RECORD OF DECISION

W.R. Grace & Co. (Acton Plant) Superfund Site
Operable Unit Three
Towns of Acton & Concord
Middlesex County, Massachusetts

Prepared by:

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Table of Contents

PART 1: THE DECLARATION

PART 2: THE DECISION SUMMARY

Table of Contents, continued

PART 3: THE RESPONSIVENESS SUMMARY

PART 1: THE DECLARATION FOR THE RECORD OF DECISION

A. SITE NAME AND LOCATION

W.R. Grace & Co. (Acton Plant)
Acton & Concord
Middlesex County, Massachusetts
EPA CERCLIS I.D. # MAD001002252
Operable Unit Three, Groundwater & Sediments

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial actions for the W. R. Grace & Co. (Acton Plant) Superfund (Site), located in Acton and Concord, Massachusetts, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 USC § 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 et seq., as amended. The Director of the Office of Site Remediation and Restoration (OSRR), EPA Region 1 New England, has been delegated the authority to approve this Record of Decision.

This decision was based on the Administrative Record, which has been developed in accordance with Section 113 (k) of CERCLA, and which is available for review at the Acton Memorial Library, located in the Town of Acton, Massachusetts and at the United States Environmental Protection Agency (EPA) Region 1 OSRR Records Center in Boston, Massachusetts. The attached Administrative Record Index (Appendix D) identifies each of the items that comprise the Administrative Record upon which the selection of the remedial actions for Operable Unit Three is based.

The Commonwealth of Massachusetts concurs with the Selected Remedy.

C. ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare and the environment from actual and or future threatened releases of hazardous substances into the environment.

D. DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy for Operable Unit Three at the W. R. Grace & Co. (Acton Plant) Superfund Site, which addresses the last of three planned activities at the Site. The first two phases, Operable Units One and Two, addressed soil, sludge and residual contamination at the Site. This final phase, Operable Unit Three, addresses groundwater, sediment and surface water contamination that will address principal and low-level threats at the Site to the extent that they exist.

The selected remedy is a comprehensive approach for Operable Unit Three that addresses all current and potential future risks caused by contaminated groundwater, surface waters and sediments. Specifically, this remedial action for groundwater addresses contaminated groundwater in the Former Lagoon Area, Southwest Area, Assabet River Area, Southwest Landfill Area, Southeast Landfill Area and the Northeast Area, as well as sediments in the North Lagoon Wetlands and Sinking Pond. See Figure 1 to view these geographical areas of the Site. The remedial measures will prevent future unacceptable risks from sediments and untreated groundwater and will allow for restoration of the Site to beneficial uses. Institutional controls will be required to prevent unacceptable exposures to hazardous materials in the future. Also, long term monitoring, operation and maintenance, and periodic five-year remedy reviews will be performed.

<u>The major components of this remedy are as follows:</u>

- Cleanup of contaminated sediments and soils posing an unacceptable risk to human health and/or the environment in Sinking Pond and the North Lagoon Wetlands.

- Extraction and treatment of groundwater contamination. Construction of an approximately 200 gallon per minute groundwater pump and treatment system. Treatment processes for extracted groundwater will include air stripping, activated carbon (air treatment), and metals precipitation prior to surface water discharge to Sinking Pond for a portion of the effluent and infiltration and/or reinjection of other effluent.

- Monitored natural attenuation in areas of groundwater contamination not captured by the extraction system.

- Institutional controls to prevent unacceptable exposures to contaminated groundwater until cleanup levels are met, and to protect against unacceptable future exposures to any wastes left covered/capped on-Site.

- Long-term groundwater, surface water, and sediment monitoring, and periodic five-year reviews of the remedy.

The selected response action addresses principal and low-level threat wastes at the Site to the extent that they are presented at this Site. Although EPA does not include groundwater in its definition of principal threat wastes, the selected remedy addresses the contamination in groundwater through treatment, monitored natural attenuation and institutional controls. The remaining low-level threat waste at the Site, the sediment/soil in Sinking Pond and the North Lagoon Wetland, will be addressed through excavation and either off-Site disposal or consolidation and/or capping to prevent exposure to contaminated sediments. To the extent that contamination remains on-Site covered or capped, institutional controls will be put in place to prevent exposure in the future. The estimated present worth cost of the remedy, including long-term operation, maintenance and monitoring is approximately $18 million.

E. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate for this remedial action (unless justified by a waiver), is cost-effective and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of materials comprising principal threats through treatment).

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action and is cost-effective.

Because this remedy will result in hazardous substances remaining on-Site above levels that allow for unlimited use and unrestricted exposure, a remedy review will be conducted within five years after initiation of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Issuance of this ROD embodies specific determinations made by the Regional Administrator pursuant to Section 404 of the Clean Water Act, and Executive Order 11990 (Protection of Wetlands) which require a determination that there is no practical alternative to taking federal actions in a wetland area. Sediments in both the wooded swamp and sedge marsh area of the North Lagoon Wetlands pose unacceptable human health and/or ecological risk. Through its analysis of the data collected in the Remedial Investigation (RI) as well as evaluations in the human health and ecological risk assessments, EPA has determined that because significant high level contamination exists in the North Lagoon Wetlands, there is no practical alternative to conducting work in the wetlands.

Once EPA determines that there is no practical alternative to conducting work in wetlands, EPA is then required to minimize potential harm or avoid adverse effects to the extent practicable. The selected remedy for the North Lagoon Wetlands requires excavation and removal of sediments that pose an unacceptable risk. These contaminated sediments may be taken off-Site for disposal, or they may be excavated from the wooded swamp, consolidated within the sedge marsh and capped to prevent exposure. If these sediments remain on-Site, the wooded swamp area wetland will be restored and enlarged while the sedge marsh would be covered. The wooded swamp area will need to be enlarged and restored to account for the sedge marsh area being capped. Although covering or filling wetland areas is generally disfavored in the analysis of minimizing impacts, because the wooded swamp has significantly greater habitat value when compared to the sedge marsh, total on-Site adverse impacts would be greatly minimized by enlarging and restoring the wooded swamp rather than restoring the sedge marsh (a low value wetlands). This analysis will be confirmed during design.

Best management practices will be used throughout the clean up of this area of the Site to minimize adverse impacts on the wetlands, wildlife or its habitat. Damage to these wetlands will be mitigated through erosion control measures and proper re-grading and re-vegetation of the impacted area with indigenous species. Following excavation activities, wetlands will be enlarged, restored or replicated consistent with the requirements of the Federal and State wetlands protection laws. Although the RI did not identify any federal wetlands in the Sinking Pond area, should additional evaluations conclude otherwise, federal and state wetland requirements will also be required to be met.

Executive Order 11988 (Protection of Flood Plains) requires a determination that there is no practical alternative to taking federal actions in a flood plain area. Once that determination is made, the action taken must be designed or modified to minimize potential harm to or within the flood plain with the goal to minimize the impact of floods on human safety, health and welfare, and to restore and preserve natural and beneficial values served by flood plains. Sediments in a portion of the North Lagoon that pose an unacceptable human health and/or ecological risk are located in a flood plain. Through its analysis of the data collected in the RI as well as evaluations in the human health and ecological risk assessments, EPA has determined that because significant high level contamination exists in a portion of the flood plain in the North Lagoon Wetlands, there is no practical alternative to conducting work in the flood plain.

Once EPA determines that there is no practical alternative to conducting work in flood plain, the Agency is then required to minimize potential harm to or within the flood plain. The selected remedy for the North Lagoon Wetlands requires excavation and removal of sediments that pose an unacceptable risk in the flood plain. Once those sediments have been excavated, the flood plain area will be restored such that there is no lost flood storage capacity.

F. ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record file for this Site.

1. Chemicals of Concern (COCs) and their respective concentrations.
2. Baseline risk represented by the COCs.
3. Cleanup levels established for COCs and the basis for the levels.
4. Current and future land and groundwater use assumptions used in the baseline risk assessment and ROD.
5. Land and groundwater use that will be available at the Site as a result of the selected remedy.
6. Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected.
7. Decisive factor(s) that led to selecting the remedy.

G. AUTHORIZING SIGNATURES

This ROD documents the selected remedy for groundwater, sediments and soils for Operable Unit Three at the W.R. Grace & Co. (Acton Plant) Superfund Site. This remedy was selected by EPA with concurrence of the Massachusetts Department of Environmental Protection (MADEP).

U.S. Environmental Protection Agency

By: Susan Studlien   Date: 09/30/05
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PART 2: THE DECISION SUMMARY

A. SITE NAME, LOCATION AND BRIEF DESCRIPTION

The W. R. Grace Superfund Site (the Site) is located in the Towns of Acton and Concord, Massachusetts and is accessed via Independence Road. The Site is comprised of approximately 260 acres of land that includes several surface water bodies and various wetlands. The CERCLIS identification number is MAD001002252. W. R. Grace Co. – Conn. (Grace or W. R. Grace) is the responsible party that is funding and performing all Site investigations, sampling, and reporting. Both the Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection Agency (MADEP) have been performing oversight activities at the Site.

The Site is bounded to the north in part by Fort Pond Brook and to the east and south by the Assabet River. Residential properties border the Grace Site to the northeast, northwest, east and west and several Industrial properties border the Site to the south and northeast. The Town of Acton has two public wellfields located near the Site. Assabet 1 & 2 are located approximately 1,300 feet south of the Site and the School Street Wellfield is located approximately 3,700 feet northeast of the Site (see Figure 2).

W. R. Grace acquired the property in 1954 from the Dewey and Almy Chemical Company (Dewey & Almy) and continued manufacturing operations at the Site. Grace produced materials used to make concrete additives, organic chemicals, container sealing compounds, latex products and paper and plastic battery separators. Process wastewater was disposed of in several on-Site lagoons and solid industrial wastes were disposed of in an on-Site landfill. See Figure 2 for the locations of these former disposal areas.

A more detailed description of the Site can be found in sections 1.2 thru 1.2.4 of the Public Review Draft Remedial Investigation Report, Operable Unit Three, dated July 1, 2005.

B. SITE HISTORY AND ENFORCEMENT ACTIVITES

1. History of Site Activities

Former industrial occupants of the Grace property include American Cyanamid Company, which manufactured explosives, and Dewey & Almy. Dewey & Almy acquired the property in 1945 and manufactured synthetic rubber container sealant products. An organic chemical plant that produced latex products, plasticizers, and resins began operating at the Site in 1949. A paper battery separator production facility was constructed in 1951 (HSI GeoTrans, 1998).

Grace acquired Dewey & Almy and the property in 1954, and chemical operations were continued at the property. Grace produced materials used to make concrete and organic chemicals, container sealing compounds, latex products, and paper and plastic battery separators. Wastewater and solid industrial wastes from these operations were disposed of in several on-Site lagoons and an on-Site landfill (the Industrial Landfill). Effluent wastes from these operations flowed into several unlined lagoons (the Primary Lagoon, Secondary Lagoon, North Lagoon and Emergency Lagoon), and were buried in or placed onto the on-Site Industrial Landfill and several other waste sites. These other waste sites included the Battery Separator Lagoons, the Battery Separator Chip Pile, the Boiler Lagoon, and the Tank Car Area. Periodically, sludge from the primary lagoon was mucked out, dried along the banks, and trucked to the landfill for disposal. In addition, the by-products of some chemical process were disposed of in the Blowdown Pit. Discharge to all lagoons and the Battery Separator Area ceased in 1980 (see Figure 1). A more complete description of the Site can be found in the report submitted by Grace under the Section XI.C. of the Consent Decree entitled the *Phase Four Site Closure Plan* (the Phase IV Report) and sections 1.2 thru 1.2.4 of the *Public Review Draft Remedial Investigation Report, Operable Unit Three*, dated July 1, 2005.

Discharge to these areas and disposal to the landfill ceased in 1980. Organic chemical production ceased in 1982. A small distribution center for concrete additives (Grace Construction Products) operated at the Site until September 1996.

A second battery separator plant (Daramic) was constructed in 1979, and operations continued there until 1991. The Daramic facility is not part of the Superfund Site (HSI GeoTrans, 1998). The investigation and remediation of the Daramic facility is being addressed independently under the Massachusetts Contingency Plan (MCP).

In 1978, groundwater contamination, consisting mainly of 1,1-dichloroethene (1,1 DCE), which is also known as vinylidine chloride (VDC), and lesser amounts of vinyl chloride, ethylbenzene, and benzene, was detected in two of Acton's municipal supply wells located southwest of the property, Assabet 1 and Assabet 2.

2. History of Federal and State Investigations, Removal and Remedial Actions

As a result of this contamination in the Acton wells, the United States filed a civil action against Grace on April 17, 1980 to require cleanup of the Site under Section 7003 of the Resource Conservation and Recovery Act (RCRA) (U.S. v. W. R. Grace & Co, U.S. District Court for the District of Massachusetts, Civil Action No. 80-748-C.) A parallel administrative action was initiated by Massachusetts (Massachusetts or State). In October 1980, EPA and Grace entered into a Consent Decree that outlined a procedural framework for site cleanup under the RCRA. The Consent Decree outlined a phased program to plan and undertake cleanup of the various waste disposal sites, and also required restoration of groundwater in drinking water aquifers that were contaminated by the facility. A similar settlement was reached with Massachusetts.

The first phase of cleanup under the Consent Decree related to the cleanup of the aquifer. Grace was required to evaluate a variety of alternatives, including alternatives which would "accelerate" the cleanup, to restore the aquifer and then develop an engineering plan for aquifer cleanup and restoration of the aquifer to a fully usable condition. The first steps evaluated the Site hydrogeology and characterized the extent and nature of groundwater contamination. Two types of models, one for simulating groundwater flow and the other for simulating contaminant transport, were developed and calibrated early in the study process. The models were used to analyze the transport and fate of contaminants from the various waste disposal or source areas and to develop a conceptual design for the Aquifer Restoration System (ARS). Using the results of these investigations and subsequent groundwater monitoring results, Grace proposed a recovery well network it expected would contain contaminated groundwater in a "capture zone," targeting the sources of contamination, thereby preventing further migration of contaminated groundwater off-Site and using active treatment to restore highly contaminated source areas. Contaminated groundwater extracted from the network of wells then would be pumped to a central treatment/air stripping facility.

EPA and the State approved Grace's cleanup plan including a critical path time schedule to implement this plan. Grace then constructed a groundwater recovery and treatment system, the ARS. Since March 1985, W. R. Grace has been operating the ARS that recovers and treats (via air stripping) contaminated groundwater under the former waste disposal units. In addition, Grace has been conducting a long term program for monitoring the contaminated aquifer and the implementation of these restoration measures.

The ARS was designed to mitigate the migration of contaminated groundwater to the Assabet Wells, the Assabet River, and Fort Pond Brook. The ARS was also designed to accelerate the removal of contaminants from groundwater in the targeted source areas, and thus return the aquifer to a fully usable condition as required by the Consent Decree. The ARS was also effective in limiting the continued migration of contaminants from the southern portion of the Site, to the Northeast Area by actively treating the source of contaminants to this area of the Site.

The installation of the ARS began in December 1983, and the main ARS became operational in March 1985. Until November 2002, the ARS consisted of eleven extraction wells pumping at a combined rate of approximately 570 gallons per minute (gpm). Between November and December 2002, three of the extraction wells were removed from service (WRG-1, RP-1, and NMGP), leaving a system of eight extraction wells pumping at a combined rate of approximately 400 gpm. Groundwater pumped from the extraction wells is treated by an air-stripping tower. An odor control system was added to the air-stripping tower in September 1992. The odor control system consists of a booster air blower and three carbon canisters (CDM, 1996) to treat the air stream prior to being discharged to the atmosphere. In accordance with the Amended Monitoring Plan (CDM, 1996), all effluent groundwater from the ARS is then discharged into Sinking Pond. Historically, the discharge to Sinking Pond created a localized groundwater flow barrier that diverted contaminated groundwater away from the

Assabet 1 and Assabet 2 wells. In addition, surface water levels in Muskrat and Turtle Ponds were historically maintained at equal elevations (via a connecting trench) to reduce the horizontal hydraulic gradient in groundwater beneath the ponds, thereby helping to shield the Assabet wells from contaminated groundwater that is east of the two ponds.

The treatment system effectiveness has been evaluated through the collection and analysis of water samples from the influent and effluent stream of the air-stripping tower, and surface water samples from the inlet to Sinking Pond. Samples are collected quarterly. The air-stripping tower influent and effluent samples are analyzed for VOCs and dissolved metals. Samples from two locations within the inlet to Sinking Pond are analyzed for dissolved metals and color/turbidity. Dissolved iron concentrations at the inlet to Sinking Pond were greater than the Amended Monitoring Plan limit of 300 ug/L for all of the sampling rounds during 2004.

Since initiation of the ARS, groundwater at the Site has been sampled on a periodic basis. Grace has submitted numerous progress reports to date documenting the operation of the ARS including the results of the sampling. Several years of groundwater sampling data have been used to generate a groundwater fate and transport model that was utilized to assist with evaluating the remedial actions for Operable Unit Three. The twenty years of groundwater sampling data was also used to calibrate and fine-tune the groundwater flow model. The data shows that the ARS has established a zone of containment under the disposal areas and has significantly reduced the levels of contamination in the groundwater both within and downgradient of the containment zone. The extent of reduction varies, with some areas reaching drinking water standards while in other areas there has been a discernable downward trend in contaminant concentrations. Figure 3 depicts 1-1, DCE concentrations at the Site in 1984 while Figure 4 depicts most recent 1-1, DCE concentrations from 2004.

The second response activity under the 1980 Consent Decree required Grace to assess and control sources of waste on-Site. Specifically, the Consent Decree established a phased investigation under EPA oversight for studying and determining the nature and extent of contamination "on, in, beneath, and immediately surrounding the landfill, all lagoons and all other waste disposal sites". Once the source investigations were completed, Grace was required to "identify, analyze, and evaluate cleanup and remedial measures that will correspond to the nature and extent of contamination." Based upon the conclusions reached, Grace was required to implement the actions approved by EPA.

In 1989, EPA approved the cleanup plan for the source control component of the cleanup, Operable Units One and Two. This plan required excavation and off-Site transportation and incineration of highly contaminated materials; excavation and/or stabilization of lesser contaminated sludge and soil from various waste disposal areas identified on the Grace property; placing both the stabilized and the non-stabilized materials excavated from the Site on the existing Industrial Landfill, and covering these materials with an impermeable cap.

Based upon the results of investigations started in 1978, on September 8, 1983, EPA added the Site to the National Priorities List (NPL), established pursuant to Section 105 of CERCLA (48

FR 40658). Based upon this listing, EPA took the position that the cleanup at the Grace Site in Acton not only had to meet the requirements of the 1980 Consent Decree, but also that the cleanup must meet the requirements of the NCP under CERCLA. As a result, earlier plans, studies and reports were required to be written such that they were not only consistent with the requirements of the Decree but also the requirements for Remedial Investigations and Feasibility Studies (RI/FS) in the NCP. Based upon studies, reports, etc. which were prepared pursuant to the Decree, in September 1989 EPA issued the first Record of Decision for Operable Units One and Two (first ROD) for the Site under CERCLA. This first ROD provided a conceptual framework to address contamination on the Grace property; essentially consistent with the Site cleanup under the Consent Decree.

The first ROD organized the cleanup work into three operable units:

- Operable Unit One: Disposal areas and surficial contamination areas at the Site.

- Operable Unit Two: Residual contamination in source areas at the Site following implementation of Operable Unit One.

- Operable Unit Three: Contaminated groundwater in the area of the Grace facility that is not contained or adequately addressed by the Aquifer Restoration System.

The first ROD also included the cleanup plan for Operable Unit One. This cleanup plan was identical to the cleanup plan approved under the Consent Decree. In 1994, Grace began implementing the Operable Unit One cleanup at the Site. By 1997, all construction work was completed for this phase of the cleanup. Over 173,000 cubic yards or contaminated soil and sludge were removed, grossly contaminated media was shipped off-Site for proper disposal, while most remaining contaminated media was thermally treated, mixed with cement and then placed and covered in the Industrial Landfill. Operable Unit Two was to follow Operable Unit One if residual contamination in soil exceeded the soil cleanup levels established in the first ROD remained. Based upon the results of post excavation sampling, no unaddressed soil remained above the cleanup levels. As a result, no action was required for Operable Unit Two.

In 1998, EPA, MADEP and Grace negotiated a Statement of Work for the RI/FS that would address Operable Unit Three. The Statement of Work was then incorporated into the Consent Decree. In 1998, Grace began work on the RI/FS for Operable Unit Three to evaluate the extent of groundwater contamination on- and off-Site and establish groundwater target cleanup levels for groundwater contaminated by the Site and to determine whether additional remedial measures were necessary to restore the groundwater affected by the Site to a fully usable condition in the shortest practical time. This evaluation also included a review of the existing ARS to determine if it was adequately containing contaminated groundwater from the Site and if the ARS was adequately remediating the groundwater affected by the Site. The RI/FS also evaluated surface water and sediments at the Site. As part of the RI/FS process, both a human health and ecological risk assessment where completed. These risk assessments evaluated if there were unacceptable risk(s) to either human health or to the environment from the Site.

The RI/FS was completed in July 2005 and is part of the basis upon which this ROD for Operable Unit Three is being issued. EPA will take actions under the Consent Decree to approve a remedial plan consistent with the remedy selected here.

3. History of CERCLA Enforcement Activities

As discussed above, in 1980, the United States filed a civil action under Section 7003 of RCRA seeking a judicial order requiring Grace to abate an imminent and substantial endangerment to human health and the environment at Grace's Acton facility. Shortly thereafter, on July 14, 1980, Massachusetts issued an administrative order (DEP Order) to Grace specifying procedures and requirements for evaluating and correcting Site contamination. EPA and Grace settled the action, agreeing on a Consent Decree that was filed with the Court on October 21, 1980. The provisions of the Consent Decree are similar to the requirements of the DEP Order, which MADEP amended to conform with the Consent Decree on April 15, 1981.

As discussed above, under the Consent Decree, Grace has been responsible for conducting the evaluations and analyses necessary for EPA and MADEP approval of remedial measures at the Site addressing groundwater and soil/sludge or source areas of contamination and then implementing those measures.

In November of 1997, the United States filed suit against W. R. Grace Co. – Conn. to recover costs spent by EPA in overseeing cleanup work at the Grace property under CERCLA. In 1998, a settlement was reached whereby Grace agreed to make a payment to resolve EPA's claim for past response costs. In addition, Grace agreed to pay EPA's oversight costs in the future.

In 1998, EPA and Grace and MADEP negotiated a Statement of Work for the RI/FS that would address Operable Unit Three. The Statement of Work was then incorporated into the Consent Decree and is now an enforceable requirement under this Decree. Work on this RI/FS had been ongoing from early 1998 until July 2005, when the RI/FS for Operable Unit Three was completed.

C. COMMUNITY PARTICIPATION

During the course of the Superfund cleanup at the W. R. Grace (Acton Plant) Site, the community has been closely and consistently involved with the Site. Both EPA and MADEP have been accessible to all interested parties and have kept the Stakeholders, (i.e., the Acton Citizens for Environmental Safety (ACES), local Town officials – Acton Board of Health, consultants for the Town and the Acton Water District, as well as the local community and other interested parties) apprised of Site activities through informational meetings, conference calls, technical meetings after most major deliverables/reports, community fact sheets, press releases, public notices, public meetings and Stakeholder meetings here at EPA. Although not required under the NCP, EPA has also provided the community with draft deliverables it receives from Grace and has sought input on these deliverables from the community prior to providing comments to Grace. Below is a brief chronology of many of EPA's public outreach efforts.

- In December of 1991, MADEP and EPA released a community relations plan that outlined a program to address community concerns and keep citizens informed about and involved in remedial activities.

- During the time that Operable Units One and Two were being discussed, local residents of Acton formed a citizen's advisory group, the Acton Citizens for Environmental Safety (ACES) to monitor Site activities. ACES had applied and were awarded a Technical Assistance Grant (TAG) in September of 1989.

- During the RI/FS process for Operable Unit Three (from 1998 – July 2005), key Stakeholders attended approximately 15 technical meetings with EPA and MADEP to discuss community comments and concerns on almost every major deliverable submitted to EPA and the State. EPA has also conducted several additional meetings to provide the community and Town of Acton with clarification on EPA policies and direction on the Risk Assessments, the Feasibility Study and most recently the July 2005 Proposed Plan (a number of these are identified specifically below).

- Community Updates on the RI/FS process and results were distributed to over 700 people on EPA's mailing list for the Site, in August 2001 and December 2002.

- On September 30, 2002, EPA attended a Public Meeting at the request of the Acton Board of Health to discuss a temporary moratorium on the installation of private irrigation wells.

- On June 12, 2003, EPA, MADEP and W. R. Grace representatives and consultants held an informational public meeting at the Acton-Boxborough High School to discuss the status and preliminary results of the Remedial Investigation and to also solicit community input regarding the Human Health and Ecological Risk Assessments.

- On October 28, 2003, EPA attended and provided support for a Public Meeting that was held by the Agency for Toxic Substance Disease Registry (ATSDR).

- On February 12, 2004, a Stakeholder meeting was held at EPA to discuss concerns, answer specific questions on EPA comments and to set out EPA's procedures on Human Health Risk Assessment for the Site.

- In September of 2004, a Draft Preliminary Re-use Assessment was prepared by EPA with input from MADEP, and various interested parties. The purpose of this document was to solicit input on the reasonably anticipated future land use and potential beneficial groundwater uses at the Site, prior to the implementation of a remedy for Operable Unit Three.

- In March of 2005, the first draft of the Feasibility Study was provided to the Town of Acton, the Acton Water District, and the local citizens advisory group, ACES.

- On April 27, 2005, a Stakeholder meeting was held at EPA to discuss concerns, answer specific questions and to set out EPA's procedures for preparing and evaluating Feasibility Study.

- On July 6, 2005, EPA and MADEP met with the local Stakeholders at the Acton Water District to provide them with an advance draft copy of EPA's July 2005, Proposed Plan and to informally discuss their questions.

- On July 8, 2005, EPA's July Proposed Plan was distributed to over 700 people on EPA's mailing list for the Site.

- On July 8, 2005, EPA made the administrative record and EPA's July 2005, Proposed Plan available for public review at EPA's offices in Boston, on-line at EPA's website and at the Acton Memorial Library in Acton Massachusetts.

- On July 8, 2005, EPA also released a press release to area media outlets announcing and describing EPA's July 2005 Proposed Plan as well as the opportunities for public involvement and the dates of the upcoming public meeting and public hearing.

- On July 14, 2005, EPA published a notice and brief analysis of the July 2005 Proposed Plan in the Acton Beacon and the Boston Globe Northwest Edition.

- From July 11, 2005 to August 9, 2005, the Agency held a 30-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. An extension to the public comment period was requested and granted. As a result, the public comment period was extended until September 8, 2005.

- On July 19, 2005, EPA held an informational meeting to discuss the results of the Remedial Investigation, Risk Assessments, the Feasibility Study and to present the Agency's July 2005 Proposed Plan to a broader community audience than those that had already been involved at the Site. At this meeting, representatives from EPA, W. R. Grace and technical consultants presented information and answered questions from the public. A transcript of this meeting including comments and questions from participants in the meeting and EPA's response is included in the administrative record for the Site. To the extent that comments and questions were not fully addressed in the meeting, EPA's response is included in the Responsiveness Summary, which is part of this Record of Decision.

- On August 4, 2005, the Agency held a public hearing on the July 2005 Proposed Plan and to accept any oral comments for the record. A transcript of this meeting and the Agency's response to comments are included in the Responsiveness Summary, which is part of this Record of Decision.

D. SCOPE AND ROLE OF OPERABLE UNIT RESPONSE ACTION

This is intended to be the final Record of Decision for this Site and addresses the final of three planned remedial activities at the Site. In summary, the selected remedy provides for a comprehensive approach for this Site that addresses all remaining current and potential future risks presented at the Site. These remedial measures will prevent exposures that present an unacceptable risk to human health and ecological receptors and meet ARARs.

As with many Superfund sites, the problems at the W.R. Grace (Acton Plant) Site are complex. As a result, EPA organized the work into three Operable Units for the W.R. Grace (Acton Plant) Site.

1. Operable Units One and Two

As described earlier, the objective of Operable Unit One was to address soil and sludge contamination that posed an unacceptable risk from the source or former disposal areas throughout the Site. EPA selected the remedies for Operable Units One and Two in a ROD signed on September 1989 and these actions were completed in 1997.

The general objective of Operable Units One and Two was to protect the drinking water aquifer by minimizing further contamination of groundwater and surface water from these sources, and to eliminate the threats posed by direct contact to or ingestion of contaminants in soil and sludge at the Site. Operable Unit Two was to follow Operable Unit One activities, if residual contamination remained which exceeded the soil cleanup levels established in the first ROD. Post-excavation sampling and analysis for Operable Unit One were conducted to ensure that the soil cleanup levels of residual contamination in each disposal area were equal to or less than the required clean-up levels. Therefore, no action was required to address the requirements of Operable Unit Two. Except for long-term operation, maintenance and monitoring, Operable Units One and Two have been completed.

2. Operable Unit Three

This Record of Decision addresses Operable Unit Three. Operable Unit Three addresses contaminated groundwater in the area of the Acton facility that is not contained or not being adequately addressed by the current Aquifer Restoration System. Operable Unit Three evaluates the extent of groundwater contamination on and off-Site and establishes target cleanup levels for groundwater that has been contaminated by the Site. The focus of Operable Unit Three is to determine whether additional remedial measures are necessary to restore the groundwater affected by the Site to a fully usable condition in the shortest practical time and to protect public health and the environment taking into account the work that has already been conducted at the Site.

As part of the Site investigations, an evaluation was also conducted of surface water and sediments to complete the assessment of all media impacted by contamination from the Grace property. As a result, Operable Unit Three not only addresses groundwater but also evaluates and addresses impacts to sediment and surface water from the following water bodies:

- Assabet River
- Fort Pond Brook
- Gravel Pit Wetland
- Former North Lagoon
- North Lagoon Wetland
- Sinking Pond

The selected remedy for Operable Unit Three was developed by considering past components of the source control (Operable Units One and Two) and management of migration (the ARS) alternatives in order to obtain a comprehensive approach.

E. SITE CHARACTERISTICS

The Conceptual Site Model (CSM) for groundwater, surface water bodies and wetlands at the Site has been provided in both the text below as well as in Figures 5 & 6 respectively. The CSM is a three-dimensional "picture" of Site conditions that illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential human and ecological receptors. It documents current and potential future Site conditions and shows what is known about human and environmental exposure through contaminant release and migration to potential receptors. The risk assessment and response action for groundwater, surface water bodies and wetlands for Operable Unit Three is based on this CSM.

The W. R. Grace property is comprised of approximately 260 acres, is located in Acton and Concord, Massachusetts, and is accessible by motor vehicle from Independence Road. The Grace property is bordered by residential properties on the northwest, east, and west, and industrial properties to the south and northeast. There are no known areas of Grace Property that have archaeological or historical importance. Fort Pond Brook bounds the property to the northwest and the Assabet River bounds the property to the southeast. Two sand and gravel pits, Massachusetts Broken Stone Pit and Assabet Sand and Gravel, are located south of the property (HSI GeoTrans, 1998).

Glacial features, including kames, swampy areas, and kettle hole ponds characterize the morphology of the Site. Site ground surface elevation ranges between approximately 125 and

200 feet National Geodetic Vertical Datum of 1929 (NGVD). The surficial geology of the area is comprised predominantly of stratified glacial deposits. Sand and gravel deposits are underlain by till, which is underlain by bedrock. The bedrock is comprised of gneisses and schists of the Nashoba formation. The upper portion of the bedrock, where it has been observed, is weathered and fractured (Hansen, 1956). The Site is located between two major northeast trending fault zones, the Bloody Bluff and the Clinton-Newbury fault zones. These major fault zones have created a northeast trending regional fabric of stratigraphic trends and foliation (Barosh, Fahey, and Pease, 1977).

The primary source of groundwater in the aquifers underlying the study area is precipitation. As precipitation enters the ground, it moves downward through the unsaturated glacial deposits to the groundwater table. For the majority of the Grace property, the groundwater table lies from 20 to 50 feet below the ground surface. However, in the vicinity of the North Lagoon, the groundwater table is generally at the ground surface.

The Site is located in the Assabet River drainage system that is part of the larger Merrimack River basin. Water within this drainage system eventually discharges to the Atlantic Ocean north of Cape Ann (Pollock, 1969). Prior to operation of the ARS, groundwater in the unconsolidated deposits flowed from a groundwater divide located in the vicinity of the Massachusetts Bay Transportation Authority (MBTA) commuter rail easement and Independence Road south and southeast towards the Assabet River as well as northwest and northeast toward Fort Pond Brook. Vertical hydraulic gradients between the unconsolidated deposits and the bedrock are generally downward, except near the Assabet River and Fort Pond Brook. Vertical hydraulic gradients in the vicinity of the Assabet River and Fort Pond Brook, are upward from the bedrock to the unconsolidated deposits indicating that groundwater discharges to the river and brook (HSI GeoTrans, 1998; GeoTrans 2001). The currently operating ARS now captures most of the contaminated groundwater at the Site, and prevents most of it from leaving the property. Groundwater collected by the ARS is treated for volatile organic compounds (VOCs) and the treated water is discharged to Sinking Pond.

Several surface water bodies are located in and around the Site. These include Sinking Pond, Turtle Pond, Muskrat Pond, the Assabet River, and Fort Pond Brook. Sinking Pond is located in the southwestern portion of the Site. It is a bowl-shaped kettle pond, approximately six acres in size, with a center depth of approximately 43 feet. Sinking Pond has one manmade surface inlet, located at the northwestern end, where treated water from the ARS is discharged at a current rate of approximately 400 gallons per minute (gpm). Stormwater runoff, from approximately 45 acres of the Site, also flows into the pond. Sinking Pond has no surface outlets (HSI GeoTrans, 1998). Water leaves the pond as groundwater flow. The Assabet River is located south and southeast of the Site and flows toward the northeast. The reported average flow of the Assabet River at Maynard, approximately 1.5 miles upstream of the Site, is 190 cubic feet per second (cfs) (USGS, 1997). Historical seasonal fluctuations in daily average stream flow range from 61.3 cfs in August to 405 cfs in March (USGS, 2001). Fort Pond Brook is located directly north of the Site and flows toward the east. The flow rate of Fort Pond Brook is unknown, but it is less than the Assabet River flow rate. Fort Pond Brook joins Nashoba Brook approximately 0.7 miles northeast of Lawsbrook Road. Nashoba Brook flows easterly into Warner's Pond, and then discharges to the Assabet River approximately 1.8 miles east of the Grace property (HSI GeoTrans, 1998).

Water supply wells owned and operated by the Acton Water District (AWD) are located in two areas near the Grace property. The Assabet well field, consisting of two wells, Assabet 1 and Assabet 2, is located approximately 1,300 feet south of the Grace property. The School Street well field, comprised of the Christofferson and Lawsbrook gravel-packed wells and the Scribner pumping station which now pumps from a group of four gravel-packed wells, is located approximately 3,700 feet northeast of the Grace property. Groundwater from all of the AWD water supply wells is currently treated by air stripping for VOC removal before being pumped into the distribution system. Organic contaminants were first found in the Assabet 1 and Assabet 2 wells in 1978 and in the Christofferson, Lawsbrook, and Scribner wells in 1980. In recent years, VDC concentrations in the Assabet 1, Assabet 2, and Christofferson wells have been below MCLs, while data from the Lawsbrook and Scribner wells have shown some VDC concentrations above the MCL.

During manufacturing activities at the Site, groundwater from an on-Site production well, WRG-3, (See Figure 1) was utilized as part of the manufacturing process. As part of a 1987 settlement between W.R. Grace and the AWD, ownership of well WRG-3 and its surrounding area was transferred to AWD. The AWD currently considers WRG-3 as a viable future water supply for the Town of Acton that would be used to address future water needs of the community.

The ARS was designed to mitigate the migration of contaminated groundwater to the Assabet Wells, the Assabet River, and Fort Pond Brook. The ARS was also designed to accelerate the removal of contaminants from groundwater, and thus return the aquifer to a fully usable condition.

Much of the contaminated groundwater at the Site is captured and treated by the ARS. Installation of the ARS began in December 1983, and the main ARS became operational in March of 1985. Until November 2002, the ARS consisted of eleven extraction wells pumping at a combined rate of approximately 570 gpm. Between November and December 2002, three of the extraction wells were removed from service (WRG-1, RP-1, and NMGP) with EPA and MADEP approval, leaving a system of eight extraction wells pumping at a combined rate of approximately 400 gpm. Groundwater pumped from the extraction wells is treated by an air-stripping tower to remove VOCs. An odor control system was added to the air-stripping tower in September 1992. In accordance with the Amended Monitoring Plan (CDM, 1996), all treated groundwater is discharged to Sinking Pond. The discharge to Sinking Pond creates a localized groundwater flow barrier that diverts contaminated groundwater away from the Assabet 1 and Assabet 2 wells. In addition, surface water levels in Muskrat and Turtle Ponds are maintained at equal elevations to reduce the horizontal hydraulic gradient in groundwater beneath the ponds, thereby helping to shield the Assabet wells from contaminated groundwater that is east of the two ponds.

The treatment system effectiveness is evaluated through the collection and analysis of water samples from the influent and effluent stream of the air-stripping tower, and surface water samples from the inlet to Sinking Pond. Samples are collected quarterly. The air-stripping tower influent and effluent samples are analyzed for VOCs and dissolved metals. Samples from the inlet to Sinking Pond are analyzed for dissolved metals, and samples from Sinking Pond are analyzed for color and turbidity. In 2003, the total VOC concentration in the influent to the main air stripping tower was less than 50 ppb. Since September 1993, with the exception of two samples in 2002, the total VOC concentration in the influent to the air-stripping tower has been less than 100 ppb. Since July 1988, the VDC concentration in the air stripper influent has been less than 50 ppb. In all samples collected in 2003, dissolved iron concentrations at the inlet to Sinking Pond were greater than the Amended Monitoring Plan limit of 0.3 mg/L.

Nature and Extent of Contamination

<u>Groundwater</u>

Numerous investigations have been performed at the Site since 1979 to determine the nature and extent of groundwater contamination. A summary of the results of these investigations is contained in the *Public Review Draft Remedial Investigation Report*, (GeoTrans, July 2005), which is part of the Administrative Record for the Site.

<u>VOCs</u>

VDC, vinyl chloride, and benzene are the three main contaminants at the Site, with VDC being the most widely distributed. VDC-contaminated groundwater extends from the former source areas to the north and northeast toward Fort Pond Brook and the AWD School Street Wellfield, and to the south and southeast beneath the Industrial Landfill to the Assabet River. Vinyl chloride, a breakdown product, and minor impurity, of VDC, is less widely distributed than VDC and is found at lower concentrations than VDC. Benzene is less widely distributed than both VDC and vinyl chloride. Benzene is found mainly southeast of the Industrial Landfill.

The VOC compounds 1,2-DCA and 1,2-dichloropropane have been detected in groundwater samples from a few wells located downgradient of the Industrial Landfill. The VOC compound 1,2-DCA was detected above its MCL of 5 μg/L in eleven wells located downgradient of the Industrial Landfill with a maximum concentration of 120 μg/L. The VOC compound 1,2-dichloropropane was detected above its MCL of 5 μg/L in six wells located downgradient of the Industrial Landfill with a maximum concentration of 90 μg/L. Methylene chloride was also detected above its MCL of 5 μg/L in four wells downgradient of the Industrial Landfill with a maximum concentration of 140 μg/L, and sporadically at two wells northeast of the former

North Lagoon with a maximum concentration of 13 µg/L. See Figure 1 which shows the 2001 VDC plume.

<u>SVOCs</u>

Bis(2-ethylhexyl)phthalate was detected above its MCL of 6 µg/L in one well located downgradient of the Industrial Landfill with a maximum concentration of 7.5 µg/L.

<u>Inorganic Compounds</u>

As described in more detail in the RI report (GeoTrans, July 2005), naturally occurring inorganic compounds in the geologic matrix through which groundwater flows are frequently detected at concentrations greater than their regulatory limits in groundwater samples. Water quality data and Site history information for the Grace Site indicate that the presence of arsenic and manganese concentrations in groundwater in excess of their regulatory limits is most likely caused by two conditions. One is the presence of naturally occurring high concentrations of these compounds in the geologic matrix and groundwater, and the other is increased dissolution of these naturally occurring compounds as a result of geochemical changes in the groundwater associated with the release and disposal of other compounds, namely VOCs. A more detailed discussion of the geochemical controls on the occurrence and distribution of arsenic and manganese in Site groundwater is provided in the *Public Review Draft Remedial Investigation Report*, (Geotrans, July 2005)

Water quality data indicate that geochemical changes in groundwater near and downgradient of the Industrial Landfill, the former Blowdown Pit, and the former Primary Lagoon likely increased the solubility of naturally occurring arsenic and manganese in these geographic areas. Elevated arsenic concentrations in groundwater appear to be closely associated with groundwater in unconsolidated deposits downgradient from the Industrial Landfill, specifically in the area of wells and well clusters LF-06, B-08, LF-15, ELF and MLF. Elevated arsenic concentrations in unconsolidated deposits groundwater are also found between the former Primary Lagoon and former Blowdown Pit and the MBTA railroad tracks. The occurrence of elevated arsenic concentrations in groundwater directly downgradient from former source areas indicates that these localized areas of higher concentrations of arsenic in groundwater are most likely the result of the dissolution of naturally occurring arsenic in response to changes in groundwater geochemistry caused by disposal of other compounds in these areas. Further downgradient from these areas, arsenic concentrations are lower and likely reflect re-precipitation, adsorption, and reduced mobility of arsenic.

Manganese has been detected at concentrations greater than the EPA Health Advisory level in both the unconsolidated deposits and bedrock groundwater across much of the Site. Unlike arsenic, elevated manganese concentrations in groundwater are widespread across the Site. Similar to arsenic, the highest concentrations of manganese are adjacent to and downgradient from the Industrial Landfill, as well as the former Primary Lagoon and former Blowdown Pit. In these portions of the Site, the elevated manganese concentrations most likely reflect the high naturally occurring concentration of manganese combined with increased dissolution of manganese containing minerals. The elevated concentrations of manganese detected in groundwater that is upgradient of the Site and distant from the former source areas reflect the naturally occurring or background concentrations for manganese. It is anticipated that as natural groundwater conditions are restored downgradient from the Industrial Landfill and former source areas as a result of the proposed groundwater remedy, manganese concentrations in groundwater are expected to decrease as a result of chemical adsorption and/or precipitation. It is expected, however, that the resulting concentrations will remain high, consistent with background concentrations of manganese. Background Manganese groundwater concentrations ranged from non-detect to 844 ppb. Further evaluation of appropriate background concentrations for manganese in groundwater will be needed. Additional discussion regarding the nature and extent of arsenic and manganese is included in Sections 3 of the RI Report (GeoTrans, July 2005) and Sections 1.3.1.1 through 1.3.1.6.

The significant findings of the Remedial Investigation are summarized below. For additional details or further information see *The Public Review Draft Remedial Investigation*, (Geotrans, July 2005).

The Site was divided into six geographic areas to simplify and improve the evaluation of the potential remedial alternatives for groundwater. See Figure 1 for the designation of the geographical areas. The geographic areas were selected on the basis of groundwater flow directions, as well as the nature and extent of groundwater contamination. These areas are:

- Former Lagoon Area
- Northeast Area
- Southwest Area
- Assabet River Area
- Southwest Landfill Area
- Southeast Landfill Area

The following sections provide a brief description of the nature and extent of Site groundwater contamination for each of these geographic areas, focusing on VDC, vinyl chloride, benzene, manganese, and arsenic. More detailed information on the nature and extent of groundwater contamination at the Site can be found in the *Public Review Draft RI Report* (GeoTrans, July 2005).

Former Lagoon Area

The Former Lagoon Area corresponds to groundwater located beneath most of the former wastewater lagoons, including the former Primary Lagoon, former Emergency Lagoon, former Blowdown Pit, former Tank Car Area, and former North Lagoon, as well as groundwater located downgradient of the former North Lagoon.

VOCs

Groundwater quality has improved in the area of the former Primary and Emergency Lagoons. VDC remains above its MCL of 7 µg/L only in the extraction wells, with a maximum concentration of 86 µg/L in 2001. The low VDC concentrations detected in the monitoring wells near these lagoons indicate that the extraction wells (SLGP-R and SLBR) in this area are likely capturing contaminated groundwater from elsewhere, such as the former Blowdown Pit. Vinyl chloride concentrations remain slightly above its MCL of 2 µg/L in one bedrock recovery well (SLBR) and one deep unconsolidated deposits monitoring well (OSA-12B), with a maximum concentration of 12 µg/L. Benzene concentrations remain above its MCL of 5 µg/L in one mid-depth unconsolidated deposit monitoring well (OSA-13B) which is located adjacent to the former Primary Lagoon. The contaminated groundwater remaining in the area of the former Primary and Emergency Lagoons was contained and captured by the ARS. In 2003, pumping in this area ceased, current data indicate low levels of contamination remaining in this area.

Water quality data indicate that VDC and vinyl chloride concentrations have decreased significantly in the groundwater beneath the former Blowdown Pit since the early 1990s. VDC concentrations remain above its MCL in the unconsolidated deposits and shallow bedrock beneath the former Blowdown Pit, although concentrations have declined from a maximum of 510 µg/L in 1994 to a maximum of 65 µg/L in 2001. Vinyl chloride concentrations remain above its MCL in the shallow bedrock adjacent to the former Blowdown Pit with a maximum concentration of 14 µg/L. Benzene is not detected above its MCL in wells adjacent to the former Blowdown Pit. The contaminated groundwater remaining in the area of the former Blowdown Pit was contained and captured by the ARS. Current data indicate low levels of contamination remaining in this area.

VDC remains above its MCL of 7 µg/L in the unconsolidated deposits and shallow bedrock near the former Tank Car Area, with a maximum concentration of 60 µg/L. Vinyl chloride concentrations are detected above its MCL only in the extraction wells, with a maximum concentration of 9.3 µg/L. Benzene is not detected above its MCL in wells adjacent to the former Tank Car Area. The contaminated groundwater remaining in the area of the former Tank Car Area was contained and captured by the ARS. Current data indicate low levels of contamination remaining in this area.

Groundwater quality beneath the former North Lagoon indicates that the maximum VDC concentration in the deep unconsolidated deposits and shallow bedrock near the former North Lagoon is 85 µg/L. VDC concentrations in these wells are lower now than they were in the early to mid-1990s, when concentrations were as high as 300 µg/L. Vinyl chloride and benzene concentrations are currently below their MCLs of 2 and 5 µg/L, respectively, in all the monitoring wells adjacent to the former North Lagoon with the exception of OSA-06BR. The vinyl chloride and benzene concentrations in the 2001 sample from bedrock well OSA-06BR were 4.6 µg/L and 10 µg/L, respectively.

VDC and benzene concentrations are currently below their MCLs of 7 and 5 µg/L, respectively, in the monitoring wells located downgradient of the former North Lagoon. Vinyl chloride was detected slightly above its MCL of 2 µg/L in one shallow bedrock monitoring well (AR-16ADP), with a concentration of 2.1 µg/L in 2001. Samples collected in 2001 from beneath Fort Pond Brook, at transect FPB-T21 downgradient of well cluster AR-16, indicate that the VDC concentration in groundwater discharging to the brook was 4 µg/L. VDC was not detected in the surface water samples collected from Fort Pond Brook at this location (Menzie-Cura, 2002).

Inorganic Compounds

Arsenic has been detected above its MCL of 10 µg/L in 12 of 29 locations in the Former Lagoon Area, with a maximum concentration of 541 µg/L. Manganese has been detected above the maximum background concentration of 844 µg/L in 13 of 29 locations and above the human health advisory of 300 µg/L in 18 of 29 locations in the Former Lagoon Area, with a maximum concentration of 5,340 µg/L.

Northeast Area

The Northeast Area includes groundwater located northeast of the former wastewater lagoons. The former Blowdown Pit was likely the source of groundwater contamination from the Grace property in the northeastern part of the Site. Although a significant amount of data has been collected in the Northeast Area, less monitoring has been conducted here compared with the remainder of the Site, as many of the current monitoring wells are relatively new and older wells were not sampled for many years.

VOCs

The data indicate that this portion of the VOC plume has been cut off from the source area by the ARS, and that the contaminated groundwater concentrations are attenuating as groundwater migrates to the northeast towards Fort Pond Brook and the School Street Wellfield. Groundwater with VDC concentrations above its MCL of 7 µg/L is found in the shallow bedrock in the area northeast of the former Blowdown Pit and beneath the BOC Gases property. Further downgradient, beneath the AWD property, groundwater with VDC concentrations above its MCL of 7 µg/L is found in the unconsolidated deposits.

It appears that groundwater with the highest VDC concentrations in the Northeast Area is located beneath the northwestern portion of the BOC Gases property as well as northeast of the BOC Gases property. The highest VDC concentration is reported from samples from MW-06B, located in the northernmost portion of the BOC Gases property. The VDC concentration measured in samples from MW-06B has declined from greater than 800 µg/L in the late 1980s and early 1990s to approximately 260 µg/L in 2001.

The maximum VDC concentration detected on the AWD property in 2001 was 140 µg/L in deep unconsolidated deposits well PS-22B. Maximum VDC concentrations that could be expected beneath the AWD property in the future will be less than the maximum VDC concentration of

260 µg/L observed in 2001 in the sample from well MW-06B on the BOC Gases property. VDC concentrations in groundwater will continue to attenuate as the contaminated groundwater flows toward Fort Pond Brook and the School Street wellfield.

Similar to VDC concentrations, vinyl chloride concentrations remain above its MCL of 2 µg/L in the deep unconsolidated deposits and shallow bedrock northeast of the former Blowdown Pit. However, vinyl chloride is currently detected at much lower concentrations than VDC. The maximum vinyl chloride concentration detected in 2001 was 17 µg/L in well MW-13B. Benzene was detected at a concentration greater than its MCL of 5 µg/L in two shallow bedrock wells in the Northeast Area. Groundwater samples from MW-07B and MW-13B, had benzene concentrations of 6 and 5.1 µg/L, respectively.

Inorganic Compounds

Arsenic has been detected above its MCL of 10 µg/L in four of 42 locations in the Northeast Area with a maximum concentration of 45.9 µg/L. Manganese has been detected above the maximum background concentration of 844 µg/L in six of 42 locations and above the human health advisory of 300 µg/L in 15 of 42 locations in the Northeast Area with a maximum concentration of 1,170 µg/L.

Southwest Area

The former Primary and Emergency Lagoons are the likely sources of groundwater contamination in the Southwest Area. Contamination moved downward beneath the former lagoons into the shallow bedrock. Contaminated groundwater flowed to the southwest in the shallow bedrock beneath Sinking, Muskrat, and Turtle Ponds, and then moved upward into the unconsolidated deposits near the Assabet wells.

VOCs

The data indicate that the source of groundwater contamination flowing to the southwest has been contained by the ARS and groundwater concentrations remain slightly above MCLs in only one monitoring well, PT-03B1, located near the Assabet River. In 2001, VDC concentrations of 10 µg/L were reported in a groundwater sample from the shallow bedrock well PT-03B1. VDC was detected at 14 µg/L in well PT-11B1, a deep unconsolidated deposit well located on the south side of the Assabet River, beyond the Site boundary. As was discussed in Section 5 of the Phase 1 RI Data Report Addendum (GeoTrans, 2002), there are several sources of groundwater contamination located south of the Assabet River. The VDC detected in groundwater samples from the PT-11 well cluster is likely related to one or more contamination sources south of the Assabet River. The VDC detected in groundwater in the PT-03 cluster may have originated at sources south of the Assabet River that were drawn under the river by pumping of Assabet 1, or it may be residual contamination from the former Primary or Emergency Lagoons.

Vinyl chloride concentrations remain above its MCL in one monitoring well located east of public water supply well Assabet 1. A vinyl chloride concentration of 3.9 µg/L was detected in shallow bedrock well PT-03B1 in 2001. The vinyl chloride detected in groundwater in the PT-03 well cluster may have originated at sources south of the Assabet River and was drawn under the river by pumping of Assabet 1, or it may be residual contamination from the former Primary or Emergency Lagoons. Benzene is not detected above its MCL of 5 µg/L in the area southwest of the former Primary or Emergency Lagoons.

Samples from the two AWD public water supply wells located in the Southwest Area have not contained VOCs at concentrations above MCLs since 1992.

Well WRG-3 is located near the Southwest Area. At the request of the AWD, W. R. Grace utilized the groundwater flow model to evaluate potential adverse effects to WRG-3 (i.e., effect on the groundwater remediation and the potential to draw Site contamination from plumes in other parts of the Site into WRG-3). W. R. Grace received this request on August 18, 2005 and prepared a letter dated September 7, 2005, which summarized their evaluation. The results of these preliminary model analyses to date indicated that pumping WRG-3 at a rate of approximately 350 gpm would not likely cause 1,1 DCE, benzene and vinyl chloride contaminated groundwater from the Grace Site to be drawn into this well. In coordination with the AWD, further evaluation of impacts of residual groundwater contamination on WRG-3 will likely be necessary during remedial design and implementation.

Inorganic Compounds

Arsenic has been detected above its MCL of 10 µg/L in two of 25 locations in the Southwest Area with a maximum concentration of 37.9 µg/L. Manganese has been detected above the maximum background concentration of 844 µg/L in nine of 25 locations and above the human health advisory of 300 µg/L in 16 of 25 locations in the Southwest Area with a maximum concentration of 3,720 µg/L.

Assabet River Area

Groundwater in the Assabet River Area may have been impacted by several different sources, including the former Primary Lagoon, the former Emergency Lagoon, and the former Blowdown Pit.

VOCs

Groundwater quality data suggest that the groundwater contamination flowing to the south has been cut off from its source by the ARS and that the remnants of the plume are attenuating, with VDC concentrations remaining above its MCL of 7 µg/L only near the Assabet River.

VDC concentrations in several wells (AR-04B1, AR-15B1, and AR-15B2) in the upgradient portion of this area have decreased from greater than 1,000 µg/L in the 1980s to below its MCL of 7 µg/L in the late 1990s. Water quality data from the newly installed LF-18 and LF-20 well clusters show that, in 2002, the maximum VDC concentration in the deep unconsolidated deposits closer to the river was 78 µg/L. VDC concentrations are below the MCL in bedrock groundwater in this area.

Water quality data from groundwater samples collected beneath the Assabet River in 2001 indicate that VDC-contaminated groundwater is discharging to the river in the area between transects ASBRV-T5 and ASBRV-T13. In 2001, the maximum VDC concentration in the groundwater beneath the river was approximately 340 µg/L at transect ASBRV-T6. VDC was detected in groundwater beneath the river in the area between transects ASBRV-T5.2 to ASBRV-T13. The VDC contained in the groundwater discharge likely represents the remnants of the VDC contaminated groundwater that has been migrating to the south. In 2000, VDC was not detected in surface water samples collected at transects ASBRV-T5 and ASBRV-T6 (Menzie-Cura, 2002).

As with VDC, the vinyl chloride concentration data suggest that contaminated groundwater flowing to the south has been cut off from the source by the ARS, and that the remnants of the contaminated groundwater are attenuating, with vinyl chloride concentrations remaining above its MCL of 2 µg/L only near the Assabet River. Water quality data from the recently installed LF-18 and LF-20 clusters show that in 2002 the maximum concentration in the deep unconsolidated deposits groundwater closer to the river was 47 µg/L. Vinyl chloride was below its MCL of 2 µg/L in the bedrock wells of the LF-18 and LF-20 clusters. Water quality data from groundwater samples collected beneath the Assabet River indicate that groundwater containing vinyl chloride is discharging to the river in the same geographic area as the VDC, although at lower concentrations. In 2001, a maximum vinyl chloride concentration of 100 µg/L was detected in groundwater beneath the Assabet River at ASBRV-T6. Vinyl chloride was not detected in surface water samples collected in 2000 at transects ASBRV-T5 and ASBRV-T6 (Menzie-Cura, 2002).

Benzene is detected slightly above its MCL of 5 µg/L in one well in this area, LF-18D, at a concentration of 7.2 µg/L. Groundwater samples collected from beneath the Assabet River indicate that benzene is discharging to the river near transect ASBRV-T6 at concentrations up to 16 µg/L. In 2000, benzene was not detected in surface water samples collected at ASBRV-T5 and ASBRV-T6 (Menzie-Cura, 2002).

Inorganic Compounds

Arsenic has been detected above its MCL of 10 µg/L in two of 17 locations in the Assabet River Area with a maximum concentration of 28.8 µg/L. Manganese has been detected above the maximum background concentration of 844 µg/L in four of 17 locations and above the human health advisory of 300 µg/L in ten of 17 locations in the Assabet River Area with a maximum concentration of 2,470 µg/L.

Southwest Landfill Area

VOCs

The source of groundwater contamination in the Southwest Landfill Area was likely the Industrial Landfill. VOC concentrations beneath the former Secondary Lagoon, which is upgradient of the landfill, are lower than concentrations observed just south of the landfill. In addition, there is a large difference in VDC concentrations between the LF-03 cluster, which has relatively low VDC concentrations, and the nearby LF-10 cluster, which has relatively high VDC concentrations. This concentration difference suggests that the source of VDC may have been relatively close to LF-10.

The highest VDC concentrations in the Southwest Landfill Area are detected closer to the Landfill. In 2001, the maximum VDC concentration detected was 610 μg/L, with a duplicate sample concentration of 660 μg/L in deep unconsolidated deposits well LF-10. VDC has not been detected in the shallow groundwater in this area. In the mid-depth unconsolidated deposits, at elevations between approximately 50 to 100 feet NGVD, VDC concentrations have generally shown a decreasing trend. The largest decrease has been observed in LF-10A, with VDC concentrations of 1,000 μg/L in 1995 and 180 μg/L in 2001. VDC concentrations in the deep unconsolidated deposits have decreased at a slower rate, likely reflecting diffusion from the low permeability till beneath the area. VDC concentrations in shallow bedrock well LF-02A, at an elevation of 34 feet NGVD, have increased, from 39 μg/L in 1997 to 210 μg/L in 2001.

Vinyl chloride and benzene concentration trends follow similar patterns as the VDC concentration trends, although their concentrations are much lower. In 2001 the maximum reported vinyl chloride concentration in wells in this area was 200 μg/L, in shallow bedrock well LF-02A. In 2001 the maximum reported benzene concentration was 32 μg/L, in deep unconsolidated deposits well LF-10.

Near the Assabet River, VDC concentrations are relatively low, with a maximum concentration of 24 μg/L reported for a sample from shallow unconsolidated deposits well LF-13B. VDC was not detected above its MCL in the bedrock in this area, with the exception of a VDC concentration of 8.3 μg/L detected in shallow bedrock well AR-20. VDC concentrations in wells near the river generally have decreasing trends. For example, VDC concentrations in samples from shallow unconsolidated deposits well AR-20A have decreased from a maximum of 290 μg/L in 1986 to 14 μg/L in 2001.

Near the river, vinyl chloride concentrations are relatively low, with a maximum concentration of 5.7 μg/L in shallow bedrock well AR-20. Benzene concentrations are below its MCL of 5 μg/L in groundwater near the river.

Inorganic Compounds

Arsenic has been detected above its MCL of 10 μg/L in eight of 24 locations in the Southwest Landfill Area with a maximum concentration of 181 μg/L. Manganese has been detected above the maximum background concentration of 844 µg/L in eight of 24 locations and above the human health advisory of 300 µg/L in 14 of 24 locations in the Southwest Landfill Area with a maximum concentration of 5,660 µg/L.

Southeast Landfill Area

VOCs

On the southeastern side of the landfill, there is an area of elevated VDC concentrations near monitoring well LF-05E and an area of elevated benzene concentrations near the B-08 monitoring well cluster. The source of groundwater contamination in the Southeastern Landfill Area was likely the Industrial Landfill. VOC concentrations in groundwater, beneath the former Secondary Lagoon, which is upgradient of the landfill, are lower than concentrations observed in groundwater just south of the landfill.

Near the edge of the landfill, VDC consistently has been detected only in mid-depth unconsolidated deposits well LF-05E. VDC concentrations in LF-05E have decreased slightly, from generally greater than 200 µg/L in the mid-1990s to less than 200 µg/L after 1997. A VDC concentration of 140 µg/L was detected in well LF-05E in 2001. Downgradient of LF-05E, VDC concentrations above its MCL of 7 µg/L are currently detected only in the unconsolidated deposits groundwater, with a maximum concentration of 76 µg/L in samples from well LF-17D. VDC concentrations in groundwater samples from most wells in this area appear to have decreased slightly since the 1980s, but have remained relatively constant through the 1990s. Closer to the river, at well cluster AR-12, VDC is only detected in the shallow unconsolidated deposits, indicating that the contaminated groundwater is discharging to the Assabet River. Groundwater samples collected from beneath the Assabet River also indicate that VDC is discharging to the river, with a concentration of 20 µg/L detected in groundwater at transect ASBRV-T2 in 2000. VDC was not detected in the surface water samples of the Assabet River at this location (Menzie-Cura, 2002).

The maximum vinyl chloride concentration detected in the Southeast Landfill Area in 2001 was 97 µg/L, in a groundwater sample from well LF-05E. Vinyl chloride concentrations in samples from this well have declined slightly from a maximum of 310 µg/L in 1993. Downgradient of well LF-05E, vinyl chloride concentrations above its MCL of 2 µg/L are currently detected mainly in the unconsolidated deposits groundwater, with a maximum concentration of 72 µg/L in samples from well LF-17D. Groundwater samples from several wells, LF-17D, AR-11, AR-11B2, and AR-11B1, have vinyl chloride concentrations that are similar to or greater than VDC concentrations in samples from the same well. This suggests that VDC degradation is occurring in this area. Closer to the river, at well cluster AR-12, vinyl chloride is only detected in the shallow unconsolidated deposits, indicating that the contaminated groundwater is discharging to the Assabet River. Groundwater samples collected from beneath the Assabet River also indicate that vinyl chloride is discharging to the river, with a concentration of 8.4 µg/L detected in groundwater sample at transect ASBRV-T2 in 2000. Vinyl chloride was not detected in surface water samples of the Assabet River at this location (Menzie-Cura, 2002).

In 2001, the maximum benzene concentration detected at the edge of the Industrial Landfill was 1,300 µg/L in deep unconsolidated deposits well B-08B. Benzene concentrations have decreased significantly in this area, from a maximum of 11,000 µg/L in 1993. The highest benzene concentrations detected downgradient of the B-08 well cluster are in samples from the LF-06 well cluster. Benzene concentrations in samples from the LF-06 well cluster currently range between 46 and 3,900 µg/L, while the maximum benzene concentration detected in samples from the other monitoring wells in this area is 16 µg/L. Benzene concentrations in samples from the LF-06 cluster have been steadily decreasing. For example, benzene concentrations in samples from LF-06C have decreased from 17,000 µg/L in 1984 to 3,900 in 2001. Benzene concentration declines in samples from several monitoring wells in this area (AR-21, B-08B3, B-08C, B-08D, LF-15) appear to correlate with the capping of the landfill in 1997.

Closer to the river, at well cluster AR-12, benzene is detected in the unconsolidated deposits groundwater. Vertical hydraulic gradients at AR-12 are upward, indicating that groundwater is discharging to the Assabet River. Groundwater samples collected from beneath the Assabet River also indicate that benzene is discharging to the river with a concentration of 7.3 µg/L detected in groundwater at transect ASBRV-T2 in 2000. Benzene was not detected in the surface water samples of the Assabet River at this location (Menzie-Cura, 2002).

Inorganic Compounds

Arsenic has been detected above its MCL of 10 µg/L in 13 of 37 locations in the Southeast Landfill Area, with a maximum concentration of 1,240 µg/L. Manganese has been detected above the maximum background concentration of 844 µg/L in 19 of 37 locations and above the human health advisory of 300 µg/L in 24 of 37 locations in the Southeast Landfill Area, with a maximum concentration of 13,000 µg/L.

Changes in VOC Concentrations Since 1984

The maximum VDC concentration detected in the 1984 time frame was 2,900 µg/L, while the maximum VDC concentration detected in 2004 was 640 µg/L. The maximum vinyl chloride concentration detected in the 1984 time frame was 420 µg/L, while the maximum vinyl chloride concentration detected in 2004 was 190 µg/L. The maximum benzene concentration detected in the 1984 time frame was 17,000 µg/L, while the maximum benzene concentration detected in 2004 was 3,200 µg/L. The declines in VOC concentrations are likely the result of cessation of waste disposal, operation of the ARS and completion of the Operable Unit One remedy. In addition, natural attenuation and dilution as well as groundwater pumping and treatment by the School Street public water supply wells have contributed to the declines in VOC concentrations. Since it began operation in 1984, the ARS has pumped approximately 4.2 billion gallons of groundwater and removed approximately 6,100 pounds of total VOCs.

