reducing the volume of water to be treated and decreasing the capital costs in the time of treatment associated with a water treatment facility. And the compliance boundary should be set away from the edge of the waste pile to permit a more realistic ability to reach desired goals.

We are concerned that the extent of the effort proposed is an unnecessary and extraordinary expenditure of scarce assets when a limited action alternative can provide adequate protection over time. Cost and community acceptance are two of your criteria. Just as you eliminated an 800 million dollar remedy, we believe you can eliminate a 26 million dollar remedy and still protect the public.

Please listen to the comments that you will hear tonight, and please be flexible in the development of the ROD to permit limited action alternatives and a very delayed and slow approach to the expenditure of this amount of money.

Now, it's easy, either in an academic or judicial environment, for us to fall into the trap of tearing each other's positions down. And all of us here, everybody here has an obligation to avoid doing that. Our task is to work together to forge an agreement on the most reasonable and fair response to this situation, and the city of Dover has been working very closely with the Agency in this regard and we will continue to do so. But it's important, however, for the Agency to understand that the imposition of an obligation to pay tens of millions of dollars in response to a situation which presents minimal if any risk will be destructive to the civic and industrial community of Dover. Thank you.

DAN COUGHLIN: Mayor Maglaras.

GEORGE MAGLARAS: Good evening, and welcome to our fine City one more time.

The City's actions, to respond along with the PRP's, has been a commendable one. We as a community over many years have been up-front and aggressive in taking a number of responsible and appropriate steps to ensure the public's health and safety as it relates to the landfill.

Specifically, I don't want to be redundant, but the restrictive use of ground water in the area, we've installed water lines in the area for our residents. We've instituted proper zoning regulations to make everyone aware of the existence of a landfill. The installation of a trench and the vegetative cover as well, and the pursuit of other institutional controls, and we have fully cooperated with the State and Federal officials as progress has surely been made and we will continue to do . But as mayor of the city of Dover, it is the city council's official position that we stand in opposition to the EPA's Preferred Alternative, and would announce our preference for a limited action alternative which may be modified through future negotiations.

Given the demographics and the socioeconomic conditions of our community, to apply our limited resources to fund a 25 million dollar project of this type, given the minimal threat the landfill imposes, is at best ill-advised and morally fleeting.

I don't want you to misunderstand what I'm saying, because we stand ready to accept our responsibility and not bury our heads in the sand; however, given all that we face as a community and as a State and as a nation, we should be able to work together to bring about a common-sense resolution to this issue, which will surely enhance and promote our quality of life. Thank you.

DAN COUGHLIN: David Wright, city manager, city of Dover.

DAVID WRIGHT: Thank you.

For the record, my name is David B. Wright. I live at 203 Henrila Avenue, and since February of last year I have been the town administrator, city manager of this community.

I want to start off by talking about what this really means. Everett Dirkson, one of my favorite U.S. Senators said: You know, a billion here, a billion there, it adds up to real money.

That's just what we have here. We've got a million here, a million there, and it gets lost. The impact of that is unclear, especially if you're far away and don't see how it affects the community and what 25 million means in terms of alternatives to this community. I may want to go work through some of those economics.

The Tolend Road landfill, SC-5, which is Source Control Preferred Alternative of the EPA and the Migration of Management option chosen by the EPA at a total cost of almost 26 million dollars, 25,954,000. If you divide it into the population of the two cities involved, Madbury and Dover, it is $2,975 per person on a capital expenditure, not including interest, on a capital expenditure. To put that in perspect' ., to equal 26 million dollars, you have to go back twelve years for every single capital expenditure the City has ever made. Twelve years equals 26 million dollars.

The average household in this community pays less than 2 thousand a year, $1997 in taxes; yet the total cost in capital for this preferred alternative is $3000 per household in this community.

You can argue that, or say that that 3000 isn't all coming out of the City's share, it's not to be paid in taxes. But frankly, who's kidding who? This is coming out of this community. And if it's coming out of the employers of this community it's going to come out in the form of wages that they can't take. The lay-offs they're going to make, expansions they're going to put off, or even plants that they have to close. And more importantly, what the City's share is going to be is going on the taxpayers of this community. That's who is going to pay the bill.

I want to talk about some of what the impact is of the solution in terms of EPA's, the City's share that's now currently proposed. Now, granted, we don't believe necessarily that we're going to pay this total amount. But we don't know because we haven't got the design. And traditionally, the conceptual amount of money that we have on the table in this just-proposed remedy, when we get the design I believe that history shows has been higher. And so this is what hopefully is not a realistic cost but probably low. And so maybe our share is high, but the cost of total construction is way below. Currently the share based on the formula that has been publicized that the City would pay the 63 percent, that is $16,351,000 that the City would pay somehow, into a bond or out of the operating budget. And just to give you some ideas of what that is compared to, what that really is, $16,275,000 is the whole City budget this year as has been proposed by me, and the city council has told me to cut it. They haven't told me how much yet, but that's clearly what's happening. Which is no where near, or not as much as your proposed alternative and our share.

The school budget is $16,500,000. Madbury's town budget is only $532,000. Dover's legal limit, how much we can bond, is only 13 million dollars as opposed to 16. And you can see why this figure is frankly ludicrous for the risk to the public posed by this landfill.

Let's talk about what we're giving up. What things we would give up to pay for this, and how maybe they affect public health.

The City's share, I hope, and this is a big hope, of the present sewer treatment plan as is proposed is a $1,600,000. For a EPA mandated

23 million dollar facility down the river that's at least our share. So we could do ten of those with the amount of money that you're going to require to close this landfill to protect a minimal risk.

A fire pumper, just on today's current business, about $198,000. We could buy 82 fire trucks. That's more than we'd ever buy in this century and maybe two centuries. And we're having offers from -- we need two and we're having a terrible struggle to get beyond one within the operating budget and within the capital budget. That's 82 pumpers.

We have an iron, manganese problem in our water wells. We have numerous wells in the City, I think in the order of about seven or eight. We have one well with an iron, manganese plant in it so that people can get decent water quality. That cost us $900,000. This particular expenditure, we could build eighteen of those and cover all our wells and any wells in the future with iron, manganese plants, this double expenditure mandated by the EPA.

We spend $100,000 a year fixing

sidewalks up. This is 163 years worth of sidewalk repair to this community. And the City has been -- as a matter of fact was the test case. They've been held liable for anybody that falls down on the sidewalks by the court system. We have to pay if somebody gets hurt, so we have to make those kinds of expenditures.

And to put it in perspective, we need to build a new public works garage. The facility now is a terrible space that directly impacts the Cocheco River, frankly. It has more of an impact on the Cocheco River than probably this particular landfill does. And that cost us 3 million dollars. That's five of those to build this landfill to solve a minimal risk.

We need a new elementary school. We've been struggling year after year for five or six years. And I think there's some people here from the school board who will talk about this. To build an elementary school, that costs about 3 million dollars. There's 4.7 elementary schools that we could pay for out of that amount of money.

We need a new interchange at Reed Circle. This is the State -- ours, of course, and the State's share. The sum of money -- and the State's money is involved in this, because they know this is a dangerous circle and people are going to die if we don't do something on this circle. And our share's a million dollars.

This landfill, we could build 16 of those for the amount of money we're going to spend capping the landfill on the preferred alternative selected by the EPA.

For $200 a foot, a running foot, we can get a first-class water, sewer line, road and drainage project going. We could build 81,000 feet of road, almost 82,000 square feet, or 15 miles of new streets for this money.

Some of our streets are in very poor shape and we need that money. We can spend -- we are currently in active negotiation to build a new industrial park in conjunction with private industry, where we would acquire the land and sell it to people building in this town, not the developers but the builders. The total amount of money we have available for that up to our maximum bond unit at 1 million and 3, $1,135,000. We could build 14 industrial parks of that size, which would pay for this cleanup over and over again, that we could build.

It cost us every time we buy a school bus $38,000. We could buy 429 school buses. That's more than probably the whole State of New Hampshire, certainly in this area, for this kind of money. And our school bus fleet is aging. And those are school children riding it daily.

I guess that's why the City feels that frankly this amount of money is not only just a waste of money, it is a moral bankrupt position and I'm saying that it's taking away from more pressing public health needs and needs of the City.

I want to talk a little bit about the financial situation next. In the last several years the city of Dover, not unlike every other city in the State, is experiencing a downturn in the economy. This top line represents tax collections. You can see that they're going. People are not able to pay their taxes now. That's the clear bottom line. Year after year after year, the last three years, that has risen to the level of about 6 million. It has never been that level historically. People cannot pay their taxes, so we don't have the wherewithal, and that drives up our costs. We have to borrow more. We don't have the interest on our money. But that's the taxes that we now have.

Our sum balance, which is, well, the way the world looks is called surplus, perhaps, but it's the money left over. It's our reserve. It's how much money we have to cover any contingencies on the basis of the government finance accounting, taking in these accruals is in a negative position. Because of that Moody's has dropped the City's bond rating for an A, for B double A 1, which is the same level as Massachusetts, or one step above, I'm sorry, the State of Massachusetts, which is the lowest in the country. And that's the bond rating we have to show these bonds at. That's the interest rate that's going to be set because of that bond rating to float this bond to take care of the EPA's Preferred Alternative.

There's some other anecdotal things that I will share with you. This is nothing I prepared. This came out of the Union Leader, the newspaper we have in this State. It's a Monday business thing of this week dated today, and it talks about the level of foreclosures and the level of bankruptcies in this State. How they've reached levels never seen before. I'd like to have that entered.

And I checked with the Stratford County Registry of Deeds today. And we've had 186 foreclosures in Stratford County, 72 in the city of Dover. That's an historical high that has never been reached since we've had records, and this is a very old county. So the ability to pay is not there, and everything we have to do we can't push on when we have to take it out of the budget and it becomes an operating cost. That's just assuming we can bond this, if we can bond this.

Let's go with how it affects the operating costs of the City.

If we were to take and float a 16 million dollar bond our debt service, principal and interest, what we have to pay a bank at 7 percent interest -- hopefully which will stay firm if our bond rating doesn't get any worse, because the direction of our collections or fund balance hasn't improved any, it's gotten worse -- is 2 million dollars, almost. $1,962,000.

What is that? That's my fire department. The entire thing is more money than we spend there.

That's more money than we spend in insurance and fringe benefits for all the city employees and to cover all the insurances for the City.

That's more than we spend in trash disposal.

And it's more than what the school department spends to operate and provide teachers for the Horne Street School and all the staff and all associated costs, gas, heat, books, everything.

It is three times the amount for the entire parks and recreation budget.

It is probably five times the size of the entire planning and development of this City, including building inspection and all those departments.

The total existing City debt -- we pay this now -- is 3 million dollars a year. It's almost double that.

The total police department is only 2.5 million. This is the largest department I have in the whole City.

Our property tax values, one dollar equals, is $501,000. Hopefully. That may go down. It's certainly not going to increase. This may be the first year in decades where the City has not had a growth in their tax evaluation. We may have a negative growth. We may have more abatements than we will have tax increases, new evaluations coming on line. So that's hopefully the best figure we're going to get. This works out to almost $4, just to pay for the debt. On a rate right now which is just under $50.

My whole budget increase which the council is sending back to me to make a major change is proposed as $4.40 to cover every increase that we have after I've bare-boned it. So there's no new programs. We've offered, you know, positions that we could. I still have $4 tax increases, I have no revenues. Your bonding will double, almost double that amount.

In terms of the total funds for the

City, I think this is a telling table. This is how much money since 1959 -- now, in 1959, I want to tell you a secret, I was 9 years old, in elementary school. Cheryl wasn't born. I'll tell you that Dan was, sort of. But he was probably about 7.

