STAMINA MILLS
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REGION I

RECORD OF DECISION

STAMINA MILLS SITE

NORTH SMITHFIELD, RHODE ISLAND

SEPTEMBER 28, 1990

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

DECLARATION FOR THE RECORD OF DECISION

Stamina Mills
North Smithfield, Rhode Island

STATEMENT OF PURPOSE

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

The State of Rhode Island has concurred on the selected remedy.

STATEMENT OF BASIS

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

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the Stamina Mills Site includes both source control and management of migration components to obtain a comprehensive remedy.

The source control measures include:

* The in-situ vacuum extraction of soil contaminated with trichloroethylene (TCE) in the spill area. A number of shallow wells will be installed throughout the spill area and will be used to withdraw air containing TCE and other volatile organic compounds (VOCs) from the soils. The air containing

VOCs is then treated using activated carbon filters prior to being discharged to the atmosphere. Spent activated carbon filters will be transported off-site where they will be either regenerated or disposed of. Attaining the soil target cleanup levels will eliminate the potential migration of contaminants from the soils into the groundwater at levels exceeding groundwater cleanup goals.

* Excavation of approximately 550 cubic yards of a mixture of landfill wastes and sediments from within the 100-year floodplain of the Branch River. This material will be redeposited onto the landfill above the floodplain and incorporated under the new RCRA multi-layer cap to be installed. A leachate collection system will be installed along the base of the landfill's southern boundary and the leachate generated will be discharged into the on-site sewer system subject to the final approval of the Woonsocket Wastewater Treatment Authority.

* Institutional controls in the form of deed restrictions will be used at the Site to regulate land use. The institutional controls would be focused on preventing the disturbance of the physical integrity of many of the remedy's components. EPA has proposed, in a consent decree lodged in federal court, institutional controls with the current owner to protect the remedy.

* Confirmation of the septic tank location, testing and removal of its contents, and disposal of the contents of the tank and the tank itself. The contents of the septic tank will be disposed of off-site but the type of facility at which it will be disposed of will be contingent upon the testing results.

The management of migration remedial measures include:

* Active restoration of the groundwater aquifer contaminated with TCE and other VOCs using the innovative ultraviolet light and hydrogen peroxide (UV/hydrogen peroxide) technology. This component of the remedy will extract and treat groundwater contaminated by releases at the Site. The goal of this remedial action is to restore the groundwater to drinking water quality standards as rapidly as possible. The results of an on-site pilot test using the UV/hydrogen peroxide system will be conducted during the predesign phase to determine which of the three disposal options being considered for treated groundwater will be used. The disposal options being considered are on-site surface water discharge, on-site subsurface water discharge, and on-site discharge to the existing sewer line. The time frame for groundwater restoration has been estimated at 10 to 15 years. EPA will conduct an evaluation of the groundwater restoration remedy within 5 years of its implementation. If the evaluation

reveals that the remedy cannot achieve the cleanup levels within a reasonable time frame, consideration will be given to making changes in the remedy.

* Extraction of groundwater through on-site wells installed into the bedrock. Design details of the extraction system will be determined from the results of a predesign pump test. Groundwater extraction would act to halt the migration of contaminants and facilitate the removal of contaminants which have migrated off-site.

* Utilization of a pressure filtration system to remove suspended solids and suspended metals in the groundwater prior to treatment in the UV/hydrogen peroxide.

* Sealing of the entrances and exits of two raceways with impermeable barriers. The raceways were used to transport water to mill buildings. Sections of both raceways which have not collapsed will be collapsed and backfilled.

* Demolishing and removing partially standing buildings at the Site which include a deteriorating smokestack. It is believed that this activity will have to be one of the first to occur in order to allow workers to safely perform work at the Site. Solid waste of an earthen nature (i.e., bricks) will be disposed of on-site and all other solid wastes will be disposed of off-site in accordance with state solid waste regulations.

* Grading and vegetation of the Site at the conclusion of the remedial activities.

* Long-term environmental monitoring of the groundwater and Branch River to ensure the effectiveness of the remedy.

DECLARATION

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

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

9/28/90
Date

Julie Belaga
Regional Administrator

RECORD OF DECISION
STAMINA MILLS SITE

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ROD DECISION SUMMARY

September, 1990

I. SITE NAME, LOCATION AND DESCRIPTION

A. General Description

The Stamina Mills Superfund Site (the Site), a former textile weaving and finishing mill, is located in the Town of North Smithfield, Providence County, Rhode Island. The Site is located approximately one-half mile southwest of the intersection of Highway 146 and 146A and is approximately 14 miles northwest of Providence, Rhode Island (Appendix A, Figure 1).

The Site, comprising approximately 5 acres, is bounded to the south by the Branch River. A dam constructed immediately adjacent to the Site forms the Forestdale Pond. The pond forms the western boundary of the Site (Appendix A, Figure 2). The land to the north and east of the Site is largely residential with some commercial use. The Halliwell Memorial Elementary School is approximately four-tenths of a mile northwest of the Site. Areas directly east of the Site, which are in the floodplain of the Branch River, have been left undeveloped. The area to the south and southwest of the Site is occupied by industrial and commercial facilities. These include a fertilizer plant, a paper and tape coating manufacturer, an electronics and gauge producer, and a metal fabricator. The southeast section of the Site, which includes a small portion of the on-site landfill, is located within the 100-year floodplain of the Branch River. The Site is within 200 feet of the Branch River and is therefore a wetland under Rhode Island law.

In 1969, an unknown quantity of the solvent trichloroethylene (TCE) was spilled at the Site and has since migrated into the soil and the bedrock aquifer beneath the Site. The contaminated groundwater beneath the Site has been shown to be hydraulically connected to areas north of the Site and has affected these areas. The Site has remained vacant since a fire destroyed the mill in 1977 and currently rubble, piles of debris, and foundation remains (including a deteriorating smoke stack) cover the Site. A more complete description of the Site can be found in the "Remedial Investigation Report, Stamina Mills Site", January, 1990, (RI) in Section 2 of Volume I.

B. Geologic Characteristics

The bedrock underlying the Site is made up of schists, gneiss, and quartzite belonging to the Precambrian to lower Paleozoic age Blackstone Series. These rocks are exposed in outcrops over an area extending from 1.5 miles northwest of the Site to the southern side of Woonsocket Hill, approximately 2 miles to the south.

On-site drilling and geophysical work indicated that: the bedrock surface is irregular; the orientation of joints and fractures appear to be generally northeast-southwest and northwest-southeast; the fractures generally dip between 15 and 35 degrees and are parallel to the foliation planes in the rock. These discontinuities in the rock are important because they are the principal areas where groundwater is stored and transmitted.

Natural overburden soils encountered on the Site consist of thin glacial till, stratified ice contact deposits and local recent fluvial deposits. Glacial deposits found are generally thin, with relatively dense till deposited as a mantle overlying bedrock. Surficial soils have been significantly altered in the course of excavations and construction of structures at the Site. The overburden materials vary in thickness from 0 to 20 feet.

C. Hydrogeological Characteristics

The Site lies within the watershed of the Branch River, which is the recipient of most surface water runoff from the residential area north of the Site, the Stamina Mills property, and the area south of the Site. A dam constructed adjacent to the Site forms the eastern boundary of the Forestdale pond. Groundwater migrating beneath the Site occurs predominantly in the bedrock aquifer and to a lesser extent in the lower few feet of the overburden. With the exception of the landfill area at the east end of the Site, unconsolidated materials may lie completely above the saturated zone or may only be seasonally saturated and, therefore, do not play a major role in the storage and movement of groundwater through the Site.

Regional groundwater flow under natural conditions (i.e., non-pumping of residential wells north of the Site) is generally toward the Branch River from upland areas along the north and south banks, and then eastward parallel to the River. Residential and community pumping, occurring prior to the installation of public water supplies, altered the natural hydraulic system shown in Appendix A, Figure 3. EPA determined by the pump test conducted at the Forestdale Water Association Well that the pumping of individual bedrock wells to the north of the Site produced a reversal of the regional groundwater flow. As presented in Appendix A, Figure 4, the regional flow was reversed such that flow from beneath the

Site was induced toward the residential area north of the Site. Groundwater sampling data obtained in March 1988, indicates that the groundwater flow continues to follow the natural regional trend under non-pumping conditions.

Flow within the bedrock aquifer is controlled by hydraulic head and interconnected fractures and is affected locally at the Site by hydraulic gradients induced by the Forestdale Pond. The orientation of what are believed to be the principal water bearing features are to the northeast and northwest coinciding roughly with the location of the contaminant plume. Additional data, collected and described in Section 5 of the RI, indicated that locally across the Site the upper 15 feet of bedrock was significantly fractured providing available openings for groundwater flow while below this depth the bedrock exhibited a much tighter structure limiting the groundwater flow. Groundwater elevations indicated that hydraulic gradients at the Site are further effected by the local surface hydrology, specifically the Forestdale pond which borders the western section of the Site.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land Use and Response History

Since the early 1800's the Site has been operated as a textile (cotton and wool) weaving and finishing facility. As part of the manufacturing process, various chemicals were used at the Site. These included detergents and solvents to clean the wool; acids, bases and dyes to color fabrics; pesticides and solvents for moth proofing; and plasticizers to coat fabrics. During the 1930's a fire at the Site destroyed one of the mill buildings. A portion of the burned-out foundation was used as a landfill for process wastes until approximately 1968. In 1968, the landfill was covered and used as a parking area.

In March 1969, a solvent-based scouring system was installed at the mill. The scouring system used TCE to remove oil and dirt from newly-woven fabrics. Shortly after the system was installed, an unknown quantity of TCE was spilled during the filling of an above-ground storage tank. The mill did not clean up the spill. Some of the spilled TCE infiltrated into the soil and entered the groundwater. The remainder of the TCE ran off into the Branch River. The mill continued to operate the scouring system until the mill closed in 1975.

In October 1977, a fire destroyed the mill complex. Since that time the property has remained vacant and unused. The Site is currently overgrown and contains rubble, piles of debris, and the remains of the building's foundation (including a deteriorating smokestack). A more detailed description of the Site history can be found in the RI, pages

1-4 through 1-7.

In 1979, TCE was detected off-site in the Forestdale Water Association well, a community water system located approximately 800 feet north of the Site. This sampling was conducted by the Rhode Island Department of Health (RIDOH) as part of a statewide groundwater survey. RIDOH then expanded the groundwater sampling program to include an additional 51 private residential wells in the Forestdale area. As a result RIDOH found elevated levels of TCE in 18 of these residential wells and advised area residents to boil water used for drinking and cooking.

In 1981, the State of Rhode Island Water Resources Board and the Town of North Smithfield financed the construction of a municipal water main to serve the residential area north of the Site that had been affected or had the potential to be affected by contamination from the Stamina Mills Site. Between 1981 and 1984, only seven of the approximately 50 affected or potentially affected residences had been connected to the new municipal water supply, reportedly because of the costs associated with connecting to the water main.

On September 8, 1983 the Site was placed on the final National Priorities List (NPL) and later that month EPA began to supply bottled water to residents not connected to the municipal water supply. During November 1984 EPA initiated an immediate removal action under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) §104(a), 42 U.S.C. §9604(a)(1984) to extend the existing water line as well as fund the residents' costs for connecting to the municipal water supply. In July 1988, EPA initiated a second removal action at the Site which dealt with two deteriorating underground storage tanks. The contents of both tanks were removed and then treated and disposed of off-site. The interiors of both tanks were decontaminated and the tanks were then decommissioned. In August 1990, EPA initiated a third removal action which removed the contents of an above-ground storage tank. The contents were treated and disposed of off-site. The interior of the tank was decontaminated and the tank shell was left on-site and will be disposed of during remedial activities. A more detailed description of the Site history can be found in the RI at pages 1-7 through 1-8.

B. Enforcement History

On September 19, 1984, EPA notified the owner of the Site at the time of the spill, Kayser-Roth Corporation, of its potential CERCLA liability with respect to the Site. In addition, on October 23, 1984, EPA notified the current owner of the Site, Hydro-Manufacturing Company, of its potential CERCLA liability with respect to the Site. In the absence of an offer by Kayser-Roth or Hydro-Manufacturing to reimburse the government for the costs of the removal actions and to fund the remediation of the Site, EPA filed suit against both companies in federal district court on May 23, 1988.

In July 1989, EPA entered into a partial consent decree with Hydro-Manufacturing in settlement of the company's liability. The consent decree, with subsequent modifications, has been lodged with the district court.

On October 11, 1989, the district court ruled that Kayser-Roth is liable under CERCLA for cleanup costs at the Site. The court entered a declaratory judgement on January 16, 1990, holding Kayser-Roth liable for all past and future costs consistent with the Act. Kayser-Roth filed an appeal on April 5, 1990. On August 2, 1990, the Court of Appeals for the First Circuit affirmed the district court's ruling.

Technical comments on the proposed plan were first presented by representatives of Kayser-Roth at the informal public hearing during the public comment period. A summary of the comments received during the meeting as well as the written comments are included in the Administrative Record.

III. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement has been moderate to low. EPA has kept the community and other interested parties apprised of the Site activities through informational meetings, fact sheets, press releases and public meetings.

During December 1986, EPA released a community relations plan which outlined a program to address community concerns and keep citizens informed about and involved in activities during remedial activities. On March 10, 1986, EPA held an informational meeting in the Municipal Annex Building, North Smithfield, Rhode Island to describe the plans for the Remedial Investigation (RI) and Feasibility Study (FS). On February 21, 1990 EPA held an informational meeting in the Municipal Annex Building, North Smithfield, Rhode Island to discuss the results of the RI.

On March 22, 1989, EPA made the administrative record available for public review at EPA's offices in Boston and at the North Smithfield Public Library. Additional materials were added to the Administrative Record on February 12, 1990 with the release of the RI and on July 10, 1990 with the release of the FS and the Proposed Plan. EPA published a notice and brief analysis of the Proposed Plan in the Woonsocket Call on June 29, 1990 and made the plan available to the public at the North Smithfield Public Library.
On July 10, 1990, EPA held an informational meeting to discuss the cleanup alternatives presented in the Feasibility Study and to

present the Agency's Proposed Plan. Also during this meeting, the Agency answered questions from the public. From July 11 to August 9, 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. On July 31, 1990, the Agency held a public meeting to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments and the Agency's response to comments are included in the attached responsiveness summary found in Appendix C of this document.

IV. SCOPE AND ROLE OF RESPONSE ACTION

The selected remedy was developed by combining components of different source control and management of migration alternatives to obtain a comprehensive approach for Site remediation. In summary, the remedy provides for the treatment of contaminated soil in the TCE spill area, the excavation of landfill wastes within the 100-year floodplain of the Branch River and consolidation with landfill wastes above the floodplain, construction of a leachate collection system and an impermeable cap over the on-site landfill, and the confirmation of the Mills' septic tank location and disposal of its contents. These activities constitute the source control measures that will be undertaken to remediate areas which are acting as sources of contamination to the groundwater and surface water.

The remedy also includes the extraction and treatment of contaminated groundwater as well as the sealing and filling of the existing on-site raceways. These constitute the management of migration measures. They address the contaminated groundwater plume which has migrated beyond the Site boundaries and the migration of contaminants into the Branch River via the raceways. Prior to safely implementing either the source control or management of migration alternatives discussed above, it will be necessary to demolish the partially standing buildings at the Site and thereby ensure the safety and protection of on-site workers.

The remedial action will address the principal threats identified at the Site through treatment and will use engineering controls for areas of the Site which pose a relatively low long-term threat, consistent with the National Oil and Hazardous Substances Pollution Contingency Plan 40 CFR 300.5, Federal Register, Vol. 55, No. 46, March 8, 1990 (NCP). Areas of the Site which have been identified as the principal threats include the TCE spill area soils and the groundwater contaminant plume. The areas of the Site which are believed to pose a lower long-term threat include the landfill, raceways and septic tank. The remedial action will address the following threats to human health and the environment posed by the Site:

1. The off-site migration of contaminants;

2. The future ingestion of contaminated groundwater on-site and off-site;

3. The direct contact with and ingestion of contaminated soils, sediments, solid waste.

V. SUMMARY OF SITE CHARACTERISTICS

Chapter 1.0 of the FS contains an overview of the RI. The study area extends beyond the Site's boundaries and includes residential/commercial areas that are bounded to the north and east by Route 146, to the south by railroad tracks and to the west by Roselawn Avenue (See Appendix A, Figure 1). These areas were included to help delineate the extent of the contaminated groundwater plume resulting from the TCE spill at the Site. The significant findings of the RI are summarized below. A complete discussion of Site characteristics can be found in the RI at pages 6-1 through 6-59.

A. Soil

The discussion of the types and nature of contaminants found in the soil at the Site follows the format described in the RI and is broken up into the following three areas; 1) TCE spill area, 2) landfill area, and 3) remaining areas of the overall Site (Appendix A, Figure 5). These areas are described separately because of their different physical characteristics and chemical contaminants.

1. TCE Spill Area

Soil in the TCE spill area consists mainly of granular fill (e.g., sand and gravel), fragments of bedrock, and smaller amounts of miscellaneous construction debris (e.g., brick, concrete, and cinders). The thickness of this layer ranges from 10 to 18 feet, with groundwater seasonally occurring in the lower few feet.

Soils from the TCE spill area were found to contain the highest concentrations of volatile organic compounds (VOCs) detected at the Site. Smaller concentrations of base neutral compounds, pesticides, and metals were also detected in this area as well as over most of the Site. TCE (detected in 71 of 80 soil samples) and its degradation product 1,2-dichloroethylene (detected in 31 of 80 samples) were the principal VOCs detected in the spill area.

The following is a partial list of the volatile organic compounds detected in the spill area:

Compound	Concentration Range (ppb)
Trichloroethylene	less than 5 - 430,000
1,2-Dichloroethylene	less than 5 - 19,000
Methylene Chloride	less than 5 - 1,120
Tetrachloroethylene	less than 5 - 39

Other VOCs which were detected less frequently in the spill area and at much lower concentrations include toluene, chlorobenzene, ethylbenzene, total xylenes, chloroform, and 1,1,1-trichloroethane.

The following were the principal semi-volatile, base neutral compounds detected in the spill area soils:

Compound	Concentration Range (ppb)
Chrysene	37 - 2,700
Pyrene	96 - 4,300
Benzo(a)pyrene	110 - 3,600
Benzo(a)anthracene	120 - 2,800
Phenanthrene	52 - 2,200

Pesticide compounds identified above their detection limits and the range at which they were found include: dieldrin (1 - 200 ppb), endosulfan I (2 - 16 ppb), and endosulfan II (5 ppb). Three other pesticides (Alpha BHC, Beta BHC, and 4,4'-DDT) were detected in one soil sample each. No PCBs were observed above the contract required quantitation limit (CRQL). The CRQL is the amount of a compound which is necessary to produce a response that can be identified and reliably quantified and is part of the EPA contract laboratory program (CLP).

The following trace metals were among the ones that exceeded background levels and also typical ranges of trace metals found in soils:

Compound	Concentration Range (ppb)
Cadmium	7,000
Copper	45,000 - 139,000
Lead	78,000 - 880,000
Mercury	2,000 - 4,000
Vanadium	37,000 - 506,000
Zinc	90,000 - 542,000

The principal route of off-site migration of these contaminants from the spill area is through leaching from the soil into the bedrock aquifer located beneath it. Soil sampling indicated that the highest concentrations of TCE were found adjacent to where the TCE tank was reported to have been and where the spill occurred. In addition, sampling results indicated that the TCE concentration increases with soil depth in this area. The higher concentrations of TCE in the deeper soils are most likely due to two mechanisms: 1) TCE near the surface of the soil was able to volatilize easily into the ambient air, and 2) spilled TCE migrated through the coarser fill material near the surface and its progress was impeded when it encountered the finer grained material at the bedrock surface. Further contaminant migration through volatilization, wind, and water erosion is not likely to be significant because the concentrations of TCE and other VOCs in the upper soil layers have decreased to low levels as a result of these processes.

2. Landfill Area

The landfill wastes consist of a mixture of various fabric wastes, plastic, paper, felt, wood, metal, brick, cinders, glass, and rock interbedded with layers of sandy fill. The material ranges in thickness from 2 feet to more than 19 feet.

The most prevalent contaminant types detected in the landfill wastes were semi-volatile compounds, both base neutral and acid extractable compounds. These compounds were found distributed throughout the landfill material but the areas of highest concentrations of total semi-volatile compounds were found to correspond to sections of the landfill with depths greater than 10 feet of landfill material (Appendix A, Figure 6). Concentrations of individual base neutral semi-volatile compounds, primarily consisting of polycyclic aromatic hydrocarbons (PAHs), ranged between 40 ppb and 10,000 ppb. The PAHs detected with the greatest frequency include:

Compound	Concentration Range (ppb)
Benzo(b)fluoranthene	41 - 8,300
Fluoranthene	41 - 9,100
Phenanthrene	48 - 8,700
Chrysene	66 - 5,100
Benzo(k)fluoranthene	43 - 8,300
Pyrene	48 - 8,700
Benzo(a)pyrene	40 - 4,900
Benzo(a)anthracene	40 - 5,000
Phenanthrene	52 - 2,200

Among the seven acid extractable compounds detected in the landfill material only 4-methylphenol and benzoic acid were found at concentrations above 8,000 ppb. The 4-methylphenol and benzoic acid were detected as high as 100,000 ppb and 70,000 ppb, respectively.

TCE and other VOCs were detected in some of the landfill samples, but at much lower concentrations and frequencies than the semi-volatile compounds. The concentrations of VOCs detected in the landfill wastes did not exceed 2,500 ppb with the exception of one sample in which 51,000 ppb of TCE was detected. This sample was taken at a depth of 13 feet below the ground surface and at the time of sampling this was immediately above the water table. The other VOCs detected in the landfill in order of decreasing frequency are 1,2-dichloroethylene (2 - 980 ppb), toluene (5 - 81 ppb), and chlorobenzene (31 - 97 ppb).

Of the pesticides tested for, dieldrin was detected the most frequently (in 32 of 54 soil samples) and at the highest concentrations (33 ppb to 17,000 ppb). Two other pesticides, 4,4'-DDD and 4,4'-DDT, were detected less frequently and at concentrations below 100 ppb. No PCBs were observed at levels above the CRQL.