A comparison of 1984 data with 2004 data indicates that Site-wide, VDC concentrations were considerably higher in 1984 than in 2004. The areal extent of VDC contamination has also decreased significantly since the early 1980s. The area containing VDC concentrations greater than 200 µg/L was much more extensive in the early 1980s, extending from beneath the former Blowdown Pit to the south beneath a portion of the Industrial Landfill, Sinking Pond, the Agway/Kress property and partially beneath Muskrat Pond. In addition, while there were no monitoring wells located northeast of the Grace property in the 1984 time frame, data collected by others between 1984 and 1987 indicate that VDC was likely present in groundwater in this area at concentrations greater than 200 µg/L by 1984. The area containing VDC concentrations greater than 200 µg/L in 2004 is limited to a few monitoring wells located adjacent to and immediately south of the Industrial Landfill.

Maximum VDC concentrations in the Former Lagoon Area have decreased from approximately 2,900 µg/L in the early 1980s to 100 µg/L in 2004. While the distribution of VDC was not delineated for the Northeast Area in the early 1980s because there were very limited groundwater monitoring data, data collected in this area beginning in 1986 indicate that the VDC plume likely had a similar areal distribution to what is seen in 2004, but that VDC concentrations were likely significantly higher. VDC concentrations in the Northeast Area were as high as 810 µg/L in the early 1990s and were likely higher in the 1980s. The maximum VDC concentration detected in the Northeast Area in 2004 was 190 µg/L.

The greatest decreases in VOC concentrations have taken place in the Southwest Area, which is the vicinity of the Assabet water supply wells. The maximum VDC concentrations in the Southwest Area decreased from approximately 2,000 µg/L in the early 1980s to 5.8 µg/L in 2004. VDC concentrations have been below the MCL of 7 µg/L since the early 1990s in the entire Southwest Area, while in the early 1980s most of the area contained VDC concentrations in groundwater in excess of 200 µg/L.

In the Assabet River Area, VDC concentrations have decreased from approximately 2,100 µg/L in the early 1980s to 150 µg/L in 2004. The areal extent of VDC contamination in the Assabet River Area has also decreased significantly since the early 1980s. The apparent difference in the extent of VDC contamination in the southern portion of the Assabet River Area near the river is likely due to an absence of groundwater quality data from the deep unconsolidated deposits in the early 1980s as opposed to an expansion of the VDC plume.

Sediment

During the RI, sediment samples were collected from the Assabet River, Fort Pond Brook, the Gravel Pit Wetland, the Former North lagoon, the North Lagoon Wetland, and Sinking Pond. The collected samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), and inorganic compounds. In addition, samples from Sinking Pond were analyzed for polychlorinated biphenyls (PCBs) and pesticides. The results of the chemical analyses and associated evaluations indicated that there were arsenic-contaminated sediments in Sinking Pond as well as arsenic and manganese-contaminated sediments in the North Lagoon Wetland that required an evaluation of remedial alternatives.

Arsenic concentrations in Sinking Pond sediments ranged from a low of 15 mg/kg at sample location SP-S18, which is located on the southwest portion of Sinking Pond, to a maximum of 1,860 mg/kg at sample location SP-S03, located at the northwestern portion of the pond near the ARS discharge. Arsenic concentrations in the North Lagoon Wetland Area ranged from a low of 17 mg/kg at sample location FPB-S09, which is located on the northeast portion of the North Lagoon Wetland adjacent to Fort Pond Brook, to a maximum of 3,900 mg/kg at sample location NLW-S12, located in the southern portion of the North Lagoon Wetland near the swale area. Manganese concentrations in the North Lagoon Wetland ranged from a low of 100 mg/kg at sampling location FPB-S09, which is located in the northeast portion of the North Lagoon Wetlands, adjacent to Fort pond Brook, to a maximum of 48,400J mg/kg (a "J" designation means that this value was estimated by the laboratory) at sample location NLW-S01, which is located in the southern portion of the North Lagoon Wetlands, within the Sedge Marsh area. See Figures 7, 8, and 9 for the sediment sampling locations and results.

Surface Water

During the RI, surface water samples were collected from the Assabet River, Fort Pond Brook, the Gravel Pit Wetland, the Former North Lagoon, and Sinking Pond. The samples were analyzed for VOCs, SVOCs, and inorganic compounds. In addition, samples from Sinking Pond were analyzed for PCBs and pesticides. The results of the chemical analyses and associated evaluations indicated that all contaminants were detected at very low levels.

However, an evaluation of Sinking Pond indicated unacceptable impacts to surface water from the discharge from the ARS. The ARS discharge to Sinking Pond was identified in the Baseline Ecological Risk Assessment (Menzie-Cura, 2005b) and Attachment B to Appendix A as potentially having a detrimental effect on some ecological receptors in the pond. The current ARS system does not have a inorganic (e.g., iron, arsenic) treatment. The ARS discharge is the source of arsenic, phosphorus, and turbidity to the pond. The arsenic accumulates in sediment, which was identified in the Human Health & Ecological Risk Assessments as posing unacceptable risks to both human health and ecological receptors. The phosphorus was identified as having the potential to cause algal blooms which would have a detrimental effect on the ecological health of the pond. The turbidity may be limiting plant growth, which may in turn be limiting habitat for fish. Since the discharge of treated groundwater is a groundwater issue, it was included in the groundwater portions of the FS.

This Third Operable Unit does not address any principal threat wastes. Principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied. Wastes generally considered to be principal threats are liquid, mobile and/or highly-toxic source material. The major focus of this Operable Unit is groundwater. By definition, EPA does not consider groundwater contamination to be a principal threat.

This Operable Unit does, however, address low-level threat wastes in the sediment/soil at Sinking Pond and the North Lagoon Wetland. Low-level threat wastes are those source materials that generally can be reliably contained, and that would present only a low risk in the event of exposure. Wastes that are generally considered to be low-level threat wastes include non-mobile contaminated source material of low to moderate toxicity, surface soil containing chemicals of concern that are relatively immobile in air or ground water, low leachability contaminants or low toxicity source material.

A three-dimensional groundwater flow model was constructed for the Site to aid in understanding the groundwater flow system and to provide a comprehensive tool that could be used to evaluate selected remedial alternatives for the FS. The calibrated groundwater flow model was also used in the July 2005, Remedial Investigation to evaluate the following:

- The pathways and travel times of groundwater flow from suspected source areas to discharge locations under historic conditions;
- The extent of capture of the ARS, the ARS pumping combined with the Public Water supply wells, and each of the individual ARS extraction wells;
- The pathways and travel times of groundwater flow under average current hydraulic conditions.

The groundwater flow model was utilized in the FS to analyze the following scenarios:

- The effects of alternative pumping rates and approximate locations for extraction wells on capture zones and groundwater flow;
- Re-injection of treated groundwater; and,
- The approximate clean-up times for VDC and benzene contaminated groundwater.

The groundwater flow model was constructed based on the Site history, hydrogeologic and contaminant distribution information described in the July 2005, RI Report. The groundwater flow model was effectively calibrated based on site-specific hydrogeologic data and measured or determined boundary conditions. The model was verified under both a steady state and transient scenario. Results of the calibrated flow model were evaluated in several ways, including analysis of residuals, vertical hydraulic gradients, groundwater flux to surface water and potentiometric surfaces. In addition to these evaluations, the calibrated model was tested under historic conditions, and was determined to produce groundwater travel pathways that are consistent with the known distribution of groundwater contamination. The calibrated model provides a good representation of the groundwater flow system at the Site under steady–state and transient conditions, with appropriately applied changes in boundary conditions. See volume II of the July 2005 RI for additional information. Over twenty years of historical groundwater sampling data from the Site was used to calibrate and verify the model with actual Site conditions. Most Superfund sites do not have several years of extensive sampling data that can be used to verify groundwater flow models. This fact gives added weight to the reliability and accuracy of the groundwater flow model used in the FS for the W. R. Grace Site.

F. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

EPA issued a Draft Preliminary Re-use Assessment for the Site, dated September 2004. This Assessment characterizes current and potential future use for the Site. Community and stakeholder input was sought and incorporated through an active outreach program. EPA conducted interviews with representatives from the Towns of Acton and Concord, Acton's Economic Development Committee (EDC) and Economic Development and Industrial Corporation (EDIC), Acton Citizens for Environmental Safety (ACES) and W. R. Grace, as part of its preparation of this Draft Reuse Assessment for the Site. Reasonably anticipated future land uses and potential future groundwater uses at the Site and adjacent areas were determined through a review of local zoning, master plans and interviews with the EDC, EDIC, and the local Town officials in Acton and Concord, Massachusetts. A summary of this Assessment is summarized below. For more specific details, see the Draft Preliminary Re-use Assessment, dated September 2004, for the Site.

1. Current Land Use of the Site and Surrounding Area

Figure 10 shows the Grace Property boundary and relevant Site features. The on-Site landfill, referred to as the Industrial Landfill, is located within the Acton portion of the Site, just west of the Concord town line. The Industrial Landfill has been capped as part of remedial actions at the Site. As described further in this ROD, contaminated sludge and soil from source areas were excavated, stabilized and placed onto the Industrial Landfill prior to capping.

Surface water bodies located at the Site include Sinking Pond, in the southwest area of the Grace property, the Assabet River along the eastern border of the Site, Fort Pond and several wetland areas. Fort Pond Brook is located just north of the Grace property. The MBTA commuter rail line runs in an east-west direction across the Grace property. A natural gas pipeline easement runs through the Grace property from north to south. A sewer line was recently installed by the town of Acton along Independence Road, which carries sewage to the new Middle Fort Pond Brook Sewage Treatment Plant. Previously the Grace property was not serviced by a municipal sewer system, and the property was vacated by Grace prior to the new sewer system being placed in operation. The Town of Acton's current zoning designations for the Site and surrounding areas are shown on Figure 11. The Acton portion of the Grace property is zoned Technology District (TD). Business and industrial uses that are allowed without a special permit include: office; health care facility; repair shop, technical shop, or studio; building trade shop; parking facility; transportation services; warehouse; or manufacturing. Allowable institutional and public service uses include: municipal, educational, religious, public or private utility facilities, child care facility, and commercial education or instruction. Agriculture and conservation uses are also allowed. Uses that are prohibited in this zone include recreation, all residential uses, retail stores, services, gas stations, commercial entertainment, and vehicle repair, sale, or rental. Uses that would require a special permit from the Board of Selectmen include: retirement community, hospital, restaurant, hotel, commercial recreation, distribution plant, or scientific. Details are provided in the Town of Acton Zoning Bylaw (amended through April 2004). Soil on the Grace property (Operable Unit One) was remediated to a level sufficient to allow for future residential use.

As part of the RI/FS process, W.R. Grace was required to perform a private well survey to determine the location of any wells within 500 feet of the mapped VDC plume both on-Site and off-Site their property. Parcels in Acton within the private well survey area are zoned TD, various types of residential, Agricultural Recreation Conservation (ARC), or Powder Mill (PM) District ARC zoning applies to the parcels owned by the Acton Water District, and where municipal well fields are located (see Figure 3). The Assabet well field is south of the Grace property and the School Street well field is to the northeast of the Grace property. The PM zoning applies to Parcels 34-5 (Assabet Sand and Gravel) and 34-8 (Powder Mill Shopping Plaza). PM is a business district but single-family residences (with or without an apartment) are allowed. Of the non-residential parcels located within the private well survey area, the majority are in use in accordance with TD or PM zoning for various commercial purposes. Uses include offices, manufacturing, warehouses, a gravel pit, various shops, and commercial recreation. The Grace-owned parcels are vacant, as are the parcels that are zoned ARC (with the exception of the municipal wells located on ARC-zoned parcels; see Figure 11).

The Concord portion of the Grace property (Parcel No. 2322 on Figure 3) is zoned as Residence B. Uses that are allowed in Residence B areas without a special permit include: single-family dwellings; certain institutional uses (educational, child care facility, religious, or cemetery); municipal or underground utility uses; or forestry, agriculture, or conservation uses. Other uses are allowable with a special permit, such as residential developments; private recreation (e.g., country club, playground, boating, fitness club); philanthropic (library, museum, art gallery); lodge and club (private); or greenhouse. Details are provided in the Town of Concord Zoning Bylaw (amended through April 2004).

2. <u>Future Land Use</u>

Grace commissioned the preparation of a land use analysis in 2001. The land use analysis was prepared by Sasaki Associates, Inc. The analysis divided the Grace-owned parcels into several areas : Area 1 - north side of railroad tracks (51 acres, Acton), Area 2 - south side of railroad tracks (136 acres, Acton), Area 3 - south side of railroad tracks (72 acres, Concord). Net Usable Land Areas were estimated as follows: Area 1 - 27 acres (53% of the actual acreage); Area 2 - 92 acres (67% of the actual acreage); and Area 3 - 42 acres (58% of the actual acreage).

The analysis identified several potential constraints to redevelopment, such as: steep slopes and wetland areas/surface water bodies that limit the usable land area and the railroad tracks that separate Area 1 from Areas 2 and 3, the gas transmission line that bisects the property, abutting uses that are noisy and/or visually unappealing, and currently limited access for vehicles via a small residential street (Independence Road).

The analysis presented three redevelopment scenarios encompassing the three areas: Office R & D, Light Industrial, and Residential/Recreational. The first two scenarios are consistent with the Technology District zoning, but the land use analysis noted that they were developed based on the assumptions of "unconstrained market, utility, and traffic conditions." The conclusion of the analysis was that a residential/recreational plan was more likely to be feasible, and a conceptual site plan was presented for an 18-hole golf course and some housing. The Town of Acton has disagreed with many of the conclusions in this plan. As a result, there is a lack of consensus between Grace and the Town regarding the future use of this property.

3. <u>Ground/Surface Water Uses</u>:

The current use of groundwater at the Site and surrounding area is as a public drinking water supply. The aquifer underlying the Site is classified as GW-1 under Massachusetts MADEP regulations because portions of it are currently used as a drinking water supply (a Current Drinking Water Supply Area) and the remainder of it is considered a Potential Drinking Water Supply Area. The Acton Water District (AWD) currently utilizes this aquifer as a drinking water supply for the Town of Acton. The AWD treats and maintains air stripping treatment to remove VOCs from the raw water pumped from the Town wells, prior to distribution to the public for potable uses. A temporary moratorium is in place in the Town of Acton that prohibits private well installations in a portion of the aquifer. The Town has also expressed an interest in reactivating well WRG-3 for use as a potential drinking water source in the future. As discussed later in this document, a goal of this remedy is to restore the groundwater at the Site consistent with these uses.

G. SUMMARY OF SITE RISKS

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The public health risk assessment followed a four step process: 1) hazard 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 and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates. A summary of those aspects of the human health risk assessment which support the need for remedial action is discussed below followed by a summary of the environmental risk assessment.

1. Human Health Risk Assessment

Fifty-three of the more than 100 chemicals detected at the Site were selected for evaluation in the human health risk assessment as chemicals of potential concern. The chemicals of potential concern were selected to represent potential Site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment and can be found in Tables C1.1, C2.4, D1.1, D1.2, E1.1, and F1.1 of the risk assessment (Menzie-Cura, 2005). From this, a subset of the chemicals were identified in the Feasibility Study as presenting a significant current or future risk or were identified based on exceedences of an ARAR and are referred to as the chemicals of concern in this ROD and summarized in Tables G-1 and G-2 for sediment and groundwater. These tables contain the exposure point concentrations used to evaluate the reasonable maximum exposure (RME) scenario in the baseline risk assessment for the chemicals of concern. Estimates of average or central tendency exposure concentrations for the chemicals of concern and all chemicals of potential concern can be found in Tables C1.3, C2.5, D1.3, D1.4, E1.2, F1.3, I1.2, I1.5, I2.2, and I2.3 of the risk assessment (Menzie-Cura, 2005).

Potential human health effects associated with exposure to the chemicals of potential concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure pathways. 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 Site is bordered by industrial/commercial properties to the south and northeast, and residential properties to the east, west, and northwest. The Grace property itself is an inactive industrial facility. Surface water bodies and wetlands that potentially receive groundwater discharge from the Site include Sinking Pond, the former North Lagoon, Fort Pond Brook, Assabet River, Gravel Pit Wetland, and North Lagoon Wetland. These ponds and wetlands areas may be used recreationally for swimming or wading so incidental ingestion and dermal contact with sediments and surface water were evaluated in the baseline risk assessment. It is believed that people are not consuming fish from surface water bodies surrounding the Site, as attempts to collect edible fish proved unsuccessful.

The groundwater at and around the Site is classified by the State as GW-1, meaning that it is valued and may be used for potable purposes. The Town of Acton has municipal water supply wells located to the northeast and to the southwest of the Site. The ARS has been operating at the Site since 1985 to mitigate the migration of contaminated groundwater to the Acton public water supply wells (i.e., the Assabet and School Street Wellfields), the Assabet River, and Fort Pond Brook. The public water supply wells are currently treated to remove organic groundwater contamination prior to public distribution. For the purposes of this risk assessment, the Site aquifer was divided into six geographic areas including the Assabet River Area, Former Lagoon Area, Northeast Area, Southeast Landfill Area, Southwest Area, and Southwest Landfill Area. Risks for each groundwater area were evaluated assuming the groundwater would be used for domestic purposes (including exposure via ingestion, dermal contact and inhalation) and irrigation use (i.e. swimming - including exposure via incidental ingestion and dermal contact) in the risk assessment. There is one private well relevant to the study area although it is not presently used for potable purposes. The risk assessment evaluated potential exposure to groundwater from the private Powdermill Plaza irrigation well, were it to be used for domestic purposes in the future or for irrigation (i.e. swimming) purposes. Where relevant, the potential for vapor intrusion from groundwater contaminants into structures overlying the groundwater study area was also considered, but potential risks associated with this exposure pathway were deemed to be insignificant.

The following is a brief summary of only those risks associated with a reasonable maximum exposure (RME) which were judged to be significant (i.e., cancer risk in excess of 10^{-4} to 10^{-6} and/or a non-cancer hazard index in excess of unity. A more thorough description of all exposure pathways evaluated in the risk assessment including risk estimates for an average exposure scenario, can be found in Section 3.0 and on Tables C1.4, C1.5, C2.7, D1.5 through D1.14, D3.6, D3.7, D3.8, E1.3, F1.4, I1.3, I1.4, I1.7, and I2.4 through I2.16 of the risk assessment (Menzie-Cura, 2005). No current exposure pathways were found to present a significant risk.

The reasonable maximum exposures for future potential receptors that were identified as presenting a significant risk include risk to a:

- Recreational wader (adult and young child) as a result of exposure to sediments at the North Lagoon Wetland via incidental ingestion and dermal contact;[1]
- Recreational swimmer/wader (adult and young child) as a result of exposure to sediment at Sinking Pond via ingestion and dermal contact;[2]
- Residential household exposure to untreated groundwater via ingestion, dermal contact, and inhalation within all six geographic areas of the Site;[3]

[1] For future recreational sediment exposures, ingestion of 100 mg/day for 24 years was presumed for an adult. For a young child (age 1 to 6), ingestion of 200 mg/day for 6 years was presumed. Body weights of 70 kg and 15 kg were used for the adult and child, respectively. Dermal contact was assumed with 6,074 cm^2 of surface area for the adult and 2,178 cm^2 for the child. Future sediment exposures at North Lagoon Wetland were assumed to occur 1 hour/day, 78 days/year. A sediment adherence factor of 0.07 mg/cm^2 for the adult and 0.2 mg/cm^2 for the child were assumed.
[2] For future recreational sediment exposures at Sinking Pond, ingestion rates, surface areas, body weights, and exposure durations were the same as those used for the North Lagoon Wetland adult and child recreational wader. Future sediment exposures at Sinking Pond were also assumed to occur 78 days/year.
[3] For future exposures to untreated contaminated groundwater, drinking water ingestion rates of 2 L/day and 1.5 L/day for the adult and child, respectively, were assumed. An exposure frequency of 350 days/year was used for a combined exposure duration of 30 years. Dermal contact was assumed with 18,000 cm^2 of surface area for the adult, and 6,600

- Residential irrigation water exposure (i.e., swimming pool exposure) to untreated groundwater via incidental ingestion and dermal contact within five geographic areas of the Site (risks from potential exposure via this pathway for the Southwest Area were within acceptable levels);[4] and
- Residential household water exposure to untreated groundwater from the School Street Wellfield via ingestion, dermal contact, and inhalation).[5]

Excess lifetime cancer risks were determined for each exposure pathway by multiplying a daily intake level with the chemical specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the actual risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. 1×10^{-6} or 1E-06 for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater that a one in a million chance of developing cancer over 70 years as a result of Site-related exposure (as defined) to the compound at the stated concentration. All risks estimated represent an "excess lifetime cancer risk" - or the additional cancer risk on top of that which we all face from other causes such as cigarette smoke or exposure to ultraviolet radiation from the sun. The chance of an individual developing cancer from all other (non-Site related) causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for Site related exposure is 10^{-4} to 10^{-6}. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances. A summary of the cancer toxicity data relevant to the chemicals of concern is presented in Table G-3.

In assessing the potential for adverse effects other than cancer, a hazard quotient (HQ) is calculated by dividing the daily intake level by the reference dose (RfD) or other suitable benchmark. Reference doses have been developed by EPA and they represent a level to which an individual may be exposed that is not expected to result in any deleterious effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. A HQ ≤ 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g. liver) within or across those media to which the same individual may reasonably be exposed. A HI ≤ 1 indicates that toxic non-

cm^2 for the child. Showers/baths were assumed to occur 350 days/year for 0.58 hr/day for the adult and 1 hr/day for the child. The inhalation risk was assumed to be equal to the ingestion risk for volatile organic compounds.

[4] For future exposure to untreated contaminated groundwater, water ingestion rates during swimming of 0.05 L/day and 0.1 L/day for the adult and child, respectively, were assumed. Exposure frequencies of 52 days/year and 65 days/year for the adult and child, respectively, were used for a combined exposure duration of 30 years. Dermal contact was assumed with 18,000 cm^2 of surface area for the adult, and 6,600 cm^2 for the child. Swimming exposures were assumed to occur for 1 hr/day for the adult and 2 hr/day for the child.

[5] For future exposures to untreated groundwater from the School Street Wellfield, the same assumptions used for the household water use pathways at the six on-site geographic areas were used.

carcinogenic effects are unlikely. A summary of the non-carcinogenic toxicity data relevant to the chemicals of concern is presented in Table G-4.

The following is a summary of the media and exposure pathways that were found to present a significant risk exceeding EPA's acceptable cancer risk range of 10^{-4} to 10^{-6} and/or a non-cancer hazard index in excess of unity. Only those risk estimates based on reasonable maximum exposure assumptions that were deemed relevant to the remedy, are presented in this ROD. Readers are referred to Section 5 and Tables C3.1, D2.1, D3.9a, E2.1, E2.2, F2.1 through F2.10, I1.1b, and I2.1b of the risk assessment (Menzie-Cura, 2005) for a more comprehensive risk summary of all exposure pathways evaluated for all chemicals of potential concern and for estimates of the central tendency risk.

Recreational Swimmer/Wader in Natural Water Bodies and Wetlands

Tables G-5 and G-6 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in sediment evaluated to reflect potential future recreational exposure corresponding to the RME scenario. For a potential future young child and adult recreational receptor, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6}. Excess RME cancer risks for potential exposures at North Lagoon Wetland were estimated to be 9×10^{-4}, while cancer risks attributed to potential exposures to sediments at Sinking Pond were estimated to be 4×10^{-4}. The potential for non-cancer effects as a result of exposure as defined by RME assumptions also exists for both the North Lagoon Wetland (HI = 20) and Sinking Pond (HI=7). Arsenic in sediments at the North Lagoon Wetland and Sinking Pond was the main contributor to these risk estimates.

Residential Groundwater Use

Tables G-7 and G-8 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in groundwater evaluated to reflect potential future potable water and irrigation water (i.e., swimming pool) exposure corresponding to the RME scenario.

Should a resident in the future use untreated groundwater for their household needs, carcinogenic and non-carcinogenic risks may exceed the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1 for all six geographic areas. The greatest risks were estimated for potential exposures to groundwater from the Southeast Landfill Area where cancer risks were projected to be as great as 6×10^{-2} and the non-cancer HI as great as 400 for effects on skin and the cardiovascular system. Principle compounds found to contribute to these risk estimates include benzene, 1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, methylene chloride, methyl tert-butyl ether, trichloroethene, vinyl chloride, bis(2-ethylhexyl)phthalate, bis(2-chloroethyl)ether, arsenic, chromium, manganese, and nickel..

Should a resident use untreated groundwater in a swimming pool (referred to as the irrigation water scenario), carcinogenic and non-carcinogenic risks may exceed the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1 for five of the six geographic areas. The only area that did not exceed these risk benchmarks for the scenario of interest, was the Southwest Area. The greatest excess cancer risks were estimated for potential exposures to groundwater used to fill a swimming pool from the Southwest Landfill Area where the RME cancer risks were projected to be as great as 2 x 10^{-3}. The non-cancer potential for this exposure pathway may be the greatest for potential exposures in the Northeast Area (HI = 20) if assumptions regarding the valency state of chromium (conservatively assumed to be hexavalent) are accurate. Principle compounds found to contribute to these risk estimates include benzene, 1,2-dichloroethane, 1,2-dichloropropane, vinyl chloride, bis(2-chloroethyl)ether, arsenic, and chromium.

If a resident were to use untreated groundwater from the School Street Wellfield as a source of potable water, non-carcinogenic risks projected (HI = 2) may exceed the EPA acceptable target organ HI of 1. The two major compounds contributing to these potential hazards include arsenic and manganese. Excess cancer risks attributed to potential exposure to groundwater in this area do not exceed EPA's acceptable risk range.

While not necessarily contributing significantly to the excess cancer risk or hazard index, several compounds detected in groundwater were noted in excess of their respective ARAR (MCLs or MMCLs) and thus have also been identified as compounds of concern for the groundwater remedy. Groundwater compounds of concern meeting this criterion include beryllium and lead.

Groundwater data collected at the Site in 2002 and 2003 were not quantitatively evaluated in the risk assessment since the data were not validated prior to the start of the risk assessment. However, the 2002/2003 groundwater data were qualitatively reviewed to determine how their inclusion of this data would have affected the conclusions of the risk assessment. In general, concentrations of contaminants in groundwater have been deceasing over time. Therefore, had the additional data from 2002/2003 been included in the risk assessment (which was based on data collected between 1999 and 2002), it would not likely have resulted in risk estimates greater than those presently characterized in the Public Health Risk Assessment.

A potential inhalation exposure pathway associated with the swimming pool (irrigation water) exposure scenario was not quantitatively evaluated due to a lack of accepted exposure models. However, because swimming pools are typically filled once per season and volatile compounds tend to transfer to the atmosphere fairly quickly, the contribution that this exposure pathway to cumulative risk is likely to be insignificant. A qualitative evaluation of the potential risk from inhalation while swimming further supported this conclusion.

Airborne concentrations of volatile compounds for the showering/bathing scenarios were not modeled. Instead, the inhalation risk associated with showering/bathing was assumed to be equal to the drinking water ingestion risk. This assumption may result in either an under- or over-estimate of risk depending on the differential toxicity of compounds via the ingestion and inhalation routes of exposure and the validity of this assumption. Section 6 of the Public Health Risk Assessment contains a more complete discussion of the uncertainties inherent in the risk assessment for the Site.

2. Ecological Risk Assessment

A Baseline Ecological Risk Assessment (BERA) was completed for the W. R. Grace Superfund Site to evaluate the potential risks to ecological receptors in wetlands and surface water bodies on-Site that receive the discharge of contaminated groundwater or receive discharge of treated water from the Aquifer Restoration System (ARS). The six surface water and wetland exposure areas addressed in the BERA were: Assabet River, Fort Pond Brook, Gravel Pit Wetland, Former North Lagoon, North Lagoon Wetland, and Sinking Pond.

Identification of Chemicals of Concern

Contaminants of potential concern (COPCs) were identified using an effects-based screening comparison of maximum contaminant concentrations to ecological benchmarks for each medium and exposure area. The COPCs were selected to represent potential Site-related hazards based on toxicity, concentration, frequency of detection, mobility, and persistence in the environment. Summaries of the COPC screening for surface water and sediment can be found in Tables G-9 and G-10. No surface water was present in the North Lagoon Wetland, therefore only sediment data were used in the screening of COPCs.

Exposure Assessment

Several surface water bodies are located in and around the Site. These include Sinking Pond, the Assabet River, and Fort Pond Brook. Fort Pond Brook bounds the property to the northwest and the Assabet River bounds the property to the southeast. Sinking Pond is located in the southwestern portion of the Site. It is a bowl-shaped kettle pond, approximately six acres in size, with a center depth of approximately 43 feet. Sinking Pond has one surface inlet, located at the northwestern end, where treated water from the ARS is discharged. Stormwater runoff from approximately 45 acres of the Site also flows to the pond. Sinking Pond has no surface outlets (HSI GeoTrans, 1998). The Assabet River is located south and southeast of the Site and flows toward the northeast. Fort Pond Brook is located directly north of the Site and flows toward the east.

Gravel Pit Wetland is a large scrub-shrub wetland located south of Sinking Pond. It is seasonally inundated with standing pools of water through much of the year. The other two wetland habitats on-Site are the Former North Lagoon and the North Lagoon Wetland. The former North Lagoon is an isolated man-made depression created from excavation during soil remediation of the Site. It is a small area, seasonally inundated up to 2 feet, with marginal habitat to support wildlife. The North Lagoon Wetland is located immediately north and downgradient of the former North Lagoon Wetland. This wetland drains into a swale that flows to Fort Pond Brook. The wetland consists of the swale and an associated emergent wetland.

The upland portions of the Site were not evaluated as ecosystems potentially at risk because the Site soils were evaluated and remediated as part of Operable Unit One. The primary habitats evaluated at the Site were the surface waters and wetlands that receive the discharge of contaminated groundwater or receive the discharge of treated water for the ARS. The major exposure routes for the ecological receptors were through direct exposure to COPCs in sediment and surface water and through ingestion of contaminants through dietary exposures. Aquatic and semi-aquatic receptors may be exposed to COPCs through ingestion of contaminated food items (invertebrates, fish, and vegetation), sediment, and surface water. Exposure pathways, assessment endpoints, and measurement endpoints are summarized in Table G-11.

Receptor species were selected for exposure evaluation to represent various components of the food chain in the surface water or wetland ecosystems. The potentially affected receptors identified for Sinking Pond, Assabet River, and Fort Pond Brook included the benthic macroinvertebrate community, water column invertebrates and fish, and semi-aquatic wildlife (mink, muskrat, kingfisher, turtles, and mallard). The potentially affected receptors for the Gravel Pit Wetland and the Former North Lagoon included the benthic macroinvertebrate community, water column invertebrates, and semi-aquatic wildlife (mink, muskrat, turtles, and mallard). The potentially affected receptors for North Lagoon Wetland included the benthic macroinvertebrate community and semi-aquatic wildlife (mink, muskrat, turtles, and mallard).

Exposure point concentrations for each chemical within each exposure pathway for the receptor species or community are presented in Appendices D and E of the BERA. The 95% upper confidence limit (UCL) of the arithmetic mean was used as the exposure point concentration (EPC) for each medium and area unless the value was greater than the maximum, in which case, the maximum was used as the EPC.

Chemical concentrations for fish, invertebrates, and plant tissue were estimated from sediment concentrations for the water bodies in which these tissue data were not collected: Assabet River, Fort Pond Brook, Gravel Pit Wetland, and the Former North Lagoon. Chemical concentrations were measured in fish from Sinking Pond and in plants from Sinking Pond and North Lagoon Wetland. Laboratory bioaccumulation tests with Sinking Pond sediment and North Lagoon Wetland sediment were used to estimate invertebrate concentrations for these water bodies.

Ecological Effects Assessment

Surface water and sediment effects-based benchmarks were used to evaluate potential ecological effects. For surface water, the characterization used chronic and acute benchmarks. For sediment, the characterization used both the lower threshold benchmark level (i.e., a level at which effects are unlikely to occur) and the higher effects benchmark (i.e., a concentration associated with potential effects).

In addition, the measures of effects on benthic invertebrates included acute and chronic toxicity tests with Chironomus tentans. Laboratory sediment toxicity tests were conducted with sediments from Sinking Pond (nine samples), North Lagoon Wetland (six samples), and their reference areas. The measures of effects on benthic invertebrates for the Assabet River also included an evaluation of benthic invertebrate community data. Several standard measures of community composition were compared among three sampling stations.

The evaluation of the potential effects on fish populations in Sinking Pond was also based on comparisons of actual measured tissue concentrations in fish to critical body burdens or concentrations of COPCs in fish tissues that correspond to toxicological effects. Concentrations measured in composite minnow samples from Sinking Pond were compared to critical body residues to assess the potential for risk of harm to fish.

Estimates of dietary exposures for wildlife (mink, muskrat, kingfisher, turtle, and mallard) were quantified for each of the selected receptor species. Dietary exposure models were used to estimate exposure of each receptor species to each of the COPCs identified in the screening of sediment and surface water data. The dietary doses were compared to mammalian and avian toxicity reference values (TRVs) obtained from the literature.

Risk Characterization

The BERA (Menzie-Cura, 2005b) concluded that there were no unacceptable ecological risks due to Site-related chemicals from exposure to sediment in the Assabet River, Fort Pond Brook, Gravel Pit Wetland, or Former North Lagoon. Risks were identified to semi-aquatic wildlife and benthic invertebrates in sediment from the North Lagoon Wetland and Sinking Pond and to fish in Sinking Pond. There were no unacceptable ecological risks from exposure to surface water in any of the other surface water bodies or wetlands evaluated. Risks to wildlife are due to exposure to arsenic and manganese in North Lagoon Wetland sediment and exposure to arsenic in Sinking Pond sediment. Risks to benthic invertebrates are likely due to exposure to elevated sediment concentrations of arsenic and other metals (likely copper, iron, and manganese) in North Lagoon Wetland and Sinking Pond.

There is some uncertainty associated with estimates of risk in any BERA because the risk estimates are based on a number of assumptions regarding exposure and toxicity. There is uncertainty associated with the Site conceptual model, including the selection of COPCs, with natural variation and parameter error, and model error.

There was some uncertainty in the identification of COPCs, due to lack of suitable benchmarks, and in a few cases, due to high detection limits. However, in sediments, this uncertainty is reduced through the use of toxicity tests, which directly evaluate sediment toxicity regardless of the COPCs present. There was some uncertainty in the identification of sediment contaminants associated with benthic invertebrate toxicity in sediments, as the results of the toxicity testing data did not show clear associations between the locations of toxicity and the concentrations of individual COPCs potentially contributing to the observed toxicity.

Food-chain modeling is typically associated with fairly high uncertainty, as a number of assumptions and estimates are required in both dietary doses and identifying a corresponding TRV. Food chain modeling assumes that 100% of each COPC is available to wildlife, a likely overestimate of the actual bioavailability and ability for an organism to absorb the COPC via ingestion in the diet. No toxicity data were available for turtles. The level of uncertainty of dividing the mammalian TRVs by a factor of ten for applicability to the turtle is unknown. For fish tissue, TRVs were not available for similar minnow species, and comparisons for arsenic and zinc were based on TRVs from other fish species. The magnitude of uncertainty of this comparison is unknown.

All sediment in North Lagoon Wetland is considered accessible to ecological receptors. COC concentrations expected to provide adequate protection of ecological receptors from exposure to sediments in the Sinking Pond are provided in Table G-12.

Sinking Pond consists of two different aquatic habitats, the inlet and the pond, as shown on Figure 13. The inlet was designed to be a settling basin that receives ARS discharge. It no longer appears to be performing this function well, as evidenced by the high turbidity in the Pond. A stream flows through the center of this area and discharges directly into the pond. Particulates from the ARS settle out at the mouth of the inlet area. The pond itself is a kettle pond, and therefore has no surface outflow. It is quite deep (43 feet at the deepest) for its size (6 acres) and has steep sides in some areas. With the current ARS discharge, the water turbidity in the pond is quite high as a result of particulates that remain in the water column. The turbidity limits light penetration. The entire pond is a habitat for fish, but no fish, other than minnows, were observed in the pond during Site visits, notwithstanding extensive efforts to sample fish. The fish (minnows) that were collected had tissue levels of arsenic and zinc that have the potential to be toxic to fish. Although the presence of a poor fish community may be due to habitat limitations, high turbidity, or other non-chemical factors, the tissue residues indicate some potential risk from surface water.

Limited sampling for nutrients in the ARS discharge indicated that the ARS serves as a source of phosphorus to Sinking Pond. The discharge of phosphorus to surface water bodies has the potential to cause eutrophic conditions characterized by algal blooms with consumption of dissolved oxygen when the bloom dies back, resulting in deterioration in habitat for both fish and benthic invertebrates. The evaluation of Sinking Pond indicated impacts to surface water from the discharge from the ARS. These impacts will be addressed in the evaluation of groundwater alternatives.

The exposure area of greatest concern for ecological receptors in Sinking Pond is above the thermocline, since dissolved oxygen levels may be depleted below the thermocline in summer months, reducing the sustainability of fish and invertebrates. The area of greatest ecological concern may be described as a band around the pond with water depths up to about 12 feet, the measured depth of the thermocline in late summer. The portions of this area with flat or shallow slopes are likely to be the most biologically important areas in the pond, because they may provide foraging and nesting areas for fish. The most biologically active areas include the inlet and areas labeled SPBK-1 through SPBK-4 on Figure 13, which were identified as having flat or shallow slopes. COC concentrations expected to provide adequate protection of ecological receptors from exposure to sediments in the Sinking Pond are provided in Table G-12. A long-term PRG (maximum background concentration of 42 mg/kg) is identified for arsenic in sediment of Sinking Pond within the top two inches of sediment; however, toxicity was only observed where other metals, notably copper, manganese, and iron, were also elevated. Therefore concentrations of these metals were also used to identify areas of the pond requiring immediate action. The short-term goal for the most biologically active areas (the inlet and areas where the ground slope is shallow) is to remediate areas with arsenic greater than 730 mg/kg (the lowest arsenic concentration at which toxicity was observed in sediment toxicity testing); or where any of the four COCs (arsenic, copper, iron and manganese) exceeds an effects-based benchmark [Probable Effects Concentration (PEC) or Severe Effects Level (SEL), see Table G-12 for the PEC and SEL values]. The short-term goal for sediments in other areas of the pond that are covered by less than 12 feet of water is to identify areas with arsenic concentrations greater than 730 mg/kg and copper, iron, or manganese above an effects-based benchmark, and then evaluate the need to remediate such areas based on risks, feasibility, and implementability.

3. <u>Basis for Response Action</u>

Because the baseline human health and ecological risk assessments revealed that potential exposure to compounds of concern in groundwater and sediment via ingestion, dermal contact, and/or inhalation by human receptors may present an unacceptable human health risk (cancer risk greater than 10^{-4} and noncancer Hazard Index greater than 1), or an unacceptable ecological risk (sediment toxicity and exceedences of benchmarks), 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, welfare, or the environment. In order to address these risks, the focus of the remedial action is groundwater within the Assabet River Area, Former Lagoon Area, Southeast Landfill Area, Southwest Landfill Area, Northeast Area, and Southwest Area, and sediment in the North Lagoon Wetland and Sinking Pond.

H. REMEDIATION OBJECTIVES

Based on preliminary information relating to types of contamination, environmental media of concern, and potential exposure pathways, Response Action Objectives (RAOs) were developed to aid in the development and screening of alternatives.

These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats human health and the environment and based on the current and reasonably anticipated future land use and potential beneficial groundwater use.

The RAOs for the selected remedy for Operable Unit Three for the W. R. Grace Site are as follows:

- Prevent potential exposure to concentrations of contaminated groundwater from the Site having carcinogens in excess of ARARs (i.e., MCLs, non-zero MCLGs), and prevent exposure to groundwater that may pose a total excess cancer risk in groundwater in excess of USEPA's cancer risk range of 10^{-4} to 10^{-6} and/or which exceed a target noncancer hazard index of one.
- Restore groundwater quality consistent with ARARs and cleanup goals so that the aquifer is suitable as a public water supply and for irrigation purposes without pre-treatment for Site-related contaminants.

The RAOs for sediments for the protection of human health and the environment are the following:

- Control discharge of treated effluent groundwater to prevent unacceptable impacts to sediment and surface water in Sinking Pond.
- Prevent a future resident from exposure to sediment in the North Lagoon Wetland and Sinking Pond that poses an excess cancer risk above 10^{-4} to 10^{-6} or a hazard index of 1.0.
- Prevent exposure to contaminants in sediment that presents an unacceptable risk to the environment.

I. 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 and facility siting 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 Congressional mandates.

B. Technology and Alternative Development and Screening

CERCLA and the National Contingency Plan (NCP) set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives was developed for the Site.

The FS developed a limited number of remedial alternatives that attain Site-specific remediation levels within different time frames using different technologies and a no action alternative.

The initial evaluation or initial screening was done to reduce to a manageable number those technologies that were potentially applicable to the Site prior to performing a more stringent screening. During the initial screening step in Chapter 3 of the FS, process options and entire technology types were evaluated on the basis of technical implementability. Those process options and technology types that could not be implemented effectively were eliminated from further consideration. Specific Site information/constraints were used to screen out technology types and process options that could not be effectively implemented at the Site.

Once those technologies that could not be effectively implemented were screened out, the remaining groundwater and sediment technology remedial options were then assessed and screened based on implementability, effectiveness, and cost. Where there were a number of cleanup options within a technology type, a representative option(s) was selected to move forward. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of potential options. The remaining technologies were then combined into sediment alternatives for both Sinking Pond and the North Lagoon Wetland, and groundwater alternatives. Chapter 4 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. While Chapter 4 presented additional screening of technology types and process options on the basis of effectiveness, implementability, and cost and then assembled a range of alternatives, Chapter 5 screened the entire assembled alternatives on the basis of effectiveness, implementability, and cost. Each remaining assembled alternative was then evaluated in detail in Chapter 6 of the FS.

In summary, two remedial alternatives were retained as possible remedial options for the cleanup of sediment in Sinking Pond; two remedial alternatives were retained as possible options for the cleanup of sediment in the North Lagoon Wetland; and three remedial alternatives were selected for detailed analysis for the cleanup of groundwater for the Site.

J. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each groundwater and sediment alternative that was evaluated for the Site.

1. Groundwater

Alternative GW-1: No Action

The No Action Alternative was included as a baseline against which other remedial alternatives can be compared.

Description

As required under CERCLA, the No Action Alternative was used as a baseline for comparison to other alternatives. The No Action Alternative assumes that the current ARS would no longer operate. Under this alternative, natural attenuation processes, such as dilution, dispersion, natural biological and chemical degradation, adsorption, and precipitation would likely reduce the concentrations of groundwater contamination to remedial goals over a long time period. However, no monitoring would be done to determine if contaminant concentrations were decreasing or when the remedial goals would be reached. The groundwater flow and chemical transport model was used to estimate the time for VDC concentrations in groundwater to be reduced to the remedial goal of 7 μg/L Site-wide and benzene concentrations to be reduced to the remedial goal of 5 μg/L in the Southeast Landfill Area due to natural attenuation processes. The estimated time to achieve remedial goals for VOCs in groundwater at the Site under the No-Action Alternative varies across the Site depending on the geographical areas of the Site. Clean-up time frames range from zero years for the Southwest Area (see Figure 1) to approximately 42 years for the Southwest Landfill Area. The estimated time required for each of the six geographic areas to achieve remedial goals under the No Action Alternative is listed in Table 6-1of the FS.

Under the No Action Alternative, treated groundwater would no longer be discharged to Sinking Pond. This would eliminate some of the detrimental effects that the ARS discharge has had on the pond, such as turbidity of the surface water and continued loading of arsenic and phosphorus to the pond. No monitoring would be done to evaluate the impacts of this change to the ecological receptors in the pond.

Evaluation

The detailed analysis of the No Action Alternative against the NCP evaluation criteria is presented in Table 6-2 of the July 2005, FS.

Cost

The estimated cost for the No Action Alternative is $0 as no further work at the Site is assumed.

Alternative GW-2: Limited Action

The detailed analysis for the Limited Action Alternative is presented in Table 6-3 of the July 2005, FS.

Description

The Limited Action Alternative would be applied to all six geographic areas of the Site (see Figure 1) and is intended to prevent direct contact with contaminated groundwater at the Site. It consists of shutting down the existing ARS, implementing institutional controls to control human exposure to contaminated water along with long term monitoring to evaluate the progress toward achieving remedial goals. The groundwater flow and transport model was used to estimate the time for VDC concentrations in groundwater to decrease to the remedial goal of 7 μg/L Site-wide and benzene concentrations to decrease to the remedial goal of 5 μg/L in the Southeast Landfill Area due to natural attenuation processes. The estimated time to achieve remedial goals for groundwater under this alternative is the same as the No Action Alternative and ranges from zero years for the Southwest Area to approximately 42 years for the Southwest Landfill Area. The estimated time required for each of the six geographic areas to achieve remedial goals under the Limited Action Alternative is listed in Table 6-1of the July 2005, FS.

Under the Limited Action Alternative, treated groundwater would no longer be discharged to Sinking Pond. This would eliminate some of the detrimental effects that the ARS discharge has had on the pond, such as turbidity of the surface water and continued addition of arsenic and phosphorus to the pond. As part of this alternative, monitoring would be done to evaluate the impacts of this change on ecological receptors in the pond. Long term monitoring of groundwater would be performed to determine if the alternative is performing as expected and to monitor and track changes in groundwater concentrations over time. Five-year reviews would be conducted to evaluate whether the remedial alternative remains protective of human health and the environment. If appropriate, additional actions may be implemented as a result of these reviews.

Evaluation

The detailed analysis of the Limited Action Alternative against the NCP evaluation criteria is presented in Table 6-3 of the FS.

Cost

The estimated present worth cost of the Limited Action Alternative is $1,774,000. Costs are broken down into capital costs, monitoring costs, and operation and maintenance (O&M) costs. Capital costs of $114,000 are associated with decommissioning of existing ARS extraction wells and implementation of institutional controls. There are no O&M costs associated with this alternative. The estimated present worth cost for long term monitoring and reporting as part of this alternative is approximately $1,660,000.

Alternative GW-3: Active Remediation

The detailed analysis for the Active Remediation Alternative is presented in Table 6-8 of the July 2005 FS.

Description

The Active Remediation Alternative for groundwater consisted of groundwater extraction from the Southeast and Southwest Landfill Areas with ex-situ treatment and effluent discharge to Sinking Pond, monitored natural attenuation, operation and maintenance, long term groundwater monitoring and periodic Five Year Remedy Reviews. This alternative consists of groundwater extraction wells designed to capture groundwater in specified areas of the Site. Contaminated groundwater that will not be captured by the new extraction system would be remediated through natural attenuation processes. This alternative assumes that groundwater from the extraction wells would be treated via air stripping for VOC removal and chemical precipitation for inorganics removal. Treated groundwater would be discharged to Sinking Pond. Institutional controls would be implemented to restrict use of and exposure to contaminated groundwater throughout the duration of the remedial action. Groundwater monitoring and Five Year Remedy Reviews would be done to evaluate the effectiveness of the remedy.

Development of Conceptual Pumping Scenarios

The groundwater flow and contaminant transport model was used to evaluate numerous pumping scenarios throughout the Site in order to select components of the Active Remediation Alternative. A description of the various pumping scenarios is provided below. For each of these scenarios, groundwater beyond the capture zone would be remediated through natural attenuation processes/ monitored natural attenuation (MNA).

Former Lagoon Area

Two pumping scenarios were evaluated for the Former Lagoon Area. Analysis of the model results indicates that groundwater extraction under either pumping scenario would not reduce the time to reach the remedial goals for VOCs as compared to the Limited Action Alternative. Model analyses also indicate that the Assabet Public Water Supply Wells will not become recontaminated as a result of cessation of pumping in the Former Lagoon Area. Further study was also done to evaluate the potential for metals contamination (arsenic) to recontaminate the North Lagoon Wetlands, which are also slated for cleanup under this proposal. Based upon the results of this study, the potential to re-contaminate the North Lagoon Wetland sediments as a result of Site-related contaminated groundwater will also decrease. As a result, pumping in this area was not included in the Active Remediation Alternative.

Southwest Area

Groundwater extraction in the Southwest Area was not considered as a component of the groundwater extraction system. Little or no VOC contamination above Drinking Water Standards remains in the Southwest Area groundwater. Because prior active pumping along with natural processes has reduced contaminant concentrations to very low levels, the MNA component of this remedial alternative was considered appropriate for the remaining cleanup in this area of the Site.

Assabet River Area

One pumping scenario was considered for the Assabet River Area. Model calculations indicate that cleanup time under active pumping is the same as the predicted cleanup time under the Limited Action Alternative. In addition, given that current groundwater discharge to the Assabet River does not pose an unacceptable risk to human health or the environment, active management of the groundwater contamination in this area is not necessary. Therefore, groundwater extraction in this area was not included as part of the Active Remediation Alternative.

Southwest Landfill Area

Two pumping scenarios were considered for the Southwest Landfill Area. Both scenarios would limit the migration of contaminated groundwater to the Assabet River and prevent the area between the Industrial Landfill and the Assabet River, for which remedial goals have been achieved, from becoming re-contaminated. This alternative would reduce the time to achieve remedial goals from approximately 42 years under the Limited Action Alternative to approximately 23 years under the active treatment pumping scenario. For this reason, groundwater extraction in this area of the Site was included as a component of the Active Remediation Alternative.

Southeast Landfill Area

Two pumping scenarios were also considered for the Southeast Landfill Area. A comparison of the two pumping scenarios indicates that neither pumping scenario reduces clean-up times for VOC-contaminated groundwater as compared to the Limited Action Alternative. However, continued groundwater extraction in this area was considered necessary to provide hydraulic containment of groundwater with highly elevated benzene concentrations which create conditions that continue to mobilize arsenic. Therefore, groundwater extraction is included as a component of the Active Remediation Alternative.

Northeast Area

The most in-depth evaluation of groundwater extraction scenarios was conducted for the Northeast Area. Four different pumping scenarios were evaluated for the Northeast Area. Two of the pumping scenarios considered groundwater extraction with discharge of treated water to

Sinking Pond and two of the scenarios considered groundwater extraction with downgradient reinjection of the treated water back into the Northeast Area.

Development of the pumping scenarios for the Northeast Area required consideration of two issues not present in other areas of the Site. One issue was the management of the extracted and treated groundwater. The second issue was the time frame necessary for an extraction/injection system to be constructed and become operational.

Management of extracted groundwater is an issue here because under current conditions, contaminated groundwater in the Northeast Area flows toward and discharges to Fort Pond Brook and/or flows toward and is captured and treated at the School Street Wellfield. Installation of extraction wells in the Northeast Area has the potential to lower water levels in the vicinity of the School Street Wellfield thereby reducing the amount of water available to the community. Because of potential adverse impacts on the Town's water supply wells, the two pumping scenarios that did not include reinjection were unacceptable. The two other scenarios assumed that extracted groundwater would be re-injected to the aquifer in the Northeast Area instead of being discharged to Sinking Pond to minimize impacts to the Town wells. Reinjection presented additional issues however – the possibility of biogeochemical changes resulting in well fouling and/or aquifer clogging either at the injection well or in the aquifer.

In addition, the time frame for construction was also taken into account because with very limited Grace owned land located within the Northeast Area, extraction/injection system infrastructure would need to be located on privately-owned land, and access agreements would need to be obtained for the construction, operation, and monitoring of any extraction/injection system in the Northeast Area. Reaching these agreements can take considerable time. This time factor was taken into account in evaluating an extraction/injection system for the Northeast Area. As a result, the model-calculated time to reach drinking water standards (MCLs) for this area under the various pumping scenarios evaluated ranged from 17 to 36 years, as compared to 25 years under the scenario involving continued flushing of the aquifer under current conditions. The two scenarios involving re-injection ranged from 17 to 20 years, while the scenarios without reinjection were 28 and 36 years. Cost estimates for the active pumping scenarios in this area ranged from $3.5 million to $8 million.

Taking these timing factors into consideration, EPA evaluated the time frame within which concentrations of contaminants would be reduced to acceptable levels (MCLs) in the area close to the School Street Wellfield. Although MCLs will not immediately be met, the groundwater flow model indicated that in a few years, the concentration of VDC in the School Street public supply wells (as opposed to groundwater in other areas in the northeast) will be less than or equal to the safe drinking water standard (MCL) of 7 ppb (μg/L).

As a result, considering the implementation difficulties associated with groundwater extraction and treatment in this area, the time it would take to achieve MCLs, and the costs associated with the pumping scenarios, groundwater extraction and treatment in the Northeast Area was not included as a component of the Active Remediation Alternative as presented in the July 2005, Proposed Plan for the Site.

Groundwater Extraction System

Based on the modeling results and other considerations discussed above, the conceptual design of the active remediation alternative consisted of groundwater extraction wells installed to capture groundwater generally in the Southwest Landfill Area and the Southeast Landfill Area.

Two of the existing ARS wells (MLF and WLF) were included as part of a new groundwater extraction and treatment system. Two additional wells would be installed south of the Industrial Landfill. The model indicates that these four wells would pump at a combined rate of approximately 90 gpm.

Evaluation

The detailed analysis of the Active Remediation Alternative against the NCP evaluation criteria is presented in Table 6-8 of the July 2005, FS.

Cost

Costs are broken down into capital costs, monitoring costs, and O & M costs. Capital costs are the direct and indirect costs incurred to develop, construct, and implement the remedial alternative. Monitoring costs include annual sampling and reporting. O & M costs include costs to evaluate and maintain the effectiveness of the extraction system after the remedy is constructed.

The estimated present worth cost of Alternative GW-3 is $7,536,000. The estimated capital costs are $2,651,000. The present worth for long-term monitoring is approximately $1,722,000. The present worth for O&M is approximately $3,163,000.

2. Sediments

Sinking Pond

Alternative SP-SED-1: No Action

The No Action Alternative is included as a baseline for evaluating the other remedial alternatives.

Description

In accordance with the NCP and RI/FS Guidance (USEPA, 1988), the No Action Alternative was developed as a baseline with which to compare other remedial alternatives. This alternative represents the minimal effort that would be taken at this Site. Under this alternative no sediment removal or treatment would be conducted.

Evaluation

The detailed analysis of the No Action Alternative against the NCP evaluation criteria is presented in Table 6-9 of the July 2005, FS.

Cost

There are no costs associated with this alternative.

Alternative SP-SED-3: Active Remediation

Description

Alternative SP-SED-3 includes excavation of the sediments from the Sinking Pond inlet as well as removal and/or capping of sediments from select portions of the Pond that are above the thermocline and pose risks to either human health and/or to environmental receptors. The decision regarding whether to remove and/or cap sediment within the Pond would be made during the remedial design phase and would take into consideration implementability factors as well as impacts on sensitive receptors/habitat. It is anticipated that most of the pond sediments would be removed by pumping, however some sediments may be removed through excavation/dredging. Work within the pond would require construction of temporary floating docks, while access to the Sinking Pond area would require construction of temporary roads. Sediments would be excavated and moved by pumped pipeline or truck to a temporary staging area on the Grace property for dewatering, analysis for disposal waste profile characterization, and ultimately preparation for disposal. Dewatered sediments would be disposed of off-Site in a appropriate manner. Based on the results of the waste profile characterization, however, consideration would be given to on-Site capping of recovered sediments. The disposal options will be further defined during the Remedial Design phase for this project.

The inlet and select pond excavation areas would require restoration in accordance with appropriate performance standards. Assuming the discharge of some portion of treated groundwater to the pond would continue, the inlet would be redesigned to provide more effective energy dissipation. The mouth from the inlet to the Pond would be widened, and a hydraulic control, such as an overflow weir, would be installed. During this construction period, the area of the bank adjacent to the former Pump House would be rehabilitated by a qualified restoration expert. Environmental monitoring would be conducted to evaluate the top two inches of sediment within the Sinking Pond inlet area and within the Pond located between an elevation of 144.5 feet NGVD (the maximum surface water elevation of Sinking Pond) and 128 feet NGVD (twelve feet below the minimum surface water elevation of Sinking Pond) for trends toward the background concentration of 42 mg/kg for arsenic. In addition, periodic five-year remedy reviews would be conducted to determine the protectiveness of the remedy. Data collected during the long-term environmental monitoring program would provide information for this review. The review would assess potential impacts of contaminants remaining in the Sinking Pond sediments and evaluate whether human health and the environment continue to be protected. If appropriate, additional actions may be implemented as a result of these reviews.

Evaluation

The detailed analysis for the Active Remediation Alternative SP-SED-3 against the NCP evaluation criteria is presented in Table 6-10 of the July 2005, FS.

Cost

A cost estimate was prepared for Alternative SP-SED-3 to aid in the selection of a remedial alternative. The total estimated present worth cost of this alternative is $5,961,000. The capital costs were estimated to be $5,730,000. The present worth cost for implementing long term monitoring and maintenance and five year reviews was estimated to be $231,000.

North Lagoon Wetland

Alternative NLW-SED-1: No Action

The No Action Alternative is included as a baseline for evaluating the other remedial alternatives.

Description

In accordance with the NCP and RI/FS Guidance (USEPA, 1988), the No Action Alternative was developed as a baseline with which to evaluate other remedial alternatives. This alternative represents the minimal effort that would be taken at this Site. Under this alternative, no sediment removal or treatment would be conducted in the North Lagoon Wetland.

Evaluation

The detailed analysis of Alternative NLW-SED-1 against the NCP evaluation criteria is presented in Table 6-11 of the July 2005, FS.

Cost

There are no costs associated with this alternative.

Alternative NLW-SED-3: Active Remediation

This section presents Alternative NLW-SED-3, Active Remediation.

Description

Alternative NLW-SED-3 would address sediments within the North Lagoon Wetland that pose risks to either human health and/or environmental receptors. Remediation may include excavation, off-Site disposal, on-Site consolidation, and/or capping in-place. Additional investigations and sampling would need to be performed during the Remedial Design phase to make this determination. This alternative requires excavation of at least a portion of the impacted sediments in the North Lagoon Wetland. Some excavation will be required in the portion of the North Lagoon Wetland sediments that reside within the 100-year flood plain of Fort Pond Brook. Consideration will be given to capping in-place for North Lagoon Wetland sediments that reside outside of the 100-year flood plain. Both off-Site disposal and on-Site consolidation of dewatered wetland sediments will be considered during the design phase, based on assessment of post-dewatering characteristics.

Work within the wetland using heavy equipment would require either construction of temporary roads or load-distributing floating platforms from which to excavate. Sediments would be excavated and moved by truck to a temporary staging area on the Grace property for dewatering, analysis for disposal waste profile characterization, and ultimately preparation for disposal. The wetland would require complete restoration in accordance with industry standards, including proper sediment restoration planning, planting plans, long term monitoring for success of revegetated areas, and follow up restoration activities.

Cost

A cost estimate was prepared for Alternative NLW-SED-3 to aid in the selection of a remedial alternative. The costing assumes:

- Full sediment removal with off-Site disposal;
- Excavation of sediment within the wetland to a depth of one foot; and
- Complete restoration of the wetland.

The total estimated present worth of this alternative is $3,445,000. The capital costs for excavation and disposal of sediments from, and restoration of the North Lagoon Wetland was estimated to be $3,382,000. The present worth cost for implementing long term monitoring and maintenance was estimated to be $62,000. Detailed cost information is included in Appendix C of the July 2005, FS.

K. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a Site remedy (see section 6.0 of FS). The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria.

EPA's Nine Criteria are summarized as follows:

The two Threshold Criteria described below must be met in order for the alternative to be eligible for selection in accordance with the NCP.

These criteria include:

1. **Overall protection of human health and the environment** addresses whether or not a

remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

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

The five *Primary **Balancing** Criteria* are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria.

These criteria include:

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

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

5. **Short term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

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

7. **Cost** includes estimated capital and Operation Maintenance (O&M) costs, as well as present-worth costs.

The two ***Modifying** criteria* are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI, FS, and Proposed Plan.

These criteria include:

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

waivers.

9. **Community acceptance** addresses the public's general response to the alternatives described in the Proposed Plan 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 7.0 and Tables 1, 2, and 3 are attached to this ROD.

The sections below present the nine criteria and a brief narrative summary of each alternative's strengths and weaknesses according to the comparative analysis. Only those alternatives that satisfied the first two threshold criteria were balanced using the seven remaining criteria.

Comparative Analysis of Remedial Alternatives for Groundwater

Overall Protection of Human Health and the Environment

Alternative GW-1 (No Action) would be the least protective of the three alternatives. It would offer no protection to human health and the environment. Potential risks from exposure to contaminated groundwater would remain. While natural attenuation processes would eventually reduce contaminant concentrations in groundwater to remedial goals, no monitoring would be done to indicate when they are met. Alternative GW-2 (Limited Action) would provide greater protection than Alternative GW-1 (No Action) because institutional controls would be implemented to restrict the use of contaminated groundwater. In addition, long-term groundwater monitoring would be done to verify the continued protection of human health and the environment, identify the then-current distribution of contamination, and document the progress toward reaching remedial goals. The time to reach remedial goals Site-wide is estimated to be 42 years for either Alternative GW-1 (No Action) or GW-2 (Limited Action). The combination of institutional controls and natural attenuation is considered to be protective of human health and the environment. Alternative GW-3 (Active Remediation) would also be protective of human health and the environment and provides the greatest overall protection. Similar to Alternative GW-2 (Limited Action), institutional controls would be implemented to restrict the use of contaminated groundwater and long-term groundwater monitoring would be conducted to verify the continued protection of human health and the environment, identify the then-current distribution of contamination, and document the progress toward reaching remedial goals. Groundwater extraction with ex-situ treatment would decrease the time to reach remedial goals Site-wide to 23 to 26 years and therefore, provides greater overall protection than Alternatives GW-1 (No Action) and GW-2 (Limited Action).

Compliance with ARARs

Each of the alternatives would attain remedial goals in the long term. Alternative GW-3 (Active Remediation) would attain ARARs more quickly than Alternatives GW-1 (No Action) and GW-2 (Limited Action).

Long-term Effectiveness and Permanence

Alternative GW-1 (No Action) would provide the least long-term effectiveness because there would be no controls put in place to limit access to contaminated groundwater. Alternative GW-2 (Limited Action) would be more effective than Alternative GW-1 (No Action) because institutional controls would be implemented to limit access to contaminated groundwater. Alternative GW-3 (Active Remediation) provides the greatest long-term effectiveness and permanence because, in addition to limiting access to contaminated groundwater, it requires treatment that permanently destroys contaminants in groundwater. All three alternatives would permanently reduce contaminant concentrations to remedial goals; however GW-3 (Active Remediation) provides greater permanence in a shorter time frame.

Reduction of Toxicity, Mobility, or Volume

All three alternatives would reduce toxicity and volume of contamination through natural attenuation processes. Alternative GW-3 (Active Remediation), however, also provides active containment and treatment of contaminated groundwater, which would reduce the mobility, volume, and toxicity of contaminants by treatment.

Short-Term Effectiveness

Under Alternatives GW-1 (No Action) and GW-2 (Limited Action), the existing groundwater extraction system (the ARS) would be shut down, without being replaced by another active treatment system. As a result, there may be some short-term impacts to the community. Under Alternative GW-3 (Active Remediation), portions of the existing groundwater extraction system would be shut down, which could result in some short-term impacts from these construction activities. Risks to on-Site workers will be minimal and will be managed by the Site-specific health and safety plan. Trucking of building materials and process equipment for construction of the on-Site groundwater treatment facility will be necessary. Also, EPA has identified several implementability issues that are expected to be associated with construction activities, especially in the Northeast Area of the Site. However, the Town of Acton, the local citizens group as well as a number of private property owners have committed to assist EPA and/or W. R. Grace to address these implementability issues in a short time frame.

Under Alternative GW-3 (Active Remediation), discharge of treated groundwater to Sinking Pond may have some environmental impacts on the Pond. As a result of the modifications to the water treatment system, any environmental impacts would be significantly less than currently exist and would be evaluated through the long term monitoring.

Implementability

Alternative GW-1 (No Action) could be readily implemented. The institutional controls required for either Alternative GW-2 (Limited Action) or Alternative GW-3 (Active Remediation) may present some implementation issues that would affect the time frame to have institutional controls/deed restrictions in place. The groundwater extraction and treatment planned under Alternative GW-3 (Active Remediation) is a frequently used and effective remedial alternative. All aspects of the proposed extraction and treatment system are standard. Alternative GW-3 (Active Remediation) would require long-term maintenance to remain effective.

Cost

Alternative GW-1 (No Action) is the least costly. Total cost for this alternative is $ 0. Alternative GW-2 (Limited Action) is more expensive than Alternative GW-1 (No Action). Total cost for this alternative is $1,774,000. Alternative GW-3 (Active Remediation) is the most costly. Total cost for this alternative is $8,642,000.