In 1959 for this year we only spent a little less than 15 million dollars for City purposes in bonds. The schools managed to do a little less than 10 million dollars. We have the water department, the sewer department and all the others. None of them can equal the Tolend Road land[illegible]l, an EPA mandate, or the waste water treatment plant was an EPA mandate. Now, everybody says you're supposed to get State funding for that, and this is supposed to be our share, not including the -- you know, there's a 23 million dollar treatment plant, 5 million dollars of which is coming from you guys. The rest is coming from the State of New Hampshire. I suppose you haven't followed the budgets up here. In Boston you may not get that. They have not funded that.

The House budget was passed last week;

did not include a dime to repay us for the bonds for this item. So this is going to go on our tax rate, this mandate. We're going to pay all that, unless there's some change, and the State's in worse shape than we are, frankly.

If you add up every single expenditure paid for by bonds -- I think it's about 40 million going back to 1959. And I'll bet a good 6 million of that or so is for EPA mandates for other things doing with the sewer plant, sewer separation and those kinds of things. That's 40 million dollars; that's everything we've ever bonded for all those years. If yo dd these two projects together, the waste water treatment plant we were mandated by the EPA to do, and the Tolend Road project at the level we're thinking about that it appears we're going to have to pay, that's 40 million dollars. That equals every bond we've had since I was 9 years old.

I guess you can see why the City is concerned. I understand where you guys are coming from. I understand it that you're concerned about the taxpayers. The EPA, the Superfund was established by taxpayers ultimately through, they paid money for oil and other, those kinds of surcharges. And they set up the Superfund and the EPA has been very cognizant of that and has acted very responsibly toward that to make sure the taxpayers are not having that money wasted. But in this case, to paraphrase my other favorite politic theorist, Pogo: We have met the taxpayers and these are them. These are your taxpayers that are paying your salary and my salary, and they're going to be paying for this closure one way or another in the wages that they can't get or in taxes. And I think that deserves the EPA's full attention on this issu I think it deserves the EPA to look hard at the question of mixed funding for we have a lot of industries who have gone away. Because if you don't pay for it these taxpayers, your taxpayers will pay for it. And that's basically my remarks to this point and I have copies of this to enter on the record.

DAN COUGHLIN: Okay. Thank you.

Richard Houghton, Chairman, Madbury Board of Selectmen.

RICHARD HOUGHTON: My name is Richard Houghton. I am chairman of the Madbury Board of

Selectmen. Together with my fellow Selectmen, Joseph Moriarty and Bruce Hodson, both of whom are with me tonight, I speak on behalf of the 1200 residents of the Town of Madbury who potentially face an enormous liability exposure threatening the economic well-being of our town.

For your perspective, my comments are organized to address just who Madbury is, what ties Madbury has to the Tolend landfill, and finally, how Madbury hopes that the EPA's practical and equitable use of discretion in overseeing the future remediation of the site can balance environmental and fiscal concerns, neither of which is any more important than the other to our citizens' day-to-day life.

At the conclusion of my statement I wish to submit my comments, supporting detail in writing to be made a part of EPA's administrative record.

When waste disposal operations were initiated at the Tolend landfill between 1961 and 1962, the Town of Madbury had an approximate population of 556 people. The non-school portion of our Town budget then slightly exceeded $15,000.

Excerpts from our Town's Master Plan evidences our town's population growth, 704 people by 1970; 987 by 1980; and 1202 by 1988. Master Plan excerpts show that only one out of every four Madbury citizens has been a resident in town for more than ten years.

The building of single-family homes over the past three decades has caused our rural agricultural town to become in part a bedroom community, a suburb to Dover, Durham, the University of New Hampshire, Portsmouth and the Seacoast generally. Very few people work in town. Our households are made up primarily of ried couples, many with children.

Any remediation costs to be paid by Madbury citizens will have a significant fiscal impact on every household. The Town's appropriations or budget for the calendar year 1991 anticipate expenditures, excluding school costs, of only $532,868. This is one fiftieth the cost of EPA's proposed remediation plan for the Tolend landfill site as announced by EPA in midMarch. Actual town expenditures for fiscal year 1990, excluding school costs, were $437,131.

15 percent of our local real estate taxes funds our schools, our town's budget. An average family household's tax bill may range from $3500 to $4000. Last year's $40.75 tax rate per $1000 of assessed valuation was allocated as follows:

$31.13, or 76 percent of the total tax rate funded the Oyster River School District, a cooperative school district, including the towns of Madbury, Durham and Lee.

9 cents, or 1 percent of the total tax rate funded the Madbury water district.

$3.35, or 8 percent of the total tax rate funded Stratford County expenditures.

And finally $6.18 or 15 percent of the total tax rate funded the 1990 town budget of $437,131.

A proposed remediation plan costing more than 50 times the town's current annual budget opens eyes in Madbury. Whatever portion Madbury must bear of a proposed 25 million dollar remediation plan will have a direct and costly effect on the $6.18 portion of our current tax rate.

During the 1960s and '70s, when the Tolend landfill was in operation, Madbury's population varied between only 500 and 800 people. For so long as the Tolend site was being used there was never any general garbage collection in town resulting in waste disposal at the Tolend landfill. The majority of town residents disposed of household trash through personal incineration, trash burial and private dumps. Townspeople contributed negligible waste to the site.

During the same time there were only and still only three major industries in town.

The Taylor egg farm composted, burned and buried most of its waste on it's own premises. Some rotten eggs were brought to the Tolend landfill.

Madbury Metals did not even open until 1975.

The Elliot Greenhouse is also in Madbury, but both it and its greenhouses operations use private dumps on their own property.

Since 1955 New Hampshire state law has required municipalities to provide public disposal facilities for either privately or publicly owned land. The language of the applicable state statute, RSA 147:23 was then, just as it is now, per RSA 149 M 13, mandatory in its requirement that a municipality provide for and assure access to a public disposal facility for garbage and other solid waste.

The lack of a town dump in Madbury appears to have been a problem resolved by a permitting procedure by which a limited number of Madbury residents could obtain permits to use the Tolend Road landfill. Our 1963 Town Report confirms this arrangement for the limited number of only 40 families.

Nothing can be confirmed about this limiting permitted use except for the 1971 payment of $97 to the city of Dover for dump permit fees.

By 1972 lease arrangements were made by prior selectmen, presumably in a continued effort to fulfill state mandates and allow for continued minimal use of the site by Madbury residents. A general survey of town residents conducted in February of 1988 confirms nothing more than a diminutive non-environmentally threatening use of the site my a minimal number of Madbury residents.

Realizing the small town that we are and the negligible use that we made of the dump, and while one can well imagine the level of concern Madbury residents have about their need and ability to contribute toward the remediation of the Tolend landfill site, municipal budgets have everything to do with the allocation of scarce financial resources among a wide variety of community needs. The Dover landfill cleanup presents a potentially greater cost than any other municipal expenditure in the town's history.

Madbury is environmentally conscious. As one example, the town is currently reviewing a major recodification of our zoning ordinance, doing away with more typical dimensional requirement schemes, and instead proposing zoning to encourage appropriate use of suitable soils and the protection of aquifers. However, the potential joint and several liability to pay for environment damage as a result of Federal and State statutes and regulations imposed strictly and retroactively is of great concern. While a sharing of the burden may be inevitable, it is appropriate to assure that any burden shared is cost effective and one which is reasonably necessary to eliminate practical health risk while not financially crippling the town's ability to address other needs.

The town of Madbury joins in supporting the comments of the Dover city attorney.

The town of Madbury will join in the submission of professional comments addressing EPA's selected proposed plan.

The town of Madbury believes that the selection of a cost effective remediation, as required by federal statute and regulation, requires EPA to compare the marginal benefit and overly designed remedy will have to the communities of Madbury and Dover to the more direct benefits citizens of our municipalities will obtain by directing scarce tax dollars to other needed municipal services and household budgets.

Any design and implementation of a Management of Migration remedy must be deferred until the benefits of Source Control can be assessed through well monitoring.

It was literally with some amazement that my fellow Selectmen and I listened to EPA's current assessment of risk to both the Cocheco River and the Bellamy reservoir at EPA's public hearing at the Dover Horne Street School on Monday, March 25th.

Much of the immediate and irreparable harm perceived some years ago has significantly subsided. Contaminant plumes have been controlled and the previously perceived threat to both the Cocheco and Bellamy reservoir has lessened considerably. No one in Madbury would spend large sums of money to design a school which only might become necessary in the future. Particularly when future needs might actually differ from present perceived needs, thus requiring redesign of any actually needed school.

If town residents are to support and fund even a portion of a multi-million dollar remediation plan to the Dover Tolend landfill site, residents will expect the same Yankee spirit to influence discretionary decisions of the EPA.

The technical comments to be submitted on behalf of the participating PRPs should be seriously and earnestly considered by the EPA. Every effort must be made to assure that cost-effective decisions are made with regard to choice, design and implementation of remedy. Federal law mandates EPA to consider cost, technology, reliability, administrative and other concerns and their relevant effects on the public health and welfare and the environment.

Madbury's obligations to educate its young, extend essential fire and police protection to all, care for its needy and to provide other basic municipal services are equally important provisions for the public health and welfare. Excessive remedy design, implementation costs will adversely affect the public health and welfare. A cost-effective remedy is justified, but its effects will be certain and significant to Madbury residents and the essential municipal services they demand, which together with Madbury's remediation liability exposure can only be funded by what has already become an overbearing property tax burden. Thank you. I do have a submission for you.

DAN COUGHLIN: Thank you.

Lee Perlman, Eastern Air Devices.

LEE PERLMAN: My name is Lee Perlman. I'm president of Eastern Air Devices. We are a manufacturing company located in Dover. We have a 150 employees, approximately 40 percent of them are residents of Dover.

I'm an owner of this business and I'm a taxpayer in Dover. I want to say what I have to say will be short, because much of what has already been said I want to tell you I wholeheartedly endorse and agree with in detail in terms of the selected remedy and its benefits.

An increment of 20 million, approximately 20 million dollars is simply not worth it. As I see the problem, there isn't an incentive on the part of the people who are deciding how much money is to be spent simply because they're spending other people's money. There's a very, very small incremental benefit you get for spending a very, very large incremental dollars that doesn't have to be spent because it can be spent later, if you follow the Dover suggestion and the problems can be eliminated. It does not have to be spent now, instantaneously.

The aquifer, the Bellamy can be protected and decisions can be made on an ongoing basis.

One last point. To show you how I feel about the sensitivity for spending money, so far well over 1 and a half million dollars -- 1 and a half million dollars has been spent by the PRPs, and probably, my guess, somewhere between a quarter of a million and another half million dollars has been spent outside of the PRPs or not counted in the PRP expenditure. So somewhere between 1 and 3 quarters and 2 million dollars have been spent so far on this so-called problem to remedy th' problem and not a single shovel of dirt has been moved. I think that's a telling fact that we're spending money capriciously. So I recommend that the presentation of the Dover managers be received carefully and implemented. Thank you.

DAN COUGHLIN: Thank you.

Thomas Cravens, Portsmouth Water Division.

THOMAS CRAVENS: My name is Thomas Cravens. I'm the representative for the Portsmouth Water Division. And we certainly sympathize with the residents of Dover and Madbury who have quite a cost and impact to their budget for this cleanup.

And I think that we are probably seeing something similar of this sort in our own landfill that we have declared as a Superfund site, the Coakley landfill. However, in the water division we have a responsibility to our water customers that we do what we can to protect their drinking water and the sources of drinking water. To that end we are also working to develop well head protection programs to protect our well areas. And we have written o' letter to the EPA already stating that we support the EPA's proposed cleanup program for this Dover Superfund site. Thank you.

DAN COUGHLIN: Hamilton R. Krans, Jr. D.I.D.A. Can you tell me what that is?

HAMILTON R. KRANS, JR.: Yes, I will.

DAN COUGHLIN: Thank you.

HAMILTON R. KRANS, JR.: My name is Hamilton Krans. I live on Hamilton Street in Dover, and I represent the Dover Industrial Development Authority, which is the D.I.D.A.