The following trace metals, among others, were detected in the landfill wastes at concentrations in excess of both background levels and published ranges typical of soils:

Compound	Concentration Range (ppb)
Cadmium	3,000 - 17,000
Copper	45,000 - 2,130,000
Lead	70,000 - 1,380,000
Arsenic	18,000 - 71,000
Vanadium	24,000 - 427,000
Zinc	91,000 - 1,900,000
Antimony	120,000

The presence of some of the semi-volatile compounds, pesticides, and metals in the groundwater beneath the landfill is believed to be the result of the leaching of these contaminants from landfill wastes. In addition, there is evidence based upon the erosional patterns shown in the steep side slope of the landfill adjacent to the Branch River, and the similarity of compounds detected in the sediment of the river, that erosion is playing a part in the migration of contaminants from the landfill into the Branch River.

The concentrations and locations at which TCE was detected in samples obtained from landfill wastes do not indicate that the TCE migrated from a source within the landfill. Test pit activities carried out during the RI did not detect the reported disposal of TCE still bottoms in the landfill. Rather, it appears that the TCE found in landfill wastes is the result of TCE contaminated groundwater migrating from the spill area through the raceway and sewer line into the landfill area and then volatilizing into the landfill wastes.

3. Overall Site

The overall Site refers to the remaining areas of the five acre Site. These areas are primarily covered with piles of rubble, partially collapsed buildings, or overgrown with weeds and small trees. No laboratory analyses were performed on the on-site debris and building remains. A sample of sludge from the on-site septic systems drain pipe was screened in the field during the RI and the results indicated the presence of TCE. The septic tank itself is believed to be buried under one of the piles of debris and therefore its contents could not be tested during the RI to determine if TCE-contaminated sludge were present. Based upon the results of the RI, contaminants detected in soil samples from the overall Site area were not acting as a significant migration source to either the groundwater or surface water.

The types of compounds detected in soil samples from the overall Site are similar to those already described in the TCE spill area and landfill area. Primarily low levels of the compound TCE, PAHs, and metals were found throughout this area. The low levels of these contaminants found in the soils of the overall Site are believed to be associated with residues produced during normal operations at the Mill. There were no pesticides or PCBs found above their CRQLs in this area.

TCE was detected in 12 of 45 soil samples in the overall Site area and ranged from 2 ppb (estimated value below the CRQL) to a high of 63 ppb. The sample with the highest TCE concentration (63 ppb) was collected from within the ruins of the former mill building. In addition to TCE, the following VOCs were detected above their detection limits (in only two or fewer soil samples out of 45): chloroform (1 - 27 ppb), 1,1,1-trichloroethane (19 ppb), methylene chloride (11 ppb), and benzene (5 ppb).

Seventeen semi-volatile, base neutral compounds were detected in soil samples from this area. The principal ones detected include:

Compound	Concentration Range (ppb)
Benzo(b)fluoranthene	68 - 7,500
Fluoranthene	90 - 5,700
Phenanthrene	40 - 3,300
Chrysene	99 - 3,200
Benzo(k)fluoranthene	730 - 7,500
Pyrene	33 - 6,000
Benzo(a)pyrene	120 - 2,900
Benzo(a)anthracene	71 - 4,500
Bis(2-ethylhexyl)phthalate	130 - 1,300

All of the base neutral compounds shown above with the exception of the last are PAHs. Although low levels of PAHs were found throughout the overall Site, the highest concentrations outside of the landfill area were confined to one small area referred to as the "hot spot" which is located just west of the partially standing mill building (Appendix A, Figure 5). The PAHs detected in the "hot spot" may be the result of some former mill operation, the 1977 fire that took place (the burning of wood produces PAHs), or the location of a nearby asphalt pad. Although this area of elvevated PAHs is referred to as a "hot spot" in the RI and FS, the levels of PAHs found in this area do not pose a risk to public health and the environment.

The following trace metals were among those detected in samples obtained from the overall Site which exceeded published ranges typically found in soils:

Compound	Concentration Range (ppb)
Cadmium	1,000 - 3,000
Lead	4,000 - 2,340,000
Mercury	100 - 2,000
Selenium	3,000 - 4,000

The highest concentration of lead in a soil sample from the overall Site (2,340,000 ppb) appears to be an anomaly, since the second highest concentration is 65,000 ppb. The ranges of metals detected in these samples from the overall Site also served as "background levels" for the comparison of samples from the landfill area and TCE spill area.

B. Groundwater

The majority of groundwater at the Site is stored in and transmitted through the bedrock aquifer located approximately 10 to 20 feet beneath the surface. To a lesser extent, the lower few feet of the soil layer above this is seasonally saturated. Under current conditions, with the residential wells and the community well directly north of the Site not pumping, the natural regional groundwater flow is generally toward the Branch River. The natural regional flow has been shown to be affected by previous groundwater pumping activity directly north of the Site. During the pump test conducted as part of the RI, pumping of a the Forestdale Water Association Well, a community well located north of the Site, produced a reversal of the regional hydraulic gradient. Reversal of the groundwater flow is believed to be the mechanism by which contaminants migrated from the Site to residential wells north of the Site.

In 1988, the groundwater contaminant plume extended approximately 500 feet northwest of the TCE spill area and then southeast towards the Branch River. The contaminant plume appears to be slowly reversing the previous trend of northward migration based upon 1986 and 1988 groundwater sampling results (Appendix A, Figure 7). TCE and its breakdown products were found to be the major compounds present in the contaminated groundwater. The highest concentrations were found in the groundwater beneath the spill area. The concentration of TCE in the groundwater in this area had ranged as high as 850,000 ppb but during the most recent sampling round (March, 1988) the highest concentration detected was 290,000 ppb (Appendix A, Figure 8). The following volatile organic compounds were the principal ones detected in the March, 1988 groundwater sampling round:

Compound	Concentration Range (ppb)
Trichloroethylene	less than 5 - 290,000
1,2-Dichloroethylene	32 - 31,000
Toluene	9 - 16
1,1-Dichloroethylene	12 - 36
Chloroethane	2,200
Vinyl Chloride	129

TCE contamination is found to a depth of at least 175 feet in the spill area as evidenced by the concentrations of 190,000 ppb detected in MW-10 in March 1988. Based on the high concentrations of TCE detected in the groundwater, there is a strong likelihood that a separate Dense Non-Aqueous Phase Liquid (DNAPL) exits within the contaminant plume. If DNAPL does exist, the higher specific gravity of TCE (when compared to water) may increase its downward migration through vertical joints present in the fractured bedrock thereby extending the contaminant plume. The presence of DNAPL in fractured bedrock conditions such as those found beneath the Site will increase the difficulty of extracting the contaminant plume and may extend the time frame needed to meet groundwater cleanup levels.

To a lesser extent, some semi-volatile organic compounds, trace metals, and pesticides have been found in the groundwater beneath the Site. These compounds have been primarily detected in the vicinity of the landfill. The principal semi-volatile base neutral compounds detected in March 1988, include:

Compound	Concentration Range (ppb)
Bis(2-ethylhexyl)phthalate	less than 180 - 230
1,2,4-Trichlorobenzene	less than 10 - 300
1,2-Dichlorobenzene	less than 10 - 14
1,4-Dichlorobenzene	less than 10 - 110
1,3-Dichlorobenzene	18 - 130

Two semi-volatile acid extractable compounds, benzoic acid and 2-methylphenol were found at concentrations below the CRQL in the August 1986, sampling round. These compounds were not detected in any subsequent groundwater sampling rounds.

The pesticides detected in the March 1988, sampling included dieldrin (4 ppb), 4,4'-DDE (0.48 ppb), and 4,4'-DDD (0.54 ppb). One other pesticide, endosulfan I, was detected below the CRQL. The metals that exceeded drinking water standards in groundwater samples in March 1988, and the range of detected values above the standard are: chromium (128 ppb - 190 ppb), iron (567 ppb - 14,100 ppb), manganese (76 ppb - 18,200 ppb) and zinc (710 ppb). There were no PCBs found above the CRQL in this area.

The semi-volatile compounds, pesticides, and metals detected in the groundwater in the vicinity of the landfill were found primarily in two shallow wells. These two wells, MW-4A and MW-6A, were screened over intervals located in saturated sections of landfill wastes (3 to 8 feet, and 11.5 to 21.5 feet, respectively) and which are located above the bedrock aquifer. As part of the RI activities, two additional deeper wells were placed into the bedrock aquifer, adjacent to the shallow wells. These wells, MW-4 and MW-6, were screened over intervals below all landfill wastes and unconsolidated materials.

The results of the sampling and analysis during the RI shows that the contaminants detected in the groundwater beneath the landfill were found primarily in the shallow wells. Based on the depths over which both shallow wells were screened and the physical description and characteristics of the wastes encountered over these screened intervals (See RI, Appendix A), EPA believes the water sampled in the shallow wells is representative of landfill leachate rather than groundwater found in the bedrock aquifer.

C. Surface Water

The Branch River located just south of the Site flows from west to east in this vicinity. A dam constructed adjacent to the Site forms the eastern-most boundary of the Forestdale Pond. The pond was historically used as a source of hydromechanical power for mill operations. Two "raceways" or rock tunnels were constructed to lead water away from the pond to the mill buildings (Appendix A, Figure 5).

The "old" raceway originates at the Forestdale Pond, directly west of the dam and loops in an easterly direction through the Site exiting to the river just east of the landfill. The inlet is still visible; however, the outlet has collapsed and sections of the raceway in the landfill are also believed to be collapsed. Based on test pit excavations during the RI and evidence of water seepage in the area where the outlet is believed to be located, water continues to travel through the tunnel.

The "new" raceway also originates just west of the dam and exits into the river just southwest of the landfill. The raceway inlet and outlet are still intact and there is visible evidence of water flowing through it.

Surface water and sediment samples were obtained from ten locations along the Branch River during two sampling rounds in the summer of 1986 and one during June 1988. Sampling locations included those adjacent to the Site immediately upstream and downstream, as well as a background location approximately one-quarter of a mile upstream, and a sampling location approximately one-half mile downstream to identify any contaminant transport. In addition, surface water samples were taken at the entrance and exits of both raceways to determine their impacts on the River.

The results of the surface water sampling indicate that upstream of the dam there were no detectable levels of TCE or other site-related contaminants such as the pesticide dieldrin. Downstream of the dam, TCE and its breakdown product 1,2-dichloroethylene were found approaching the CRQL (i.e., concentrations at or below 5 ppb). Higher concentrations of TCE and its breakdown products were found in surface water samples obtained from within or near the raceway exits as described below.

Concentrations of TCE and 1,2-dichloroethylene ranged as high as 59 ppb and 48 ppb, respectively, outside the exit of the new raceway. In addition, vinyl chloride was detected at this location at approximately 5 ppb. No semi-volatile compounds (base neutrals and acid extractables) were detected in any of the surface water samples collected in July and August 1986 and only one compound, diethylphthalate, was found below its CRQL in 1988. The only pesticide detected in the surface water sampling was 4,4'-DDT which was detected at a concentration of 0.13 ppb outside the new raceway exit in June 1988. The surface water sampling results for metals indicated that a limited number of metals were found both upstream and downstream of the dam and the concentrations found did not indicate any discernable site-related trends. There were no PCBs found above their CRQLs in samples from this area.

Although the exact mechanism by which the contaminants from the Site are entering the raceways is unknown (i.e., whether from groundwater migration or transport of soil particles through water erosion), both raceways were shown to be preferential pathways for the migration of contaminants from the Site into the Branch River. The evidence for this preferential pathway is the elevated levels of site-specific compounds found during the RI at the exit of the new raceway and where the exit to the old raceway is thought to be located.

D. Air

Ambient air monitoring completed during the RI to quantify air emissions at the Site under existing conditions did not detect any volatile compounds. Three of the principal volatile compounds detected in the soils at the Site, TCE, trans-1,2-dichloroethylene, and tetrachloroethylene, were used as target compounds for this air sampling effort. Other contaminants detected at the Site, which include PAHs, pesticides, and metals were not analyzed for at the time. These compounds were not tested for because their airborne release is primarily associated with particulate or fugitive dust emissions from bare soil areas. Since the Site is heavily vegetated, dust emissions and airborne releases would be limited and therefore these compounds would not be expected to pose a risk to public health and the environment. Any future activities at the Site which would potentially generate dust or particulate matter, would require ambient air monitoring to protect public health and the environment.

E. Sediment

As described in Section C above, sediment and surface water samples were obtained from ten sampling locations along the Branch River and three locations at or inside the raceway entrances or exits. Because the dam is located adjacent to the Site, sediment samples were easily obtained upstream of the Site. Downstream of the Site there was very little sediment to collect due to the velocity and scouring action of the water flowing over the dam. The one exception to this was a quiescent area located adjacent to the new raceway exit and extending downstream to approximately the eastern boundary of the landfill. Because the quiescent area is protected somewhat from the main flow of the river, sediment and soil have accumulated there.

The trends shown for the sediment sampling results are similar to those described for the surface water sampling. Upstream of the dam, levels of TCE or other site-related contaminants such as the pesticide dieldrin were not detected above the CRQL. Downstream of the dam, elevated levels of TCE and its breakdown product 1,2-dichloroethylene were found, with the highest concentrations between the new raceway exit and the eastern boundary of the landfill (e.g., the quiescent area). The concentrations of TCE and 1,2-dichloroethylene ranged between 6 to 240 ppb and 110 to 140 ppb, respectively, during the June 1988 sediment sampling round in the quiescent area.

A number of semi-volatile base neutral compounds were detected in the sediments obtained both upstream and downstream of the dam. Of those compounds detected in June 1988, six were detected only downstream of the dam and most of these were detected in the vicinity of the collapsed old raceway exit. These compounds and the range of concentrations found downstream of the Site are:

Compound	Concentration Range (ppb)
1,2,4-Trichlorobenzene	130
Naphthalene	100
Acenaphthylene	170 - 180
Dibenzofuran	200
Fluorene	140 - 250
Dibenz(a,h)anthracene	110 - 130

All other base neutral compounds detected downstream of the dam were also detected in sediment collected upstream. However, many of these compounds found downstream were detected in samples at concentrations an order of magnitude greater which indicates that the Site is potentially contributing to the presence of base neutral compounds in the sediment of the Branch River.

The pesticides dieldrin and 4,4'-DDT were identified in several sediment samples. Five sediment samples contained 4,4'-DDT at concentrations ranging from 35 ppb to 200 ppb. The highest concentration of 4,4'-DDT was detected in the sediment sample furthest upstream of the dam and the Site. Dieldrin was detected only downstream of the dam and ranged as high as 1,700 ppb in a sediment sample taken 40 feet downstream of the landfill. In June 1986, PCB aroclor-1254 was detected at 980 ppb at the same sampling location as the 1,700 ppb dieldrin.

Therefore, based on these findings, the presence of pesticides in Branch River sediments cannot be linked specifically to the Site with the exception of dieldrin. The trend seen for metals in the sediments was similar to that of the surface water. Elevated levels of metals were seen both upstream and downstream and no discernable impacts on the sediment could be linked specifically to the Site. The presence of PCB aroclor-1254 in the one sample downstream of the landfill is not believed to be Site-related because the presence of PCBs were not confirmed in any other soil samples taken at the Site. A more detailed discussion of the impacts of the contaminants from the Site on the Branch River can be found in the Ecological Assessment which is included in Appendix E of the FS.

VI. SUMMARY OF SITE RISKS

A risk assessment (RA) for the Stamina Mills Site was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site. The public health risk assessment followed a four step process: 1) contaminant identification, which identified those hazardous substances which, given the specifics of the Site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of the exposure; 3) toxicity assessment, which considered the types and magnitude of adverse human and environmental effects associated with exposure to hazardous substances, and 4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic, noncarcinogenic, and environmental risks. The results of the public health risk assessment for the Stamina Mills Site are discussed below.

Twenty-three contaminants of concern, listed in Tables 1 through 8 found in Appendix B of this Record of Decision, were selected for evaluation in the RA. These contaminants constitute a representative subset of the more than 90 contaminants identified at the Site during the RI. The twenty-three contaminants of concern were selected to represent potential Site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. Toxicity profiles describing the health effects of each of the contaminants of concern can be found in Appendix J, Volume 2 of the RI.

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively 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 current exposure pathways for the Site, which is presently abandoned and fenced, are through contact with contaminated soil and indirectly through the consumption of fish from the Branch River. There is no current risk posed by ingesting groundwater from the Site since it is not being used as a drinking water supply. Potential future exposure pathways include contact with contaminated soil, ingestion of groundwater and consumption of fish from the Branch River and are based upon the assumption that the Site would not be cleaned up and would be developed for residential use. Although the Site is currently zoned for manufacturing, a conservative assumption was made based upon the current residential nature of the area surrounding the Site, that it might be developed for residential use sometime in the future.

The following is a brief summary of the exposure pathways evaluated. A more thorough discussion can be found in Section 7.3 through 7.4 of the risk assessment which is located in the RI. For incidental ingestion and direct contact with contaminated soil, the health risk was evaluated for a child between the ages of 2 and 6 who may be exposed on average 60 times a year and at a maximum of 120 times a year for two hours per visit. During that time the child might ingest 50 mg of contaminated soil and absorb contaminants from soil covering the childs forearms, hands, legs and feet. For ingestion of groundwater used as a drinking water supply, the health risk was evaluated for an adult who may consume two liters per day for seventy years. For incidental ingestion and dermal absorption of surface water, the health risk was evaluated for a child between the ages of five and eighteen who may accidently ingest and swim in contaminated surface water once each year. For incidental ingestion of sediments via the consumption of fish (it was assumed that the fish tissues are contaminated to a level in equilibrium with the sediments), the health risk was evaluated for an adult consuming 6.5 grams of fish per day over seventy years. For each pathway evaluated, an average and a reasonable maximum exposure estimate was generated corresponding to exposure to the average and the maximum concentration detected in that particular medium.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the exposure level with the chemical specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is very unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. 1×10^{-6} for one in a million) and indicate (using this example), that an individual is not likely to have greater than 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. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances. The hazard index was also calculated for each pathway as EPA's measure of the potential for noncarcinogenic health effects. The hazard index is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for noncarcinogenic health effects. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime and they reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The hazard index is often expressed as a single value (e.g. 0.3) indicating the ratio of the stated exposure as compared to the reference dose value (In this example, the exposure as characterized is approximately one third of the acceptable exposure level for the given compound). The hazard index is only considered additive for compounds that have the same or similar toxic endpoints. As an example, conversely, the hazard index for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage.

Table 1 depicts the cumulative risk summary for the carcinogenic and noncarcinogenic contaminants of concern for each pathway analyzed. The hazard indices for the individual contaminants of concern and their target endpoints can be found in Appendix B of this ROD. For a more detailed analysis on the risk for each contaminant of concern, see Tables J-44A through J-66A of the RI.

Cumulative potential cancer risks associated with ingestion of groundwater from off-site active wells, incidental ingestion of soils from the spill area, incidental ingestion of shallow soils (0-5') from the landfill area, and incidental ingestion of soils from the site proper did not exceed EPA's acceptable cancer risk range of 10^{-4} to 10^{-6}. The cumulative hazard indices as a measure of the potential for non-carcinogenic effects for ingestion of groundwater from off-site active wells and incidental ingestion of soils from the spill area, did not exceed unity. All off-site wells that are no longer being used as a drinking water source, as a result of the construction of the public water supply, are considered inactive and were not included in the off-site active well category.

Based on the findings in the Baseline RA, EPA has concluded that the risk posed by the future ingestion of groundwater from the Site will exceed the acceptable risk range of 10^{-4} to 10^{-6}. The principle contributors to carcinogenic risk from the ingestion of groundwater are trichloroethylene and 1,2-dichloroethylene. The maximum concentration of trichloroethylene detected on-site, 850,000 ppb, exceeded the Maximum Contaminant Level of 5 ppb promulgated in the Safe Drinking Water Act. Total 1,2-dichloroethylene was also found at high concentrations with a maximum concentration of 31,000 ppb. The Maximum Contaminant Level established in the Safe Drinking Water Act for 1,2-dichloroethylene is 7 ppb.

The hazard index exceeds unity for the future ingestion of groundwater from the Site for both the average and maximum cases. Total 1,2-dichloroethylene is the major contributor for the noncarcinogenic effects with a hazard index of 50. In addition, under a potential future scenario in which the landfill area would be developed, and deeper soils from within the landfill would be brought to the surface, the hazard index for these exposed soils would exceed unity. The principle contributor to the hazard index for the deeper soils from within the landfill is dieldrin, having The excess lifetime carcinogenic risk posed by eating the fish from the Branch River have been predicted to exceed the acceptable risk

TABLE 1
Cumulative Carcinogenic Risk Estimates and Cumulative Hazard Indices by Exposure Pathway

Exposure Pathway	Cancer Risk		Hazard Index	
	Average	Maximum	Average	Maximum
Present				
Ingestion of Groundwater, Off-site Active Wells	$3X10^{-6}$	$3X10^{-6}$	$1X10^{-1}$	$3X10^{-1}$
Incidental Ingestion of Soil, TCE Spill Area	$2X10^{-6}$	$8X10^{-6}$	$1X10^{-1}$	$6X10^{-1}$
Incidental Ingestion of Soil (0 - 5'), Landfill Area	$2X10^{-6}$	$2X10^{-5}$	$6X10^{-1}$	$3X10^{0}$
Incidental Ingestion of Soil (0 - 5'), Soil Outside of Landfill and Spill Area	$1X10^{-6}$	$1X10^{-5}$	$7X10^{-2}$	$1X10^{0}$
Ingestion of Sediments via Fish, Downstream of Site	$8X10^{-3}$	$3X10^{-2}$	$6X10^{-1}$	$2X10^{0}$
Ingestion of Sediments via Fish, Upstream of Site	$4X10^{-3}$	$4X10^{-3}$	$2X10^{-3}$	$2X10^{-3}$
Incidental ingestion of Surface Water	$5x10^{-7}$	$6x10^{-7}$	$2x10^{-2}$	$4x10^{-2}$
Future				
Ingestion of Groundwater, Tce Spill Area	$8x10^{-2}$	$4x10^{-1}$	$5x10^{1}$	$2x10^{2}$
Ingestion of Groundwater, Landfill Area	$2x10^{-2}$	$7x10^{-2}$	$3x10^{1}$	$6x10^{1}$
Ingestion of Groundwater, Off-site Active Wells	$3x10^{-6}$	$3x10^{-6}$	$1x10^{-1}$	$3x10^{-1}$
Incidental Ingestion of Soil (5 - 20'), Landfill Area a hazard index of 5.	$2x10^{-6}$	$3x10^{-6}$	$5x10^{-1}$	$6x10^{0}$

range of 10^{-4} to 10^{-6}. This is based on the assumption that contaminant levels in fish tissue are in equilibrium with contaminant levels found in sediment from the river. The principle contributors to the predicted carcinogenic risk are the PAHs and the pesticide dieldrin. The total hazard index for the most probable (average) case for the noncarcinogenic risk posed by eating fish tissue is less than one. However for the maximum case the hazard index is 2. Dieldrin is the compound of particular concern, having a hazard index of 2.