Community Acceptance

From July 11, 2005 through September 8, 2005, EPA held a public comment period to seek input from the community regarding remedial cleanup alternatives evaluated for the Site. In addition to written comments provided to EPA, comments were received during an Informational Meeting held on July 19, 2005 and a Public Hearing held on August 4, 2005.

On the basis of comments received, there was support for active remediation but commenters expressed an interest in increased pumping of contaminated groundwater as part of the remedy. As a result of these comments, EPA further assessed and revised the remedy with regard to pumping in the Northeast Area. A summary of the comments received and EPA's response to comments is included in the Responsiveness Summary portion of this ROD (Part 3).

State Acceptance

The Commonwealth of Massachusetts has indicated its support for the selected remedy by providing its concurrence in the attached letter (see Appendix A)

Comparative Analysis of Remedial Alternatives for Sinking Pond

Overall Protection of Human Health and the Environment

Alternative SP-SED-1 (No Action) does not provide overall protection of human health and the environment. Potential risks from exposure to contaminated sediments would remain. While natural attenuation processes might reduce contaminant concentrations in sediments to remedial goals in a very long time frame, no monitoring would be done to indicate whether or when they are met. Alternative SP-SED-3 (Active Remediation) provides overall protection of human health and the environment by excavating and removing and/or by covering or capping contaminated sediments that present an unacceptable risk to human health and the environment. Institutional controls would be required in the form of a deed restriction if the final design incorporates capping of impacted sediments as part of the remediation strategy.

Compliance with ARARs

Both the No Action Alternative (SP-SED-1) and Alternative SP-SED-3 (Active Remediation) will meet ARARs.

Long-term Effectiveness and Permanence

Alternative SP-SED-1 (No Action) would not provide long-term effectiveness or permanence. Alternative SP-SED-3 (Active Remediation) provides the greatest level of long-term effectiveness and permanence by virtue of having impacted sediments permanently removed from the areas of concern or made inaccessible to sensitive receptors by capping.

Reduction of Toxicity, Mobility, or Volume

The No Action Alternative (SP-SED-1) would not reduce toxicity, mobility or volume except to the extent that natural processes occur.

Alternative SP-SED-3 (Active Remediation) would reduce toxicity, mobility and volume but not through treatment to the extent that materials are excavated and taken off-Site for disposal. To the extent that some of the target sediments within the Pond may be capped under this alternative, there would be no reduction in volume; however, there will be some reduction in potential toxicity and mobility but not through treatment by virtue of having sediments no longer exposed to surface activities.

Short-Term Effectiveness

The No Action Alternative (SP-SED-1) has no short-term impacts. The Active Remediation Alternative, SP-SED-3, would have greater short-term impacts on the community, on-Site workers and the environment.

Alternative SP-SED-3 could potentially have air quality and truck traffic impacts on the community. Excavation and/or capping will be required in Sinking Pond. Any activity that disturbs the contaminated sediment during clean up could present short-term risks during the excavation, so air monitoring would be performed to protect workers and ensure that the surrounding neighborhood air quality is not impacted. Dust suppression methods will be employed as necessary. Significant truck traffic may be necessary for any excavated materials destined for off-Site disposal. Efforts will be made to minimize traffic concerns. Normal construction-related access prohibitions and health and safety plans would be in place during construction activities, and should provide sufficient protection to the community, the workers, and the environment.

Implementability

Because the No Action Alternative (SP-SED-1) does not require any activities to take place, it does not present any implementation issues. The technology for Alternative SP-SED-3 (Active Remediation) is commonly used and readily available. The primary Site constraints applicable to work in the Sinking Pond area are that work in and around the Pond is cumbersome and arduous. The most challenging technical issues for Alternative SP-SED-3 (Active Remediation) involve removal of sub-aqueous sediments and restoration of the inlet area. However, this Alternative is reasonably implementable.

Cost

The No Action alternative (SP-SED-1) is the least costly alternative. The total costs for this alternative are $0. Alternative SP-SED-3 (Active Remediation) is the most costly. The total costs for this alternative are $5,961,000.

Community Acceptance

From July 11, 2005 through September 8, 2005, EPA held a public comment period to seek input from the community regarding remedial cleanup alternatives evaluated for the Site. In addition to written comments provided to EPA, comments were received during an Informational Meeting held on July 19, 2005 and a Public Hearing held on August 4, 2005.

On the basis of comments received, there was support for Alternative SP-SED-3, Active Remediation. Many commentors expressed a preference for off-Site disposal of sediments to be excavated as part of this alternative. A summary of the comments received and EPA's response to comments is included in the Responsiveness Summary portion of this ROD (Part 3).

State Acceptance

The Commonwealth of Massachusetts has indicated its support for the selected remedy by providing its concurrence in the attached letter (see Appendix A)

<u>Comparative Analysis of Remedial Alternatives for North Lagoon Wetland</u>

Overall Protection of Human Health and the Environment

Alternative NLW-SED-1 (No Action) would not provide overall protection of human health and the environment. Potential risks from exposure to contaminated sediments would remain. While natural attenuation processes might reduce contaminant concentrations in sediments to remedial goals in a very long time frame, no monitoring would be done to indicate whether or when they are met. Alternative NLW-SED-3 (Active Remediation) provides overall protection of human health and the environment by excavating and removing and/or by covering or capping contaminated sediments that present an unacceptable risk to human health and the environment. Institutional controls would be required in the form of a deed restriction if the final plan incorporates capping of impacted sediments as part of the remediation strategy.

Compliance with ARARs

Both the No Action Alternative (NLW-SED-1) and Alternative NLW-SED-3 (Active Remediation) will meet ARARs.

Long-term Effectiveness and Permanence

Alternative NLW-SED-1 (No Action) would not provide long-term effectiveness or permanence and the residual contamination that remains is high. The alternative that incorporates removal or isolation of all sediments that pose risk to humans and the environment, NLW-SED-3 (Active Remediation) provides the greatest level of long-term effectiveness and permanence by virtue of having all impacted sediments removed from the area of concern or made inaccessible to sensitive receptors by capping.

Reduction of Toxicity, Mobility, or Volume

The No Action Alternative (NLW-SED-1) would not reduce toxicity, mobility or volume except to the extent that natural processes occur. Alternative NLW-SED-3 (Active Remediation) would reduce toxicity, mobility and volume but not through treatment to the extent that materials are excavated and taken off-Site for disposal. To the extent that some of the target sediments may be capped under this alternative, there would be no reduction in volume; however, there will be some reduction in potential toxicity and mobility by virtue of having sediments no longer exposed to surface activities.

Short-Term Effectiveness

The No Action Alternative (NLW-SED-1) has no short-term impacts on the community, on-Site workers and the environment. Alternative NLW-SED-3 (Active Remediation) has greater potential short-term impacts. The proposed cleanup plan could potentially have air quality and truck traffic impacts on the community. Any option that disturbs the wastes during clean up could present short term risks during the excavation, so air monitoring will be performed to protect workers and ensure that the surrounding neighborhood air quality is not impacted. Dust suppression methods will be employed as necessary. In addition, significant truck traffic may be necessary for any excavated materials destined for off-Site disposal. Efforts will be made to minimize traffic concerns. Because action is being taken in the wetlands and floodplain, actions will be taken to minimize impacts as discussed in the selected remedy to protect the environment. Normal construction-related access prohibitions and health and safety plans would be in place during construction activities, and should provide sufficient protection to the community and the workers.

Implementability

Because the No Action Alternative (NLW-SED-1) does not require any activities to take place, it does not present any implementation issues. The technology for Alternative NLW-SED-3 (Active Remediation) is commonly used and readily available. The primary Site constraint applicable to work in the North Lagoon Wetland area is that work in and around the wetlands is cumbersome and arduous. However, this Alternative is reasonably implementable.

Cost

The No Action alternative (NLW-SED-1) is the least costly alternative. The total costs for this alternative are $0. The remaining alternative, NLW-SED-3 (Active Remediation) is the most costly. The total costs for this alternative are $3,445,000.

Community Acceptance

From July 11, 2005 through September 8, 2005, EPA held a public comment period to seek input from the community regarding remedial cleanup alternatives evaluated for the Site. In addition to written comments provided to EPA, comments were received during an Informational Meeting held on July 19, 2005 and a Public Hearing held on August 4, 2005.

On the basis of comments received, there was support for Alternative NLW-SED-3, Active Remediation. Many commentors expressed a preference for off-Site disposal of sediments to be excavated as part of this alternative. A summary of the comments received and EPA's response to comments is included in the Responsiveness Summary portion of this ROD (Part 3).

State Acceptance

The Commonwealth of Massachusetts has indicated its support for the selected remedy by providing its concurrence in the attached letter (see Appendix A)

L. THE SELECTED REMEDY

1. Summary of the Rationale for the Selected Remedy

The selected remedy for the Site is a comprehensive remedy that includes active remediation for groundwater (GW-3) and removal of contaminated sediments within both Sinking Pond (SP-SED-3) and the North Lagoon Wetlands (NLW-SED-3). The selected response action addresses principal and low-level threat wastes at the Site, to the extent that they exist, by remediating and preventing exposure to contaminated groundwater and sediments.

The selected remedy is consistent with EPA's preferred alternative, which was identified in the Proposed Plan and presented in more detail in the FS. However, as further described below, EPA has modified the conceptual design for GW-3, to include extraction wells within the Northeast Area of the Site based on comments submitted during the public comment period. EPA believes that overwhelming number of comments by the State and the community stressing the need to pull the plume of contamination back from Acton's wells in the Northeast Area, support a modification to EPA's preferred alternative for groundwater. Based on the number of issues regarding the implementability of active extraction in the Northeast Area (e.g., potential impacts to the Town's public supply wells, ability to secure access agreements on private property in a timely manner), EPA has slightly modified one of the conceptual pumping scenarios presented in the FS to develop a design that is acceptable to the community and the State, while still meeting the criteria for a cost effective remedy and addressing implementation issues. As discussed further below, design of the extraction and discharge system(s) for the Northeast Area will be closely coordinated with the AWD to ensure that adverse impacts to the aquifer yield and usability for the School Street Wellfield are minimized. A summary of the selected remedy, including modifications to the conceptual design for GW-3, is presented below.

2. Description of Remedial Components

The selected remedy includes active treatment of contaminated groundwater (Alternative GW-3) monitored natural attenuation of groundwater beyond the active treatment zones and institutional controls to restrict groundwater use until the cleanup objectives have been met to address unacceptable risks. The selected remedy for Sinking Pond, Alternative SP-SED-3 and the North Lagoon Wetlands, Alternative NLW-SED3, includes excavation of contaminated sediments exceeding cleanup levels and off-Site disposal with the option for on-Site consolidation and capping to address unacceptable risks.

The primary components of EPA's Alternatives for Operable Unit Three include:

• Cleanup of contaminated sediments and soils posing an unacceptable risk to human health and/or the environment in Sinking Pond and the North Lagoon Wetlands;

• Extraction and treatment of groundwater contamination in the Southeast and Southwest Industrial Landfill Areas on the Grace Property and at targeted areas within the Northeast Area as described below;

• A redesigned and/or modified Aquifer Restoration System that will treat extracted groundwater for both metals and organic contaminants. Treatment processes for extracted groundwater would include air stripping, activated carbon (air treatment), and metals precipitation prior to surface water discharge to Sinking Pond;

• Monitored Natural Attenuation of areas of groundwater contamination not captured by the extraction system;

• Institutional Controls such as deed restrictions and/or local ordinances to prevent unacceptable exposures to contaminated groundwater until cleanup levels are met and to protect against unacceptable future exposures to any wastes left in place on-Site.

• Long-term groundwater, surface water, and sediment monitoring, and periodic five-year reviews of the remedy.

a. Groundwater

A groundwater extraction and treatment system will be designed and implemented to restore the groundwater at the Site, see cleanup levels below.

The conceptual design for the groundwater extraction system presented in the July 2005 Proposed Plan consisted of pumping the two existing extraction wells within the Southwest Landfill Area and adding two new wells within the Southeast Landfill Area. Because the modeling results indicated that the time for restoration of the Northeast Area was not significantly different between active remediation and MNA, extraction wells were not initially included in as a component of the design of the Active Remediation alternative for groundwater in this part of the Site. Several factors supported this conclusion including: (1) concerns over potential impacts that active pumping would have on the Town's public water supply wells; (2) the ability to secure access agreements on private property within a reasonable period of time; (3) the lack of a current risk from exposure to contaminated groundwater; (4) the amount (approximately 24 gallons) of VDC remaining in the groundwater in this area of the Site; and (5) the Town's moratorium on installation of private wells in the Northeast Area preventing exposure to groundwater through irrigation and other purposes. Each of these factors was presented in the FS, Proposed Plan, and public information meeting held on July 19, 2005.

EPA has re-evaluated the conceptual design presented in the FS and Proposed Plan, and, consistent with the evaluation criteria set forth in the National Contingency Plan, EPA has selected Active Remediation as the clean up technology for groundwater (GW-3) but slightly modified the design of that alternative to include extraction wells in the Northeast Area. The remedy has been revised as follows:

As discussed above, EPA initially decided not to propose active remediation in the Northeast Area based, in part, on implementation issues related to impacts on the Town's water supply wells and access issues related to locating components of an extraction and treatment system on private property. EPA believes it can minimize the first of these impacts by allowing treated groundwater to be disposed of via an infiltration basin rather than a reinjection system. Although EPA believes that infiltration is the best means to address implementability concerns and concerns regarding yield and water quality at the School Street wells, the option of reinjection will also be retained should pre-design studies indicate that infiltration is not feasible.

As to the second issue, EPA has decided to place a limited number of extraction wells located within the area of the highest groundwater concentrations to limit the number of properties impacted. Therefore, Active Remediation would now target areas in the Northeast Area where mass reduction of high residual VOC concentrations in groundwater can be cost-effectively accomplished with minimal impacts to the Town's public supply wells or private property.

As outlined in the FS, the conceptual design for the southeast and southwest landfill areas would include approximately four extraction wells. Two extraction wells are currently in place as part of the ARS (MLF and WLF), and two new extraction wells would be installed, one in each area, to attain a capture zone. The combined pumping rate from all four wells, as derived from the groundwater flow model needed to achieve this capture zone, was estimated to be 90 gpm. The modified conceptual design for the Northeast Area includes withdrawing groundwater from approximately three to five bedrock groundwater extraction wells in the part of the plume with VDC concentrations greater than 200 μg/L (based on the 2001 plume map) at a combined rate of approximately 50 gpm to target mass reduction. Treatment of that water would either be potentially located near the Industrial Landfill or at a new location near the extraction wells in the Northeast Area (location to be determined during remedial design based on cost and property access etc.); and discharge of the treated water in nearby infiltration basins or reinjection back into the Northeast Area to offset water loss to the School Street Wellfield. The specific number of extraction wells, flow rates, locations, depth and other details will be evaluated in close coordination with the AWD during remedial design, and may be modified, as necessary, to attain the appropriate plume captures.

The objectives of this modified component of the Active Remediation Alternative are to protect the municipal water supply by reducing the areal extent of contamination; reduce the mass of contamination in the most concentrated part of the plume; minimize impacts to the School Street wellfield and Fort Pond Brook; and minimize impacts to residential property owners in the Northeast Area by locating remedial system components on industrial property or public lands where technically and administratively feasible. Given the relatively low estimated volume of contamination that remains in the aquifer, EPA assumes that this aggressive targeted pumping would continue for approximately three years. At the end of this three-year time frame, and, if necessary, every two years thereafter, an evaluation will be conducted to determine if pumping can be discontinued. This evaluation will include the following factors: 1.) input from the AWD regarding yield and drawdown; 2.) contaminant concentrations at each of the three School Street Wells and whether they are meeting, and are expected to continue to meet, MCLs; and 3.) the effectiveness of the extraction and treatment system.

It is anticipated that a central groundwater treatment plant (GWTP) would be located near the area of the Industrial Landfill. However, as part of the remedial design an evaluation will be conducted to determine if it would be more cost effective to locate a separate groundwater treatment system in the Northeast Area, specifically for treating groundwater pumped from the Northeast area. The GWTP will be designed so that the plant has sufficient capacity to address any reasonable design and operational changes that may occur as the result of changes in capture zones, and/or the number/pumping rate of recovery wells. Based upon EPA's review of probable pumping needs, the GWTP would be designed to handle approximately 200 gpm.

Results of bench-scale jar testing were completed in December 2003 and the testing indicated that potassium permanganate was effective in removing iron, manganese, and arsenic from the groundwater that is extracted by the current system. The treatability testing also indicated that removal of these inorganic compounds in groundwater would be optimal if chemical precipitation was followed by filtration and if a portion of the removed solids were recycled. In addition, the test indicated that chemical precipitation was successful in removing phosphorous and in controlling odors.

The results of the treatability test were then used to select an inorganics removal system which would consist of an influent equalization tank and feed pumps, chemical precipitation system (flocculation/gravity settler/thickener), gravity sand filter and chemical feed systems using potassium permanganate and anionic polymer. Following precipitation of inorganic compounds, water would be pumped to the air stripper for VOC treatment. For the treatment of VOCs in groundwater extracted from the Site, a shallow tray air stripper is proposed. Air would be forced into the air stripper via a blower to assure greater than 99% removal of VOCs in groundwater. Following treatment, the treated groundwater would be discharged and federal and state discharge requirements would be required to be met.

Water from the treatment plant would be conveyed to the discharge area through underground piping. The clean effluent water extracted from the southern portion of the Site would be discharged to Sinking Pond. Treated effluent from the Northeast Area would be put back into the aquifer for the Town wells by either reinjection or recharge basins in this same area. The inlet area of Sinking Pond would be redesigned to accommodate the effluent flow and to develop a less turbulent discharge. This may consist of a widened inlet mouth and design of a flow dampening hydraulic control, such as an overflow weir. Air stripper off-gas would be directed into a GAC unit for odor control and removal of VOCs. Sludge generated from the chemical precipitation system would be collected in a sludge holding tank. The sludge would be dewatered periodically with a filter press. Prior to disposal of sludge, sludge samples would be collected and tested to confirm whether or not this material should be handled as hazardous or non hazardous waste. See Figure 14 for the process flow diagram of the proposed groundwater treatment system. Monthly sampling would occur for VOCs, inorganics, and phosphorus analyses of influent to, and effluent from the treatment system. Periodic groundwater sampling will be conducted throughout the Site to evaluate the extent of the plume, evaluate progress towards meeting cleanup levels and evaluate the need for any adjustment in extraction well capture zones or pumping rates, etc. including adjustments in capture zones due to asymptotic conditions with respect to a decrease in contaminant concentrations being reached for certain areas.

The existing ARS will continue to operate until the remedy is constructed and operational, allowing for appropriate transition between systems.

b. Sediment

The selected remedy for contaminated sediment in Sinking Pond is consistent with EPA's preferred alternative, SP-SED-3: Active Remediation, which was identified in EPA's July 2005 Proposed Plan and FS.

Alternative SP-SED-3: Active Remediation includes excavation of approximately 4,533 cubic yards of sediments from the Sinking Pond inlet as well as removal and/or covering of sediments from select portions of the Pond that are above the thermocline (12 feet of water or less) and considered to pose an unacceptable risk to either human health or to environmental receptors. See cleanup levels below.

The decision regarding whether to remove and/or cap/cover sediment within the Pond depends upon the steepness of the slopes of the Pond as well as potential habitats for the ecological receptors, i.e. fish. If the excavated sediments are hazardous wastes under RCRA, then they would be disposed of off-Site. It is assumed that maximum sediment removal depth would be no greater than one foot, throughout much of Sinking Pond where cleanup actions are targeted, but may be as much as six feet in limited areas near the inlet. Additional data will need to be collected as part of the Remedial Design phase to determine these specific details, as well as the full nature and extent of sediment contamination vertically and horizontally. In addition, further evaluation will be required to determine whether wetlands exist in the Sinking Pond area, and, if so, whether or not they will be impacted by the remedial action. Should it be determined that wetlands would be impacted, state and federal wetland requirements (ARARs) will be required to be met.

Clean up work within the Pond may require construction of temporary floating docks, while access to the Sinking Pond area would require construction of temporary roads. Sediments would be excavated and moved by pumped pipeline or truck to a temporary staging area on the Grace property for dewatering, analysis for disposal waste profile characterization, and ultimately preparation for proper disposal. It is currently assumed that the dewatering process can be conducted within the general location of the current inlet area to minimize adverse impacts to other areas of the pond. Off-Site disposal of dewatered sediments is preferred, however, based on the results of the waste profile characterization, consideration would be given to on-Site consolidation and capping of recovered sediments if analyses conclude that the sediments are not hazardous waste. Should a determination be made that these sediments are not hazardous waste, contaminants left on-Site do not have the potential to re-mobilize, and that capping in an upland location is appropriate, the cap would be required to meet state solid waste requirements. Additional evaluation will be performed as part of the Remedial Design Phase to determine the appropriate disposal or consolidation method and location.

The inlet and select pond excavation areas would require restoration by a qualified company in accordance with ARARs. Assuming that discharges of treated groundwater to the pond will continue (see groundwater discussion above), the inlet would be redesigned to slow down the flow of treated water entering Sinking Pond. The mouth from the inlet to the Pond would be widened, and a hydraulic control, such as an overflow weir, would be installed. The purpose of these activities is to provide increased retention time for settling of suspended particles before the treated groundwater is discharged to the Pond and to reduce the energy of water when it enters the Pond, thus minimizing erosion. During this construction period, the area of the bank adjacent to the former Pump House would also be rehabilitated by a qualified restoration expert. A long term environmental monitoring program will also be established as part of this alternative. In addition, every five years a remedy review would be conducted to ensure that the remedy remains protective.

The selected remedy for contaminated sediment in the North Lagoon Wetlands is consistent with EPA's preferred alternative, NLW-SED-3: Active Remediation, which was identified in EPA's July 2005 Proposed Plan and FS.

Alternative NLW-SED-3: Active Remediation, would address approximately 1,600 cubic yards of sediment within the North Lagoon Wetland that pose risks to either human health or environmental receptors. (See cleanup levels below.) Remediation may include excavation, off-Site disposal and/or consolidation and capping on-Site. This alternative requires excavation of at least a portion of the impacted sediments in the North Lagoon Wetland. It is anticipated that some excavation will be required in the portion of the North Lagoon Wetland sediments that reside within the 100-year flood plain of Fort Pond Brook. Consideration will be given to consolidation and capping in place for North Lagoon Wetland sediments in an area outside of the 100-year flood plain. Decisions regarding excavation/consolidation/capping and on-Site consolidation or off-Site disposal will be made during the design phase and will take into consideration, characteristics of the excavated material, implementability factors, as well as a functionality assessment of certain portions of the wetland. To determine these specific details, data that will need to be collected as part of the Remedial Design Phase. If the excavated sediments are hazardous wastes under RCRA, then they would be disposed of off-Site. A wetland delineation and habitat characterization to determine the function and value of the sedge marsh will also need to be completed as part of the remedial design to determine if consolidation is viable.

It is assumed that maximum sediment removal depth would be no greater than one foot in most areas, and that much of the wetland area would either be removed or destroyed in the removal effort. Additional sampling as part of the remedial design will help further delineate the areas requiring cleanup. Work within the wetland using heavy equipment would require either construction of temporary roads or load-distributing floating platforms from which to excavate. Sediments would be excavated and moved by truck to a temporary staging area on the Grace property for dewatering, analysis for disposal waste profile characterization, and ultimately preparation for disposal. The wetland would require complete restoration in accordance with industry standards, by a qualified company which would include proper sediment restoration planning, planting plans, and long term monitoring to determine the success of revegetated areas, and follow up construction work as warranted by the relative success of the restored/replicated wetland. EPA will require the work in this wetland to be performed while minimizing potential harm and avoiding adverse effects to the extent practicable.

An environmental monitoring program would also be established be to assess the success of the wetland restoration efforts and to evaluate the North Lagoon Wetland and Sinking Pond areas for signs of re-deposition of significant concentrations of arsenic and manganese

To the extent required by law, EPA will review the Site at least once every five years after the initiation of remedial action at the Site if any hazardous substances, pollutants or contaminants remain at the Site to assure that the remedial action continues to protect human health and the environment.

c. Institutional Controls/Deed Restrictions

The institutional controls pertaining to groundwater will likely take the form of a local Town ordinance and/or moratorium that would be put in place under and within 500 feet of the edge of the mapped groundwater plume in Concord and Acton; see Figure 11. Other potential institutional controls mechanisms include Grants of Environmental Restrictions and Notices of Activity and Use Limitations. Those implementing the ICs would be responsible to work with the Towns and affected property owners to help put in place these restrictions. Should waste be left covered or capped on Site (either as part of the cleanup of Sinking Pond or the North Lagoon Wetland, then Grace (or the current property owner) would be required to place restrictions on the use of this portion of its property so that this area is not disturbed in the future.

Institutional controls on groundwater are expected to be temporary, until such time as groundwater cleanup goals are met. Therefore, as the areal extent of contamination in the aquifer decreases, the area impacted by these restrictions will also change (decrease). Therefore periodic reevaluation of the area impacted the ICs will be performed and the restrictions will change accordingly.

d. Design and Pre-Design Efforts

Remedial design efforts will need to be completed prior to the initiation of remedial actions at the Site. Additional sediment sampling for the North Lagoon Wetlands and Sinking Pond will likely need to be performed in order to more accurately refine the volume estimates and areal extent of sediments to be cleaned-up. Additional design efforts will also be necessary to more accurately determine the subsurface areas of Sinking Pond that are considered to be accessible and where humans can stand comfortably for a period of time. If the excavated sediments are determined to be hazardous wastes under RCRA, then they would be disposed of off-Site. Also, the decision whether or not to consolidate contaminated sediments from the wooded area into the sedge marsh area of the North Lagoon wetlands will be determined during this phase. To assist in this determination, a wetland delineation and habitat characterization to determine the function and value of the sedge marsh will be completed to determine if consolidation is appropriate. Before EPA could approve any consolidation and/or capping of sediments, testing should also be performed for leachability characteristics and other parameters, as well as an evaluation of the appropriate design of any cap or cover to meet ARARs.

Additional sampling and/or the installation of additional groundwater monitoring wells will be needed to adequately determine an appropriate background level for manganese in groundwater. Design of the extraction and discharge system for the Northeast Area will require extensive coordination/cooperation with the AWD and will likely require additional modeling efforts. Groundwater modeling may need to be performed over time as Site conditions change and or extraction occurs and to evaluate progress in meeting clean up goals. Additional modeling may also be needed to evaluate impacts of contamination on groundwater in the vicinity of well WRG-3, a potential future public water supply for Acton.

The selected remedy may change somewhat as a result of the Remedial Design and construction processes. Changes to the remedy described in this record of Decision will be documented in a fact sheet, an Explanation of Significant Differences or a Record of Decision Amendment, depending on the magnitude of the changed component.

e. Operation and Maintenance and Long Term Monitoring Components

An Operation and Maintenance Plan (O & M Plan) will be developed describing procedures for long-term operation of the groundwater treatment plant, wells, and associated piping, and will include a regular list of tasks to be carried out, the scope of which will be determined as part of the remedial design/remedial action workplan. An O&M Plan will also be needed for maintenance of caps or covers if any wastes are left in place as part of this remedy. Periodic Five-year reviews will be conducted to ensure that the remedy remains protective.

Long Term periodic sampling for inorganics, VOCs, and SVOCs will be conducted. An appropriate long term groundwater sampling plan will need to be developed based on Site conditions and the remedial actions and risk(s). This long term groundwater monitoring may also include evaluation of inorganics to ensure that their mobility is decreased commensurate with the decrease in concentrations of VOCs.

Additional monitoring wells and/or sampling may be needed upgradient of the School Street Wellfield. Although EPA does not expect contamination levels to increase, this would serve as an indicator to determine the groundwater quality and concentrations of Site related contamination prior to reaching and/or impacting the School Street wells and to address community concerns. Long term monitoring will also be required to ensure that contamination is not spreading or adversely impacting surface water bodies, or other future water supply wells (i.e. WRG-3). Furthermore, if adverse impacts are identified to WRG-3 as a result of modeling or monitoring, additional work may also be needed.

Progress towards meeting long-term ecological clean up goals for sediment in Sinking Pond will be evaluated by: 1) Measurement of surface sediment concentrations (0-2 inches) of metals (As, Cu, Mn, and Fe) throughout the pond every 2 years. A minimum of 10 sediment samples will be collected. These samples should be taken from areas that adequately represent the remediated and non-remediated areas, as well as depth zones of the pond on an area-weighted basis. 2) At 5-year intervals after the actions taken to achieve the interim clean up goal have been completed, sediment toxicity testing (Hyalella azteca, chronic tests) will be conducted to evaluate sediment toxicity. 3) If sediment concentrations of arsenic do not decline[6] in sediment and/or significant toxicity to invertebrates is found after 10 years post-remediation, additional corrective actions will be evaluated and, if determined appropriate, will be taken to achieve these goals.

Institutional controls will be implemented and enforced by the appropriate entities.

3. Summary of the Estimated Remedy Costs

Table L-1 includes the revised costs for groundwater alternative GW-3: Active Remediation ($8,642,000); Table L-2 includes costs for Sinking Pond sediment alternative SP-SED3 ($5,961,000): Active Remediation and Table L-3 contains cost for North Lagoon Wetland sediment alternative NLW-SED 3: Active Remediation ($3,445,000). Thus, the total present worth cost of this remedy is estimated as $18,048,000.

The information in these cost estimate summary tables are based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

4. Expected Outcomes of the Selected Remedy

The primary expected outcome of the selected remedy is that the groundwater/aquifer at the Site will be restored such that it will be useful for domestic purposes (e.g., ingestion, bathing,

6 For purposes of this demonstration, decline means significantly different from baseline and a minimum of 10% decrease in mean concentration.

cooking, etc.) without pre-treatment for Site-related contaminants. As indicated by Site-specific groundwater modeling, approximately 26 years are estimated as the amount of time necessary to achieve the remedial goals consistent with potable/domestic use of the aquifer. Another expected outcome of the remedy is to prevent unacceptable risks to potential human who may come in contact with sediments at and around Sinking Pond or the North Lagoon Wetland. Sinking Pond and North Lagoon Wetland remedial goals consistent with recreational use and ecological exposures will be achieved immediately upon removal, covering, or capping of impacted sediments, at the close of construction activities. It is anticipated that the improvements in the ARS discharge system will result in improvements in water quality and habitat conditions in Sinking Pond. It is anticipated that the selected remedy may also provide socio-economic and community revitalization impacts such as reduced water supply costs, increased tax revenues due to redevelopment, and enhanced human uses of ecological resources.

a. Cleanup Levels

1. Interim Ground Water Cleanup Levels

Interim cleanup levels have been established in ground water for all Site-related[7] chemicals of concern identified in the Public Health Risk Assessment for the Site which were found to pose an unacceptable risk to either public health or the environment or which were found to exceed an ARAR. Interim cleanup levels have been set based on the ARARs [e.g., non-zero Drinking Water Maximum Contaminant Level Goals (MCLGs), MCLs, and Massachusetts MCLs] as available, or other suitable criteria described below. 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 Interim Ground Water Cleanup Levels identified in the ROD, ARARs, and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on all residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by all chemicals of concern (including but not limited to the chemicals of concern identified in this section of the ROD) via ingestion, dermal contact, and inhalation of VOCs from domestic water use. If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the

7 Because some issues remain unresolved regarding whether or not certain contaminants are site-related or whether background levels exceed ARARs or risk-based cleanup levels, as part of pre-design, an evaluation will be conducted to resolve these issues. Should contaminants be determined by EPA to be non-site related or should background levels exceed ARARs/risk-based levels, the cleanup levels will be revised to reflect this.

remedial action shall continue until either protective levels are achieved, and are not exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective or is modified. These protective residual levels shall constitute the final cleanup levels for this ROD and shall be considered performance standards for this remedial action.

Because the aquifer under the Site is classified as a high-yield aquifer within an approved Zone 2 (i.e., a GW-1 aquifer), which is a source of drinking water, MCLs and non-zero MCLGs, established under the Safe Drinking Water Act and MMCLs established by MADEP are ARARs. Groundwater at the Site contributes to an aquifer that is presently used as a community drinking water supply and it is probable that the aquifer will continue to be used as a drinking water supply in the future. Thus, attainment of federal and state drinking water standards shall be a requirement of the groundwater remedy.

Interim cleanup levels for known, probable, and possible carcinogenic chemicals of concern (Classes A, B, and C) have been established to protect against potential carcinogenic effects and to conform with ARARs. Because the MCLGs for Class A and B compounds are set at zero and are thus not suitable for use as interim cleanup levels, MCLs have been selected as the interim cleanup levels for these Classes of chemicals. Because the MCLGs for the Class C compounds are greater than zero, and can readily be confirmed, MCLGs have been selected as the interim cleanup levels for Class C chemicals of concern.

Interim cleanup levels for Class D and E chemicals of concern (not classified, and no evidence of carcinogenicity) have been established to protect against potential non-carcinogenic effects and to conform with ARARs. Because the MCLGs for these Classes are greater that zero and can readily be confirmed, MCLGs have been selected as the interim cleanup levels for these classes of chemicals of concern.

Because manganese and nickel do not have either a federal or state standard yet they do have a federally established Health Advisory, the Health Advisory concentrations were considered as the basis for the interim groundwater cleanup level for these compounds. In the case of manganese, it is possible that naturally occurring levels of manganese in the aquifer may be in excess of the Health Advisory for manganese. Thus, as part of the remedial design, naturally occurring levels of manganese in the aquifer will be further investigated and in the event that they are determined to exceed the Health Advisory, then consideration will be given to the naturally occurring concentrations of manganese in the aquifer in identifying an appropriate groundwater cleanup level.

An interim groundwater cleanup level for methyl tert-butyl ether (MTBE) was established based on a concentration corresponding to an excess cancer risk of 1 E-06. While the same rationale was used for bis (2-chloroethyl) ether, because the resulting value was below the level that can reliably be quantitated, the practical quantitation limit was adopted as the interim groundwater cleanup level for bis (2-chloroethyl) ether.

Table L-4 summarizes the Interim Cleanup Levels for carcinogenic and non-carcinogenic chemicals of concern identified in ground water. Because a Site-specific risk assessment will be performed on all residual groundwater contamination at the completion of the remedial action to evaluate cumulative risk and to determine whether the remedial action is protective, overall, the groundwater remedy is viewed as having long-term protectiveness. All Interim Groundwater Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy and the protective levels determined as a consequence of the risk assessment of residual contamination, must be met at the completion of the remedial action at the points of compliance. At this Site, Interim Cleanup Levels, based on annual average concentrations for each well monitored, must be met throughout the contaminated groundwater plume. Because waste has been left in place, the point of compliance for groundwater cleanup levels is to the edge of the waste management unit(s). EPA has estimated that the Interim Cleanup levels will be obtained within 23 to 26 years after implementation of the Operable Unit Three groundwater treatment component.

2. Sediment Cleanup Levels

Sinking Pond and North Lagoon Wetland are located within on-Site areas that are partially fenced, limiting current access and exposures. The bordering areas are residential (to the west, north, and east) and industrial (to the south and northeast). EPA believes that the most likely future land uses for the Site are residential/recreational, educational, or light commercial based on a Preliminary Reuse Assessment conducted for the Site. Unacceptable risks to potential recreational receptors were identified and attributed to arsenic in sediments in Sinking Pond and North Lagoon Wetland and sediment cleanup levels have been established to protect potential human receptors. Unacceptable risks to the environment were also identified and attributed to arsenic in portions of Sinking Pond and arsenic and manganese in North Lagoon Wetland. Sediment cleanup levels, protective of the environment, have also been established for these areas.

A risk-based cleanup level for arsenic protective of human health was identified based on a 1E-06 excess cancer risk considering incidental ingestion and dermal contact with sediments by a recreational receptor as described in Table A-5 of Appendix A of the FS. However, because the value thus described was found to be less than the background arsenic value obtained from the reference locations, the maximum background values for arsenic in sediments obtained from reference wetland #2 and from White Pond were used as the sediment cleanup levels for North Lagoon Wetland and Sinking Pond, respectively 28 mg/kg and 42 mg/kg. Cleanup of sediments to these values will provide public health protection as the RME excess cancer risks for a recreational user should not exceed 2×10^{-5} and the potential for adverse non-carcinogenic effects should be below levels of concern. The sediment cleanup levels are presented in Tables

L-5 and L-6. For the North Lagoon Wetland, the manganese cleanup level (2,030 mg/kg) corresponds to a risk-based concentration, protective of ecological exposures. These sediment cleanup levels must be met at the completion of the remedial action at the points of compliance. For the North Lagoon Wetland, compliance with the identified sediment cleanup level will be for the biologically-active interval (i.e., top one foot) of the entire wetland area since sediments in this wetland are consistently covered by less than 24 inches of standing water and sediments are accessible to both humans and ecological receptors.

For human exposures in Sinking Pond, compliance with the identified final cleanup level for arsenic (42 mg/kg) is for accessible sediments, that is, near shore-line sediments including sediments that are submerged by no more than 24 inches of water and which lie in the inlet to the pond, on the western edge of the pond (Area SPBK-1), or on the southwestern edge of the pond (Area SPBK-2). For ecological receptors, the area of compliance includes the biologically-active interval (i.e., top one foot) above the thermocline which includes a band around the entire perimeter of the pond with water depths up to about 12 feet, the measured depth of the thermocline in late summer. The portions of this area with flat or shallow slopes are likely to be the most biologically-important areas and include the inlet and Areas SPBK-1 through SPBK-4.

The short-term goal for the most biologically active areas of Sinking Pond (the inlet and areas where the ground slope is shallow) is to remediate areas with arsenic greater than 730 mg/kg (the lowest arsenic concentration at which toxicity was observed in sediment toxicity testing); or where any of the four COCs (arsenic, copper, iron and manganese) exceeds an effects-based benchmark [Probable Effects Concentration (PEC) or Severe Effects Level (SEL), see Table G-12 for the PEC and SEL values]. The short-term goal for sediments in other areas of the pond that are covered by less than 12 feet of water is to identify areas with arsenic concentrations greater than 730 mg/kg and copper, iron, or manganese above an effects-based benchmark, and then evaluate the need to remediate such areas based on risks, feasibility, and implementability.

Compliance with the cleanup levels will be demonstrated by confirmatory sampling. These sediment cleanup levels attain EPA's risk management goal for remedial actions and have been determined by EPA to be protective of human health and the environment.

3. Updated Assessments

EPA's new Cancer Guidelines and Supplemental Guidance (March 2005) will be used as the basis for EPA's analysis of all new carcinogenicity risk assessments. If updated carcinogenicity risk assessments become available, EPA will determine whether an evaluation should be conducted as part of the remedial design to assess whether adjustments to the target cleanup levels for this remedial action are needed in order for this remedy to remain protective of human health.

M. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the W. R. Grace Superfund Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, will comply with ARARs and is cost effective. In addition, the selected remedy utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable, and satisfies the statutory preference for treatment that permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element.

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

The remedy at this Site will adequately protect human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through treatment, engineering controls and/or institutional controls. More specifically, contaminated groundwater will be extracted and treated prior to discharge or infiltration. Remaining low level residual contamination will be addressed through Monitored Natural Attenuation. Sediment in the North Lagoon Wetland and Sinking Pond will be addressed by excavation, and either off-Site disposal or on-Site consolidation. Institutional controls will be used to prevent unacceptable exposures to contaminated groundwater and will also be used to restrict the use of those areas where sediment waste remains on-Site should that be determined to be an acceptable option during design.

The selected remedy will reduce potential human health risks such that risks will not exceed EPA's acceptable risk range of 10^{-4} to 10^{-6} for incremental carcinogenic risk and the remedy will reduce the potential for adverse non-cancer health effects. The remedy will reduce potential human health risk levels to protective ARARs levels, i.e., the remedy will comply with ARARs and To Be Considered criteria. Ecological risks from arsenic in Sinking Pond and the North Lagoon Wetland and from manganese in the North Lagoon Wetland will be addressed by excavation and either off-Site or on-Site consolidation and/or capping). Implementation of the selected remedy will not pose any unacceptable short-term risks or cause any cross-media impacts.

At the time that the ARAR-based Interim Ground Water Cleanup Levels identified in the ROD, ARARs, newly promulgated ARARs, and modified ARARs that call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedy is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by residential use of untreated groundwater and resulting exposures via ingestion, dermal contact and inhalation and use of groundwater as a source of irrigation water and/or as a source of water for swimming pools with exposures via incidental ingestion and dermal contact.

If, after review of the risk assessment, the remedy is not determined to be protective by EPA, the remedial action shall continue until protective levels are achieved and have not been exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective. 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 along with all other chemical–specific ARARs

2. The Selected Remedy Complies With ARARs

The selected remedy will comply with all federal and any more stringent state ARARs that pertain to the Site. See the tables in Appendix C for a list of all ARARs and To Be Considered requirements for the selected remedy.

3. The Selected Remedy is Cost-Effective

In the Lead Agency's judgment, the selected remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all federal and any more stringent ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria -- long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The overall effectiveness of each alternative then was compared to the alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent.

For groundwater, EPA has determined that the Active Remediation Alternative is cost effective as it meets both threshold criteria and is reasonable given the relationship between the overall effectiveness afforded by the other alternative and cost compared to other available options. In evaluating the differences between the Limited Action Alternative and the Active remediation alternative, the decisive factors were that the Active Remediation Alternative provides greater reduction in toxicity, mobility, and volume, through treatment in a shorter time frame. Finally, while the Limited Action Alternative has marginally fewer short-term impacts than the Active Remediation Alternative on the community, the difference is not significant given that these types of impacts are typical during cleanup operations and can be minimized or eliminated through routine, standard operating procedures.

For the sediment cleanups in the North Lagoon Wetlands and Sinking Pond, EPA has determined that the Active Remediation Alternatives are cost effective as they meet both threshold criteria and are reasonable given the relationship between the overall effectiveness afforded by the other alternative and cost compared to other available options. In evaluating the differences between the No Action Alternatives and the Active Remediation Alternatives, the decisive factors were that the Active Remediation Alternatives provide greater long-term protectiveness and permanence and unlike the No Action Alternatives, reduce toxicity, mobility, and volume, although not through treatment. Finally, while the No Action Alternatives have no short-term impacts when compared with the Active Remediation Alternatives, the difference is not significant given that the types of impacts from the Active Remediation Alternatives are typical during cleanup operations and can be minimized or eliminated through routine, standard operating procedures.

4. 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 remedy for groundwater provides the greatest long-term effectiveness and permanence by treating the remaining highest levels of contamination in groundwater. The selected remedy for groundwater also provides the greatest reduction in toxicity, mobility, and volume through treatment. The selected groundwater remedy would reduce mobility through pumping of the contaminated groundwater while treatment would reduce the volume and toxicity of the contaminants. The selected remedy has acceptable short-term impacts to the community and workers that can be minimized or eliminated through routine, standard operating procedures. The selected remedy is implementable (although there will be some obstacles to overcome in the Northeast Area) and the cost is reasonable given the overall effectiveness of this remedy. The selected remedy also has significant support from the community and the Commonwealth of Massachusetts. The Limited Action Alternative, on the other hand, was actively opposed by those in the community that provided input on remedy selection. This leads to the conclusion that the selected remedy provides the best balance of trade-offs among the alternatives. The selected remedy for groundwater provides the greatest long-term effectiveness and permanence by treating the remaining highest levels of contamination in groundwater.

The selected remedy for sediments also provides the greatest reduction in toxicity, mobility, and volume through treatment. The selected sediment remedy would reduce mobility, volume and toxicity (although not by treatment) through excavation and either on-Site consolidation or off-Site disposal of the contaminants. The selected sediment remedy has acceptable short-term impacts to the community and workers that can be minimized or eliminated through routine, standard operating procedures. The selected remedy is implementable (although there will be some obstacles to overcome in the wetland areas) and the cost is reasonable given the overall effectiveness of this remedy. The selected remedy also has significant support from the community when compared to the No Action Alternative. This leads to the conclusion that the selected remedy for sediment provides the best balance of trade-offs among the alternatives.

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

The principal elements of the selected remedy are management of migration of the groundwater and source control of the sediments in the North Lagoon Wetland and Sinking Pond. These elements address the primary threats at the Site: risks to human health from groundwater and risks to human health and ecological receptors from sediment. The selected remedy satisfies the statutory preference for treatment as a principal element by using treatment to address contaminated groundwater.

6. Five-Year Reviews of the Selected Remedy are Required.

Because this remedy will result in hazardous substances remaining on-Site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

N. DOCUMENTATION OF NO SIGNIFICANT CHANGES

In accordance with EPA Guidance 540-R-98-031, OSWER 9200.1-23.P, entitled: *A Guide To Preparing Superfund Proposed Plans, Records of Decision and Other Remedy Selection Decision Documents*, dated July 1999, and NCP 300.430(f)(3)(ii) documentation in the ROD is needed for "Significant changes that could have been reasonably anticipated based on the information available to the public."

July 2005 Proposed Plan, OU 3

EPA presented a Proposed Plan (preferred alternatives) for the remediation of groundwater contamination (OU 3) for the Site in July 2005, which included the following components:

- Cleanup of contaminated sediments and soils posing an unacceptable risk to human health and/or the environment in Sinking Pond and the North Lagoon Wetlands.

- Extraction and treatment of groundwater contamination in the Southeast and Southwest Industrial Landfill areas on the Grace property. Construction of an approximately 200 gallon per minute groundwater pump and treatment system. Treatment processes for extracted groundwater would include air stripping, activated carbon (air treatment), and metals precipitation prior to surface water discharge to Sinking Pond.

- Monitored natural attenuation and /or enhanced flushing of areas of groundwater contamination not captured by the extraction system.

- Institutional Controls such as deed restrictions and/or local Town ordinance to prevent unacceptable exposures to contaminated groundwater until cleanup levels are met and to protect against unacceptable future exposures to any wastes left in place on-Site.

- Long-term groundwater, surface water, and sediment monitoring, and periodic five-year reviews of the remedy.

In response to comments from the community, the Town and the State, EPA has modified a component of the Preferred Alternative which could have been reasonably anticipated by the public based on information in the RI/FS and the July 2005 Proposed Plan (e.g., a change in the Preferred Alternative's cost, timing, level of performance, or ARARs). Instead of relying on monitored natural attenuation for groundwater in the Northeast Area of the Site, EPA has added targeted active pumping in this area. This will include extracting groundwater from approximately three to five bedrock extraction wells in the part of the plume with VDC concentrations >200 µg/L (based on the 2001 plume map) at a combined rate of approximately 50 gpm; treatment of that water either at the new groundwater treatment system to be located near the Industrial Landfill or near the extraction wells; and discharge of the treated water via reinjection or nearby infiltration basins. Because this change only modestly increases the performance of the proposed remedy by increasing the number of extraction wells and quantity of water to be treated, a possibility discussed a great length in the FS, additional public comment is not warranted. The increase in cost is also not significant. EPA Guidance 540-R-98-031 and NCP 300.430(f)(3)(ii), further states, "Additional public notice or comment on this type of change is not required..."

O. STATE ROLE

The Massachusetts Department of Environmental Protection – Bureau of Waste Site Cleanup (MADEP) has reviewed the various alternatives and has indicated its support for the selected remedy. The MADEP has also reviewed the Public Review Draft Remedial Investigation, Public Review Draft Risk Assessments and Public Review Draft Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State environmental and facility siting laws and regulations.

The Commonwealth of Massachusetts concurs with EPA's selected remedy for Operable Unit Three at the W. R. Grace (Acton Plant) Superfund Site located in the Towns of Acton and Concord, Massachusetts. A copy of the of the State's concurrence letter is attached as Appendix A.

PART 3: THE RESPONSIVENESS SUMMARY

There has been extensive community participation during the Remedial Investigation/Feasibility Study process for the W. R. Grace (Acton Plant) Superfund Site Operable Unit 3. A more detailed summary of community coordination and involvement is outlined in Section C of Part 2 of the ROD, Community Participation.

EPA released its Proposed Plan to the public on July 8, 2005 and published a notice of availability of the Proposed Plan and Administrative Record in the Acton Beacon and the Boston Globe's Northwest Weekly Edition on July 14, 2005. EPA also held a public information session on July 19, 2005 at Town Hall in Acton, Massachusetts and a Public Hearing on August 4, 2005, also at Acton Town Hall. Transcripts were created for both meetings and have been made part of the Administrative Record for this Record of Decision. During the comment period, the deadline for written comments was extended to 60 days after multiple requests. In addition to the oral comments, numerous written comments were provided on the Proposed Plan. The full text of all written and oral comments received during the comment period has been included in the Administrative Record. Outlined below is a summary of significant comments received from the public and other interested parties during the public comment period and EPA's response to those comments. Similar comments have been summarized and grouped together and technical and legal issues have been divided into a number of general categories.

I: Summary of Major Issues and Concerns

The predominant concern expressed by the community during the public comment period centered on how the Proposed Plan addressed groundwater contamination in one specific part of the site, the Northeast Area. This section provides a general response to this overriding concern, while Section II below outlines, in more detail, responses to technical and legal issues raised during the comment period.

As stated in the ROD, the groundwater component of the remedy is active remediation (GW-3), which consists of the following: (1) groundwater extraction and treatment; (2) monitored natural attenuation (MNA) for areas outside the treatment zone; and (3) institutional controls. Because groundwater extraction wells were not included in all areas of the Site, EPA received a number of comments regarding the reliance on MNA to address groundwater contaminants in areas where extraction wells were not proposed. A response to the specific comments concerning EPA's MNA Policy is included later in this summary.

a. EPA has required active pump and treat for twenty years.

Many commenters expressed concern that EPA is ignoring the problem in the Northeast Area. In fact, activities required by EPA have actively addressed this area over a very long time. One of the most important aspects of EPA's proposed remedy was that the focus of this operable unit was not to design and implement a groundwater remedy at a site where contamination had not yet been addressed. Rather, the focus was to review all previous groundwater remediation activities that have taken place to date to determine whether additional actions are warranted to maximize the effectiveness of prior groundwater clean up activities. This is because twenty years of active treatment have taken place at all areas of the site, including the Northeast Area, through the operation of the Aquifer Restoration System (ARS). A critical component of the ARS was to address all known sources of contamination on the Grace Property through active pumping and treating of groundwater contamination. The ARS was designed to address all of these source areas including the Former Lagoon Area that was the source of the contamination in the Northeast Area.

The basic premise of groundwater cleanups is that remediation should first focus on eliminating the source of the contamination by removing the source through excavation, capping, active treatment etc. This action was taken as a component of Operable Unit One that required contaminated soil and sediment be removed from the Former Lagoon Area. The ARS then focused the groundwater clean up on the most contaminated area of groundwater as it moved toward the Northeast Area. As a result, active groundwater treatment has occurred for many years in the northeast with the emphasis being placed on addressing the area of the plume with the highest levels of contamination near the source area. All that remains at this point in time is the relatively low level *residual* contamination in an area that has been cut off from the source area. If these activities had not taken place, the levels of contamination approaching the Town's well would be expected to be much higher than what is seen today.

b. Role of Monitored Natural Attenuation as a part of groundwater cleanup

MNA is a component of the active remediation alternative. It is not a separate alternative. MNA was included in the active remediation alternative because extraction systems that remediate groundwater do not generally treat the entire groundwater contaminant plume(s). Rather, these systems are designed to actively treat only those portions of the plume(s) where contaminant concentrations prevent the restoration of an aquifer in a reasonable period of time. A number of factors are considered when deciding how reasonable the restoration timeframe is or how extensive the extraction system should be. In almost all cases, some portion of the groundwater contaminant plume will be addressed via MNA regardless of site risk. This is because most groundwater plumes are too widespread to be cost-effectively and/or practically managed through extraction and treatment alone. In most cases, MNA is appropriate to address the lower levels of contamination that remain here either outside the containment area or after other active groundwater remediation activities have been completed.

In recognition of the number of comments concerning impacts to the Acton Water District's School Street wells, EPA has modified the conceptual design to include extraction wells in the Northeast Area. Details regarding this modified conceptual design are presented in the ROD. Responses to additional comments regarding groundwater remediation are included below.

II: Responses to Technical and Legal Issues

A. Comments/Questions Regarding Remedy Selection Process:

A.1. Multiple requests were made for extensions to the 30-day public comment period.

EPA Response: The comment period, which was originally due to end on August 9' 2005, was extended by 30 days to September 8, 2005 in response to requests by the community.

A.2 Several questions were raised regarding the process by which EPA arrived at its Proposed Plan and how the Public Comment Draft Feasibility Study was prepared.

EPA Response: The process by which EPA arrived at its Proposed Plan followed EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (OSWER Directive 9355.3-01, October 1988). The Draft Feasibility Study was prepared by GeoTrans Inc., consultant to W.R. Grace, under the oversight of EPA. This approach is consistent with other CERCLA sites where the potentially responsible party (PRP) has entered into a legal agreement with EPA to perform the work. In the case of the Grace site, a Statement of Work for the RI/FS was incorporated into the Consent Decree.

A.3 Some comments expressed concern regarding the range of alternatives presented in the Feasibility Study and their belief that it lacked detailed analyses, underlying assumptions, and supporting data and calculations.

EPA Response: The Feasibility Study (FS) contains sufficient information to support the range of alternatives presented in the FS. All data collected that was considered or relied upon by EPA is included as part of the Administrative Record for the Site. EPA would like to emphasize that the role of the FS is to collect sufficient information on each cleanup approach so that a fair and balanced comparison of the alternatives can be developed. Groundwater data has been collected, analyzed and/or submitted to EPA for over twenty years. In addition, groundwater and sediments have been studied for over five years. An FS should not be confused with an engineering design document that includes a much higher level of detail. Following the issuance of this ROD, pre-design studies will be performed on several components of the selected remedy to verify the assumptions made in the FS. The results of these studies will then be incorporated into the various design documents that follow and will be made available to the public following EPA approval.

A.4 Several commenters requested that EPA alter its remedy selection process. In addition, several requests were made for EPA to continue to work collaboratively with local stakeholders to develop a cleanup plan.

EPA Response: EPA has worked collaboratively with local stakeholders to develop a cleanup plan. Since 1998, EPA has held over 15 meetings and presented numerous fact sheets regarding the work performed as part of the RI/FS. In addition, EPA has modified the conceptual design to include extraction wells in the Northeast Area based on community concerns. EPA will continue to work with the local stakeholders regarding the implementation of this plan. However, the decision regarding remedy selection of response actions is the final responsibility of EPA. Decisions regarding future involvement with stakeholders will be made in accordance with CERCLA and the NCP.

A.5 One commenter asked EPA to postpone its Record of Decision and/or move forward on certain parts of the remedy without rendering a decision regarding areas where community concerns were raised.

EPA Response: There is no basis to delay the issuance of a ROD. Sufficient technical data exist to support this remedy decision.

A.6 One commenter requested that EPA make changes to the proposed clean up plan should the remedy not perform as expected.

EPA Response: Periodic Five-year Reviews will be preformed at the site to determine if the remedy is still protective of human health and the environment and to ensure that is functioning as it was designed. If the Five-year Reviews determine that the remedy is not protective or not functioning as intended, the remedy would have to be re-evaluated and/or redesigned. A major change in the remedy would be documented through a ROD Amendment or Explanation of Significant Differences.

A.7 One commenter asked that minor changes be made to the remedial action objectives specified in the Feasibility Study. One commenter asked that additional tables, maps, etc. be prepared and included in the FS and that other information be included. Also a number of editorial comments were provided on the FS.

EPA Response: The FS was written in accordance with appropriate guidance. The July 2005 FS contained sufficient information and supporting data as it was written to support the remedial alternatives as outlined in this Record of Decision. There is no need to revise the FS because these comments do not alter the conclusions of this report and, in some cases, conflict with EPA guidance.

A.8 Some commenters requested that public information sessions on the Proposed Plan also be held in the towns of Concord and Billerica, Massachusetts.

EPA Response: There is no need to hold public information sessions regarding the Proposed Plan in other towns based on the geographic location of the site. The Proposed Plan was mailed to numerous parties that have expressed interest in this site in the past, including to residents of Concord and Billerica. The notice in the Boston Globe and the

Acton Beacon also served to notify other interested parties regarding the proposed plan outside the Acton community. The Proposed Plan is a public document that is accessible to other communities should they wish to review it either at the local repository or on the internet. Finally, it is important to note that no unacceptable risks were identified for surface water in the Assabet River and its tributary, Fort Pond Brook, adjacent to the site, therefore there is no reason to believe that site-related risks exist in the Concord River in Billerica, approximately 15 miles downstream.

A.9 Multiple requests were made for a copy of ATSDR's draft Public Health Assessment, noting its potential impact on EPA's cleanup decision-making. W. R. Grace commented that the ATSDR report is not necessary for the Superfund remedial decision process.

EPA Response: ATSDR is a separate agency from EPA. EPA has provided the community's request to it. Further inquiries should be made to ATSDR directly.

A.10 The town asked what the planned level of public participation will be for development of various design documents and monitoring plans for implementation of the remedy and at other decision points during the project.

EPA Response: As was the case with the RI/FS process, EPA will continue to keep the community informed of the progress of the remedy. However, unlike the remedy selection process, EPA does not expect the same level of community involvement regarding the review of the various documents necessary to implement the remedy. EPA will however, consult with the community on matters that may directly affect them (e.g., truck traffic).

A.11 Several comments were received asking EPA to provide additional documents regarding communications between EPA and Grace on the FS.

EPA Response: While these documents are not part of the administrative record for this remedy decision, these documents were provided to the requester.

B. General Comments/Questions Regarding Groundwater Remediation:

B.1 Several comments were received in support of the proposed treatment processes, including air stripping, carbon adsorption, and metals precipitation.

EPA Response: Comment noted.

B.2 Several commenters stressed the need for the cleanup to restore groundwater to a "fully usable condition".

EPA Response: The term "fully usable condition" is taken from a settlement (Consent Decree) between the United States and W. R. Grace in 1980. Both parties to this Decree are in agreement as to what "fully usable condition" means in terms of the settlement and also in terms of the cleanup required in this ROD. Generally speaking, the cleanup required in the Consent Decree and presented in this ROD is expected to restore groundwater to meet ARARs as well as meet protectiveness requirements. This means that groundwater will be restored to a level that is protective in accordance with state and federal regulations such as Safe Drinking Water Act, taking into account site-specific conditions.

B.3 Several concerns were raised regarding the risks from arsenic contamination in groundwater and the need for additional data. One commenter requested additional backup data regarding the potential mobilization of arsenic due to VOC contamination in areas where additional treatment is not planned, specifically areas that were being addressed by the Aquifer Restoration System. In addition, another commenter expressed concern that modeling of arsenic was not conducted in the Northeast Area. W. R. Grace commented that data demonstrate that inorganics will be addressed over time without additional treatment.

<u>EPA Response:</u> The data collected as part of the RI/FS are sufficient to support the conclusion that extraction wells do not need to be placed in every part of the site where arsenic levels are elevated. Rather, extraction wells are only included in those areas where existing VOC concentrations continue to create conditions that favor the dissolution and mobilization of arsenic present in naturally occurring arsenic-bearing minerals beneath the site.

As VOC concentrations continue to decrease Site-wide by extraction/treatment and/or natural attenuation, aquifer geochemical conditions will become less favorable for the dissolution and mobilization of metals. Biological oxidation reaction rates will slow, decreasing the balancing reduction reactions of inorganic species like iron and manganese. In addition, infiltrated precipitation and influx of oxidizing groundwater will make the unconsolidated aquifer more oxidizing, further limiting dissolution of inorganic species. The long-term monitoring program will be designed to check for these trends by monitoring for oxidation-reduction potential (ORP) and inorganic species as well as the VOCs of concern at the site.

B.4 A commenter noted that the FS stated that contaminated water remaining in the area of the former Blowdown Pit is contained and is being captured by the ARS, and asked, why, therefore, EPA is proposing to allow the removal of the ARS in this area.

<u>EPA Response:</u> The former Blowdown Pit area is located within the Former Lagoon Area that was evaluated as one of the six main geographic areas of the site. For the Former Lagoon Area, the FS Report modeled two pumping scenarios with capture zones as shown on Figure 6-1 of the FS Report. One scenario involved a single new well pumping at 45 gallons per minute (gpm), and another, more extensive scenario, included two existing ARS wells south of the MBTA rail line plus three new wells, pumping at a

combined rate of approximately 100 gpm. The model predictions indicated that the time to reach MCLs for VDC and/or benzene in the north lagoon area (including the former Blowdown Pit area) would be approximately 12 years under either of the pumping scenarios. When this area was modeled with no pumping at all, the estimated time frame was 13 years. These results indicate that continuation of pumping in this area would not significantly reduce the time required for groundwater in the north lagoon area to meet remedial action objectives.

B.5 The town expressed the need for the remedy to protect and restore the aquifer in the vicinity of well WRG-3. The Acton Water District offered to further communicate and coordinate regarding well WRG-3 in an effort to resolve issues for this future water supply well. The town requested that additional monitoring and investigations be conducted, as necessary to ensure that there are no adverse impacts from organic and inorganic contamination on the aquifer in the vicinity of WRG-3 from all waste areas on the site. In addition, a comment was received requesting that the cleanup plan include measures to protect WRG-3 in the future should this potential drinking water source be used in the future. W.R. Grace provided information regarding recent modeling efforts for WRG-3 conducted at the request of the Acton Water District.

EPA Response: Water in the vicinity of WRG-3 no longer shows elevated levels of groundwater contaminants as evidenced by the data and maps shown on Figures 1-3 through 1-6 of the FS report. EPA acknowledges the Town's desire to convert this well into a water supply source. The modeling efforts for WRG-3 that were performed by W.R. Grace in response to AWD's request are described in the ROD. Under the selected remedy, none of the former source areas, nor any plumes of contaminated groundwater, are within the capture zone of WRG-3 when it is pumped at the AWD-proposed rate. The ROD includes provisions for additional monitoring and modeling efforts regarding WRG-3, if necessary.

B.6 A number of questions were raised regarding the groundwater flow model, its performance, and reliability. A request was made for additional documentation regarding the statistical analysis of the model, its validity, and past performance of similar models.

EPA Response: The groundwater flow and contaminant transport model used in the FS was developed using site- specific data and assumptions based on field observations. Appendix A of the RI report includes a detailed explanation of the calibration and verification of the groundwater flow model, and Appendix B of the FS report includes the same information for the contaminant transport model. The models were used as a tool in order to estimate location, number, and pumping rates of extraction wells and to compare remediation times between different alternatives. The model-calculated cleanup times were used as relative numbers rather than absolute numbers because of the generally-accepted complexity and imprecision associated with contaminant transport modeling at any site.

The models both use codes that are publicly available and widely accepted in the regulatory community. The models were subjected to review by personnel from EPA, MADEP, and consultants to both agencies. Several comment/response cycles occurred as the models were developed, and meetings were held to resolve issues. The model is a reasonable representation of the groundwater flow system at the site and adequate to simulate the transport of organic contaminants for comparisons of cleanup alternatives.

B.7 A commenter requested that if there are still sources of groundwater contamination (such as the Industrial Landfill) these sources should be eliminated or groundwater treatment should continue to capture and contain contamination.

EPA Response: The sources of groundwater contamination were addressed by previous actions including the Operable Unit 1 and 2 remedies and, to a degree, the operation of the ARS. Contaminated materials from areas other than the Industrial Landfill were excavated and either taken off-site for disposal by incineration or treated and disposed of in the Industrial Landfill. The Industrial Landfill was then capped to essentially eliminate leaching of contaminants by infiltration or precipitation. Therefore, while contaminated materials remain on the site in the Landfill, they are no longer a source of groundwater contamination.

B.8 One commenter requested that monitoring well OSA-13B be included in treatment capture zones, since it has a benzene concentration of 55ppb, noting that this benzene concentration has been fairly consistent over the past several years and asked whether there an ongoing source at this location and whether this is outside of the current ARS capture zone.

EPA Response: OSA-13B is within the ARS capture zone. Measured benzene concentrations in groundwater have been in the range of 40 to 80 μg/L in the past several years. The screen in this well is located about 20 to 30 feet below the water table. As shown in Appendix C of the RI report, sampling from a deeper overburden monitoring well (OSA-13C) at this location between 1993 and 1998 did not detect VOCs. Sampling from a shallower overburden monitoring well (OSA-13A) at this location showed that benzene concentrations declined by over two orders of magnitude between 1997 and 2002. VDC and vinyl chloride concentrations in OSA-13B fell to undetectable levels in 1997 and have remained there. Benzene concentrations appear to have decreased slightly since the mid 1990s, but remain elevated at this time.