As a former chairman and member, the

other members have asked me to speak against the preferred action by the EPA and for a more limited and less expensive alternative.

Dover is in competition with a number of communities throughout this State and throughout the Country to attract industry into this City.

One of the ways that we are planning on doing this and have done so in the past is to create an industrial park. As Mr. Wright has indicated, our bonding capacity now is a little over 1 million dollars. I believe he indicated that the City's bonding capacity is 13 million dollars. What we are fearful . as Mr. Wright indicated, is that this preferred action will usurp all of the bonding capacity that the City has. And consequently I think that one can see the dire consequences of not being able to compete either locally or nationally for industries.

Consequently, I won't belabor the point, but a number of people have testified here tonight concerning the balancing of the good that the preferred plan would do with the devastating effect that it would have economically on Dover. And specifically speaking for the Dover Industrial

Development Authority, I can assure you that this will have a devastating effect on our ability to compete, to gain industries into this city. Thank you.

DAN COUGHLIN: Otis Perry.

OTIS PERRY: Thank you. My name is Otis Perry. I live at 137 County Farm Crossroad in Dover. I'm a member of the city council.

I don't have any prepared remarks and I wasn't sure about the format, so I'll speak off the cuff. But I want to emphasize very strongly my support for the idea that we're talking here not about just cleaning up the Tolend R J landfill, we're talking about an allocation of resources issue and a moral issue about how the City and the government will distribute our taxes.

As far as I can see from what I've read in the proposed remediation and in the FS that was shown, the situation and from what I heard you say, Mr. Coughlin, at the original public hearing, public meeting at Horne Street School, the situation at the Tolend Road landfill is not that serious. It is not the overriding public health problem that it was conceived to be seven years ago when we started this process. And it seems to me that a careful, well-monitored program of watching the situation out there, fully prepared to step in and do whatever is necessary to protect the public health, if and when the public health is really threatened by the pollutants in the ground out there, is a much more preferred alternative to spending a lot of money piling dirt up on top of what is already there, with the hope that by doing that nothing at all will happen when we know that something probably will anyway.

As I said originally, I think of this as an economic resource allocation issue and the ci' manager made a very eloquent statement about how we have to think about spending, allocating our resources and spending the money we have to provide the services, public health services for the people who live in this community and in our neighboring communities, and I think that spending this kind of money on this particular proposal is a waste of that money and is probably -- well, I won't say that. I just think it's a waste of money.

DAN COUGHLIN: Thank you.

David Penniman.

DAVID PENNIMAN: I'm David Penniman, of 51 Evans Road in Madbury. And I'm a member of the Oyster River Cooperative School Board, which is made up of the Towns of Madbury, Lee, and Durham.

As a school board member, certainly I'm charged not only to ensure the quality education of our children, but even more so in these times to use scarce fiscal resources effectively. Education of our children is naturally of prime importance. Failure to do so ransoms our future, but more importantly their future.

We're already strapped for school funds, as we had in our district, a major battle to reduce spending this last budget cycle, and we expect another such endeavor this next budget cycle.

In the town of Madbury, which is the smallest of the three towns, 76 percent as already attested to, makes up, of Madbury's tax revenue is for the schools. And with no industry in town, being a residential community, you're talking about people that own homes to produce the tax base in the town of Madbury. And such an effort as you have portrayed in this particular thing is just going to kill people when it comes to trying to keep their homes.

Unfortunately, further monetary requirements for whatever reason again must be raised by property taxes. As you well know in this State there aren't many other ways to get more money. Property taxes seems to be the only way. Some people are trying other methods, but it's going to be a long term, if any. Residents are already at their limit regarding property taxes and are strapped just to support our schools, to say nothing about just trying to support the minimal town requirements we have in Madbury.

Monetary requirements on the Town of the magnitude are you proposing will break the taxpayer's backs. Many are at the limit and are barely able to hang onto their homes at this point just trying to support the taxes required today. With what you are implying, many will probably have to lose their homes. There's no way they can keep them and pay such a tax burden.

We ask a reasonable approach to the

landfill situation. I strongly support environmental protection, but we mustn't go for the silver spoon approach when a plastic spoon approach would do the job in this case. Thank you very much.

DAN COUGHLIN: Thank you.

Gerald Daley, Dover School Department.

GERALD DALEY: My name is Gerald Daley. I'm the superintendent of schools here in Dover. And I'm here this evening to ask that the EPA give careful consideration to one of the less costly but viable alternatives for solving the problem at the Tolend landfill. I certainly recognize the severity of the problem, but I want to be sure that I also bring forth the severity of the school's problems.

We're facing severe budget crunches at this particular time, due at least in part to the new sewage treatment plant which is going on line very shortly.

I really fear that the impact of this particular plan, the preferred plan, will have a serious, very serious effect on our situation. We need a new elementary school in Dover. We don't have it because we can't afford it.

We don't have a kindergarten in Dover. We can't afford it.

This month I sent out reduction force notices, layoffs, to 26 professional staff people, including our elementary librarians and classroom teachers on every level. There's every possibility that we can't afford them.

We also can't afford continuing costs, continuing hits like the one that may come to us if the preferred plan goes through.

The EPA has a responsibility to protect the citizenry from environmental hazards, and I respect that. I have a responsibility to educate the citizenry. I'm willing to seek less costly means to discharge my responsibility and I ask that the EPA do the same. Thank you.

DAN COUGHLIN: Thank you.

James Richards, director of public works, Dover.

JAMES RICHARDS: Good evening. My name is Jim Richards, 143 Long Hill Road, Dover. I'm the director of public works and I agree with all that has been said before me.

First, the landfill was closed in conformance with the standards that existed in 1979.

Second, the pollution plume appears to be lessening in size and intensity, and doesn't warrant this type of expense.

Third, as you've seen indicated before you tonight, the means of payment is more than the populace can afford.

Lastly, I've built secure, sanitary landfills that were generally lined, albeit on the bottom, with clay or membrane. The proposed barriers, all of them, vinyl, clay and membrane are excessive in their approach to protection.

I believe that monitoring and monitoring only should be required and hopefully a more common sense design, rather than building a pyramid of trash -- maybe even to extraction wells or hydraulic barriers or just some more thought given. The existing layer, the capping that was put on in '79 apparently is working fairly decently. That's all I have to say. Thank you.

DAN COUGHLIN: Thank you.

Rosie Walker-Bois, president, Greater

Dover Chamber of Commerce.

ROSIE WALKER-BOIS: Thank you.

I'm the president of the Greater Dover Chamber of Commerce, and I'm a resident of Dover as well. I represent close to 500 business people in the community, most of whom live here.

The words that I hear when I go out and talk with business people in the community -- I'm in the real estate business myself, and I have an opportunity to be out and about and talking with people on a daily basis. And the words that I hear them saying is: Well, we're struggling along. We're here for the long haul, but it's going to be very hard. We're working very, very hard for even fewer dollars.

And this is the point that I would like you to really sincerely keep in mind. Everybody is really struggling to try to do their very best to live and work in this community, to be able to stay in this community. And a greater tax burden is going to make it increasingly difficult for them.

I see the responsibility here as a two-part responsibility. It is your responsibility to come up with some kind of a plan to help us, give us some ideas of how we can take care of this landfill, and that's one part of the responsibility.

The other part of the responsibility is the fiscal impact on the community. And I sincerely hope that you will take that part of your responsibility as seriously as you take the part of giving us the ideas in the plan put forward to take care of the hazardous waste. Thank you.

DAN COUGHLIN: Thank you.

Jim Caliendo, tax payer.

JIM CALIENDO: Good evening. My name is Jim Caliendo, and I am a taxpayer, and when I see something like this, why. I do get a little irate.

You've heard from all of the illustrious people here in the city of Dover except a taxpayer. And I'd like to ask a couple of questions. You said we could ask you some questions, so I'd like to ask you some.

Number one, why, out of all the multimillion places that are more contaminated than the city of Dover that you picked the city of

Dover?

DAN COUGHLIN: I should explain before we go on with the questions, we will take comments. We'll respond to the comments in the Responsiveness Summary as part of the Record of Decision. This is not a question and answer session right now. We'll take down all the questions and we can assure you'll be given an answer in the Responsiveness Summary.

JIM CALIENDO: Well, I thought I was the last speaker so I thought I'd throw that in and give you a chance anyway.

DAN COUGHLIN: Okay.

JIM CALIENDO: As a taxpayer, as you've already noted, it would fall on our shoulders to pay an additional 2 or 3 thousand dollars. When I moved to Dover in 1965 I was paying $400 a year for taxes. Now I'm paying in excess of 4000.

And I do fight city hall and I do fight the school department and I do fight the public works and I do fight the fire department and I do fight the federal government.

And I've seen some places in this State that need a lot more work done than the Dover landfill.

I am also a contractor and I am well aware that given a given period of time the land seems to refurbish itself in many cases. And we do have facts right here in this City that the Dover landfill in the last 30 years has receded from becoming any more hazardous than it was originally thought to be.

And like a lot of farms that went to waste 200 years ago, you can walk in the woods and about the only thing you can see is some stone fences. Outside of that, the trees are there, the pines are there, and forth.

We don't see any dead animals out there around the Dover landfill, we don't see any dead birds out there and we don't see anything out there. We've got shrubs, you've got trees, everything else is growing out there. And I just can't see the government coming in here and asking us to spend 26 million dollars when there's really no need of it. And I'd like to have you take some real consideration on that fact. Thank you very much.

DAN COUGHLIN: Thank you, sir.

Bi l Dube.

BILL DUBE: My name is Bill Dube. I live 242 Dover Point Road. I'm chairman of the Dover Economic Commission.

I'd like to make my comments to let you know how this extensive cleanup will impact the economy of this City.

I really support a limited action plan that would reduce the cost to the city of Dover. The size of this obligation that the City would be incurring is tremendous. We've heard the city manager point out that it's as large as our school budget, as large as our total city budget. As a small businessman in the community, it's 15 to 20 years total salary for our whole dealership. I just -- it's mind-boggling.

We need to look at the economic development, the ability to pay for this if the City is saddled with this obligation, the increase in the tax rate, the number of foreclosures, as mentioned before by other people. It's just going to create a problem that will stifle economic development. There will be no economic development. Businesses will refuse to come to this City because of the tax rate. We're going to stifle all of the growth of the community and I think that we're going to wind up either bankrupting or tremendously crippling this community that we will not be able to go forward.

I really respect the EPA's abilities, their knowledge, but please think of us and take a limited approach that will serve all of us and not just an extensive cleanup that will serve to destroy the city rather than clean it. Thank you very much.

DAN COUGHLIN: Thank you, sir. Is there anybody else that would like to comment?

ROBERT GALLO: My name is Robert Gallo, and I'm counsel for the town of Madbury. And I just wanted to add the larger perspective to what you've heard here.

Assume everything you've heard is true, and then multiply that by three because of the impact on the seacoast area of New Hampshire that results from similar remedies being required at Coakley in Northhampton and at Somersworth and here in Dover. And I think a fair assessment of the amount of money that's being looked for is probably in the range of about 70 million dollars.

And you can't miss the fact that those are not three absolutely isolated communities. People in Dover work in the Portsmouth-Northampton area. People from Portsmouth-Northampton area come to Dover to work. The same kind of exchange has happened with Dover and Somersworth. I mean, these are interrelated communities.

So once again, everything that you've heard about what will happen to Dover and Madbury is absolutely true, although unfortunately it's going to be multiplied by three by the general proposals you've made for this area. Thank you.

DAN COUGHLIN: Anybody else?

Okay. With that I'll close the hearing.

Do I have somebody else that would like to comment?

GARY SEAR: My name is Gary Sear. I'm a councillor of Ward 3. I'd just like to take a second and respond to some of the comments made tonight.