An ecological assessment was also completed for the Site. The ecological assessment found in Appendix E of the FS is a qualitative appraisal of the potential effects and risks of hazardous substances found at the Site on the environment (specifically target species of the fish population found in the Branch River). Using the quantitative information generated from the RI, the assessment compares the concentrations of contaminants reported at the Site, to those reported in available literature, and subsequently, attempts to define more clearly the potential ecological impacts from the Site. The main conclusion of the ecological assessment is that there is some potential for adverse impacts on the fish population in the Branch river due to contaminants being released from the Stamina Mills Site. Specifically, the elevated concentrations of dieldrin detected in the sediments of the Branch River, which are being released from the Site, pose a threat to the environment. The higher concentrations of some contaminants found in the furthest upstream sample, which is located well above where contaminants could be attributed to the Site, indicates that sources besides the Site may be effecting the environment.

Consequently, the Stamina Mills Site remediation shall strive to achieve cleanup levels for soil and groundwater that are protective of public health and the environment. Actual or threatened releases of hazardous substances in groundwater from the 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.

VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

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

Based on preliminary information relating to types of contaminants, environmental media of concern, prior and present use of groundwater as a drinking water source, and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These remedial action objectives were developed to mitigate existing and future potential threats to public health and the environment. These response objectives were:

1. Restore the groundwater to Federal and State drinking water standards (or criteria when drinking water standards are not available) as quickly as possible because the aquifer is a drinking water source.

2. Prevent the public from direct contact with contaminated soils, sediments, and solid wastes which may present health risks.

3. Eliminate or minimize the migration of contaminants from the soil into the groundwater.

4. Prevent the off-site migration of contaminants to the surface water above levels protective of public health and the environment.

5. Reduce risks to human health associated with the physical hazards while implementing remedial actions at the Site.

B. Technology and Alternative Development and Screening

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

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

With respect to groundwater response action, the RI/FS developed a limited number of remedial alternatives that attain site specific remediation levels using different technologies; and a no action alternative.

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

In summary, of the nine source control and ten management of migration remedial alternatives screened in Section 4, thirteen were retained for detailed analysis. It should be noted that among the ten remedial alternatives being classified under the category of management of migration, five specifically address existing physical conditions at the Site. Because these five also address the remediation of the on-site raceways which have been shown to be a pathway for the preferential migration of contaminants, they are also being classified as management of migration alternatives. Table 4-2 in Section 4 of the FS identifies the thirteen alternatives that were retained through the screening process, as well as those that were eliminated from further consideration.

VIII. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each alternative evaluated.

A. Source Control (SC) Alternatives Analyzed

As described in Section V of this document and Section 4 of the FS, the Site consists of a number of areas with different physical characteristics and chemical contaminants (Appendix A, Figure 9). As a result, separate source control measures have been developed for both the TCE spill area (identified as TSA alternatives) and landfill area (identified as LA alternatives). The source control alternatives analyzed for each of these areas include the following:

TCE Spill Area (TSA)

TSA-1: Excavation and On-site Incineration;

TSA-3: Soil Vacuum Extraction;

TSA-4: No-action Alternative;

Landfill Area (LA)

LA-1: Excavation and On-site Incineration;

LA-3: Capping Including Consolidation;

LA-5: No-action Alternative.

1. TCE Spill Area

TSA-1
Excavation and On-site Incineration

This alternative would involve the excavation and incineration of approximately 6,000 cubic yards of TCE contaminated soils. TCE contaminated soils would be excavated to the groundwater table and then processed and separated as necessary to prepare them for incineration in a mobile rotary kiln. The soils in the TCE spill area have been identified as one of the principal threats found at the Site and therefore the use of treatment to remediate this area is preferred by EPA.

The efficiency of rotary kiln incinerators for destroying organic hazardous materials is well proven and a destruction and/or removal efficiency (DRE) of 99.99% or greater is anticipated for TCE and other VOCs in soils from the TCE spill area. During the excavation of contaminated soils a foaming agent or other synthetic material would be employed to suppress dust and vapor emissions. Stockpiled soil would be stored in a lined containment area and will remain covered with polyethylene sheeting.

Materials excavated from the spill area which are not suitable for incineration would be disposed of in accordance with Rhode Island Solid Waste and Hazardous Waste Regulations. Because the TCE contaminated soil is considered a listed hazardous waste under the Resource Conservation and Recovery Act of 1976, as amended, 42 U.S.C. 6901 et seq. (RCRA), and the excavation, treatment, or disposal of contaminated soils is considered placement, RCRA, Land Disposal Restrictions (LDRs), and Rhode Island Hazardous Waste Regulations are all important applicable or relevant and appropriate requirements (ARARs) for this alternative. A brief discussion of ARARs can be found on page 69 of this document. Both state and federal air emission standards are ARARs for any type of incineration.

Before implementing this alternative, site preparation activities including grading, staging pad construction, security fence construction, and utility hookup will have to be completed. Prior to the full-time operation of the incinerator, a series of test burns would be required to determine the optimum operating parameters of the rotary kiln. The principal residue expected to be produced during the operation of the incinerator is bottom ash; smaller quantities of scrubber liquor and fly ash are expected to be produced. The bottom ash, which is composed primarily of the inert inorganic elements of the soil, would require testing to determine whether it exhibits a RCRA hazardous waste characteristic. In the event that the bottom ash is a hazardous waste, it would be treated consistent with the appropriate federal and state hazardous waste regulations and LDR requirements and disposed of at an off-site RCRA facility. The scrubber liquor and fly ash are residues from the pollution control equipment used for treating air emissions. The fly ash and scrubber liquor will also require testing and, based upon the results, would be disposed of appropriately. The options being considered for the scrubber liquor include: disposal into a municipal sewer with or without treatment and on-site or off-site treatment.

ESTIMATED TIME FOR CONSTRUCTION:	3 Months
ESTIMATED TIME FOR OPERATION:	2.5 Years
ESTIMATED CAPITAL COST:	$ 9,994,150
ESTIMATED O & M (Cost/Year):	$ 100,000
ESTIMATED TOTAL COST (Present worth):	$10,690,620

TSA-3
Soil Vacuum Extraction

This alternative would use in-situ soil vacuum extraction to actively remove TCE and other volatile organic compounds from the soil. Contaminant laden air would be treated using vapor phase granular activated carbon (GAC). Shallow wells would be installed to a depth of ten feet, or far enough above the water table to avoid the extraction of excess moisture. A plastic ground cover may be required to be installed over the surface of the TCE spill area soils to minimize the infiltration of air and precipitation. This will be decided during the design phase or during the start up phase of the operational period. Vacuum extraction has been shown to remove as much as 99.99 percent of similar VOCs from soils. A removal efficiency of 97 percent for TCE would result in residual levels below the cleanup levels. Soil sampling would be done to confirm that the technology reduced contaminants to protective levels.

The technology, although proven for the type of contaminants found at the Site, does have some uncertainties which may affect the exact time frame required for cleanup. The physical properties of the chemicals being removed (e.g., Henry's Constant) and the soil being cleaned up (e.g., permeability) both play an important role in affecting the cleanup time frame. These physical properties can be estimated using calculated or laboratory derived values to obtain a rough estimation of the cleanup time frame. Because the values being used for the physical properties are not necessarily site-specific, the accuracy of the estimated cleanup time would only be known once the system is operational. Therefore, until the system is operational and field data is available a more refined cleanup time frame cannot be estimated.

The vapor phase GAC system that would be used to meet air emission standards would require the off-site transport of spent activated carbon for treatment and regeneration. It is also possible that a liquid residue associated with condensate from the vapor stream may be produced; this would be either combined with extracted groundwater for treatment on-site or be shipped off-site for treatment. Because the soils from the TCE spill area are considered a listed RCRA hazardous waste, any residues derived from the treatment of the soil would also be considered a hazardous waste. Therefore, state and federal Hazardous Waste Regulations, and state and federal air emission standards are the major ARARs for this alternative. Soil vacuum extraction is considered an in-situ activity, and as such, there is no excavation or placement of a RCRA waste. Therefore, LDRs are not considered an ARAR.

ESTIMATED TIME FOR CONSTRUCTION:	2 Months
ESTIMATED TIME FOR OPERATION:	1 Year
ESTIMATED CAPITAL COST:	$266,465
ESTIMATED O & M (Cost/Year):	$ 1,500
ESTIMATED TOTAL COST (Present worth):	$280,605

TSA-4
<u>No-Action</u>

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

The no-action alternative for the TCE spill area would not involve any treatment of the contaminated soils. However, in order to provide minimal protection of human health and the environment, the no-action option would require the placement of a vegetative soil cover over the spill area. The soil in the spill area would be cleared and graded to provide surface runoff, and then covered with clean fill and vegetated with a low maintenance growth cover. Institutional controls would be implemented to limit future use of the area. A long-term groundwater monitoring program, which would be implemented along with the groundwater extraction and treatment alternative selected, would provide further information on the migration of contaminants from spill area soils if the no-action alternative were to be chosen. The no-action alternative does not help meet any identified ARARs. Indeed, the no-action alternative would impede the restoration of the groundwater to federal and state drinking water standards because the TCE spill area soils would continue to serve as a source of contamination of the groundwater.

ESTIMATED TIME FOR CONSTRUCTION:	2 Months
ESTIMATED TIME FOR OPERATION:	2 Months
ESTIMATED CAPITAL COST:	$40,140
ESTIMATED O & M (Cost/Year):	$ 1,500
ESTIMATED TOTAL COST (Present worth):	$54,280

2. Landfill Area

LA-1
Excavation and On-site Incineration

This alternative would involve the excavation and incineration of approximately 12,300 cubic yards of landfill soils and wastes and involves equipment and operations similar to TSA-1. Landfill soils and wastes would be excavated, separated, and processed as necessary, to prepare them for incineration in a mobile rotary kiln. Because of the variety of materials which were place in the landfill, it is expected that landfill wastes will require a greater effort to sort than the TCE spill area soils. It is also expected for this same reason, that a larger volume of materials will be generated which cannot be incinerated. The wastes that cannot be incinerated, which may include discarded mill equipment and building debris, may require some type of decontamination prior to their disposal. The disposal will be in accordance with federal and state solid waste requirements.

The efficiency of rotary kiln incinerators for destroying organic hazardous materials is well proven and a destruction and removal efficiency (DRE) of 99.99% or greater is anticipated for the organic materials in the landfill area. Material of an organic nature makes up a majority of the volume of landfill wastes expected to be excavated, but smaller quantities of inorganic compounds, primarily trace metals, were found in the landfill as described in Section V.A.2. of this document. Most trace metals would not be removed by incineration and will accumulate in the bottom ash. During the excavation of landfill wastes a foaming agent or other synthetic material would be employed to suppress dust and vapor emissions. Stockpiled landfill wastes would be stored, prior to disposal, in a lined containment area and would remain covered with polyethylene sheeting.

The major ARARs for this alternative would be similar to those described for TSA-1 and include state and federal Hazardous Waste Regulations, and federal and state air emission standards. Since the landfill is considered a wetlands under state regulations, state laws concerning the protection of wetlands will be an ARAR. In addition, sections of the landfill are in the 100-year floodplain of the Branch River and federal policies regarding floodplains would be considered.

Landfill wastes are not known to contain listed RCRA wastes, but further testing would be needed to determine if the wastes exhibit a hazardous waste characteristic. If the wastes exhibit a RCRA hazardous waste characteristic then LDRs would be applicable to this alternative. Even if the wastes do not exhibit a RCRA hazardous waste characteristic, the toxicity of the compounds already found in the landfill would make LDRs relevant and appropriate for this alternative. It is expected that incineration could achieve the treatment limits established by the LDRs.

Before implementing this alternative, site preparation activities including grading, staging pad construction, security fence construction, and utility hookup would have to be completed. Prior to the full-time operation of the incinerator a series of test burns would be required to determine the optimum operating parameters of the rotary kiln.

The principal residue expected to be produced during the operation of the incinerator is the bottom ash with smaller quantities of scrubber liquor and fly ash produced. Bottom ash, which is composed primarily of the inert inorganic elements (i.e., trace metals), would require testing to determine if it exhibits a RCRA hazardous waste characteristic. In the event that the bottom ash is a hazardous waste it would be treated consistent with LDRs and disposed of in a RCRA facility, off-site, in conformance with state and federal requirements. The scrubber liquor and fly ash are residues from the pollution control equipment used for treating air emissions. The fly ash and scrubber liquor will also require testing, and based upon the results, will be disposed of appropriately. The options that were considered for the waste scrubber liquor include: disposal into a municipal sewer with or without treatment and on-site or off-site treatment.

ESTIMATED TIME FOR CONSTRUCTION:	3 Months
ESTIMATED TIME FOR OPERATION:	3 Years
ESTIMATED CAPITAL COST:	$17,960,700
ESTIMATED O & M (Cost/Year):	$ 100,000
ESTIMATED TOTAL COST (Present worth):	$18,815,840

LA-3
<u>Capping Including Consolidation</u>

This alternative would involve the consolidation of approximately 550 cubic yards of landfill wastes beneath a new multi-layer cap to be installed on the landfill. A schematic of the multi-layer cap, designed to meet the requirements of RCRA (40 CFR Part 264, Subpart N), and the proposed limits of excavation can be found in Appendix A, Figure 10. Emissions created by the excavation would be minimized by using a foaming agent or other synthetic material to cover excavated wastes. Erosional control measures would be implemented during excavation of landfill wastes and consolidation activities to reduce the potential effects on the adjacent Branch River. Once the waste is removed from the 100-year floodplain of the Branch River, and the side slopes of the landfill have been stabilized and covered with a RCRA cap, the area of the landfill subject to the 100-year flooding would be further protected by placement of a stone layer (e.g., rip-rap) over it.

The multi-layer cap system will include a vegetative layer, a drainage layer, and an impermeable barrier (e.g., a low permeability barrier of clay and synthetic liner material). A leachate collection system is to be constructed along the southern toe of the landfill. Any leachate generated would be discharged into the existing on-site sewer line, subject to meeting all State of Rhode Island pre-treatment requirements and receiving approval from the Woonsocket wastewater treatment plant. The leachate generated from the landfill is not expected to exceed pretreatment standards and therefore require treatment prior to its discharge into the sewer system based upon data obtained during the RI.

An environmental monitoring program consisting of surface water and sediment sampling in the Branch River will be implemented to assure that the leachate collection system is meeting the response objectives of this Record of Decision. The details regarding the environmental monitoring program, including the frequency of sampling, sampling locations, and parameters to be sampled will be decided during the design phase.

A passive gas collection system may be required to control the potential releases of volatile emissions. The cap design would incorporate the existing manholes which currently provide access to the on-site sewer line traversing the landfill. The manholes will be raised to the new surface of the cap to continue to provide access to the sewer line. Institutional controls in the form of deed restrictions would be implemented to limit further land use of the landfill area. EPA has proposed, in a consent decree lodged in federal court, institutional controls with the current owner -- Hydro-Manufacturing -- to protect the remedy. An extended policy of inspections and maintenance would be needed over the life of the landfill to insure that the remediation goals continue to be met over time.

Because of the location of the landfill, as explained under LA-1 above, state wetland requirements and federal floodplain policies are ARARs for this alternative. One of the purposes of state and federal hazardous waste regulations is to minimize the risks posed by hazardous wastes by providing for their safe disposal. Although no known hazardous wastes were disposed of in the landfill, other hazardous substances as defined by CERCLA have been disposed of there. These hazardous substances disposed of in the landfill present a potential risk to public health and the environment. Since the disposal of hazardous substances in the landfill at the Site presents circumstances sufficiently similar to those being regulated under state and federal hazardous waste regulations, these regulations would be relevant and appropriate to the closure of the on-site landfill. RCRA LDRs are not an ARAR for LA-3 because all wastes to be excavated are either within the confines of the existing landfill or contiguous to the landfill; therefore, there will be no "land disposal" within the meaning of RCRA.

Wastes identified in the landfill area have been found to contribute a lower long-term threat than the principal threats identified at the Site. Therefore, in accordance with the NCP it is appropriate to consider engineering controls, such as containment, to address these threats.

ESTIMATED TIME FOR CONSTRUCTION:	6 Months
ESTIMATED TIME FOR OPERATION:	30 Years
ESTIMATED CAPITAL COST:	$ 587,750
ESTIMATED O & M (Cost/Year):	$ 62,000
ESTIMATED TOTAL COST (Present worth):	$1,172,000

LA-5
<u>No-Action</u>

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

The no-action alternative for the landfill area would not involve any treatment of the contaminated soils and materials. However, in order to provide minimal protection of human health and the environment, the no-action option would require the placement of a vegetative soil cover over the landfill area. The area would be cleared and graded to provide surface runoff, and then covered with clean fill and vegetated with a low maintenance growth cover.

Institutional controls would be implemented to limit future use of the area. A long-term groundwater monitoring program, which would be implemented along with the groundwater extraction and treatment alternative selected, would monitor the groundwater in the vicinity of the landfill area. Contaminants from the landfill have been detected in sediments found in the Branch River and this alternative would not eliminate the continued release of contaminants from the landfill into the river. Therefore, this alternative does not help meet any identified ARARs.

ESTIMATED TIME FOR CONSTRUCTION:	2 Months
ESTIMATED TIME FOR OPERATION:	2 Months
ESTIMATED CAPITAL COST:	$ 30,140
ESTIMATED O & M (Cost/Year):	$ 18,500
ESTIMATED TOTAL COST (Present worth):	$204,540

B. Management of Migration (MM) Alternatives Analyzed

Management of migration alternatives address contaminants that have migrated from the original source of contamination. At the Stamina Mills Site, contaminants have migrated from the TCE spill area into the bedrock aquifer beneath the Site as well as into the on-site raceways and from there into the Branch River. As discussed in Section V.C. of this document, contaminated groundwater is currently found approximately 500 feet northwest of the Site as a result of pumping activities of residential wells and a community well north of the Site. The plume appears to be slowly receding toward the spill area and the Branch River, now that pumping activities directly north of the Site have ceased. The management of migration alternatives evaluated for the Site have been divided into two groups. The first group addresses the extraction and treatment of contaminated groundwater in the bedrock aquifer and the second addresses the migration of contaminants through the on-site raceways. The filling and sealing of the raceways is only one component of the overall Site remedy which also deals with the buried on-site septic tank, demolition of partially standing structures, and removal of debris piles.

Contaminated groundwater has been identified as one of the principal threats found at the Site and therefore the use of treatment in remediating the groundwater is preferred by EPA. The migration of contaminants through the raceways is believed to contribute a lower long-term threat than principal threats identified at the Site, and therefore, it is appropriate to consider engineering controls, such as containment, to address this threat. The following management of migration alternatives were developed for the groundwater extraction and treatment and overall Site:

Groundwater Extraction and Treatment (GW)

GW-1: Air Stripping;

GW-2: Granular Activated Carbon;

GW-4: Ultraviolet Light and Hydrogen Peroxide;

GW-5: No-action;

Overall Site (OS)

OS-3: Building Demolition, Sealing Raceways, Location and Excavation of Septic Tank, and Site Grading;

OS-4: Building Demolition, Sealing Raceways, Location and Excavation of Septic Tank, Excavation of PAH "Hot Spot", Site Grading;

OS-5: No-action.

1. Groundwater Extraction and Treatment

As identified in Section 4 of the FS, the principal objectives for the groundwater remedial action is to return the groundwater within the contaminated plume to federal and state drinking water quality standards within a reasonable time frame. EPA's preference for contaminated groundwaters that are currently a source of a drinking water supply, such as those found in the bedrock aquifer at the Site, is to design an extraction and treatment system for rapid restoration, when technically practicable. The minimum restoration time frame for the Site will be determined by hydrogeological conditions, physical properties of contaminants found in the groundwater at a site, and the size of a plume. EPA is aware that the subsurface conditions found at the Site present inherent difficulties that may affect achieving the cleanup of the groundwater in the time frame estimated for all treatment alternatives, approximately 10 to 15 years. As a result, EPA will conduct a complete evaluation of the treatment system within five years of the start up of the treatment system, regardless of which treatment system is chosen. If the evaluation reveals that the remedy cannot achieve the stated cleanup levels, or that they cannot be reached in a reasonable time frame, then consideration will be given to making changes in the remedy.

The groundwater beneath the Site has been classified under the draft, State of Rhode Island Groundwater Protection Regulations as GAA, non-attainment (i.e., groundwater which must be restored to drinking water quality) with the exception of the landfill area which has been classified as GB (i.e., groundwater which has been degraded but will not require cleanup). Since this groundwater classification system has not yet been adopted, the federal groundwater classification system which is based upon EPA's Groundwater Protection Strategy will apply to the Site. Under this classification system, groundwater within a two mile radius of the Site boundary, has been identified as Class II, Subclass IIA. This classification indicates that the groundwater within the two mile radius of the Site is being used as a current source of drinking water.

During the FS assumptions were made regarding design details of the extraction system based on the information that was available at the time. Many of these details, including the specific number of extraction wells, depth, pumping rates, and locations, will only be defined upon completion of a predesign pump test. To allow for a comparison in the FS of the differences between treatment technologies, the following assumptions for the extraction system were held constant for each groundwater treatment alternative. All groundwater treatment alternatives were based upon: 1) the placement of two extraction wells, 2) a maximum combined pumping rate of 40 gallons per minute (gpm), 3) the extension of each well to approximately 200 feet below the ground surface, and 4) the casing of each well over the upper 50 feet of bore hole.