The ARS extraction well that captures the contamination in the overburden groundwater in this area is SLGP-R. The measured benzene concentrations in this well have been <1 μg/L. The much lower concentration of benzene in the extraction well and the absence of VOCs in the other monitoring wells at this location suggest that the plume of benzene is relatively small. Benzene, toluene, ethylbenzene, and xylenes (all of which have been detected in OSA-13B) are more readily biodegraded than chlorinated VOCs such as VDC and are not expected to travel great distances in the subsurface. Nonetheless, the relative stability of the concentrations over the last several years suggests that continued monitoring would be prudent. This well will be included in the long-term monitoring program at the site and, if the contamination is persistent, its presence will be noted in the Five-year Reviews and may become the subject of future investigative or remedial activities.

B.9 A commenter asked for clarification on the correct maximum on-site benzene concentration in the RI/FS.

EPA Response: The Remedial Investigation Report Appendix B, Table B-1 is a summary of compounds detected in groundwater between August 2000 and June 2002 as noted in the table title. The data presented in Appendix E of the RI includes results from 1999, 2000, 2001, and 2002. The maximum benzene concentration of 6000 μg/L that was cited in FS Table 1-2 entitled *Summary of Indicator Compounds Detected in Groundwater, September 1999 through June 2002* was from a sample from LF-06C collected in September 1999. When the database was queried to generate Table B-1, this value was not included because it was reported prior to the date range queried. Regarding the RI text reference for benzene concentrations at the LF-06 cluster on page 3-11, this section of text is discussing data collected between July 2001 and June 2002 as indicated in the first sentence of Section 3.3.3. Examination of Appendix E shows that the maximum benzene concentration detected in LF-06 cluster wells within this date range was 3900 μg/L that is consistent with the text. Similarly, for the text on page 4-16, the text cites the maximum concentration for the most recent round of data used in the RI (the 3900 μg/L value, for LF-06C sampled in April 2002), and then goes on to discuss earlier results and trends.

B.10 One comment was received asking that chemical oxidation or reductive dechlorination be fully evaluated for the Site.

EPA Response: In-situ chemical oxidation was evaluated in section 3.0, Identification and Screening of Applicable Technologies, of the July 2005 FS. Chemical oxidation presented both implementability and effectiveness issues. In particular, the amount of wells (over 1,000) needed to effectively distribute the oxidant throughout the aquifer at the Site was unacceptable. Naturally occurring reductive dechlorination is currently taking place at the site, as evidenced by the presence of vinyl chloride which is the first dechlorination breakdown product of VDC. This reductive dechlorination contributes to the natural attenuation of the VDC and vinyl chloride (which can also be dechlorinated to ethene). Engineered enhancements to the reductive dechlorination process were not explicitly evaluated in the FS. However, the same limitations identified in the FS for in situ chemical oxidation or bioaugmentation (e.g., need to install injection wells over a very large area, very high cost) would also apply to injection of enhancements to attempt to accelerate the reductive chlorination process.

C. Comments/Questions Regarding Groundwater in the Northeast Area

C.1 Several people expressed concern regarding the proposal's lack of active extraction and treatment of groundwater in the northeast plume area. These comments discussed protectiveness, the preference for mass reduction, the validity of implementability concerns outlined in the FS, and the need for treatment in this area, and provided its own evaluation relative to EPA's nine criteria for remedy selection. The town also expressed the belief that EPA's proposal for the Northeast Area was inconsistent with the National Contingency Plan and EPA guidance documents[1]. Several commenters suggested that the remedy for the Northeast Area should include extraction and treatment with the goal of reducing the timeframe where contaminated groundwater is reaching the town's supply wells and should be designed to minimize adverse impacts to the town's water supply. W.R. Grace provided comments in support of the proposed remedy for the northeast, noting that the benefit of treatment in the Northeast Area is not proportional to the cost and that the source of contamination to the Northeast Area has been cut off for some time and that levels of contaminants have been declining. One commenter expressed concern that the plume in the Northeast Area is not adequately characterized in areal and vertical extent, expressed concerns about contamination below analytical detection limits, and risks from "emerging contaminants" not analyzed. Another commenter stated that VDC appears to be pooling at the base of the groundwater and not moving with the groundwater flow.

EPA Response: The remedy presented in the Proposed Plan is consistent with the NCP and CERCLA. As mentioned previously, the remedy proposed for groundwater is active remediation (pumping and treatment of contaminated groundwater with MNA), not MNA alone. The evaluation of the nine criteria provided by the commenter is inconsistent with the NCP in several respects. The principal problem with this evaluation is that it evaluates *one* component of the remedy, MNA, to EPA's nine criteria and guidance for remedy selection instead of evaluating the complete remedy for the Site with all of its components (groundwater extraction and treatment, institutional controls, MNA, groundwater disposal/discharge, etc.) against the criteria. The result is a skewed analysis of the factors EPA is required to evaluate is selecting a remedy under the NCP. As stated in the Proposed Plan, EPA compared the active remediation alternative (GW-3) to both the No Action (GW-1) and Limited Action Alternative (GW-2) using its nine criteria for remedy selection. Based on this evaluation, EPA selected the active remediation alternative as its preferred alternative.

[1] Several pages of comments were received regarding EPA's guidance on MNA attempting to point out areas where EPA's proposed remedy was inconsistent with EPA Directive # 9200.4-17P, entitled: *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* The commentor inappropriately applied this guidance by focusing only on one component of the remedy.

The Northeast Area is an area where residual contamination exists after the source to this contamination has been actively treated by twenty years of pumping. The proposal not to include extraction wells in this area was based on a number of factors including the limited impact that extraction wells would have on both the mass removal of contaminants and time it would take to achieve cleanup levels. However, in recognition of the community's concerns regarding impacts to the Town's water supply wells, EPA has modified the conceptual design to include extraction wells in the Northeast Area. It is important to note that this decision was based on the criteria of community acceptance as it applies to the active remediation alternative as well as adjustments to other criteria. The decision is no way should be construed to mean that MNA, as a component of the active remediation alternative, is not consistent with the NCP or EPA guidance.

Regarding the comment about adequate characterization of the plume in the Northeast Area, This plume is well defined areally and vertically. The plume, as defined by VDC concentrations >7 μg/L, covers a large area. The lateral extent of the plume, as shown on various figures in the RI/FS reports, was based on water level and water quality data from monitoring wells; on water quality data from sub-stream sampling in Fort Pond Brook; and on basic hydrogeologic principles. The vertical extent of the plume shown on cross-sections in the RI report was based on the same data. Plume delineation always requires a certain amount of professional judgment, even in smaller plumes, since there are never enough data points horizontally or vertically to simply draw contours with certainty. The depth of plumes, where they have reached bedrock, is most frequently undetermined, due to a variety of reasons including the typically smaller amount of flow in the deep bedrock; the expense of installing deep bedrock wells; and the uncertainty associated with groundwater flow in deep bedrock even if a number of data points are available (since flow directions are determined not only by gradients, but also by the fracture network which is extraordinarily difficult to characterize in even a small area).

The concerns about the presence of contaminants at concentrations below detection limits or "emerging contaminants" are not unique to this site. EPA's national drinking water program includes the identification of potentially harmful substances in water and the development of allowable maximum contaminant levels (MCLs) for those contaminants. The recent change in the MCL for arsenic is an example of EPA's ongoing efforts to regulate water quality for consumers of drinking water. The list of compounds that are investigated at a site, and the detection limits for those compounds, are a function of the disposal history of the site and the availability and capabilities of analytical methods. One component of the Five-year Review process is the identification of new water quality standards, the determination of their applicability to the site, and their incorporation into short- or long-term monitoring if appropriate.

Finally, regarding the concern that VDC may not be moving with groundwater flow, VDC in the dissolved phase would not pool in the aquifer. Its movement is, however, slower than the flow of groundwater due to retardation, the process by which the contaminant is first adsorbed to soil particles, then later released as less contaminated water moves through the aquifer. If VDC were present as a separate phase liquid at this site, then pooling could occur; however, it is not present in that state, so pooling will not occur.

C.2 One commenter points to a number of factors to support the request that pumping be conducted to "pull back" the contaminated plume.

EPA Response: Although EPA doe not agree with a number of the factors cited by the commenter, EPA has revised the remedy to require targeted pumping in the Northeast Area.

As a point of clarification, plumes are seldom "pulled back" very far from a given point. The capture zone for a well extends far upgradient but only a short distance downgradient. Therefore, the term "cut off" more appropriately describes the effect of an extraction well on a plume. The contaminated groundwater that is beyond the capture zone continues flowing downgradient, at a slower rate compared to the pre-extraction scenario due to the reduction in hydraulic gradient. Putting the extraction well close to the end of the plume is the obvious way to decrease the length of the plume that is not captured; however, the extraction well then reduces the amount of water that reaches the well or stream at the end of the plume, and it becomes necessary in some cases to try to site an infiltration or injection facility for the treated water in a location where it does not defeat the purpose of the extraction well yet still replenishes the stream or supply well.

C.3 One commenter asked that the groundwater model, as well as additional field data, be used to compare the fate of the plumes in the Northeast Area under various options, over time.

EPA Response: There have been over twenty years of past groundwater quality data incorporated into the three dimensional groundwater flow model which was used to help generate the July 2005 FS. As part of the selected remedy, continued long-term monitoring of groundwater at the site will be required. Future groundwater sampling data will be used to periodically update the groundwater flow model and evaluate the effectiveness and protectiveness of the remedy.

C.4 A request was made for EPA to use the maps provided by the Town during the public hearing to evaluate the potential benefit pulling back the plume from the public drinking water wells.

EPA Response: EPA has reviewed the maps provided by the Town is making its decision to provide targeted extraction in the Northeast Area.

C.5 One commenter stated that EPA failed to sufficiently address collateral issues related to the Town's water supply. In a related comment, concern was expressed that EPA did not communicate sufficiently with the water district regarding EPA's concerns regarding possible impacts to the water supply in the Northeast Area.

EPA Response: The AWD has been an active participant in all meetings and correspondence with the community over the past several years. As participants in these meetings/recepients of correspondence, the AWD had numerous opportunities to provide input to EPA. EPA has attempted to work with the AWD and the Acton Board of Health (BOH) regarding potential impacts to the School Street wells from extraction or reinjection of groundwater in the Northeast Area of the site. For example, when W.R. Grace submitted the first draft FS to EPA and MADEP in March 2005, this report was also provided to the AWD. This draft report did not include an evaluation of extraction and reinjection of groundwater for the Northeast Area. The AWD noted that if groundwater were only extracted in the Northeast Area (without reinjection) this would cause a negative impact in the water yield (decrease) to the School Street wells. To address the AWD's concerns, EPA held a meeting on April 27, 2005 with AWD, ABOH, and ACES, the community's concerns about the Northeast Area evaluation that was included in the March Draft FS. As a result of that meeting, EPA required W.R. Grace to include an evaluation of extraction and reinjection as part of the next FS submittal (the July 2005 FS). Also during the March 2005 meeting, EPA requested that the AWD provide an approximation of how much a decrease in water yield could occur without affecting the Town overall supply of drinking water. While the AWD was not able to provide this specific information, EPA directed W.R. Grace to propose a conceptual model in the July FS. The selected remedy provides for additional continued coordination with AWD during the design and implementation of the groundwater remedy, especially for the Northeast Area.

C.6 One commenter requested additional data and model depictions to support the conclusion that if the School Street wellfield were not pumped, that contaminated groundwater would not migrate beyond that point but would discharge to Fort Pond Brook.

EPA Response: Modeling results are part of the Administrative Record. If the supply wells were not pumped, contaminated groundwater would then discharge to Fort Point Brook. While some migration a short distance to the north of the well field would likely occur as the plume rose through the aquifer to reach the brook, significant movement to the north would be prevented by the flow of groundwater to the southeast and south from areas northwest and north of the brook and well field.

C.7 One comment was received regarding the term "enhanced flushing" in the Proposed Plan and asked that this term not be used to describe the treatment being conducted by the Acton Water District in the School Street Wellfield. Concern was also expressed regarding EPA's use of the statistic estimating the gallons of VDC remaining in the Northeast Area.

EPA Response: The term "enhanced flushing" was included as an acknowledgement of the influence that the School Street wells have on groundwater flow in the Northeast Area. The term has since been removed in response to this comment. Also, while the reference to the quantity of VDC remaining in the plume may not be useful to the public, it is commonly used by environmental professionals in the evaluation of contamination cleanup scenarios and is therefore included in the FS report.

C.8 One commenter questioned the assertion that Fort Pond Brook and the Assabet River serve as discharge boundaries for contaminated groundwater at the site, noting that, in the Northeast Area, contamination from the Grace property flows under and to the other side of Fort Pond Brook, (due to the pumping of an AWD public well) and that, in the case of the Assabet River, which should also serve as a discharge boundary, contamination also flows under the River to the other side, due to the pumping of an AWD public well.

EPA Response: Streams and rivers act as drains for aquifers since they usually represent the "lines" of lowest hydraulic head in an area. In the absence of a well or some other drain, a river or stream will act as a discharge boundary to groundwater. However, if a large capacity well near a river is pumped at a rate that causes the hydraulic head around the well to fall below the river elevation, the groundwater within that area is diverted to the well, and surface water from the stream or wetland seeps downward into the aquifer. Groundwater that was flowing toward the river on the opposite side from the well can no longer discharge to the river, so it flows beneath the river to the well. In this case, the river and Fort Pond Brook are no longer discharge boundaries.

D. Comments/Questions Regarding Groundwater in the Former Lagoon Area

D.1 Several people expressed concern regarding the proposal's lack of continued active extraction and treatment of groundwater in the Former Lagoon Area, including concerns regarding inorganic contamination in that area and the potential for arsenic to mobilize and re-contaminate the North Lagoon Wetland and/or Sinking Pond or other areas of the site. One commenter provided its own evaluation relative to EPA's nine criteria for remedy selection. One commenter also asked whether discharge of groundwater to Sinking Pond from the Former Lagoon Area has been measured. W.R. Grace provided comments in support of the proposed remedy for the Former Lagoon Area.

EPA Response: Without the influence of the ARS extraction wells, the groundwater in the Former Lagoon Area will flow north toward Fort Pond Brook and southeast toward the Assabet River. Some of it may be captured by the extraction wells at the Industrial Landfill, but some will flow to natural points of discharge. The residual organic contaminants in the groundwater in the Former Lagoon Area are at relatively low concentrations, and those levels will continue to decline as the water migrates through the aquifer. While the concentrations of arsenic in the Former Lagoon Area are, and may remain, elevated for some time, the VOC concentrations are anticipated to be too low to promote dissolution and mobilization of arsenic in downgradient parts of the aquifer where arsenic is not currently mobile. The arsenic that is already in the groundwater that will be migrating out of the Former Lagoon Area will decrease, due to sorption/co-precipitation with other inorganic species that form precipitates, as that groundwater moves into portions of the aquifer that are more oxidizing. The long-term monitoring program will evaluate this expected chemical behavior in the aquifer to ensure that recontamination does not become a problem.

With the ARS operating, groundwater does not discharge to Sinking Pond. The level of the pond is raised by the discharge of the treated water, and water seeps out of the pond in response to that condition. Treated water will continue to be discharged to the pond at a lower rate when the remedy is implemented, and it is anticipated that groundwater will still not discharge to the pond. The long-term monitoring program presented in the ROD will verify this expectation.

D.2 Some commenters asked about the consequences, particularly to the Northeast Area, the Assabet Wells and WRG-3, of shutting down the extraction wells in the Former Lagoon Area for the spread of organic and inorganic contaminants. Commenters asked that EPA substantiate through modeling that these areas will not become recontaminated should pumping in the Former Lagoon Area cease.

EPA Response: The model does not include elements for computing fate and transport of any inorganic chemicals. The geochemical processes that are involved in the dissolution and adsorption of inorganics are too complex to be modeled. Model simulations of groundwater flow to the Assabet wells and WRG-3 following the shutdown of the ARS were conducted in response to requests by the Acton Water District. See GeoTrans letter dated September 7, 2005, for this request and a presentation of the results. Those simulations showed that groundwater from the Former Lagoon Area will not flow to any of these three wells, so they will be unaffected by the shutdown of the ARS. Some groundwater from the Former Lagoon Area may flow to the northeast; however, as stated in the response to Comment D.1, the concentrations of organic contaminants are not anticipated to be high enough to support the mobilization and transport of inorganic contaminants. Extraction in the Northeast Area will remove the most contaminated groundwater in the plume, which is anticipated to halt the dissolution and mobilization of inorganic contaminants that are now observed in the central northeast plume area.

D.3 One commenter asks why pumping was included to address high arsenic levels in the Southeast Landfill Area but not in the Former Lagoon Area

EPA Response: The geochemical conditions in the aquifer downgradient of the landfill are still conducive to the mobilization and transport of inorganic contaminants. As discussed in response to Comment D.1, the levels of organic contaminants in the Former Lagoon Area are not believed to be capable of sustaining transport of inorganic contaminants out of that area and through the aquifer to Fort Pond Brook or to the Assabet River.

D.4 One commenter asked for additional supporting information regarding oxidation reduction potential (ORP), sulfate, and the role of total organic carbon (TOC) in evaluating arsenic mobility issues. This commenter also asked whether the data that support the 24 samples for which both arsenic concentrations and ORP measurements are available in the Former Lagoon Area and that they be included in either the RI or FS.

EPA Response: Direct correlations do not exist between ORP, sulfate, or TOC and arsenic concentrations in groundwater or the potential for arsenic mobilization. However, these parameters, in addition to pH and dissolved iron, are used qualitatively to evaluate this potential and the geochemistry of the aquifer. For example, high iron concentrations in groundwater (>0.2 mg/L), low sulfate concentrations in groundwater (<1 mg/L), or low ORP values (<0 mV) can be indicators of high arsenic in groundwater (Smedley and Kinniburgh, 2004); however, conditions vary from site to site and within the subsurface at a given site. Reducing conditions in groundwater do not always mean that arsenic will be elevated, as pointed out in the comment. Arsenic may not be abundantly present, or various ligands may prevent it from being mobilized. Long term monitoring at the site will be performed to determine if inorganic contaminants (particularly arsenic) are being mobilized, and if additional groundwater extraction for treatment of inorganic contaminants is needed. The groundwater treatment plant conceptualized in the ROD will be designed to accommodate a reasonable contingency flow in the case that additional extraction is deemed necessary.

Finally, ORP and TOC data that were included with the July 2005 draft FS provided adequate information to support EPA's remedy decision for the site. However a commenter requested that additional specific data for ORP and TOC be supplied. This information was provided to the commenter by Grace and will be included in the Administrative Record.

D.5 A commenter notes that some locations within the Former Lagoon Area have negative ORPs, indicating reducing conditions, and yet arsenic is lower than 10μg/L, and asked, if nearby arsenic contaminated groundwater migrates to these locations due to the shutdown of the ARS, whether it is likely that the arsenic will stay in solution in these reducing areas, thus spreading arsenic contamination.

EPA Response: As noted above, exact correlations do not exist between ORP, sulfate, or TOC and arsenic concentrations in groundwater or the potential for arsenic mobilization. However, direct relationships have been observed between TOC and arsenic in groundwater in several studies. Arsenic mobility in subsurface environments is complicated and is impacted by these parameters and others including pH and dissolved iron. Taken collectively, a combination of these parameters can be used qualitatively to evaluate the geochemistry of the aquifer and the potential for arsenic/metals mobilization. TOC concentrations can be equated to microbiological activity, which by oxidation of organic matter can create reducing conditions. Reducing conditions in groundwater do not always mean that arsenic will be elevated, as pointed out in the comment. Arsenic may not be abundantly present, or various ligands may prevent it from being mobilized.

If arsenic contaminated groundwater did migrate to areas that have negative ORP values it is likely that arsenic will stay in solution, as conditions are not favored for arsenic co-precipitation. However, arsenic concentrations in groundwater would decrease by dilution. Long term monitoring at the site will be performed to determine if inorganic contaminants (particularly arsenic) are being mobilized, and if additional groundwater extraction for treatment of inorganic contaminants is needed. The groundwater treatment plant conceptualized in the ROD will be designed to accommodate a contingency flow in the case that additional extraction is deemed necessary.

D.6 One comment was received stating the MNA in the Northeast Area and the Former Lagoon Area does not reduce toxicity, mobility or volume through treatment. For example, VDC (1,1, DCE), degrades into vinyl chloride, a more toxic, carcinogenic contaminant than VDC; mobility will not be reduced under MNA but instead contaminants are spread out over a larger geographic area; and volume is reduced at a lower rate.

EPA Response: In Table 6-8 of the FS report, the natural attenuation part of the active remediation alternative is stated to be capable of reducing the mass and volume of contaminants. Biodegradation, volatilization, transformation, and destruction reduce the mass of VOCs in groundwater, as successive chlorine atoms are removed and the compound eventually is completely degraded. Other attenuation processes reduce the concentration of VOCs, but the overall mass does not change. Dispersion (spreading throughout a larger area as the groundwater advects downgradient) and dilution (interaction with less concentrated groundwater and infiltrated precipitation) reduce the concentrations of contamination and are recognized as important natural attenuation processes [EPA, 1998]. These processes also reduce the potential for mobilization and transport of inorganic chemicals in groundwater. As part of the long term groundwater monitoring, sampling for natural attenuation parameters will be used to evaluate the progress of VOCs (including vinyl chloride) attenuating over time. The Long Term Monitoring Plan will be developed during the remedial design phase.

D.7 A commenter asks if there are there predictions about how quickly arsenic concentrations will decrease in the Former Lagoon Area. In a related question, this commenter asked how long it will take for arsenic levels in groundwater to decrease to cleanup requirements under MNA in the Former Lagoon Area.

EPA Response: The model does not include elements for computing fate and transport of any inorganic chemicals. Fate and transport of metals and arsenic concentration in groundwater are complex and driven by many factors. A model that could predict actual cleanup times would require many assumptions, and the results would contain much uncertainty. As VOC concentrations decrease in the former source areas and the plumes, the potential for dissolution of inorganic species will decrease. The long-term monitoring program and the Five-year Review process will evaluate this expected chemical behavior in the aquifer.

E. Comments/Questions Regarding Groundwater Remedy Implementation Issues

E.1 Several comments were received regarding specific long-term monitoring parameters, including a request for monitoring for additional organic compounds as well as inorganic compounds and the need for "triggers" for future additional action if natural attenuation were selected for the Northeast Area groundwater and the Former Lagoon Area. Similarly, requests were made for a backup plan and/or a contingency fund for further treatment in the Northeast Area and periodic evaluation of new technologies in the future, if the remedy did not include extraction wells in the Northeast Area. Another commenter requested that additional long-term monitoring be performed in the Assabet River and Fort Pond Brook. W. R. Grace expressed its belief that continuation of the existing groundwater monitoring program is sufficient as a long-term monitoring program.

EPA Response: The selected remedy includes both requirements for long-term monitoring and 5-year reviews to help ensure that the remedy remains protective until the cleanup levels described in the ROD are achieved. The long-term monitoring program will include all contaminants for which interim cleanup levels were identified in the ROD and will be performed at a frequency that will allow for early detection and intervention in the event that groundwater conditions change unexpectedly. In addition, EPA will perform a review of the remedy every five years to determine if changes in site conditions compromise the protectiveness of the remedy. Should this be the case, then EPA will reevaluate the remedy and modify the remedy if necessary.

Human health risks and hazards associated with recreational exposures in the Assabet River and its tributary, Fort Pond Book, were within EPA's cancer risk range and less than a target organ hazard index of 1. Similarly, the baseline ecological risk assessment concluded that there were no unacceptable ecological risks due to site-related chemicals from exposure to sediment in the Assabet River or Fort Pond Brook. Therefore, no action is warranted for these surface water bodies for the protection of human health and the environment, and a long-term monitoring program is not planned. If a Five-year Review were to indicate that changed site conditions could present a potential for unacceptable site-related impacts to the river or brook that might change the risk assessment conclusions, EPA would, at that time, consider modifying the site monitoring program.

E.2 One commenter asked that future groundwater monitoring include analysis for acrylonitrile and 1,4-dioxane. This commenter also requested that arsenic concentrations be monitored in areas that currently show elevated arsenic, in wells downgradient of those areas, and upgradient of the public water supply wells, including the potential supply well WRG-3. W. R. Grace provided comments expressing their belief that 1,4 dioxane, trichloroethane (TCA), trichloroethene (TCE), and methyl tert-butyl ether (MTBE) are not site-related and do not warrant future monitoring as part of this remedy.

EPA Response: The long-term groundwater monitoring program will include monitoring for arsenic as well as VOCs. The list of VOCs to be monitored will continue to include TCA, TCE, and MTBE. See also Footnote 7 in the ROD. The well locations to be monitored for arsenic will most likely include the 12 wells currently monitored that were identified by the Acton Water District as locations that would provide information on the inorganic constituent concentrations in the vicinity of the Assabet and School Street wellfields. Monitoring for arsenic will include not only the wellfield areas, but other areas of the site where arsenic has become mobilized due to reducing conditions caused by VOC contamination, to verify the conceptual site model that arsenic mobility will decline over time as the aquifer returns to natural conditions.

Acrylonitrile is not considered to be a contaminant of concern in site groundwater, based on past infrequent detections that are no longer present, as well as its behavior in the environment. Acrylonitrile is a highly volatile and degradable compound with a short half-life in the environment and would not be expected to persist in groundwater once source areas have been removed, as was done between 1994 and 1997 under Operable Unit One. According to groundwater data summaries prepared for the Initial Site Characterization Report (HSI Geotrans, 1998), it was detected twice in samples collected prior to January 1, 1984 out of 526 samples collected. A subsequent database search performed by GeoTrans of data collected between 1979 and 2002 (over 3000 samples at 287 locations) reported six detections of acrylonitrile at well locations where subsequent results showed no detections, indicating that the low levels of acrylonitrile present at one time have since attenuated.

With respect to 1,4-dioxane, this contaminant has recently been added as a contaminant of concern for certain sites in New England where TCA is a significant groundwater contaminant, because 1,4-dioxane is an additive to TCA formulations. In response to an inquiry from EPA, the database for the Grace site was searched to evaluate TCA concentrations to determine whether co-located contamination with 1,4-dioxane might be of concern. Detections of TCA within the Grace property and the VDC plume have been low and infrequent, and are not indicative of widespread contamination with TCA or related contaminants such as 1,4-dioxane. However, the database search noted detections of TCA in the hundred parts-per-billion range in wells near the Assabet wells that are believed to be related to sources other than the Grace site (south of the Assabet River), and sporadic detections of TCA have been reported from wells near the School Street wellfield. EPA will consider including analysis for 1,4-dioxane as part of future monitoring efforts.

E.3 A commenter requests that monitoring be conducted downgradient of the contamination to measure possible migration, especially of arsenic for Former Lagoon Area.

EPA Response: The selected remedy includes both requirements for long-term monitoring and 5-year reviews to help ensure that the remedy remains protective until the cleanup levels described in the ROD are achieved. The long-term monitoring program will include all contaminants for which interim cleanup levels were identified in the ROD and will be performed at a frequency that will allow for early detection and intervention in the event that groundwater conditions change unexpectedly. The program will monitor all six areas, including the Former Lagoon Area, and will not be restricted to areas where active pumping is proposed.

E.4 A commenter ask if Lisa Lane and Bellantoni Drive monitoring wells ever sampled for inorganics and requested that EPA sample the converted Lisa Lane well for inorganics, especially arsenic.

EPA Response: The Lisa Lane and Bellantoni Drive monitoring wells were not sampled for inorganics. The Bellantoni Drive well has been decommissioned rather than converted to a monitoring well, per the property owner's preference. EPA will consider sampling the Lisa Lane well for inorganics. It will also be considered for possible monitoring when wells are selected for inclusion in the long-term monitoring program to be developed during the remedial design process.

E.5 Several commenters, including local residents, BOC Gases, and the town of Acton offered the use of their property (under certain conditions) for implementation of a treatment alternative in the Northeast Area. Related issues were raised regarding the time frame analysis used in the proposed plan.

EPA Response: EPA appreciates the efforts taken to address implementation issues identified by EPA in the FS and Proposed Plan. EPA has reviewed the information provided and believes that the concerns it expressed still exist here.[2] First, many commenters have assumed that W. R. Grace will be the party performing this work. Records of Decision make no assumptions regarding whether potentially responsible parties will conduct the cleanup work at the Site. Those decisions are made after the ROD has been issued and EPA begins the enforcement process. As a result, RODs are written assuming EPA will perform the work. This is important because all parties that have offered use of their properties have done so based upon reaching agreement with Grace regarding a variety of issues such as compensation for use of their properties, indemnifications, etc.. Instead, EPA assumes it will be conducting the work, and has taken into account the issues EPA may have in obtaining access to a number of properties.

EPA may only provide nominal compensation to landowners for work it does on these properties over the contaminated plume. In addition, EPA would not agree to indemnification agreements etc. should it seek to conduct a portion of the work on these properties. Based upon EPA's experience at other Superfund sites, given the conditions laid out by these parties in writing, these issues could take months to work out. If EPA

[2] It should be noted that of all of the letters received from private residents, ***only two properties*** are located anywhere near where work would likely be located.

were unable to reach agreement with all the necessary parties, EPA would then proceed to take appropriate enforcement actions, including, if warranted judicial action. Enforcement actions such as these, can also take considerable time. Assuming that Grace does agree to perform the cleanup, the conditions laid out by the various landowners are typical of what may be requested by landowners in similar circumstances. However, EPA's experience has been that it can also take several months and even years for private parties to work out these issues. For example, at the McKin Site (in Maine), private parties have been unable to reach agreement regarding compensation for locating monitoring wells on a number of rural properties for over three years. It should also be noted that at the Kellogg-Deering Wellfield Site in Connecticut, after two years the private parties were not able to reach agreements and EPA could only get access by issuing an Administrative Order.

Another option cited was for the federal government to exercise its eminent domain (condemnation) authority and "take" private landowners' properties. This option is an option of last resort in the Superfund program as EPA prefers to work cooperatively with landowners. However, should the government exercise this authority, given the nature of the work required here, it may take several months, if not years, to complete this proceeding as it is a several step process involving detailed federal property acquisition requirements.

That being said, EPA has made modest changes to its proposal to do work in the Northeast Area in an attempt to better deal with implementation concerns. EPA has limited both number of wells and the duration that they will be in operation. This would limit the number of properties that would require access agreements and also increase the chances that agreements can be quickly reached. In addition, EPA has reevaluated the use of infiltration basins and included this option in the selected remedy with the hope that these can be used in lieu of reinjection. As infiltration basins are a less disruptive alternative, this will also limit the timeframe to reach agreements with the effected landowners.

E.6 One commenter requested information showing the potential locations of treatment facilities and extraction and reinjection wells for the groundwater remedy and a discussion of issues to be considered regarding these locations.

EPA Response: It is expected that one groundwater pump and treatment facility will be located near the Industrial Landfill and the treated effluent discharged to Sinking Pond. A second separate groundwater pump and treatment facility may be constructed (based on cost, implementability, access) in the Northeast Area of the Site to treat groundwater from this Area and then discharge the treated water back into the aquifer, via infiltration galleries or reinjection wells. It is estimated that three to five bedrock extraction wells pumping at a combined rate of about 50 gpm will be required for the Northeast Area. It is expected that for the Southeast Landfill and Southwest Landfill areas, four extraction wells will be utilized, two that already exist as part of the current ARS (extraction wells MLF and WLF), and two new wells to be installed, one in each Area. It is estimated that the combined pumping rate may be approximately 90 gpm in order to achieve an appropriate capture zone. It is important to note that the FS is only a conceptual layout and that the actual placement of facilities, number and depth of extraction wells, piping, will be determined during remedial design. Several factors need to be considered regarding where to place the treatment plant and wells. For example, extraction wells need to be placed in locations that can effectively capture and treat groundwater contaminants. Similarly, the facilities will be sited in locations that would be cost effective and implementable.

E.7 One commenter questioned the assumption that a new extraction and treatment system for the Northeast Area could not be implemented before 2008, as assumed in the Feasibility Study.

EPA Response: The ROD for this site will be issued in September 2005. Following the issuance of the ROD, EPA expects to enter into discussions with Grace to provide it with the opportunity to perform the work described in the ROD. EPA's experience at other sites shows that these discussions often last a year or more because any agreements between EPA and the PRP would need to be included in a legally binding document. Assuming that this agreement can be completed in a year, it would then take between one year and eighteen months to complete pre-design studies and a final design. This means that the earliest construction could start is the Spring of 2008 which is approximately three years from the date that the Proposed Plan was released.

E.8 The Town requested that the current ARS system continue to operate in its current configuration until the final remedy is implemented.

EPA Response: As stated in the ROD, the existing ARS will continue to operate until the remedy is constructed and operational, allowing for appropriate transition between systems.

E.9 The Town requested that the design for the groundwater treatment plant incorporate sufficient treatment capacity of all areas of the site that may require treatment during the life of the plant.

EPA Response: As stated in the ROD (Section L. (2)(a)) the groundwater treatment plant will include sufficient treatment capacity to address reasonable design changes which may be necessary.

E.10 Questions were received regarding air emissions, specifically odors, from the existing Aquifer Restoration System. In a related comment, a concern was raised regarding the ability of activated carbon to remove vinyl chloride from air emissions, potential testing or modeling to determine whether or not emissions are occurring and at what levels in light of State standards.

Many years ago, EPA evaluated the air emissions discharge from the current ARS and found no unacceptable risk to human health.

Bench-scale jar testing was done in December 2002 to evaluate the effectiveness of chemical precipitation at removing inorganic compounds from groundwater at the Site. The results were presented in the *Groundwater Treatability and Pilot Testing Evaluation Report* prepared by GeoTrans (2003). Results of the testing indicated that potassium permanganate was effective in removing iron, manganese, and arsenic from the groundwater that is extracted by the current system. The treatability testing also indicated that removal of these inorganic compounds in groundwater would be optimal if chemical precipitation was followed by filtration and if a portion of the removed solids were recycled. This testing also indicated that chemical precipitation was successful in removing phosphorous and in controlling nuisance odors.

The new treatment system will be designed to treat the off-gas air emissions to remove VOCs from the air stream, prior to being discharged to the atmosphere. It is anticipated that this can be accomplished through a granular activated carbon unit. VOCs, including vinyl chloride, would be taken into consideration during the engineering designs for the new treatment system. The Remedial Design Phase will include monitoring requirements for the initial start up and long term operation of the treatment system. Air emission sampling for VOCs (including vinyl chloride) will be conducted to determine what levels, if any, are being discharged to the atmosphere and if these levels pose an unacceptable risk to human health and or the environment. Additional treatment and or remedial measures may be needed if it is determined that the remedy is not function as intended.

E.11 One commenter asked that if groundwater extraction pulls water from Fort Pond Brook or the Assabet River, that the extracted water be returned to these sources so as not to affect stream flow.

<u>EPA Response:</u> Under the modified cleanup plan, treated groundwater from the Northeast Area would be returned to the aquifer from which it was extracted, (via an infiltration basin or reinjection well), so the net effect on stream flow and the School Street Wellfield would be minimized.

<u>F. Comments/Questions Regarding Monitored Natural Attenuation</u>

F.1 Several questions were raised regarding natural attenuation processes for the various groundwater contaminants, including concerns regarding degradation of contamination and breakdown products, and the suitability of monitored natural attenuation (MNA) as a component of the remedy. In a related comment, one commenter noted that there are issues related to the natural processes relied upon by natural attenuation. Specifically, one commenter was concerned that that the breakdown products during natural processes could be as toxic or more toxic than the original contaminants, that adsorption to soil particles could lead to longer cleanup time frames, and that biological processes could be hampered by the mix of chemicals present in the groundwater.

<u>EPA Response:</u> MNA is a part of almost every remedial action, since total removal of a contaminant plume is rarely achievable. As chlorinated VOCs are dechlorinated, they pass through the vinyl chloride stage as part of the degradation process, and the comment is correct that vinyl chloride is more toxic than VDC. However, vinyl chloride also biodegrades over time to ethene (under anaerobic conditions) or to carbon dioxide (under aerobic conditions). The vinyl chloride present in Site groundwater is one line of evidence that VDC is undergoing dechlorination by natural processes. The vinyl chloride observed in Site groundwater is at lower concentrations and is less widely distributed than the VDC, and vinyl chloride will continue to be monitored along with VDC. The long-term monitoring will also include selected monitoring for additional breakdown products such as ethene, to assess the progress of MNA for vinyl chloride. Retardation of transport through adsorption to soil particles does unavoidably lead to longer cleanup times. Retardation was taken into account in the contaminant transport model simulations. The mix of chemicals in the plumes is not expected to hamper the progress of the biological degradation of the organic compounds. The primary VOCs of concern (VDC, benzene, vinyl chloride) are susceptible to biodegradation, although they degrade at different rates and by different mechanisms, and the conditions that are most favorable for the dechlorination of VDC are not the same conditions that are most favorable for degradation of vinyl chloride or benzene. Remedy evaluations every 5 years will consider any trends in the long-term monitoring data for each contaminant of concern, whether the expected breakdown products are being formed, and whether progress to cleanup goals is being made at the model-predicted rates.

F.2 A commenter asks, given residual organic material (TOC) in source areas, (the Former Lagoon Area, the Southeast Landfill Area, and the Southwest Landfill Area), if the groundwater model underestimates the time MNA would take to reach MCLs in these former disposal areas.

<u>EPA Response:</u> The model-predicted times to reach cleanup levels were based on the attenuation of organic contaminants. The cleanup times were not presented as absolute times but were considered to be relative clean-up times for the different scenarios. The geochemical processes that will result in the immobilization of the inorganic contaminants are so complex that the cleanup times cannot be predicted with certainty. As stated in the ROD, after Interim Groundwater Cleanup Levels have been met for a period of three years, a risk assessment will be performed. If after the risk assessment, the remedial action is not determined to be protective, the remedial action will continue until it is deemed protective.

F.3 One commenter asked whether there are there contaminants in the area that may be resistant to natural attenuation (1, 4-Dioxane for example).

EPA Response: The VOCs of concern in site groundwater have different rates of natural attenuation but some degree of attenuation occurs for each, due to a combination of mechanisms including volatilization, sorption to soil and biodegradation. 1,4-Dioxane is resistant to natural attenuation because of its high water solubility and low biodegradability. Please see Response to Comment E.2 for further discussion regarding 1,4-dioxane.

F.4 One commenter asked whether potential additional contamination from the Former Lagoon Area was taken into account in the analysis of MNA for the Northeast Area. In a related comment, a question was raised on whether the modeled MNA cleanup times included this extra contamination migrating into the Northeast Area.

EPA Response: Some groundwater from the Former Lagoon Area may flow to the northeast. The amount of contamination, however, is expected to be small, and since the concentrations are much lower than those in the northeast plume, they are not expected to influence the cleanup time. Furthermore, as stated in the response to Comment D.1, the concentrations of organic contaminants in the groundwater that will migrate out of the Former Lagoon Area are not anticipated to be high enough to support the mobilization and transport of inorganic contaminants.

F.5 One commenter noted that, based on the extraction and treatment being conducted by the Acton Water District, the proposed remedy does not meet the definition of monitored natural attenuation. In a related comment, a commented stated that the decision not to pump in the Northeast Area is not consistent with EPA's guidance on the use of Monitored Natural Attenuation. W.R. Grace provided a comment asserting that operation of the Acton Water District's school street wellfield is not required as part of the remedy for the Northeast Area as it does not impact model predicted cleanup times for this part of the plume.

EPA Response: As stated in the ROD, the remedy for the site is active remediation. MNA is only a component of the active remediation remedy (see general comment above). The area outside the capture zone of these wells is being addressed by MNA as is the case with all parts of the site where extraction wells will be located. See also responses to Comments C.1 and F.1. Although the extraction of groundwater from the School Street wells may provide some minimal benefit to the cleanup of the Northeast Area, the remedy does not include nor does it rely on this action to meet groundwater objectives.

F.6 Several commenters asked for examples of other Superfund sites in Massachusetts where contaminated aquifers are being treated and used as water supplies and monitored natural attenuation was selected as the remedial approach for groundwater.

EPA Response: The commenter outlined a very specific set of circumstances that are unique to the W.R. Grace site and, therefore, no specific similar examples exist at Massachusetts National Priorities List (NPL) sites. One site example is noteworthy, however. At the Groveland Wells Superfund Site in Groveland, MA, a plume of primarily trichloroethene (TCE) had migrated from its source area at an industrial facility to two public water supply wells. Treatment facilities to remove the TCE from the water supply were built. A groundwater extraction system was installed between the source and the supply wells, to capture contaminants at the point in the plume where concentrations were about 1,000 μg/L (concentrations are >100,000 μg/L at the source). The portion of the plume beyond the extraction wells was left to naturally attenuate. The current situation at Groveland is somewhat different from the current situation for the Grace site, in that the groundwater reaching the supply wells no longer contains detectable contamination and the treatment facilities have been taken off line. However, it is an example of the concept of extracting highly contaminated portions of a plume that impacts a drinking water aquifer, while allowing downgradient portions to attenuate naturally.

The proposed remedy for the site was active remediation (pump and treating contaminated groundwater along with MNA, etc.), not MNA alone. MNA is one of a number of components of the remedy. Bifurcating the MNA component from the rest of the remedy is inaccurate and misleading. As noted in the general response at the beginning of this responsiveness summary, in almost all cases, some portion of the groundwater contaminant plume will be addressed via MNA regardless of site risk. This is because most groundwater plumes are too widespread to be cost-effectively and/or practically managed through extraction and treatment alone. In most cases, MNA is appropriate to address the lower levels of contamination that remain here either outside the containment area or after other active groundwater remediation activities have been completed.

G. Comments/Questions Regarding Soil/Sediment Remediation:

G.1 Several commenters expressed support for EPA's proposal to excavate contaminated sediments in the North Lagoon Wetland and Sinking Pond.

EPA Response: Comment noted.

G.2 Several commenters expressed concerns about the proposal to allow on-site disposal of contaminated sediment from Sinking Pond and the North Lagoon wetland area and requested that this material be excavated and disposed off-site, noting that this would reduce the need for further monitoring and maintenance and prevent recontamination at the site. These comments also noted that, if this material were kept on-site, it should be put in an area with a bottom liner as well as a cap to reduce the potential for further migration and would require institutional controls. The town also asked about any planned public involvement in the decision for the final approach to addressing these sediments and what the process will be to make these decisions. In addition, concerns were raised about potential recontamination in Sinking Pond and the North Lagoon Wetlands given EPA's propose to reduce the number of areas where active pumping is required. This commenter also requested that the analysis be included in the final FS and that EPA determine whether or not the assumptions used in this analysis were valid. The commenter also stated that the analysis of this potential recontamination was absent from the draft FS, but should be included in the final FS.

EPA Response: EPA's selected remedy for Sinking Pond addresses contaminated sediment in the Sinking Pond area that poses an unacceptable risk to human health and or the environment. Off-site disposal of dewatered sediments is preferred, however, based on the results of the waste profile characterization, consideration would be given to on-site disposal and capping of recovered sediments if analyses conclude that the sediments are not hazardous waste. If the excavated sediments are determined to be hazardous wastes under RCRA, then they would be disposed of offsite.

The decision regarding whether to remove and/or cap/cover sediment within the Pond also depends upon the steepness of the slopes of the Pond as well as potential habitats for the ecological receptors, e.g. fish. In addition, further evaluation will be required to determine whether wetlands exist in the Sinking Pond area, and, if so, whether or not they will be impacted by the remedial action. Should it be determined that wetlands would be impacted, state and federal wetland requirements will be required to be met. Additional data and evaluation will need to be performed as part of the Remedial Design phase to determine these specific details, as well as the full nature and extent of sediment contamination vertically and horizontally.

The selected remedy for the North Lagoon Wetlands is NLW-SED-3. Consideration will be given to consolidation and capping in place for North Lagoon Wetland sediments in an area outside of the 100-year floodplain. Decisions regarding excavation/consolidation/ capping and on-site or off-site disposal will be made during the design phase and will take into consideration, characteristics of the excavated material, implementability factors as well as a functionality assessment of certain portions of the wetland. To determine these specific details, additional data will be collected and will be used to refine the estimates of sediment volume, determine its leachability characteristics and other parameters, and evaluate the appropriate design of any cap or cover to meet ARARs. As is the case with Sinking Pond, if sediments excavated are determined to be hazardous waste, they will be disposed of at an appropriate off-site location. Also, a wetland delineation and habitat characterization will be conducted to determine the function and value of the sedge marsh area to evaluate if consolidation/capping is viable and would not cause contaminants to leach out and/or cause recontamination. Should a determination be made that capping is appropriate, the cap would be required to meet state solid waste requirements.

With respect to concerns about the potential for the recontamination of Sinking Pond and the North Lagoon Wetlands, based on review of the July 2005 FS, EPA does not believe this will occur given the proposed alternatives outlined in this ROD. Sufficient data to support this conclusion was included in the FS. See EPA response to comment D.1. Also, long term groundwater and sediment monitoring will be performed and Five-year Reviews will be conducted to ensure the remedy remains protective of human health and the environment.

Coordination with the town and other interested parties will be done consistent with the requirements in the NCP.

G.3 Regarding Sinking Pond, commenters asked that the human health-based cleanup level be applied to the entire pond perimeter. Comments were also received regarding the definition of accessible sediments, citing concerns about future land use changes in the area and future changes in water levels. In addition, questions were raised regarding the use of deed restrictions and whether signs would be posted to prevent exposure to contaminated sediment. Questions were also raised re: measurement and timeframe for meeting a goal of trending toward background conditions.

<u>EPA Response:</u> The human health clean up level will be applied to portions of Sinking Pond, not the entire perimeter of the Pond, based on the physical characteristics of the Pond (as it relates to human exposure potential) and risk management considerations. Through the human health risk assessment process, EPA concluded that potentially significant risks may result to receptors that repeatedly swim or wade in Sinking Pond whereas occasional contact with sediments is not likely to be associated with a significant risk. Thus, sediments located between the maximum surface water elevation observed in the pond and two feet below the minimum surface water elevation will guide the selection of sediment areas of concern for humans due to fluctuations in water levels that might indirectly influence potential exposure to contaminated sediments. Additionally, due to the steepness of the slopes on the eastern and southeastern shoreline of the Pond and the industrial nature of the land use abutting the eastern shore of the pond, the nature and frequency of exposure to contaminated sediments in these areas and resulting risk is limited and thus is only prescribing cleanup of sediments for human health protection in areas of the Pond where significant human exposure might occur.

EPA will be further evaluating the accessibility of sediments on the western side of Sinking Pond particularly in the area between the pond inlet and SPBK-1 as part of the remedial design and may further refine the designation of accessible sediments, if warranted.

Institutional controls would only be placed on accessible sediment that is covered. Should a decision be made to consolidate non-harzardous waste on site, restrictions would be put in place to assure that this material is not disturbed and a cover would be required to be maintained. Given the current limited accessibility to sediments, signs would not be required.

Questions were also raised concerning the interim ecological clean up level of 730 mg/kg and trending towards the final (background) clean up level of 42 mg/kg. The short term clean up goal for arsenic for the protection of ecological receptors will be to attain the interim clean up level of 730 mg/kg after the first phase of the remediation. This interim clean up goal of 730 mg/kg is considered a probable effect concentration that is protective and, when reached, will greatly improve Pond conditions for ecological receptors. Attaining this interim goal and controlling the input of inorganic contaminants from the ARS discharge will greatly improve the water quality and ecological habitats of Sinking Pond over time. After sediment remediation, long-term sediment monitoring will be conducted to ensure that the interim remedial actions taken have caused sediments to decrease and trend towards the final clean up goal of 42 mg/kg. EPA is not recommending remediating to 42 mg/kg (background concentration) in the short term in areas where ecological risk is the principal problem due to concerns about negatively impacting the Sinking Pond ecology by remediating large areas of sediments in an effort to meet natural background concentrations when 730 mg/kg is considered protective of benthic invertebrates and wildlife in the short term. If a decreasing trend towards background cannot be established or it is determined that this remedy is no longer protective, then EPA may require additional sampling and/or response actions.

G.4 A commenter asked a number of questions regarding the possible covering of sediments in Sinking Pond, including whether capping sediments preferable to "covering" them; would sediments still accessible; and, questioned whether they could be disturbed, uncovered, and/or redistributed under this approach.

EPA Response: There are several factors that go into the analysis of whether to cap or whether to cover sediments. For example, additional analyses completed as part of the remedial design may determine that the slopes of Sinking Pond are too steep for capping (with fabric or an impermeable liner) or covering (with cobbles or sand) or that an underwater cap may limit ecological habitats. In either case, however, sediments would be inaccessible and controls would be put in place to prevent these sediments from being disturbed in the future.

G.5 One commenter raised concerns about the proposed scope of the long-term monitoring effort for sediments in Sinking Pond and how the monitoring plan will be developed.

EPA Response: The ROD provides the basic conceptual framework for the long-term monitoring effort. Specific details regarding sampling parameters, frequency, and locations will be developed as part of a long-term monitoring plan to be developed in the future.

G.6 Several comments supported the excavation and restoration of contaminated wetland areas and stressed the importance of continued monitoring and replacement of restored vegetation until the restored wetland is completely reestablished.

EPA Response: Both the Massachusetts Wetland Protection Act (WPA) and federal wetland regulations are ARARs. In compliance with these ARARs, EPA will develop a wetland restoration and monitoring plan for restored wetlands and wetland vegetation, to comply with the goal of no net loss of wetlands. Typically acceptable monitoring plans require annual monitoring, and performance criteria including 75% cover by wetland vegetation and 75% survival of planted trees and shrubs. Failure to meet these standards will require corrective action, long-term monitoring of restored wetlands will also take place during 5-year reviews.

G.7 One commenter asked whether the North Lagoon Wetland area extended into the Massachusetts Bay Transportation Authority's right-of-way (ROW) which runs through the Site. This commenter requested information on groundwater and soil/sediment data within the ROW.

EPA Response: The North Lagoon Wetland is north of the MBTA ROW and does not extend into it. It is bordered by Fort Pond Brook to the north and the northern edge of the Former North Lagoon to the south. The Former North Lagoon is just north of the MBTA ROW. The Public Comment Draft Remedial Investigation may be consulted for figures showing the location of the North Lagoon Wetland and its sampling locations in relation to the ROW. The locations of groundwater monitoring wells that are close to the ROW, and results for samples collected from those wells between 2000 and 2002, can also be found in the RI. More recent groundwater monitoring data is documented in annual groundwater monitoring reports, the most recent of which is for 2004 (GeoTrans, 2005) and is available in the site repositories (Acton Public Library and EPA New England Records Center).

G.8 One commenter asked why the limited action alternative for the North Lagoon was eliminated and also asked why capping of contaminated sediment within the floodplain was not considered feasible.

EPA Response: The limited action alternative was eliminated because it was not protective of human health and the environment. Only those alternatives that are protective can move forward to the final evaluation step. The main reason why this alternative was not protective was that limited measures such as institutional controls (deed restrictions, fences, signs, etc.) are not effective in preventing exposure to environmental receptors.

Capping of sediment in the flood plain was eliminated because it does not comply with the Flood Plains Executive Order. This Executive Order does not allow actions to be taken in flood plains unless there are no practical alternatives. In this case, because high levels of contamination are located in a floodplain, there is no practical alternative to conducting work in a flood plain. Once that decision is made, then measures must be taken to minimize impacts. Capping in place would displace storage capacity, one of the significant benefits to flood plains; it would not minimize impacts as required, but instead maximize impacts. As a result, this alternative would not meet ARARs. Only those alternatives that meet ARARs can move forward to the final evaluation step (absent a waiver).

H. Comments/Questions Regarding ARARs or Risk Assessments

H.1 The Town of Acton noted its belief that the local groundwater cleanup standard bylaws should be considered an ARAR for this remedy. One commenter asked that Safe Drinking Water Act requirements be considered Applicable rather than Relevant and Appropriate. The Town's comment letter was accompanied by a table of ARARs that they believed should be included for the remedy. In addition, comments were received stating that the cleanup should be to a "fully usable condition " as required by the Consent Decree entered into between the United States and W. R. Grace. In a related comment, it was stated that failure to address arsenic is not consistent with the "fully useable requirement" and water is not fully useable if deed restrictions are put in place.

EPA Response: Local requirements are not ARARs. In accordance with the NCP, only State and Federal requirements are ARARs. In addition, for a requirement to be an ARAR it must of general applicability throughout a State. In this case, the by-law is only applicable within the Town of Acton.

The Safe Drinking Water Act requirements are considered "relevant and appropriate" rather than "applicable", because under the circumstances of this particular site, all jurisdictional prerequisites have not been meet. Under the Safe Drinking Water Act, compliance is measured at the tap. EPA is using these standards in this case to measure concentrations of contaminants in the aquifer, not at the tap. As a result, this law does not directly apply to the situation that EPA is addressing at this site. However, the circumstances here are similar enough to those addressed under the Safe Drinking Water Act that EPA has identified this as a "relevant and appropriate" requirement.

As discussed in the responses to Comments B.2 and J.2, the cleanup recommended is consistent with the settlement reached many years ago with W. R. Grace. Deed restrictions or other forms of institutional controls are required as temporary measures to protect human health until safe levels are achieved. This is not inconsistent with the settlement in that both parties to the settlement understood that clean up would not be instantaneous, but rather that the clean up would occur over a long period of time. It is not inconsistent with the Decree to require interim measures to protect public health. Finally, EPA has addressed arsenic in this cleanup plan. As levels of VOCs are reduced, arsenic should return to background levels. The selected remedy also requires clean up to safe federal drinking water standards consistent with CERCLA Section 104(c)(3). See also response to Comment B.2

Finally, a commenter included a list of additional legal requirements for consideration in the cleanup. These laws included State requirements (Chapter 21(e) and the MCP) and the town by-law. These are not ARARs. See also response to Comment H.8. This list also included a citation to Safe Drinking Water Act zero MCLGs for organic contaminants. Although it is unclear how the commenter wished to have these requirements incorporated into the cleanup, it has been EPA's long-standing policy that zero MCLGs are not appropriate remedial response objectives as outlined in the NCP Section 300.430(e)(2)(i)(B) and Section 300.430(e)(2)(i)(C).

H.2 The town questioned whether the remedy will require a Notice of Intent be filed under state and/or local wetlands regulations and whether the cleanup will be required to abide by requirements and conditions set forth by the local conservation commission and MADEP. In a related comment, what are the applicable standards the proposed plan states will be followed for work in wetlands and floodplains.

EPA Response: All work in the wetlands and flood plain will be conducted in accordance with the ARARs identified for this portion of the remedy. These are the applicable standards that will be followed in conducting this work. These ARARs include state wetland protection requirements. The NCP has limited ARARs to only substantive requirements. Procedural requirements such as permits, approvals, etc. are not necessary for actions conducted on the site. As a result, EPA will not be filing a Notice of Intent. However, EPA will coordinate activities with local officials. See also Response H.1 regarding local requirements.

H.3 Several commenters are concerned about the current and future water quality of drinking water (from the School Street wellfield) in the Town of Acton. Comments were also raised regarding the threat posed to these wells from inorganic contaminants.

EPA Response: The Acton Water District, as a public drinking water supply, is required by law (Safe Drinking Water Act) to provide safe drinking water to the residents of Acton. The AWD is required to conduct periodic sampling and, if the results of sampling warrant, the water must be treated to safe levels for all regulated contaminants including inorganics. That being said, under this cleanup plan, levels of site-related contamination, including inorganics, will continue to be reduced to acceptable levels.

H.4 One commenter expressed concern that water quality in the Assabet River would deteriorate once pumping on the Grace property is reduced.

EPA Response: EPA assumes that this concern relates to the reduction in pumping that will occur when the ARS wells are shut down and the new extraction wells (per this

ROD) are activated. Groundwater extraction will continue in the landfill area, but the ARS wells in the Former Lagoon Area will be shut down. The concentrations of contaminants in the groundwater in the current capture zone of those wells are relatively low (VDC, vinyl chloride, and benzene all < 50 μg/L), and by the time this groundwater reaches and discharges to the Assabet River (about 3,000 feet away), the concentrations will be undetectable.

H.5 One commenter noted that working within the MBTA ROW could require special training and certification as well as coordination with the MBTA during design and construction.

EPA Response: Over the years, EPA has conducted significant clean up work on or near rail lines. As in the past, EPA will coordinate with the MBTA to ensure this work is done in a safe manner

H.6 A question was received regarding why a short-term or interim clean up goal was proposed that would allow sediments with arsenic concentrations up to 730mg/kg to remain unremediated in Sinking Pond. In a related comment, a request was made to monitor until the long term cleanup goal is met

EPA Response: The value of 730 mg/kg arsenic was selected as the short-term goal for sediments in Sinking Pond. This value is used as an index for the areas of highest sediment metal concentrations, and corresponds to the lowest arsenic concentration in Sinking Pond sediment at which toxicity was observed in sediment toxicity testing (FS, page B-4). Based on evaluation of wildlife receptors in the pond, a sediment concentration of 730 mg/kg was substantially below the values estimated to be protective of wildlife exposures. The interim clean up goal was proposed to address the areas of highest biological activity (sediments in shallow water) to reduce potential exposures of arsenic and associated metals in the sediments to below levels at which biological effects (sediment toxicity) were recorded. The ecological risk data indicate that leaving areas of sediment in parts of the pond with concentrations above background in the short term does not represent an unacceptable ecological risk. In addition, due to the specific site conditions, EPA expects that the removal of the areas of highest sediment arsenic (above 730 mg/kg) and elevated associated metals, combined with the elimination of the ARS discharge, will result in a trend toward lower sediment metals (including arsenic) concentrations and restore the aquatic habitat, without taking the much more ecologically disruptive approach of a removal or capping action across the entire pond. The contaminants in question are not bioaccumulative, nor is there a risk for transport out of this system since Sinking Pond is an isolated kettle pond. The removal of the source of metals (ARS discharge), along with removal of the most contaminated sediments, will allow accumulation of natural sediment over time, and allow the sediment concentrations of metals throughout the pond to decrease toward background. Long-term sediment monitoring will be conducted; further details are provided in the ROD.

H.7 A commenter asked why the proposed cleanup goal for manganese in sediments in the North Lagoon Wetland is 2,030mg/kg, which is protective of semi-aquatic wildlife, rather than for benthic invertebrates and semi-aquatic wildlife. The commenter asked whether a lower manganese cleanup goal would used if it were set to be protective of benthic invertebrates and asked that EPA use the lower of the two levels as the clean up goal for manganese in sediment in the North Lagoon Wetland.

EPA Response: The clean up goal for manganese in sediments in the North Lagoon Wetlands is 2,030 mg/kg which is protective of semi-aquatic life. The clean-up goal is not based on benthic invertebrate data, since the toxicity testing results did not show a correspondence of manganese concentrations with toxicity results. No toxicity was observed for benthic invertebrates chronic endpoints at NLW-S13 where manganese concentrations were elevated (7,200 mg/kg). A lower manganese cleanup goal could not be established based on the benthic invertebrate data. However, arsenic is co-located with other metals in the wetland sediments, therefore, the basis of the clean up addressing elevated concentrations of arsenic for benthic invertebrates will also address co-located metals having a similar source, fate, and transport characteristics.

H.8 One comment was received stating that the proposed cleanup plan was not consistent with the Massachusetts Contingency Plan.

EPA Response: EPA has not included Chapter 21(e) or the Massachusetts Contingency Plan in its final list of ARARs. Instead, EPA and MADEP rely on the provision of the MCP that provides that "(t)he Department shall deem response actions at a disposal site subject to CERCLA adequately regulated for purposes of compliance with 310 CMR 40.0000, provided: (a) the Department concurs with the ROD and/or other EPA decisions for remedial actions at such site in accordance with 40 CFR 300.515(e)". Massachusetts is expected to concur on the ROD and therefore the site is "adequately regulated" for purposes of state law.

H.9 A commenter stated that no analysis was provided to show whether or not there would be increased risk to human and environmental receptors in Fort Pond Brook, the North Lagoon Wetland or Sinking Pond if the ARS goes offline in these areas.

EPA Response: The ARS will remain online until the new groundwater extraction and treatment system is ready for operation, thereby minimizing the time that the ARS is offline. As far as evaluation of potential future risks as conditions change over time, this is done through the Five-year Review process. Once every five years, EPA will conduct a formal review during which long-term monitoring data are evaluated, new ARARs are considered, and the baseline risk assessments are reviewed and updated as needed to reflect changes in site conditions and uses, toxicity values, and EPA risk assessment guidance. The Five-year Review also includes a site inspection and interviews with community leaders and site owners, and a report is generated that is available to the public. If the review indicates that the remedy may no longer be protective, EPA will modify the remedy accordingly.

H.10 One commenter questioned whether the MCL or the MCLG should be used as cleanup levels and also questioned the additive effects of multiple contaminants and impacts to sensitive populations, including children. In a related question, a commenter asks whether the cumulative effects of exposure to all media (soil, sediment and groundwater) have been taken into account in assessing risk at this site. The commenter requests that clean up levels should be set based on these cumulative risks. One commenter asked that the risk assessment evaluate risk via all pathways, including residual risk from soil contamination addressed in Operable Units 1 and 2. In a related comment, there was concern that EPA did not take into account the synergistic effects of contaminants of concern.

Consistent with Section 300.430(e)(2)(i)(B) and Section 300.430(e)(2)(i)(B) of the NCP, MCLs and non-zero MCLGs established under the Safe Drinking Water Act are appropriate remedial goals for ground or surface waters that are current or potential sources of drinking water.

In accordance with EPA guidance effects on sensitive populations were taken into consideration in the quantitative risk assessment. For example, current risk assessment methodology seeks to incorporate sensitive populations in the exposure (e.g. children) and the toxicity evaluations. The toxicity evaluations for trichloroethylene and vinyl chloride were two such examples in which the risk assessment incorporated emerging information on the enhanced toxicity of these compounds to various sensitive receptor groups.

The baseline risk assessment also included an evaluation of cumulative receptor risk (risk aggregated across applicable media and exposure pathways for each exposure point) to determine whether action was necessary. For example, the surface water dermal contact and incidental ingestion risk was added to the sediment dermal contact and incidental ingestion risk to determine whether remedial action needed to be taken at specific recreational exposure points (see Table 6 of the Public Health Risk Assessment). Cumulative risks were summarized for those receptors that might reasonably be expected to contact multiple media. Once risk to a potential receptor is identified as exceeding risk management criteria, cleanup levels are developed for the relevant media considering the nature and magnitude of the projected risk and all applicable routes of exposure (e.g., ingestion, dermal contact, and inhalation pathways). The Five-year Review process will evaluate residual risk for the Site as a whole (all operable units), once remedial actions have been completed to determine whether the overall remedy is protective of human health.

While there is little information available to judge whether complex mixtures present at a site might act additively, synergistically (more than additive), or antagonistically (less than additive), the risk assessment assumed dose and response additivity where appropriate, in accordance with EPA guidance.

H.11 A commenter asks why FS Table 2-1 mentions an exemption to MCLs in areas where wastes have been left in situ as part of prior remediation (other Operable Units). In related comments, commenters stated their belief that meeting the MCL for arsenic still presents a significant risk; antimony, and chromium exceed EPA's health based target Health Index; nickel exceeds the State's MCP GW-1 standard; antimony, chromium, and nickel all exceed MCLs.

EPA Response: EPA is aware that some MCLs and MCLGs do not meet CERCLA expectations regarding acceptable cancer risk (10^{-4} – 10^{-6}) or might contribute to a non-cancer hazard index in excess of unity. For this reason, EPA has referred to the cleanup levels in ROD Table L-4, including those characterized by the MCL or MCLG value, as "interim". It is EPA's expectation that after the groundwater remedial action has been implemented, a risk assessment on all residual groundwater contamination will be performed according to EPA risk assessment procedures, for the purpose of evaluating cumulative risk. At that time, if the cumulative risk posed by the remaining compounds in groundwater does not meet EPA's expectation of protectiveness, then the remedy will continue until protective levels have been met or until the remedy is otherwise deemed protective of public health.

The NCP prescribes points of compliance for each contaminated media (soil, groundwater, etc). For groundwater, the compliance boundary is at the edge of the waste management unit. As a result, MCLs are not required to be met beneath those areas where waste has been left in place (Industrial Landfill).

H.12 One comment was received expressing concern that unknown or unidentified contaminants in the residual contamination in the Northeast Area could present an additional risk to the Town's well (1,4-Dioxane, chromium, and acrylonitrile cited in comment as well as TCE and TCA.)

EPA Response: All remedies selected under CERCLA must not only provide protection of public health and the environment but must also comply with ARARs. Because that the most appropriate time to make these two determinations for groundwater remedies is at the completion of the remedy, EPA has chosen to select interim groundwater cleanup levels in this ROD based on current knowledge of potential risks and based on ARARs with the understanding that a risk assessment on all residual contamination and an evaluation of compliance with ARARs for all constituents detected throughout the aquifer shall be performed to assess public health protection and compliance with ARARs prior to concluding that the remedy is complete.