You know, when we think of Switzerland we think of fine chocolate and fine watchmaking. In 1967 they had a council of watchmakers that met, which they do meet every year, but in 1967 there was a gentlemen who introduced an electronic watch. And in that time the council of watchmakers, who were the people that were in the know of fine watchmaking, decided that it would never work. That individual two years later sold that patent to a Japanese firm and as you know it today we have what we have, the electronic watch. Okay?

Now, in 1967 the Swiss had 85 percent of the watch market and today they have 20 percent of the watch market. Okay? Because they failed to listen and to ' with the times.

In 1967 I was 14 years old and I had my first cigarette. A few years after that cigarette packs came out and said it could cause, it could be hazardous to your health. I think today -- I don't smoke anymore, but they do in fact say it is hazardous to your health. Times do change and we have to be cognizant of that, but we all try to do the right thing. We stopped drinking coffee, we drink decaffeinated coffee until they tell us it's no longer good for you, and then we go back to drinking regular coffee.

When I first went in the service they told me salt tablets were great for you, so they gave me all kinds of salt tablets. Now they say it's bad for your blood pressure.

We continue to be in a vicious cycle and be led by government officials, and I can perfectly appreciate where you're standing right now because we all are there from time to time. But the bottom line is that we are faced with a decision that has to be made over the next several months which could effect the future of this City and could destroy the City if it wasn't dealt with properly.

Nobody wants to do the wrong thing here, and we all want to do the right thing. I think consciously we want to do that, but I think there are alternatives and I think there have been some presentations made tonight that show that we can in fact do something that's positive but do it in a way that's not going to be a detriment to the community. And I would strongly urge you to take those into consideration. Thank you.

DAN COUGHLIN: Yes, ma'am.

JANET WALL: For the record, I'm State

rep. Janet Wall. I live in the town of Madbury. I was not going to speak this evening, but I think I need to join the unanimous voice that you've heard here tonight that the project you're planning to implement is going to more than cripple us, it's going to cripple the next generation.

In our school district this year we nearly had a taxpayers' revolt. We desperately needed school funds, and yet at the same time people are crying out saying they simply cannot afford the property taxes anymore.

Tonight you've heard f'- civic leaders in the city of Dover and the town of Madbury. You've heard from businessmen. All of us are saying the same thing: We simply can't afford any more. As a State rep. I can tell you that the State of New Hampshire is hurting and hurting badly. That's not political rhetoric, that's called hard reality. There's not going to be any money coming from the State to help the cities and towns this year; we don't have it. And I think you folks from Massachusetts need to realize what we're feeling up here. We're no better off than

Massachusetts.

As a private citizen I need to tell you, I live in a house that's been in my family since 1740. Our family has been around since Madbury was part of the city of Dover, town of Dover at that time, before it became a town of its own. In the years I was growing up in the town of Madbury our family had land. Our family had an alternative means for disposing of our household waste. We had an incinerator and we had ways of burying and places to bury what we could bury. In the whole time that I have lived in the town of Madbury I believe that our family has mad. 'se or did make use of the landfill at the Tolend site approximately two years.

Now, I fully believe in having responsibility for cleaning up problems that we have created over time, and I don't abhor the idea at all of picking up my share of the responsibility. But when I heard the figures tonight for what I'm going to have to probably pay as a taxpayer, I'm going to tell you that I am so crippled at this point financially that I'm quite frightened about how I'm going to hang onto my house.

From a household that -- a family, rather, that once had large portions of land and more than once house, I live in the old family homestead on one acre of land. My taxes are in the vicinity of $4000 a year. I have two sons, one of college age, one about to go to college. I don't know how I'm going to do it.

I'm doing the best I can to be fiscally responsible, and I realize that you know that the rest of the city of Dover and the town of Madbury are trying to do the same. But when you're dipping into the till for resources there comes a point when there's nothing left to take. We now have gone to the well to draw out for the school district, we've gone out to handle our major responsibilities for simply maintaining our municipalities. And we've gone to the well so often and for so much, and we've been so careful, actually, in how we've done it. But at the same time there's just nothing there to take anymore. We're at a point now where people are leaving the area because people just cannot afford to live here anymore. And I ask that you seriously consider an alternative plan.

I'm sure that you will be very careful in choosing exactly what is best for the cleanup of that site, and I have a tremendous amount of respect for the EPA. But I also ask that you consider what a burden it's going to put on us and our children. Thank you.

DAN COUGHLIN: Yes, sir.

TOM FORBES: Hi. My name is Tom Forbes. I live at 254 Tolend Road. I'm also chairman of the Dover Planning Board. Welcome to Dover. Three brave souls.

I guess I'm just naive, and I was just sitting back there and I talked to a guy next to me. I said, "They don't really, they don't' really propose to mandate this on us, do they?" And no disrespect. It's just beyond me. That kind of money is just beyond me. You know, being on the planning board we work with the CIP and I have to smile about it. Because, you know, we sit there and quibble about fire trucks, but we quibble about smaller things than that. Air conditioners in the library, in the children's reading room. I mean, we bartered that thing around for two or three years. We don't have the capability of paying this. It's just, you know, preferred plan, that's good.

It's like going to the doctor, you know, and having an injury to my back and the preferred treatment would be surgery. Well, I couldn't up for that. You know, I can't feed my family if I'm laid up for six months. So I'd say to the doctor: Well, what else can we do? You know, maybe I can change my exercising habits, maybe I can change my diet? What can I do?

What can we do over there and still not compromise the water in the Bellamy reservoir or in the Cocheco.

Again, I guess I'm just naive. It seems to me if you go out there and grade it, if you go up-slope and divert the water, if you put some vegetation back on it, some trees, some grasses, it seems to me nature mends very well.

And again, you know, I don't profess to be a scientist in environmental studies or anything else. Just common sense, there must be things that can be done on an interim basis and still make sure that, you know, number one utmost concern is the protection of the water. There ought to be things that can be started right now and monitor the situations. From what I understand it's already getting better. If we do some simple things out there maybe we won't have to go forward with a plan that has a price tag that really is just beyond us. It's beyond us. Thank you.

DAN COUGHLIN: Thank you.

Any last comments? Yes, sir.

JAMES H. McADDAMS: My name is James H. McAddams. I am a forty-five year resident of this community. Was for a lengthy period of time the executive officer of the chamber of commerce during a period of years when the community experienced a large growth and development, and since 1980 have been a member of the city council, presently a mayor pro tem of the community.

My remarks are directed in the hope that EPA might consider one of the several alternatives that have been suggested to the much more elaborate and expensive program as laid out in your report and recommendations.

There are several reasons why I think

that consideration is worthy of thought. For one thing, I have been, as many others have, closely aware of this particular landfill site since we first began to worry about it in the late '70s and early '80s. There are at least one or two features -- and this information may have been shared earlier. I'm sorry, I was unable to be here earlier this evening. But there are at least two or three features in this landfill that perhaps make it somewhat different than some of the others.

And I think the most important thing that I want to emphasize is that from the very beginning the citizens of this community and the government of this community have been primarily interested in the health and welfare in the residents of this community and the areas nearby.

And consideration of one of the alternative methods, and I refer particularly to perhaps monitoring, even more extensive monitoring while we have a chance to learn if any of the bad effects of this landfill are permeating further than they are at the present time can be studied.

So without further comment, I just

simply feel that on the basis of the community's record and being interested in public safety and its continued interest in wanting that to be the first and most important thing -- I know that there's been lots of testimony about the economic situation and the terrible impact it might have upon this community. So if there's any way possible, I would want to be one of those who worked in every way that we possibly could to support and guarantee public health and safety but do it in the way that might let us determine what the problem may be in the future. Thank you.

DAN COUGHLIN: Thank you.

Yes, sir.

HOWARD WILLIAMS: My name is Howard Williams. I live at 18 Lisabeth Circle. I am also a member of the Dover City Council, and I couldn't let an opportunity go by, Dan, without sharing my views again with you on my feelings on the landfill.

I certainly support the cleanup the landfill and protecting the environment at every opportunity. I don't want to do anything that might damage our water supply or damage the water supply of Portsmouth. I'm certainly concerned about that, like every member of the Dover City Council is.

However, as you can see from the presentation from the city manager of Dover, we have trained him well in the value of a dollar. This city council is very fiscal responsible and we're working very hard to control our tax rate.

I would hope that you would look at the options, and don't look at them in terms of the risk that was present seven or eight or nine or ten years ago. Look at it in terms of the risk that's present today. And is this elaborate type of a cleanup really merited based on the risk that we have present to us today and what looks like the risk that we could be facing in the future.

And I certainly want to assure you, and I'm sure that you would not do otherwise, that you would look at this and present to the taxpayer of Dover a cleanup proposal that is both safe and economically justifiable. Thanks very much.

DAN COUGHLIN: Thank you.

Anybody else?

JEANNE SHAHEEN: Like the officials in

Dover, I, as a state senator for this district, can't pass up this opportunity to express my concern about where the money to fund cleanup will come from. As you heard earlier from State Representative Janet Wall, the State is in a real fiscal crisis. It's my hope that the State senate will be able to put back the funds for the waste water treatment plant, but if we cannot the city of Dover is looking at a 13.9 million dollar cost for the waste water treatment plant. If that comes on top of 26 million for the cost of cleanup of the landfill, clearly that's a burden that the local taxpayer is not going to be able to pay. Therefore we can hopefully all work together. The State, the city of Dover, the town of Madbury, the other responsible parties and the EPA to reach a cooperative agreement on how we can best cleanup the landfill in everyone's best interests. Thank you.

DAN COUGHLIN: Thank you. What is your name, please?

JEANNE SHAHEEN: Yes. My name is Jeanne Shaheen, and I'm a resident of the town of Madbury.

DAN COUGHLIN: Okay. Anybody else?

We thank you for your participation tonight. I'd like to remind you that May 24th is the close of comments. If you do want to make written comment, please do so. Make sure they are postmarked by May 24th. The address is included in the Proposed Plan. And it's also on the board, Cheryl tells me. So we thank you for coming, and I declare the hearing closed. We will be here to answer any questions up front if you'd like.

(Hearing closed.)

C-E-R-T-I-F-I-C-A-T-E

I hereby certify the above 71 pages to be a true and correct transcription of the tape recorded on April 16th 1991, at the Dover Public Hearing, Dover, New Hampshire, to the best of my knowledge, skill and ability.

Nancy D. Lowney
Certified Court Reporter
Notary Public

My Commission expires January 16, 1994

APPENDIX H

Dover Municipal Landfill

NPL Site Administrative Record

Index

ROD Signed: September 10, 1991

Prepared for

Region I
Waste Management Division
U.S. Environmental Protection Agency

With Assistance from

AMERICAN MANAGEMENT SYSTEMS, INC.
One Bowdoin Square, Seventh Floor • Boston, Massachusetts 02114 • (617) 557-2000

Section I

Site-Specific Documents

Introduction

This document is the Index to the Administrative Record for the September 10, 1991 Record of Decision (ROD) for the Dover Municipal Landfill National Priorities List (NPL) site. Section I of the Index cites site-specific documents and Section II cites guidance documents used by EPA staff in selecting a response action at the site.

The Administrative Record is available for public review at EPA Region I's Office in Boston, Massachusetts, and at the Dover Public Library 73 Locust Street, Dover, New Hampshire. *This Index contains confidential documents that are available only for judicial review.* Questions concerning the Administrative Record should be addressed to the EPA Region I site manager.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

ADMINISTRATIVE RECORD INDEX

for the

Dover Municipal Landfill NPL Site

(ROD Signed: September 10, 1991)

1.0 Pre-Remedial

1.1 CERCLIS Site Discovery

1. "Notification of Hazardous Waste Site" Form, EPA Region I (June 8, 1981) with attached Letter from Jay E. Stephens, City of Dover to Paul Dade, EPA Region I.

1.2 Preliminary Assessment

1. "Potential Hazardous Waste Site Identification and Preliminary Assessment" Form, EPA Region I (March 13, 1981).
2. "Potential Hazardous Waste Site Identification and Preliminary Assessment" Form, EPA Region I (October 15, 1981).
3. "Potential Hazardous Waste Site Identification and Preliminary Assessment" Form, EPA Region I (May 3, 1982) with attached National Priorities List Checklist of Data Requirements.