The pumping rate of 40 gpm was based upon a pulsed-pumping scenario. In a pulsed-pumping scenario, a maximum flow rate of 40 gpm might be seen for short durations. Therefore, this pumping rate was used to provide a conservative estimate of what the maximum capital costs and operation and maintenance (O&M) costs would be for each alternative. Although a flow rate of 40 gpm was used for costing purposes, a lower flow rate of 10 gpm was used for calculating cleanup times. This lower flow rate, which was based upon actual pumping yields from nearby wells and an off-site pump test, was believed to be more representative of a reasonable yield from the bedrock aquifer on a long term basis. As described above the results of the predesign pump test will help validate these assumptions.

A pretreatment step would probably be necessary to remove inorganic compounds and solids in the extracted groundwater prior to treatment. A pressure filtration unit is assumed for all groundwater extraction and treatment alternatives and has been included in the costing of each alternative. This pretreatment unit would be primarily designed to remove suspended metal ions, primarily iron and manganese. Bench-scale laboratory testing, as part of the predesign work, will determine if any additional pretreatment is necessary. The bench-scale testing would focus on the necessity of removing soluble metal ions in order to meet discharge requirements.

Three methods of disposal for treated groundwater were discussed and compared in the FS. These included: on-site surface water discharge, disposal via an on-site sewer hookup to an off-site publicly owned treatment works (POTW), and on-site subsurface discharge. The on-site subsurface discharge was selected during the FS but EPA believes at this time that the on-site surface water discharge may be the most appropriate and feasible disposal alternative. The final decision on what discharge alternative will be used for treated groundwater will be made during design based upon the results of predesign activities which will include pilot testing of the groundwater treatment technology. Should the results of the pilot testing of the groundwater treatment technology indicate that the effluent would not meet Rhode Island water quality criteria then the additional costs of treating the water to meet water quality criteria as well as the feasibility of the other two discharge options would be considered.

GW-1
<u>Air Stripping</u>

This alternative would treat the extracted groundwater using a system consisting of air stripping, vapor phase granular activated carbon (GAC), and liquid phase GAC polishing. Extracted groundwater is pumped to the top of an air stripping tower filled with an inert packing material while clean air is forced up through the tower. The packing material provides a large surface area over which groundwater and air can come in contact, and where contaminants can be transferred from the groundwater to the air.

The air stripper to be designed for the Site would consist of approximately 40 feet of packing material and is expected to achieve about 99 percent removal for the VOCs found at the Site. Assuming this removal rate, the remaining TCE concentration in the treated groundwater would still exceed drinking water quality standards and therefore require the use of a polishing step consisting of liquid phase GAC. The air emissions would also be treated using a vapor phase GAC system to meet state and federal air emission standards. Carbon residues generated from the liquid polishing step and treatment of air emissions would require off-site disposal and treatment. These residues will contain elevated levels of TCE and therefore be subject to the requirements of State and Federal Hazardous Waste Regulations pertaining to the generation, transportation, and disposal of hazardous wastes. In addition, Rhode Island Pollutant Discharge Elimination System (RIPDES) requirements, state pretreatment requirements, and Rhode Island Underground Injection Control Regulations (UIC) would be important ARARs for the three discharge options being considered for the disposal of treated groundwater. Prior to full operation of the air stripper, pilot testing will be required to ensure that all air emissions and effluent discharge limitations would be met.

Construction activities associated with the implementation of the air stripping alternative are minimal and are similar for all groundwater treatment alternatives. Activities include the drilling and installation of extraction wells; plumbing and piping installation to and from the air stripper; grading and preparation of the staging area; and utility hookup.

The time frame to achieve groundwater restoration is estimated to be 10 to 15 years based upon modeling. This time frame is the same for all groundwater treatment alternatives and is primarily dependent upon the subsurface conditions found in the bedrock aquifer. Quarterly monitoring of the groundwater from selected wells would also be considered part of all groundwater treatment alternatives.

ESTIMATED TIME FOR CONSTRUCTION:	2 Months
ESTIMATED TIME FOR OPERATION:	10 - 15 Years
ESTIMATED CAPITAL COST:	$1,537,140
ESTIMATED O & M (Cost/Year):	$ 139,525
ESTIMATED TOTAL COST (Present worth):	$3,190,010

GW-2
Granular Activated Carbon

This alternative is identical to alternative GW-1 with the exception that the method of treatment for the groundwater is solely a liquid phase granular activated carbon (GAC) system. Based upon the concentrations of VOCs detected in the groundwater two 20,000 pound carbon units would be required to achieve the desired cleanup levels. Carbon replacement for both units would be needed on a monthly basis initially but carbon usage is expected to decrease with time.

The effectiveness of GAC for removing TCE and most VOCs is well proven. A bench-scale treatability study was conducted using groundwater from the Site to determine the applicability of this technology to site-specific contaminants. The analytical results obtained from the treatability sample were not in line with the results of the sampling which occurred during the RI. Very high concentrations of the contaminant vinyl chloride were detected by the company performing the accelerated carbon test. EPA believes, based upon the fact that these results differ significantly from all of the groundwater sampling results obtained during the RI, and the fact that the company performing the treatability study had concerns about their own analytical results, that the treatability study results cannot be used without additional confirmation through sampling and analysis. Quarterly monitoring of the groundwater from selected wells, which is considered part of all groundwater treatment alternatives, would help indicate any changes in groundwater contaminant makeup such as those which can produce vinyl chloride.

The significance of the presence of vinyl chloride is that vinyl chloride is very difficult to treat using carbon adsorption and there is a possibility that cleanup levels could not be achieved using GAC. Prior to full operation of the GAC system, pilot testing would be required to ensure that all cleanup levels and effluent discharge limitations would be met.

Construction activities associated with the implementation of the GAC alternative are minimal and are similar for all groundwater treatment alternatives. Activities would include the drilling and installation of extraction wells, plumbing and piping installation to and from the GAC units, grading and preparation of the staging area, and utility hookup.

The time frame to achieve groundwater restoration is estimated to be the same for all groundwater treatment alternatives, approximately 10 to 15 years. The uncertainty associated with this time frame is discussed in the introduction to the groundwater extraction and treatment section (Section VIII.B.1.) above.

There are no air emissions associated with this treatment alternative. Therefore federal and state air pollution control regulations will not be ARARs. Carbon residues generated from the groundwater treatment would require off-site treatment and disposal. These residues will contain elevated levels of TCE, a RCRA hazardous waste. Therefore state and federal hazardous waste regulations pertaining to the generation, transportation, and disposal of the spent carbon, are ARARs. RIPDES, POTW pretreatment requirements, and UIC regulations are potential ARARs for the three discharge alternatives being considered.

ESTIMATED TIME FOR CONSTRUCTION:	2 Months
ESTIMATED TIME FOR OPERATION:	10 - 15 Years
ESTIMATED CAPITAL COST:	$1,789,425
ESTIMATED O & M (Cost/Year):	$ 114,225
ESTIMATED TOTAL COST (Present worth):	$3,262,792

GW-4

Ultraviolet Light and Hydrogen Peroxide

This alternative utilizes an innovative technology to destroy VOCs so that the only residuals produced are carbon dioxide, water, and very small quantities of free chlorides which go on to form simple salts. The technology uses ultraviolet (UV) light to react with hydrogen peroxide to form hydroxyl radicals which then react with and destroy organic contaminants.

The system, which was sized for the 40 gpm groundwater extraction rate, consists of a self-enclosed treatment unit approximately two feet wide by three feet long and five feet high and also includes a 300 gallon hydrogen peroxide storage tank. A bench-scale laboratory test was completed using groundwater from the Site and it was found that TCE levels could be destroyed down to a level below the drinking water quality standard within an exposure time of approximately three minutes. Although vinyl chloride was not detected in the sample submitted for the UV/hydrogen peroxide treatability test, this system has been shown to be effective in destroying this compound.

Prior to full operation of the UV/hydrogen peroxide system, pilot testing will be required to ensure that all cleanup levels and effluent discharge limitations would be met. Quarterly monitoring of the groundwater from selected wells would also be considered part of this alternative.

Construction activities associated with the implementation of the UV/hydrogen peroxide alternative are minimal and are similar for all groundwater treatment alternatives. Activities include the drilling and installation of extraction wells, plumbing and piping installation to and from the UV/hydrogen peroxide system, grading and preparation of the staging area, and utility hookup.

The time frame to achieve groundwater restoration is estimated to be the same for all groundwater treatment alternatives, approximately 10 to 15 years. The uncertainty associated with this time frame is discussed in the introduction to the groundwater extraction and treatment section (Section VIII.B.1.) above.

There are no air emissions or residues produced as a result of this treatment alternative. Therefore the only major ARARs would be those regarding RIPDES, POTW pretreatment requirements, and UIC regulations for the discharge alternatives being considered.

ESTIMATED TIME FOR CONSTRUCTION:	2 Months
ESTIMATED TIME FOR OPERATION:	10 - 15 Years
ESTIMATED CAPITAL COST:	$ 705,890
ESTIMATED O & M (Cost/Year):	$ 73,500
ESTIMATED TOTAL COST (Present worth):	$1,889,760

GW-5
<u>No-action</u>

This alternative is included in the FS, as required by CERCLA, to serve as a basis for comparison with the other management of migration alternatives being considered for the groundwater.

The no-action alternative for the on-site groundwater is also the no-action alternative for the entire Site. Under this alternative, there would not be any treatment of the contaminated groundwater. However, in order to provide minimal protection of human health and the environment, the no-action option would include quarterly sampling of selected existing monitoring wells to monitor the condition of the groundwater contaminant plume. An estimated 70 to 175 years would be needed to achieve the cleanup levels for the groundwater if this alternative were implemented along with one of the source control alternatives which involves treatment of the TCE spill area soils. An estimated 300 years would be needed to reach groundwater cleanup levels if nothing were done to eliminate the spill soils as a continuing contaminant source. The no-action alternative does not help meet the remediation levels for the groundwater and also does not return the groundwater to its beneficial use in a reasonable time period as described in the NCP and further defined in EPA's Groundwater Protection Strategy.

ESTIMATED TIME FOR CONSTRUCTION:	0 Months
ESTIMATED TIME FOR OPERATION:	70 - 175 Years
ESTIMATED CAPITAL COST:	$ 6,850
ESTIMATED O & M (Cost/Year):	$ 46,200
ESTIMATED TOTAL COST (Present worth):	$442,372

2. Overall Site

OS-3

Building Demolition, Sealing Raceways, Location and Excavation of Septic Tank, and Site Grading

This alternative would include the demolition of the on-site structures, location of the septic tank, removal of its contents, and sealing and filling of the two raceways. At the conclusion of these remedial activities and in conjunction with the source control actions and other management of migration action taking place, the entire five acre site would be graded and covered with a vegetative soil covering, and the perimeter fencing would be enhanced.

The first activity which would have to take place under this alternative would be the demolition and removal of the remaining structures. The implementation of any of the overall Site alternatives cannot safely take place until this step is completed. The wood and metal material encountered during demolition would be removed to an off-site disposal area. Construction materials of an earthen nature (i.e.,bricks and concrete) would be disposed of on-site while all other debris would be disposed of off-site, in accordance with Rhode Island Solid Waste Regulations. Material to be removed from the septic tank would be tested prior to its disposal. Based on the state's hazardous waste regulations, septage is a hazardous waste and must be disposed of in accordance with the hazardous waste regulations. In the event that testing indicates that the sludge from the septic tank is a hazardous waste, the disposal would have to adhere to LDRs. The inlets and outlets of both raceways would be sealed with a concrete barrier and then suitable backfill material would be placed in sections of the raceway that are not collapsed. Some of the raceway construction activities will occur within the floodplain of the Branch River as well as within an area defined as a wetlands by the State of Rhode Island. Therefore federal and state regulations regarding floodplains and wetlands will be important ARARs.

ESTIMATED TIME FOR CONSTRUCTION:	3 Months
ESTIMATED TIME FOR OPERATION:	3 Months
ESTIMATED CAPITAL COST:	$715,825
ESTIMATED O & M (Cost/Year):	$ 27,400
ESTIMATED TOTAL COST (Present worth):	$974,120

OS-4

Building Demolition, Sealing Raceways, Location and Excavation of Septic Tank, Excavation of PAH "Hot Spot", Site Grading

This alternative is identical to OS-3 with the addition of the excavation of contaminated raceway sediments and "hot spot" soils. It is estimated that 22 cubic yards of sediment would be excavated from both raceways prior to their being backfilled. The sediments would be tested and if they did exhibit a hazardous characteristic as defined by Rhode Island Hazardous Waste Regulations, they would be treated and disposed of off-site. Sampling and analysis of the "hot spot" area would be necessary to delineate the extent of soil contamination that would require excavation and treatment. The "hot spot" as described in Section V.B.3., of this document, is a localized area of PAH contamination. Although elevated levels of PAHs, as compared to background levels were found in the "hot spot", these levels were not found to pose a health risk to public health and the environment.

For cost estimation purposes, the volume of contaminated soils in this area was assumed to be 15 cubic yards. The exact amount will not be known until further sampling and analysis of the area is completed. The ultimate disposal of "hot spot" soils would be dependent upon analytical results, but would be in accordance with the appropriate State Solid Waste Regulations or Hazardous Waste regulations.

ESTIMATED TIME FOR CONSTRUCTION:	4 Months
ESTIMATED TIME FOR OPERATION:	4 Months
ESTIMATED CAPITAL COST:	$ 914,475
ESTIMATED O & M (Cost/Year):	$ 31,400
ESTIMATED TOTAL COST (Present worth):	$1,210,480

OS-5

No-action

This alternative is included in the FS, as required by CERCLA, to serve as a basis for comparison with the other management of migration alternatives being considered for the overall Site.

The no-action alternative would implement institutional controls on future land use to ensure that future development of the Site be limited to prevent future health and environmental risks. In addition, the fencing around the Site would be improved to provide a more effective barrier preventing entry of third parties onto the Site. This alternative would not prevent the migration of contaminants from the Site through the raceways into the Branch River and therefore the current risk to the public health and environment would continue.

ESTIMATED TIME FOR CONSTRUCTION:	2 Months
ESTIMATED TIME FOR OPERATION:	2 Months
ESTIMATED CAPITAL COST:	$ 42,510
ESTIMATED O & M (Cost/Year):	$ 8,000
ESTIMATED TOTAL COST (Present worth):	$116,930

IX. 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 National Contingency Plan articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

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

Threshold Criteria

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

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

2. **Compliance with applicable or relevant and appropriate requirements (ARARS)** addresses whether or not a remedy will meet all of the ARARs of other Federal and State environmental laws and/or provide grounds for invoking a waiver.

Primary Balancing Criteria

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

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

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

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

6. **Implementability** addresses the technical and administrative

feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

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

Modifying Criteria

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

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

9. **Community acceptance** addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS report.

A detailed narrative assessment of each alternative according to the nine criteria can be found in Section 5 of the FS on pages 5-4 through 5-82.

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 Table 6-1 of the FS.

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

A. TCE Spill Area

1. Overall Protection of Human Health and the Environment

Alternatives TSA-1 and TSA-3 use technologies that will be protective of human health and the environment by treating the soil so that the mobility, toxicity and volume of contaminants will be reduced. Alternative TSA-1 uses excavation and incineration. TSA-3 uses in-situ soil vacuum extraction. Alternative TSA-4 is not protective because it proposes no-action.

Both alternatives TSA-1 and TSA-3 use treatment technologies which are effective in eliminating the principal threats found in the spill area, i.e., TCE and its breakdown products. Alternative TSA-1 would achieve the destruction of additional contaminants such as PAHs, which were found in the spill area at lower concentrations. The concentrations of PAHs found in the spill area were not found to present a risk to public health and the environment.

The time frame required to reach the soil remediation levels can be estimated with greater certainty for alternative TSA-1 than for alternative TSA-3. Excavation and incineration are two unit operations for which accurate time estimates are available. This information can be applied to the conditions at the Site to come up with an accurate estimate of the time required to reach the remediation levels for spill area soils. Alternative TSA-3, soil vacuum extraction, relies on the physical properties of the soil and the compounds being removed to estimate the remediation time frame. Therefore, the estimated cleanup time for TSA-3 is subject to greater uncertainty because the physical properties of the soil at the Site are non-homogeneous as a result of previous construction activities at the Site. In addition, many of the chemical properties important to vacuum extraction (i.e., Henry's constant) are either calculated or laboratory derived values and not necessarily representative of site-specific values. Furthermore, it is likely that not all areas of TCE spill soils would achieve cleanup levels at the same time using vacuum extraction, thereby requiring an extended and intermittent operation interspersed with a series of confirmation sampling rounds. Despite these uncertainties associated with TSA-3, the overall time frame for reaching remediation levels throughout the spill area is roughly equivalent for both alternatives, TSA-1 and TSA-3, and would take approximately 1 to 2.5 years.

Of the two treatment alternatives, TSA-3 carries the lesser risk to human health and the environment during construction and operation. Also, alternative TSA-3 would generate fewer waste streams and the one principal waste stream that it does generate, spent activated carbon, can be regenerated off-site and then reused. The fact that the spent carbon can be regenerated lessens the amount of hazardous waste generated by alternative TSA-3 which requires disposal. The principal waste stream produced by alternative TSA-1, bottom ash, may require treatment consistent with LDR requirements and disposal in a RCRA landfill.

2. Compliance with ARARs

Each alternative was evaluated for compliance with ARARs, including chemical-specific, action-specific, and location-specific ARARs. A description of these ARARs is presented in Tables 9 through 11 in Appendix B of this document. These tables list all potential ARARs identified for the Site and give brief synopses of the ARARs and explanations of the actions necessary to meet the ARARs. The tables also indicate whether the ARARs are applicable or relevant and appropriate to actions at the Site. Alternatives TSA-1 and TSA-3 meet their respective ARARs. Alternative TSA-3 is expected to have less impact on spill areas that are considered wetlands under the state definition and the least potential for affecting the water quality of the adjacent Branch River because of the limited excavation and construction activities that would take place. Alternative TSA-4 does not attain the following ARARs: Safe Drinking Water Act (SDWA) Maximum

Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs), Rhode Island Regulations Pertaining to Public Drinking Water (R46-13-DWS), Draft Groundwater Classification under the R.I. Groundwater Protection Act (R.I.G.L. 46-13.1), Clean Water Act Ambient Water Quality Criteria (AWQCs), and R.I. Water Quality Regulations for Water Pollution Control (RI GL 46-12).

3. Long-Term Effectiveness and Permanence

Alternatives TSA-1 and TSA-3 would be equally effective in treating and removing the residual TCE and its breakdown products from spill area soils. Incineration destroys the source of contamination. Soil vacuum extraction withdraws the source of contamination; the contaminants are later destroyed when the spent carbon is regenerated or disposed of. The levels of TCE and related VOCs left in spill area soils upon completion of either alternative would meet cleanup levels. Alternative TSA-3 would not produce a significant removal of other contaminant types, such as PAHs, although the levels at which the PAHs were found did not pose a significant risk to the public health and the environment. Both alternatives would provide for permanent and irreversible contaminant removal for the contaminants of concern, TCE and related VOCs. Alternative TSA-4 would not provide any long term protection of human health and the environment as the source of the groundwater contamination would be left in place without any type of treatment or containment.

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

Alternatives TSA-1 and TSA-3 would both achieve a reduction in the toxicity, mobility, and volume of contaminants in the soils of the TCE spill area. Both technologies use treatment as the means whereby contaminants are significantly and irreversibly reduced. The no-action alternative, TSA-4, provides no reduction in toxicity, mobility, or volume because no treatment is included.

5. Short-Term Effectiveness

The no-action alternative, TSA-4 would take the shortest time to complete, with an expected duration of 2 months. Alternative TSA-1 would take an estimated 1 to 2.5 years and alternative TSA-3 would take an estimated 1 year to achieve cleanup levels. With respect to protection of the community, the environment, and workers on-site, alternative TSA-3 poses the least potential for adverse impacts of the treatment options. The only potential impacts might result from the generation of dust during the installation of extraction wells. Air emissions from the vacuum extraction system would be treated through the use of vapor phase activated carbon. Although alternative TSA-1 also includes air pollution equipment to control air emissions, there would still be a large potential for air emissions during the excavation, separation, and processing of soils prior to incineration. Even with the use of strict engineering controls such as foaming agents to act as dust suppressants, the potential risks to the community and workers due to air emissions would be significant. In addition, the excavation of soil from the TCE spill area as part of alternative TSA-1 presents a potential environmental risk to the adjacent Branch River if soil were to be transported to the river by wind erosion or surface water runoff. Alternative TSA-4 would not present any potential risks to public health and the environment because it would not entail any remediation activities.

6. Implementability

Although all of the alternatives can be implemented, some alternatives are technically and administratively easier to implement than others, based on their simpler design and lack of complexity.

Of the two treatment alternatives, TSA-3, in-situ soil vacuum extraction, would be easier to implement. The installation of extraction wells and operation of extraction equipment require fewer engineering controls than excavation and incineration. TSA-3 also produces fewer waste streams. Therefore, fewer substantive requirements would have to be met by TSA-3. Although both technologies are available, the equipment needed for the installation and operation of the vacuum extraction system is easily acquired from many different sources and would require very little time to construct and have operating. The installation of the mobile rotary kiln incinerator is much more involved and there are a limited number of sources available for this type of equipment. Incineration would also require a test burn which might prevent the full-time operation of the equipment for a period of up to one year after initiating the test burn. Alternative TSA-4 would be easily implemented because the equipment for grading soil is readily available and this alternative would not have any administrative requirements.

There is more certainty in the time frame required by alternative TSA-1 to achieve the remediation levels than by TSA-3. Once the soil has been incinerated, remediation levels will have been reached. Soil vacuum extraction will require a series of confirmation soil samples interspersed between operational periods to make the determination of when remediation levels will have been reached. The sampling and operation of the vacuum extraction system will have to continue until remediation levels have been achieved throughout the spill area.

7. Cost

The estimated capital, O&M, and present worth values of each alternative are as follows:

COST COMPARISON OF TCE SPILL AREA ALTERNATIVES

		Capital Costs	O&M Costs ($/yr)	Present Worth
TSA-1	Excavation and Incineration	$9,994,150	100,000	10,690,620
TSA-3	Soil Vacuum Extraction	$266,465	1,500	280,605
TSA-4	No-action	$40,140	1,500	54,280

8. State Acceptance

The Rhode Island Department of Environmental Management (RIDEM) concurs with the selection of a soil vacuum extraction system as the source control alternative for the TCE spill area.