H.13 One commenter asked that the EPA health advisory limit of 300 ppb or the average background concentration be used as a cleanup level for manganese in groundwater. This commenter also expressed concern that comparison of site contamination to background concentrations was not protective of human health. On a related issue, one comment was received asking what the correct cleanup level for manganese in groundwater should be: the MA Ground Water Quality Standard of 50 μg/L; the screening toxicity for manganese of 88 μg/L; the USEPA Health Advisory limit of 300 μg/L; or the background concentration.

<u>EPA Response:</u> EPA anticipates that additional information will be collected during remedial design that will attempt to characterize natural occurring levels of manganese in groundwater. Pending the outcome of this evaluation, EPA will compare the naturally occurring levels of manganese in groundwater to EPA's Health Advisory value of 300 μg/L for this compound and will adopt an interim groundwater cleanup level for manganese as appropriate. Some commenters have suggested that other benchmarks (e.g. a Massachusetts standard of 50 μg/L or a screening toxicity value of 88 μg/L) might be considered as cleanup levels for this compound. These values are not appropriate at this time as interim groundwater cleanup levels. The MA standard referenced of 50 μg/L is a secondary MCL and because it is based on aesthetic qualities of the water (e.g. taste and odor), it is not necessary for public health protection. EPA views the value of 88 μg/L manganese to be unnecessarily conservative for use as an interim groundwater cleanup level at this time as 88 μg/L corresponds to a very small fraction (about 1/10) of the reference dose for manganese.

The Superfund statute limits response actions in situations where naturally occurring substances (background) exceed ARARs or other protective clean up goals. As a result, when background concentrations exceed these standards, clean up can only be required to the established background concentration. At this site, it appears that background levels of manganese may exceed EPA's health advisory limit. If that is the case, the interim cleanup level would be set at the background concentration.

H.14 One commenter asked that Appendix A of the Feasibility Study be revisited to reconsider the exclusion of infrequently detected compounds as drivers of risk, including bis(2-ethylhexyl)phthalate. W.R. Grace commented that no changes to the list of Chemicals of Concern are appropriate, and provided a number of comments regarding Attachment A.

<u>EPA Response:</u> Risk assessors from EPA and EPA's oversight contractor, Metcalf & Eddy (M&E) have reviewed Appendix A of the July 2005 FS in detail. EPA agrees that it may be inappropriate to use a low frequency of detection as the sole reason to exclude compounds found to be risk drivers when developing the list of compounds of concerns (COCs) for the remedy. In addition to potential risk, EPA considers compliance with ARARs in selecting compounds of concern for the remedy. As such, bis(2-ethylhexyl)phthalate and several other compounds not identified in Appendix A of the FS have been included as compounds of concern for the remedy in this ROD. All remedies selected under CERCLA must not only provide protection of public health and the environment but must also comply with ARARs. Because the most appropriate time to make these two determinations for groundwater remedies is at the completion of the

remedy, EPA has chosen to select interim groundwater cleanup levels in this ROD based on current knowledge of potential risks and based on ARARs with the understanding that a risk assessment on all residual contamination and an evaluation of compliance with ARARs for all constituents detected throughout the aquifer shall be performed to assess public health protection and compliance with ARARs prior to concluding that the remedy is complete.

As the commenters noted, Table 1 of Appendix A of the FS contains a list of "Chemicals Appropriate to Target for Groundwater Remediation". The commenter appeared to make a distinction between chemicals of concern for [active] groundwater remediation and chemicals of concern for [natural attenuation] groundwater monitoring. No distinction between two lists of chemicals of concern for active vs. natural attenuation groundwater remedies exist; rather a single list of contaminants of concern applicable to the groundwater remedy is included in this ROD. As Table 1 of Appendix A of the FS did not adequately reflect the June 6, 2005 comments from EPA devoted to the issue of identification of compounds of concern for the remedy (both active and passive), the list of groundwater compounds of concern for the remedy will be as noted in the ROD.

EPA is choosing to include antimony, beryllium, chromium, lead and TCE as interim groundwater chemicals of concern for this ROD based on current comparisons with ARARs (MCL and MCLGs) and to include bis (2-chloroethyl) ether, MTBE, and nickel based on projected risk to human health. See also Footnote 7 in the ROD. If any of the inorganic constituents noted as compounds of concern for the groundwater remedy are subsequently found to be due to naturally occurring contamination or due to other sources, then EPA may consider this new information as appropriate. EPA agrees with a commenter that vanadium should not be included as a compound of concern for the interim groundwater remedy as vanadium concentrations in groundwater were found to pose an insignificant non-cancer hazard (HI<1) and since vanadium did not exceed any ARAR value (no ARARs were identified for vanadium).

H.15 A commenter expressed concern that EPA's proposed plan does not provide overall protection of human health for a variety of reasons: 1) although the plan calls for arsenic to meet MCLs, this level exceeds the HI of 1; 2) the Town's wells are not equipped to treat inorganics such as manganese and arsenic calling into question the overall protection afforded by the remedy; and 3) clean up to background levels such as for manganese may not be protective.

<u>EPA Response:</u> As previously noted, once the ARAR-based interim groundwater cleanup levels are achieved, a risk assessment will be performed on the residual groundwater contamination, including but not limited to arsenic, to determine whether the remedy is protective. If the results of the risk assessment indicate that the remedy is not protective, the remedial action will continue until protective levels are achieved or other action is taken to ensure that the remedy is protective. See also response to Comment H.13.

H.16 One commenter stated that ARARs would be met more quickly for a high percentage of the Northeast Area through active remediation, than through MNA.

EPA Response: EPA agrees that ARARs would likely be met for a larger portion of the site in a somewhat shorter timeframe. However, there are a number of factors other than time frame that EPA must take into account in making remedy decisions, including overall effectiveness, implementability and cost.

H.17 Some commenters expressed concerns about the basis and methodologies used in the Human Health & Ecological Risk Assessments.

EPA Response: Regarding methodologies in the Human Health Risk Assessment, the process used to evaluate human health risk at the site is adapted from well-established chemical risk assessment principles and procedures (National Academy of Sciences, 1983. Risk Assessment in the Federal Government: Managing the Process. National Academy Press, Washington, D.C) Under CERCLA, the goal of the human health risk assessment is to gather information sufficient to support an informed risk management decision regarding what risks need to be reduced or eliminated. The CERCLA risk assessment does not aim to fully characterize all site risks or to eliminate all uncertainty from the analysis. As there is much uncertainty in the risk assessment process, beginning with the nature and extent of chemical contamination, but also including uncertainty in chemical toxicity, and uncertainty in knowledge regarding the frequency and magnitude of potential human exposure, EPA must manage the uncertainties while pursuing our mission of public health protection. To this end, EPA relies on scientific information to the extent feasible, and supplements the science with judgments and assumptions designed to protect public health. As a result, EPA's risk estimates are generally considered conservative estimates of risk, meaning that the "true risk" is not likely to exceed the risk estimate derived and may be less than that predicted.

Regarding methodologies in the Ecological Risk Assessment, the Baseline Ecological Risk Assessment (BERA) was conducted following the primary U.S. Environmental Protection Agency guidance for conducting ecological risk assessments: U.S. Environmental Protection Agency, 1998. Guidelines for Ecological Risk Assessment. EPA/630/R-95/002F. Risk Assessment Forum. Washington, D.C. and U.S. Environmental Protection Agency, 1997. Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments. EPA/540/R-97/006.

The Baseline Ecological Risk Assessment (BERA) mentions that future site conditions were assumed to be the same as current conditions. This approach is typically used by EPA unless we are notified of specific future activities or plans that would alter the current Site conditions. There are always inherent uncertainties associated with risk assessments regardless of the number of sampling events. EPA accounts for uncertainties in risk assessments by being overly conservative throughout the risk assessment process. One sampling event was deemed sufficient for remedy decision making.

Together these documents outline a process that begins with a Site Conceptual Model, in which exposure pathways are developed to describe how animals and plants might be exposed to site contaminants. These exposure pathways are first evaluated in a conservative screening process by comparing site data with ecological "benchmarks". These benchmarks are conservative estimates of the concentration below which no risk would be expected. Chemicals that exceed this screening are more fully evaluated using various methodologies. These include modeling exposures to wildlife receptors, toxicity testing, and measurement of chemicals in tissue. There are inherent uncertainties within risk assessments. EPA has designed risk assessments to be conservative to account for uncertainties at each step of the screening process.

The risk assessment identifies risk levels for various exposure pathways and chemicals, and these are carried forward for a determination of cleanup goals. Cleanup goals are generally based on the most sensitive exposure pathway for each chemical and are thereby expected to be broadly protective of animals and plants on the site.

H.18 One commenter expressed concern that EPA has underestimated the contamination problem in the Assabet River by relying on inappropriately "high" background levels. The commenter also expressed the view that the existence of river water and sediment pollution from upstream sources does not justify additional contamination from the W.R. Grace site. The commenter is concerned that if this logic were followed, it would be impossible for the Assabet River to reach its designated Class B status.

EPA Response: The human health and ecological risk assessments were based on detected concentrations of contamination in all media and the resulting risk estimates reflect risk regardless of the source – whether it be site related or due to naturally occurring or background contamination. When a significant risk is identified, it is appropriate for EPA to consider naturally occurring and or background levels of contamination in determining the appropriate response. See also response to Comment H.13 regarding limits on remedial actions due to naturally occurring contamination.

The human health risk assessment evaluated the results from samples from the Assabet River (sediment and surface water). All detected contaminant concentrations were compared to conservative risk-based screening criteria. Any contaminant whose maximum concentration exceeded the screening criteria was included in the evaluation of cancer and noncancer risk, regardless of whether the concentrations were judged to be consistent with background (that is, similar both upstream and downstream of the site).

The ecological risk assessment also evaluated the results from samples from the Assabet River (sediment and surface water). Similar to the human health, all detected contaminant concentrations were compared to conservative risk-based screening criteria. Any contaminant whose maximum concentration exceeded the screening criteria was included in the evaluation of ecological risk, regardless of whether the concentrations were judged to be consistent with background (that is, similar both upstream and downstream of the site). Although some PAH values were above screening-level concentrations, site-specific evaluation of risk to benthic invertebrates using benthic community analysis did not indicate toxicity to benthic communities. Food-chain modeling also indicated that there were no significant risks to wildlife from exposure to PAHs. Total PAH concentrations in sediments in the vicinity of the site were lower than PAH concentrations upstream of the site.

For both human health and ecological risk evaluations, background is taken into consideration after the risk assessment process, during risk management, to evaluate whether the potential risks identified in the risk assessment is likely to be site-related or associated with background conditions in the area. The goal of the ecological risk assessment process is to ensure that site-related contaminants do not contribute to unacceptable ecological risk. It is not within the mandate of CERCLA to ensure that the Class B status is met.

H.19 Several commenters asked that, if background concentrations were used as a basis for sediment cleanup levels, that the mean or median concentration be used, not maximum background.

EPA Response: Identification of a mean or median representation of the background concentration for use as the sediment cleanup level may result in cleanup of naturally occurring contamination, which EPA views as inappropriate. The chosen sediment cleanup levels are to serve as guides for remediation. Residual concentration levels remaining in accessible sediment after remediation will be used to evaluate whether further remediation is necessary. A detailed plan for sediment confirmation sampling and evaluation of the results will be developed during the remedial design

H.20 One commenter was concerned about the risks to the ecological health of the Assabet River and its tributary, Fort Pond Brook as well as potential human health risk posed by Assabet River water and a desire to see the River meet its Class B (fishable and swimmable) designation.

EPA Response: The Baseline Ecological Risk Assessment concluded that there were no unacceptable ecological risks due to site-related chemicals from exposure to sediment in the Assabet River or Fort Pond Brook. In both cases, the limited indications of potential risk to benthic invertebrates were exceedences of sediment benchmarks. For the benchmarks that were exceeded, many of the exceedences occurred upstream of the site as well as in portions of the stream and river segments along and downstream of the site. Therefore, the risks are not site-related and the certainty of risk from these exceedences is low. In addition, benthic community analysis in the Assabet River did not detect differences in the benthic invertebrate population upstream and along the site attributable to VOCs in pore water. No site related risks to fish and aquatic invertebrates were identified. Food chain modeling did not indicate site-related risks to semi-aquatic wildlife that may use Fort Pond Brook or Assabet River due to site-related COPCs.

Human health risks and hazards associated with recreational exposures in the Assabet River and its tributary, Fort Pond Brook, were within EPA's cancer risk range and less than a target organ hazard index of 1. Therefore, no action is warranted for these surface water bodies for the protection of human health

H.21 One commenter asked whether the Ecological Risk Assessment considered effects on amphibians; this commenter also asked whether the North Lagoon exhibits the characteristics of a vernal pool.

EPA Response: Although the Ecological Risk Assessment did not use amphibians as a specific receptor endpoint, concentrations of contaminants in surface water were screened against protective benchmarks, including National Recommended Water Quality Criteria, which were developed to be broadly protective of aquatic life in general, including amphibians. Although more data are becoming available on the concentrations of contaminants that pose risks to amphibians, this group historically has not been routinely used as a receptor in ecological risk assessments as toxicity data for evaluation of risk is too sparse to support a robust evaluation of risk specifically for this group.

The Former North Lagoon is a man-made depression that is seasonally inundated with water. The former North Lagoon was remediated previously as part of Operable Unit One through the excavation of contaminated material and no contaminated groundwater is known to migrate to this habitat. It was included in the risk assessment based on the presence of standing water. To be regulated under The Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) vernal pools must exhibit certain characteristics. Field data from the former north lagoon did not provide evidence that the lagoon was populated by vernal pool species (amphibians, reptiles and invertebrates characteristic of vernal pools). As a result, the lagoon was not characterized as a vernal pool. Furthermore, initial evaluations of contaminants in the sediments in this lagoon indicated concentrations were below levels associated with ecological risk and was therefore not further evaluated in the Baseline Risk Assessment.

H. 22 One commenter noted that professional judgment was used in the PHRA to estimate the frequency of human exposures in some pathways; however no basis for this judgment was cited. In a related comment, the PHRA grouped people by ages into tow groups (1-6 years) and (7-30 years). Is this supportable given the physiological differences within the age groupings.

EPA Response: Conservative assumptions, based on professional judgment, were sometimes used in identifying exposure frequencies for the receptor groups of concern considering the nature of the exposure. Consistent with EPA Human Health Risk Assessment Guidance (OSWER Directive 9285.6-03), a residential exposure frequency of 350 days/yr was assumed which is based on a daily exposure save for a two-week absence each year. Exposure frequencies for other receptors or scenarios may also have considered behavioral and/or climatic factors and the rationale for each exposure frequency can be found in Section 3.3 of the Public Health Risk Assessment. The related comment regarding the grouping of people into two age groups may be based on physiological and/or behavioral factors influencing exposure. For example, research has shown that young children consume more water per unit body weight than adults leading young children to have a greater exposure per unit body weight than older children or adults. Likewise young children have a greater tendency to ingest small amounts of soil in relation to most adults due to hand-to-mouth behavior prevalent in young children. Where such age dependent differences in exposure are relevant to the risk evaluation process, the human health risk assessment attempted to capture these age dependent differences in the risk evaluation.

H.23 One commenter asked how much of the risk to human health in the North Lagoon Wetland is attributable to swimming and how likely is it that swimming will occur given the shallow depth of the water.

EPA Response: As the commenter noted, water depths in the North Lagoon Wetlands are not sufficient for swimming and thus EPA did not evaluate risk from swimming in this area but instead only evaluated risks from exposure to sediment in the North Lagoon Wetland. Because assumptions regarding exposure to sediment were the same for North Lagoon Wetland as for the Former North Lagoon and the Gravel Pit Wetland (where water and wading is possible), exposures to North Lagoon Wetland sediment were characterized as a "wading" activity for consistency.

H. 24 Was the risk to environmental receptors in the North Lagoon wetland based upon toxicity studies or visible evidence of harmful effects?

EPA Response: The July 2005, Public review draft baseline ecological risk assessment determined that there is unacceptable risk to ecological receptors in the North Lagoon Wetlands. Plant samples were taken from the North Lagoon Wetland and reference wetland and then analyzed for the presence of inorganics. Concentrations of some inorganics exceeded their benchmarks from the samples collected in this his area. Whole sediment toxicity tests with and benthic invertebrate testing, indicated that the North Lagoon Wetland samples had decreased survival that was statistically different from the off-site reference wetland or reproductive effects statistically different from laboratory controls in each sample tested. The results of the food chain modeling indicated potential unacceptable risks to muskrat and Eastern painted turtles from arsenic and manganese.

I. Comments/Questions Regarding Institutional Controls

I.1 The Town asked for additional information regarding Institutional Controls, where they would be required and under what circumstances private irrigation wells would be allowed. The Town expressed concerns over potential limitations of private property rights that might result from the proposed remedy as well as its ability to put in place the necessary controls to prevent exposure should these controls be required. Several commenters requested that EPA identify the types of institutional controls and who would be responsible for securing, maintaining and enforcing the ICs. W. R. Grace noted that institutional controls would be required regardless of the selected groundwater remedy

EPA Response: EPA has left open the specific details regarding Institutional Controls for this site. This is because EPA prefers to work cooperatively with all stakeholders to define the details of what the controls will consist of to meet the needs of all parties. This is consistent with the comments filed by the MADEP. Although the Town has expressed some concern about its ability to participate in this process, EPA's experience has been that communities are eager to work with State and Federal governments to put in place measures to protect the health and safety if its residents. EPA has significant experience, for example, in helping towns pass local ordinances throughout the New England states and has typically not encountered the problems envisioned by the Town in their comments. In addition, it is important to bear in mind the water use restrictions are only temporary in nature and will be revisited periodically so that they may be lifted as the cleanup work proceeds. Finally, private irrigation wells will be allowed when use of the groundwater is determined not to present a risk and it can be determined that pumping will not adversely impact the selected remedy.

I.2 One question was asked regarding whether institutional controls would be required for longer periods of time in the Former Lagoon Area if MNA is selected as opposed to active pumping.

EPA Response: Institutional controls will be required to be maintained until safe levels are achieved in the groundwater. Under an extraction and treatment scenario, the model calculated an approximate clean up time of 12 years for VDC concentrations in groundwater in the Former Lagoon Area to reach the MCL of 7 ppb. Under the monitored natural attenuation scenario, the model calculated an approximate clean up time frame of 13 years for VDC concentrations in groundwater in the Former Lagoon Area to reach the MCL of 7 ppb. It is important to note that under either scenario institutional controls would be required in order to prevent potential exposure to contaminated groundwater until safe levels are achieved.

J. Comments/Questions Regarding Funding and Enforcement:

J.1 Several commenters noted that W. R. Grace should be required to fund the removal of contamination from the public water supply wells, noting their belief that the proposed remedy left the Acton Water District ratepayers with that burden. The town stated its belief that W.R. Grace should be responsible for treating AWD's future water supply at WRG-3. W.R. Grace provided information on its 1987 settlement with AWD, which provided funding for wellhead treatment. In a related comment, the Town expressed its belief that W .R. Grace should be required to pay to the Acton Water District the money saved if active treatment is not selected for the Northeast Area.

<u>EPA Response:</u> Comments regarding funding of the remedy are not considered comments on the remedy, but rather comments on the enforcement process and thus are not addressed in this responsiveness summary.

J.2 The town raised several questions regarding the proposed cleanup plan's consistency with existing federal and state orders. Questions were raised re: a federal court order and whether it required the implementation of an "accelerated cleanup" and prohibited "self-cleansing" of the aquifer and whether the proposed cleanup plan violated this Order. W. R. Grace commented that the cleanup plan proposed is consistent with the Consent Decree.

<u>EPA Response:</u> Comments regarding compliance with the federal Consent Decree are not considered comments on the remedy, but rather comments on the enforcement process. However, it should be noted that EPA has carefully reviewed the terms of that settlement and has determined that the selected remedy is fully consistent with that Consent Decree. See responses to comments B.2 and H.1.

J.3 The MBTA provided comments regarding its status as a potentially interested party at the site based on their railroad right-of-way.

<u>EPA Response:</u> Comments regarding liability are not considered comments on the remedy, but rather comments on the enforcement process and thus are not addressed in this responsiveness summary.

J.4 One commenter asked that rapid enforcement take place should there be delays or other non-compliance in implementing the remedy.

<u>EPA Response:</u> Assuming this work is conducted by potentially responsible parties, EPA will ensure that this work is appropriately overseen and that the enforcement process is fully utilized.

Appendix A

Commonwealth of Massachusetts
Letter of Concurrence

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

MITT ROMNEY
Governor

KERRY HEALEY
Lieutenant Governor

STEPHEN R. PRITCHARD
Secretary

ROBERT W. GOLLEDGE, Jr.
Commissioner

September 29, 2005

Ms. Susan Studlien
Office of Site Remediation and Restoration
U.S. Environmental Protection Agency, Region 1
One Congress Street, Suite 1100
Boston, MA 02114-2023

Re: State Concurrence Determination
Record of Decision – W.R. Grace Superfund Site Operable Unit 3
Acton, Massachusetts

Dear Ms. Studlien:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed the Selected Remedy described in the Record of Decision (ROD) prepared by the U.S. Environmental Protection Agency (EPA) for Operable Unit 3 of the W.R. Grace – Acton Superfund Site. Portions of the Selected Remedy have been revised from the proposed remedy contained in the Proposed Plan.

The Selected Remedy, in summary, includes:

- Cleanup of contaminated sediments and soils posing an unacceptable risk to human health and/or the environment in Sinking Pond and the North Lagoon Wetlands.

- Extraction and treatment of groundwater contamination in the Southeast and Southwest Industrial Landfill Areas on the Grace Property and at targeted areas within the Northeast Area. A treatment system will be designed and constructed with the ability to treat approximately 200 gallons per minute of groundwater to address the extracted water from all these areas. There is a provision contained in the ROD for a separate treatment facility to be constructed in the area of the Northeast Plume extraction system if one combined treatment system is not feasible. Treatment processes for extracted groundwater will include air stripping, activated carbon (air treatment), and metals precipitation. A portion of the treated water will be discharged to Sinking Pond; the remainder will be infiltrated and/or reinjected into the ground in the area of the Northeast Plume to minimize reduction in yield at the School Street municipal wells.

- Monitored natural attenuation in areas of groundwater contamination not captured by the extraction system.

- Institutional controls to prevent unacceptable exposures to contaminated groundwater until cleanup levels are met, to protect against unacceptable future exposures to any wastes left in place on-site, and to prevent the disturbance of any covered or capped areas, and

- Long-term groundwater, surface water, and sediment monitoring, and periodic five-year reviews of the remedy.

Two important components that were identified by MassDEP and others during the public comment period as necessary to an overall protective remedy were added by EPA to the Selected Remedy. The remedy now includes active pumping in the Northeast Plume area to provide greater protection to the School Street municipal water supply wells. That system will be designed to minimize any adverse impact to the ongoing operation of those wells. The Selected Remedy now also includes provisions to evaluate the potential for impacts from existing areas of contamination on a proposed new public supply well in the vicinity of WRG-3. In addition, the Selected Remedy includes provisions for additional work in the event the modeling or monitoring suggests adverse impacts to a supply well in that area.

During the public comment period, MassDEP also identified a need for EPA to analyze potential types of institutional controls prior to selecting the particular types of institutional controls appropriate for the Selected Remedy. Related issues to be addressed include without limitation comparing and contrasting the efficacy of the different types of institutional controls, and assessing the timing and who will be responsible for securing, maintaining and enforcing the institutional controls. While MassDEP supports the use of institutional controls as a component of the Selected Remedy, our concurrence assumes that EPA will address these issues before EPA or MassDEP commit to particular types of institutional controls, during remedial design.

Based on the foregoing, we believe the Selected Remedy, as modified from the proposed remedy and as described above, will address the remaining contamination in a manner that is protective of public health and the environment and is responsive to public comment, and we concur with this approach.

Congratulations and thank you for your responsiveness to MassDEP and to the public in modifying the proposed remedy.

If you have any questions regarding this letter, please contact Mr. Dan Keefe, Project Manager at (617) 292-5940 or Mr. Jay Naparstek, Deputy Division Director at (617) 292-5697.

Very truly yours,

Robert W. Golledge, Jr.
Commissioner
Department of Environmental Protection

Copies to:

Jay Naparstek, MassDEP Boston
Dan Keefe, MassDEP Boston
Derrick Golden, USEPA

Appendix B

Glossary of Terms and Acronyms

APPENDIX B

GLOSSARY OF TERMS AND ACRONYMS

1,2-DCA	1,2-dichloroethane
AAL	Allowable Ambient Limits
ARS	Aquifer Restoration System
ARAR	Applicable or Relevant and Appropriate Requirements
AUL	Activity and Use Limitation
AWD	Acton Water District
AWQC	Ambient Water Quality Criteria
BERA	Baseline Ecological Risk Assessment
CCC	Chronic Criteria Continuous Concentration
COC	Contaminant of Concern
cfs	cubic feet per second
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMC	Acute Criteria Maximum Concentration
Dewey & Almy	Dewey and Almy Chemical Company
EO	Executive Order
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
GAC	granulated activated carbon
gpm	gallons per minute
Grace	W.R. Grace & Co. - Conn.
GW	Groundwater
GWQS	Massachusetts Groundwater Quality Standards
HI	Hazard Index
HQ	Hazard Quotient
IRIS	integrated risk information system
ISCO	In-situ Chemical Oxidation
J	estimated value
LEL	Lowest Effect Levels
LOAEL	lowest observed adverse effect level
MADEP	Massachusetts Department of Environmental Protection
MBTA	Massachusetts Bay Transportation Authority
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MCP	Massachusetts Contingency Plan
mg/kg	milligrams per kilogram (or part per million)
mg/L	milligrams per liter (or part per million)
MMCL	Massachusetts Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan

NESHAP	national emission standards for hazardous air pollutants
NGVD	National Geodetic Vertical Datum of 1929
NOAEL	no observed adverse effect level
NRWQC	National Recommended Water Quality Criteria
O&M	Operations and Maintenance
ORSG	Massachusetts Office of Research and Standards Guidelines
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbons
PCB	poly-chlorinated biphenyl
PEC	Probable Effects Concentration
PHRA	Public Health Risk Assessment
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SEL	Severe Effects Level
Site	W.R. Grace Superfund Site, Acton & Concord, Massachusetts
SDWA	Safe Drinking Water Act
SOW	Statement of Work
SVOCs	semi-volatile organic compounds
TBC	To Be Considered
TCA	Trichloroethane
TCE	Trichloroethene
TEL	Threshold Effects Exposure Limit
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
VDC	1,1-dichloroethene or vinylidine chloride
VOCs	volatile organic compounds
WPA	Wetlands Protection Act
µg/kg	micrograms per kilogram (or part per billion)
µg/L	micrograms per liter (or part per billion)

Appendix C

Applicable or Relevant and Appropriate Requirements (ARARs) Tables

Table C-1. ARARs and TBCs for Groundwater Remediation

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARS
CHEMICAL SPECIFIC ARARS			
Safe Drinking Water Act ("SDWA") National Primary Drinking Water Regulations Maximum Contaminant Levels ("MCLs"), 40 C.F.R. § 141.11-141.16, 141.60-141.62	Relevant and Appropriate	Maximum Contaminant Levels (MCLs) have been promulgated for several common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies. MCLs are applicable only at the tap, but are relevant and appropriate because the groundwater underneath parts of the Site may be used as a drinking water source. Table 2-4 lists the MCLs.	This alternative will attain MCLs.
Non-zero SDWA Maximum Contaminant Level Goals ("MCLGs"), 40 C.F.R. § 141.50-141.51.	Relevant and Appropriate	MCLGs, defined by SDWA regulations as the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety, are non-enforceable health goals under the SDWA. Because MCLGs are not enforceable regulatory standards, they are not applicable. However, they are relevant and appropriate because groundwater aquifers beneath parts of the Site may be used as a source for drinking water. Table 2-4 lists the MCLGs.	This alternative will attain non-zero MCLGs.
Massachusetts Drinking Water Regulations, 310 C.M.R. 22.06, 22.06B, 22.07A, 22.07B	Relevant and Appropriate	These regulations set forth Massachusetts MCLs ("MMCLs"), based on health and technical practicality, for public water systems. The aquifer on site is not a public water system, but the requirements are relevant and appropriate for those areas of the Site that are "GW-1" areas under the MCP, because the groundwater in those areas of the Site may be potentially used as a source for drinking water. When MMCLs are more stringent than federal levels, the state levels must be met. The MMCLs for 1,4-Dichlorobenzene (also known as para-Dichlorobenzene in 310 CMR 22.07B) and ethylene dibromide are more stringent than the MCLs. In addition, there is no MMCL for lead, which has been found at the site, but there is a Massachusetts "action level", similar to an MCL, for lead. Table 2-4 lists the MMCLs.	This alternative will attain MMCLs.

Table C-1. ARARs and TBCs for Groundwater Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARS
Massachusetts Ground Water Quality Standards ("GWQS"), 314 C.M.R. 6.01-6.10	Relevant and Appropriate	The GWQSs, based on health and technical practicality, are relevant and appropriate to groundwater in Massachusetts. They set numeric limits for certain contaminants (e.g. arsenic, cadmium, copper, lead, manganese, mercury and non-numeric health-based standards for others (e.g. pathogenic organisms), as well as a pH range. The GWQSs are relevant and appropriate because they set standards for contaminant concentrations in groundwater. They are not applicable, because they technically only apply as criteria to be used in permitting discharges to groundwater. The groundwater beneath the site is Class I (fresh groundwater found in the saturated zone of unconsolidated deposits and is designated as a source of potable water supply). Table 2-4 lists the GWQSs.	This alternative will attain GWQSs.
Office of Research and Standards Guidelines ("ORSGs"), as found in Massachusetts Drinking Water Standards and Guidelines for Chemicals in Massachusetts Drinking Waters (May 1998)	TBC	The ORS has identified guidelines, based on health and technical practicality, applicable to drinking water. Table 2-4 lists the ORSGs. Because the ORSGs are not regulations, they are TBCs, rather than ARARs.	This alternative will attain ORSGs.
Human health Reference Doses (RfDs) and Cancer Slope Factors (CSFs) found in USEPA's IRIS database	TBC	USEPA requires the use of these values in the assessment of human health risk.	These values were used in the risk assessment and calculation of numerical remediation goals.
LOCATION-SPECIFIC ARARS			
Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00	Applicable	The Wetlands Protection Act (WPA) imposes requirements and limitations for alteration of land under water bodies and establishes performance standards for projects that affect wetlands. Because there are land under water bodies on the Site, these regulations are applicable.	The discharge of treated groundwater to Sinking Pond will be designed to comply with applicable provisions of the WPA and regulations.

Table C-1. ARARs and TBCs for Groundwater Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARS
Massachusetts Wellhead Protection Regulations, 310 CMR 22.21	Applicable	301 CMR 22 requires that protective zones around a wellhead be established that limit activities and land uses (such as storage of chemicals and removal of soil) in the zones. Because the Assabet and School Street wellfields are within the Site, and because the Assabet 1 and 2, Christofferson, Scribner, and Lawsbrook wells have DEP-approved Zone II wellhead protection areas which overlap with the site, these requirements are applicable.	Alternative GW-3 will be designed to comply with 301 CMR 22.
ACTION SPECIFIC ARARS			
Clean Water Act (CWA) § 402 (33 U.S.C. §1342	Relevant and Appropriate	Section 402 of the CWA requires issuance of an NPDES permit prior to discharge of any pollutant to a water of the United States. Permits can only be issued in compliance with applicable technology standards.	The discharge for Alternative GW-3 will be designed to meet relevant and appropriate substantive standards under NPDES regulations.
Clean Water Act (CWA) § 304(a) (33 U.S.C. §1314(a))	Relevant and Appropriate	Federal National Recommended Water Quality Criteria (NRWQC) include (1) human health-based criteria and (2) other water quality parameters protective of fish and aquatic life. NRWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Discharges subject to NPDES permitting requirements must not result in exceedances of NRWQCs. Table 2-5 lists the NRWQC.	The discharge to Sinking Pond will not cause or contribute to an exceedance of NRWQC.
Resource Conservation and Recovery Act (RCRA, 42 USC 6901-6992) - Groundwater Protection; 40 CFR Part 264, Subpart F.	Relevant and Appropriate	These regulations establish acceptable concentrations of hazardous constituents in the groundwater at licensed RCRA hazardous waste facilities. The point of compliance is set at the edge of the waste management unit(s). The regulations also establish groundwater monitoring requirements.	The groundwater monitoring provisions of Subpart F will be used to develop a long-term monitoring plan for the Site.

Table C-1. ARARs and TBCs for Groundwater Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARS
RCRA - Identification and Listing of Hazardous Wastes; 40 CFR Part 261	Relevant and Appropriate	Part 261 establishes requirements for determining whether wastes are hazardous.	These regulations will be used to determine whether any wastewater treatment residuals are hazardous waste.
RCRA Generator Requirements; 40 CFR Part 262	Relevant and Appropriate	RCRA establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	Wastewater treatment residuals that are determined to be hazardous waste will be handled in compliance with these regulations.
Massachusetts Air Pollution Control Regulations, 310 CMR 7.00	Applicable	These regulations set requirements on the control of fugitive emissions and dust.	These requirements will be met during construction activities.
Massachusetts Clean Water Act; G.L. ch. 21, § 26-51; 314 CMR 3.00	Applicable	The Massachusetts Clean Water Act and regulations impose requirements for permits prior to discharges to waters of the Commonwealth.	This alternative will be designed and operated in compliance with the MCWA and 314 CMR 3.00.
Massachusetts Clean Water Act, G.L. ch. 21, § 26-51; 314 CMR 3.00.	Applicable	The Massachusetts regulations provide that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards. These standards are the same as the NRWQCs for the compounds analyzed for at the Site (see Table 2-5).	The discharge to Sinking Pond will be designed and operated so that it will not cause or contribute to an exceedance of the MSWQS.
Massachusetts Hazardous Waste Rules for Identification and Listing of Hazardous Waste; 310 CMR 30.100.	Applicable	310 CMR 30.100 establishes requirements for determining whether wastes are hazardous.	These regulations will be used to determine whether any wastewater treatment residuals are hazardous waste.

APPENDIX C – APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARs
Safe Drinking Water Act, Underground Injection Control Requirements, 40 CFR Part 144	Applicable	The Underground Injection Control program regulations promulgated under Part C of the Safe Drinking Water Act (SDWA) establish requirements for underground injection of treated groundwater.	These requirements wells will be met if treated water is re-injected as part of this Alternative.
Massachusetts Hazardous Waste Rules for Generators of Hazardous Waste; 310 CMR 30.300.	Applicable	310 CMR 30.300 establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	Wastewater treatment residuals that are determined to be hazardous waste will be handled in compliance with these regulations.

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARs
Massachusetts Rules for Remedial Air Emissions, 310 CMR 40.0049	Relevant and Appropriate	The Massachusetts rules set forth standards for emissions from remedial activities, including a general requirement for 95% control over emissions from the remedial system.	This alternative will be designed and operated in compliance with these requirements
Massachusetts Threshold Exposure Limits (TELs) and Allowable Ambient Limits (AALs) for Ambient Air	TBC	DEP has issued guidance setting out permissible concentrations of air toxics in ambient air. The TELs and AALs are used to guide permitting decisions for sources of air toxics. Table 2-6 lists the TELs and AALs for compounds analyzed for at the Site.	This alternative will be designed and operated so that remedial air emissions do not cause any exceedances of TELs or AALs.
Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00	Applicable	The Wetlands Protection Act Imposes requirements and limitations for alteration of wetlands. It establishes performance standards for projects that affect wetlands. Because there are wetlands on the Site, these regulations are applicable.	The discharge of treated groundwater to Sinking Pond will be designed to comply with applicable provisions of the WPA and regulations.
Policy on Control of Air Emissions Superfund Sites OSWER Directive 9355.0-28	TBC	Provides EPA Policy regarding control of emissions from air strippers used during cleanup at Superfund Sites.	This policy will be considered in the design and operation of the air stripper.

APPENDIX C – APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARs
USEPA Region 1 Memo Lois Gitto to Merrill Hohman, July 12, 1989	TBC	Lays out Regional policy on emissions from air strippers at Superfund Sites.	This policy will be considered in the design and operation of the air stripper.
Massachusetts Well Decommissioning Requirements, 313 CMR 3.03.	Applicable	Massachusetts regulations provide for certain notification requirements upon well abandonment.	The Massachusetts regulations will be followed to the extent that the alternative involves decommissioning any wells.

Table C-2: ARARs and TBCs for Sinking Pond Sediment Remediation

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARS
CHEMICAL SPECIFIC ARARS			
Consensus-Based Sediment Quality Guidelines; MADEP, 2002. Technical Update, Freshwater Sediment Screening Benchmarks for Use Under the Massachusetts Contingency Plan.	TBC	MADEP recommends using the MacDonald et al. (2000) screening values for evaluating freshwater sediment and risks to benthic organisms. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology, 39, 20-31.	These guidelines were considered in the risk assessments and in developing risk-based remedial goals for sediment.
Ontario Provincial Sediment Quality Guideline	TBC	The Ontario Provincial Lowest Effect Levels (LEL) are used to identify sediment at which most benthic organisms are unaffected. (Ontario Ministry of the Environment, 1993a and b, 1994). Ontario Ministry of the Environment and Energy, 1993a. *Development of the Ontario Provincial Sediment Quality Guidelines for PCBs and the Organochlorine Pesticides,* Water Resources Branch. Ontario Ministry of the Environment and Energy, 1993b. *Development of the Ontario Provincial Sediment Quality Guidelines for Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, and Zinc*, Water Resources Branch. Ontario Ministry of the Environment and Energy, 1994. Development of the Ontario Provincial Sediment Quality Guidelines for Polycyclic Aromatic Hydrocarbons (PAH), Water Resources Branch.	These guidelines were considered in the risk assessments and in developing risk-based remedial goals for sediment.

Table C-2: ARARs and TBCs for Sinking Pond Sediment Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARS
LOCATION-SPECIFIC ARARS			
Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00	Applicable	The Wetlands Protection Act (WPA) imposes requirements and limitations for alteration of areas subject to protection under the WPA, including land under water bodies and establishes performance standards for projects that affect land under water bodies. Because Sinking Pond contains areas subject to jurisdiction under the WPA, these regulations are applicable.	It should be feasible to design this Alternative to be consistent with the performance standards in the Wetlands Protection Act Regulations.
Bordering Vegetated Wetland Delineation Criteria and Methodology, Issued: March 1, 1995	TBC	This policy defines which plant species or other plants are wetland indicator plants as specified in the wetland regulations (310 CMR 10.55(2)(c)). This policy also identifies a standard methodology for determining the boundary of Bordering Vegetated Wetlands (BVWs) in accordance with 310 CMR 10.55(2)(c)(1-3).	These Alternatives can be implemented in compliance with this Policy.
ACTION SPECIFIC ARARS			
RCRA - Identification and Listing of Hazardous Wastes; 40 CFR Part 261	Relevant and Appropriate	Part 261 establishes requirements for determining whether wastes are hazardous.	This alternative can easily be implemented to comply with the Part 261 regulations in determining whether any excavated sediments are hazardous waste.
RCRA Generator Requirements; 40 CFR Part 262	Relevant and Appropriate	RCRA establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	This Alternative can easily be the Part 262 regulations 310 CMR 30.300 if in fact any excavated sediments are hazardous waste.

Table C-2: ARARs and TBCs for Sinking Pond Sediment Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARs
Massachusetts Hazardous Waste Rules for Identification and Listing of Hazardous Waste; 310 CMR 30.100.	Applicable	310 CMR 30.100 establishes requirements for determining whether wastes are hazardous.	This Alternative can easily be implemented to comply with 310 CMR 30.100 in determining whether any excavated sediments are hazardous waste.
Massachusetts Hazardous Waste Rules for Generators of Hazardous Waste; 310 CMR 30.300.	Applicable	310 CMR 30.300 establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	This Alternative can easily be implemented to comply with 310 CMR 30.300 if in fact any excavated sediments are hazardous waste.
Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00	Applicable	The Wetlands Protection Act (WPA) imposes requirements and limitations for alteration of areas subject to protection under the WPA, including land under water bodies and establishes performance standards for projects that affect land under water bodies. Because Sinking Pond contains areas subject to jurisdiction under the WPA, these regulations are applicable.	It should be feasible to design this Alternative to be consistent with the performance standards in the Wetlands Protection Act Regulations.
Massachusetts Solid Waste Management Regulations (310 CMR 19.00)	Applicable	These regulations address non-hazardous waste and closure, post closure and maintenance of solid waste landfills. If non-hazardous wastes are left on site as part of this Alternative, the disposal Closure/Post Closure Standards would be met.	If non-hazardous wastes are left on-site, this Alternative will meet the closure/post closure standards to prevent human contact and migration of contaminants to surface and groundwater.

Table C-3: ARARs and TBCs for North Lagoon Wetland Sediment Remediation

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARS
CHEMICAL SPECIFIC ARARS			
Consensus-Based Sediment Quality Guidelines; MADEP, 2002. Technical Update, Freshwater Sediment Screening Benchmarks for Use Under the Massachusetts Contingency Plan.	TBC	MADEP recommends using the MacDonald et al. (2000) screening values for evaluating freshwater sediment and risks to benthic organisms. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology, 39, 20-31.	These guidelines were considered in the risk assessments and in developing risk-based remedial goals for sediment.
Ontario Provincial Sediment Quality Guideline	TBC	The Ontario Provincial Lowest Effect Levels (LEL) are used to identify sediment at which most benthic organisms are unaffected. (Ontario Ministry of the Environment, 1993a and b, 1994). Ontario Ministry of the Environment and Energy, 1993a. *Development of the Ontario Provincial Sediment Quality Guidelines for PCBs and the Organochlorine Pesticides,* Water Resources Branch. Ontario Ministry of the Environment and Energy, 1993b. *Development of the Ontario Provincial Sediment Quality Guidelines for Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, and Zinc*, Water Resources Branch. Ontario Ministry of the Environment and Energy, 1994. Development of the Ontario Provincial Sediment Quality Guidelines for Polycyclic Aromatic Hydrocarbons (PAH), Water Resources Branch.	These guidelines were considered in the risk assessments and in developing risk-based remedial goals for sediment.

Table C-3: ARARs and TBCs for North Lagoon Wetland Sediment Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARS
LOCATION-SPECIFIC ARARS			
Protection of Wetlands Executive Order No. 11990 (May 24, 1977), 42 Fed. Reg. 26961, 18 C.F.R. § 725.	Applicable	The Executive Order (EO) imposes requirements on federal agencies that oversee projects undertaken in wetlands areas, including natural ponds. It requires federal agencies to avoid construction in wetlands unless there is no practicable alternative to such construction. If there is no practical alternative to conducting work in the wetlands all practicable measures to minimize harm to wetlands from such construction must be taken. The North Lagoon Wetland is a jurisdictional wetland area. Because there are wetlands on the Site and a federal agency is overseeing the remediation, this requirement is applicable.	Because the contamination that will be remediated is located in wetlands, there is no practical alternative to address this contamination. Measures will be taken to minimize impacts.
Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00	Applicable	The Wetlands Protection Act (WPA) imposes requirements and limitations for alteration of wetlands and establishes performance standards for projects that affect wetlands. Because the North Lagoon Wetland contains areas subject to jurisdiction under the WPA, these regulations are applicable.	This alternative will be conducted in accordance with these regulations.

Table C-3: ARARs and TBCs for North Lagoon Wetland Sediment Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARs
Floodplain Management Executive Order No. 11988 (May 24, 1977), 42 Fed. Reg. 26951, 18 C.F.R. § 725.	Applicable	The Executive Order (EO) imposes requirements on federal agencies that oversee projects undertaken in floodplains. It requires federal agencies to avoid activities in floodplains unless there is no practicable alternative to such activities. If there is no practical alternative to conducting work in the floodplain, all practicable measures to minimize impacts must be taken. Because there is a floodplain on the Site and a federal agency is involved with the remediation, this requirement is applicable	Because some of the contamination in the North Lagoon Wetland that presents an unacceptable risk is located in a floodplain, there is no practical alternative to address this contamination. Measures will be taken to minimize impacts.
Bordering Vegetated Wetland Delineation Criteria and Methodology, Issued: March 1, 1995	TBC	This policy defines which plant species or other plants are wetland indicator plants as specified in the wetland regulations (310 CMR 10.55(2)(c)). This policy also identifies a standard methodology for determining the boundary of Bordering Vegetated Wetlands (BVWs) in accordance with 310 CMR 10.55(2)(c)(1-3).	This guidance will be used to define the boundary of the wetlands for state wetland purposes.
ACTION SPECIFIC ARARS			
RCRA - Identification and Listing of Hazardous Wastes; 40 CFR Part 261	Relevant and Appropriate	Part 261 establishes requirements for determining whether wastes are hazardous.	These regulations will be used to determine whether excavated sediments should be managed as hazardous waste.
RCRA Generator Requirements; 40 CFR Part 262	Relevant and Appropriate	RCRA establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	Sediment that is determined to be hazardous waste will be handled in compliance with these regulations.

Table C-3: ARARs and TBCs for North Lagoon Wetland Sediment Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARs
Clean Water Act (CWA) § 402 (33 U.S.C. § 1342	Applicable	Section 402 of the CWA requires issuance of an NPDES permit prior to discharge of any pollutant to a water of the United States. Permits can only be issued in compliance with applicable technology standards.	To the extent that this Alternative requires dewatering of contaminated sediments, the discharge from the dewatering operations will be designed to meet applicable substantive standards under NPDES regulations.
Clean Water Act (CWA) § 304(a) (33 U.S.C. § 1314(a))	Applicable	Federal National Recommended Water Quality Criteria (NRWQC) include (1) human health-based criteria and (2) other water quality parameters protective of fish and aquatic life. NRWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Discharges subject to NPDES permitting requirements must not result in exceedances of NRWQCs. Table 2-5 lists the NRWQC.	To the extent that this Alternative requires dewatering of contaminated sediments, the discharge from the dewatering operations will be designed and operated so that it will not cause or contribute to an exceedance of the NRWQC.
Massachusetts Clean Water Act, G.L. ch. 21, § 26-51; 314 CMR 3.00.	Applicable	The Massachusetts regulations provide that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards. These standards are the same as the NRWQCs for the compounds analyzed for at the Site (see Table 2-5).	To the extent that this Alternative requires dewatering of contaminated sediments, the discharge from the dewatering operations will be designed and operated so that it will not cause or contribute to an exceedance of the MSWQS.
Massachusetts Hazardous Waste Rules for Identification and Listing of Hazardous Waste; 310 CMR 30.100.	Applicable	310 CMR 30.100 establishes requirements for determining whether wastes are hazardous.	These regulations will be used to determine whether excavated sediments should be managed as hazardous waste.

Table C-3: ARARs and TBCs for North Lagoon Wetland Sediment Remediation (CONTINUED)

STATUTE/REGULATION	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARARs
Massachusetts Hazardous Waste Rules for Generators of Hazardous Waste; 310 CMR 30.300.	Applicable	310 CMR 30.300 establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	Sediment that is determined to be hazardous waste will be handled in compliance with these regulations.
Massachusetts Air Pollution Control Regulations, 310 CMR 7.00	Applicable	These regulations set requirements on the control of fugitive emissions and dust.	These requirements will be met during construction activities.
Massachusetts Solid Waste Management Regulations (310 CMR 19.00)	Applicable	These regulations address non-hazardous waste and closure, post closure and maintenance of solid waste landfills. If non-hazardous wastes are left on site as part of this Alternative, the disposal Closure/Post Closure Standards would be met.	If non-hazardous wastes are left on-site, this Alternative will meet the closure/post closure standards to prevent human contact and migration of contaminants to surface and groundwater.

Appendix D

Administrative Record Index and Guidance Documents

W. R. Grace & Co., Inc.(Acton Plant)
NPL Site Administrative Record
Record of Decision (ROD)
Operable Unit 3

Index

September 2005

Prepared by
EPA New England
Office of Site Remediation & Restoration

Introduction to the Collection

This is the Administrative Record for the W.R. Grace & Co., Inc. (Acton Plant) Superfund site, Acton & Concord, MA, OU 3, Contaminated Groundwater, Record of Decision (ROD), released September 2005. The file contains site-specific documents and a list of guidance documents used by EPA staff in selecting a response action at the site.

This file replaces the Proposed Plan for Record of Decision Administrative Record released in July 2005. This file includes, by reference, the administrative record files for the W.R. Grace & Co., Inc. (Acton Plant) Record of Decision (ROD) OU1, September 29, 1989.

The administrative record file is available for review at:

Acton Memorial Library
486 Main Street
Acton, MA 01720
978-264-9641 (phone)
http://www.actonmemoriallibrary.org/

EPA New England Superfund Records & Information Center
1 Congress Street, Suite 1100 (HSC)
Boston, MA 02114 (by appointment)
617-918-1440 (phone)
617-918-1223 (fax)
http://www.epa.gov/region01/superfund/resource/records.htm

Questions about this administrative record file should be directed to the EPA New England site manager.

An administrative record file is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Instructions about PDF

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03: REMEDIAL INVESTIGATION (RI)

42861 **REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) STATEMENT OF WORK (SOW)**

Author: M MITCH OBRADOVIC W R GRACE & CO
Addressee: EDMUND G BENOIT MA DEPT OF ENVIRONMENTAL PROTECTION
DAVID O LEDERER US EPA REGION 1
Doc Date: 03/25/1998 **# of Pages:** 72
File Break: 03.03
Doc Type: REPORT

42862 **APPROVAL OF REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) STATEMENT OF WORK (SOW)**

Author: DAVID O LEDERER US EPA REGION 1
Addressee: M MITCH OBRADOVIC W R GRACE & CO
Doc Date: 04/15/1998 **# of Pages:** 1
File Break: 03.03
Doc Type: LETTER

43197 **INITIAL SITE CHARACTERIZATION REPORT**

Author: HSI GEOTRANS
Addressee:
Doc Date: 08/12/1998 **# of Pages:** 423
File Break: 03.06
Doc Type: REPORT

03: REMEDIAL INVESTIGATION (RI)

43192 **PHASE 1 REMEDIAL INVESTIGATION (RI) WORK PLAN**

Author: HSI GEOTRANS
Addressee:
Doc Type: REPORT
Doc Date: 05/14/1999 **# of Pages:** 209
File Break: 03.07

43193 **RESPONSE TO JULY 13, 1999 GOVERNMENT PARTY COMMENTS ON PHASE 1 REMEDIAL INVESTIGATION (RI) WORK PLAN**

Author: HSI GEOTRANS
Addressee:
Doc Type: REPORT
Doc Date: 11/12/1999 **# of Pages:** 232
File Break: 03.07

43194 **ADDENDUM TO THE PHASE 1 REMEDIAL INVESTIGATION (RI) WORK PLAN**

Author: HSI GEOTRANS
Addressee:
Doc Type: REPORT
Doc Date: 01/14/2000 **# of Pages:** 60
File Break: 03.07

43195 **PROJECT OPERATIONS PLAN, REVISED [PART 1 OF 2]**

Author: HSI GEOTRANS
Addressee:
Doc Type: REPORT
Doc Date: 03/10/2000 **# of Pages:** 496
File Break: 03.04

03: REMEDIAL INVESTIGATION (RI)

43196 **PROJECT OPERATIONS PLAN, REVISED [PART 2 OF 2]**

Author: HSI GEOTRANS
Addressee:
Doc Type: REPORT
Doc Date: 03/10/2000
# of Pages: 164
File Break: 03.04

229291 **PHASE 1 REMEDIAL INVESTIGATION (RI) WORK PLAN (REVISED) [WITH TRANSMITTAL]**

Author: HSI GEOTRANS
Addressee:
Doc Type: WORK PLAN
Doc Date: 03/10/2000
# of Pages: 196
File Break: 03.07

42863 **PHASE 1 REMEDIAL INVESTIGATION (RI) DATA REPORT**

Author: GEOTRANS INC
Addressee: W R GRACE & CO
Doc Type: REPORT
Doc Date: 04/30/2001
# of Pages: 324
File Break: 03.06

03: REMEDIAL INVESTIGATION (RI)

232820 **SUB-RIVER SAMPLING DATA**

Author: ANNE E BENJAMIN GEOTRANS INC
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION

Doc Date: 09/27/2001 **# of Pages:** 16
File Break: 03.02

Doc Type: LETTER

232783 **SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT [WITH TRANSMITTAL]**

Author: KENNETH CERRETO MENZIE-CURA & ASSOCIATES INC
Addressee: JERRY CURA MENZIE-CURA & ASSOCIATES INC
KATHERINE A FOGARTY MENZIE-CURA & ASSOCIATES INC
GEOTRANS INC

Doc Date: 04/19/2002 **# of Pages:** 475
File Break: 03.10

Doc Type: REPORT

232791 **WORKPLAN FOR PHASE 2 ECOLOGICAL RISK ASSESSMENT (ERA)**

Author: JERRY CURA MENZIE-CURA & ASSOCIATES INC
Addressee: KATHERINE A FOGARTY MENZIE-CURA & ASSOCIATES INC
SUSAN B KANE DRISCOLL MENZIE-CURA & ASSOCIATES INC
GEOTRANS INC

Doc Date: 04/19/2002 **# of Pages:** 23
File Break: 03.07

Doc Type: WORK PLAN

03: REMEDIAL INVESTIGATION (RI)

232792 **COMMENTS ON SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT (ERA) AND WORK PLAN FOR PHASE 2 ECOLOGICAL RISK ASSESSMENT (ERA)**

Author: NANCY BETTINGER MA DEPT OF ENVIRONMENTAL PROTECTION
Addressee: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 06/04/2002 **# of Pages:** 6
File Break: 03.10
Doc Type: MEMO

232793 **SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (ERA)**

Author: KENNETH CERRETO MENZIE-CURA & ASSOCIATES INC
Addressee: JERRY CURA MENZIE-CURA & ASSOCIATES INC
KATHERINE A FOGARTY MENZIE-CURA & ASSOCIATES INC
GEOTRANS INC
Doc Date: 07/09/2002 **# of Pages:** 61
File Break: 03.10
Doc Type: REPORT

229292 **PHASE 1 REMEDIAL INVESTIGATION (RI) DATA REPORT ADDENDUM [WITH TRANSMITTAL DATED 08/14/2002]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Date: 08/16/2002 **# of Pages:** 240
File Break: 03.06
Doc Type: REPORT

03: REMEDIAL INVESTIGATION (RI)

232758 **DRAFT REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 2 OF 2 (APPENDICES)**

Author: GEOTRANS INC
Addressee:
Doc Type: REPORT
Doc Date: 08/30/2002 **# of Pages:** 288
File Break: 03.06

232810 **DRAFT REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 1 OF 2 [WITH TRANSMITTAL DATED 08/29/2002]**

Author: GEOTRANS INC
Addressee:
Doc Type: REPORT
Doc Date: 08/30/2002 **# of Pages:** 228
File Break: 03.06

232790 **REVIEW OF "DRAFT REMEDIAL INVESTIGATION (RI) REPORT"**

Author: BARBARA A WEIR METCALF AND EDDY, INC
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: REPORT
Doc Date: 09/30/2002 **# of Pages:** 5
File Break: 03.06

232824 **COMMENTS ON AUGUST 2002 DATA REPORT ADDENDUM AND PHASE 1 REMEDIAL INVESTIGATION (RI) REPORT**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Type: LETTER
Doc Date: 10/04/2002 **# of Pages:** 9
File Break: 03.06

03: REMEDIAL INVESTIGATION (RI)

232825 **COMMENTS ON PHASE 1 REMEDIAL INVESTIGATION (RI) DATA REPORT ADDENDUM AND THE DRAFT REMEDIAL INVESTIGATION (RI) REPORT**

Author: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 10/07/2002 **# of Pages:** 4
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
File Break: 03.06
Doc Type: LETTER

232784 **REVIEW OF THE GROUND-WATER FLOW MODEL**

Author: DAVID G JEWETT US EPA CENTER FOR SUBSURFACE MODELING SUPPORT
Doc Date: 01/26/2003 **# of Pages:** 7
Addressee: DERRICK GOLDEN US EPA REGION 1
File Break: 03.01
Doc Type: MEMO

232778 **MONITORING PROGRAM REPORT, 2002 [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Doc Date: 03/28/2003 **# of Pages:** 69
Addressee: WR GRACE & CO - CONN
File Break: 03.02
Doc Type: REPORT

232782 **RESPONSE TO GOVERNMENT PARTY COMMENTS ON PHASE 1 REMEDIAL INVESTIGATION (RI) DATA REPORT, ADDENDUM AND DRAFT REMEDIAL INVESTIGATION (RI) REPORT [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Doc Date: 03/28/2003 **# of Pages:** 55
Addressee: WR GRACE & CO - CONN
File Break: 03.06
Doc Type: REPORT

03: REMEDIAL INVESTIGATION (RI)

232788 **DATA REPORT FOR ECOLOGICAL RISK ASSESSMENT (ERA), VOLUME 1 OF 2 [WITH TRANSMITTAL]**

Author: MENZIE-CURA & ASSOCIATES INC
Addressee: GEOTRANS INC
Doc Date: 04/25/2003 **# of Pages:** 371
File Break: 03.02
Doc Type: REPORT

232789 **DATA REPORT FOR ECOLOGICAL RISK ASSESSMENT (ERA), VOLUME 2 OF 2**

Author: MENZIE-CURA & ASSOCIATES INC
Addressee: GEOTRANS INC
Doc Date: 04/25/2003 **# of Pages:** 855
File Break: 03.02
Doc Type: REPORT

232756 **PHASE 2 REMEDIAL INVESTIGATION (RI) DATA REPORT [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Date: 05/14/2003 **# of Pages:** 39
File Break: 03.02
Doc Type: REPORT

232779 **EVALUATION OF WRG-1, RP-1, AND NMGP**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Date: 05/30/2003 **# of Pages:** 27
File Break: 03.02
Doc Type: REPORT

03: REMEDIAL INVESTIGATION (RI)

232785 **REVIEW OF RESPONSE TO GOVERNMENT PARTY COMMENTS ON THE GROUND-WATER FLOW MODEL**

Author: DAVID G JEWETT US EPA CENTER FOR SUBSURFACE MODELING SUPPORT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 07/31/2003 **# of Pages:** 6
File Break: 03.01
Doc Type: MEMO

232757 **COMMENTS ON PHASE 2 REMEDIAL INVESTIGATION (RI) DATA REPORT**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Date: 08/07/2003 **# of Pages:** 2
File Break: 03.02
Doc Type: LETTER

232786 **RESPONSE TO COMMENTS ON EVALUATION OF GROUNDWATER WELLS: WRG-1, RP-1 AND NMGP**

Author: MARYELLEN C JOHNS REMEDIUM GROUP INC
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 09/05/2003 **# of Pages:** 4
File Break: 03.01
Doc Type: LETTER

03: REMEDIAL INVESTIGATION (RI)

232821 **DATA REPORT FOR HUMAN HEALTH RISK ASSESSMENT SAMPLES [WITH TRANSMITTAL]**

Author: MENZIE-CURA & ASSOCIATES INC
Addressee: GEOTRANS INC
Doc Date: 10/01/2003 **# of Pages:** 40
File Break: 03.02
Doc Type: REPORT

234829 **BENTHIC INVERTEBRATE EVALUATION FOR THE ASSABET RIVER [WITH TRANSMITTALS DATED 10/27/2003 AND 11/13/2003]**

Author: SUSAN KANE DRISCOLL MENZIE-CURA & ASSOCIATES INC
Addressee: KATHERINE A FOGARTY MENZIE-CURA & ASSOCIATES INC
GEOTRANS INC
Doc Date: 10/27/2003 **# of Pages:** 50
File Break: 03.10
Doc Type: REPORT

232814 **CONTAMINANT TRANSPORT MODELING**

Author: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Date: 10/28/2003 **# of Pages:** 2
File Break: 03.01
Doc Type: LETTER

03: REMEDIAL INVESTIGATION (RI)

232815 **REVIEW OF THE RESPONSE TO GOVERNMENT PARTY COMMENTS ON THE GROUNDWATER FLOW MODEL**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Date: 10/29/2003 **# of Pages:** 5
File Break: 03.01
Doc Type: LETTER

234830 **DRAFT PUBLIC HEALTH RISK ASSESSMENT, INTERIM DELIVERABLE 1 AND 2 [WITH TRANSMITTAL]**

Author: LISA BAILEY MENZIE-CURA & ASSOCIATES INC
Addressee: KATHERINE A FOGARTY MENZIE-CURA & ASSOCIATES INC
DONNA VORHEES MENZIE-CURA & ASSOCIATES INC
GEOTRANS INC
Doc Date: 10/31/2003 **# of Pages:** 367
File Break: 03.10
Doc Type: REPORT

234842 **COMMENTS ON DRAFT PUBLIC HEALTH RISK ASSESSMENT [WITH TRANSMITTAL DATED 12/15/2003]**

Author: JANE CERASO ACTON (MA) WATER DISTRICT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 10/31/2003 **# of Pages:** 2
File Break: 03.10
Doc Type: MEMO

03: REMEDIAL INVESTIGATION (RI)

234827 **REVIEW OF "RESPONSE TO GOVERNMENT PARTY COMMENTS ON PHASE 1 REMEDIAL INVESTIGATION (RI) DATA REPORT, ADDENDUM AND DRAFT REMEDIAL INVESTIGATION (RI) REPORT"**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Type: LETTER
Doc Date: 11/06/2003 **# of Pages:** 4
File Break: 03.06

232787 **NMGP AREA GROUNDWATER MONITORING**

Author: MARYELLEN C JOHNS REMEDIUM GROUP INC
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Type: LETTER
Doc Date: 11/10/2003 **# of Pages:** 2
File Break: 03.01

234828 **COMMENTS ON RESPONSE TO GOVERNMENT PARTY COMMENTS ON PHASE 1 REMEDIAL INVESTIGATION (RI) DATA REPORT ADDENDUM AND DRAFT REMEDIAL INVESTIGATION (RI) REPORT**

Author: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Type: LETTER
Doc Date: 11/10/2003 **# of Pages:** 3
File Break: 03.06

03: REMEDIAL INVESTIGATION (RI)

232816 **UPDATE ON PRIVATE IRRIGATION WELLS**

Author: JOHN H GUSWA HSI GEOTRANS
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 12/04/2003 **# of Pages:** 14
File Break: 03.01
Doc Type: LETTER

234841 **COMMENTS ON BENTHIC INVERTEBRATE EVALUATION FOR THE ASSABET RIVER**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Date: 01/16/2004 **# of Pages:** 5
File Break: 03.10
Doc Type: LETTER

232759 **RECENT TECHNICAL ISSUES SUMMARY: PUBLIC HEALTH RISK ASSESSMENT, THALLIUM, BENTHIC INVERTEBRATE SURVEY COMMENT LETTER, AND DRAFT OUTLINE FOR REUSE ASSESSMENT REPORT**

Author: BARBARA A WEIR METCALF AND EDDY, INC
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 01/30/2004 **# of Pages:** 5
File Break: 03.09
Doc Type: MEMO

03: REMEDIAL INVESTIGATION (RI)

232822 **DECEMBER 2003 AR-35 SAMPLING RESULTS AND PASSIVE DIFFUSION SAMPLING EVALUATION**

Author: JONATHAN R BRIDGE GEOTRANS INC
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 02/25/2004
# of Pages: 6
File Break: 03.02
Doc Type: LETTER

232781 **DATA USABILITY SUMMARY REPORT FOR PUBLIC HEALTH AND ECOLOGICAL RISK ASSESSMENT (ERA) [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Addressee: NEW ENVIRONMENTAL HORIZONS INC
Doc Date: 03/02/2004
# of Pages: 351
File Break: 03.02
Doc Type: REPORT

232780 **MONITORING PROGRAM REPORT, 2003 [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Date: 05/04/2004
# of Pages: 63
File Break: 03.02
Doc Type: REPORT

03: REMEDIAL INVESTIGATION (RI)

232817 **COMMENTS ON SUPPORTING DATA FOR THE GROUNDWATER FLOW MODELING TO SUPPORT THE REMDIAL INVESTIGATION / FEASABILITY STUDY (RI/FS)**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Date: 05/27/2004 **# of Pages:** 3
File Break: 03.01
Doc Type: LETTER

232794 **ADDENDUM TO REVISED BENTHIC INVERTEBRATE EVALUATION FOR THE ASSABET RIVER**

Author: KATHERINE A FOGARTY MENZIE-CURA & ASSOCIATES INC
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 07/13/2004 **# of Pages:** 23
File Break: 03.10
Doc Type: LETTER

232763 **BASELINE ECOLOGICAL RISK ASSESSMENT [WITH TRANSMITTAL]**

Author: MENZIE-CURA & ASSOCIATES INC
Addressee: GEOTRANS INC
Doc Date: 07/30/2004 **# of Pages:** 293
File Break: 03.10
Doc Type: REPORT

03: REMEDIAL INVESTIGATION (RI)