1.3 Site Inspection

1. "Potential Hazardous Waste Site - Site Inspection Report" Form, EPA Region I (September 24, 1981).

3.0 Remedial Investigation (RI) and Field Elements Study (FES)

3.1 Correspondence - Remedial Investigation (RI)

1. Letter from Paul J. Cavicchi, State of New Hampshire Water Supply and Pollution Control Commission to Judy Bersin (February 23, 1981). Concerning well water testing on February 11, 1981 and the precautionary recommendation that the water supply not be used for drinking purposes.
2. Memorandum from Paul J. Cavicchi, State of New Hampshire Water Supply and Pollution Control Commission to File (March 23, 1981). Concerning results of a meeting to discuss groundwater contamination in the vicinity of the site.
3. Trip Report on a Visit to Dover Municipal Landfill Site, Tom Roy, State of New Hampshire Bureau of Waste Management, Susan Hanamoto and Steve Mangion, EPA Region I (September 24, 1981). Concerning inspection of contaminated water.
4. Letter from Dan H. Allen, State of New Hampshire Water Supply and Pollution Control Commission to Robert Steele, City of Dover (January 15, 1982). Concerning agreement that a second round of sampling, as recommended by Camp, Dresser & McKee, is advisable.
5. Memorandum from John R. Moebes, EPA Region I to Merrill S. Hohman, EPA Region I (August 9, 1983). Concerning transmittal of the second Draft Remedial Action Master Plan and recommending its release.

3.1 Correspondence - Remedial Investigation (RI) (cont'd.)

6. Letter from John F. Zipeto, EPA Region I to Robert D. Steele, City of Dover (September 14, 1983). Concerning transmittal of the Final Remedial Action Master Plan.
7. Letter from John F. Zipeto, EPA Region I to Michael Donahue, State of New Hampshire Water Supply and Pollution Control Commission (September 14, 1983). Concerning transmittal of the Final Remedial Action Master Plan.
8. Letter from Timothy J. Porter, EPA Region I to Jean Doherty (October 4, 1984). Concerning transmittal of the Final Remedial Action Master Plan.
9. Letter from Patrick G. Gillespie, Wehran Engineering Corporation to Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission (July 1, 1985). Concerning transmittal of the Phase I Hydrogeological Investigation Report for review.
10. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Patrick G. Gillespie, Wehran Engineering Corporation (February 14, 1986). Concerning the request that additional background information be submitted and the status of all deliverables be reported.
11. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Renny Perry, City of Dover (April 15, 1987) with attached map of observation wells, "Water Quality Monitoring Data - OW-1" and "Water Quality Monitoring Data - OW-1A". Concerning groundwater samples taken from observation wells and notification that the lower aquifer (observation well OW-1) is contaminated.
12. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Ferioli (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
13. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Susan Conner (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
14. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Thomas Dubois (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
15. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Wagner (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
16. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Delp (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
17. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. D. Dubois (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
18. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Nystedt (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.

3.1 Correspondence - Remedial Investigation (RI) (cont'd.)

19. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Miles (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
20. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Dowaliby (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
21. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. H. Ekola, Sr. (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
22. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. K. Purrington (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
23. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Dumas (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
24. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Doherty (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
25. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Gagnon (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
26. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. R. Grant (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
27. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. A. Purrington (May 17, 1988). Concerning negative results of water samples taken from the local water supply well.
28. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Doherty (June 9, 1988). Concerning negative results of water samples taken from the local water supply well.
29. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Dubois (December 7, 1988). Concerning negative results of water samples taken from the local water supply well.
30. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Connors (December 7, 1988). Concerning negative results of water samples taken from the local water supply well.
31. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Mr. and Mrs. Thomas Dubois (October 12, 1989). Concerning negative results of water samples taken from the local water supply well.

3.1 Correspondence - Remedial Investigation (RI) (cont'd.)

32. Letter from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission to Susan Conner (October 12, 1989). Concerning negative results of water samples taken from the local water supply well.

3.1 Correspondence - Field Elements Study (FES)

33. Letter from Cheryl L. Sprague for Paul N. Marchessault, EPA Region I to Randall L. Lund, Davidson Interior Trim/Textron (July 19, 1989). Concerning field locations for the proposed monitoring wells.
34. Letter Report from Walter L. Graf Jr., Geo/Resource Consultants, Inc. to Cheryl L. Sprague, EPA Region I (September 19, 1989). Concerning a summary of drilling activities for monitoring well MW-101 during the period of August 9-25, 1989.
35. Letter from Richard C. Cote, HMM Associates, Inc. to Cheryl L. Sprague, EPA Region I (January 23, 1990). Concerning transmittal of the pages to be inserted into the January 8, 1990 "Draft Field Elements Study," HMM Associates.
36. Letter from Richard C. Cote, HMM Associates, Inc. to Cheryl L. Sprague, EPA Region I (March 6, 1991). Concerning modifications to the Management of Migration Alternative MM-4.

3.2 Sampling and Analysis Data

Sampling and Analysis Data - Remedial Investigation (RI)

1. Memorandum from C. E. Fuller, Camp Dresser & McKee, Inc. to Don Muldoon (March 23, 1981). Concerning analysis of water samples taken from private residential wells near the site. The following are attached:
   A. "Sample & Site Data - Water Analysis - Former Landfill Area."
   B. "Test Locations - Existing Wells."
   C. "Certificate of Laboratory Analysis," Camp Dresser & McKee, Inc. (April 3, 1981).
   D. "Certificate of Laboratory Analysis," Camp Dresser & McKee, Inc. (April 8, 1981).
2. Letter from Rance G. Collins, City of Portsmouth to Paul J. Cavicchi, State of New Hampshire Water Supply and Pollution Control Commission (June 5, 1981). Concerning transmittal of the results of surface water samples for volatile organic analysis.
3. Letter from Brook S. Dupee, State of New Hampshire Division of Waste Management to Beatrice Fogg, City of Dover (August 10, 1984). Concerning attached results of a private analysis of water which is discharging from the site and recommending that direct contact with run-off water be avoided.

The remaining Sampling and Analysis Data for the Remedial Investigation (RI) may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

Sampling and Analysis Data - Field Elements Study (FES)

4. Letter from Cheryl L. Sprague, EPA Region I to Randall L. Lund, Davidson Interior Trim/Textron (October 3, 1989). Concerning the Air Monitoring Program at the site.
5. Split Sampling Results, State of New Hampshire Department of Environmental Services (October 1989).

3.2 Sampling and Analysis Data - Field Elements Study (FES) (cont'd.)

6. Memorandum from David N. Pease, Resource Analysts, Inc. to William Rice, State of New Hampshire Department of Environmental Services (November 3, 1989). Concerning the attached:
   A. "Certificate of Approval - Wastewater Analysis."
   B. "Certificate of Approval - Drinking Water Analysis."
   C. Test results for pesticides, PCBs, and acid/base/neutral extractable organic compounds.
7. Letter from Richard H. Pease, State of New Hampshire Department of Environmental Services to Cheryl L. Sprague, EPA Region I (January 5, 1990). Concerning transmittal of attached Chain of Custody forms and split sampling results taken at the site on November 12 - 13, 1989.
8. Memorandum from Richard C. Cote, HMM Associates, Inc. to Cheryl L. Sprague, EPA Region I (March 7, 1990). Concerning the treatability study work plan and the attached list of wells and parameters to be sampled.
9. Letter from Walter L. Graf Jr., Geo/Resource Consultants, Inc. to Cheryl L. Sprague, EPA Region I (March 13, 1990). Concerning the attached data comparison tables for samples split between HMM Associates, Inc. and the Geo/Resource Consultants, Inc. oversight team between November 6 - 11, 1989.
10. Letter from Cheryl L. Sprague, EPA Region I to Randall L. Lund, Davidson Interior Trim/Textron (January 9, 1991). Concerning transmittal of the "Ambient Air Risk Summary."
11. Letter from Richard H. Pease, State of New Hampshire Department of Environmental Services to Cheryl L. Sprague, EPA Region I (March 7, 1991). Concerning the results from sampling conducted on February 19, 1991 at B-8WT and B-8U monitoring wells.
12. Letter from Richard H. Pease, State of New Hampshire Department of Environmental Services to Cheryl L. Sprague, EPA Region I (March 26, 1991). Concerning the results from sampling conducted on March 8, 1991 from eight wells at four locations between the Bellamy Reservoir and the Dover Municipal Landfill.

The remaining Sampling and Analysis Data for the Field Elements Study (FES) may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

3.4 Interim Deliverables

Reports - Remedial Investigation (RI)

1. "Remedial Action Master Plan," NUS Corporation (September 1983).

The maps associated with the record cited as entry number 2 are oversized and may be reviewed, by appointment only, at EPA Region I in Boston, Massachusetts.

2. "Phase I Geophysical Investigations," Weston Geophysical Corporation for Wehran Engineering Corporation (March 1985).
3. "Quality Assurance Project Plan," Wehran Engineering (April 1985).
4. "Appendices - Quality Assurance Project Plan," Wehran Engineering (April 1985).

The maps associated with the record cited as entry number 5 are oversized and may be reviewed, by appointment only, at EPA Region I in Boston, Massachusetts.

5. "Data Report - Phase I - Field Investigations," Goldberg-Zoino & Associates, Inc. for Wehran Engineering Corporation (June 1985).

3.4 Interim Deliverables (cont'd)

Reports - Remedial Investigation (RI) (cont'd.)

6. "Quality Assurance Project Plan," State of New Hampshire Water Supply and Pollution Control Commission (October 1986).

Comments - Remedial Investigation (RI)

7. Comments Dated December 4, 1985 from Richard H. Pease, State of New Hampshire Water Supply and Pollution Control Commission on the March 1985 "Phase I Geophysical Investigations," Weston Geophysical Corporation for Wehran Engineering Corporation.

Reports - Field Elements Study (FES)

8. "Quality Assurance Project Plan - Enforcement Support," Jacobs Engineering Group, Inc. (July 12, 1989).
9. "Quality Assurance Project Plan for the Field Elements Study," HMM Associates, Inc. (August 8, 1989).

3.6 Remedial Investigation (RI) Reports

Reports - Remedial Investigation (RI)

1. "Volume I - Remedial Investigation," Goldberg-Zoino & Associates, Inc. and Wehran Engineering Corporation (November 1988).

The maps associated with the record cited as entry number 2 are oversized and may be reviewed, by appointment only, at EPA Region I in Boston, Massachusetts.

2. "Volume II - Remedial Investigation - Tables and Figures," Goldberg-Zoino & Associates, Inc. and Wehran Engineering Corporation (November 1988).
3. "Volume III - Remedial Investigation - Appendices A-H," Goldberg-Zoino & Associates, Inc. and Wehran Engineering Corporation (November 1988).
4. "Volume IV - Remedial Investigation - Appendices I & J," Goldberg-Zoino & Associates, Inc. and Wehran Engineering Corporation (November 1988).
5. "Section 8 - Risk Assessment - Volume I - Remedial Investigation," Wehran Engineering Corporation (February 1989).

Reports - Field Elements Study (FES)

6. "Draft Field Elements Study," HMM Associates (January 8, 1990).
7. "Draft Field Elements Study and Supplemental Risk Assessment," HMM Associates (May 18, 1990).
8. "Draft Field Elements Study and Supplemental Risk Assessment - Appendices," HMM Associates (May 18, 1990).
9. "Final Field Elements Study and Supplemental Risk Assessment," HMM Associates (February 11, 1991).
10. "Final Field Elements Study and Supplemental Risk Assessment - Appendices," HMM Associates (February 11, 1991).