9. Community Acceptance

The comments received during the public comment period and the discussions during the Proposed Plan and FS public meeting are summarized in the attached document entitled "The Responsiveness Summary" (Appendix C). Varied comments were received from residents living near the Site and from officials representing the community and state. The residents indicated that they preferred a treatment alternative for the TCE spill area but did not declare a preference for one over the other.

B. Landfill Area

1. Overall Protection of Human Health and the Environment

Alternatives LA-1 and LA-3 use technologies that would be protective of human health and the environment. Alternative LA-1 uses excavation and incineration. LA-3 uses consolidation, capping, and leachate collection. Alternative LA-5 is not protective because it proposes no-action to address the response objectives of this area.

Alternative LA-1 provides the greatest long-term effectiveness by destroying the contaminants present in the landfill. However, short-term risks posed by air emissions during the materials handling and operational phases are judged to override the benefits of complete destruction. Alternative LA-3 provides protection from direct contact with contaminants, controls further downward and off-site migration of contaminants in the groundwater caused by precipitation and soil leachate, and minimizes dust erosion and surface runoff. However, capping does not reduce the toxicity of materials or provide the certainty of protection that incineration does.

2. Compliance with ARARs

Each alternative was evaluated for compliance with ARARs, including chemical-specific, action-specific, and location-specific ARARs. A description of these ARARs are presented in Tables 9 through 11 in Appendix B of this document. Alternatives LA-1 and LA-3 meet their respective ARARs.

Alternative LA-3 is expected to have the least impact on areas that are considered wetlands under the state definition and the least potential for affecting the water quality of the adjacent Branch River because the amount of excavation is limited to only those areas of the landfill in the 100-year floodplain. The volume to be excavated during LA-3 is roughly equivalent to five percent of the total landfill volume. Alternative LA-1 would require the excavation and processing of all of the landfill wastes. Since both alternatives would require the excavation of landfill wastes, both will require strict engineering controls to minimize any potential air emissions. In addition, both would require engineering controls to minimize potential releases of contaminants into the Branch River which would violate floodplain and wetlands ARARs. Alternative LA-5 does not attain the following ARARs: RCRA Landfill Closure Requirements (40 CFR 264, Subpart N), Rhode Island Rules and Regulations for Solid Waste Management Facilities (R.I.G.L. 23-18.9, 23-19, 42-17.1), Clean Water Act Ambient Water Quality Criteria (AWQCs), and R.I. Water Quality Regulations for Water Pollution Control (RI GL 46-12).

3. Long-Term Effectiveness and Permanence

Alternative LA-1 is the treatment option considered for the landfill area. Incineration destroys the source of contamination but also produces a residual ash composed mainly of inorganic elements which requires disposal. The residual ash may, upon testing, exhibit a hazardous waste characteristic and therefore require treatment consistent with LDRs (e.g., solidification) and disposal in a RCRA landfill. Alternative LA-1 has a higher degree of certainty associated with the permanence of the technology versus alternative LA-3. Once the wastes have been destroyed by incineration the remediation levels will have been met.

Under the capping alternative, LA-3, the risk of direct contact and the risk of release into the environment would be minimized for as long as the physical integrity of the cap were maintained. Capping would provide for long-term effectiveness by meeting RCRA closure requirements. However, the design life of a cap is subject to some uncertainty. While proper installation and maintenance will extend the cap's life significantly, cap replacement may be necessary at some time in the future. A long term monitoring program, such as the one included as part of LA-3, would provide sufficient warning of a potential cap failure. Alternative LA-5, the no-action alternative, provides very little, if any, long-term effectiveness and permanence.

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

Alternatives LA-1 is the only alternative that provides for the reduction of toxicity, mobility, and volume of landfill wastes through treatment. In addition, the incineration process provides for the greatest reduction of toxicity, mobility, or volume of landfill wastes of all the alternatives considered for the landfill. A potential drawback for the incineration process is that it produces a residual ash which may require further treatment to assure that the toxicity and mobility of the ash are reduced to a level which are protective of human health and the environment.

Alternative LA-3 would achieve a reduction in the mobility of contaminants in the landfill but does not use treatment to achieve this reduction. Capping will limit the infiltration of precipitation and control leaching of contaminants into the groundwater as well as the surface migration of contaminants into the Branch River. The no-action alternative, LA-5, provides no reduction in toxicity, mobility, or volume since no treatment or containment is included.

5. Short-Term Effectiveness

The no-action alternative, LA-5, would be completed in the shortest time, with an expected duration of 2 months. Alternative LA-1 would take an estimated 2.5 to 3 years and alternative LA-3 would take an estimated 6 months to achieve cleanup levels. With respect to protection of the community, the environment, and workers on-site, alternative LA-3 poses the least potential for adverse impacts. A potential impact of this alternative may be air emissions and the generation of dust during the excavation of landfill wastes located in the 100-year floodplain.

Although alternative LA-1 includes air pollution equipment to control air emissions, there would still be a potential for air emissions during the excavation, separation, and processing of soils prior to incineration. Even with the use of strict engineering controls the potential risks to the community and workers due to air emissions would be significant. Alternative LA-5 would not present any potential risks to public health and the environment because it would entail only minimal risk of contaminated fugitive dusts being generated and carried off-site during site grading activities.

6. Implementability

Although all of the alternatives can be implemented, some alternatives are technically and administratively easier to implement than others, based on their simpler design and lack of complexity.

Of all the three alternatives, the no-action alternative, LA-5, would be the easiest to implement since there are only a limited number of activities to be conducted. The equipment needed for grading soil as described in the no-action alternative is readily available and this alternative would not have any administrative requirements. Of the two alternatives which would achieve the response objectives for the landfill area, LA-3 is simpler to implement. Capping has been used on other Superfund sites and is not difficult to design and construct. Capping would require the use of institutional controls to limit further land use of the area. The capping alternative would also produce fewer waste streams than incineration. Therefore, fewer substantive requirements would have to be met. Although the expertise and equipment for both capping and incineration is available, the number of sources of available mobile rotary kiln vendors are more limited. In addition, prior to full operation of the rotary kiln a test burn would be necessary to assure the efficiency of the equipment in destroying Site-specific contaminants and determine optimum operating conditions. The procedures and requirements necessary for a successful test burn could postpone the full-time operation of the equipment at the Site for up to one year.

7. **Cost**

The estimated capital, O&M, and present worth value of each alternative are as follows:

COST COMPARISON OF LANDFILL AREA ALTERNATIVES

		Capital Costs	O&M Costs ($/yr)	Present Worth
LA-1	Excavation and Incineration	$17,960,700	100,000	18,815,840
LA-3	Consolidation and Capping	$587,750	62,000	1,172,000
LA-5	No-action	$30,140	18,500	204,540

8. **State Acceptance**

The Rhode Island Department of Environmental Management (RIDEM) would have preferred excavation and off-site disposal of the material found in the landfill. However, the Department understands the uncertainty as to whether any or all of that material is actually hazardous waste and, if so, the corresponding difficulty and expense in disposing of those materials.

RIDEM concurs with the selection of a multi-layer cap and leachate collection system, with institutional controls in place, as the source control alternative for the landfill area. RIDEM cannot unilaterally impose the institutional controls necessary to protect the integrity of the landfill.

9. Community Acceptance

The comments received during the public comment period and the discussions during the Proposed Plan and FS public meeting are summarized in the attached document entitled "The Responsiveness Summary" (Appendix C). Varied comments were received from residents living near the Site and from officials representing the community and state. The residents indicated that they preferred a treatment alternative for the Landfill area which permanently remediates the material there and eliminates any future risks and expressed a preference for the excavation and removal of landfill wastes to an off-site location.

C. Groundwater Extraction and Treatment

1. Overall Protection of Human Health and the Environment

Alternatives GW-1, GW-2, and GW-4 use treatment technologies that will be protective of human health and the environment by reducing the concentration of TCE and other VOCs found in the groundwater to below the drinking water standards. The technologies used for alternatives GW-1 and GW-2, air stripping and GAC, have a long proven history for effectively treating TCE and other VOCs. Alternative GW-4 is considered an innovative technology and has a more limited history of full-scale applications. Alternative GW-5, the no-action alternative, is not protective because it would not reduce the concentration of TCE and other VOCs found in the groundwater.

Alternative GW-4, utilizing the ultraviolet (UV) light and hydrogen peroxide system, provides the greatest long-term effectiveness by destroying the contaminants present in the groundwater without producing any residuals requiring treatment. Alternatives GW-1 and GW-2 both produce spent activated carbon which is a hazardous waste and requires treatment prior to disposal.

The UV/hydrogen peroxide technology also has the ability to effectively treat additional contaminants which may be found in the groundwater including the breakdown products of TCE, such as vinyl chloride. The importance of the potential presence of vinyl chloride is that both alternatives GW-1 and GW-2 use activated carbon and activated carbon is not effective for the treatment of vinyl chloride. During the RI, vinyl chloride was detected in only a few groundwater samples and at very low concentrations. At this time it is not known whether the natural transformation of TCE into vinyl chloride, which occurs in groundwater, will cause vinyl chloride to become a contaminant of concern in the groundwater at the Site. In the event that vinyl chloride is found in the groundwater at higher concentrations in the future, alternative GW-4, treatment by UV light and hydrogen peroxide, would provide the greatest protection and effectiveness in treating vinyl chloride to cleanup levels. Alternatives GW-2 and GW-4 have been shown to be effective in treating dieldrin which was also found at very low levels in a limited number of groundwater monitoring wells at the Site. GW-1 would not be effective in removing dieldrin from the groundwater.

2. Compliance with ARARs

Each alternative was evaluated for compliance with ARARs, including chemical-specific, action-specific, and location-specific ARARs. A description of these ARARs are presented in Tables 9 through 11 in Appendix B of this document. Alternatives GW-1, GW-2, and GW-4 all meet their respective ARARs. Alternative GW-1 would have to meet the greatest number of substantive requirements because of the air emissions and the production of two waste streams which would be considered hazardous wastes. These two hazardous waste streams would consist of spent activated carbon generated during the treatment of air emissions and polishing of the groundwater prior to its discharge.

Based upon the information presented in the RI and FS, which includes a laboratory-scale treatability study for alternative GW-4, all three treatment alternatives are expected to achieve cleanup levels which would meet drinking water standards as well as discharge limitations for all of the disposal options being considered for the treated groundwater. The disposal options being considered include discharge to the Branch River, discharge to a sewer line on-site, and subsurface discharge to a leaching field. Pilot testing of the groundwater treatment alternative selected will be necessary to assure that cleanup level ARARs and groundwater disposal ARARs can be met. Alternative GW-5, the no-action alternative, does not attain the following ARARs: SDWA MCLs and MCLGs, Rhode Island Regulations Pertaining to Public Drinking Water (R46-13-DWS), and the Draft Groundwater Classification under the R.I. Groundwater Protection Act (R.I.G.L. 46-13.1).

3. Long-Term Effectiveness and Permanence

Alternative GW-1, GW-2, and GW-4 would all achieve the groundwater response objectives and essentially the same level of cleanup. Air stripping and GAC are proven technologies for the removal of VOCs such as TCE. UV/hydrogen peroxide is an innovative technology which has only in the last few years been used for this type of application. Full-scale operating systems using the UV/hydrogen peroxide technology have been shown to be very effective in destroying VOCs such as those found at the Site. In addition, a bench-scale laboratory study was completed using groundwater from the Site and this demonstrated that the UV/hydrogen peroxide system could destroy site-specific contaminants to below cleanup levels in approximately three minutes. Alternative GW-4 also has the flexibility for effectively treating TCE breakdown products such as vinyl chloride which may form over time in the groundwater as a result of natural biological processes. Alternatives GW-1 and GW-2 would not be effective in removing vinyl chloride and might not be able to achieve cleanup levels for this compound. Alternatives GW-2 and GW-4 would be effective in removing and treating dieldrin, a pesticide found at very low concentrations in a few monitoring wells at the Site.

Alternatives GW-1 and GW-2 both produce spent carbon which is a hazardous waste and will require further treatment before disposal or reuse. The only known byproducts of alternative GW-4 are carbon dioxide, water and small quantities of free chloride ions (which combine with other minerals in the groundwater to form very small quantities of simple salts). Alternative GW-5, the no-action alternative, provides very little, if any, long-term effectiveness and permanence.

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

Alternatives GW-1, GW-2, and GW-4 would all achieve comparable reductions in the toxicity, mobility, and volume of contaminants found in the groundwater. The one exception to this is that alternatives GW-1 and GW-2 are not effective in removing vinyl chloride. The concentrations of vinyl chloride found in the groundwater at the Site, may increase with time as a result of natural biological processes. Therefore alternatives GW-1 and GW-2 would not effectively provide for the reduction of toxicity, mobility, or volume of all known and potential contaminants at the Site. GW-4, however, can effectively treat and reduce the toxicity, mobility, and volume of vinyl chloride.

Alternatives GW-1 and GW-2 both treat the groundwater by transferring the contaminants from the water to activated carbon and, as a result, both alternatives produce a waste residue of spent carbon. The spent carbon would be transported off-site for treatment and disposal. During treatment the majority of spent carbon is regenerated for reuse. The carbon that cannot be reused requires disposal. Alternative GW-4 is the only alternative which directly destroys the contaminants and therefore does not produce any waste residues requiring treatment. The no-action alternative, GW-5, provides no reduction in toxicity, mobility, or volume since no treatment is included.

5. Short-Term Effectiveness

The estimated time frames for cleaning up the groundwater for alternatives GW-1, GW-2, and GW-4 are all approximately 10 to 15 years. The no-action alternative, GW-5, would require an estimated 70 to 175 years to achieve cleanup, assuming removal of the source of contamination (i.e., TCE contaminated soils), and an estimated 300 years if the source were not removed.

EPA is aware that the subsurface conditions found at the Site (e.g., fractured bedrock) present inherent difficulties that may affect achieving the cleanup of the groundwater in the time frame estimated for all treatment alternatives. In addition the presence of high concentrations of TCE which may be indicative of DNAPL, further exacerbates the difficulty in predicting the cleanup time frame. Therefore, the cleanup time frames proposed may be subject to revision upon completing a thorough review of the performance of the treatment system, five years after the start up of the system.

All three treatment alternatives would generate a small amount of dust during the construction phase and thereby present a minimal risk to the community and workers on-site. Alternative GW-1 has the potential risk of air emissions. Alternatives GW-1 and GW-2 both generate spent carbon which is a hazardous waste. Alternative GW-4 uses hydrogen peroxide as one of its treatment components; this compound is a strong oxidizer. Proper storage and handling of hydrogen peroxide will reduce the risk to on-site workers. The risks to people off-site due to an on-site release is expected to be minimal. Alternative GW-5 would not present any potential risks to public health and the environment because it would not entail any remediation activities (but as true of all the no-action alternatives, it would also not eliminate any of the potential risks that already exist).

6. Implementability

Although all of the alternatives can be implemented, some alternatives are technically and administratively easier to implement than others, based on their simpler design and lack of complexity.

The two major questions regarding implementability relate to the design of the extraction system and unknowns associated with the effectiveness of the extraction system in achieving the cleanup levels in the estimated time frame. The predesign pump test will help provide the details needed to effectively design the extraction system. The implementability and effectiveness of the extraction system will only be known once the system is operating and its progress can be monitored.

Of all the alternatives, the no-action alternative, GW-5, would be the easiest to implement since the only activity to take place would be quarterly sampling of selected existing monitoring wells. For the three treatment alternatives, off-the-shelf equipment is readily available. Unforseen technical problems associated with the use of alternatives GW-1 and GW-2 are anticipated to be minimal since these technologies are well proven. Alternative GW-4 is an innovative technology and does not have a long operational history for this type of application. Therefore, there may be a greater number of unforseen technical problems. However, the UV/hydrogen peroxide technology has been used in the last few years at sites with similar types of contaminants and it has been shown to be very effective and reliable in destroying the contaminants to cleanup levels this Record of Decision requires. To insure the implementability of the alternative chosen, a pilot test would be conducted in conjunction with the on-site pump test as part of predesign activities.

GW-4 has the fewest administrative requirements to meet of the treatment options because it does not produce any air emissions as GW-1 does or any hazardous wastes as both GW-1 and GW-2 do.

7. Cost

The estimated capital, O&M, and present worth value of each alternative are as follows (the cost of extraction is the same for each alternative and is also included in the total cost):

COST COMPARISON OF GROUNDWATER TREATMENT ALTERNATIVES

	Capital Costs	O&M Costs ($/yr)	Present Worth
GW-1 Air Stripping	$1,537,140	139,525	3,190,010
GW-2 Granular Activated Carbon	$1,789,425	114,225	3,262,792
GW-4 UV/hydrogen Peroxide	$705,890	73,500	1,889,760
GW-5 No-action	$6,850	46,200	442,372

8. State Acceptance

The Rhode Island Department of Environmental Management (RIDEM) concurs with the selection of a UV/hydrogen Peroxide treatment system as the management of migration alternative for the groundwater. It is estimated that this alternative should achieve the cleanup levels after ten to fifteen years of operation. The Department is concerned, however, with the uncertainties associated with the technical feasibility and associated costs of achieving drinking water standards in a bedrock aquifer at the Site. RIDEM has emphasized, as specified in this Record of Decision, that periodic reviews be conducted to evaluate the performance of the system and, the feasibility and cost effectiveness of continued operation of the system in achieving the clean up levels. Revisions to the remedy should be made as necessary.

9. Community Acceptance

The comments received during the public comment period and the discussions during the Proposed Plan and FS public meeting are summarized in the attached document entitled "The Responsiveness Summary" (Appendix C). Varied comments were received from residents living near the Site and from officials representing the community and state. The residents indicated that they preferred a treatment alternative for the groundwater but did not declare a preference for one over the other.

D. Overall Site

1. Overall Protection of Human Health and the Environment

Alternatives OS-3 and OS-4 use technologies that will be protective of human health and the environment. Alternative OS-4 affords the most effective long-term protection by addressing the "hot spot" and sediment from the raceways. Alternative OS-4 also poses the greatest short-term risks to human health and the environment because of the potential for generating dust and air emissions during the excavation of these same materials.

Alternatives OS-3 and OS-4 would both significantly reduce the risks posed to on-site workers by reducing the physical hazards at the Site. OS-3 and OS-4 would eliminate a known migration pathway for contaminants from the Site to the Branch River by sealing and filling the raceways. They would both eliminate a potential source of groundwater contamination by removing the contents of the on-site septic tank and treating and disposing of the contents off-site. The primary difference between these two alternatives is that OS-4 includes the excavation of "hot spot" soils and sediment from the raceways. Although OS-4 includes the removal of "hot spot" soils, the concentrations of PAHs detected there were below levels which would pose a significant risk to public health and the environment but were considered elevated as compared to other background areas of the Site. Alternative OS-5 is not protective since it would not prevent further migration of contaminants from the Site into the Branch River via the raceways. It would also not remove the physical hazards existing at the Site. Until the physical hazards existing at the Site were removed, workers could not safely perform other activities of the remedy, which include addressing the landfill, spill area, and groundwater.

2. **Compliance with ARARs**

Each alternative was evaluated for compliance with ARARs, including chemical-specific, action-specific, and location-specific ARARs. A description of these ARARs are presented in Tables 9 through 11 in Appendix B of this document.

Alternatives OS-3 and OS-4 include remedial activities in the 100-year floodplain of the Branch River and in an area designated as a wetlands by the RIDEM. Excavated "hot spot" soils and raceway sediments may be a hazardous waste as defined by state and federal regulations. Originally it was proposed in the FS to combine the materials excavated from the "hot spot" and raceways with landfill wastes since they both exhibit similar chemical characteristics. Because this would not comply with Rhode Island Rules and Regulations for Hazardous Waste Generation, Transportation, Storage, and Disposal, the excavated material will have to be disposed of off-site in accordance with federal and state ARARs. All debris which is disposed of on-site would be done so in accordance with Rhode Island Solid Waste Regulations. Both OS-3 and OS-4 will meet their respective ARARs.

Alternative OS-5, the no-action alternative, does not attain the Clean Water Act Ambient Water Quality Criteria (AWQCs), and R.I. Water Quality Regulations for Water Pollution Control (RI GL 46-12). In addition, the selection of the no-action alternative would hinder the implementation of other source control and management of migration alternatives because of the dangers associated with the partially standing structures at the Site. These structures, which includes the smokestack, could collapse on workers implementing remediation activities in the spill area and landfill area. Therefore, workers could not safely work in these areas until the physical hazards associated with the on-site structures were eliminated.

3. Long-Term Effectiveness and Permanence

Alternative OS-4 would provide the greatest long-term effectiveness by removing and treating the contaminated materials from the "hot spot" and raceways, removing the physical site risks, and sealing of the raceways. As a result of the excavation of materials taking place under this alternative, hazardous materials will be generated and will require treatment and disposal. Depending on the treatment technology used for the excavated materials, a waste residue may be produced requiring further treatment prior to disposal.

Alternative OS-3 would achieve the same degree of long-term effectiveness as OS-4 in protecting public health and the environment even though OS-3 does not remove "hot spot" soils and sediment from the raceways. The levels at which PAHs were found in "hot spot" soils did not pose a risk to public health and the environment. The risk posed by sediments entering the Branch River would be eliminated in OS-3 by the sealing and filling of the raceways and therefore the removal of the sediments in OS-4 would not provide a greater degree of protection. As one of the remedial activities proposed for both OS-3 and OS-4, the location of the septic tank will be pinpointed and its contents removed, tested, treated, and disposed of. The exact location of the septic tank is unknown although it is believed to be under one of the existing debris piles. Therefore, the chemical nature and quantity of its contents still needs to be determined. Alternative OS-5 would not be effective in removing the known risks posed by contaminants migrating into the Branch River through the raceways and the potential risks due to the contents of the septic tank impacting the groundwater. In addition the no-action alternative does not eliminate the physical hazards presented by the partially standing buildings, deteriorating smokestack and numerous holes scattered throughout the Site. These physical hazards would increase with time as the standing structures continue to deteriorate and would prevent the implementation of construction activities for other aspects of the Site remedy.

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

Alternative OS-4 would reduce the toxicity, mobility, and volume of contaminants from the "hot spot" and raceways. The extent of reduction would be dependent on the treatment method used for the excavated materials. Alternative OS-3 would achieve a reduction of mobility of contaminants through the raceways but this would be through containment rather than treatment. Both alternatives would reduce the toxicity, mobility, and volume of potential contaminants in the septic tank through treatment. Alternative OS-5 provides no reduction in toxicity, mobility, and volume since no treatment is included.