232762 **PUBLIC HEALTH RISK ASSESSMENT, INTERIM DELIVERABLE 3 [WITH TRANSMITTAL DATED 08/12/2004]**

Author: LISA BAILEY MENZIE-CURA & ASSOCIATES INC
Addressee: KATHERINE A FOGARTY MENZIE-CURA & ASSOCIATES INC
DONNA VORHEES MENZIE-CURA & ASSOCIATES INC
MENZIE-CURA & ASSOCIATES INC
GEOTRANS INC

Doc Date: 08/05/2004 **# of Pages:** 960
File Break: 03.10

Doc Type: REPORT

232811 **MONITORING PROGRAM REPORT, 2004 [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN

Doc Date: 06/03/2005 **# of Pages:** 73
File Break: 03.04

Doc Type: REPORT

234839 **CORRECTED TABLE FOR BACKGROUND METALS CONCENTRATIONS FOR NORTH LAGOON WETLAND SEDIMENT**

Author: ANNE BENJAMIN SHEEHAN GEOTRANS INC
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION

Doc Date: 06/21/2005 **# of Pages:** 2
File Break: 03.02

Doc Type: LETTER

03: REMEDIAL INVESTIGATION (RI)

232805 **PUBLIC REVIEW DRAFT REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 1 OF 2 [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Date: 07/01/2005 **# of Pages:** 227
File Break: 03.06
Doc Type: REPORT

232806 **PUBLIC REVIEW DRAFT REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 2 OF 2**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Date: 07/01/2005 **# of Pages:** 202
File Break: 03.06
Doc Type: REPORT

232807 **PUBLIC REVIEW DRAFT PUBLIC HEALTH RISK ASSESSMENT [WITH TRANSMITTAL]**

Author: MENZIE-CURA & ASSOCIATES INC
Addressee: GEOTRANS INC
Doc Date: 07/01/2005 **# of Pages:** 918
File Break: 03.10
Doc Type: REPORT

232808 **PUBLIC REVIEW DRAFT BASELINE ECOLOGICAL RISK ASSESSMENT**

Author: MENZIE-CURA & ASSOCIATES INC
Addressee: GEOTRANS INC
Doc Date: 07/01/2005 **# of Pages:** 502
File Break: 03.10
Doc Type: REPORT

03: REMEDIAL INVESTIGATION (RI)

232809 **PROPOSED PLAN**

Author: US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
Doc Date: 07/01/2005 **# of Pages:** 20
File Break: 04.09

234840 **CONSTRUCTION, CALIBRATION, AND ANALYSIS OF A THREE-DIMENSIONAL NUMERICAL GROUNDWATER FLOW MODEL**

Author: GEOTRANS INC
Addressee: W.R. GRACE
Doc Type: REPORT
Doc Date: 07/01/2005 **# of Pages:** 110
File Break: 03.04

232818 **ADDITIONAL MODEL ANALYSES FOR NORTHEAST AREA**

Author: JOHN H GUSWA HSI GEOTRANS
Addressee: DERRICK GOLDEN US EPA REGION 1
GRETCHEN MUENCH US EPA REGION 1
Doc Type: MEMO
Doc Date: 07/07/2005 **# of Pages:** 1
File Break: 03.01

03: REMEDIAL INVESTIGATION (RI)

232819 **GROUNDWATER FLOW AND CONTAMINANT TRANSPORT MODELS**

Author: WARREN DIESL METCALF & EDDY
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 07/07/2005 **# of Pages:** 3
File Break: 03.01
Doc Type: MEMO

232823 **MCP AS APPLICABLE OF RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) FOR THE GRACE SITE**

Author: GRETCHEN MUENCH US EPA REGION 1
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 07/07/2005 **# of Pages:** 1
File Break: 03.05
Doc Type: MEMO

237275 **SEDIMENT SAMPLING RESULTS FOR NORTH LAGOON WETLAND AND SINKING POND, W.R.GRACE SUPERFUND SITES, ACTON, MA**

Author: ANNE BENJAMIN SHEEHAN GEOTRANS INC
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/13/2005 **# of Pages:** 36
File Break: 03.01
Doc Type: LETTER
Doc Type: REPORT

04: FEASIBILITY STUDY (FS)

43198 **DEVELOPMENT AND INITIAL SCEENING OF ALTERNATIVES**

Author: HSI GEOTRANS
Addressee:
Doc Type: REPORT
Doc Date: 11/15/2001 **# of Pages:** 96
File Break: 04.04

229294 **DETAILED ANALYSIS OF ALTERNATIVES WORK PLAN [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Type: WORK PLAN
Doc Date: 04/19/2002 **# of Pages:** 30
File Break: 04.07

229293 **REVIEW OF POTENTIALLY RESPONSIBLE PARTY (PRP) DELIVERABLES: SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT, WORKPLAN FOR PHASE 2 ECOLOGICAL RISK ASSESSMENT, AND DETAILED ANALYSIS OF ALTERNATIVES WORK PLAN**

Author: BARBARA A WEIR METCALF AND EDDY, INC
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 05/31/2002 **# of Pages:** 10
File Break: 04.04

232760 **GROUNDWATER TREATABILITY AND PILOT TEST EVALUATION REPORT [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Type: REPORT
Doc Date: 04/28/2003 **# of Pages:** 64
File Break: 04.04

04: FEASIBILITY STUDY (FS)

232761 **COMMENTS ON GROUNDWATER TREATABILITY AND PILOT TEST EVALUATION REPORT**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Date: 08/28/2003 **# of Pages:** 3
File Break: 04.04
Doc Type: LETTER

229295 **MA DEP COMMENTS ON DETAILED ANALYSIS OF ALTERNATIVES WORK PLAN**

Author: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Addressee: MARYELLEN C JOHNS REMEDIUM GROUP INC
Doc Date: 05/03/2004 **# of Pages:** 5
File Break: 04.07
Doc Type: LETTER

232812 **DRAFT FEASIBILITY STUDY (FS) [WITH MARGINALIA]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Date: 03/01/2005 **# of Pages:** 350
File Break: 04.06
Doc Type: REPORT

04: FEASIBILITY STUDY (FS)

232813 **BACKGROUND METALS CONCENTRATIONS FOR NORTH LAGOON WETLAND SEDIMENT [WITH MARGINALIA]**

Author: ANNE BENJAMIN SHEEHAN GEOTRANS INC
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 03/08/2005 **# of Pages:** 8
File Break: 04.02
Doc Type: LETTER

234845 **COMMENTS ON DRAFT FEASIBILITY STUDY (FS)**

Author: JANE CERASO ACTON (MA) WATER DISTRICT
Addressee: JIM DEMING ACTON (MA) WATER DISTRICT
DERRICK GOLDEN US EPA REGION 1
Doc Date: 03/14/2005 **# of Pages:** 3
File Break: 04.06
Doc Type: LETTER

234847 **COMMENTS ON DRAFT FEASIBILITY STUDY (FS) ON BEHALF OF TOWN OF ACTON**

Author: JAMES D OKUN OREILLY TALBOT & OKUN ASSOCIATES
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 03/16/2005 **# of Pages:** 8
File Break: 04.06
Doc Type: LETTER

04: FEASIBILITY STUDY (FS)

234833 **COMMENTS ON FEASIBILITY STUDY (FS) ON BEHALF OF TOWN OF ACTON**

Author: STEPHEN D ANDERSON ANDERSON & KREIGER
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 03/17/2005 **# of Pages:** 5
File Break: 04.06
Doc Type: LETTER

234831 **COMMENTS ON BACKGROUND METALS CONCENTRATIONS FOR NORTH LAGOON WETLAND SEDIMENT**

Author: MARY MICHELMAN ACTON CITIZENS FOR ENVIRONMENTAL SAFETY (STARMET/NUCLEAR METAI
Addressee: GEOTRANS INC
Doc Date: 03/23/2005 **# of Pages:** 2
File Break: 04.02
Doc Type: LETTER

234834 **COMMENTS ON DRAFT FEASIBILITY STUDY (FS) [WITH MARGINALIA]**

Author: MARY MICHELMAN ACTON CITIZENS FOR ENVIRONMENTAL SAFETY (STARMET/NUCLEAR METAI
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 03/23/2005 **# of Pages:** 13
File Break: 04.06
Doc Type: LETTER

04: FEASIBILITY STUDY (FS)

234846 **COMMENTS ON DRAFT FEASIBILITY STUDY (FS)**

Author: MARY MICHELMAN ACTON CITIZENS FOR ENVIRONMENTAL SAFETY (STARMET/NUCLEAR METAI
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 03/23/2005 **# of Pages:** 13
File Break: 04.06
Doc Type: LETTER

234832 **COMMENTS ON "DRAFT FEASIBILITY STUDY (FS)"**

Author: BARBARA A WEIR METCALF AND EDDY, INC
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 03/25/2005 **# of Pages:** 11
File Break: 04.06
Doc Type: REPORT

234835 **CLARIFICATION OF COMMENTS ON DRAFT FEASIBILITY STUDY (FS)**

Author: JANE CERASO ACTON (MA) WATER DISTRICT
Addressee: JIM DEMING ACTON (MA) WATER DISTRICT
DERRICK GOLDEN US EPA REGION 1
Doc Date: 04/08/2005 **# of Pages:** 2
File Break: 04.06
Doc Type: LETTER

04: FEASIBILITY STUDY (FS)

234843 **DRAFT, COMMENTS ON DRAFT FEASIBILITY STUDY (FS)**

Author: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 05/09/2005 **# of Pages:** 6
File Break: 04.06

234836 **REVIEW OF PORTIONS OF ATTACHMENT A OF THE FEASIBILITY STUDY (FS)**

Author: SARAH LEVINSON US EPA REGION 1
Addressee:
Doc Type: MEMO
Doc Date: 06/06/2005 **# of Pages:** 6
File Break: 04.06

234837 **PUBLIC REVIEW DRAFT FEASIBILITY STUDY (FS) [WITH TRANSMITTAL]**

Author: GEOTRANS INC
Addressee: WR GRACE & CO - CONN
Doc Type: REPORT
Doc Date: 07/01/2005 **# of Pages:** 478
File Break: 04.06

234838 **COMMENTS ON REVISED DRAFT FEASIBILITY STUDY (FS) [WITH E-MAIL TRANSMITTAL]**

Author: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 07/07/2005 **# of Pages:** 3
File Break: 04.06

04: FEASIBILITY STUDY (FS)

235009 **CLARIFICATION AND REVISIONS TO JUNE 6, 2005 MEMO ENTITLED "REVIEW OF PROTIONS OF ATTACHMENT A OF THE FEASIBILITY STUDY (FS)"**

Author: SARAH LEVINSON US EPA REGION 1
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 07/12/2005 **# of Pages:** 6
File Break: 04.06
Doc Type: MEMO

236627 **ADDITIONAL GROUNDWATER EVALUATIONS**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee:
Doc Date: 07/20/2005 **# of Pages:** 23
File Break: 04.06
Doc Type: MEMO
Doc Type: SAMPLING & ANALYSIS DATA

236671 **MAY 2005 NMGP AREA GROUNDWATER SAMPLING RESULTS**

Author: ANNE BENJAMIN SHEEHAN GEOTRANS INC
Addressee: DERRICK GOLDEN US EPA REGION 1
DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 07/20/2005 **# of Pages:** 3
File Break: 04.02
Doc Type: LETTER

05: RECORD OF DECISION (ROD)

236672 **REQUEST FOR EXTENSION OF THE PUBLIC COMMENT PERIOD**

Author: DON P JOHNSON ACTON (MA) TOWN OF
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 07/14/2005 **# of Pages:** 3
File Break: 05.03
Doc Type: LETTER

236673 **REQUEST FOR EXTENSION OF THE PUBLIC COMMENT PERIOD**

Author: PAMELA RESOR MA SENATE
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 07/14/2005 **# of Pages:** 4
File Break: 05.03
Doc Type: LETTER

237281 **REQUEST FOR THE RELEASE OF MORE DOCUMENTS AND AN EXTENSION OF THE PUBLIC COMMENT PERIOD**

Author: MARTIN MEEHAN US HOUSE OF REPRESENTATIVES
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 07/14/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: LETTER

237295 **COMMENTS ON THE PROPOSED PLAN**

Author: FRANCES E FOWLER ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 08/01/2005 **# of Pages:** 3
File Break: 05.03
Doc Type: LETTER

05: RECORD OF DECISION (ROD)

238225 **COMMENTS ON THE PROPOSED PLAN**

Author: ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 08/01/2005 **# of Pages:** 4
File Break: 05.03

237279 **TEXT OF COMMENTS FOR THE 8/4/05 PUBLIC HEARING ON THE PROPOSED PLAN**

Author: LAUREN ROSENZWEIG ACTON (MA) TOWN OF
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 08/04/2005 **# of Pages:** 2
File Break: 05.03

237284 **COMMENTS ON THE PROPOSED PLAN**

Author: DAVID DOWNING ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 08/04/2005 **# of Pages:** 1
File Break: 05.03

05: RECORD OF DECISION (ROD)

237285 **REQUEST FOR AN EXTENSION OF THE PUBLIC COMMENT PERIOD**

Author: JIM DEMING ACTON (MA) WATER DISTRICT
Addressee: MARY MICHELMAN ACTON CITIZENS FOR ENVIRONMENTAL SAFETY (STARMET/NUCLEAR METAI
LAUREN ROSENZWEIG ACTON (MA) TOWN OF
DERRICK GOLDEN US EPA REGION 1
Doc Date: 08/04/2005 **# of Pages:** 2
File Break: 05.03
Doc Type: LETTER

237287 **COMMENTS ON THE PROPOSED PLAN**

Author: DOUG HALLEY ACTON (MA) TOWN OF
Addressee:
Doc Date: 08/04/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: FORM

238215 **COMMENTS ON THE PROPOSED PLAN**

Author: GILBERT K WOOLLEY SIERRA CLUB
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 08/09/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

05: RECORD OF DECISION (ROD)

237282 **REQUEST FOR RELEASE OF MORE DOCUMENTS AND AN EXTENSION OF THE PUBLIC COMMENT PERIOD**

Author: CORY ATKINS MA STATE LEGISLATURE
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 08/15/2005 **# of Pages:** 2
File Break: 05.03
Doc Type: LETTER

237286 **COMMENTS ON THE PROPOSED PLAN**

Author: BETH WOLF ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 08/22/2005 **# of Pages:** 2
File Break: 05.03
Doc Type: LETTER

237289 **COMMENTS ON THE PROPOSED PLAN**

Author: MICHAEL S RESH BOC GASES
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 08/30/2005 **# of Pages:** 2
File Break: 05.03
Doc Type: LETTER

237288 **COMMENTS ON THE PROPOSED PLAN**

Author: RICHARD A HATFIELD ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/02/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: LETTER

05: RECORD OF DECISION (ROD)

237298 **COMMENTS ON THE PROPOSED PLAN**

Author: JANET HART ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/03/2005 **# of Pages:** 2
File Break: 05.03

237299 **COMMENTS ON THE PROPOSED PLAN**

Author: PEGGY MIKKOLA ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/03/2005 **# of Pages:** 1
File Break: 05.03

237300 **COMMENTS ON THE PROPOSED PLAN**

Author: BETTINA D ABE ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/03/2005 **# of Pages:** 1
File Break: 05.03

05: RECORD OF DECISION (ROD)

237301 **COMMENTS ON THE PROPOSED PLAN**

Author: CAROL LOPICCOLO ACTON (MA) RESIDENT
Addressee: PHIL LOPICCOLO ACTON (MA) RESIDENT
DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/03/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

237302 **COMMENTS ON THE PROPOSED PLAN**

Author: JANET GELLER-MCGRATH ACTON (MA) RESIDENT
Addressee: JOSH GELLER-MCGRATH ACTON (MA) RESIDENT
DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/03/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

237303 **COMMENTS ON THE PROPOSED PLAN**

Author: ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/03/2005 **# of Pages:** 1
File Break:
Doc Type: MEMO

05: RECORD OF DECISION (ROD)

237312 **COMMENTS ON THE PROPOSED PLAN**

Author: KAREN RIVERA
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/03/2005 **# of Pages:** 1
File Break: 05.03

237304 **COMMENTS ON THE PROPOSED PLAN**

Author: ADAM PARKER
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/04/2005 **# of Pages:** 1
File Break: 05.03

237305 **COMMENTS ON THE PROPOSED PLAN**

Author: DEENA FERRARA ACTON (MA) RESIDENT
Addressee: ROBERT FERRARA ACTON (MA) RESIDENT
DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/04/2005 **# of Pages:** 1
File Break: 05.03

05: RECORD OF DECISION (ROD)

237306 **COMMENTS ON THE PROPOSED PLAN**

Author: BRIAN R SZETELA ACTON (MA) RESIDENT
Addressee: REBECCA L SZETELA ACTON (MA) RESIDENT
DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/04/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

237307 **COMMENTS ON THE PROPOSED PLAN**

Author: JIM SNYDER-GRANT ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/04/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

237308 **COMMENTS ON THE PROPOSED PLAN**

Author: JUDITH ARONSTEIN ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/04/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

05: RECORD OF DECISION (ROD)

237311 **COMMENTS ON THE PROPOSED PLAN**

Author: PAUL M WHITE ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/05/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

237290 **COMMENTS ON THE PROPOSED PLAN AND REQUEST TO EXTEND THE COMMENT PERIOD**

Author: EDWARD M KENNEDY US SENATE
Addressee: JOHN F KERRY US SENATE
MARTIN MEEHAN US HOUSE OF REPRESENTATIVES
STEPHEN L JOHNSON US EPA - HEADQUARTERS
Doc Date: 09/06/2005 **# of Pages:** 2
File Break: 05.03
Doc Type: LETTER

237297 **COMMENTS ON THE PROPOSED PLAN**

Author: KAREN ONEILL ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/06/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

05: RECORD OF DECISION (ROD)

237309 **COMMENTS ON THE PROPOSED PLAN**

Author: HANNAH BLOCH ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/06/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

237310 **COMMENTS ON THE PROPOSED PLAN**

Author: ANDREA SOUTHWICK ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/06/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

237313 **COMMENTS ON THE PROPOSED PLAN**

Author: DOROTHY CAMPBELL ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/06/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

238211 **COMMENTS ON THE PROPOSED PLAN**

Author: KAVITA BATRA ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/06/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

05: RECORD OF DECISION (ROD)

238212 **COMMENTS ON THE PROPOSED PLAN**

Author: DAN PENNEY ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/06/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

238213 **COMMENTS ON THE PROPOSED PLAN**

Author: MICHELE PRUETT ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/06/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

238214 **COMMENTS ON THE PROPOSED PLAN**

Author: GEORGE L JOHNSTON ACTON (MA) RESIDENT
Addressee: PATRICIA A JOHNSTON ACTON (MA) RESIDENT
DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/06/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: MEMO

05: RECORD OF DECISION (ROD)

238221 **COMMENTS ON THE PROPOSED PLAN**

Author: CAROL HOLLEY ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 09/06/2005 **# of Pages:** 3
File Break: 05.03

237292 **COMMENTS ON THE PROPOSED PLAN**

Author: ROBERT H BRUECKNER ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 09/07/2005 **# of Pages:** 2
File Break: 05.03

237293 **COMMENTS ON THE PROPOSED PLAN**

Author: RICHARD SO ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 09/07/2005 **# of Pages:** 3
File Break: 05.03

237294 **COMMENTS ON THE PROPOSED PLAN**

Author: ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 09/07/2005 **# of Pages:** 3
File Break: 05.03

05: RECORD OF DECISION (ROD)

237296 **COMMENTS ON THE PROPOSED PLAN**

Author: ANDREW RODWIN ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/07/2005 **# of Pages:** 1
File Break: 05.03

237314 **COMMENTS ON THE PROPOSED PLAN**

Author: BARBARA DOWDS
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/07/2005 **# of Pages:** 1
File Break: 05.03

238209 **COMMENTS ON THE PROPOSED PLAN**

Author: SARA EVANGELOS ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/07/2005 **# of Pages:** 1
File Break: 05.03

238210 **COMMENTS ON THE PROPOSED PLAN**

Author: NANCY K HUNTON ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/07/2005 **# of Pages:** 1
File Break: 05.03

05: RECORD OF DECISION (ROD)

238220 **COMMENTS ON THE PROPOSED PLAN**

Author: PAMELA RESOR MA SENATE
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/07/2005 **# of Pages:** 4
File Break: 05.03
Doc Type: LETTER

238224 **COMMENTS ON THE PROPOSED PLAN**

Author: ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/07/2005 **# of Pages:** 3
File Break: 05.03
Doc Type: LETTER

238227 **COMMENTS ON THE PROPOSED PLAN**

Author: ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/07/2005 **# of Pages:** 3
File Break: 05.03
Doc Type: LETTER

237277 **COMMENTS ON THE PROPOSED PLAN**

Author: MARYELLEN C JOHNS REMEDIUM GROUP INC
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/08/2005 **# of Pages:** 89
File Break: 05.03
Doc Type: LETTER
Doc Type: REPORT

05: RECORD OF DECISION (ROD)

237278 **TOWN OF ACTON COMMENTS ON THE PROPOSED PLAN**

Author: SETH JAFFE FOLEY HOAG LLP
Addressee: GRETCHEN MUENCH US EPA REGION 1
Doc Type: LETTER
Doc Date: 09/08/2005 **# of Pages:** 4
File Break: 05.03

237291 **COMMENTS ON THE PROPOSED PLAN**

Author: BRENT REAGOR ACTON (MA) BOARD OF HEALTH
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/08/2005 **# of Pages:** 1
File Break: 05.03

238217 **COMMENTS ON THE PROPOSED PLAN**

Author: MARY MICHELMAN ACTON CITIZENS FOR ENVIRONMENTAL SAFETY (STARMET/NUCLEAR METAI
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 09/08/2005 **# of Pages:** 31
File Break: 05.03

238218 **COMMENTS ON THE PROPOSED PLAN**

Author: JULIA BLATT ORGANIZATION FOR THE ASSABET RIVER (OAR)
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Type: LETTER
Doc Date: 09/08/2005 **# of Pages:** 4
File Break: 05.03

05: RECORD OF DECISION (ROD)

238219 **COMMENTS ON THE PROPOSED PLAN**

Author: SCOTT DARLING MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/08/2005 **# of Pages:** 4
File Break: 05.03
Doc Type: LETTER

238222 **MA DEP COMMENTS ON THE PROPOSED PLAN**

Author: DANIEL KEEFE MA DEPT OF ENVIRONMENTAL PROTECTION
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/08/2005 **# of Pages:** 5
File Break: 05.03
Doc Type: LETTER

238223 **TOWN OF ACTON COMMENTS ON THE PROPOSED PLAN**

Author: JOHN MURRAY ACTON (MA) TOWN OF
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/08/2005 **# of Pages:** 162
File Break: 05.03
Doc Type: LETTER

238226 **COMMENTS ON THE PROPOSED PLAN**

Author: MICHELE KENERSON ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/08/2005 **# of Pages:** 1
File Break: 05.03
Doc Type: LETTER

05: RECORD OF DECISION (ROD)

238228 **COMMENTS ON THE PROPOSED PLAN**

Author: MARION MAXWELL ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/08/2005 **# of Pages:** 3
File Break: 05.03
Doc Type: LETTER

238216 **COMMENTS ON THE PROPOSED PLAN**

Author: MARGARETHA ECKHARDT ACTON (MA) RESIDENT
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 09/12/2005 **# of Pages:** 6
File Break: 05.03
Doc Type: MEMO

237032 **STATE CONCURRENCE DETERMINATION FOR THE RECORD OF DECISION (ROD) OPERABLE UNIT 3**

Author: ROBERT W GOLLEDGE JR MA DEPARTMENT OF ENVIRONMENTAL PROTECTION - COMMISSIONER
Addressee: SUSAN STUDLIEN US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Doc Date: 09/29/2005 **# of Pages:** 2
File Break: 05.01
Doc Type: LETTER

237033 **RECORD OF DECISION (ROD) OPERABLE UNIT 3**

Author: US EPA REGION 1
Addressee:
Doc Date: 09/30/2005 **# of Pages:** 208
File Break: 05.04
Doc Type: RECORD OF DECISION

13: COMMUNITY RELATIONS

234844 **REQUEST OF EXTENSION OF TIMELINE FOR RECORD OF DECISION (ROD)**

Author: MARY MICHELMAN ACTON CITIZENS FOR ENVIRONMENTAL SAFETY (STARMET/NUCLEAR METAI
Addressee: DERRICK GOLDEN US EPA REGION 1
Doc Date: 04/18/2005 **# of Pages:** 3
File Break: 13.01
Doc Type: LETTER

236691 **REMEDIAL INVESTIGATION (RI) COMPLETE / EPA ISSUES PROPOSED CLEANUP PLAN FOR W.R. GRACE SITE IN ACTON, MA**

Author: US EPA REGION 1
Addressee:
Doc Date: 07/01/2005 **# of Pages:** 1
File Break: 13.03
Doc Type: PRESS RELEASE

236692 **SAVE THESE DATES!! US EPA WILL HOLD PUBLIC INFORMATIONAL MEETING AND HEARING**

Author: US EPA REGION 1
Addressee:
Doc Date: 07/01/2005 **# of Pages:** 1
File Break: 13.04
Doc Type: FACT SHEET

236697 **EPA TO REPORT ON W.R. GRACE**

Author: NICK PINTO THE BEACON
Addressee:
Doc Date: 07/07/2005 **# of Pages:** 1
File Break: 13.03
Doc Type: NEWS CLIPPING

13: COMMUNITY RELATIONS

236690 **EPA ANNOUNCES PROPOSED CLEANUP PLAN FOR W.R. GRACE SITE IN ACTON**

Author: US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
Doc Date: 07/08/2005 **# of Pages:** 3
File Break: 13.03

236696 **OFFICIALS WARY OF EPA PLAN**

Author: NICK PINTO THE BEACON
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 07/14/2005 **# of Pages:** 4
File Break: 13.03

235013 **PUBLIC INFORMATION MEETING, EPA'S PROPOSED CLEANUP PLAN**

Author: US EPA REGION 1
Addressee:
Doc Type: MEETING NOTES
Doc Date: 07/19/2005 **# of Pages:** 1
File Break: 13.04

236674 **ANNOUNCEMENT OF DISAPPOINTMENT WITH US EPA'S PROPOSED PLAN**

Author: ACTON (MA) TOWN OF
Addressee: ACTON (MA) WATER DISTRICT
ACTON CITIZENS FOR ENVIRONMENTAL SAFETY (STARMET/NUCLEAR METALS)
Doc Type: PRESS RELEASE
Doc Date: 07/19/2005 **# of Pages:** 5
File Break: 13.03

13: COMMUNITY RELATIONS

236675 **EPA'S PLAN FOR THE WR GRACE SITE NOT ENOUGH ACTION FOR ACTON!**

Author: ACTON CITIZENS FOR ENVIRONMENTAL SAFETY (STARMET/NUCLEAR METALS) **Doc Date:** 07/19/2005 **# of Pages:** 1
Addressee: **File Break:** 13.05
Doc Type: FACT SHEET

237364 **PUBLIC INFORMATION MEETING, EPA'S PROPOSED CLEANUP PLAN, ACTON TOWN HALL**

Author: DAVID A ARSENAULT FRAMER ARSENAULT BROCK LLC **Doc Date:** 07/19/2005 **# of Pages:** 1
Addressee: **File Break:** 13.04
Doc Type: PUBLIC MEETING RECORD

237283 **COMMENTS ON THE PUBLIC HEARING**

Author: JANE CERASO ACTON (MA) WATER DISTRICT **Doc Date:** 07/20/2005 **# of Pages:** 1
Addressee: DERRICK GOLDEN US EPA REGION 1 **File Break:** 13.04
Doc Type: MEMO

236695 **TOWN RIPS APART EPA**

Author: NICK PINTO THE BEACON **Doc Date:** 07/21/2005 **# of Pages:** 3
Addressee: **File Break:** 13.03
Doc Type: NEWS CLIPPING

13: COMMUNITY RELATIONS

236698 **EPA EXTENDS PUBLIC COMMENT PERIOD ON THE PROPOSED CLEANUP PLAN FOR W.R. GRACE (ACTON PLANT) SITE IN ACTON MASSACHUSETTS**

Author: US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
Doc Date: 07/21/2005 **# of Pages:** 3
File Break: 13.03

236694 **EDITORIAL: TRUST DEPENDS ON EPA'S OPENNESS**

Author: THE BEACON
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 07/28/2005 **# of Pages:** 2
File Break: 13.03

236693 **TOWN IS WAITING FOR EPA UPDATE**

Author: NICK PINTO METRO WEST DAILY NEWS
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 08/04/2005 **# of Pages:** 2
File Break: 13.03

236702 **YEAR 5, YEAR 10, YEAR 15, YEAR 20: VISUAL AIDS FOR PUBLIC MEETING**

Author: ACTON (MA) TOWN OF
Addressee:
Doc Type: MAP
Doc Date: 08/04/2005 **# of Pages:** 1
File Break: 13.04

13: COMMUNITY RELATIONS

237280 **EPA'S PLAN FOR W R GRACE SITE NOT ENOUGH ACTION FOR ACTON**

Author: ACTON CITIZENS FOR ENVIRONMENTAL SATETY (ACES)
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 08/04/2005 **# of Pages:** 1
File Break: 13.04

237365 **PUBLIC HEARING, EPA'S PROPOSED CLEANUP PLAN, W. R. GRACE (ACTON PLANT) SUPERFUND SITE, ACTON TOWN HALL**

Author: DAVID A ARSENAULT FRAMER ARSENAULT BROCK LLC
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 08/04/2005 **# of Pages:** 1
File Break: 13.04

14: CONGRESSIONAL RELATIONS

237273 **RESPONSE TO REQUEST FOR EXTENSION OF COMMENT PERIOD AND RECONSIDERATION OF PROPOSD REMEDY**

Author: ROBERT W VARNEY US EPA REGION 1
Addressee: JOHN F KERRY US SENATE
Doc Type: LETTER
Doc Date: 09/15/2005 **# of Pages:** 2
File Break: 14.01

14: CONGRESSIONAL RELATIONS

237274 **RESPONSE TO REQUEST FOR EXTENSION OF COMMENT PERIOD AND RECONSIDERATION OF PROPOSD REMEDY**

Author: ROBERT W VARNEY US EPA REGION 1
Addressee: EDWARD M KENNEDY US SENATE
Doc Date: 09/15/2005 **# of Pages:** 1
File Break: 14.01
Doc Type: LETTER

237276 **RESPONSE TO REQUEST FOR EXTENSION OF COMMENT PERIOD AND RECONSIDERATION OF PROPOSD REMEDY**

Author: ROBERT W VARNEY US EPA REGION 1
Addressee: MARTIN MEEHAN US HOUSE OF REPRESENTATIVES
Doc Date: 09/15/2005 **# of Pages:** 1
File Break: 14.01
Doc Type: LETTER

16: NATURAL RESOURCE TRUSTEE

235014 **NOTIFICATION OF PUBLICATION OF PROPOSED PLAN**

Author: DERRICK GOLDEN US EPA REGION 1
Addressee: KENNETH FINKELSTEIN US NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
KENNETH MUNNEY US DOI/US FISH & WILDLIFE SERVICE
ANDREW RADDANT US DEPT OF THE INTERIOR
MARTHA STEELE MA DEPT OF PUBLIC HEALTH
WILLIAM SWEET US AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR)
DALE YOUNG MA DEPT OF ENVIRONMENTAL PROTECTION
Doc Date: 07/14/2005 **# of Pages:** 2
File Break: 16.01
Doc Type: LETTER

Number of Documents in Collection: 167

EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
PROTOCOL FOR GROUND-WATER EVALUATIONS

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1986	OSWER #9080.0-1	2406

TITLE
MANAGEMENT OF INVESTIGATION-DERIVED WASTES DURING SITE INSPECTIONS.

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/1/1991	EPA 540/G-91/009	C189

TITLE
EPA GUIDE FOR MINIMIZING ADVERSE ENVIRONMENTAL EFFECTS OF CLEANUP OF UNCONTROLLED HAZARDOUS-WASTE SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/1985	EPA/600/8-85/008	2001

TITLE
INTERIM GUIDANCE ON SUPERFUND SELECTION OF REMEDY

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/24/1986	OSWER #9355.0-19	9000

TITLE
RCRA/CERCLA DECISIONS MADE ON REMEDY SELECTION

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/24/1985		9001

TITLE
COMPENDIUM OF TECHNOLOGIES USED IN THE TREATMENT OF HAZARDOUS WASTES

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1987	EPA/625/8-87/014	2300

TITLE
DATA QUALITY OBJECTIVES FOR REMEDIAL RESPONSE ACTIVITIES: EXAMPLE SCENARIO: RI/FS ACTIVITIES AT A SITE W/ CONTAMINATED SOILS AND GROUNDWATER

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1987	EPA/540/G-87/004	2102

TITLE
INTERIM FINAL GUIDANCE FOR CONDUCTING REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES UNDER CERCLA.

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/1/1988	OSWER #9355.3-01	2002

TITLE
RI/FS IMPROVEMENTS

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/23/1987	OSWER #9355.0-20	2008

TITLE
RI/FS IMPROVEMENTS FOLLOW-UP

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/25/1988	OSWER #9355.3-05	2009

TITLE
SEDIMENT SAMPLING QUALITY ASSURANCE USER'S GUIDE

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/1985	EPA/600/4-85/048	2116

EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
COSTS OF REMEDIAL RESPONSE ACTIONS AT UNCONTROLLED HAZARDOUS WASTE SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
1/1/1981		1001

TITLE
GUIDANCE DOCUMENT FOR PROVIDING ALTERNATE WATER SUPPLIES

DOCDATE	OSWER/EPA ID	DOCNUMBER
2/1/1988	OSWER #9355.3-03	4001

TITLE
MODELING REMEDIAL ACTIONS AT UNCONTROLLED HAZARDOUS WASTE SITES (VOL. I-IV)

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/1/1985	OSWER #9355.0-08	2004

TITLE
SUPERFUND REMEDIAL DESIGN AND REMEDIAL ACTION GUIDANCE

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/1986	OSWER #9355.0-4A	2011

TITLE
POLICY ON FLOOD PLAINS AND WETLAND ASSESSMENTS FOR CERCLA ACTIONS

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1985	OSWER #9280.0-02	2005

TITLE
INTERIM GUIDANCE ON POTENTIALLY RESPONSIBLE PARTY PARTICIPATION IN REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/16/1988	OSWER #9835.1a	8001

TITLE
COMMUNITY RELATIONS IN SUPERFUND: A HANDBOOK (INTERIM VERSION). INCLUDES CHAPTER 6, DATED 11/03/88.

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/1988	OSWER #9230.0-03B	7000

TITLE
ENDANGERMENT ASSESSMENT GUIDANCE

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/22/1985	OSWER #9850.0-1	8000

TITLE
SUPERFUND EXPOSURE ASSESSMENT MANUAL

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/1/1988	OSWER #9285.5-1	5013

TITLE
SUPERFUND PUBLIC HEALTH EVALUATION MANUAL

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/1/1986	OSWER #9285.4-1	5014

TITLE
TOXICOLOGY HANDBOOK

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1985	OSWER #9850.2	5015

EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
RISK ASSESSMENT GUIDANCE FOR SUPERFUND, VOLUME I, HUMAN HEALTH EVALUATION MANUAL

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/29/1989	OSWER #9285.7-01a	5023

TITLE
RISK ASSESSMENT GUIDANCE FOR SUPERFUND, VOLUME II, ENVIRONMENTAL EVALUATION MANUAL

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1989	EPA/540/1-89/001	5024

TITLE
GUIDANCE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER AT SUPERFUND SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1988	OSWER #9283.1-2	2413

TITLE
LAND DISPOSAL RESTRICTIONS AS RELEVANT AND APPROPRIATE REQUIREMENTS FOR CERCLA CONTAMINATED SOIL AND DEBRIS

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/5/1989	OSWER #9347.2-01	3016

TITLE
OPTIONS FOR INTERIM POLICY FOR SOIL INGESTION ASSUMPTIONS

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/4/1988		5022

TITLE
MODEL STATEMENT OF WORK FOR A REMEDIAL INVESTIGATION AND FEASIBILITY STUDY CONDUCTED BY POTENTIALLY RESPONSIBLE PARTIES

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/2/1989	OSWER #9835.8	2016

TITLE
GUIDANCE FOR SOIL INGESTION RATES

DOCDATE	OSWER/EPA ID	DOCNUMBER
1/27/1989	OSWER #9850.4	5021

TITLE
EXPOSURE FACTORS HANDBOOK

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/1989	EPA/600/8-89/043	5020

TITLE
TOXICOLOGICAL PROFILE FOR BENZENE

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/1/1989		5029

TITLE
TOXICOLOGICAL PROFILE FOR VINYL CHLORIDE

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1989		5041

TITLE
TOXICOLOGICAL PROFILE FOR ARSENIC

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1989		5028

EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
EVALUATION OF GROUND-WATER EXTRACTION REMEDIES-VOLUME 1 SUMMARY REPORT

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1989	EPA/540/2-89/054	2412

TITLE
GUIDE FOR CONDUCTING TREATABILITY STUDIES UNDER CERCLA; INTERIM FINAL;

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1989	EPA/540/2-89/058	2015

TITLE
GUIDE TO SELECTING SUPERFUND REMEDIAL ACTIONS

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/1/1990	OSWER #9355.0-27FS	9002

TITLE
INNOVATIVE TECHNOLOGY - SOIL WASHING [QUICK REFERENCE FACT SHEET]

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1989	OSWER #9200.5-250FS	2327

TITLE
INNOVATIVE TECHNOLOGY - IN-SITU VITRIFICATION [QUICK REFERENCE FACT SHEET]

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1989	OSWER #9200.5-251FS	2325

TITLE
CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - OVERVIEW OF ARARs - FOCUS ON ARAR WAIVERS [QUICK REFERENCE FACT SHEET]

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1989	OSWER #9234.2-03FS	3011

TITLE
GETTING READY - SCOPING THE RI/FS [QUICK REFERENCE FACT SHEET]

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1989	OSWER #9355.3-01FS1	2013

TITLE
REMEDIAL INVESTIGATION - SITE CHARACTERIZATION AND TREATABILITY STUDIES [QUICK REFERENCE FACT SHEET]

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1989	OSWER #9355.3-01FS2	5025

TITLE
FEASIBILITY STUDY - DEVELOPMENT AND SCREENING OF REMEDIAL ACTION ALTERNATIVES [QUICK REFERENCE FACT SHEET]

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1989	OSWER #9355.3-01FS3	2018

TITLE
FEASIBILITY STUDY: DETAILED ANALYSIS OF REMEDIAL ACTION ALTERNATIVES [QUICK REFERENCE FACT SHEET]

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1990	OSWER #9355.3-01FS4	2019

TITLE
TREATABILITY STUDIES UNDER CERCLA: AN OVERVIEW [QUICK REFERENCE FACT SHEET]

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1989	OSWER #9380.3-02FS	2020

EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
GUIDANCE ON REMEDIAL ACTIONS FOR SUPERFUND SITES WITH PCB CONTAMINATION

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1990	OSWER #9355.4-01	2014

TITLE
AIR/SUPERFUND NATIONAL TECHNICAL GUIDANCE STUDY SERIES VOLUME I - APPLICATION OF AIR PATHWAY ANALYSES FOR SUPERFUND ACTIVITIES

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1988		5016

TITLE
AIR/SUPERFUND NATIONAL TECHNICAL GUIDANCE STUDY SERIES VOLUME II - ESTIMATION OF BASELINE AIR EMISSIONS AT SUPERFUND SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
1/1/1989	EPA/450/1-89/002	5017

TITLE
AIR/SUPERFUND NATIONAL TECHNICAL GUIDANCE STUDY SERIES VOLUME III - ESTIMATION OF AIR EMISSIONS FROM CLEANUP ACTIVITIES AT SUPERFUND SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
1/1/1989	EPA/450/1-89/003	5018

TITLE
ANALYSIS OF RCRA CLOSURE OPTIONS FOR SUPERFUND SITES IN SUPERFUND 1987: PROCEEDINGS OF THE 8TH NATIONAL CONFERENCE.

DOCDATE	OSWER/EPA ID	DOCNUMBER
		C002

TITLE
PROTECTION OF WETLANDS: EXECUTIVE ORDER 11990. 42 FED. REG. 26961 (1977).

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/24/1977		C003

TITLE
DEVELOPMENT OF STATISTICAL DISTRIBUTION OR RANGES STANDARD FACTORS USED IN EXPOSURE ASSESSMENTS.

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1985	EPA 600/8-85-010	C020

TITLE
DRAFT GUIDANCE FOR CONDUCTING REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES UNDER CERCLA. SUPERSEDED BY 2002.

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1988	OSWER 9335.3-01	C021

TITLE
DRAFT GUIDANCE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER AT SUPERFUND SITES.

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/1/1986	OSWER 9283.1-2	C022

TITLE
ENDANGERMENT ASSESSMENT HANDBOOK.

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1985	OSWER 9850.1	C025

TITLE
GUIDANCE ON FEASIBILITY STUDIES UNDER CERCLA.

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/1985	EPA 540/G-85-003	C034

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
GUIDANCE ON REMEDIAL INVESTIGATIONS UNDER CERCLA.

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/1985	EPA 540/G-85/002	C035

TITLE
INTERIM GUIDANCE ON COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS.

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/9/1987	OSWER 9234.0-05	C055

TITLE
FEASIBILITY TESTING OF IN SITU VITRIFICATION OF NEW BEDFORD HARBOR SEDIMENTS.

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1988		C028

TITLE
POLICY FOR SUPERFUND COMPLIANCE WITH THE RCRA LAND DISPOSAL RESTRICTIONS.

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/17/1989	OSWER 9347.1-02	C058

TITLE
LAND DISPOSAL RESTRICTIONS AS RELEVANT AND APPROPRIATE REQUIREMENTS FOR CERCLA CONTAMINATED SOIL AND DEBRIS. DUPLICATE OF 3016.

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/5/1989	OSWER 9347.2-01	C054

TITLE
IN SITU VITRIFICATION OF PCB-CONTAMINATED SOILS. FINAL REPORT.

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/1/1986		C040

TITLE
SUPPLEMENTAL RISK ASSESSMENT GUIDANCE FOR THE SUPERFUND PROGRAM. DRAFT FINAL.

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/1989	EPA 901/5-89-001	C104

TITLE
GUIDANCE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER AT SUPERFUND SITES. INTERIM FINAL. DUPLICATE OF 2413.

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1988	OSWER 9283.1-2	C106

TITLE
GUIDE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER. DUPLICATE OF 2409.

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/1/1989	OSWER 9283.1-2FS	C120

TITLE
ARARS Q'S & A'S. GENERAL POLICY: RCRA, CWA & SDWA. SUPERFUND FACT SHEET. DUPLICATE OF 3006.

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/1/1989	OSWER 9234.2-01/FS-A	C122

TITLE
EVALUATION OF GROUND-WATER EXTRACTION REMEDIES. VOLUME 1. SUMMARY REPORT. DUPLICATE OF 2412.

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1989	EPA 540/2-89/054	C131

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
GROUND WATER ISSUE. PERFORMANCE EVALUATIONS OF PUMP-AND-TREAT REMEDIATIONS.

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/1/1989	EPA 540/4-89/005	C134

TITLE
ATSDR FACT SHEET.

DOCDATE	OSWER/EPA ID	DOCNUMBER
		C150

TITLE
INTERIM FINAL GUIDANCE FOR CONDUCTING REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES UNDER CERCLA. DUPLICATE OF 2002.

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/1/1988	OSWER 9355.3-01	C170

TITLE
RISK ASSESSMENT GUIDANCE FOR SUPERFUND. VOLUME I. HUMAN HEALTH EVALUATION MANUAL (PART A). INTERIM FINAL.

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1989	EPA 540/1-89/002	C174

TITLE
GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: THE PROPOSED PLAN, THE RECORD OF DECISION, E.S.D.'S, R.O.D. AMENDMENT. INTERIM FINAL.

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/1989	OSWER 9355.3-02	C179

TITLE
RISK ASSESSMENT GUIDANCE FOR SUPERFUND. HUMAN HEALTH EVALUATION MANUAL PART A.

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/1989	OSWER 9285.7-01A	C180

TITLE
SOIL SAMPLING QUALITY ASSURANCE USER'S GUIDE. SECOND EDITION.

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1989	EPA 600/8-89/046	C091

TITLE
APPLICABILITY OF LDRS TO RCRA AND CERCLA GROUND WATER TREATMENT REINJECTION SUPERFUND MANAGEMENT REVIEW: RECOMMENDATION NO. 26. DUPLICATE OF C119.

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/27/1989	OSWER 9234.1-06	C117

TITLE
FINAL GUIDANCE ON OVERSITE OF POTENTIALLY RESPONSIBLE PARTY REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES. VOLUMES 1 & 2.

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/1991	OSWER 9835.1 (d)	C184

TITLE
BASICS OF PUMP-AND-TREAT GROUND-WATER REMEDIATION TECHNOLOGY.

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1990	EPA 600/8-90/003	C194

TITLE
INTERIM FINAL GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: PROPOSED PLAN, RECORD OF DECISION, ESD'S, RECORD OF DECISION AMENDMENT.

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/1989	OSWER 9355.3-02	C249

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
TRANSPORT AND FATE OF CONTAMINANTS IN THE SUBSURFACE. SEMINAR PUBLICATION.

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1989	EPA 625/4-89/019	C252

TITLE
COMMUNITY RELATIONS IN SUPERFUND: A HANDBOOK.

DOCDATE	OSWER/EPA ID	DOCNUMBER
3/1/1986	OSWER 9230.0-3A	C260

TITLE
FINAL POLICY TOWARD OWNERS OF PROPERTY CONTAINING CONTAMINATED AQUIFERS

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/24/1995	PB96-109145	C271

TITLE
ROLE OF THE BASELINE RISK ASSESSMENT IN SUPERFUND REMEDY SELECTION DECISIONS

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/22/1991	OSWER 9355.0-30	C276

TITLE
ARAR'S FACT SHEET: COMPLIANCE WITH CLEAN THE CLEAN AIR ACT AND ASSOCIATED AIR QUALITY REQUIREMENTS

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1992		C281

TITLE
RISK UPDATE ISSUE NO. 2

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1994		C288

TITLE
ECOLOGICAL RISK ASSESSMENT GUIDANCE FOR SUPERFUND PROCESS FOR DESIGNING AND CONDUCTING ECOLOGICAL RISK ASSESSMENTS (EPA 540-R-97-006)

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/2/1997		C361

TITLE
REVIEW OF ECOLOGICAL ASSESSMENT CASE STUDIES FROM A RISK ASSESSMENT PERSPECTIVE

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/1/1993	EPA 630/R-92-005	C363

TITLE
FRAMEWORK FOR ECOLOGICAL RISK ASSESSMENT (EPA/630/R-92/001)

DOCDATE	OSWER/EPA ID	DOCNUMBER
2/1/1992	EPA 630/R-92-001	C364

TITLE
DRAFT FINAL GUIDELINES FOR ECOLOGICAL RISK ASSESSMENT

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/18/1997		C366

TITLE
REVIEW OF ECOLOGICAL ASSESSMENT CASE STUDIES FROM A RISK ASSESSMENT PERSPECTIVE - VOLUME II (EPA/630/R-94/003)

DOCDATE	OSWER/EPA ID	DOCNUMBER
1/1/1994	EPA 630/R-94-003	C367

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
TOXICOLOGICAL BENCHMARKS FOR WILDLIFE: 1996 REVISION

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/1996		C368

TITLE
ECOLOGICAL RISK ASSESSMENT ISSUE PAPERS (EPA/630/R-94/009)

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1994	EPA 630/R-94-009	C369

TITLE
ROLE OF BTAG'S IN ECOLOGICAL ASSESSMENT -ECO UPDATE - VOL. 1, NO. 1

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1991	OSWER 9345.0-05I	C416

TITLE
SUMMARY OF EPA SEDIMENT POLICY GOALS

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/9/1997		C449

TITLE
HEALTH EFFECTS ASSESSMENT SUMMARY TABLES - FY 1997 UPDATE

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/1997	EPA 540/R-97-036	C468

TITLE
DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS

DOCDATE	OSWER/EPA ID	DOCNUMBER
1/1/1992	EPA 600/8-91-011B	C469

TITLE
DOCUMENTATION FOR THE RISK ASSESSMENT SHORTFORM RESIDENTIAL SCENARIO(POLICY #WCS/ORS-142-92)

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/1/1992		C470

TITLE
DRAFT INTERIM FINAL OSWER MONITORED NATURAL ATTENUATION POLICY

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1997	OSWER 9200.4-17	C474

TITLE
EXECUTIVE ORDER 11988 - FLOODPLAIN MANAGEMENT

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/24/1977		C471

TITLE
EXECUTIVE ORDER 11990 - PROTECTION OF WETLANDS

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/24/1977		C472

TITLE
RULES OF THUMB FOR SUPERFUND REMEDY SELECTION (EPA 540-R-97-013)

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1997	OSWER 9355.0-69	C473

EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
USE OF MONITORED NATURAL ATTENUATION AT SUPERFUND, RCRA CORRECTIVE ACTION, AND UNDERGROUND STORAGE TANK SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1997	OSWER 9200.4-17	C475

TITLE
COMMUNITY RELATIONS IN SUPERFUND: A HANDBOOK

DOCDATE	OSWER/EPA ID	DOCNUMBER
1/1/1992	EPA 540/R-92/009	C488

TITLE
USE OF MONITORED NATURAL ATTENTUATION AT SUPERFUND, RCRA CORRECTIVE ACTION, AND UNDERGROUND STORAGE TANK SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/21/1999	OSWER 9200.4-17P	C515

TITLE
GROUND WATER ISSUE: MICROBIAL PROCESSES AFFECTING MONITORED NATURAL ATTENUATION OF CONTAMINANTS IN THE SUBSURFACE

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1999	EPA 540/S-99/001	C516

TITLE
ANALYSIS OF GROUND-WATER REMEDIAL ALTERNATIVES AT A SUPERFUND SITE, GROUNDWATER, VOL. 29, NO. 6

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1991		C517

TITLE
RISK ASSESSMENT GUIDANCE FOR SUPERFUND, VOLUME 1, HUMAN HEALTH EVALUATION MANUAL, INTERIM

DOCDATE	OSWER/EPA ID	DOCNUMBER
1/1/1998	OSWER 9285.7-01D	C530

TITLE
INSTITUTIONAL CONTROLS: A SITE MANAGER'S GUIDE TO IDENTIFYING, EVALUATING AND SELECTING INSTITUTIONAL CONTROLS AT SUPERFUND AND RCRA CORRECTIVE ACTION CLEANUPS.

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/2000	OSWER 9355.0-74 FS-P	C531

TITLE
FIELD APPLICATIONS OF IN SITU REMEDIATION TECHNOLOGIES: CHEMICAL OXIDATION.

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1998	EPA 542-R-98-008	C533

TITLE
GUIDE FOR CONDUCTING TREATABILITY STUDIES UNDER CERCLA, BIODEGRADATION REMEDY SELECTION, INTERIM GUIDANCE

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1993	EPA 540/R-93/519A	C542

TITLE
GUIDANCE FOR MONITORING AT HAZARDOUS WASTE SITES: FRAMEWORK FOR MONITORING PLAN DEVELOPMENT AND IMPLEMENTATION

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/2002	OSWER 9355.4-28	C543

TITLE
HANDBOOK, GROUND WATER, VOLUME 1: GROUND WATER AND CONTAMINATION

DOCDATE	OSWER/EPA ID	DOCNUMBER
9/1/1990	EPA 625/6-90/016A	C559

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
HANDBOOK, GROUND WATER, VOLUME 2: METHODOLOGY

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/1991	EPA 625/6-90/016B	C560

TITLE
ECOLOGICAL RISK ASSESSMENT AND RISK MANAGEMENT PRINCIPLES FOR SUPERFUND SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/7/1999	OSWER 9285.7-28 P	C563

TITLE
ROLE OF THE ECOLOGICAL RISK ASSESSMENT IN THE BASELINE RISK ASSESSMENT

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/12/1994	OSWER 9285.7-17	C564

TITLE
PRINCIPLES FOR MANAGING CONTAMINATED SEDIMENT RISKS AT HAZARDOUS WASTE SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
2/12/2002	OSWER 9285.6-08	C565

TITLE
WILDLIFE EXPOSURE FACTORS HANDBOOK, VOLUME 1 OF 2

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1993	EPA 600/R-93/187	C566

TITLE
WILDLIFE EXPOSURE FACTORS HANDBOOK, VOLUME 2 OF 2

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1993	EPA 600/R-93/187	C567

TITLE
DRAFT GUIDANCE FOR EVALUATING THE VAPOR INTRUSION TO INDOOR AIR PATHWAY FROM GROUNDWATER AND SOILS (SUBSURFACE VAPOR INTRUSION GUIDANCE)

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/20/2002		C574

TITLE
EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT

DOCDATE	OSWER/EPA ID	DOCNUMBER
5/24/1977	EO 11988	C578

TITLE
A GUIDE TO DEVELOPING AND DOCUMENTING COST ESTIMATES DURING THE FEASIBILITY STUDY

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/2000	OSWER 9355.0-75	C582

TITLE
RISK UPDATES NO 3

DOCDATE	OSWER/EPA ID	DOCNUMBER
8/1/1995		C591

TITLE
RISK UPDATES NO 4

DOCDATE	OSWER/EPA ID	DOCNUMBER
11/1/1996		C592

EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

TITLE
RISK ASSESSMENT GUIDANCE FOR SUPERFUND VOLUME I: HUMAN HEALTH EVALUATION MANUAL. PART D. STANDARDIZED PLANNING, REPORTING, AND REVIEW OF SUPERFUND RISK ASSESSMENTS. FINAL

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/2001		C593

TITLE
PRELIMINARY REMEDIATION GOALS TABLE REGION 9 TECHNICAL SUPPORT TEAM

DOCDATE	OSWER/EPA ID	DOCNUMBER
10/1/2002		C594

TITLE
NATIONAL RECOMMENDED WATER QUALITY CRITERIA

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/27/2002		C597

TITLE
DRINKING WATER STANDARDS

DOCDATE	OSWER/EPA ID	DOCNUMBER
6/1/2003		C599

TITLE
RISK-BASED CONCENTRATION TABLE REGION III TECHNICAL GUIDANCE MANUAL RISK ASSESSMENT

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/14/2004		C600

TITLE
PRO-UCL VERSION 3.0 STATISTICAL SOFTWARE TO COMPUTE UPPER CONFIDENCE LIMITS ON THE UNKNOWN POPULATION MEAN

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/1/2004		C601

TITLE
RISK ASSESSMENT GUIDANCE FOR SUPERFUND VOLUME I: HUMAN HEALTH EVALUATION MANUAL (PART E SUPPLEMENTAL GUIDANCE FOR DERMAL RISK ASSESSMENT) FINAL

DOCDATE	OSWER/EPA ID	DOCNUMBER
7/1/2004		C602

TITLE
GUIDELINES FOR ECOLOGICAL RISK ASSESSMENT

DOCDATE	OSWER/EPA ID	DOCNUMBER
4/1/1998		C614

TITLE
DETERMINATION OF BACKGROUND CONCENTRATIONS OF INORGANICS IN SOILS AND SEDIMENTS AT HAZARDOUS WASTE SITES

DOCDATE	OSWER/EPA ID	DOCNUMBER
12/1/1995	EPA/540/S-96/500	C625

TABLES

ROD RISK WORKSHEET [Human Health]

Table G-1

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Concern	Concentration Detected Minimum	Concentration Detected Maximum	Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
North Lagoon Wetland								
	Arsenic	38.4	3900	mg/kg	15 / 15	1510	mg/kg	95% UCL - G
Sinking Pond								
	Arsenic	15	1300	mg/kg	10 / 10	724.5	mg/kg	95% UCL - N

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP); 95% UCL of Gamma Distributed Data (95% UCL - G); Arithmetic Mean (Mean)

The table represents the current chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in sediment deemed pertinent to the remedy for the protection of human health (i.e., the concentrations that were used to estimate the exposure and risk). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at each exposure point), the EPC, and how the EPC was derived. This table indicates that arsenic is the only COC in sediment being identified for the remedy for the protection of human health. The 95% UCL on the arithmetic mean was used as the EPC for arsenic.

Table G-2

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Minimum	Maximum (2)					(1)
School Street Wellfield								
	1,1-Dichloroethene	6.4	8.2	ug/L	2 / 5	8.2	ug/L	Max
	Arsenic	5.2	5.2	ug/L	1 / 3	5.2	ug/L	Max
	Manganese	0.99	520	ug/L	3 / 3	520	ug/L	Max
Assabet River Area								
	1,1-Dichloroethene	1	420	ug/L	30 / 59	348.3	ug/L	Max
	Benzene	0.23	16	ug/L	25 / 60	16	ug/L	Max
	Vinyl Chloride	0.2	100	ug/L	27 / 60	94.33	ug/L	Max
	Arsenic	22.6	28.8	ug/L	2 / 16	28.8	ug/L	Max
	Manganese	92.7	2470	ug/L	15 / 16	2470	ug/L	Max
Former Lagoon Area								
	1,1-Dichloroethene	1	135	ug/L	55 / 86	108.3	ug/L	Max
	Benzene	0.41	55	ug/L	33 / 86	40	ug/L	Max
	1,2-Dichloropropane	0.81	3.4	ug/L	11 / 86	2.867	ug/L	Max
	Vinyl Chloride	0.25	27	ug/L	50 / 86	14.6	ug/L	Max
	Arsenic	5.8	541	ug/L	15 / 29	541	ug/L	Max
	Manganese	5	5340	ug/L	29 / 29	5340	ug/L	Max
Southeast Landfill Area								
	1,1-Dichloroethene	0.29	140	ug/L	47 / 120	93	ug/L	Max
	Benzene	0.3	6000	ug/L	81 / 120	4375	ug/L	Max
	1,2-Dichloroethane	0.41	120	ug/L	53 / 120	83	ug/L	Max
	1,2-Dichloropropane	0.65	86	ug/L	25 / 120	62.67	ug/L	Max
	Methylene Chloride	0.21	140	ug/L	21 / 120	81.25	ug/L	Max
	Trichloroethene	0.24	0.97	ug/L	8 / 120	0.97	ug/L	Max
	Vinyl Chloride	0.23	97	ug/L	59 / 120	70.5	ug/L	Max
	bis(2-Ethylhexyl)phthalate	0.46	7.5	ug/L	6 / 27	7.5	ug/L	Max
	bis(2-Chloroethyl)ether	1.6	30	ug/L	16 / 27	17.47	ug/L	Max
	Arsenic	4.7	1240	ug/L	20 / 41	1240	ug/L	Max
	Beryllium	0.27	8.3	ug/L	14 / 39	8.3	ug/L	Max
	Manganese	9.1	13000	ug/L	38 / 39	13000	ug/L	Max
	Nickel	2	945	ug/L	27 / 41	945	ug/L	Max
Southwest Landfill Area								
	Benzene	0.36	31	ug/L	40 / 63	30.67	ug/L	Max
	1,2-Dichloroethane	0.8	3.4	ug/L	12 / 63	2.367	ug/L	Max
	1,1-Dichloroethene	0.48	635	ug/L	49 / 63	588.3	ug/L	Max
	1,2-Dichloropropane	0.42	2.2	ug/L	9 / 63	2.1	ug/L	Max
	Vinyl Chloride	0.23	200	ug/L	39 / 63	176.7	ug/L	Max
	Arsenic	12	181	ug/L	12 / 28	101	ug/L	Max
	Lead	1.6	19.7	ug/L	4 / 28	1.978	ug/L	Mean
	Manganese	2.2	5660	ug/L	26 / 26	3715	ug/L	Max

Table G-2

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected Minimum	Concentration Detected Maximum (2)	Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
Northeast Area								
	1,1-Dichloroethene	0.24	260	ug/L	56 / 102	253.3	ug/L	Max
	Benzene	0.42	9.5	ug/L	28 / 102	5.167	ug/L	Max
	Methylene Chloride	0.45	13	ug/L	3 / 102	6.750	ug/L	Max
	Methyl-tert-butyl ether	0.22	190	ug/L	21 / 89	119	ug/L	Max
	Trichloroethene	0.28	3.8	ug/L	12 / 102	2.9	ug/L	Max
	Vinyl Chloride	0.3	21	ug/L	32 / 102	19	ug/L	Max
	Antimony	3.8	75.7	ug/L	3 / 46	75.7	ug/L	Max
	Arsenic	18.5	45.9	ug/L	4 / 46	45.9	ug/L	Max
	Chromium	0.95	5150	ug/L	11 / 46	5150	ug/L	Max
	Lead	2.2	21.7	ug/L	8 / 46	1.876	ug/L	Mean
	Manganese	4.2	1170	ug/L	46 / 46	1170	ug/L	Max
	Nickel	2.2	360	ug/L	23 / 46	180.3	ug/L	Max
Southwest Area								
	1,1-Dichloroethene	0.36	11	ug/L	40 / 60	10.07	ug/L	Max
	Benzene	0.46	1.5	ug/L	7 / 60	1.2	ug/L	Max
	Methyl-tert-butyl ether	0.54	59	ug/L	11 / 38	45	ug/L	Max
	Trichloroethene	5.7	26	ug/L	3 / 60	14.23	ug/L	Max
	Vinyl Chloride	0.28	4.7	ug/L	17 / 60	4.3	ug/L	Max
	Arsenic	5.9	37.9	ug/L	5 / 25	37.9	ug/L	Max
	Lead	1.7	144	ug/L	9 / 25	8.99	ug/L	Mean
	Manganese	5.8	3720	ug/L	24 / 25	3720	ug/L	Max
	Nickel	2.8	110	ug/L	20 / 25	110	ug/L	Max

Key

(1) Statistics: *Maximum* Detected Value (Max); 95% UCL *of Transformed* Data (95% UCL - T); 95% UCL *of Normal* Data (95% UCL - N); 95% UCL *of Non-parametric* Data (95% UCL - NP).
95% UCL of Gamma Distributed Data (95% UCL - G); Arithmetic Mean (Mean). Max represents maximum concentration after temporal averaging.

(2) Maximum concentration listed was identified prior to temporal averaging

The table represents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in groundwater deemed pertinent to the remedy for the protection of human health (i.e., the concentrations that were used to estimate the exposure and risk). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that the inorganic chemical, manganese, and the organic chemicals, benzene, 1,1-dichlorothene, and vinyl chloride are the most frequently detected COCs in groundwater at the site. The maximum detected concentration identified after temproal averaging of well data was used as the EPC for all COCs detected in groundwater, except lead. For lead, the arithmetic mean concentration was used as the EPC as an input for the lead model.

Table G-3

Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source	Date (MM/DD/YYYY)
1,1-Dichloroethene	N/A	N/A	N/A	C	IRIS removed value	08/13/02
1,2-Dichloroethane	9.1E-02	9.1E-02	1/(mg/kg-day)	B2	IRIS	01/01/91
1,2-Dichloropropane	6.8E-02	6.8E-02	1/(mg/kg-day)	B2	HEAST	07/31/97
Benzene	5.5E-02	5.5E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS (Oral Slope Factor Range 1.5E-2 to 5.5E-2)	01/09/00
Methyl tert butyl ether	1.8E-03	1.8E-03	1/(mg/kg-day)	N/A	Cal EPA	02/01/03
Methylene chloride	7.5E-03	7.5E-03	1/(mg/kg-day)	B2	IRIS	02/01/95
Trichloroethene	4.0E-01	4.0E-01	1/(mg/kg-day)	B1	NCEA Draft	08/01/01
Vinyl Chloride	7.5E-01	7.5E-01	1/(mg/kg-day)	A (medium/high)	IRIS	08/07/00
bis(2-chloroethyl)ether	1.1E+00	1.1E+00	1/(mg/kg-day)	B2	IRIS	02/01/94
bis(2-ethylhexyl)phthalate	1.4E-02	1.4E-02	1/(mg/kg-day)	B2	IRIS	02/01/93
Antimony	N/A	N/A	N/A	--	IRIS	07/26/99
Arsenic	1.5E+00	1.5E+00	1/(mg/kg-day)	A	IRIS	04/10/98
Beryllium	N/A	N/A	N/A	--	IRIS	04/03/98
Chromium	N/A	N/A	N/A	D	IRIS	09/03/98
Manganese	N/A	N/A	N/A	D	IRIS	12/01/96
Nickel	N/A	N/A	N/A	N/A	IRIS	08/01/94

Key

N/A: Not applicable

IRIS: Integrated Risk Information System, U.S. EPA

NCEA: National Center for Environmental Assessment, U.S. EPA

STSC = Superfund Health Risk Technical Support Center

Cal EPA = California Environmental Protection Agency

HEAST = Health Effects Assessment Summary Table

-- : Not available

EPA Group

A - Human carcinogen

B1 - Probable human carcinogen - Indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

This table provides the carcinogenic risk information which is relevant to the contaminants of concern in sediment and groundwater. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in this assessment have been extrapolated from oral values. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. Adjustments are particularly important for chemicals with less than 50% absorption via the ingestion route. However, adjustment is not necessary for the chemicals evaluated at this site. Therefore, the same values presented above were used as the dermal carcinogenic slope factors for these contaminants. The inhalation pathway for groundwater domestic use was evaluated using the assumption that the inhalation risk is equal to the ingestion risk. Therefore, the unit risk values have not been presented because they were not used quantitatively in the risk assessment.