Comments - Field Elements Study (FES)

11. Comments Dated January 14, 1991 from Cheryl L. Sprague, EPA Region I on the May 18, 1990 "Draft Field Elements Study," HMM Associates, Inc.
12. Comments Dated January 29, 1991 from Cheryl L. Sprague, EPA Region I on the May 18, 1990 "Draft Field Elements Study," HMM Associates, Inc.
13. Cross-Reference: Letter from Cyndi Perry, United States Department of the Interior to Cheryl L. Sprague, EPA Region I (May 24, 1991). Concerning comments on the February 11, 1991 "Final Field Elements Study and Supplemental Risk Assessment," HMM Associates and the February 28, 1991 "Final Feasibility Study," HMM Associates, Inc. [Filed and cited as entry number 2 in 16.1 Correspondence]

3.7 Work Plans and Progress Reports

Work Plans - Field Elements Study (FES)

Reports

1. "Work Plan for Dover Municipal Landfill Field Elements Study," HMM Associates, Inc. (August 23, 1989).

Comments

2. Letter from Cheryl L. Sprague, EPA Region I to Randall L. Lund, Davidson Interior Trim/Textron (September 18, 1989). Concerning EPA approval of the Field Elements Study Quality Assurance Project Plan, Field Elements Study Work Plan, and the Feasibility Study Final Work Plan pending one correction to the Field Elements Study Work Plan.

Responses to Comments

3. Letter from Richard C. Cote, HMM Associates, Inc. to Paul Marchessault, EPA Region I (October 3, 1989) with the attached "FS Field Element Work Plan Addendum" and "Draft Project Schedule." Concerning the correction requested by EPA in the September 18, 1989 letter.

Progress Reports - Field Elements Study (FES)

4. "Monthly Progress Status Report," HMM Associates, Inc. (August 1988).
5. "Monthly Progress Status Report," HMM Associates, Inc. (September 1988).
6. "Monthly Progress Status Report," HMM Associates, Inc. (October 1988).
7. "Monthly Progress Status Report," HMM Associates, Inc. (November 1988).
8. "Monthly Progress Status Report," HMM Associates, Inc. (December 1988).
9. Letter from Sherilyn Burnett Young, Rath, Young, Pignatelli and Oyer (Attorney for the Settling Parties) to Paul N. Marchessault, EPA Region I (January 17, 1989). Concerning transmittal of the attached Contract Task Summary which is a supplement to the monthly progress reports (The cost information of the Attachment is Withheld as CONFIDENTIAL).
10. "Monthly Progress Status Report," HMM Associates, Inc. (January 1989).
11. "Monthly Progress Status Report," HMM Associates, Inc. (February 1989).
12. "Monthly Progress Status Report," HMM Associates, Inc. (March 1989).
13. "Monthly Progress Status Report," HMM Associates, Inc. (April 1989).
14. "Monthly Progress Status Report," HMM Associates, Inc. (May 1989).
15. "Monthly Progress Status Report," HMM Associates, Inc. (June 1989).
16. "Monthly Progress Status Report," HMM Associates, Inc. (July 1989).
17. "Monthly Progress Status Report," HMM Associates, Inc. (August 1989).

3.7 Work Plans and Progress Reports (cont'd.)

Progress Reports - Field Elements Study (FES) (cont'd.)

18. "Monthly Progress Status Report," HMM Associates, Inc. (September 1989).
19. Memorandum from Richard C. Cote, HMM Associates, Inc. to Cheryl L. Sprague, EPA Region I (October 16, 1989). Concerning the status of sediment, surface water, and air sampling.
20. "Monthly Progress Status Report," HMM Associates, Inc. (October 1989) with attached "Soil Borings - Phase II Summary - 11/10/89."
21. "Monthly Progress Status Report," HMM Associates, Inc. (November 1989).
22. "Monthly Progress Status Report," HMM Associates, Inc. (April 1990).

3.9 Health Assessments

1. "Health Assessment for Dover Municipal Landfill," Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) (April 12, 1989).

4.0 Feasibility Study (FS)

4.1 Correspondence

1. Cross-Reference: Letter from Richard C. Cote, HMM Associates to Cheryl L. Sprague, EPA Region I (March 6, 1991). Concerning modifications to the Management of Migration Alternative MM-4 [Filed and cited as entry number 36 in 3.1 Correspondence].

4.2 Sampling and Analysis Data

The record cited in entry number 1 may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

1. Routine Sampling Results from Selected Wells at the Site (Samples Collected March 15, 16, and 17, 1989) State of New Hampshire Department of Environmental Services.

4.6 Feasibility Study (FS) Reports

Reports

Some figures associated with the record cited as entry number 1 are oversized and may be reviewed, by appointment only, at EPA Region I in Boston, Massachusetts.

1. "Draft Feasibility Study," HMM Associates, Inc. (June 1990).
2. "Draft Feasibility Study - Appendices," HMM Associates, Inc. (June 1990).
3. "Draft Feasibility Study," HMM Associates, Inc. (November 1990).
4. Letter from Richard C. Cote, HMM Associates to Dover Landfill PRP Group (May 1, 1989). Concerning the attached report. [This document was submitted to EPA Region I in November 1990 as "Draft Feasibility Study - Appendices - Arsenic," HMM Associates, Inc.]

Some figures associated with the record cited as entry number 5 are oversized and may be reviewed, by appointment only, at EPA Region I in Boston, Massachusetts.

5. "Draft Feasibility Study," HMM Associates, Inc. (January 30, 1991).

4.6 Feasibility Study (FS) Reports (cont'd.)

Reports (cont'd.)

6. "Draft Feasibility Study - Appendices - Groundwater-Remediation Time Frame Model," HMM Associates, Inc. (January 30, 1991).
7. "Final Draft Feasibility Study," HMM Associates, Inc. (February 6, 1991).
8. "Final Draft Feasibility Study - Appendices," HMM Associates, Inc. (February 6, 1991).
9. Letter from Richard C. Cote, HMM Associates, Inc. to Cheryl L. Sprague, EPA Region I (February 20, 1991) with the attached "Draft Feasibility Study - Appendix VIII Estimates of Remediation Time Frame." Concerning the Groundwater-Remediation Time Frame Model.
10. "Final Feasibility Study," HMM Associates, Inc. (February 28, 1991).
11. "Final Feasibility Study - Appendices," HMM Associates, Inc. (February 28, 1991).

Comments

12. Comments Dated August 31, 1990 from Cheryl L. Sprague, EPA Region I on the June 1990 "Draft Feasibility Study," HMM Associates, Inc.
13. Comments Dated January 4, 1991 from Cheryl L. Sprague, EPA Region I on the November 1990 "Draft Feasibility Study," HMM Associates, Inc.
14. Cross-Reference: Comments Dated January 29, 1991 from Cheryl L. Sprague, EPA Region I on the May 18, 1990 "Draft Field Elements Study," HMM Associates, Inc. [Filed and cited as entry number 12 in 3.6 Remedial Investigation (RI) Reports].
15. Comments Dated February 20, 1991 from Andrew W. Serell for Sherilyn Burnett Young, Rath, Young, Pignatelli and Oyer (Attorney for PRP Steering Committee) on the February 6, 1991 "Final Draft Feasibility Study," HMM Associates, Inc.
16. Comments Dated February 22, 1991 from Cheryl L. Sprague, EPA Region I on the February 6, 1991 "Final Draft Feasibility Study," HMM Associates, Inc.
17. Cross-Reference: Letter from Cyndi Perry, United States Department of the Interior to Cheryl L. Sprague, EPA Region I (May 24, 1991). Concerning comments on the February 11, 1991 "Final Field Elements Study and Supplemental Risk Assessment," HMM Associates and the February 28, 1991 "Final Feasibility Study," HMM Associates, Inc. [Filed and cited as entry number 2 in 16.1 Correspondence]

Responses to Comments

18. Correction Guide from HMM Associates, Inc. to the Comments Dated January 4, 1991 from EPA Region I on the November 1990 "Draft Feasibility Study," HMM Associates, Inc.

4.7 Work Plans and Progress Reports

1. "Final Work Plan Dover Municipal Landfill Feasibility Study," HMM Associates, Inc. (September 8, 1989).

4.9 Proposed Plans for Selected Remedial Actions

1. "EPA Proposes Cleanup Plan for the Dover Municipal Landfill Site," EPA Region I (March 1991).

5.0 Record of Decision (ROD)

5.1 Correspondence

1. Letter from Robert J. Gallo, McNeill & Taylor (Attorney for the Town of Madbury) to John T. McNeil, EPA Region I (March 26, 1991). Concerning the request that the public comment period on the March 1991 Proposed Plan be extended an additional thirty days.
2. Letter from Andrew W. Serell, Rath, Young, Pignatelli and Oyer (Attorney for the PRP Steering Committee) to Cheryl L. Sprague, EPA Region I (March 29, 1991). Concerning the request that the public comment period on the March 1991 Proposed Plan be extended an additional forty-five days.
3. Letter from Merrill S. Hohman, EPA Region I to Robert J. Gallo, McNeill & Taylor (Attorney for the Town of Madbury) (April 5, 1991). Concerning notification that the public comment period has been extended thirty days and will now close on May 24, 1991.
4. Letter from Merrill S. Hohman, EPA Region I to Andrew W. Serell, Rath, Young, Pignatelli and Oyer (Attorney for the PRP Steering Committee) (April 5, 1991). Concerning notification that the public comment period has been extended thirty days and will now close on May 24, 1991.
5. Letter from Philip J. O'Brien and Robert Varney, State of New Hampshire Department of Environmental Services to Julie Belaga, EPA Region I (September 9, 1991). Concerning state concurrence with the selected remedy.

5.3 Responsiveness Summary

1. Cross-Reference: Responsiveness Summary is an attachment to the September 10, 1991 "Record of Decision," EPA Region I [Filed and cited as entry number 1 in 5.4 Record of Decision (ROD)].

The following citations indicate documents received by EPA Region I during the formal public comment period.

2. Comments Dated April 12, 1991 from David S. Allen and Richard G. McCann, City of Portsmouth on the March 1991 Proposed Plan.

The record cited as entry number 3 is oversized and may be reviewed by appointment only at EPA Region I, Boston, Massachusetts.

3. "An Updated Public Health Evaluation of the Dover Municipal Landfill," Environmental Standards, Inc. for Dover Landfill PRP Group (May 18, 1991).
4. Comments Dated May 22, 1991 from John and Linda Sibik on the March 1991 Proposed Plan.
5. Comments Dated May 23, 1991 from Otis E. Perry, Green Fields Farm on the March 1991 Proposed Plan.
6. Comments Dated May 23, 1991 from George Maglaras, City of Dover on the March 1991 Proposed Plan.
7. Comments Dated May 23, 1991 from Robert J. Gallo, McNeill & Taylor (Attorney for the Town of Madbury) and Christopher A. Wyskiel, Wyskiel, Boc & Reid (Attorney for the Town of Madbury) on the March 1991 Proposed Plan with the attached Exhibits A through P.
8. Letter from Christopher A. Wyskiel, Wyskiel, Boc & Reid (Attorney for the Town of Madbury) to Cheryl L. Sprague, EPA Region I (May 24, 1991). Concerning corrections to be made to the Comments Dated May 23, 1991 on the March 1991 Proposed Plan.
9. Comments Dated May 24, 1991 from David B. Wright, City of Dover on the March 1991 Proposed Plan with the attached financial charts.

5.3 Responsiveness Summary (cont'd.)

10. Comments Dated May 24, 1991 from Gary M. Garfield and John A. Gilbert, Balsam Environmental Consultants, Inc. for the Dover Municipal Landfill PRP Group on the March 1991 Proposed Plan.
11. "Comments on the EPA Preferred Remedy for the Dover Landfill Site," Balsam Environmental Consultants, Inc. for the Dover Municipal Landfill PRP Group (May 24, 1991).
12. Letter from Gary M. Garfield and John A. Gilbert, Balsam Environmental Consultants, Inc. for the Dover Municipal Landfill PRP Group to Cheryl L. Sprague (May 24, 1991). Concerning the attached "Alternative Remedy for the Dover Landfill Superfund Site," Balsam Environmental Consultants, Inc. for the Dover Municipal Landfill PRP Group.
13. "Petitions to the City of Dover, New Hampshire."