5. Short-Term Effectiveness

The no-action alternative, OS-5, would be completed in the shortest time (2 months). Alternative OS-3 would take an estimated 3 months and alternative OS-4 would take an estimated 4 months to achieve remediation objectives. With respect to protection of the community, the environment, and workers on-site, alternative OS-5 poses the least potential for adverse impacts since no remedial activities would take place. Of the two treatment alternatives, OS-3 would have less impact during construction and implementation because of the limited excavation activities. OS-3 would not excavate the "hot spot" soils or raceway sediments and therefore would not have the same potential as OS-4 to generate dust and air emissions during these activities. There would be potential air emissions associated with materials removed from the septic tank under alternatives OS-3 and OS-4.

Both alternatives OS-3 and OS-4 would generate noise, heavy equipment traffic, and particulate emissions during the demolition and removal of structures and the filling of the raceways. The investigations to date have not included explorations into or beneath existing structures because of health and safety concerns. Therefore, there remains a lack of certainty of what may be encountered during the demolition of the structures and what potential releases, if any, may occur and effect the community, workers on-site, and the environment.

6. Implementability

While all of the alternatives can be implemented, some alternatives are technically and administratively easier to implement than others, based on their simpler design and lack of complexity.

Of all the alternatives, the no-action alternative, OS-5, would be the easiest to implement since there are no remedial activities to be conducted other than improvements to the fencing. Alternatives OS-3 and OS-4 are both technically implementable but OS-4 would be the more complicated of the two with the additional excavation activities required for the "hot spot" and raceway sediments. The demolition of the partially standing building and smokestack will require the services of experts to minimize any potential impacts to nearby residents. Based on administrative implementability, the most significant difference between the treatment alternatives is the additional substantive requirements that will be necessary for the disposal of excavated materials under OS-4. Both alternatives will have activities occurring in designated state wetlands of the Branch River and will have to meet the substantive requirements of the Rhode Island Wetlands Protection Act. In addition, both alternatives OS-3 and OS-4 would require the implementation of institutional controls to control future land use over the raceways, and buildings.

7. Cost

The estimated capital, O&M, and present worth value of each alternative are as follows:

COST COMPARISON OF OVERALL SITE ALTERNATIVES

	Capital Costs	O&M Costs ($/yr)	Present Worth
OS-3 Demolition, Sealing Raceways, Septic Tank, and Site Grading	$715,825	27,400	974,120
OS-4 Demolition, Sealing Raceways, Septic Tank, "Hot Spot" Excavation, and Site Grading	$914,475	31,400	1,210,480
OS-5 No-action	$42,510	8,000	116,930

8. State Acceptance

The Rhode Island Department of Environmental Management (RIDEM) concurs with the selection of the combination of demolition of the remaining structures on the Site, sealing of the remaining raceways, location and removal of the septic tank, and final site grading as the management of migration alternative for the overall Site. The department has raised concerns about the potential routes of migration through the sewer line trench and through potentially uncollapsed sections of the raceway underneath the landfill. This issue will be further evaluated during the predesign, design, and operation of the remedy.

9. Community Acceptance

The comments received during the public comment period and the discussions during the Proposed Plan and FS public meeting are summarized in the attached document entitled "The Responsiveness Summary" (Appendix C). Varied comments were received from residents living near the Site and from officials representing the community and state. The residents voiced very strong concerns over the present physical conditions of the Site and indicated that they wanted the physical hazards which have existed there for years addressed as quickly as possible. However, they did not indicate a preference for which alternative they thought should be used to accomplish the overall Site cleanup.

X. THE SELECTED REMEDY

EPA has selected a comprehensive remedy consisting of the following alternatives to address the different remedial areas identified at the Stamina Mills Site:

<u>TCE Spill Area</u>

TSA-3: Soil Vacuum Extraction;

<u>Landfill Area</u>

LA-3: Capping Including Consolidation;

<u>Groundwater Treatment</u>

GW-4: Ultraviolet Light and Hydrogen Peroxide; and

<u>Overall Site</u>

OS-3: Building Demolition, Sealing and Filling of Raceways, Location of Septic Tank and Removal of Contents, and Site Grading.

EPA believes this remedy is comprehensive as it contains both source control and management of migration components which use treatment to address the principal threats and engineering controls to address relatively low long-term threats identified at the Site. A detailed description of the cleanup levels and the selected remedy is presented below.

A. Cleanup Levels

Cleanup levels have been established for contaminants of concern identified in the baseline risk assessment found to pose an unacceptable risk to either public health or the environment. Cleanup levels have been set based on the appropriate ARARs (e.g., Drinking Water MCLGs and MCLs) if available. In the absence of a chemical-specific ARAR, or other suitable criteria to be considered, a 10^{-6} excess cancer risk level for carcinogenic effects or a concentration corresponding to a hazard index of one for compounds with non-carcinogenic effects was used to set cleanup levels. In instances in which the values described above were not feasible to quantify, the limit that could be reliably measured by analytical methods was used as the cleanup level. 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. If the remedial action is not found to be protective, further action shall be required.

1. <u>Groundwater</u>

Because the aquifer at and beyond the compliance boundary of the Site is a current source of drinking water (i.e., it is classified as Class

II, Subclass IIA) MCLs and non-zero MCLGs established under the Safe Drinking Water Act are ARARs. The compliance boundary established for groundwater cleanup levels is throughout the contaminated groundwater plume from the boundary of the waste management area on-site to the edge of the plume off-site. Cleanup levels will be achieved in each compliance monitoring well located at or beyond the compliance boundary. The waste management area for the Site is defined as those areas of the Site where wastes will be contained in place and includes the area delineated by the landfill, raceways, and building structures to be demolished.

Cleanup levels for known and probable carcinogenic compounds (Class A & B) have been set at the appropriate MCL because the MCLG for these compounds is generally set at zero. Cleanup levels for the Class C compounds (possible carcinogens), Class D (not classified) and Class E (no evidence of carcinogenicity) have been set at the MCLs. When appropriate (e.g., the cumulative risk is greater than 10^{-4} or the hazard index is greater than 1), the cleanup levels have been set up at non-zero MCLGS if MCLGs are more stringent than MCLs. In the absence of a MCLG, a MCL, a proposed drinking water standard or other suitable criteria to be considered (i.e. health advisory, state standard), a cleanup level was derived for carcinogenic effects based on a 10^{-6} excess cancer risk level considering the ingestion of groundwater.

Cleanup levels for compounds in groundwater exhibiting non-carcinogenic effects have been set at the MCLG. In the absence of a MCLG, a MCL, a proposed drinking water standard or other suitable criteria to be considered (i.e. health advisory, state standard), cleanup levels for non-carcinogenic effects have been set at a level thought to be without appreciable risk of an adverse effect when exposure occurs over a lifetime (hazard index = 1). The hazard index is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime. They reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect.

Table I below summarizes the cleanup levels for carcinogenic and non-carcinogenic contaminants of concern identified in groundwater.

TABLE 1: GROUNDWATER CLEANUP LEVELS

Carcinogenic Contaminants of Concern	**Cleanup Level (ppb)**	**Basis**	**Level of Risk**
Trichloroethylene	**5**	**MCL**	**$2x10^{-6}$**
Tetrachloroethylene	**5**	**PMCL(1)**	**$7x10^{-6}$**
1,1-Dichloroethylene	**7**	**MCL**	**$1x10^{-4}$**
Vinyl Chloride	**2**	**MCL**	**$1x10^{-4}$**

Non-Carcinogenic Contaminants of Concern	Cleanup Level (ppb)	Basis	Target Endpoint of Toxicity	Hazard Index
1,2-Dichloroethylene	70	PMCL	Liver	0.2
Tetrachloroethylene	5	PMCL	Liver	0.01
Dieldrin	2	HA(2)	Liver	1.0
Chromium	50	NIPDWR(3)	Liver	0.2

(1) Proposed Maximum Contaminant Level
(2) Health Advisory
(3) National Interim Primary Drinking Water Regulation

These cleanup levels must be met at the completion of the remedial action at the compliance boundary, which as described earlier, is throughout the contaminated groundwater plume, from the boundary of the waste management area on-site to the edge of the plume off-site. Cleanup levels will be achieved in each compliance monitoring well located at or beyond the compliance boundary. The waste management area for the Site is defined as those areas of the Site where wastes will be contained in place and includes the area delineated by the landfill, raceways, debris piles, and building structures to be demolished.

The location and number of compliance monitoring wells will be finalized during design; however, at a minimum, a subset of existing on-site and off-site wells will be selected and may include the installation of additional monitoring wells. The type and frequency of monitoring will also be finalized during design. Sampling parameters will include the following: the target compound list (TCL) volatile organic compounds, the target analyte list for metals, dieldrin, pH, temperature, specific conductance, and chloride. Specific parameters may be added or deleted depending on sampling results and observed trends. EPA has estimated that these levels will be obtained within 10 to 15 years. Once the cleanup levels have been obtained, the extraction wells will be shut down and a monitoring program will be implemented to confirm the results. This program will, at a minimum, consist of three years of quarterly monitoring of groundwater quality.

These cleanup levels are consistent with ARARs for groundwater and will attain EPA's risk management goal for remedial actions. The cleanup levels for vinyl chloride and 1,1-dichloroethylene have been set at the MCL and MCLG respectively, which is the lowest levels that can be analytically quantified and therefore the lowest levels that can be practically set. Given the effectiveness of the groundwater treatment process for destroying chlorinated solvents and the relatively low concentrations of both vinyl chloride and 1,1-dichloroethylene as compared to TCE, the primary contaminant of concern, EPA believes that the levels of both of these compounds in treated groundwater will be below cleanup levels.

It should be noted that the levels of chromium detected in the groundwater at the Site did not exceed the target cleanup level shown in Table I with the exception of one well in the landfill. As described in Section V.C., of this Record of Decision, chromium levels which did exceed the cleanup level were obtained from what is believed to be landfill leachate. Since the remedy for the Site includes a leachate collection system, EPA believes that target cleanup levels for chromium will be met without the need for additional groundwater treatment. Levels of chromium and other trace metals found in the groundwater will be monitored during the predesign activities, which includes a pump test and pilot testing of the groundwater treatment system, to determine if any additional treatment of metals will be necessary to meet cleanup levels and groundwater disposal requirements. In addition, an environmental monitoring program, which will involve the sampling of sediment and surface water from the Branch River, will be developed during the remedial design phase to assure that the response objectives of the landfill area will be met.

2. **Soil Cleanup Levels**

Cleanup levels in soils were established in order to protect human health, the environment, and the aquifer below the Stamina Mills Site from contamination. The Summers Model was used to estimate residual soil levels that are not expected to impair future groundwater quality. ARARs for the groundwater (MCLGs and MCLs) were used as inputs into the leaching model. In the absence of an ARAR, the level corresponding to a 10^{-6} risk level (for carcinogens) or a hazard index of one (non-carcinogenic effects) was utilized. If the cleanup values described above were not capable of being detected or were below regional background values, then either the CRQL or a background value was substituted. Partitioning coefficients, and additional inputs to the leaching model, were either laboratory derived (as in the case of TCE) or obtained from EPA guidance documents. Table 2 summarizes the soil cleanup values for the contaminants of concern developed to protect public health, the environment, and the aquifer.

TABLE 2: SOIL CLEANUP LEVELS

Carcinogenic Contaminants of Concern	Soil Cleanup Level (ug/kg)	Basis for Model Input	Residual Groundwater Risk
Trichloroethylene	195	MCL	$2x10^{-6}$
Tetrachloroethylene	66	PMCL	$7x10^{-6}$
1,1-Dichloroethylene	17	MCL	$1x10^{-4}$

Non-Carcinogenic Contaminants of Concern	Soil Cleanup Level (ug/kg)	Basis for Model Input	Target Endpoint Toxicity	Residual Groundwater Hazard Index
1,2-Dichloroethylene	151	PMCL	Liver	0.2

Soil cleanup levels were not established for dieldrin and chromium because theses compounds were only detected at elevated levels in the landfill wastes which are to be consolidated and capped in place as part of the remedy selected for this Site. Soil cleanup levels were also not established for vinyl chloride because this compound was not detected in any soil samples obtained at the Site during the RI. Monitoring of the cleanup levels in the TCE spill area soils will include the analysis for vinyl chloride. In the event that vinyl chloride is detected during the monitoring, a soil cleanup level will be established using the Sommers Model and the same procedures used for calculating the soil cleanup levels shown above.

These cleanup levels in soils are consistent with ARARs for groundwater and attain EPA's risk management goal for remedial actions of 10^{-4} to 10^{-6} and a hazard index of less than one. Furthermore, these soil levels should be protective of any potential health risks posed by direct contact or incidental ingestion of the soils.

These cleanup levels must be met at the completion of the remedial action throughout the contaminated soils in the TCE spill area and which are located above the bedrock aquifer. The location and number of compliance monitoring points and the sampling procedures by which cleanup levels are to be demonstrated will be developed during the design. EPA has estimated that cleanup levels will be achieved within one year.

B. Description of Remedial Components

The following is a list of the major components of the remedy:

1. In-situ vacuum extraction of TCE spill area soils;
2. Excavation of landfill wastes from 100-year floodplain and consolidation with landfill wastes above floodplain;
3. Installation of leachate collection system in landfill;
4. Capping of the landfill;
5. Groundwater extraction and treatment using UV/hydrogen peroxide system;
6. Demolition of on-site structures;
7. Sealing and backfilling of raceways;
8. Location of septic tank, testing and removal of contents, and off-site treatment and/or disposal;
9. Grading of Site;
10. Long-term environmental monitoring; and
11. Institutional controls.

The in-situ soil vacuum extraction system will consist of a number of shallow wells installed to a depth of approximately 10 feet, or far enough above the water table to avoid the extraction of excess moisture. These wells are connected to a vacuum pump which pulls air and VOCs with it through and from the soil. The air containing VOCs is then treated with activated carbon filters before it is discharged to the atmosphere. Water vapor is sometimes withdrawn from the soil along with VOCs and if a collectable quantity is formed it will be combined with extracted groundwater and treated accordingly. During the design phase, the number, depths, and locations of extraction wells will be finalized. It is expected that these design details as well as the optimum operating conditions can be provided through the initial pilot-testing of a full-scale unit. Periodic review and modification of the design, construction, maintenance, and operation of the soil vacuum extraction system may be necessary over time. A frequency for reviewing the progress of the system for meeting the goals and design criteria will be established during the design phase.

Approximately 550 cubic yards of a mixture of landfill wastes and sediments will be excavated from the 100-year floodplain of the Branch River. This material will be redeposited above the floodplain onto the existing landfill area before the new cap is installed. As described in Section XI.B.3., of this Record of Decision, EPA does not believe these activities constitute placement because of the contiguous nature of the materials being excavated. They therefore are not subject to LDRs. During the excavation of the wastes in the floodplain as well as the grading and stabilization of landfill slopes adjacent to the Branch River, appropriate engineering controls will be used to minimize the migration of landfill wastes into the river as well as to control odors and air emissions. Upon completion of excavation, a leachate collection system will be installed along the toe of the landfill on its southern side.

EPA believes that the installation of a leachate collection system and capping of the landfill will address the release of trace metals into the Branch River and the groundwater. During the RI low levels of trace metals were detected in monitoring wells near the landfill area and one compound, chromium, exceeded drinking water standards. The two wells in which chromium levels exceeded drinking water standards are screened over intervals which are above the bedrock aquifer but are in direct contact with landfill wastes. Therefore, the water being sampled in these shallow wells in the vicinity of the landfill is believed to be representative of landfill leachate rather than groundwater beneath the Site. Monitoring wells positioned adjacent to the shallow wells, that were screened over deeper intervals below landfill wastes but within the bedrock aquifer, showed much lower concentrations of chromium. The concentrations of chromium detected in these deeper wells were below levels which posed a significant public health risk. The results from the sampling of these deeper wells, as well as from other wells throughout the Site, shows that trace metals are not impacting the groundwater beneath the Site and therefore the need for a groundwater treatment system to address soluble metal ions is not indicated at this time. An environmental monitoring program consisting of surface water and sediment sampling in the Branch River will be implemented to assure that the leachate collection system is meeting the response objectives of this Record of Decision. The details regarding the environmental monitoring program, including the frequency of sampling, sampling locations, and parameters to be sampled will be decided during the design phase.

The leachate collection system will discharge into the on-site sewer system subject to the approval of the Woonsocket Wastewater Treatment Plant, the Town of North Smithfield, and upon meeting all pretreatment and monitoring requirements. Based on the chemical characteristics of the leachate currently being generated in the landfill it appears that the leachate will meet pretreatment standards without requiring any additional treatment. In the event that the physical characteristics of the leachate change as a result of capping or the POTW refuses to accept the leachate, a laboratory-scale treatability study will be performed to determine the cost effectiveness of pretreatment of the leachate and the feasibility of on-site versus off-site disposal.

The landfill cap design will be consistent with the State and Federal closure requirements for a RCRA facility. At a minimum, the cap will consist of a multi-layer system composed of a vegetative topsoil layer and a subsurface drainage layer overlying a low-permeability barrier of clay and synthetic liner material. The details of the materials of construction, the thickness of the layers, and the groundwater monitoring system will be established during the remedial design phase.

Capping of the landfill will also require the protection of landfill side slopes still within the floodplain of the Branch River; the extension of existing manholes up to the new surface of the cap; and may require the installation of a passive gas collection system. The gas collection system, if determined to be necessary during design, will consist of small-diameter PVC pipe placed in a network of shallow trenches backfilled with crushed stone. The trenches will be located within the intermediate cover layer below the final cover. Because of the small size of the landfill, the quantity of gases expected to be generated will be minimal. The potential for emissions and necessary treatment, if any, for any gases collected will be evaluated during the design phase. Sections of the southern side slope of the landfill which would still be subject to the effects of Branch River flooding would be further protected by covering with stone (i.e., rip-rap) once the cap is in place. The existing manholes which provide access to the sewer line travelling roughly diagonally across the landfill would be raised and incorporated into the final design of the cap.

The groundwater extraction system will consist of a number of wells installed on-site into the bedrock. Many of the design details of the extraction system and its associated groundwater monitoring system, including the specific number of wells, depth, pumping rates, and locations, will be defined upon completion of a predesign pump test. Extracted groundwater will be treated on-site using the innovative ultraviolet light and hydrogen peroxide (UV/hydrogen peroxide) technology.

Prior to treatment, the extracted groundwater will undergo pretreatment to remove suspended solids and some inorganic metals. Based on the results of an initial laboratory treatability study conducted with groundwater from the Site, pretreatment will consist of a pressure filtration system. Further laboratory bench-scale or pilot-scale testing will be conducted during predesign to determine the effectiveness of pressure filtration for removing suspended solids. In the event that testing indicates the need for further pretreatment, either to meet groundwater cleanup ARARS or disposal ARARs for treated groundwater, additional laboratory bench-scale or pilot testing will be completed. It is not anticipated that the need for additional pretreatment will change the selected remedy since this additional pretreatment would be necessary for all of the groundwater treatment alternatives that were considered.

The UV/hydrogen peroxide system consists of a self-enclosed unit having the dimensions of 2x3x5 feet and a 300 gallon high density polyethylene (HDPE) storage tank for hydrogen peroxide. The treatment unit including the storage tank will be constructed within a bermed area. This innovative technology uses ultraviolet light to react with hydrogen peroxide and form hydroxyl radicals which react with and destroy organic contaminants. The technology has been proven to be very effective in destroying chlorinated solvents in a limited number of full-scale operations. A bench-scale laboratory test was performed as well during the FS using groundwater from the Site and it was determined that TCE levels were reduced to below cleanup levels in approximately three minutes. The only residuals produced are carbon dioxide, water, and small amounts of free chlorides which react with minerals in the water to form simple salts.

In order to further test the effectiveness of this innovative technology, a pilot test will be conducted at the Site during predesign activities. Groundwater extracted during the predesign pump test will be treated on-site using full-scale equipment and the results will be used to make a final determination on the effectiveness of this technology to achieve cleanup levels. In the event that this innovative technology is not found to be effective in achieving the groundwater cleanup levels, EPA will select air-stripping with GAC and vapor phase carbon as the treatment technology for removal of TCE and other VOCs from the groundwater.

The results of the predesign groundwater treatment pilot test will also be used to make a final determination on how treated groundwater will be disposed of. Currently the options being considered are on-site surface water discharge, disposal via on-site sewer hookup to an off-site POTW, and on-site subsurface discharge. EPA prefers the first option, on-site surface water discharge, but will review the results of the pilot test and determine if all state discharge requirements which have been identified as ARARs will be met before making a final determination.

Although attaining drinking water quality standards within a reasonable time frame is the desired cleanup goal, groundwater contamination may be especially persistent in the bedrock aquifer beneath the Site. Therefore, periodic review and modification of the design, construction, maintenance, and operation of the groundwater extraction and treatment system as well as the monitoring system may be necessary. A complete evaluation of the performance of the system will be made within five years of the start up of the groundwater treatment system to determine if the goals and standards of the design criteria are being met. If the evaluation reveals that the remedy cannot achieve the stated cleanup levels, or that the cleanup levels cannot be achieved within a reasonable time frame, consideration will be given to making changes in the remedy.

After the cleanup levels have been met and the remedy is determined to be protective, the groundwater extraction and treatment system will be shut down. The groundwater monitoring system will continue to be utilized to collect information quarterly for three years after the shut down date to ensure that the cleanup levels have been met and the remedy is protective. Once these levels are maintained and the remedy is protective for three years after the shut down date, an additional monitoring program for the Site in accordance with Rhode Island Hazardous and Solid Waste rules will be implemented.

The Site, which has remained vacant since a fire destroyed the mill building in 1977, is covered with rubble, piles of debris, and foundation remains, including a deteriorating smoke stack. These structures will be demolished and removed prior to the implementation of other remedial activities to insure the health and safety of workers on-site. The wood and metal materials found in the demolition debris as well as in the existing debris piles will be removed and disposed of off-site in accordance with Rhode Island Solid Waste Rules. Construction materials of an earthen nature will be disposed of on-site. Engineering controls will be used to limit the generation of dust during demolition.