Table G-4

Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of Rfd: Target Organ (MM/DD/YYYY)
Benzene	Chronic	4.0E-03	mg/kg-day	4.0E-03	mg/kg-day	Hematological, Immunological	300	IRIS	04/17/03
1,1-Dichloroethene	Chronic	5.0E-02	mg/kg-day	5.0E-02	mg/kg-day	Hepatic	100	IRIS	08/13/02
1,2-Dichloroethane	Chronic	2.0E-02	mg/kg-day	2.0E-02	mg/kg-day	Renal	3000	STSC Provisional Value	10/01/02
1,2-Dichloropropane	Chronic	2.0E-02	mg/kg-day	2.0E-02	mg/kg-day	Renal	1000	surrogate - bromodichloromethane (IRIS)	03/01/91
Methyl tert butyl ether	Chronic	3.0E-01	mg/kg-day	3.0E-01	mg/kg-day	Hepatic, Renal	300	ATSDR	08/01/96
Methylene chloride	Chronic	6.0E-02	mg/kg-day	6.0E-02	mg/kg-day	Hepatic	100	IRIS	03/01/88
Trichloroethene	Chronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Hepatic, Renal, Developmental	3000	NCEA Draft	08/01/01
Vinyl Chloride	Chronic	3.0E-03	mg/kg-day	3.0E-03	mg/kg-day	Hepatic	30	IRIS	08/07/00
bis(2-chloroethyl)ether	N/A	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	02/01/94
bis(2-ethylhexyl)phthalate	Chronic	2.0E-02	mg/kg-day	2.0E-02	mg/kg-day	Hepatic	1000	IRIS	05/01/91
Antimony	Chronic	4.0E-04	mg/kg-day	6.0E-05	mg/kg-day	Whole Body, Hepatic	1000	IRIS	02/01/91
Arsenic	Chronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Integumental, Cardiovascular	3	IRIS	02/01/93
Beryllium	Chronic	2.0E-03	mg/kg-day	1.4E-05	mg/kg-day	Gastrointestinal Tract	300	IRIS	04/03/98
Chromium	Chronic	3.0E-03	mg/kg-day	7.5E-05	mg/kg-day	None Reported	900	IRIS	09/03/98
Manganese	Chronic	2.4E-02	mg/kg-day	9.6E-04	mg/kg-day	Neurological	3	IRIS (10 mg/day RfD, minus 5 mg/day background ingestion, divided by 70 kg body weight, divided by modifying factor of 3)	05/01/96
Nickel	Chronic	2.0E-02	mg/kg-day	8.0E-04	mg/kg-day	Whole Body, Hepatic	300	IRIS (soluble salts)	12/01/96

Key

N/A - No information available
IRIS - Integrated Risk Information System, U.S. EPA
STSC = Superfund Health Risk Technical Support Center
ATSDR = Agency for Toxic Substances and Disease Registry
NCEA: National Center for Environmental Assessment, U.S. EPA

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in sediment and groundwater. Fifteen of the COCs have oral toxicity data indicating their potential for adverse non-carcinogenic health effects in humans. Chronic and subchronic toxicity data available for the fifteen COCs for oral exposures have been used to develop chronic oral reference doses (RfDs), provided in this table. The available chronic and subchronic toxicity data indicate that benzene affects the immune system and blood, 1,1-dichloroethene, methyl tert-butyl ether, methylene chloride, trichloroethene, vinyl chloride, bis(2-ethylhexyl)phthalate, antimony, and nickel affect the liver, 1,2-dichloroethane, 1,2-dichloropropane, methyl tert-butyl ether, trichloroethene affect the kidney, trichloroethene affects a developing child, antimony and nickel are systemic toxicants, arsenic affects the skin and cardiovascular system, and beryllium affects the gastrointestinal tract. A reference dose is not available for bis(2-chloroethyl)ether. Dermal RfDs are not available for any of the COCs. As was the case for the carcinogenic data, dermal RfDs can be extrapolated from oral RfDs by applying an adjustment factor as appropriate. Oral RfDs were adjusted for COCs with less than 50% absorption via the ingestion route (antimony, beryllium, chromium, manganese, and nickel) to derive dermal RfDs for these COCs.
The inhalation pathway for groundwater domestic use was evaluated using the assumption that the inhalation hazard is equal to the ingestion hazard. Therefore, the RfC values have not been presented becaue they were not used quantitatively in the risk assessment.

ROD RISK WORKSHEET [Human Health]

Table G-5

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Sediment	Sediment	North Lagoon Wetland	Arsenic	8E-04	- -	7E-05	- -	9E-04
							Sediment Risk Total =	9E-04
Sediment	Sediment	Sinking Pond	Arsenic	4E-04	- -	3E-05	- -	4E-04
							Sediment Risk Total =	4E-04
							Total Risk =	N/A

Key

-- Route of exposure is not applicable to this medium.

N/A - Not applicable. Summing of sediment risks across exposure points is not applicable since risks were estimated assuming all of a receptor's exposure occurred at each exposure point.

This table provides risk estimates for the significant routes of exposure for the future child and adult recreational wader/swimmer. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's and adult's exposure to sediment, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated sediment at this site to a future child and adult recreational user is estimated to be 9×10^{-4} for the North Lagoon Wetland and 4×10^{-4} for Sinking Pond. The COC contributing most to this risk level is arsenic in sediment. This risk level indicates that if no clean-up action is taken, an individual may have an increased probability of up to 9 in 10,000 and 4 in 10,000 of developing cancer as a result of site-related exposure to the COCs at North Lagoon Wetland and Sinking Pond, respectively.

ROD RISK WORKSHEET [Human Health]

Table G-6

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	North Lagoon Wetland	Arsenic	Integumental, Cardiovascular	1E+01	- -	9E-01	2E+01
							Sediment Hazard Index Total =	2E+01
							Cardiovascular Hazard Index =	2E+01
							Integumental Hazard Index =	2E+01
Sediment	Sediment	Sinking Pond	Arsenic	Integumental, Cardiovascular	7E+00	- -	4E-01	7E+00
							Sediment Hazard Index Total =	7E+00
							Cardiovascular Hazard Index =	7E+00
							Integumental Hazard Index =	7E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- *Route of exposure is not applicable to this medium.*

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future child and adult recreational user exposed to sediment. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 20 for the North Lagoon Wetland and 7 for Sinking Pond indicates that the potential for adverse noncancer effects could occur from exposure to contaminated sediment containing arsenic, given the assumptions regarding exposure specified.

Table G-7

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Tap Water	School Street Wellfield	Arsenic	1E-04	- -	- -	- -	1E-04
							Groundwater Risk Total =	1E-04
Groundwater	Tap Water	Assabet River Area	Benzene	2E-05	2E-05	2E-06	- -	3E-05
			Vinyl Chloride	8E-03	8E-03	- -	- -	2E-02
			Arsenic	8E-04	- -	- -	- -	8E-04
							Groundwater Risk Total =	2E-02
Groundwater	Irrigation Water	Assabet River Area	Vinyl Chloride	5E-04	- -	4E-04	- -	9E-04
			Arsenic	6E-06	- -	1E-06	- -	7E-06
							Groundwater Risk Total =	9E-04
Groundwater	Tap Water	Former Lagoon Area	Benzene	4E-05	4E-05	5E-06	- -	8E-05
			1,2-Dichloropropane	3E-06	3E-06	—	- -	7E-06
			Vinyl Chloride	1E-03	1E-03	---	- -	3E-03
			Arsenic	1E-02	—	---	- -	1E-02
							Groundwater Risk Total =	2E-02
Groundwater	Irrigation Water	Former Lagoon Area	Vinyl Chloride	7E-05	- -	7E-05	—	1E-04
			Arsenic	1E-04	- -	2E-05	—	1E-04
							Groundwater Risk Total =	3E-04
Groundwater	Tap Water	Southeast Landfill Area	Benzene	4E-03	4E-03	5E-04	- -	9E-03
			1,2-Dichloroethane	1E-04	1E-04	---	- -	3E-04
			1,2-Dichloropropane	8E-05	8E-05	—	- -	2E-04
			Methylene Chloride	1E-05	1E-05	---	- -	2E-05
			Trichloroethene	7E-06	7E-06	1E-06	- -	1E-05
			Vinyl Chloride	6E-03	6E-03	---	- -	1E-02
			bis(2-Ethylhexyl)phthalate	2E-06	---	3E-06	- -	5E-06
			bis(2-Chloroethyl)ether	3E-04	—	—	- -	3E-04
			Arsenic	3E-02	—	---	- -	3E-02
							Groundwater Risk Total =	6E-02

ROD RISK WORKSHEET [Human Health]

Table G-7

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Irrigation Water	Southeast Landfill Area						
			Benzene	3E-05	---	1E-04	--	2E-04
			1,2-Dichloroethane	1E-06	---	1E-06	--	2E-06
			1,2-Dichloropropane	6E-07	---	1E-06	--	2E-06
			Vinyl Chloride	4E-04	---	3E-04	--	7E-04
			bis(2-Chloroethyl)ether	3E-06	---	2E-06	--	4E-06
			Arsenic	3E-04	---	5E-05	--	3E-04
							Groundwater Risk Total =	1E-03
Groundwater	Tap Water	Southwest Landfill Area						
			Benzene	3E-05	3E-05	4E-06	--	6E-05
			1,2-Dichloroethane	4E-06	4E-06	---	--	8E-06
			1,2-Dichloropropane	3E-06	3E-06	---	--	5E-06
			Vinyl Chloride	2E-02	2E-02	---	--	3E-02
			Arsenic	3E-03	---	---	--	3E-03
							Groundwater Risk Total =	3E-02
Groundwater	Irrigation Water	Southwest Landfill Area						
			Vinyl Chloride	9E-04	---	8E-04	--	2E-03
			Arsenic	2E-05	---	4E-06	--	2E-05
							Groundwater Risk Total =	2E-03
Groundwater	Tap Water	Northeast Area						
			Benzene	5E-06	5E-06	6E-07	--	1E-05
			Methyl-tert-butyl ether	4E-06	4E-06	1E-07	--	8E-06
			Methylene Chloride	(1)	(1)	(1)	--	(1)
			Trichloroethene	2E-05	2E-05	3E-06	--	4E-05
			Vinyl Chloride	2E-03	2E-03	---	--	3E-03
			Arsenic	1E-03	---	---	--	1E-03
							Groundwater Risk Total =	5E-03
Groundwater	Irrigation Water	Northeast Area						
			Methylene Chloride	(1)	(1)	(1)	--	(1)
			Vinyl Chloride	1E-04	---	9E-05	--	2E-04
			Arsenic	9E-06	---	2E-06	--	1E-05
							Groundwater Risk Total =	2E-04

ROD RISK WORKSHEET [Human Health]

Table G-7

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Tap Water	Southwest Area						
			Benzene	1E-06	1E-06	1E-07	--	2E-06
			Methyl-tert-butyl ether	1E-06	1E-06	4E-08	--	3E-06
			Trichloroethene	(1)	(1)	(1)	--	(1)
			Vinyl Chloride	4E-04	4E-04	---	--	8E-04
			Arsenic	1E-03	---	---	--	1E-03
							Groundwater Risk Total =	2E-03
							Total Risk =	N/A

Key

-- Route of exposure is not applicable to this medium.

N/A - Not applicable *Summing of groundwater risks across exposure points is not applicable since risks were estimated assuming all of a receptor's exposure occurred at each exposure point.*

(1) - No quantitative calculation was performed during the baseline risk assessment due to low frequency of detection in pertinent area.

This table provides risk estimates for the significant routes of exposure for the future young child and adult resident. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's and child's exposure to groundwater, as well as the toxicity of the COCs. The total risk from direct exposure to contaminated groundwater at this site to a future resident is estimated to range between 1×10^{-4} and 6×10^{-2}. The COCs contributing to these risk levels are benzene, 1,2-dichloroethane, 1,2-dichloropropane, methylene chloride, methyl tert-butyl ether, trichloroethene, vinyl chloride, bis(2-ethylhexyl)phthalate, bis(2-chloroethyl)ether, and arsenic. These risk levels indicate that if no clean-up action is taken, an individual may have an increased probability of up to 1 in 10,000 or even as great as 6 in 100 (depending on the area from which the water was obtained) of developing cancer as a result of site-related exposure to COCs.

Table G-8

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Tap Water	School Street Wellfield	1,1-Dichloroethene	Hepatic	2E-02	2E-02	1E-03	3E-02
			Arsenic	Integumental, Cardiovascular	2E+00	—	—	2E+00
			Manganese	Neurological	2E+00	—	—	2E+00
							Groundwater Hazard Index Total =	4E+00
							Cardiovascular Hazard Index =	2E+00
							Hepatic Hazard Index =	3E-02
							Neurological Hazard Index =	2E+00
							Integumental Hazard Index =	2E+00
Groundwater	Tap Water	Assabet River Area	1,1-Dichloroethene	Hepatic	7E-01	7E-01	6E-02	1E+00
			Vinyl Chloride	Hepatic	3E+00	3E+00	—	6E+00
			Arsenic	Integumental, Cardiovascular	9E+00	—	—	9E+00
			Manganese	Neurological	1E+01	—	—	1E+01
							Groundwater Hazard Index Total =	3E+01
							Hepatic Hazard Index =	7E+00
							Integumental Hazard Index =	9E+00
							Cardiovascular Hazard Index =	9E+00
							Neurological Hazard Index =	1E+01
Groundwater	Tap Water	Former Lagoon Area	1,1-Dichloroethene	Hepatic	2E-01	2E-01	2E-02	4E-01
			Benzene	Hematological, Immunological	1E+00	1E+00	1E-01	2E+00
			Arsenic	Integumental, Cardiovascular	2E+02	—	—	2E+02
			Manganese	Neurological	2E+01	—	—	2E+01
							Groundwater Hazard Index Total =	2E+02
							Hematological Hazard Index =	2E+00
							Hepatic Hazard Index =	4E-01
							Immunological Hazard Index =	2E+00
							Integumental Hazard Index =	2E+02
							Cardiovascular Hazard Index =	2E+02
							Neurological Hazard Index =	2E+01

Table G-8

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Irrigation Water	Former Lagoon Area	1,1-Dichloroethene	Hepatic	3E-03	---	6E-03	8E-03
			Arsenic	Integumental, Cardiovascular	2E+00	---	3E-01	2E+00
							Groundwater Hazard Index Total =	2E+00
							Hepatic Hazard Index =	8E-03
							Integumental Hazard Index =	2E+00
							Cardiovascular Hazard Index =	2E+00
Groundwater	Tap Water	Southeast Landfill Area	1,1-Dichloroethene	Hepatic	2E-01	2E-01	2E-02	4E-01
			Benzene	Hematological, Immunological	1E+02	1E+02	1E+01	2E+02
			Vinyl Chloride	Hepatic	2E+00	2E+00	---	5E+00
			Arsenic	Integumental, Cardiovascular	4E+02	---	---	4E+02
			Beryllium	Gastrointestinal Tract	4E-01	---	3E-01	6E-01
			Manganese	Neurological	5E+01	---	---	5E+01
			Nickel	Whole Body, Hepatic	5E+00	---	---	5E+00
							Groundwater Hazard Index Total =	7E+02
							Gastrointestinal Tract Hazard Index =	6E-01
							Hematological Hazard Index =	2E+02
							Immunological Hazard Index =	2E+02
							Hepatic Hazard Index =	9E+00
							Integumental Hazard Index =	4E+02
							Cardiovascular Hazard Index =	4E+02
							Neurological Hazard Index =	5E+01
							Whole Body Hazard Index =	5E+00
Groundwater	Irrigation Water	Southeast Landfill Area	1,1-Dichloroethene	Hepatic	2E-03	---	5E-03	7E-03
			Benzene	Hematological, Immunological	1E+00	---	3E+00	4E+00
			Arsenic	Integumental, Cardiovascular	5E+00	---	6E-01	6E+00
			Beryllium	Gastrointestinal Tract	5E-03	---	9E-02	1E-01
							Groundwater Hazard Index Total =	1E+01
							Gastrointestinal Tract Hazard Index =	1E-01
							Hematological Hazard Index =	4E+00
							Hepatic Hazard Index =	7E-03
							Immunological Hazard Index =	4E+00
							Integumental Hazard Index =	6E+00
							Cardiovascular Hazard Index =	6E+00

Table G-8

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Tap Water	Southwest Landfill Area						
			Benzene	Hematological, Immunological	7E-01	7E-01	8E-02	2E+00
			1,1-Dichloroethene	Hepatic	1E+00	1E+00	1E-01	2E+00
			Vinyl Chloride	Hepatic	6E+00	6E+00	—	1E+01
			Arsenic	Integumental, Cardiovascular	3E+01	—	—	3E+01
			Lead	CNS/Developmental	(2)	(2)	(2)	(2)
			Manganese	Neurological	1E+01	—	—	1E+01
							Groundwater Hazard Index Total =	6E+01
							Hepatic Hazard Index =	1E+01
							Integumental Hazard Index =	3E+01
							Cardiovascular Hazard Index =	3E+01
							Neurological Hazard Index =	1E+01
Groundwater	Tap Water	Northeast Area						
			1,1-Dichloroethene	Hepatic	5E-01	5E-01	4E-02	1E+00
			Methylene Chloride	Hepatic	(1)	(1)	(1)	(1)
			Trichloroethene	Hepatic, Renal, Developmental	9E-01	9E-01	1E-01	2E+00
			Antimony	Whole Body, Hepatic	2E+01	—	—	2E+01
			Arsenic	Integumental, Cardiovascular	1E+01	—	—	1E+01
			Chromium	None Reported	2E+02	—	6E+01	2E+02
			Lead	CNS/Developmental	(2)	(2)	(2)	(2)
			Manganese	Neurological	5E+00	—	—	5E+00
			Nickel	Whole Body, Hepatic	9E-01	—	—	9E-01
							Groundwater Hazard Index Total =	3E+02
							Hepatic Hazard Index =	2E+01
							Renal Hazard Index =	2E+00
							Developmental Hazard Index =	2E+00
							Integumental Hazard Index =	1E+01
							Cardiovascular Hazard Index =	1E+01
							Neurological Hazard Index =	5E+00
							Whole Body Hazard Index =	2E+01
Groundwater	Irrigation Water	Northeast Area						
			1,1-Dichloroethene	Hepatic	6E-03	—	1E-02	2E-02
			Methylene Chloride	Hepatic	(1)	(1)	(1)	(1)
			Chromium	None Reported	2E+00	—	2E+01	2E+01
			Lead	CNS/Developmental	(2)	(2)	(2)	(2)
			Nickel	Whole Body, Hepatic	1E-02	—	7E-03	2E-02
							Groundwater Hazard Index Total =	2E+01
							Hepatic Hazard Index =	4E-02
							Developmental Hazard Index =	N/A
							Whole Body Hazard Index =	2E-02

Table G-8

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Tap Water	Southwest Area	1,1-Dichloroethene	Hepatic	2E-02	2E-02	2E-03	4E-02
			Trichloroethene	Hepatic, Renal, Developmental	(1)	(1)	(1)	(1)
			Arsenic	Integumental, Cardiovascular	1E+01	--	--	1E+01
			Lead	CNS/Developmental	(2)	(2)	(2)	(2)
			Manganese	Neurological	1E+01	--	--	1E+01
			Nickel	Whole Body, Hepatic	5E-01	--	--	5E-01
							Groundwater Hazard Index Total =	3E+01
							Integumental Hazard Index =	1E+01
							Cardiovascular Hazard Index =	1E+01
							Hepatic Hazard Index =	6E-01
							Neurological Hazard Index =	1E+01
							Whole Body Hazard Index =	5E-01

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

(1) - No quantitative calculation was performed during the baseline risk assessment due to low frequency of detection in pertinent area.

(2) - Potential hazards from exposures to lead in groundwater from the Southwest Landfill Area, Northeast Area, and Southwest Area were evaluated using EPA's IEUBK model. No significant hazards were projected for children for any area based on average lead concentrations and model inputs.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future young child and adult resident using groundwater for potable and irrigation purposes. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target endpoint specific HIs of between 2 and 400 indicate that the potential for adverse noncancer effects could occur from exposure to contaminated groundwater containing 1,1-dichloroethene, benzene, trichloroethene, vinyl chloride, antimony, arsenic, chromium, manganese, and nickel.

ROD RISK WORKSHEET [Ecological]

Table G-9

Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)

Medium: Surface Water

Chemical	Frequency of Detection	Maximum Detected Concentration[1] (ug/L)	Location of Maximum Detected Conc.	Screening Criterion (ug/L)	Type	Notes[2]
Study Area: W.R. Grace Superfund Site - Assabet River						
Carbon disulfide	0 / 7	ND	ND	0.92	Tier II	DL
trans-1,3-Dichloropropene	0 / 7	ND	ND	0.055	Tier II	DL
Xylene, m/p-	0 / 7	ND	ND	1.8	Tier II	DL
Acenaphthene	1 / 7	0.011	ASBRV-T2	NA	NA	NA
Benzo(b)fluoranthene	3 / 7	0.017	ASBRV-T1	NA	NA	NA
Dibenzo(a,h)anthracene	1 / 7	0.024	ASBRV-T1	NA	NA	NA
Fluoranthene	1 / 7	0.012	ASBRV-L	NA	NA	NA
Pyrene	1 / 7	0.01	ASBRV-L	NA	NA	NA
Aluminum	3 / 7	129	ASBRV-T3	87	Freshwater Chronic NAWQC	
Barium	7 / 7	23.5	ASBRV-L	4	Tier II	
Study Area: W.R. Grace Superfund Site - Fort Pond Brook						
Carbon disulfide	0 / 7	ND	ND	0.92	Tier II	DL
trans-1,3-Dichloropropene	0 / 7	ND	ND	0.055	Tier II	DL
Benzo(b)fluoranthene	1 / 7	0.015	FPB-T20	NA	NA	NA
bis(2-Ethylhexyl)phthalate	6 / 7	17	FPB-T21-08/12/02	3	Tier II	
Chrysene	1 / 7	0.013	FPB-T20	NA	NA	NA
Fluoranthene	4 / 7	0.024	FPB-T20	NA	NA	NA
Phenanthrene	1 / 7	0.013	FPB-T21-08/12/02	NA	NA	NA
Pyrene	5 / 7	0.023	FPB-T20	NA	NA	NA

ROD RISK WORKSHEET [Ecological]

Table G-9						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Surface Water						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration[1] (ug/L)**	**Location of Maximum Detected Conc.**	**Screening Criterion (ug/L)**	**Type**	**Notes[2]**
Aluminum	7 / 7	309	FPB-T20	87	Freshwater Chronic NAWQC	
Barium	7 / 7	20	FPB-S01-08/12/02	4	Tier II	
Chromium	6 / 9	56.7	FPB-S01-09/26/01	50	Freshwater Chronic NAWQC[3,4]	
Manganese	7 / 7	970	FPB-T21-08/12/02	120	Tier II	
Study Area: W.R. Grace Superfund Site - Gravel Pit Wetland						
Carbon disulfide	0 / 4	ND	ND	0.92	Tier II	DL
trans-1,3-Dichloropropene	0 / 4	ND	ND	0.055	Tier II	DL
Phenanthrene	2 / 6	0.014	GPW-S03	NA	NA	NA
Barium	6 / 6	22.2	GPW-S01	4	Tier II	
Iron	6 / 6	1,490	GPW-S03	1,000	Freshwater Chronic NAWQC	
Manganese	6 / 6	315	GPW-S02	120	Tier II	
Zinc	2 / 6	108	GPW-S02	54	Freshwater Chronic NAWQC[3]	
Study Area: W.R. Grace Superfund Site - Former North Lagoon						
Carbon disulfide	0 / 3	ND	ND	0.92	Tier II	DL
trans-1,3-Dichloropropene	0 / 3	ND	ND	0.055	Tier II	DL
Aluminum	3 / 3	8550	NL-04	87	Freshwater Chronic NAWQC	
Beryllium	3 / 3	1.6	NL-04 & NL-06	0.66	Tier II	
Cadmium	2 / 3	0.62	NL-06	0.10	Freshwater Chronic NAWQC[3]	
Cobalt	3 / 3	32	NL-06	23	Tier II	
Copper	3 / 3	60	NL-04	4	Freshwater Chronic NAWQC[3]	

ROD RISK WORKSHEET [Ecological]

Table G-9

Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)

Medium: Surface Water						
Chemical	Frequency of Detection	Maximum Detected Concentration[1] (u g/L)	Location of Maximum Detected Conc.	Screening Criterion (u g/L)	Type	Notes[2]
Iron	3 / 3	7,300	NL-06	1,000	Freshwater Chronic NAWQC	
Lead	3 / 3	2.6	NL-04 & NL-06	0.6	Freshwater Chronic NAWQC[3]	
Manganese	3 / 3	4200	NL-06	120	Tier II	
Nickel	3 / 3	24	NL-04	18	Freshwater Chronic NAWQC[3]	
Silver	1 / 3	0.071	NL-S01	0.36	SCV	DL[5]
Zinc	2 / 3	140	NL-06	40	Freshwater Chronic NAWQC[3]	
Study Area: W.R. Grace Superfund Site - Sinking Pond						
Carbon disulfide	0 / 3	ND	ND	0.92	Tier II	DL
trans-1,3-Dichloropropene	0 / 3	ND	ND	0.055	Tier II	DL
alpha-Chlordane	0 / 3	ND	ND	0.0043	Freshwater Chronic NAWQC	DL
gamma-Chlordane	0 / 3	ND	ND	0.0043	Freshwater Chronic NAWQC	DL
Heptachlor	0 / 3	ND	ND	0.0038	Freshwater Chronic NAWQC	DL
Heptachlor epoxide	0 / 3	ND	ND	0.0038	Freshwater Chronic NAWQC	DL
Methoxychlor	0 / 3	ND	ND	0.019	Tier II	DL
Toxaphene	0 / 3	ND	ND	0.0002	Freshwater Chronic NAWQC	DL
Barium	17 / 17	20.5	SP-S02-12/23/02	4	Tier II	
Cadmium	1 / 17	0.61	SP-S01-04/19/01	0.19	Freshwater Chronic NAWQC[3]	
Lead	2 / 17	1.9	SP-S01-04/19/01	1.6	Freshwater Chronic NAWQC[3]	
Manganese	17 / 17	10000	SP-S01-H-08/13/02	120	Tier II	

Notes:

[1] Metals concentrations are from dissolved (filtered) analysis except for aluminum.

[2] Analytes with maximum detected concentrations exceeding screening criteria were included as Chemicals of Potential Concern (COPCs); if an analyte

ROD RISK WORKSHEET [Ecological]

Table G-9						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Surface Water						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration[1] (u g/L)**	**Location of Maximum Detected Conc.**	**Screening Criterion (u g/L)**	**Type**	**Notes[2]**

was retained as a COPC for another reason, it is noted in this column.

[3] Metals criteria adjusted for hardness using equations provided in USEPA, 2002.

[4] Value reported for chromium $^{3+}$, it is assumed that chromium in surface water is present in reduced form.

[5] Silver was detected in one of three samples at a concentration below the screening value; however, it was retained as a COPC as the detection limit exceeded the screening criterion in other samples.

COPC - Chemical of Potential Concern

NAWQC - National Ambient Water Quality Criterion (USEPA 1986a,b; 1987; 1992a, 1998, 2002).

SCV - Secondary Chronic Value as presented in Suter and Tsao (1996).

Tier II - Ecotox Thresholds Great Lakes Water Quality Initiative Tier II Methodology (USEPA, 1996).

NA - Screening Criterion Not Available. Detected chemicals without screening criteria were retained as COPCs.

ND - Not Detected

DL - Retained as a COPC because, although the the chemical was not detected in surface water, the detection limit exceeded the screening criterion

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Sediment						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
Study Area: W.R. Grace Superfund Site - Assabet River						
Acetone	3 / 7	1.4	ASBRV-T3	0.0087	SCV	
Carbon Disulfide	0 / 7	ND	ND	0.00085	SCV	DL
2-Methylnaphthalene	7 / 7	0.065	ASBRV-T1	0.065	ERL	
2-Methylphenol	0 / 7	ND	ND	0.012	SCV	DL
4-Methylphenol	6 / 7	0.95	ASBRV-T5	NA	NA	NA
Acenaphthylene	7 / 7	0.14	ASBRV-T4	NA	NA	NA
Anthracene	7 / 7	0.23	ASBRV-T4	0.0572	TEC	
Benzo(a)anthracene	7 / 7	0.55	ASBRV-T4	0.108	TEC	
Benzo(a)pyrene	7 / 7	0.68	ASBRV-T4	0.15	TEC	
Benzo(b)fluoranthene	7 / 7	0.66	ASBRV-T4	NA	NA	NA
Benzo(g,h,i)perylene	7 / 7	0.22	ASBRV-T4	0.17	LEL	
Benzo(k)fluoranthene	7 / 7	0.29	ASBRV-T4	0.24	LEL	
Benzoic Acid	1 / 7	0.13	ASBRV-T5	NA	NA	NA
Benzyl Alcohol	0 / 7	ND	ND	0.0011	SCV	DL
Carbazole	2 / 7	0.28	ASBRV-T4	NA	NA	NA
Chrysene	7 / 7	0.61	ASBRV-T4	0.166	TEC	
Dibenzo(a,h)anthracene	7 / 7	0.072	ASBRV-T4	0.033	TEC	
Fluoranthene	7 / 7	1.1	ASBRV-T4	0.423	TEC	
Fluorene	7 / 7	0.082	ASBRV-T4	0.0774	TEC	
Indeno(1,2,3-cd)pyrene	7 / 7	0.21	ASBRV-T4	0.2	LEL	
Phenanthrene	7 / 7	0.80	ASBRV-T4	0.204	TEC	
Phenol	2 / 7	0.045	ASBRV-T5	0.031	SCV	

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Sediment						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
Pyrene	7 / 7	1.0	ASBRV-T4	0.195	TEC	
Total PAHs	7 / 7	6.8	ASBRV-T4	1.61	TEC	
Aluminum	7 / 7	5260	ASBRV-T5	NA	NA	NA
Barium	7 / 7	36.5	ASBRV-T5	NA	NA	NA
Beryllium	7 / 7	0.3	ASBRV-T1	NA	NA	NA
Chromium	7 / 7	49.3	ASBRV-T5	43.3	TEC	
Cobalt	7 / 7	6.1	ASBRV-T1	NA	NA	NA
Manganese	7 / 7	478	ASBRV-T4	460	LEL	
Selenium	1 / 7	0.14	ASBRV-T5	NA	NA	NA
Thallium	7 / 7	0.11	ASBRV-T1	NA	NA	NA
Vanadium	7 / 7	13.2	ASBRV-T5	NA	NA	NA
Study Area: W.R. Grace Superfund Site - Fort Pond Brook						
Acetone	6 / 9	0.66	FPB-S08	0.0087	SCV	
Carbon Disulfide	0 / 9	ND	ND	0.00085	SCV	DL
2-Methylphenol	0 / 9	ND	ND	0.012	SCV	DL
Acenaphthylene	9 / 9	0.12	FPB-S08	NA	NA	NA
Anthracene	9 / 9	0.22	FPB-T21	0.0572	TEC	
Benzo(a)anthracene	9 / 9	0.76	FPB-S04	0.108	TEC	
Benzo(a)pyrene	9 / 9	0.79	FPB-S04	0.15	TEC	
Benzo(b)fluoranthene	9 / 9	1.6	FPB-S08	NA	NA	NA
Benzo(g,h,i)perylene	9 / 9	0.26	FPB-S04	0.17	LEL	

ROD RISK WORKSHEET [Ecological]

Table G-10

Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)

Medium: Sediment

Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Location of Maximum Detected Conc.	Screening Criterion		Notes[2]
				Conc. (mg/kg)	Type [1]	
Benzo(k)fluoranthene	9 / 9	0.88	FPB-S08	0.24	LEL	
Benzoic Acid	6 / 9	2.4	FPB-S08	NA	NA	NA
Benzyl Alcohol	1 / 9	0.028	FPB-S08	0.0011	SCV	
Carbazole	3 / 9	0.10	FPB-S08	NA	NA	NA
Chrysene	9 / 9	0.98	FPB-S04	0.166	TEC	
Dibenzo(a,h)anthracene	9 / 9	0.082	FPB-S04	0.033	TEC	
Di-n-octylphthalate	1 / 9	0.038	FPB-S08	NA	NA	NA
Fluoranthene	9 / 9	1.7	FPB-S04	0.423	TEC	
Fluorene	9 / 9	0.15	FPB-T21	0.0774	TEC	
Indeno(1,2,3-cd)pyrene	9 / 9	0.34	FPB-S04	0.2	LEL	
Phenanthrene	9 / 9	1.2	FPB-T21	0.204	TEC	
Phenol	2 / 9	0.088	FPB-S08	0.031	SCV	
Pyrene	9 / 9	1.6	FPB-S04	0.195	TEC	
Total PAHs	9 / 9	9.7	FPB-S04	1.61	TEC	
Aluminum	9 / 9	13000	FPB-S08	NA	NA	NA
Arsenic	9 / 9	280	FPB-S08	9.79	TEC	
Barium	9 / 9	130	FPB-S08	NA	NA	NA
Beryllium	9 / 9	0.74	FPB-S08	NA	NA	NA
Chromium	9 / 9	223	FPB-S03	43.3	TEC	
Cobalt	9 / 9	20.6	FPB-S03	NA	NA	NA
Copper	9 / 9	60	FPB-S08	31.6	TEC	
Cyanide, total	2 / 9	0.57	FPB-S08	NA	NA	NA
Iron	9 / 9	48000	FPB-S08	21200	LEL	

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Sediment						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
Lead	9 / 9	140	FPB-S08	35.8	TEC	
Manganese	9 / 9	1260	FPB-S04	460	LEL	
Mercury	9 / 9	0.69	FPB-S03	0.18	TEC	
Selenium	7 / 9	1.4	FPB-S08	NA	NA	NA
Thallium	7 / 9	0.27	FPB-S08	NA	NA	NA
Vanadium	9 / 9	39	FPB-S08	NA	NA	NA
Study Area: W.R. Grace Superfund Site - Gravel Pit Wetland						
2-Butanone	9 / 12	0.84	GPW-S06	0.27	SCV	
Acetone	8 / 12	0.66	GPW-S05	0.0087	SCV	
Carbon Disulfide	7 / 12	0.033	GPW-S01	0.00085	SCV	
Toluene	3 / 12	1.0	GPW-S06	0.05	SCV	
2-Methylphenol	0 / 12	ND	ND	0.012	SCV	DL
4-Methylphenol	6 / 12	1.3	GPW-S04	NA	NA	NA
Acenaphthylene	12 / 12	0.0090	GPW-S01	NA	NA	NA
Benzo(b)fluoranthene	12 / 12	0.13	GPW-S10	NA	NA	NA
Benzoic Acid	8 / 12	1.6	GPW-S01	NA	NA	NA
Benzyl Alcohol	5 / 12	0.13	GPW-S05	0.0011	SCV	
Phenol	5 / 12	0.057	GPW-S10	0.031	SCV	
Aluminum	12 / 12	8000	GPW-S15	NA	NA	NA
Arsenic	15 / 15	34.7	GPW-S01	9.79	TEC	
Barium	12 / 12	81.3	GPW-S04	NA	NA	NA

ROD RISK WORKSHEET [Ecological]

Table G-10

Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)

Medium: Sediment

Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Location of Maximum Detected Conc.	Screening Criterion		Notes[2]
				Conc. (mg/kg)	Type [1]	
Beryllium	12 / 12	0.23	GPW-S01	NA	NA	NA
Cobalt	12 / 12	10.7	GPW-S01	NA	NA	NA
Copper	12 / 12	55	GPW-S10	31.6	TEC	
Cyanide, total	6 / 12	0.27	GPW-S01	NA	NA	NA
Selenium	12 / 12	2.2	GPW-S01	NA	NA	NA
Thallium	12 / 12	1.9	GPW-S01	NA	NA	NA
Vanadium	12 / 12	31	GPW-S13	NA	NA	NA
Study Area: W.R. Grace Superfund Site - Former North Lagoon						
Acetone	2 / 6	0.087	NL-S01	0.0087	SCV	
Carbon Disulfide	1 / 6	0.012	NL-S02	0.00085	SCV	
2-Methylphenol	0 / 6	ND	ND	0.012	SCV	DL
Acenaphthylene	1 / 6	0.0025	NL-S01	NA	NA	NA
Benzo(b)fluoranthene	3 / 6	0.01	NL-S01	NA	NA	NA
Benzyl Alcohol	0 / 6	ND	ND	0.0011	SCV	DL
Isophorone	1 / 6	0.052	NL-S05	NA	NA	NA
Phenol	0 / 6	ND	ND	0.031	SCV	DL
Aluminum	6 / 6	7180	NL-S01	NA	NA	NA
Arsenic	6 / 6	32.2	NL-S01	9.79	TEC	
Barium	6 / 6	55.8	NL-S03 A	NA	NA	NA
Beryllium	6 / 6	0.18	NL-S01	NA	NA	NA
Cobalt	6 / 6	4.7	NL-S02	NA	NA	NA

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Sediment						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
Copper	6 / 6	33	NL-S06	31.6	TEC	
Cyanide, total	3 / 6	0.27	NL-S01	NA	NA	NA
Iron	6 / 6	21700	NL-S01	21200	LEL	
Thallium	6 / 6	0.12	NL-S01	NA	NA	NA
Vanadium	6 / 6	15.2	NL-S01	NA	NA	NA
Study Area: W.R. Grace Superfund Site - North Lagoon Wetland						
2-Butanone	6 / 9	0.27	NLW-S14-04/29/03	0.27	SCV	
Acetone	8 / 9	1.8	NLW-S12-04/29/03	0.0087	SCV	
Carbon Disulfide	6 / 9	0.030	NLW-S10-04/29/03	0.00085	SCV	
Vinyl chloride	1 / 9	0.0044	NLW-S14-04/29/03	NA	NA	NA
1,4-Dichlorobenzene	0 / 9	ND	ND	0.34	SCV	DL
2-Methylnaphthalene	9 / 9	0.17	NLW-S10-04/29/03	0.065	ERL	
2-Methylphenol	0 / 8	ND	ND	0.012	SCV	DL
Acenaphthylene	8 / 9	0.075	NLW-S14-04/29/03	NA	NA	NA
Benzo(a)anthracene	9 / 9	0.32	NLW-S14-04/29/03	0.108	TEC	
Benzo(a)pyrene	9 / 9	0.37	NLW-S14-04/29/03	0.15	TEC	
Benzo(b)fluoranthene	9 / 9	0.64	NLW-S14-04/29/03	NA	NA	NA
Benzo(k)fluoranthene	9 / 9	0.37	NLW-S14-04/29/03	0.24	LEL	
Benzoic Acid	8 / 9	4.3	NLW-S03	NA	NA	NA
Benzyl Alcohol	2 / 8	0.17	NLW-S03	0.0011	SCV	
Naphthalene	6 / 9	0.29	NLW-S10-04/29/03	0.176	TEC	
Phenanthrene	9 / 9	0.34	NLW-S14-04/29/03	0.204	TEC	

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Sediment						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
Phenol	6 / 9	0.20	NLW-S03	0.031	SCV	
Total PAHs	9 / 9	4.4	NLW-S14-04/29/03	1.61	TEC	
Aluminum	9 / 9	19000	NLW-S10-08/15/02	NA	NA	NA
Arsenic	15 / 15	3900	NLW-S12-08/15/02	9.79	TEC	
Barium	9 / 9	755	NLW-S01	NA	NA	NA
Beryllium	3 / 3	1.6	NLW-S02	NA	NA	NA
Cadmium	15 / 15	6.2	NLW-S01	0.99	TEC	
Chromium	15 / 15	74	NLW-S14-08/15/02	43.3	TEC	
Cobalt	3 / 3	118	NLW-S01	NA	NA	NA
Copper	14 / 14	6000	NLW-S11-08/15/02	31.6	TEC	
Cyanide, total	3 / 3	1	NLW-S08	NA	NA	NA
Iron	15 / 15	390000	NLW-S12-08/15/02	21200	LEL	
Lead	15 / 15	153	NLW-S09	35.8	TEC	
Manganese	15 / 15	48400	NLW-S01	460	LEL	
Mercury	15 / 15	2	NLW-S11-08/15/02	0.18	TEC	
Nickel	15 / 15	260	NLW-S10-08/15/02	22.7	TEC	
Selenium	9 / 9	4.1	NLW-S11-08/15/02	NA	NA	NA
Thallium	2 / 3	0.42	NLW-S01	NA	NA	NA
Vanadium	9 / 9	74.5	NLW-S11-04/29/03	NA	NA	NA
Zinc	15 / 15	650	NLW-S10-08/15/02	121	TEC	
Study Area: W.R. Grace Superfund Site - Sinking Pond - Main Pond						
Acetone	3 / 7	0.30	SP-S01	0.0087	SCV	

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: *Sediment*						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
Carbon Disulfide	3 / 7	0.011	SP-S01	0.00085	SCV	
1,4-Dichlorobenzene	0 / 7	ND	ND	0.34	SCV	DL
2-Chloronaphthalene	1 / 7	0.030	SP-S20	NA	NA	NA
2-Methylphenol	0 / 7	ND	ND	0.012	SCV	DL
4-Methylphenol	1 / 7	0.028	SP-S20	NA	NA	NA
Acenaphthylene	16 / 16	0.090	SP-S20	NA	NA	NA
Anthracene	16 / 16	0.073	SP-S20	0.0572	TEC	
Benzo(*a*)anthracene	16 / 16	0.32	SP-S20	0.108	TEC	
Benzo(a)pyrene	16 / 16	0.40	SP-S20	0.15	TEC	
Benzo(b)fluoranthene	16 / 16	0.63	SP-S20	NA	NA	NA
Benzo(g,h,i)perylene	15 / 16	0.26	SP-S05	0.17	LEL	
Benzo(k)fluoranthene	16 / 16	0.50	SP-S20	0.24	LEL	
Benzoic Acid	5 / 7	3.1	SP-S01	NA	NA	NA
Benzyl Alcohol	0 / 7	ND	ND	0.0011	SCV	DL
Carbazole	1 / 7	0.040	SP-S20	NA	NA	NA
Chrysene	16 / 16	0.51	SP-S20	0.166	TEC	
Dibenzo(a,h)anthracene	15 / 16	0.062	SP-S20	0.033	TEC	
Dibenzofuran	0 / 7	ND	ND	0.42	SCV	DL
Diethylphthalate	1 / 7	0.022	SP-S19	0.6	SCV	DL
Di-n-octylphthalate	0 / 7	ND	ND	NA	NA	NA
Fluoranthene	16 / 16	0.61	SP-S20	0.423	TEC	
Indeno(1,2,3-cd)pyrene	16 / 16	0.28	SP-S05	0.2	LEL	
Isophorone	1 / 7	0.55	SP-S03	NA	NA	NA

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Sediment						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
Naphthalene	16 / 16	0.24	SP-S01	0.176	TEC	
Phenanthrene	16 / 16	0.39	SP-S20	0.204	TEC	
Phenol	3 / 7	0.19	SP-S01	0.031	SCV	
Pyrene	16 / 16	0.77	SP-S20	0.195	TEC	
Total PAHs	16 / 16	4.8	SP-S20	1.61	TEC	
Total DDT	16 / 16	0.32	SP-S05	0.00528	TEC	
Aldrin	3 / 16	0.0077	SP-S05	0.002	LEL	
alpha-BHC	4 / 16	0.023	SP-S01	0.006	LEL	
alpha-Chlordane	10 / 16	0.012	SP-S05	0.00324	TEC	
beta-BHC	5 / 16	0.051	SP-S05	0.005	LEL	
Dieldrin	8 / 16	0.011	SP-S04	0.0019	TEC	
Endosulfan II	1 / 16	0.018	SP-S04	0.0055	SCV	
Endosulfan Sulfate	10 / 16	0.015	SP-S01	NA	NA	NA
Endrin Aldehyde	10 / 16	0.017	SP-S15	NA	NA	NA
Endrin Ketone	3 / 16	0.019	SP-S05	NA	NA	NA
gamma-Chlordane	11 / 16	0.019	SP-S16	0.00324	TEC	
gamma-BHC (Lindane)	4 / 16	0.016	SP-S01	0.00237	TEC	
Heptachlor Epoxide	4 / 16	0.0093	SP-S05	0.00247	TEC	
Methoxychlor	0 / 16	ND	ND	0.019	SCV	DL
Total PCBs	16 / 16	0.74	SP-S01	0.0598	TEC	
Aluminum	16 / 16	30000	SP-17	NA	NA	NA

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Sediment						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
Arsenic	16 / 16	1860	SP-03	9.79	TEC	
Barium	16 / 16	1600	SP-14	NA	NA	NA
Beryllium	7 / 7	1.1	SP-01	NA	NA	NA
Cadmium	16 / 16	4	SP-13	0.99	TEC	
Cobalt	7 / 7	133	SP-01	NA	NA	NA
Copper	16 / 16	1500	SP-13	31.6	TEC	
Cyanide, total	5 / 7	4.2	SP-04	NA	NA	NA
Iron	16 / 16	298000	SP-03	21200	LEL	
Lead	16 / 16	130	SP-20	35.8	TEC	
Manganese	16 / 16	80000	SP-14	460	LEL	
Mercury	16 / 16	0.46	SP-01	0.18	TEC	
Nickel	16 / 16	100	SP-13 & SP-14	22.7	TEC	
Selenium	13 / 16	2.2	SP-04 & SP-05	NA	NA	NA
Thallium	7 / 7	0.34	SP-01	NA	NA	NA
Vanadium	7 / 7	65.9	SP-01	NA	NA	NA
Zinc	16 / 16	430	SP-16	121	TEC	
Study Area: W.R. Grace Superfund Site - Sinking Pond - Inlet						
Acetone	0 / 4	ND	ND	0.0087	SCV	DL
Carbon Disulfide	0 / 4	ND	ND	0.00085	SCV	DL
1,4-Dichlorobenzene	0 / 4	ND	ND	0.34	SCV	DL
2-Chloronaphthalene	0 / 4	ND	ND	NA	NA	NA
2-Methylnaphthalene	7 / 7	0.07	SP-S11-04/28/03	0.065	ERL	

ROD RISK WORKSHEET [Ecological]

Table G-10						
Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)						
Medium: Sediment						
Chemical	**Frequency of Detection**	**Maximum Detected Concentration (mg/kg)**	**Location of Maximum Detected Conc.**	**Screening Criterion**		**Notes[2]**
				Conc. (mg/kg)	**Type [1]**	
2-Methylphenol	0 / 2	ND	ND	0.012	SCV	DL
4-Methylphenol	0 / 2	ND	ND	NA	NA	NA
Acenaphthylene	7 / 7	0.028	SP-S10-04/28/03	NA	NA	NA
Anthracene	7 / 7	0.14	SP-S11-04/28/03	0.0572	TEC	
Benzo(a)anthracene	7 / 7	0.33	SP-S11-04/28/03	0.108	TEC	
Benzo(a)pyrene	7 / 7	0.29	SP-S11-04/28/03	0.15	TEC	
Benzo(b)fluoranthene	7 / 7	0.37	SP-S11-04/28/03	NA	NA	NA
Benzo(k)fluoranthene	7 / 7	0.28	SP-S11-04/28/03	0.24	LEL	
Benzoic Acid	2 / 3	0.79	SP-S10-04/28/03	NA	NA	NA
Benzyl Alcohol	0 / 2	ND	ND	0.0011	SCV	DL
Carbazole	2 / 4	0.085	SP-S11-04/28/03	NA	NA	NA
Chrysene	7 / 7	0.38	SP-S11-04/28/03	0.166	TEC	
Dibenzo(a,h)anthracene	7 / 7	0.046	SP-S11-04/28/03	0.033	TEC	
Di-n-octylphthalate	1 / 4	0.023	SP-S11-04/28/03	NA	NA	NA
Fluoranthene	7 / 7	0.78	SP-S11-04/28/03	0.423	TEC	
Fluorene	7 / 7	0.098	SP-S11-04/28/03	0.0774	TEC	
Indeno(1,2,3-cd)pyrene	7 / 7	0.22	SP-S11-04/28/03	0.2	LEL	
Isophorone	4 / 4	12	SP-S11-04/28/03	NA	NA	NA
Naphthalene	7 / 7	0.25	SP-S11-04/28/03	0.176	TEC	
Phenanthrene	7 / 7	0.68	SP-S11-04/28/03	0.204	TEC	
Phenol	0 / 2	ND	ND	0.031	SCV	DL
Pyrene	7 / 7	0.76	SP-S11-04/28/03	0.195	TEC	
Total PAHs	7 / 7	4.924	SP-S11-04/28/03	1.61	TEC	

ROD RISK WORKSHEET [Ecological]

Table G-10

Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)

Medium: Sediment

Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Location of Maximum Detected Conc.	Screening Criterion		Notes[2]
				Conc. (mg/kg)	Type [1]	
Total DDT	4 / 4	0.0196	SP-S10-08/13/02	0.00528	TEC	
alpha-BHC	1 / 4	0.00625	SP-S02	0.006	LEL	
alpha-Chlordane	0 / 4	ND	ND	0.00324	TEC	DL
Endosulfan II	0 / 4	ND	ND	0.0055	SCV	DL
Endosulfan Sulfate	3 / 4	0.003	SP-S10-08/13/02	NA	NA	NA
Endrin	1 / 4	0.015	SP-S02	0.00222	TEC	
Endrin Aldehyde	1 / 4	0.00725	SP-S02	NA	NA	NA
Endrin Ketone	1 / 4	0.00285	SP-S02	NA	NA	NA
gamma-Chlordane	3 / 4	0.013	SP-S09-08/13/02	0.00324	TEC	
gamma-BHC (Lindane)	0 / 4	ND	ND	0.00237	TEC	DL
Heptachlor Epoxide	1 / 4	0.0053	SP-S02	0.00247	TEC	
Methoxychlor	0 / 4	ND	ND	0.019	SCV	DL
Total PCBs	4 / 4	0.2056	SP-S02	0.0598	TEC	
Aluminum	4 / 4	7520	SP-S02	NA	NA	NA
Arsenic	4 / 4	1300	SP-S11-08/13/02	9.79	TEC	
Barium	4 / 4	256.5	SP-S02	NA	NA	NA
Beryllium	1 / 1	0.41	SP-S02	NA	NA	NA
Cadmium	4 / 4	0.99	SP-S11-08/13/02	0.99	TEC	
Cobalt	1 / 1	45.05	SP-S02	NA	NA	NA
Copper	4 / 4	100	SP-S11-08/13/02	31.6	TEC	
Cyanide, total	1 / 1	1.05	SP-S02	NA	NA	NA
Iron	4 / 4	260000	SP-S11-08/13/02	21200	LEL	

ROD RISK WORKSHEET [Ecological]

Table G-10

Occurrence, Distribution, and Selection of Chemicals of Potential Concern (COPCs)

Medium: Sediment

Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Location of Maximum Detected Conc.	Screening Criterion		Notes[2]
				Conc. (mg/kg)	Type [1]	
Lead	4 / 4	26.65	SP-S02	35.8	TEC	
Manganese	4 / 4	15250	SP-S02	460	LEL	
Selenium	1 / 4	0.325	SP-S02	NA	NA	NA
Thallium	1 / 1	0.155	SP-S02	NA	NA	NA
Vanadium	1 / 1	32.6	SP-S02	NA	NA	NA

Notes:

[1] SCV based on 1% sediment organic carbon content.

[2] Analytes with maximum detected concentrations exceeding screening criteria were included as Chemicals of Potential Concern (COPCs); if an analyte was retained for another reason it is noted in this column.

NA - *Screening Criterion Not Available. Detected chemicals without screening criteria were retained as COPCs.*

ND - Not Detected

DL - Retained as a COPC because, although the the chemical was not detected in surface water, the detection limit exceeded the screening criterion.

ERL - NOAA Effects Range-Low (Long *et al*., 1995; Long and Morgan, 1990)

SCV - Secondary Chronic Value (Jones *et al*., 1997)

LEL - Ontario Ministry of Environment and Energy Lowest Effect Level (Persaud *et al*., 1993)

TEC - Consensus-based Threshold Effects Concentrations (MacDonald et al., 2000)

ROD RISK WORKSHEET [Ecological]

Table G-11

Ecological Exposure Pathways of Concern

Exposure Medium	Exposure Areas	Sensitive Environment Flag Y or N	Receptor	Endangered/ Threatened Species Flag Y or N	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Sediment	Sinking Pond, Assabet River, Fort Pond Brook, Gravel Pit Wetland, North Lagoon Wetland, and Former North Lagoon	N	Benthic Invertebrates	N	Ingestion and direct contact with chemicals in sediment	Sustainability (survival, growth, reproduction) of a benthic invertebrate community	- Comparison of sediment COPC concentrations to benchmarks
	Sinking Pond and North Lagoon Wetland	N	Benthic Invertebrates	N	Ingestion and direct contact with chemicals in sediment	Sustainability (survival, growth, reproduction) of a benthic invertebrate community	- Comparison of sediment toxicity to reference areas using *Chironomus tentans*
	Assabet River	N	Benthic Invertebrates	N	Ingestion and direct contact with chemicals in sediment	Sustainability (survival, growth, reproduction) of a benthic invertebrate community	- Evaluation of of benthic invertebrate community compositon
Surface Water	Sinking Pond, Assabet River, Fort Pond Brook, Gravel Pit Wetland, and Former North Lagoon	N	Water Column Invertebrates	N	Ingestion and direct contact with chemicals in surface water	Sustainability (survival, growth, reproduction) of a water column invertebrate community	- Comparison of surface water COPC concentrations to criteria/benchmarks
	Sinking Pond, Assabet River, Fort Pond Brook, Gravel Pit Wetland, and Former North Lagoon	N	Fish	N	Ingestion and direct contact with chemicals in surface water	Sustainability (survival, growth, reproduction) of a warmwater fish population	- Comparison of surface water COPC concentrations to criteria/benchmarks
	Sinking Pond	N	Fish	N	Direct and dietary exposures of COPCs in surface water	Sustainability (survival, growth, reproduction) of warmwater fish population	- Comparison of body burdens of COPCs in fish with TRVs

ROD RISK WORKSHEET [Ecological]

Table G-11							
Ecological Exposure Pathways of Concern							
Exposure Medium	**Exposure Areas**	**Sensitive Environment Flag Y or N**	**Receptor**	**Endangered/ Threatened Species Flag Y or N**	**Exposure Routes**	**Assessment Endpoints**	**Measurement Endpoints**
Surface Water/Sediment/ Biota	Sinking Pond, Assabet River, Fort Pond Brook, Gravel Pit Wetland, North Lagoon Wetland, and Former North Lagoon	N	Mallard	N	Direct and dietary exposures of COPCs	Sustainability (survival, growth, reproduction) of local populations of mallard	- Comparison of estimated dietary doses in wildlife populations with TRVs
	Sinking Pond, Assabet River, Fort Pond Brook	N	Kingfisher	N	Direct and dietary exposures of COPCs	Sustainability (survival, growth, reproduction) of local populations of kingfisher	- Comparison of estimated dietary doses in wildlife populations with TRVs
	Northern water bodies (Fort Pond Brook, North Lagoon Wetland, and Former North Lagoon) or Southern water bodies (Sinking Pond, Assabet River and Gravel Pit Wetland)	N	Mink	N	Direct and dietary exposures of COPCs	Sustainability (survival, growth, reproduction) of local populations of mink	- Comparison of estimated dietary doses in wildlife populations with TRVs
	Sinking Pond, Assabet River, Fort Pond Brook, Gravel Pit Wetland, North Lagoon Wetland, and Former North Lagoon	N	Muskrat	N	Direct and dietary exposures of COPCs	Sustainability (survival, growth, reproduction) of local populations of muskrat	- Comparison of estimated dietary doses in wildlife populations with TRVs

ROD RISK WORKSHEET [Ecological]

Table G-11

Ecological Exposure Pathways of Concern

Exposure Medium	Exposure Areas	Sensitive Environment Flag Y or N	Receptor	Endangered/ Threatened Species Flag Y or N	Exposure Routes	Assessment Endpoints	Measurement Endpoints
	Sinking Pond, Assabet River, Fort Pond Brook, Gravel Pit Wetland, North Lagoon Wetland, and Former North Lagoon	N	Eastern Painted Turtle	N	Direct and dietary exposures of COPCs	Sustainability (survival, growth, reproduction) of local populations of Eastern painted turtles	- Comparison of estimated dietary doses in wildlife populations with TRVs

Notes:

COPC - Chemical of Potential Concern
TRVs - Toxicity reference values

ROD RISK WORKSHEET [Ecological]

Table G-12

COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors

Habitat Type/Name	Exposure Medium	Area	COC	Protective Level	Units	Basis	Assessment Endpoint
Sinking Pond	Sediment	Sediment with elevated arsenic, copper, iron, and manganese concentrations in the inlet and within the pond where the ground slope is relatively shallow (defined as areas SPBK-1 through SPBK-4 on Figure 13) and that is consistently covered by less than twelve-feet of water[1, 2].	Arsenic	42[a]	mg/kg	Maximum Background Concentration	Sustainability (survival, growth, reproduction) of a benthic invertebrate community
	Sediment	Sediment with elevated arsenic, copper, iron, and manganese concentrations within the pond but outside the areas specified above that is consistently covered by less than twelve-feet of water[1, 3].	Arsenic	42[a]	mg/kg	Maximum Background Concentration	Sustainability (survival, growth, reproduction) of a benthic invertebrate community
North Lagoon Wetland	Sediment	Sediment 0-12 inches in depth with elevated arsenic concentrations	Arsenic	28	mg/kg	Maximum Background Concentration	Sustainability (survival, growth, reproduction) of a benthic invertebrate community and of semi-aquatic wildlife.
	Sediment	Sediment 0-12 inches in depth with elevated arsenic concentrations	Manganese	2,030	mg/kg	Site-Specific Risk-Based Concentration for Muskrat	Sustainability (survival, growth, reproduction) of semi-aquatic wildlife.

Notes:

(1) Sediment located between an elevation of 144.5 feet NGVD (maximum surface water elevation observed in the pond) and 128 feet NGVD (twelve feet below the minimum surface water elevation) will be evaluated.

(2) Short-term goal is to remediate areas with arsenic greater than 730 mg/kg or where the four COCs (arsenic, copper, iron, and manganese) exceed their PEC or SEL within the areas defined. Arsenic PEC=33 mg/kg, copper PEC=149 mg/kg, iron SEL=43,766 mg/kg, and manganese SEL=1,100 mg/kg.

(3) Short-term goal is to identify areas with arsenic greater than 730 mg/kg and the following three metals, copper, iron, and manganese, exceed their PEC or SEL, and then to evaluate the need to remediate such areas based on risks, feasibility, and implementability. Copper PEC=149 mg/kg, iron SEL=43,766 mg/kg, and manganese SEL=1,100 mg/kg.

(a) Long-term goal is to achieve sediment concentrations at or below the maximum background concentraion of 42 mg/kg for sediment arsenic within the top two inches of sediment

COC - Chemical of Concern
NGVD - National Geodetic Vertical Datum
PEC - Probable Effects Concentration
SEL - Severe Effects Level

Table L-1: Groundwater Costs

Alternative GW-3 (modified): Active Remediation Including Targeted Mass Reduction in the Northeast Area, One Treatment Plant Located Near the Industrial Landfill, and Discharge of Treated Water to Both Sinking Pond and Northeast Area

Capital Costs		
Institutional Controls		$10,000
Treatment System/Building		$1,995,000
Well Installation		$356,000
Clearing, Grading, Site Improvement		$31,000
Pipeline Construction		$368,000
Wiring		$356,000
Infiltration Basins in Northeast Area		$81,000
Other Construction		$82,000
	Subtotal Capital:	$3,279,000
	Contingency:	$188,000
	Design, Management:	$212,000
	Total Capital:	**$3,679,000**
Operation and Maintenance		
	Annual O&M:	$264,000
	Present worth O&M (5%):	**$3,241,000**
Present Value of Monitoring		**$1,722,000**
Total Present Worth		**$8,642,000**

Key Assumptions and Notes:

- Extraction in Southeast and Southwest Landfill Areas for 23 years as described in the feasibility study, plus extraction in Northeast Area for 5 years to accomplish targeted mass reduction.
- Combined extraction rate of 140 gpm (90 gpm in landfill areas, 50 gpm in NE area) for first 5 years, then 90 gpm in landfill areas only for remaining 18 years.
- Long-term monitoring for each site area until cleanup goals are attained in that area.
- One 200 gpm groundwater treatment plant located near the Industrial Landfill.
- Treated water discharge: 90 gpm to Sinking Pond, 50 gpm to Northeast Area.
- Northeast Area discharge to two infiltration basins to be constructed in Northeast Area.
- Costs for piping to bring water to/from Northeast Area and treatment plant are included.
- Costs for obtaining access to private properties for placement of extraction wells, infiltration basins, and/or piping are not included.

Sinking Pond Costs

Table L-2

Alternative SP-SED-3
Active Remediation

	Quantity	Unit	Unit Cost	Subtotal Cost
Gravel Access Road Construction				
Gravel	222	cy	$26.72	$5,931
Grading	222	sy	$3.82	$848
Subtotal				$6,779
Setup				
Clearing & Grubbing	1	acre	$342.13	$342
Mobilization/Demobilization	1	ea	50,000.00	$50,000
Float. dock w/anchor	700	sf	$41.97	$29,376
Piping	600	ft	$11.55	$6,932
Subtotal				$86,650
Drainage Area Construction				
Subliner Sand	2501	cy	$23.61	$59,037
Lining Material	135000	sf	$0.60	$81,000
Draining gravel	2501	cy	$26.72	$66,803
PVC Piping System	1.5	ea	$10,000.00	$15,000
Filter Fabric	6300	sy	$4.00	$25,200
Coarse Filter Sand	2501	cy	$23.61	$59,037
Fine Filter Sand	2501	cy	$23.61	$59,037
Equipment	7.5	day	$12,000.00	$90,000
Subtotal				$455,114
Sinking Pond Sediment Removal				
Equipment Cost	40	day	$12,000.00	$480,000
Bladder Bags	15	ea	$2,500.00	$37,500
Subtotal				$517,500
Settling Basin Sediment Removal				
Equipment Cost	4	day	$12,000.00	$48,000
Bladder Bags	4	ea	$2,500.00	$10,000
Subtotal				$58,000
Disposal Of Dried Removed Sediment				
Transportation and Disposal	6,800	tons	$200.00	$1,360,000
Subtotal				$1,360,000
Settling Basin Earthwork				
Equipment	6	day	$12,000.00	$66,000
Widen Neck	1,000	cy	$4.00	$4,000
Construct Weir	445	cy	$143.88	$64,027
Subtotal				$134,027
Restoration of Former Pumphouse Area				
Demolition of Dike	6,750	cf	$6.22	$42,011
C&D Waste Disposal	500	cy	$100.00	$50,000
Bank Restoration	1	ea	$20,000	$20,000
Subtotal				$112,011

Sinking Pond Costs

Table L-2

Environmental Considerations			
Confirmatory Sampling	100 ea	$22.47	$2,247
Site Restoration			
Stabilization Fabric	52,760 sf	$0.69	$36,404
Pond Bed Gravel	4,420 cf	$26.72	$118,084
Equipment	10 day	$12,000.00	$120,000
Subtotal			$276,736
Labor			
Access Road Construction	2 day	$5,000.00	$10,000
Setup	4 day	$5,000.00	$20,000
Drainage Area costruction	10 day	$5,000.00	$50,000
Sinking Pond Sediment Removal	40 day	$5,000.00	$200,000
Settling Basin Excavation	4 day	$5,000.00	$20,000
Settling Basin Reconstruction	6 day	$5,000.00	$30,000
Pumphouse Area Restoration	2 day	$5,000.00	$10,000
Sediment Load-out for Disposal	40 day	$2,500.00	$100,000
Subtotal			$440,000
Construction Subtotal			$3,447,000
Contingency		25%	$862,000
Subtotal			$4,309,000
Project Management (8%			$345,000
Engineering and Design (15%)			$646,000
Construction Management (10%)			$431,000
Total Capital Costs			**$5,730,000**
Annual Monitoring and Maintenance	30 yr	$15,000.00	$231,000
Total			$5,961,000

Notes:

- Contractor's overhead and contractor's profit is included in rates
-Costing assumes full sediment removal with off-site disposal. However, some combination of sediment removal and capping with on-and/or off-site disposal are included in this alternative and will be considered during design.
-Assumes a final dry weight of 1.2 tons per cubic yard of in-place sediment
-Assumes depth of sediment at inlet discharge point (SPBK-4) averages about 6 feet.
-Assumes depth of sediments in shallow sloping areas (SPBK-1, SPBK-2, and SPBK-3) averages about 1 foot.
-Assumes depth of sediments averages about 0.5 feet in all other targeted sub-aqueous areas where surface grade slopes steeply.
-Assumes removal of 100% of the sediments in the inlet and SPBK-4.
-In areas SPBK-1, SPBK-2, and SPBK-3, assumes removal of about 50% of all sediments that are within two feet of the water surface, and 100% of sediments in those areas that are deeper than two feet below the water surface.
-Assumes removal of 50% of subaqueous sediments above the thermocline in areas other than SPBK-1, SPBK-2, SPBK-3, and SBK-4.