The following citation indicates a document received by EPA Region I after the formal public comment period.

14. Comments Dated May 24, 1991 from Kenneth R. Mahony, City of Portsmouth on the March 1991 Proposed Plan.

5.4 Record of Decision (ROD)

1. "Record of Decision," EPA Region I (September 10, 1991).

9.0 State Coordination

9.1 Correspondence

1. "A95 State Clearinghouse Form," State of New Hampshire Office of State Planning with the following attachments:
   A. "Authorization to File Application," State of New Hampshire Office of State Planning (October 12, 1983).
   B. "Acknowledgement," State of New Hampshire Office of State Planning (September 22, 1983).
   C. "Request for Review of Project Notification," State of New Hampshire Office of State Planning (September 22, 1983).

10.0 Enforcement

10.3 State and Local Enforcement Records

1. Letter from David B. Wright, City of Dover to Cheryl L. Sprague, EPA Region I (February 20, 1991). Concerning an update on the status of the Municipal Ordinance.

11.0 Potentially Responsible Party

11.7 PRP Steering Committee Documents

1. Letter from Andrew W. Serell, Rath, Young, Pignatelli and Oyer (Attorney for PRP Steering Committee) to Gretchen M. Muench, EPA Region I (June 20, 1990). Concerning notification that Rosen Trucking and United Parcel Service have joined the Dover Landfill PRP Group.

11.7 PRP Steering Committee Documents (cont'd.)

2. Letter from Andrew W. Serell, Rath, Young, Pignatelli and Oyer (Attorney for PRP Steering Committee) to Gretchen M. Muench, EPA Region I (July 6, 1990). Concerning notification that Cleary Cleaners has joined the Dover Landfill PRP Group.
3. Letter from Sherilyn Burnett Young, Rath, Young, Pignatelli and Oyer (Attorney for PRP Steering Committee) to Cheryl L. Sprague, EPA Region I (February 27, 1991). Concerning transmittal of the attached signature pages to the Site Trust Agreement.
4. Cross-Reference: Letter from Daniel Coughlin, EPA Region I to Randall Lund, Davidson Interior Trim/Textron (April 1, 1991). Concerning additional tasks to be completed under the Administrative Order [Filed and cited as entry number 2 in 11.9 PRP-Specific Correspondence].
5. Cross-Reference: Letter from Gary M. Garfield and John A. Gilbert, Balsam Environmental Consultants, Inc. for the Dover Municipal Landfill PRP Group to Cheryl L. Sprague (May 24, 1991). Concerning the attached "Alternative Remedy for the Dover Landfill Superfund Site," Balsam Environmental Consultants, Inc. for the Dover Municipal Landfill PRP Group [Filed and cited as entry number 12 in 5.3 Responsiveness Summaries].
6. Letter from Young, Rath, Young, Pignatelli and Oyer (Attorney for PRP Steering Committee) to Daniel Coughlin, EPA Region I (May 30, 1991). Concerning a response to the April 1, 1991 Letter from EPA Region I to Randall Lund, Davidson Interior Trim/Textron regarding additional tasks to be completed under the Administrative Order.

11.9 PRP-Specific Correspondence

1. Letter from Merrill S. Hohman, EPA Region I to attached list of Addressees (March 15, 1991). Concerning notification of potential liability for the Dover Municipal Landfill site and the invitation to voluntarily participate in the site cleanup.
2. Letter from Daniel Coughlin, EPA Region I to Randall Lund, Davidson Interior Trim/Textron (April 1, 1991). Concerning additional tasks to be completed under the Administrative Order.
3. Letter from George A. Thomas, State of New Hampshire Treasury Department to Cheryl L. Sprague, EPA Region I (May 16, 1991). Concerning the inability of the City of Dover to finance sixty-three percent of the site cleanup.
4. Letter from David B. Wright, City of Dover to Cheryl L. Sprague, EPA Region I (May 17, 1991). Concerning the attached resolution of the Dover City Council regarding the site on May 8, 1991.
5. Letter from David B. Wright, City of Dover to Cheryl L. Sprague, EPA Region I (May 24, 1991). Concerning confirmation that EPA Region I has received the May 16, 1991 Letter from David B. Wright, City of Dover to Cheryl L. Sprague, EPA Region I.
6. Letter from Robert J. Gallo, McNeil & Taylor (Attorney for the Town of Madison) to John T. McNeil, EPA Region I (June 6, 1991). Concerning the requested information regarding property owned by the Town of Madbury which may exist between the Dover Municipal Landfill and the Bellamy Reservoir.

11.9 PRP-Specific Correspondence (cont'd.)

The map cited as an attachment to the record cited below may be reviewed, by appointment only, at EPA Region I Boston, Massachusetts.

7. Letter from David B. Wright, City of Dover to Cheryl L. Sprague, EPA Region I (June 11, 1991). Concerning the requested information regarding property owned by the Town of Dover and the attached:
   A. "Hazardous Waste Landfill District I," City of Dover (May 13, 1987).
   B. "Health, Public, and Chapter 152 Streets and Sidewalks," City of Dover (April 10, 1991).
   C. "Proposed Hazardous Waste Protection Zone Map," City of Dover (January 28, 1991).
8. Letter from John E. Peltonen, Stark and Peltonen (Attorney for the City of Dover) to John T. McNeil, EPA Region I (June 25, 1991). Concerning notification that the February 1991 "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites," EPA Region I should be considered in the Record of Decision.

13.0 Community Relations

13.2 Community Relations Plans

1. "Community Relations Plan," NUS Corporation (July 1985).

13.3 News Clippings/Press Releases

1. "Environmental News Release," EPA Region I (July 20, 1983). Concerning notification of a public meeting on August 9, 1983 to discuss the Remedial Action Master Plan.
2. "Press Release," State of New Hampshire Water Supply and Pollution Control Commission (April 4, 1984). Concerning the announcement that a Cooperative Agreement has been reached between the State of New Hampshire and EPA.
3. "Environmental News," EPA Region I (August 16, 1988). Concerning the announcement that the State of New Hampshire and EPA have reached an agreement with the City of Dover and eight potentially responsible parties.
4. "Environmental News," State of New Hampshire Department of Environmental Services (December 16, 1988) with the attached "New Hampshire Department of Environmental Services Background Information for Press Release Announcing DES Release of the Remedial Investigation." Concerning the release of the Remedial Investigation Report.
5. "Environmental News," State of New Hampshire Department of Environmental Services (March 9, 1989). Concerning the announcement that the Risk Assessment for the site has been released.
6. "Environmental News," EPA Region I (March 15, 1991). Concerning the announcement that EPA has proposed a $25 million cleanup plan for the site.
7. "Environmental News," EPA Region I (April 5, 1991). Concerning the announcement that EPA has made a correction in the March 1991 Proposed Plan and that the public comment period has been extended until May 24, 1991.
8. "Bankruptcy Filing Rate Soars," The Union Leader - Manchester, NH (April 15, 1991).
9. "State Pollution Control Commission Updates Progress at Dover Municipal Landfill," State of New Hampshire Water Supply and Pollution Control Commission. Concerning an update of site activities.
10. "State Pollution Control Commission Updates Progress at Dover Municipal Landfill," State of New Hampshire Water Supply and Pollution Control Commission. Concerning an update of site activities.

13.4 Public Meetings

1. Cross-Reference: "Environmental News Release," EPA Region I (July 20, 1983). Concerning notification of a public meeting on August 9, 1983 to discuss the Remedial Action Master Plan [Filed and cited as entry number 1 in 13.3 News Clippings/Press Releases].
2. Attendance List, Remedial Action Master Plan Public Meeting for the Dover Municipal Landfill (August 9, 1983).
3. Meeting Agenda, Remedial Action Master Plan Public Meeting for the Dover Municipal Landfill (August 9, 1983)
4. Memorandum from John F. Zipeto, EPA Region I to Project Files (August 11, 1983). Concerning the August 9, 1983 Public Meeting.
5. Meeting Agenda, Public Meeting for the Dover Municipal Landfill (December 13, 1984) with the attached:
   A. "Fact Sheet."
   B. "State to Present a Public Informational Meeting on the Dover Municipal Landfill Remedial Investigation on December 13, 1984," State of New Hampshire Water Supply and Pollution Control Commission.
6. Meeting Agenda, Public Meeting for the Dover Municipal Landfill (March 30, 1989) with the attached "New Hampshire Department of Environmental Services Dover Municipal Landfill Remedial Investigation."
7. "Final Summary of the March 25, 1991 Public Informational Meeting on the Proposed Plan & Feasibility Study," Alliance Technologies Corporation.
8. Transcript, Dover Municipal Landfill Public Hearing (April 16, 1991).
9. "Statement of Richard R. Houghton, Chairman, Madbury Board of Selectmen Submitted to EPA Region I at the April 16, 1991 Public Hearing" with attached Exhibits.

13.5 Fact Sheets

1. "Fact Sheet," State of New Hampshire Department of Environmental Services (July 30, 1987). Concerning past remedial actions at the site.

13.6 Mailing Lists

The record cited as entry number 1 is withheld as CONFIDENTIAL and available only for judicial review.

1. Letter from Richard H. Pease, State of New Hampshire Department of Environmental Services to Paul Marchessault, EPA Region I (April 27, 1989). Concerning transmittal of the attached mailing list.

14.0 Congressional Relations

14.1 Correspondence

1. Letter from Robert C. Smith, Member of the U.S. House of Representatives to Michael R. Deland, EPA Region I (February 4, 1988). Concerning the issue of providing credit incentive for private parties to participate in the Remedial Investigation.
2. Letter from Paul Keough for Michael R. Deland, EPA Region I to Robert C. Smith, Member of the U.S. House of Representatives (March 1, 1988) with the attached Letter from Robert C. Smith, Member of the U.S. House of Representatives to Michael R. Deland, EPA Region I (February 4, 1988). Concerning clarification of the results of the administrative order signed on February 11, 1988.

16.0 Natural Resource Trustee

16.1 Correspondence

1. Letter from Bruce Blanchard, United States Department of the Interior to David Webster, EPA Region I (December 29, 1988). Concerning the preliminary natural resources survey.
2. Letter from Cyndi Perry, United States Department of the Interior to Cheryl L. Sprague, EPA Region I (May 24, 1991). Concerning comments on the February 11, 1991 "Final Field Elements Study and Supplemental Risk Assessment," HMM Associates and the February 28, 1991 "Final Feasibility Study," HMM Associates, Inc.
3. Letter from Kenneth Finkelstein, U.S. Department of Commerce National Oceanic and Atmospheric Administration to Cheryl L. Sprague, EPA Region I (June 5, 1991). Concerning information on a protective ecological level for arsenic in sediment.

16.3 Natural Resource Trustee Release

1. Letter from Robert Pavia, U.S. Department of Commerce National Oceanic and Atmospheric Administration to Dennis P. Gagne, EPA Region I (March 20, 1990). Concerning the attached Preliminary Natural Resource Survey.

16.4 Trustee Notification Form and Selection Guide

1. Letter from Patricia L. Meaney for Merrill S. Hohman, EPA Region I to Sharon Christopherson, United States Department of Commerce National Oceanic and Atmospheric Administration (May 15, 1987). Concerning the attached "Trustee Notification Form" and "Guide to Trustee Selection."
2. Letter from Patricia L. Meaney for Merrill S. Hohman, EPA Region I to William Patterson, United States Department of Commerce National Oceanic and Atmospheric Administration (May 15, 1987). Concerning the attached "Trustee Notification Form" and "Guide to Trustee Selection."