The inlets and outlets of both raceways will be sealed with concrete barrier walls to stop the flow of water across the Site and into the Branch River. The inlet barriers will be constructed prior to the backfilling of the raceways to reduce the need for dewatering. Temporary coffer dams may be installed to allow for the construction of cast in place concrete walls at the inlets and outlets. The details of the construction of the barrier walls will be established during the remedial design phase. The construction of an additional concrete barriers in the raceways directly upgradient of the landfill will also be considered as a means of reducing the flow of water through the landfill in the event that there is evidence of a continued flow through the old raceway after the raceway entrance has been sealed.

Sections of both raceways will be backfilled using suitable clean fill material. The roof of the raceways will be collapsed or demolished using heavy equipment and this material will be deposited in the open raceway. The material placed in the raceways will be compacted and brought to the original grade. The old raceway will be backfilled from the inlet to a point just before it goes through the landfill. Information derived from the RI indicates that sections of the old raceway in the landfill area are already collapsed. The new raceway will be backfilled along its full length.

Once the Site is cleared of piles of debris and large vegetation, it is anticipated that the septic tank can be located. Any materials remaining in the tank will be tested and the proper disposal will be determined based upon the sampling results. The tank will then be backfilled or demolished depending on the condition of the tank.

At the conclusion of the remedial activities taking place on-site, the entire five acre site would be graded and covered with a vegetated soil covering. A program for increased site security and maintenance would be instituted which would involve the enhancement of the existing perimeter fencing and the mowing and maintenance of the vegetative cover. In addition, to maintain the overall protection of human health and the environment believed to be afforded by this remedy, institutional controls would be implemented. The institutional controls would be in the form of deed restrictions regulating land use at the Site and would be focused on preventing the disturbance of the physical integrity of many of the remedies components. EPA has proposed, in a consent decree lodged in federal court, institutional controls with the current owner -- Hydro-Manufacturing -- to protect the remedy.

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. EPA will also evaluate risk posed by the Site at the completion of the remedial action (i.e., before the Site is proposed for deletion from the NPL).

XI. STATUTORY DETERMINATIONS

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

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

The remedy at this Site will permanently reduce the risks posed to human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through treatment, engineering controls, and institutional controls.

In-situ soil vacuum extraction will be used to treat one of the principal threats identified at the Site, the TCE spill area soils. The TCE spill area soils will be treated to levels which will not impact the groundwater above drinking water standards. Soil vacuum extraction will remove the contaminants from the spill area which continue to act as a source of groundwater contamination by trapping them on activated carbon filters and then treating and disposing of the spent filters off-site.

Capping of the landfill will eliminate exposure to contaminants by direct contact and will control exposure from wind blown particles and surface runoff. Capping will also limit infiltration of precipitation and control leaching of contaminants into the groundwater and surface water. A leachate collection system will insure that contaminants from the landfill do not impact the groundwater or surface water. Capping is appropriate for the landfill wastes as they have been shown to pose a relatively low long-term threat.

The ultraviolet light and hydrogen peroxide (UV/hydrogen peroxide) system will be used to treat one of the principal threats identified at the Site, the contaminated groundwater plume. Contaminated groundwater extracted from the bedrock aquifer will be treated using this innovative technology thereby eliminating future exposure through ingestion by destroying the contaminants. The extraction system will be designed to draw the groundwater contaminant plume back within the Site boundaries and to prevent the further migration of contaminants beyond its current boundaries. The ultimate goal of the groundwater extraction and treatment remedy will be to prevent further contamination of the areas of the bedrock aquifer currently being used as a drinking water source and to return the areas which have been impacted by the contamination from the Site to their previous use as a drinking water source.

The overall Site alternative will remove the safety risks posed to the public and workers on-site implementing the remedy by eliminating the physical hazards at the Site. This alternative includes the demolition of the partially standing building, the smokestack, the collapsing substructures, and the removal of piles of debris. The overall Site alternative also will reduce the risks to the public and the environment posed by contaminants migrating through on-site raceways to the Branch River. Sealing the raceways will prevent exposure to contaminants through direct contact and also indirect exposure through the ingestion of fish tissue that may have ingested contaminants. The confirming of the septic tank location and the testing and removal of its contents will eliminate the future risks of the tank contaminating the groundwater. The use of engineering controls to address these activities is appropriate as the conditions described pose a relatively low long-term threat.

A long-term monitoring program will insure that the selected remedy for the Site remains protective of human health and the environment. This program will include groundwater monitoring and surface water and sediment monitoring in the Branch River. Institutional controls in the form of deed restrictions, will be used to control the future uses of the Site and will be focused on preventing the disturbance of the physical integrity of components of the remedy.

Finally, implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts. The vacuum extraction technology will be done in-situ and will not require any soil excavation. The landfill will only be minimally disturbed during cap construction and relocation of landfill wastes from the floodplain. The innovative technology being used to treat the groundwater destroys the contaminants and produces no additional waste streams. During implementation of the overall Site alternative, strict engineering controls will be used to minimize any harmful releases from on-site activities.

B. The Selected Remedy Attains ARARs

This remedy will attain all applicable or relevant and appropriate federal and state requirements that apply to the Site. The key environmental laws from which ARARs for the selected remedial action are derived, and the specific ARARs include:

Chemical-Specific

Rhode Island Rules and Regulations Pertaining to Public Drinking Water (R46-13-DWS)
Safe Drinking Water Act (SDWA)- Maximum Contaminant Levels (MCLs)
Safe Drinking Water Act (SDWA)- Maximum Contaminant Level Goals (MCLGs)
Rhode Island Water Quality Regulations for Water Pollution Control (R.I.G.L. 46-12, 42-17.1, 42-35)
Rhode Island Pollutant Discharge Elimination System (R.I.G.L. 46-12, 42-17, 42-35)
Clean Water Act (CWA)- Ambient Water Quality Criteria

Location-Specific

Rhode Island Freshwater Wetlands Act (R.I.G.L. 2-1-18-27)
Resource Conservation and Recovery Act (RCRA)[1]
Clean Water Act, Section 404
Fish and Wildlife Coordination Act
Clean Water Act (CWA)- Section 404 (Wetlands Protection)

Action-Specific

Rhode Island Hazardous Waste Generation, Transportation, Storage and Disposal Regulations (R.I.G.L. 23-19-1-10)
Rhode Island Solid Waste Management Regulations (R.I.G.L. 23-18.9, 23-19, 42-17.1)
Rhode Island Underground Injection Control Program (R.I.G.L. 42-17.1, 46-12)
Rhode Island Pretreatment Regulations (R.I.G.L. 46-12, 42-17.1, 42-45)
Rhode Island Air Pollution Control Regulations
Resource Conservation and Recovery Act (RCRA)[1]
DOT Rules for Transportation of Hazardous Materials
OSHA Health and Safety Standards
OSHA Record Keeping, Reporting and Related Regulations
Clean Air Act- National Emission Standards for Hazardous Air Pollutants (NESHAPs)

To-be-Considered

Rhode Island Draft Groundwater Classification Regulations (R.I.G.L. 46-13.1)
EPA Risk Reference Doses
EPA Carcinogen Assessment Group Potency Factors
Threshold Limit Values
OSWER Directive 9355.0-28
Executive Order 11988 (Floodplain Management Policy)
Executive Order 11990 (Wetlands Protection Policy)

[1] Rhode Island is a RCRA authorized State Program.

A more inclusive listing of ARARs can be found in tables 2-1, 2-3, and 2-4 of Section 2 of the FS. These tables, which are identified in Appendix B of this Record of Decision, as Tables 9, 10, and 11 respectively, list all potential ARARS identified for the Site and give brief synopses of the ARARs and explanations of the actions necessary to meet the ARARs. The tables also indicate whether the ARARs are applicable or relevant and appropriate to actions at the Site. In addition to ARARs, the tables describe standards that are To-Be-Considered (TBC) with respect to remedial actions.

Tables 5-1, 5-2, and 5-3 of Section 5 of the FS, which are included in Appendix B of this Record of Decision, as Tables 12, 13, and 14 respectively, list the identified ARARs for each alternative and note whether the ARARs will be attained by the alternative. The July 10, 1990 Addendum to the FS adds ARARs for a number of alternatives and deletes laws incorrectly described as ARARs for three alternatives. It is identified as Table 15 in Appendix B of this Record of Decision.

Applicable requirements are federal or state cleanup standards or standards of control that specifically address a hazardous substance, remedial action, location or other circumstance at a Superfund site. NCP at 40 CFR 300.5, Federal Register, Vol. 55, No. 46, March 8, 1990. Relevant and appropriate requirements are federal or state cleanup standards or standards of control that, although not "applicable" to the Superfund site, address situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. Id. TBCs are advisories, criteria or guidance that were developed by EPA, other federal agencies or states that may be useful in developing CERCLA remedies. Id. at 300.400.

Requirements that EPA found to be not legally applicable to remedial activities at the Stamina Mills Site, but either to be relevant and appropriate or TBC for these activities are discussed below. All other ARARs listed in the above-referenced tables are applicable to Site remedial action.

1. Chemical-Specific Relevant and Appropriate Requirements

SDWA MCLs and MCLGs are standards that apply to public water systems. Because the groundwater in the vicinity of Stamina Mills is used as a source of private residential drinking water, but is not a public water system as defined by the SDWA, MCLs and MCLGs are relevant and appropriate rather than applicable.

The Clean Water Act Federal Water Quality Criteria are non-enforceable federal guidelines developed under the Clean Water Act which are used by states to set water quality standards for surface water. Because contaminants are migrating from the Site to the Branch River, the criteria are relevant and appropriate to remedial action at the Site. In addition, the criteria would be relevant and appropriate to any discharge of treated effluent from the Site to the River.

The Rhode Island Rules and Regulations Pertaining to Public Drinking Water are intended to protect public drinking water sources. Although the groundwater below the Site is not a source of public drinking water as defined by these regulations, it is a source of private residential drinking water. The regulations are therefore relevant and appropriate to groundwater remediation at the Site.

2. Location-Specific Relevant and Appropriate Requirements

RCRA Location Requirements impose limitations on the storage, treatment, and disposal of RCRA hazardous wastes in 100-year floodplains. There are not, to EPA's knowledge, any RCRA hazardous wastes disposed of in the landfill on-site, including those areas of the landfill within the 100-year floodplain of the Branch River. Nonetheless, RCRA location requirements are relevant and appropriate because the landfill contains other hazardous substances. Remedial actions in the landfill should therefore be consistent with the requirements that RCRA establishes for activities affecting the 100-year floodplains and which are designed to be protective of human health and the environment.

Section 404 of the Clean Water Act (Pertaining to Wetlands) is not applicable because the Site in not a federal wetlands. Section 404 is relevant and appropriate, however, because remedial activities will take place in areas that are wetlands under state law. These activities, e.g., backfilling the raceways, should conform to the specific requirements that Section 404 imposes, to protect public health and the environment, on activities in federally designated wetlands.

3. Action-Specific Relevant and Appropriate Requirements

RCRA groundwater monitoring requirements are applicable for all of the groundwater treatment alternatives with the exception of GW-5, the no-action alternative, for which they are relevant and appropriate. The no-action alternative would not involve the treatment, storage, or disposal of the groundwater and therefore would not trigger RCRA applicability.

RCRA landfill requirements are relevant and appropriate based upon EPA's current information. This information indicates that although the landfill area contains no RCRA wastes, it does contain hazardous substances. One of the purposes of RCRA is to protect human health and the environment by providing for the safe storage, treatment, and disposal of hazardous materials. Because hazardous substances were disposed of in the on-site landfill, the circumstances at the Site are similar to those intended to be regulated by RCRA making RCRA landfill requirements relevant and appropriate. If EPA learns that the landfill does contain RCRA wastes, then EPA would consider RCRA landfill requirements to be applicable.

4. Chemical-Specific TBCs

The Draft Groundwater Classification System under the Rhode Island Groundwater Protection Act is a TBC because it has not been officially promulgated. If this classification is promulgated, it will be applicable to the Site. Under the Draft, the projected classification of the groundwater beneath the Site, with the exception of the landfill area, is GAA, non-attainment -- which would require restoration to drinking water standards. Promulgation of the Draft Classification would therefore not affect remediation because federal ARARs for the Site, i.e., SDWA MCLs and MCLGs, already require the groundwater to be remediated to drinking water standards.

5. Action-Specific TBCs

Executive Order 11988 (Floodplain Management) is a TBC because, it has no specific requirements that pertain to this Site. The Executive Order, however, is a TBC to the extent that is provides general guidance for remedial activities in a floodplain.

Executive Order 11990 (Wetlands Protection Policy) is not an ARAR because no parts of the Site meet the criteria of a federally designated wetlands. Parts of the Site, including areas where remedial activity will take place are, however, wetlands under the Rhode Island law. The Executive Order, therefore, will be considered to the extent that it provides guidance on wetlands not provided by the Rhode Island wetlands ARARs.

The Rhode Island Division of Air and Hazardous Materials Policy on permitting air strippers is a TBC because it is not a promulgated statute or regulation. It is a policy which is potentially useful to this CERCLA remedy.

It should be noted that although the Site lies within the Forestdale Historic District, which is listed on the National Register of Historic Places, The National Historic Preservation Act is not an ARAR or a TBC. In the judgement of EPA and the Rhode Island Historic Preservation Commission, the selected remedy will have no adverse effect on the Historic District.

6. Land Disposal Restrictions

RCRA includes specific provisions restricting the land disposal of certain RCRA wastes. The land disposal restrictions (LDRs) establish treatment standards which must be achieved (by specific dates) for RCRA hazardous wastes prior to their disposal or placement on land. It is important to note that LDRs apply prospectively to wastes land disposed after the effective date of the restrictions but do not require removal and treatment of wastes land disposed prior to this.

LDRs are not an ARAR for the TCE spill area soils because the treatment of soils in the spill area will solely be an in-situ activity and therefore will not involve the placement of a RCRA hazardous waste.

The LDRs are not an ARAR for the excavation of sediments in the floodplain of the Branch River and the consolidation of the sediments under the cap, because this action does not involve placing of hazardous waste in a land-based unit. The area where the sediment is to be excavated from is located in the floodplain of the Branch River at the base of the retaining wall which acts as the southern boundary of the landfill. Sediments found adjacent to the landfill retaining wall result primarily from the erosion of materials from the slopes of the landfill. The sediments to be consolidated are contiguous to the landfill, uninterrupted by roads, paths, or other easements or right of ways. The landfill and sediments adjacent to it constitute one area of contamination for CERCLA purposes and thus one unit for land disposal purposes. Therefore, movement of the sediment adjacent to the landfill does not qualify as placement but is merely movement within the unit.

The only site activity for which LDRs may be an ARAR is for the removal of the contents of the septic tank. The septic tank is believed to be located underneath one of the existing debris piles at the Site. As a result, EPA has been unable to sample its contents but did find during the RI elevated levels of TCE in a leaching field pipe associated with the septic tank. Therefore, a determination cannot be made until the contents of the tank are sampled as to whether LDRs are an ARAR.

C. The Selected Remedial Action is Cost-Effective

In the Agency's judgment, the selected remedy is cost effective, i.e., the remedy affords overall effectiveness proportional to its costs. In selecting this remedy, once EPA identified alternatives that are protective of human health and the environment and that attain, or, as appropriate, waive ARARs, EPA evaluated the overall effectiveness of each alternative by assessing the relevant three criteria-- long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs. The costs of this remedial alternative are:

COST OF OVERALL REMEDY

		Capital Costs	O&M Costs ($/yr)	Present Worth
TSA-3	Soil Vacuum Extraction	$266,465	1,500	280,605
LA-3	Consolidation and Capping	$587,750	62,000	1,172,000
GW-4	UV/hydrogen Peroxide	$705,890	73,500	1,889,760
OS-3	Demolition, Sealing Raceways, Septic Tank, and Site Grading	$715,825	27,400	974,120

A discussion of the relative cost effectiveness of each component of the selected remedy follows. The present worth costs shown are based on a discount rate of ten percent as recommended in the NCP.

1. **TCE Spill Area**

COST COMPARISON OF TCE SPILL AREA ALTERNATIVES

		Capital Costs	O&M Costs ($/yr)	Present Worth
TSA-1	Excavation and Incineration	$9,994,150	100,000	10,690,620
TSA-3	Soil Vacuum Extraction	$266,465	1,500	280,605
TSA-4	No-action	$40,140	1,500	54,280

Of the two alternatives that are protective and attain ARARs, TSA-1 and TSA-3, alternative TSA-3 has the more cost-effective components. TSA-3 provides a degree of protectiveness proportionate to its costs. Soil vacuum extraction was estimated to be significantly less costly than excavation and incineration. Excavation and incineration would cost approximately 4000 percent more than soil vacuum extraction. The least expensive alternative, TSA-4, the no-action alternative, did not meet ARARs since it would not remove the contaminants from the spill area soils which are migrating into the groundwater.

2. Landfill Area

COST COMPARISON OF LANDFILL AREA ALTERNATIVES

		Capital Costs	O&M Costs ($/yr)	Present Worth
LA-1	Excavation and Incineration	$17,960,700	100,000	18,815,840
LA-3	Consolidation and Capping	$587,750	62,000	1,172,000
LA-5	No-action	$30,140	18,500	204,540

Of the two alternatives that are protective and attain ARARs, LA-1 and LA-3, alternative LA-3 has the more cost-effective components. LA-3 provides a degree of protectiveness proportionate to its costs. Consolidation of landfill wastes in the floodplain of the Branch River, construction of a leachate collection system, and capping of the landfill was estimated to be far less costly than excavation and incineration of all landfill wastes. Excavation and incineration would cost approximately 1600 percent more than consolidation and capping. The least expensive alternative, LA-5, the no-action alternative, did not meet ARARs since it would not reduce the leaching of contaminants from the landfill into the groundwater and river, nor would it prevent the erosion into the river of landfill wastes containing contaminants.

3. Groundwater Extraction and Treatment

COST COMPARISON OF GROUNDWATER TREATMENT ALTERNATIVES

		Capital Costs	O&M Costs ($/yr)	Present Worth
GW-1	Air Stripping	$1,537,140	139,525	3,190,010
GW-2	Granular Activated Carbon	$1,789,425	114,225	3,262,792
GW-4	UV/hydrogen Peroxide	$705,890	73,500	1,889,760
GW-5	No-action	$6,850	46,200	442,372

Of the three alternatives that are protective and attain ARARs, GW-1, GW-2 and GW-4, alternative GW-4 has the most cost-effective components. GW-4 provides a degree of protectiveness proportionate to its costs.

All three alternatives include the estimated costs of an extraction system and a pretreatment process to remove suspended solids (e.g., pressure filtration). The final details of the extraction system will be decided upon completion of the pump test during predesign activities. Although extraction costs may therefore change, the cost of extraction would be the same for each groundwater treatment alternative.

As part of predesign activities, a pilot test of the UV/hydrogen peroxide system will be performed with groundwater obtained from the pump test. One of the goals of the pilot test will be to determine the effectiveness of pressure filtration for removing suspended metals. In the event that additional pretreatment is needed, EPA will re-evaluate the costs of this alternative and make a determination of whether the degree of protectiveness is still proportional to its cost.

Treatment of the extracted groundwater with the UV/hydrogen peroxide system was estimated to be significantly less costly than the air stripping and the granular activated carbon alternatives. Air stripping and granular activated carbon would both cost approximately 170 percent more than the UV/hydrogen peroxide system. The least expensive alternative, GW-5, the no-action alternative, does not meet ARARs since it would not reduce the concentration of contaminants found in the groundwater to drinking water standards.

4. Overall Site

COST COMPARISON OF OVERALL SITE ALTERNATIVES

		Capital Costs	O&M Costs ($/yr)	Present Worth
OS-3	Demolition, Sealing Raceways, Septic Tank, and Site Grading	$715,825	27,400	974,120
OS-4	Demolition, Sealing Raceways, Septic Tank, "Hot Spot" Excavation, and Site Grading	$914,475	31,400	1,210,480
OS-5	No-action	$42,510	8,000	116,930

Of the two alternatives that are protective and attain ARARs, OS-3 and OS-4, alternative OS-3 has the more cost-effective components. OS-3 provides a degree of protectiveness proportionate to its costs. Demolition of the on-site structures, sealing and backfilling of the raceways, confirming the location of the septic tank and removing its contents, and site grading were estimated to be slightly less costly than alternative OS-4 which requires, in addition, the excavation of "hot spot" soils and the removal of sediment from the raceways. It should be noted that EPA has evaluated the risk levels associated with the "hot spot" soils and has determined that these soils do not pose a risk to public health and the environment. In addition, the costs for alternative OS-4 are very preliminary in that the areal extent of "hot spot" contamination and the quantity of raceway sediment has never been delineated. Moreover, the cost estimates for OS-4 shown above assume that the excavated materials could be disposed of in the on-site landfill. Based upon state comments on the FS, excavated materials would have to be tested and, if they contain hazardous substances, would have to be treated and/or disposed of off-site. The off-site disposal or treatment of excavated hazardous wastes would significantly increase the cost estimates for OS-4 shown above. Therefore, EPA does not believe that the additional activities proposed under alternative OS-4 provide a degree of protectiveness proportional to their costs. The least expensive alternative, OS-5, the no-action alternative, does not meet ARARs because it would not reduce the migration of contaminants through the raceways into the Branch River and it would not eliminate the potential groundwater contamination source presented by the septic tank and its contents.

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

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

1. TCE Spill Area

Alternative TSA-3, in-situ soil vacuum extraction, was selected as the component of the remedy to address spill contaminated soils because its long-term effectiveness, permanence, and ability to reduce toxicity, mobility, and volume of contaminants through treatment was the most efficient in light of implementability, short-term effectiveness and residual risk concerns. Although alternative TSA-1, excavation and incineration, provides for greater certainty in terms of the time frame required to achieve remediation levels and its ability to reduce toxicity, mobility, and volume of a wider range of contaminants through treatment, these advantages are outweighed by the differences between the two alternatives in terms of short-term effectiveness, costs, implementability, and residual risks remaining after treatment. A brief discussion of the advantages and disadvantages of each alternative is presented below but is discussed in greater detail in Section IX of this document.

Both alternatives TSA-1 and TSA-3 use treatment technologies which are effective in eliminating the principal contaminants found in the spill area, TCE and its breakdown products. Alternative TSA-1 would achieve the destruction of additional contaminants such as PAHs, which were found at low levels throughout the Site, but the removal of these compounds would not provide greater protection from the primary risks identified for the spill area.