North Lagoon Wetland Costs

Table L-3

Alternative NLW-SED-3
Active Remediation

	Quantity	Unit	Unit Cost	Subtotal Cost
Access Development				
Access Equipment	25	day	$5,000.00	$125,000
Clearing & Grubbing	3	acre	$342.13	$1,026
Subtotal				$126,026
Sediment Excavation to 1'				
Mobilization/Demobilization	1	ea	$50,000.00	$50,000
Equipment	25	day	$12,000.00	$300,000
Confirmatory Sampling	100	ea	$22.47	$2,247
Bladder bags	3	ea	$2,500.00	$7,500
Subtotal				$359,747
Sediment Disposal				
Transportation & Disposal	2,400	tons	$200.00	$480,000
Subtotal				$480,000
Drainage Area Construction				
Subliner Sand	1100	cy	$23.61	$25,971
Lining Material	10000	sf	$0.60	$6,000
Draining gravel	500	cy	$26.72	$13,358
PVC Piping System	1	ea	$3,500.00	$3,500
Filter Fabric	1200	sy	$4.00	$4,800
Equipment	10	day	$12,000.00	$120,000
Subtotal				$173,629
Wetlands Restoration				
Restoration	2.0	acre	$100,000.00	$200,000
Subtotal				$200,000
Railway Safety & Access				
Flagman	20	day	$1,000.00	$20,000
Railroad Crossing Construction	1	ea	$500,000.00	$500,000
Subtotal				$520,000
Labor				
Equipment Setup	2	day	$5,000.00	$10,000
Excavation	20	day	$5,000.00	$100,000
Disposal	3	day	$5,000.00	$15,000
Wetlands Restoration	10	day	$5,000.00	$50,000
Subtotal				$175,000
Construction Subtotal				$2,034,000
Contingency			25%	$509,000
Subtotal				$2,543,000
Project Management (8%				$203,000
Engineering and Design (15%)				$381,000
Construction Management (10%)				$254,000
Total Capital Costs				**$3,382,000**
Annual Monitoring and Maintenance	20	yr	$5,000.00	$62,000
Total				$3,445,000

Notes:

- Contractor's overhead and contractor's profit is included in rates
- Costing assumes full sediment removal with off-Site disposal however some combination of sediment removal and capping with on- and/or off-Site disposal are included in this alternative and will be considered during design.

Table L-4 : Interim Groundwater Cleanup Levels

Chemical Name	Cancer Class	Target Endpoint [1]	Interim Cleanup Level (ug/l)	Basis of Level
Antimony	--	body weight/liver	6	MCLG
Arsenic	A	skin/cardiovascular	10	MCL
Beryllium	--	GI tract	4	MCLG
Benzene	A	blood/imune system	5	MCL
bis(2-Chloroethyl)ether	B2	N/A	5	PQL
bis(2-Ethylhexyl)phthalate	B2	liver	6	MCL
Chromium (Total)	D	--	100	MCLG
1,2-Dichloroethane	B2	kidney	5	MCL
1,1-Dichloroethene	C	liver	7	MCLG
1,2-Dichloropropane	B2	kidney	5	MCL
Lead	B2	CNS/developmental	15	MCL [2]
Manganese	D	CNS	300 [3]	Health Advisory
Methylene chloride	B2	liver	5	MCL
Methyl tert-butyl ether (MTBE)	--	liver, kidney	16	Risk-based [4]
Nickel	--	body weight/liver	100	Health Advisory
Trichloroethene	B1 [5]	liver, kidney, developmental	5	MCL
Vinyl chloride	A	liver	2	MCL

Notes:

--: Not available

N/A: Not applicable

PQL - Practical Quantitation Limit

1. Target Endpoint based on information provided in the Integrated Risk Information System (IRIS) on-line database.
2. Remediation level for lead is based on the action level.
3. A background value, determined during remedial design, may be selected as the interim groundwater cleanup level for manganese
4. Concentration corresponds to an excess cancer risk of 1×10^{-6}.
5. Under Review. Cancer risk based on toxicity value

Table L-5: Sediment Cleanup Levels for Protection of Human Health

Location	Chemical Name	Cancer Class	Target Endpoint	Sediment Cleanup Level (mg/kg)	Basis	Carcinogenic Risk [1]	Non-Cancer Hazard [1]
Sinking Pond	Arsenic	A	skin/cardiovascular	42	maximum background White Pond	2E-05	0.4
North Lagoon Wetland	Arsenic	A	skin/cardiovascular	28	maximum background reference wetland 2	2E-05	0.3

Notes:

(1) Carcinogenic risk and/or non-carcinogenic hazard associated with the cleanup level based on adult and child recreational receptor as described in the human health risk assessment update (Appendix J).

Table L-6: Sediment Cleanup Levels for Protection of Ecological Receptors

Location	Chemical Name	Area	Sediment Cleanup Level (mg/kg)	Basis	Assessment Endpoint
Sinking Pond	Arsenic	Sediment with elevated arsenic, copper, iron, and manganese concentrations in the inlet and within the pond where the ground slope is relatively shallow (defined as areas SPBK-1 through SPBK-4 on Figure 13) and that is consistently covered by less than twelve-feet of water[1, 2].	42[a]	maximum background White Pond	Sustainability (survival, growth, reproduction) of a benthic invertebrate community
Sinking Pond	Arsenic	Sediment with elevated arsenic, copper, iron, and manganese concentrations within the pond but outside the areas specified above that is consistently covered by less than twelve-feet of water[1, 3].	42[a]	maximum background White Pond	Sustainability (survival, growth, reproduction) of a benthic invertebrate community
North Lagoon Wetland	Arsenic	Sediment 0-12 inches in depth with elevated arsenic concentrations	28	maximum background reference wetland 2	Sustainability (survival, growth, reproduction) of a benthic invertebrate community and of semi-aquatic
North Lagoon Wetland	Manganese	Sediment 0-12 inches in depth with elevated arsenic concentrations	2,030	Site-Specific Risk-Based Concentration for Muskrat	Sustainability (survival, growth, reproduction) of semi-aquatic wildlife

Notes:

(1) Sediment located between an elevation of 144.5 feet NGVD (maximum surface water elevation observed in the pond) and 128 feet NGVD (twelve feet below the minimum surface water elevation) will be evaluated.

(2) Short-term goal is to remediate areas with arsenic greater than 730 mg/kg or where the four COCs (arsenic, copper, iron, and manganese) exceed their PEC or SEL within the areas defined. Arsenic PEC=33 mg/kg, copper PEC=149 mg/kg, iron SEL=43,766 mg/kg, and manganese SEL=1,100 mg/kg.

(3) Short-term goal is to identify areas with arsenic greater than 730 mg/kg and the following three metals, copper, iron, and manganese, exceed their PEC or SEL, and then to evaluate the need to remediate such areas based on risks, feasibility, and implementability. Copper PEC=149 mg/kg, iron SEL=43,766 mg/kg, and manganese SEL=1,100 mg/kg.

(a) Long-term goal is to achieve sediment concentrations at or below the maximum background concentraion of 42 mg/kg for sediment arsenic within the top two inches of sediment

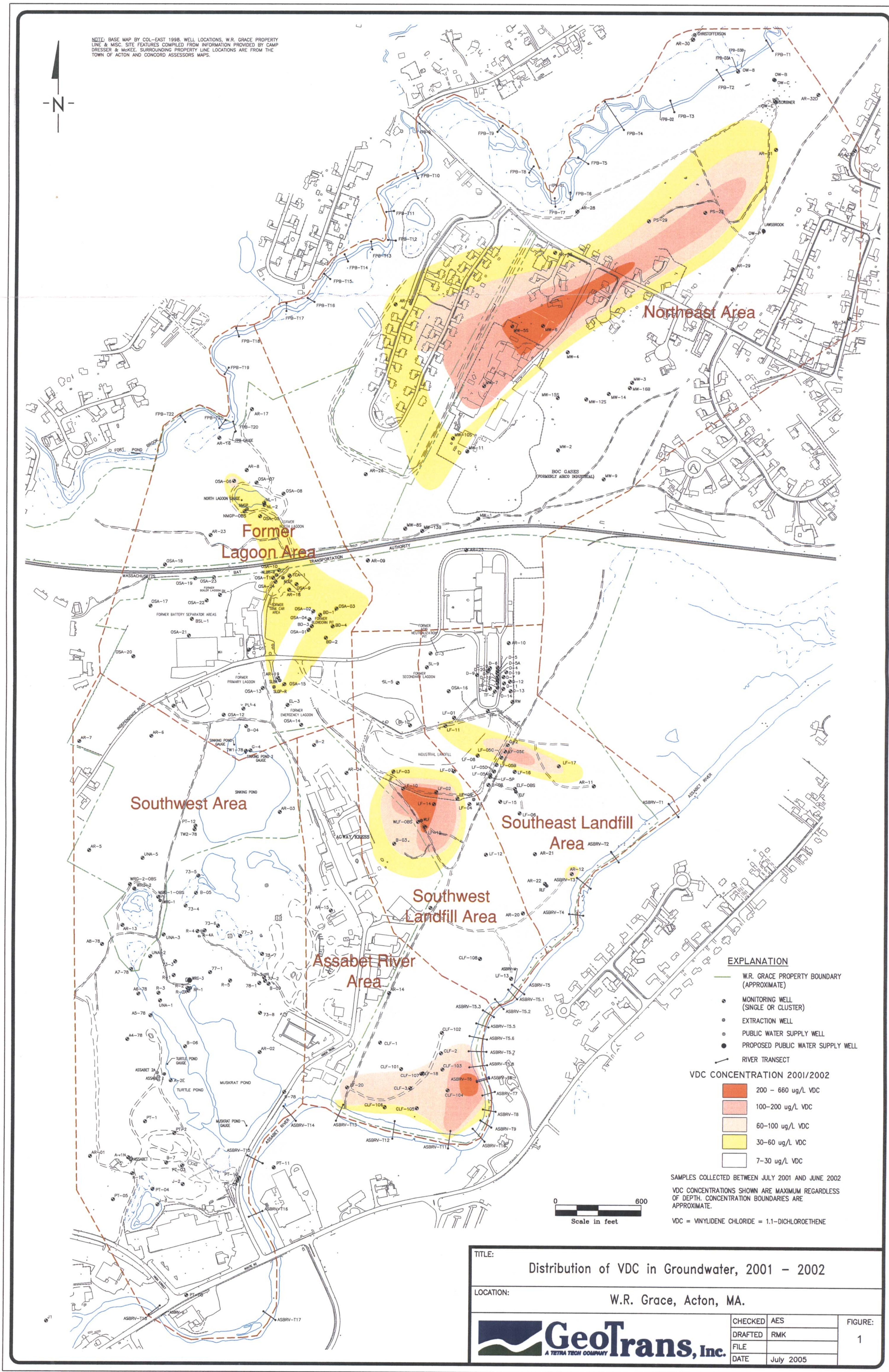
COC - Chemical of Concern

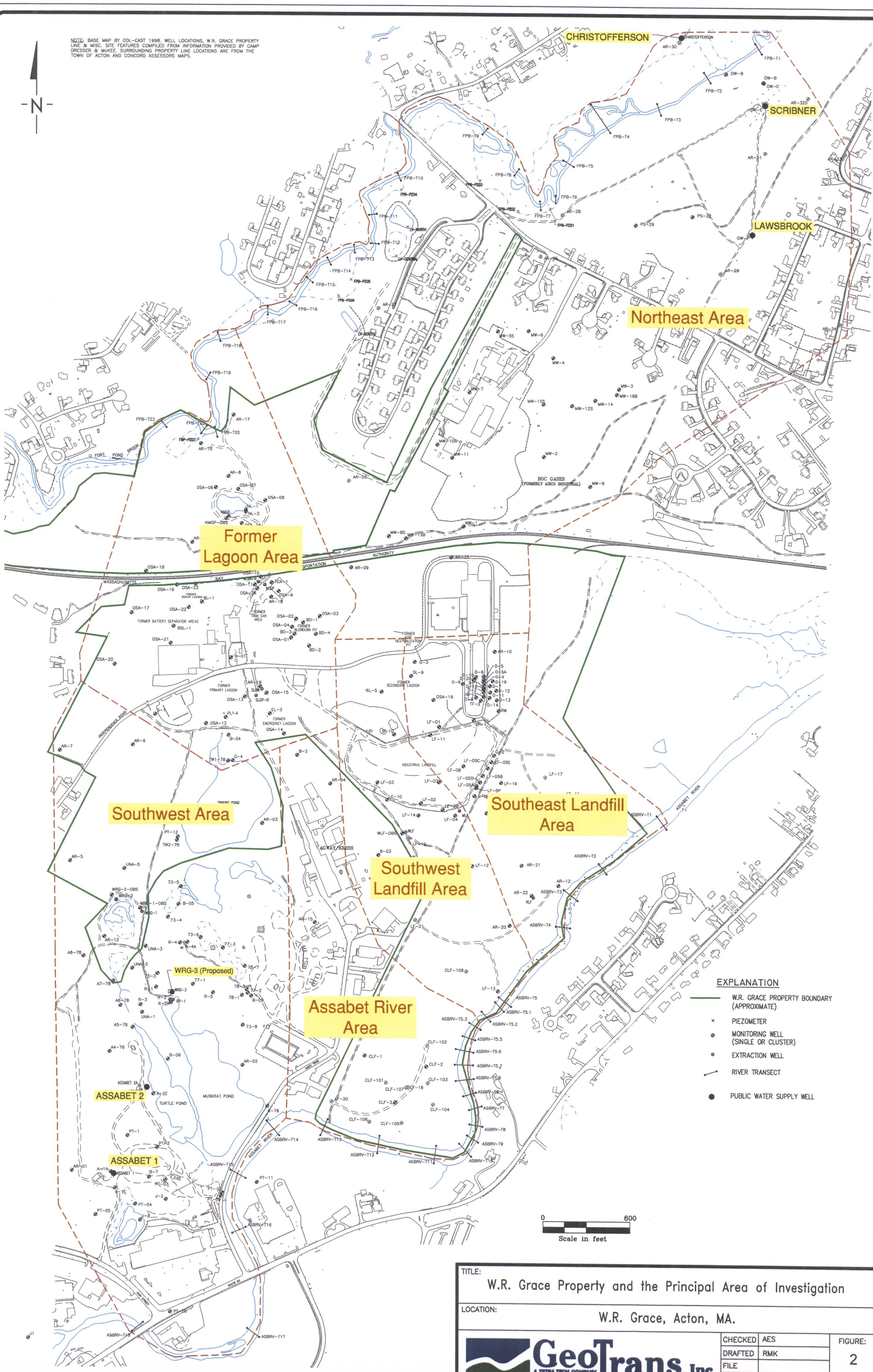
NGVD - National Geodetic Vertical Datum

PEC - Probable Effects Concentration

SEL - Severe Effects Level

FIGURES


NOTE: BASE MAP BY COL-EAST 1998. WELL LOCATIONS, W.R. GRACE PROPERTY LINE & MISC. SITE FEATURES COMPILED FROM INFORMATION PROVIDED BY CAMP DRESSER & McKEE. SURROUNDING PROPERTY LINE LOCATIONS ARE FROM THE TOWN OF ACTON AND CONCORD ASSESSORS MAPS.
N
Northeast Area
Former Lagoon Area
Southwest Area
Southeast Landfill Area
Southwest Landfill Area
Assabet River Area
BOC GASES (FORMERLY AIRCO INDUSTRIAL)
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
ASSABET RIVER
FORT POND BROOK
SINKING POND
TURTLE POND
MUSKRAT POND
INDUSTRIAL LANDFILL
EXPLANATION
W.R. GRACE PROPERTY BOUNDARY (APPROXIMATE)
MONITORING WELL (SINGLE OR CLUSTER)
EXTRACTION WELL
PUBLIC WATER SUPPLY WELL
PROPOSED PUBLIC WATER SUPPLY WELL
RIVER TRANSECT
VDC CONCENTRATION 2001/2002
200 – 660 ug/L VDC
100–200 ug/L VDC
60–100 ug/L VDC
30–60 ug/L VDC
7–30 ug/L VDC
SAMPLES COLLECTED BETWEEN JULY 2001 AND JUNE 2002
VDC CONCENTRATIONS SHOWN ARE MAXIMUM REGARDLESS OF DEPTH. CONCENTRATION BOUNDARIES ARE APPROXIMATE.
VDC = VINYLIDENE CHLORIDE = 1.1-DICHLOROETHENE
0
600
Scale in feet
TITLE:
Distribution of VDC in Groundwater, 2001 – 2002
LOCATION:
W.R. Grace, Acton, MA.
GeoTrans, Inc.
A TETRA TECH COMPANY
CHECKED AES
DRAFTED RMK
FILE
DATE July 2005
FIGURE: 1



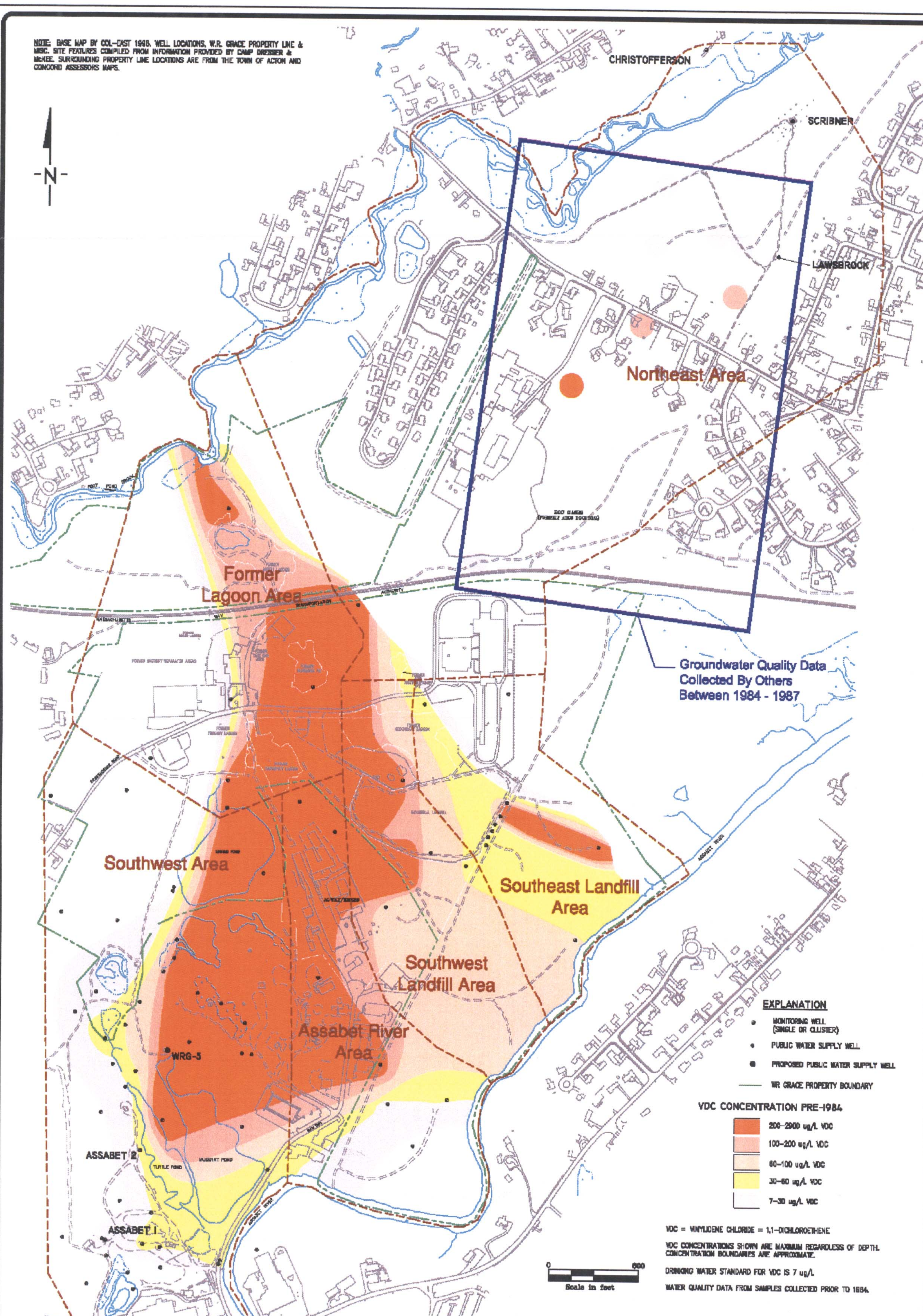
TITLE: W.R. Grace Property and the Principal Area of Investigation

LOCATION: W.R. Grace, Acton, MA.

GeoTrans, Inc. A TETRA TECH COMPANY

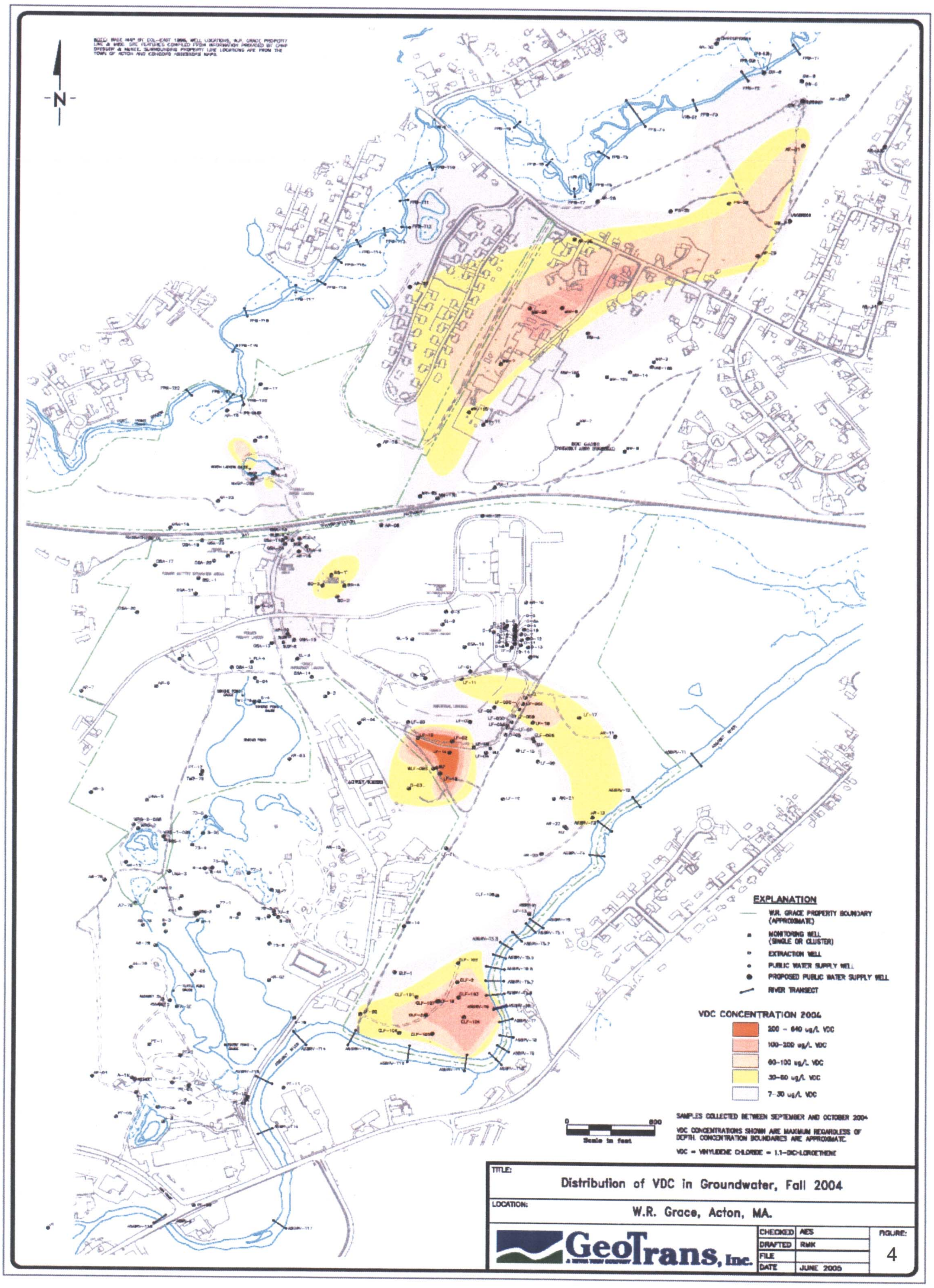
CHECKED	AES
DRAFTED	RMK
FILE	
DATE	Sept 2005

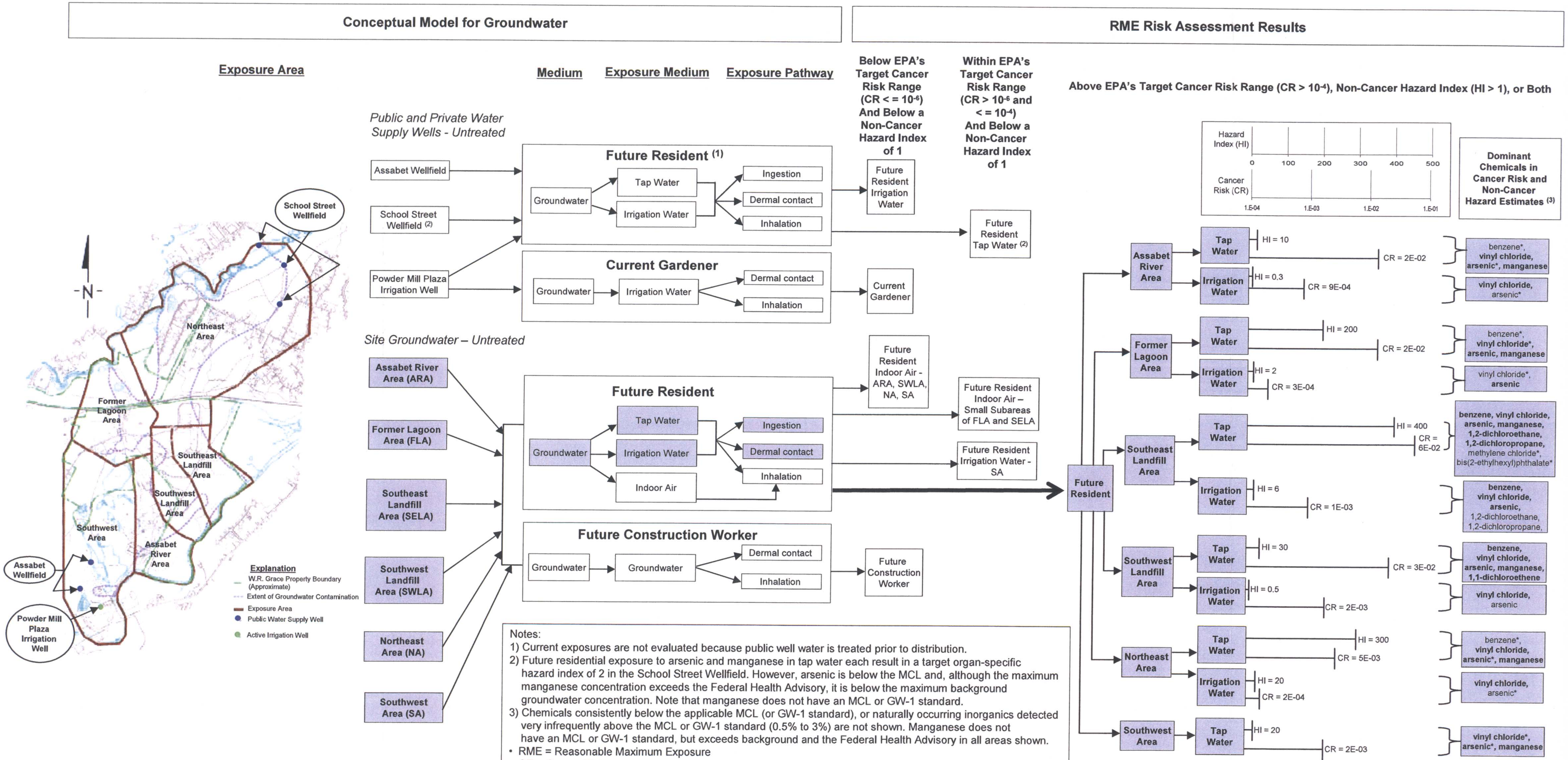
FIGURE: 2



TITLE: Distribution of VDC in Groundwater, Pre-1984			
LOCATION: W.R. Grace, Acton, MA.			
GeoTrans, Inc.	CHECKED	AES	FIGURE:
	DRAFTED	RMK	3
	FILE		
	DATE	Feb 2005	

G:\WRG-ACT_2005\04-05_2004DataRpt\Fall04-VDC-B.dwg, GeoTrans, Inc.





Notes:
1) Current exposures are not evaluated because public well water is treated prior to distribution.
2) Future residential exposure to arsenic and manganese in tap water each result in a target organ-specific hazard index of 2 in the School Street Wellfield. However, arsenic is below the MCL and, although the maximum manganese concentration exceeds the Federal Health Advisory, it is below the maximum background groundwater concentration. Note that manganese does not have an MCL or GW-1 standard.
3) Chemicals consistently below the applicable MCL (or GW-1 standard), or naturally occurring inorganics detected very infrequently above the MCL or GW-1 standard (0.5% to 3%) are not shown. Manganese does not have an MCL or GW-1 standard, but exceeds background and the Federal Health Advisory in all areas shown.

- RME = Reasonable Maximum Exposure
- CR = Cancer Risk
- HI = Hazard Index
- Blue areas and pathways result in exceedances of USEPA's target cancer risk range, target non-cancer hazard index, or both.
- **BOLD** chemicals exceed a cancer risk of 10^{-4} or a target organ-specific hazard index of 1.
- Chemicals with an asterisk (*) exceed the MCL in limited portions of the exposure area. Note, that manganese does not have an MCL or a GW-1 standard.

Figure 5. Conceptual Model for Groundwater

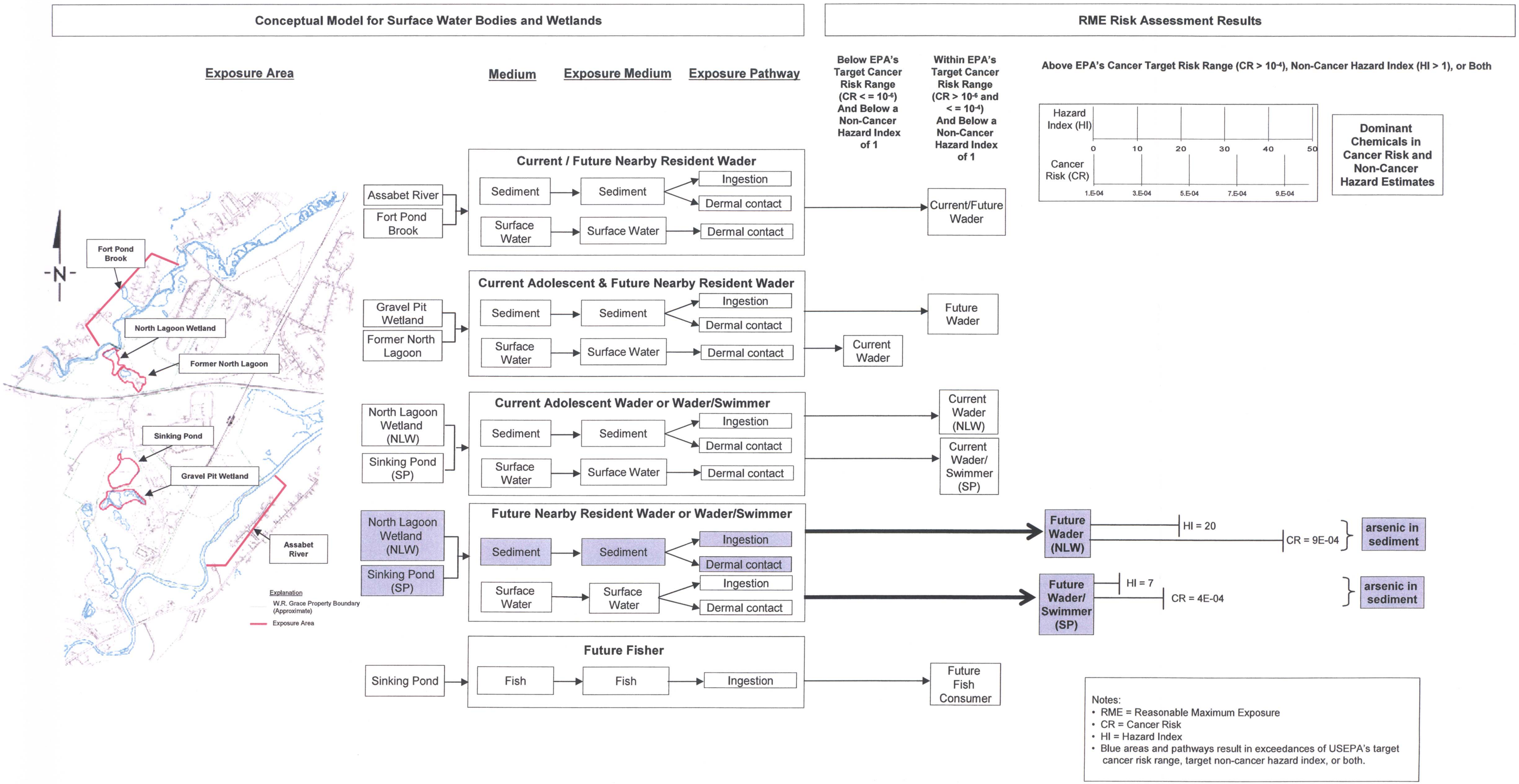
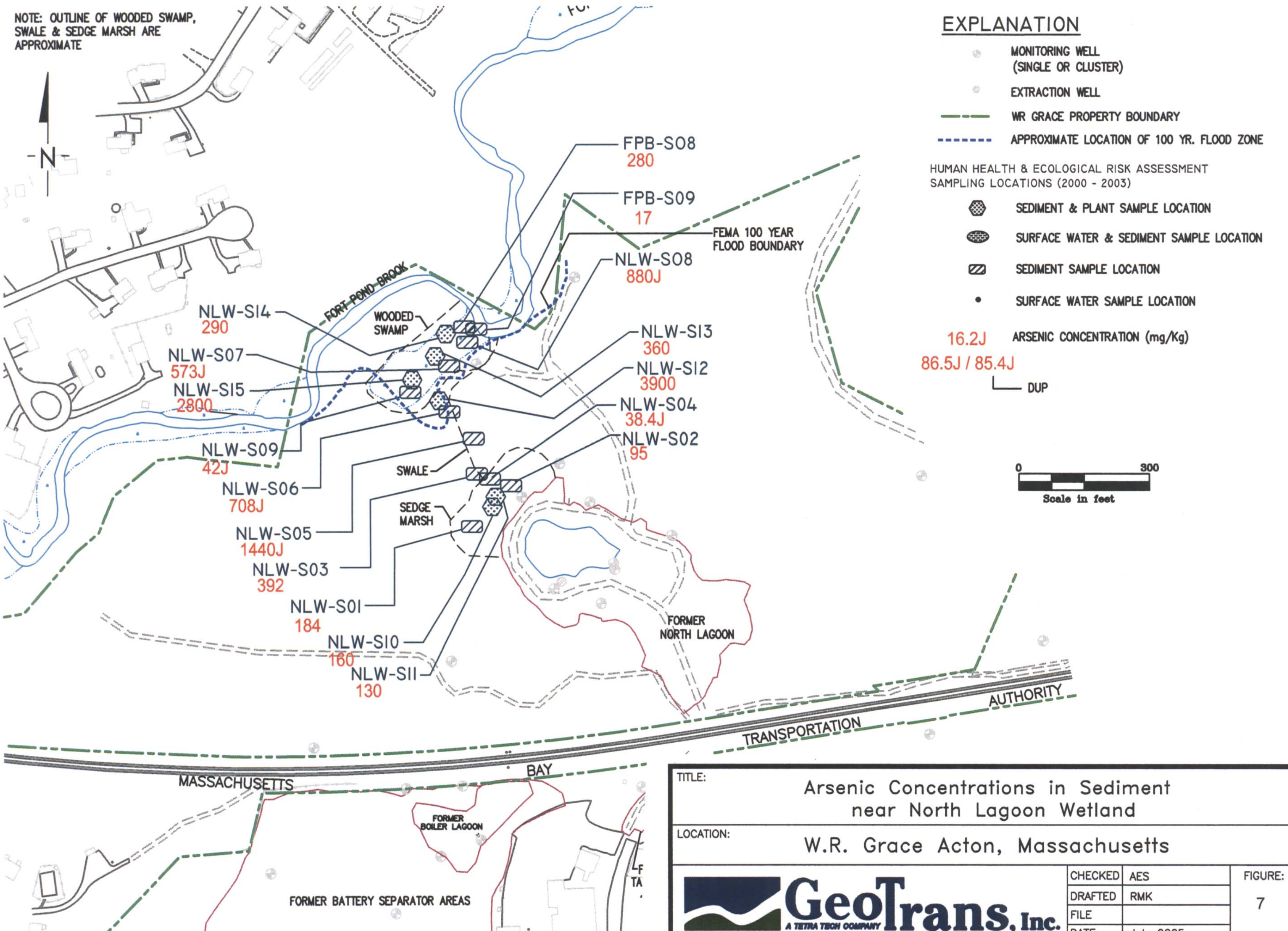


Figure 6. Conceptual Model for Surface Water and Sediment

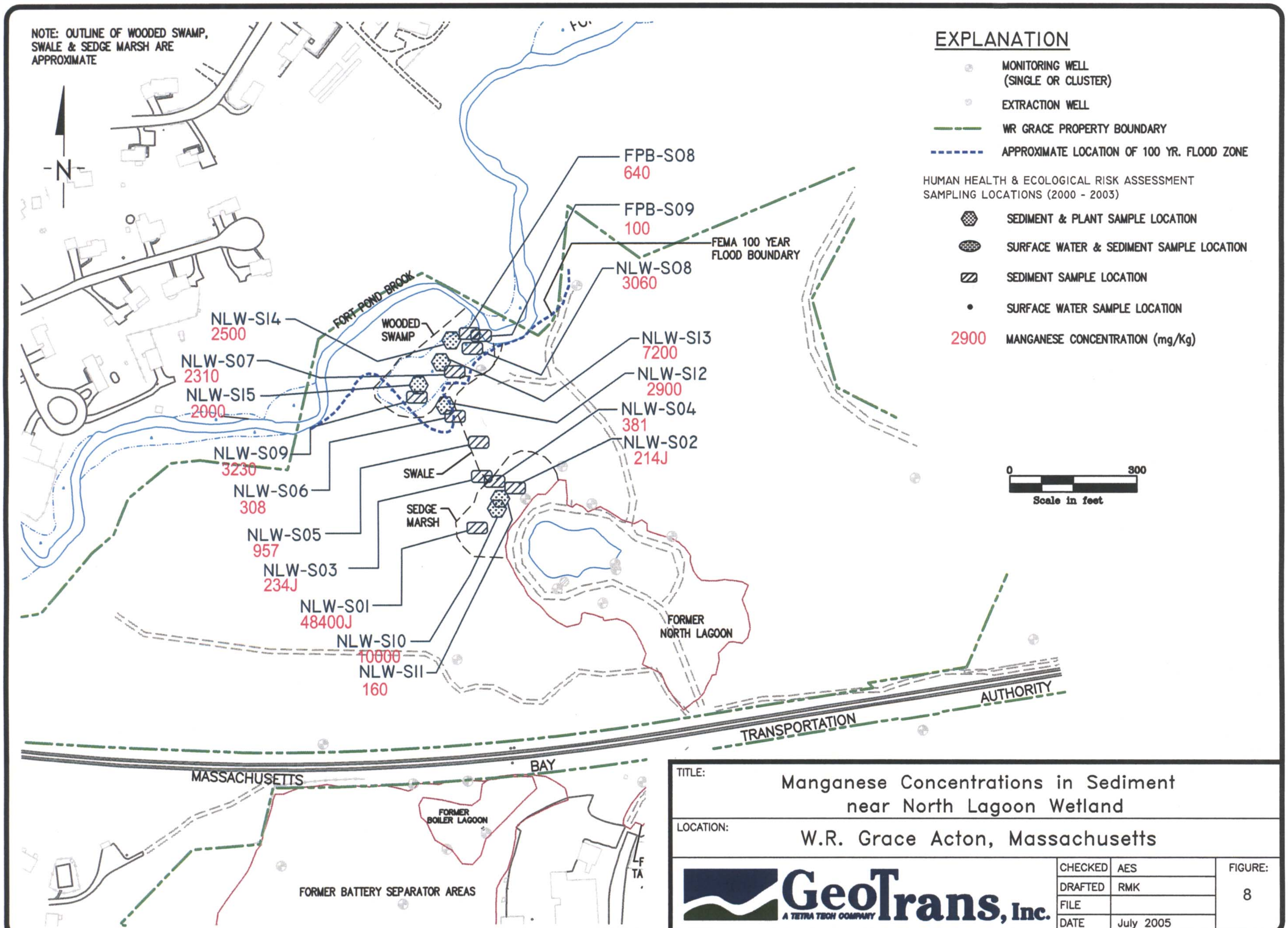


TITLE: Arsenic Concentrations in Sediment near North Lagoon Wetland

LOCATION: W.R. Grace Acton, Massachusetts

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	AES	FIGURE:
DRAFTED	RMK	7
FILE		
DATE	July 2005	

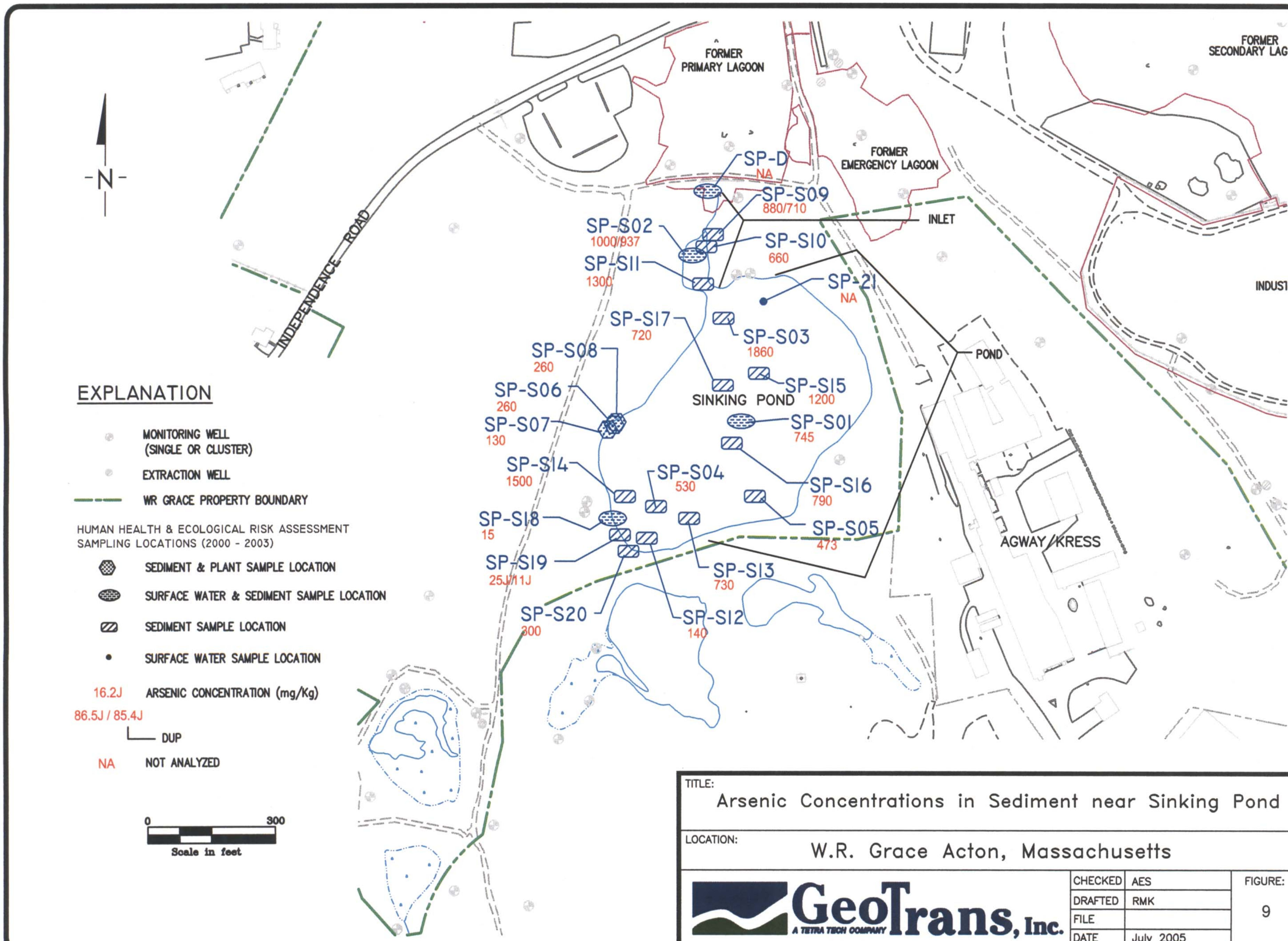


TITLE: Manganese Concentrations in Sediment near North Lagoon Wetland

LOCATION: W.R. Grace Acton, Massachusetts

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	AES	FIGURE: 8
DRAFTED	RMK	
FILE		
DATE	July 2005	

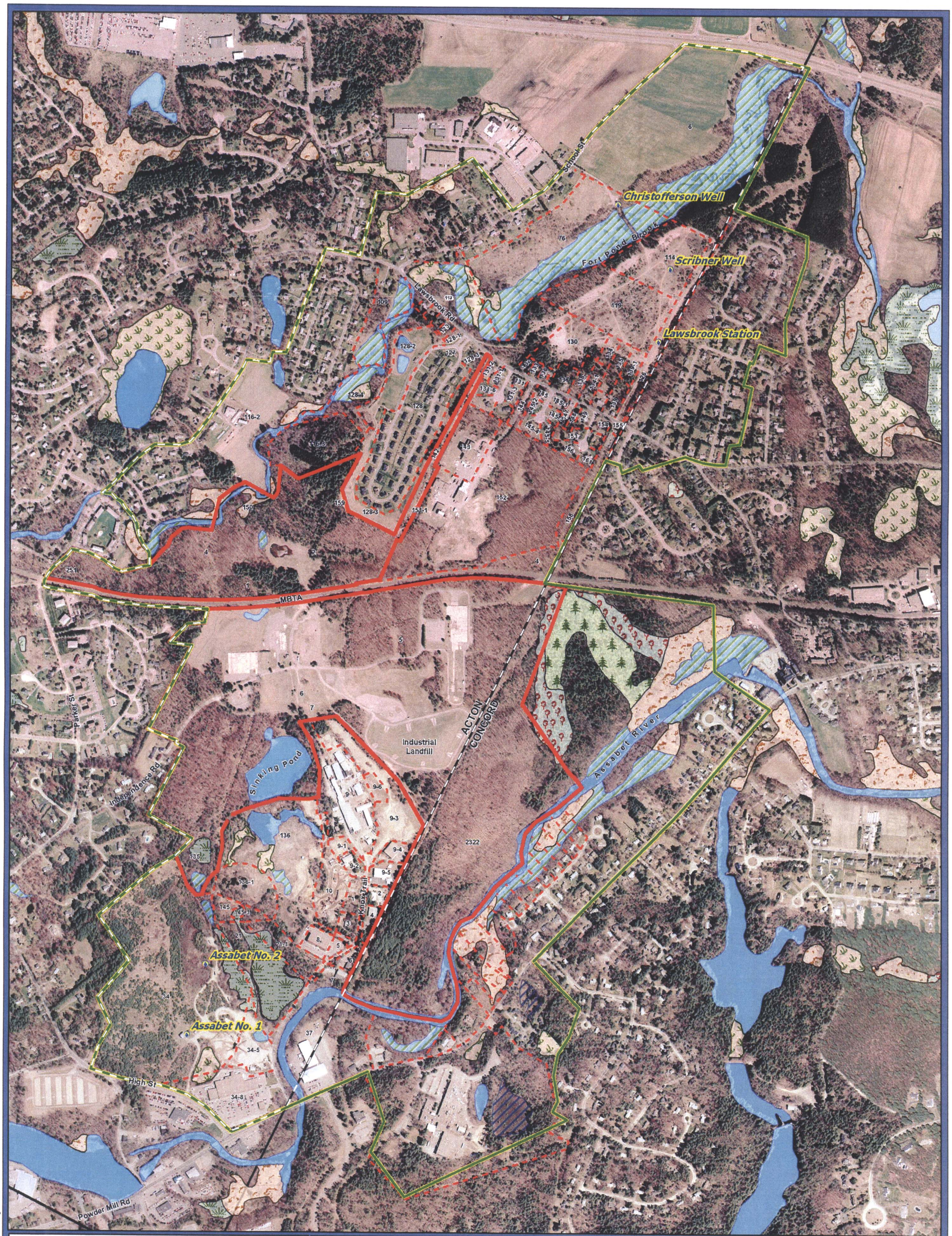


TITLE: Arsenic Concentrations in Sediment near Sinking Pond

LOCATION: W.R. Grace Acton, Massachusetts

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	AES	FIGURE:
DRAFTED	RMK	9
FILE		
DATE	July 2005	



SOURCE: Orthophoto: MassGIS, Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Property Boundaries: GeoTrans, Inc.; Revised Private Will Survey Area 2002
Wetlands: MassGIS, Commonweatlth of Massachusetts
Executive Office of Environmental Affairs

0 400 800 1,600
Feet

N

LEGEND

- WR Grace Property
- Private Well Survey Area
- Other Properties
- Municipal Wells
- Acton Temporary Well Moratorium Boundary

Wetlands

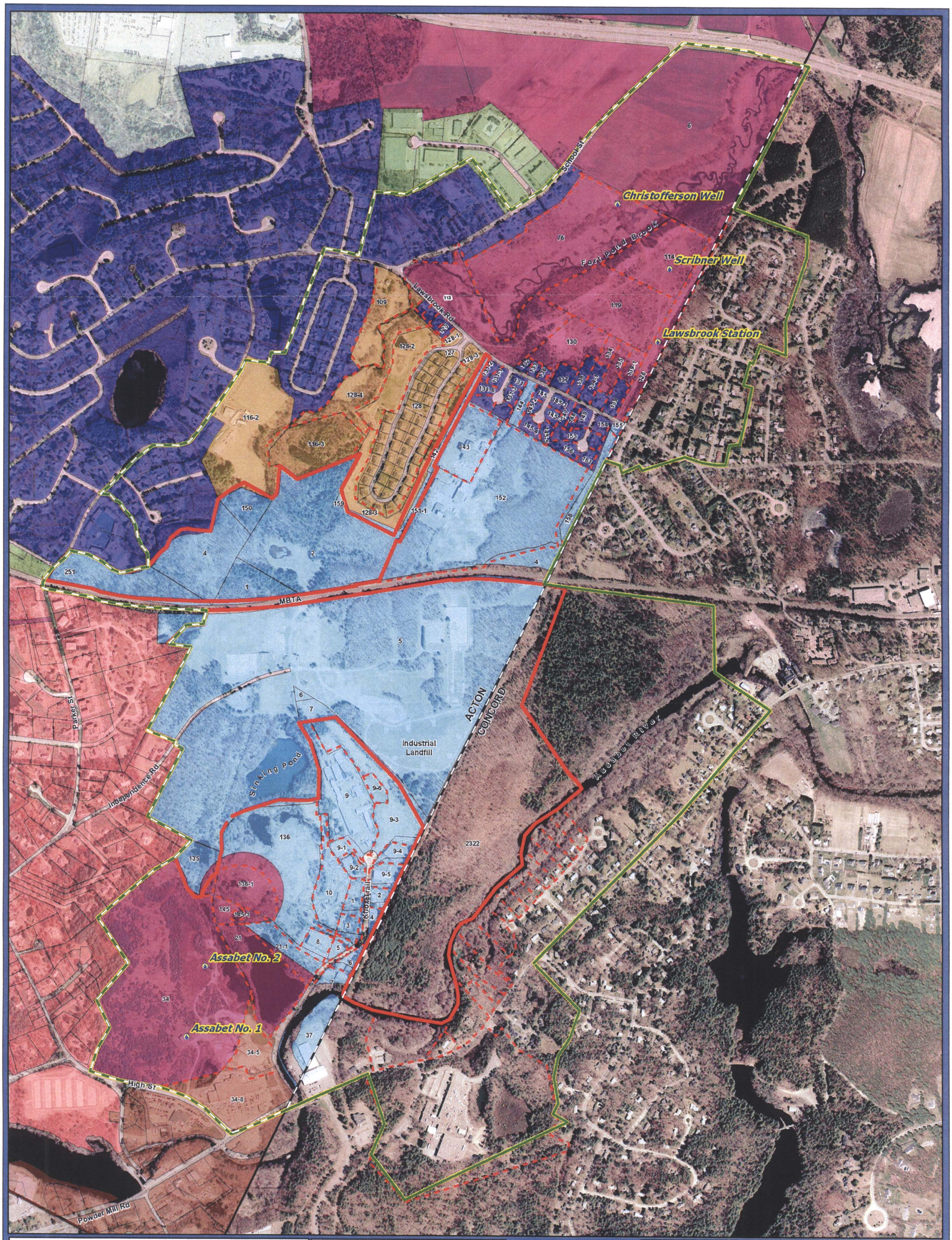
- Bog
- Shrub Swamp
- Cranberry Bog
- Upland
- Deep Marsh
- Wooded Swamp Coniferous
- Open Water
- Wooded Swamp Deciduous
- Shallow Marsh Meadow or Fen
- Wooded Swamp Mixed Trees

FIGURE 10. WETLANDS WITHIN PRIVATE WELL SURVEY AREA

WR GRACE RE-USE
ACTON, MASSACHUSETTS

METCALF & EDDY | AECOM

g:\projects\massachusetts\Acton\Maps\WRGrace-WetlandsFig10.mxd



SOURCE: Orthophoto: MassGIS, Commonwealth of Massachusetts Executive Office of Environmental Affairs
Property Boundaries: GeoTrans, Inc.; Revised Private Will Survey Area 2002

0 400 800 1,600
Feet

N

LEGEND

ZONE

- ARC
- LI
- OP-1
- PM
- R-2
- R-4
- R-8/4
- TD

- WR Grace Property
- Other Properties
- Private Well Survey Area
- Municipal Wells
- Acton Temporary Well Moratorium Boundary

FIGURE 11. PARCELS WITHIN PRIVATE WELL SURVEY AREA

WR GRACE RE-USE
ACTON, MASSACHUSETTS

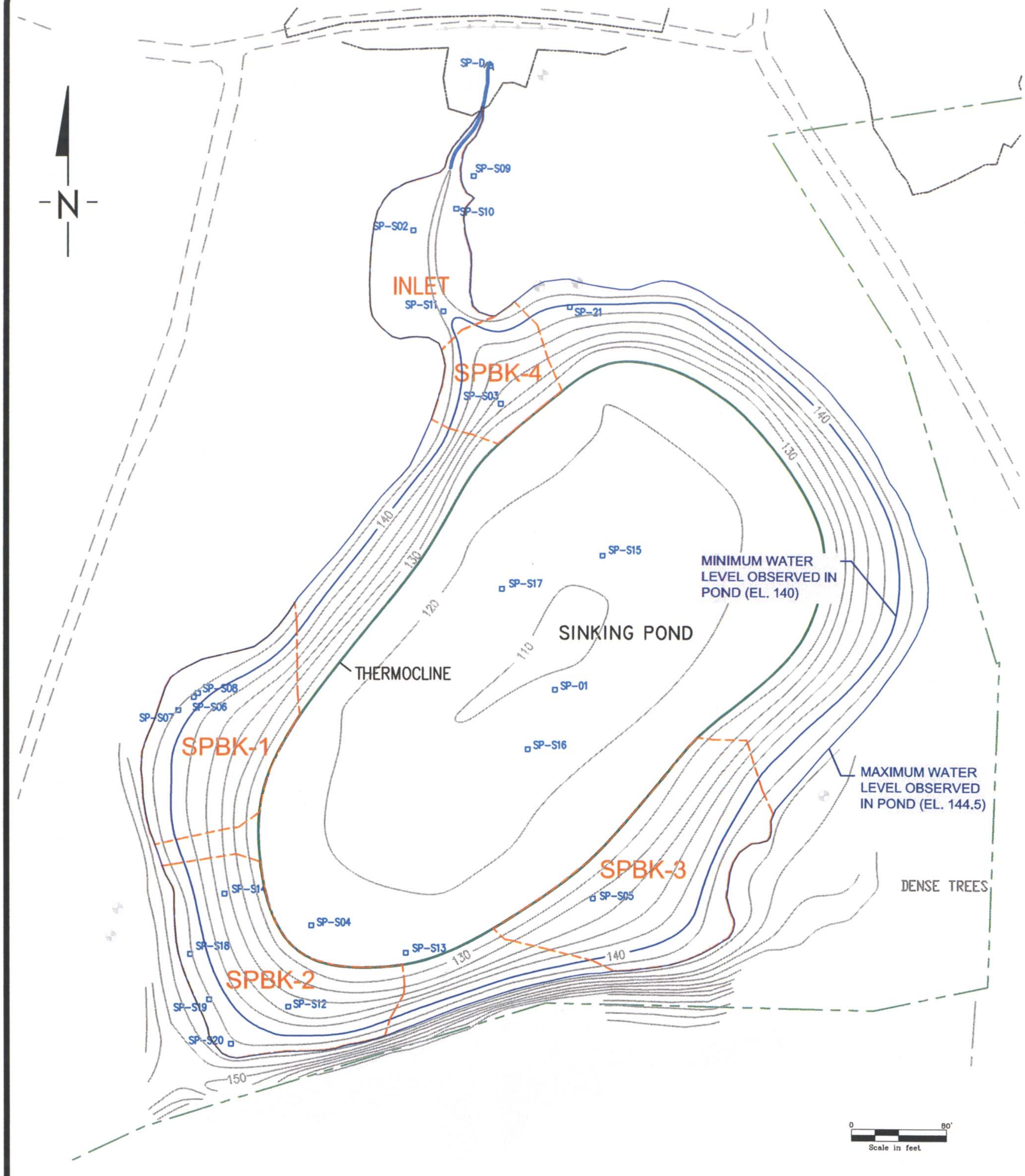
METCALF & EDDY | AECOM

g:\projects\massachusetts\Acton\Maps\WRGrace-VicinityHandoutFig11.mxd

Local Roads
Potential Access Points

Total Acres: 259 ac.
Area 1 : 51 ac.
Area 2: 136 ac.
Area 3: 72 ac.

Figure 12. Local Roads and Potential Access Points



EXPLANATION

SP-S20 ▫ SEDIMENT PROFILE LOCATION (MENZIE CURA 2000–2003). LOCATIONS NOT SURVEYED EXCEPT: SP-06, 07, 08 & 21.

MONITORING WELL (SINGLE OR CLUSTER)

GROUND SURFACE CONTOURS (FROM AREIAL SURVEY, COL-EAST 1998 NGVD)

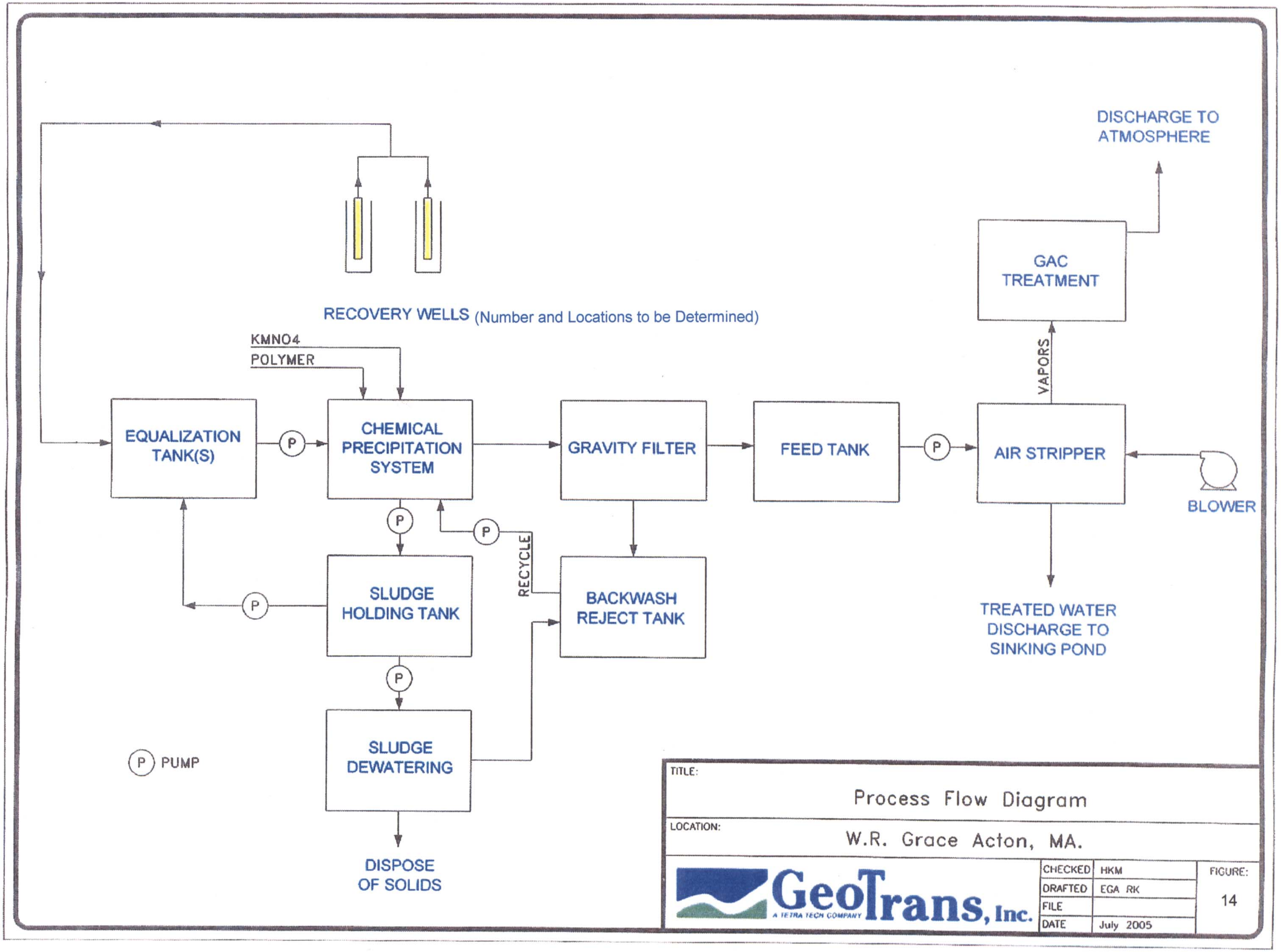
CONTOURS IN AND AROUND SINKING POND (BASED ON SURVEY BY NORWOOD ENGINEERING APRIL 1994 NGVD)

TITLE: Bathymetric Map of Sinking Pond

LOCATION: W.R. Grace, Acton, MA.

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	AES	FIGURE:
DRAFTED	RMK	13
FILE		
DATE	July 2005	


DISCHARGE TO ATMOSPHERE
GAC TREATMENT
RECOVERY WELLS (Number and Locations to be Determined)
KMNO4
POLYMER
EQUALIZATION TANK(S)
CHEMICAL PRECIPITATION SYSTEM
GRAVITY FILTER
FEED TANK
AIR STRIPPER
VAPORS
BLOWER
P
SLUDGE HOLDING TANK
RECYCLE
BACKWASH REJECT TANK
TREATED WATER DISCHARGE TO SINKING POND
SLUDGE DEWATERING
DISPOSE OF SOLIDS
P PUMP
TITLE:
Process Flow Diagram
LOCATION:
W.R. Grace Acton, MA.
GeoTrans, Inc.
A TETRA TECH COMPANY
CHECKED HKM
DRAFTED EGA RK
FILE
DATE July 2005
FIGURE:
14