17.0 Site Management Records

17.1 Correspondence

1. Letter from Arthur L. Hoffman, City of Dover to Robert Donovan, Lakes Region Disposal Co., Inc. (April 10, 1979). Concerning the quantities and characteristics of the sludge produced by the Dover Sewage Treatment Plant.

17.7 Reference Documents

The records cited below as entries number 1 and 2 may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

1. "Analytical Methods for the Prediction of Leachate Plume Migration," Douglas C. Kent, Wayne A. Pettyjohn, and Thomas A. Prickett (Spring 1985).
2. "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites," EPA Region I (February 1991).

17.8 State and Local Technical Records

Reports

1. "Report on Ground Water Investigation at 'The Hoppers' for the City of Dover," Camp Dresser & McKee, Inc. (March 1971).
2. Trip Report on a Visit to the Dover Municipal Landfill Site, William J. Carter and Jay Stevens, State of New Hampshire (July 25, 1975). Concerning a soil site investigation.
3. "Report on Groundwater Supply Investigations at 'The Hopper's,'" Camp Dresser & McKee, Inc. (January 1978).
4. "Report to the Board of Water Commissioners on New Water Supply Sources and Improvements," Camp Dresser & McKee, Inc. (November 1979).
5. "Tolend Road Landfill Site Investigation," Camp Dresser & McKee, Inc. (July 1982).

Comments

6. Comments Dated September 21, 1982 from Dan H. Allen, State of New Hampshire Water Supply and Pollution Control Commission on the July 1982 "Tolend Road Landfill Site Investigation," Camp Dresser & McKee, Inc.

The Sampling and Analysis Data for the Site Management Records may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

Section II

Guidance Documents

GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at EPA Region I, Boston, Massachusetts.

General EPA Guidance Documents

1. "Protection of Wetlands (Executive Order 11990), Appendix D," Federal Register (Vol. 42), 1977.

2. U.S. Environmental Protection Agency. Guidance Manual for Minimizing Pollution from Waste Disposal Sites (EPA/600/2-78/142), August 1978.

3. U.S. Environmental Protection Agency. Municipal Environmental Research Laboratory. Biodegradation and Treatability of Specific Pollutants (EPA/600/9-79/034), October 1979.

4. U.S. Environmental Protection Agency. Municipal Environmental Research Laboratory. Carbon Adsorption Isotherms for Toxic Organics (EPA/600/8-80/023), April 1, 1980.

5. U.S. Environmental Protection Agency. Office of Water and Waste Management. Evaluating Cover Systems for Solid and Hazardous Waste, 1980.

6. U.S. Environmental Protection Agency. Municipal Environmental Research Laboratory. Costs of Remedial Response Actions at Uncontrolled Hazardous Waste Sites, April 15, 1981.

7. U.S. Environmental Protection Agency. Office of Water and Waste Management. Engineering Handbook for Hazardous Waste Incineration (SW-889, OSWER Directive 9488.00-5), September 1981.

8. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Evaluating Cover Systems for Solid and Hazardous Waste (Revised Edition) (SW-867, OSWER Directive 9476.00-1), September 1982.

9. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Lining of Waste Impoundment and Disposal Facilities (SW-870, OSWER Directive 9480.00-4), March 1983.

10. U.S. Environmental Protection Agency. Municipal Environmental Research Laboratory. Handbook for Evaluating Remedial Action Technology Plans (EPA/600/2-83/076), August 1983.

11. "Final and Proposed Amendments to the National Oil and Hazardous Substances Pollution Contingency Plan," Code of Federal Regulations (Title 40, Part 300), September 8, 1983.

12. "National Oil and Hazardous Substances Pollution Contingency Plan," Code of Federal Regulations (Title 40, Part 300), 1985.

13. "National Oil and Hazardous Substances Pollution Contingency Plan," Federal Register (Vol. 55, No. 46), March 8, 1990.

14. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Community Relations in Superfund: A Handbook (Interim Version) (EPA/HW-6), September 1983.

15. U.S. Environmental Protection Agency. Office of Research and Development and Office of Emergency and Remedial Response. Case Studies 1-23: Remedial Response at Hazardous Waste Sites (EPA 540/2-84/002b), March 1984.

16. "National Emission Standards for Hazardous Air Pollutants Asbestos Regulations," Code of Federal Regulations (Title 40, Part 61), April 5, 1984.

17. U.S. Environmental Protection Agency. Environmental Monitoring Systems Laboratory. Soil Sampling Quality Assurance User's Guide (EPA/600/4-84/043), May 1984.

18. U.S. Environmental Protection Agency. Office of Ground-Water Protection. Ground-Water Protection Strategy (EPA/440/6-84/002), August 1984.

19. U.S. Environmental Protection Agency. Environmental Criteria and Assessment Office. Health Effects Assessment Documents (58 Chemical Profiles) (EPA/540/1-86/001-058), September 1, 1984.

20. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Final Rule and Interim Final Rule and Proposed Rule," Federal Register (Vol. 49, No. 209), October 26, 1984.

21. U.S. Environmental Protection Agency. Hazardous Response Support Division. Standard Operating Safety Guides, November 1984.

22. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Field Standard Operating Procedures Manual #4: Site Entry (OSWER Directive 9285.2-01), January 1, 1985.

23. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Field Standard Operating Procedures Manual #8: Air Surveillance (OSWER Directive 9285.2-03), January 1, 1985.

24. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Field Standard Operating Procedures Manual #9: Site Safety Plan (OSWER Directive 9285.2-05), April 1, 1985.

25. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory. Project Summary: Settlement and Cover Subsidence of Hazardous Waste Landfills (EPA/600/S2-85/035), May 1985.

26. U.S. Environmental Protection Agency. Environmental Research Laboratory. EPA Guide for Minimizing the Adverse Environmental Effects of Cleanup of Uncontrolled Hazardous-Waste Sites (EPA/600/8-85/008), June 1985.

27. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Guidance on Remedial Investigations under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) (EPA/540/G-85/002), June 1985.

28. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Guidance on Feasibility Studies under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) (EPA/540/G-85/003), June 1985.

29. Record of Decision, McKin, Gray, Maine, EPA Region I, Boston, Massachusetts, July 22, 1985.

30. U.S. Environmental Protection Agency. Environmental Monitoring Systems Laboratory. Sediment Sampling Quality Assurance User's Guide (EPA/600/4-85/048), July 1985.

31. Memorandum from William N. Hedeman, Director, U.S. Environmental Protection Agency Office of Emergency and Remedial Response to Toxic and Waste Management Division Directors, Regions I-X (OSWER Directive 9280.0-02), August 1, 1985 (discussing policy on flood plains and wetland assessments for CERCLA Actions).

32. U.S. Environmental Protection Agency. Office of Waste Programs Enforcement. Toxicology Handbook (OSWER Directive 9850.2), August 1, 1985.

33. U.S. Environmental Protection Agency. Office of Waste Programs Enforcement. Endangerment Assessment Handbook, August 1985.

34. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory and Office of Emergency and Remedial Response. Covers for Uncontrolled Hazardous Waste Sites (EPA 540/2-85/002), September 1985.

35. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

36. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Handbook of Remedial Action at Waste Disposal Sites (EPA/625/6-85/006), October 1985.

37. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory. Handbook: Remedial Action at Waste Disposal Sites (Revised) (EPA/625/6-85/006), October 1985.

38 U.S. Environmental Protection Agency and Michigan Department of Natural Resources. Field Screening for Organic Contaminants in Samples from Hazardous Waste Sites, April 2, 1986.

39. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance Document for Cleanup of Surface Impoundment Sites (OSWER Directive 9380.0-6), June 1986.

40. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory. Handbook for Stabilization/Solidification of Hazardous Waste (EPA/540/2-86/001), June 1986.

41. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Remedial Design and Remedial Action Guidance (OSWER Directive 9355.0-4A), June 1986.

42. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory. Treatment Technology Briefs: Alternatives to Hazardous Waste Landfills (EPA/600/8-86/017), July 1986.

43. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (OSWER Directive 9283.1-2), September 20, 1986.

44. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (OSWER Directive 9283.1-2), December 1988.

45. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Mobile Treatment Technologies for Superfund Wastes (EPA 540/2-86/003 (f)), September 1986.

46. U.S. Environmental Protection Agency. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended October 17, 1986.

47. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Public Health Evaluation Manual (EPA/540/1-86/060, OSWER Directive 9285.4-1), October 1986.

48. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (OSWER Directive 9283.1-2), October 1986.

49. "Hazardous Waste Management Systems; Land Disposal Restrictions; Final Rule," Federal Register (Vol. 51, No. 216), November 7, 1986.

50. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Interim Guidance on Superfund Selection of Remedy (OSWER Directive 9355.0-19), December 24, 1986.

51. Memorandum from J. Winston Porter, U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response to Regional Administrators, Regions I-X; Regional Counsels, Regions I-X, Director, Waste Management Division, Regions I, IV, V, VII, and VIII; Director, Emergency and Remedial Response Division, Region II; Director, Hazardous Waste Management Division, Regions III and VI; Director, Toxics and Waste Management Division, Region IX; Director, Hazardous and Waste Division, Region X; Environmental Services Division Directors, Regions I, VI, and VII (OSWER Directive 9355.0-19), December 24, 1986 (discussing interim guidance on Superfund selection of remedy).

52. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund State-Lead Remedial Project Management Handbook, (EPA/540/G-87/002), December 1986.

53. U.S. Environmental Protection Agency. Office of Ground-Water Protection. Guidelines for Ground-Water Classification under the EPA Ground-Water Protection Strategy, December 1986.

54. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Glossary (WH/FS-86-007), Winter 1986.

55. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory. Technology Briefs: Data Requirements for Selecting Remedial Action Technology (EPA/600/2-87/001), January 1987.

56. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Data Quality Objectives for Remedial Response Activities: Development Process (EPA/540/G-87/003, OSWER Directive 9355.0-7B), March 1987.

57. Letter from Lee M. Thomas, U.S. Environmental Protection Agency to James J. Florio, Chairman, Subcommittee on Consumer Protection and Competitiveness, Committee on Energy and Commerce, U.S. House of Representatives, May 21, 1987 (discussing EPA's implementation of the Superfund Amendments and Reauthorization Act of 1986).

58. U.S. Environmental Protection Agency. Quality Assurance Management Staff. Guidelines and Specifications for Preparing Quality Assurance Program Documentation, June 1987.

59. Memorandum from J. Winston Porter, U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response to Addressees ("Regional Administrators, Regions I-X; Regional Counsel, Regions I-X; Director, Waste Management Division, Regions I, IV, V, VII, and VIII; Director, Emergency and Remedial Response Division, Region II; Director, Hazardous Waste Management Division, Regions III and VI; Director, Toxics and Waste Management Division, Region IX; Director, Hazardous Waste Division, Region X; Environmental Services Division Directors, Region I, VI, and VII") (OSWER Directive 9234.0-05), July 9, 1987 (discussing interim guidance on compliance with applicable or relevant and appropriate requirements).

60. Memorandum from Henry L. Longest, U.S. Environmental Protection Agency Office of Emergency and Remedial Response to Directors, Waste Management Division, Regions I, IV, V, VI, VII, and VIII; Director, Emergency and Remedial Response Division, Region II; Directors, Hazardous Waste Management Division, Regions III and X; Directors, Toxics and Waste Management Division, Region IX (OSWER Directive 9355.0-20), July 23, 1987 (discussing RI/FS improvements).

61. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Additional Interim Guidance for Fiscal Year 1987 Record of Decisions, (OSWER Directive 9355.0-21), July 24, 1987.

62. Memorandum from Francis S. Blake, General Counsel, to J. Winston Porter, Assistant Administrator for Solid Waste and Emergency Response, July 31, 1987 (discussing the scope of the CERCLA petroleum exclusion under sections 101 (14) and 104 (a) (2)).

63. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Alternate Concentration Limits Guidance (OSWER Directive 9481.00-6C, EPA/530-SW-87-017), July 1987.

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