The time frame required to reach the soil remediation levels can be estimated with greater certainty for alternative TSA-1 than for alternative TSA-3. Despite the uncertainties associated with the estimation of the cleanup time frame for TSA-3, the overall time frame for reaching remediation levels throughout the spill area is roughly equivalent for both alternatives and would take approximately 1 to 2.5 years.

Because TSA-1 and TSA-3 are roughly equivalent with respect to the primary balancing criteria of long-term effectiveness and permanence and reduction of toxicity, mobility, or volume through treatment, the differences between the modifying criteria as described below formed the basis of EPA's remedy selection for the spill area.

Alternative TSA-3 poses less potential for adverse short-term effects on the community, environment, and on-site workers. This alternative, which relies on in-situ extraction, does not require the excavation of contaminated soils which contain compounds that are likely to be released into the air. The equipment needed to construct and operate alternative TSA-3 is readily available and requires fewer engineering controls to install and operate, and produces fewer waste streams thereby making it more implementable than TSA-1. The costs for alternative TSA-3 are significantly lower and since it achieves similar long-term effectiveness and permanence through treatment as alternative TSA-1, it provides the greatest degree of protectiveness proportional to its cost.

The final difference relates to the residual risks for both alternatives. Alternative TSA-3 produces spent carbon filters from the treatment of air emissions which require off-site treatment and disposal. The spent carbon can be regenerated and once it has been regenerated it can be reused and would therefore no longer require treatment and disposal. Alternative TSA-1 produces a number of side waste streams which may require treatment. The principal waste is bottom ash which often exhibits a hazardous characteristic. This waste requires treatment before its disposal in a secure landfill. Members of the community did not indicate a preference for one treatment alternative over the other.

In summary, although TSA-1 and TSA-3 are roughly equivalent with respect to the primary balancing criteria of long-term effectiveness and reduction of toxicity, mobility, or volume through treatment, TSA-3 has significant advantages with respect to the modifying criteria, specifically, short-term effectiveness, cost-effectiveness, and implementability. Therefore, TSA-3 was chosen as the component of the selected remedy for the spill area soils.

2. Landfill Area

Alternative LA-3, which includes the excavation of landfill wastes within the floodplain of the Branch River, consolidation of the wastes under a multi-layer cap, and the installation of a leachate collection system, was selected as the component of the remedy to address the existing on-site landfill. Although this alternative does not employ a treatment technology, it prevents direct contact with contaminants, controls further downward and off-site migration of leachate, and minimizes dust erosion and surface runoff. LA-3 therefore meets all the remediation goals for the landfill.

Alternative LA-1, excavation and incineration, provides much greater long-term effectiveness and permanence since it reduces the toxicity, mobility, or volume of most contaminants through treatment. The advantages of this alternative are tempered somewhat for this Site because of the concerns for its short-term effectiveness, implementability, and costs.

The excavation, separation, and materials handling required by LA-1 prior to incineration has the potential to generate air emissions during the three-year period of operation. Because of the proximity of residences, the air emission would potentially create odor problems and potential health risks to the public and on-site workers despite the use of engineering controls and air monitoring. The substantive requirements to be met for the test burn and disposal of waste streams associated with incineration would make this alternative less implementable than capping.

Of these two alternatives that are protective and attain ARARs, LA-1 and LA-3, alternative LA-3 has the more cost-effective components. LA-3 provides a degree of protectiveness proportionate to its costs. Additionally, the generation of bottom ash, which potentially requires further treatment because of the presence of metals in the landfill wastes, creates another residue requiring disposal. Some members of the community voiced their preference for a permanent solution eliminating the contaminants in the landfill. EPA also has a preference for a permanent solution. However, when balancing the overall effectiveness of incineration with the disadvantages discussed above as well as the cost-effectiveness of incineration in achieving the protectiveness objective, EPA has selected consolidation and capping of the wastes as the remedy for the landfill area.

3. Groundwater Extraction and Treatment

Alternative GW-4, which uses the innovative technology of ultraviolet light and hydrogen peroxide, was selected as the component of the remedy for the treatment of contaminated groundwater because of its long-term effectiveness, permanence, and ability to reduce the toxicity, mobility, and volume of contaminants through treatment. Alternatives GW-1 and GW-2 provide similar long-term effectiveness and permanence in their ability to eliminate known contaminants, but produce waste streams which require off-site treatment and/or disposal. An additional disadvantage of alternatives GW-1 and GW-2 is that the activated carbon used to supplement treatment in GW-1 and provide primary treatment in GW-2, is not effective in reducing the toxicity of vinyl chloride. Vinyl chloride, a breakdown product of TCE, has been found at very low levels at the Site up to now, but due to transformations brought about by natural biological reactions it may be found at a greater concentration in the future. Alternative GW-4 destroys vinyl chloride and other known contaminants in the groundwater, while producing only carbon dioxide, water and free chlorides which go on to form small quantities of salts.

GW-4 therefore has significant advantages over GW-1 and GW-2 with respect to the reduction of toxicity, mobility, and volume of known and probable contaminants, and cost-effectiveness. In addition, the community did not indicate a preference for another alternative. Consequently, EPA has selected GW-4, the innovative technology of ultraviolet light and hydrogen peroxide, as the remedy for the groundwater.

4. Overall Site

Alternative OS-3, which addresses the physical and health hazards associated with the conditions of the overall Site by demolishing on-site structures, sealing and filling the raceways, locating and removing the contents of the septic tank, and grading the overall Site, was selected as the component of the remedy for the treatment of the overall Site. It differs from OS-4 primarily in that alternative OS-4 would require the excavation of contaminated soils from the "hot spot" and raceway sediments. These excavated materials would be tested and treated and/or disposed of off-site. The "hot spot" contains elevated levels of PAHs. Whatever the source of PAHs, the levels detected in the "hot spot" were too low to pose a significant risk to public health and the environment. EPA believes that the filling and sealing of the raceways would prevent the further migration of the sediments into the Branch River. This would eliminate the future risk posed to public health and the environment without the need for excavation of the sediments.

Another potential problem associated with alternative OS-4 is related to the cost. An important assumption made in the FS and reflected in the costs for OS-4 was that the excavated soil and raceway residues would be managed on-site by combining it with landfill wastes. Based upon subsequent comments from the State, it appears that this material would have to be treated and disposed of off-site which would significantly increase the costs shown. Since the quantity of material to be excavated from the "hot spot" and raceways is unknown, a more refined cost estimate cannot be provided. Because the long-term protectiveness of both alternatives is very similar and because OS-3 provides the greater degree of protectiveness proportional to its cost, EPA has selected OS-3 as the remedy for the overall Site.

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

The principal elements of the selected remedy are source control and management of migration. These elements address the primary threats at the Site, contamination of the soil and the groundwater with TCE and other VOCs. The selected remedy satisfies the statutory preference for treatment as a principal element by 1) treating contaminated soils using soil vacuum extraction and reducing the concentration of VOCs in soils to levels which will not impair drinking water standards and 2) treating the extracted groundwater using an innovative ultraviolet light and hydrogen peroxide technology which will result in the removal of VOCs to levels protective of human health and the environment.

XII. DOCUMENTATION OF NO SIGNIFICANT CHANGES

EPA presented a proposed plan (preferred alternative) for remediation of the Site on July 10, 1990. The source control portion of the preferred alternative included:

1. In-Situ treatment of TCE spill area soils;
2. Excavation of landfill materials in the flood plain;
3. Stabilization of landfill slopes;
4. Installation of a landfill leachate collection system;
5. Capping of the landfill;
5. Location of the septic tank and removal of its contents.

The management of migration portion of the preferred alternative included:

1. Groundwater extraction and treatment;
2. Sealing of raceway entrances and exists and backfilling raceways.

No significant changes from the Proposed Plan have been made to the selected remedy as detailed in the Record of Decision. However, the following discussion is presented as a point of clarification.

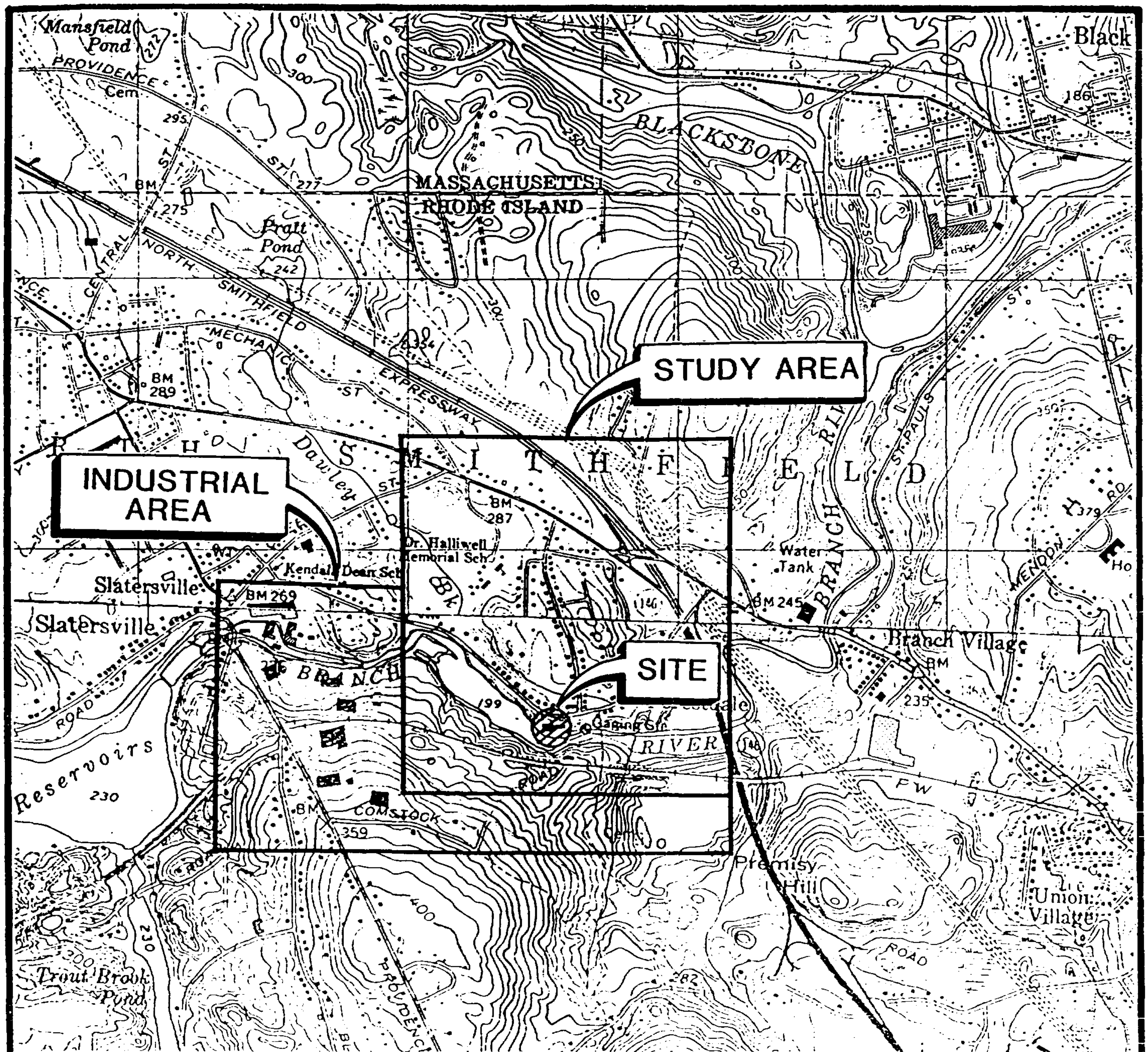
As part of the Proposed Plan, landfill wastes which are located in the 100-year floodplain of the Branch River are to be excavated, placed on the landfill above the floodplain, and incorporated under the cap to be constructed. EPA believes that landfill wastes in the floodplain also includes those sediments found in and along the bank of the Branch River adjacent to the landfill and along its southern boundary. The western limit of the sediment to be excavated is the new raceway exit and the eastern limit is roughly the eastern edge of the landfill. This sediment adjacent to the landfill has been shown to contain elevated levels of landfill-specific contaminants such as dieldrin. Additional downstream locations were tested and the sediment sampled there did not reveal significant levels of landfill-specific contaminants. Therefore, in order to achieve the cleanup goals for the landfill which includes mitigating the release of contaminants to the Branch River and thereby protecting human health and the environment, these sediments will be excavated along with other landfill wastes within the 100-year floodplain and placed under the landfill cap. During the excavation of the sediments appropriate steps will be taken to minimize the redistribution of contaminants into the Branch River by installing silt barriers or using other appropriate engineering controls.

XIII. STATE ROLE

The Rhode Island Department of Environmental Management has reviewed the various alternatives and has indicated its support for the selected remedy. The State has also reviewed the Remedial Investigation, Risk Assessment and Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State Environmental laws and regulations. The State of Rhode Island concurs with the selected remedy for the Stamina Mills Site. A copy of the Declaration of Concurrence is attached as Appendix D.

APPENDIX A

FIGURES



SCALE 1:24 000

0 — 1 MILE

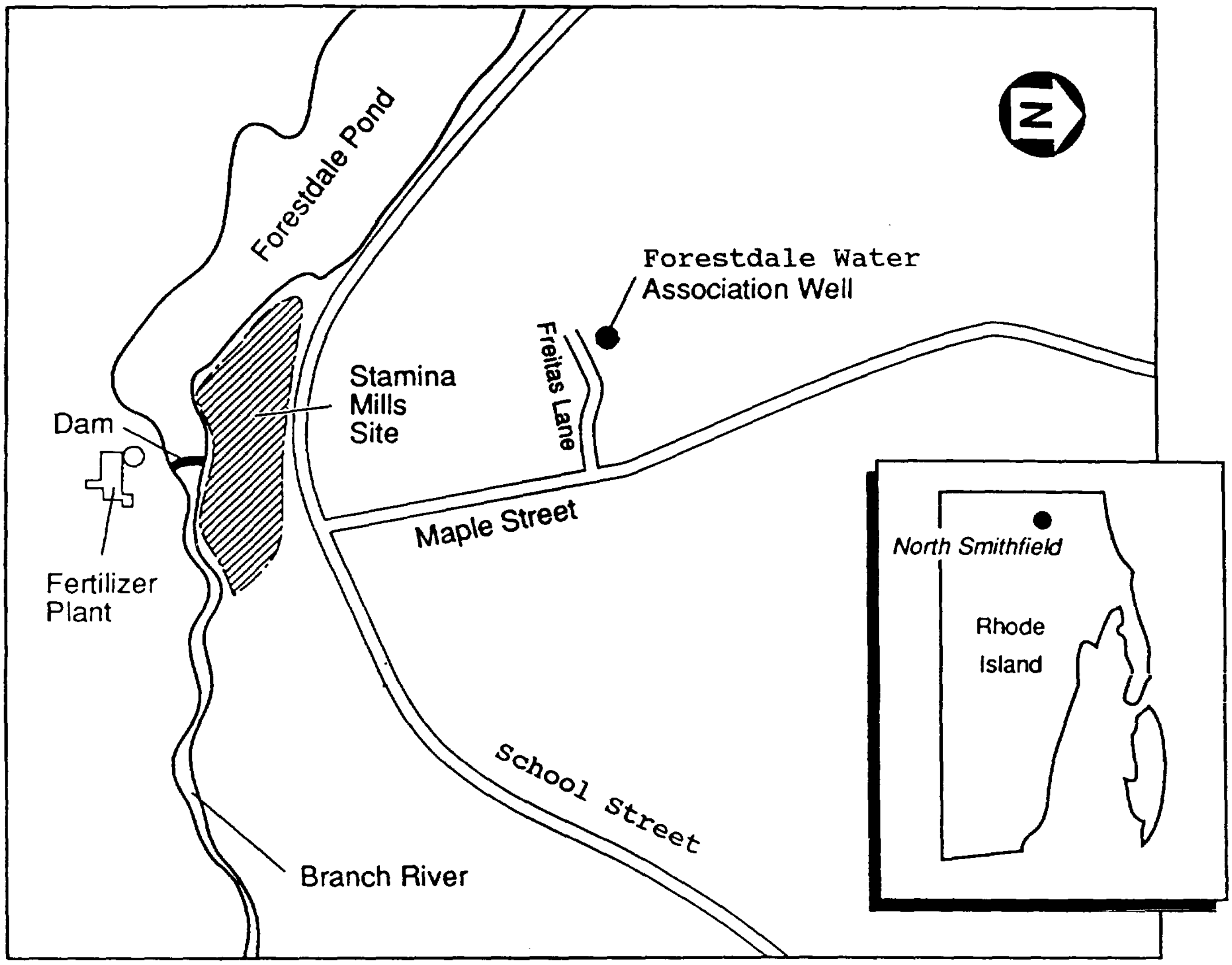
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

PROJECT: STAMINA MILLS REMEDIAL INVESTIGATION		GHR ENGINEERING ASSOCIATES, INC. 109 RHODE ISLAND ROAD LAKEVILLE, MA 02347
CLIENT: U.S. ARMY CORPS OF ENGINEERS		
TITLE: FIGURE 1 – STAMINA MILLS SITE LOCUS AND REMEDIAL INVESTIGATION STUDY AREA		
QUADRANGLE LOCATION	BLACKSTONE, MASS. – R.I. GEORGIAVILLE, R.I. QUADRANGLE NAME	PROJECT NUMBER 3108-027

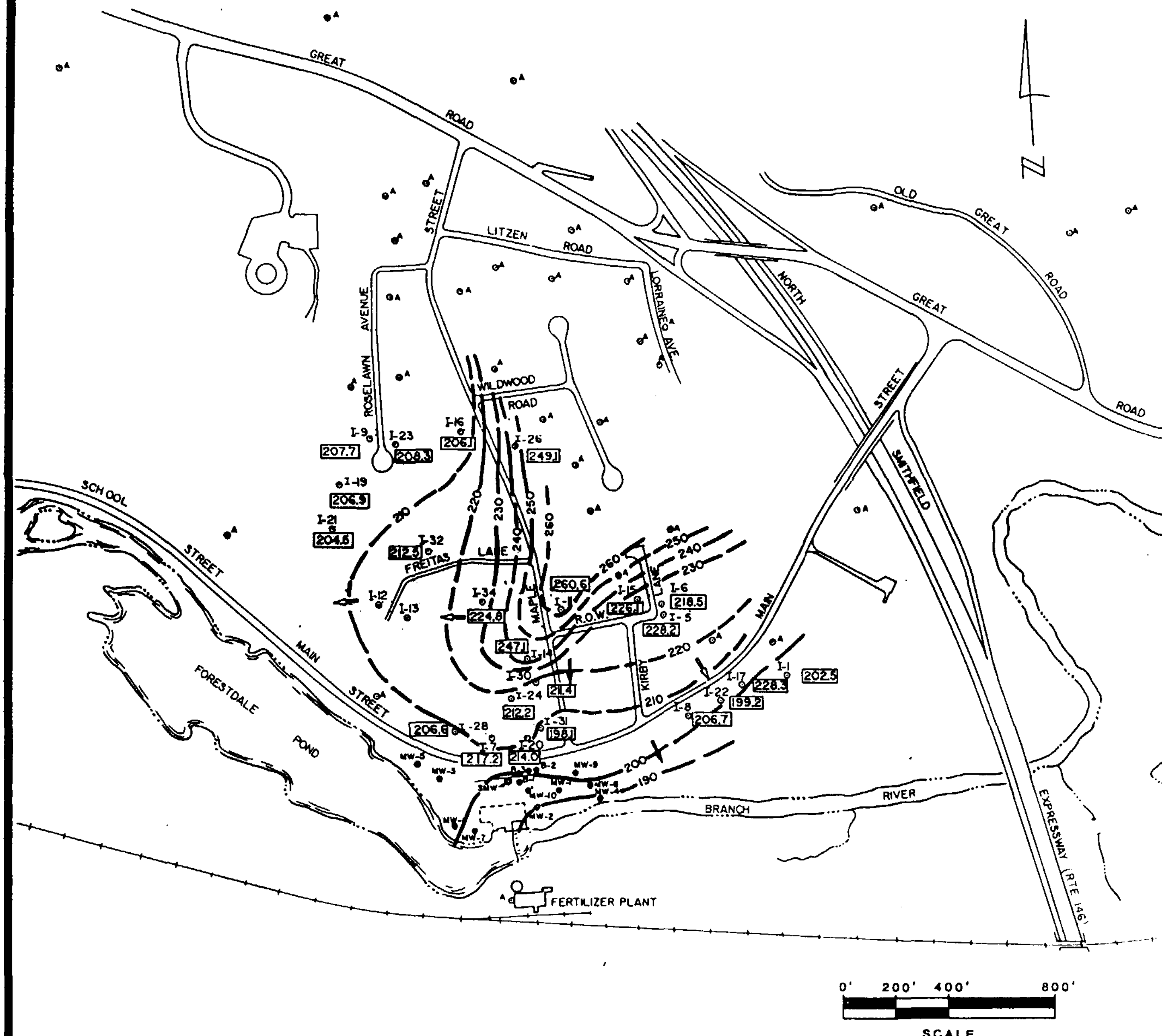
Figure 2
Stamina Mills Superfund Site Location Map



Legend

Stamina Mills Site

Drawing Not to Scale



NOTES:

1. GROUNDWATER ELEVATIONS ARE CALCULATED FROM WATER LEVEL MEASUREMENTS MADE IN SEPT. 15,1986 FLUCTUATIONS IN GROUNDWATER LEVELS MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE TIME MEASUREMENTS WERE MADE.
2. GROUNDWATER CONTOURS DEPICTED ARE BASED ON INTERPOLATIONS BETWEEN WIDELY SPACED EXPLORATIONS POINTS. ACTUAL SUBSURFACE CONDITIONS MAY VARY FROM THOSE SHOWN.
3. REFER TO SITE PLAN NO. 6 FOR ADDITIONAL NOTES AND LEGEND.
4. GROUNDWATER ELEVATIONS SHOWN REPRESENT PIEZOMETRIC LEVELS IN OPEN BEDROCK HOLES.
5. GROUNDWATER CONTOURS AND FLOW DIRECTION SHOWN ASSUME HOMOGENEOUS AND ISOTROPIC AQUIFER CONDITIONS AND STEADY STATE HORIZONTAL FLOW
6. PIEZOMETRIC LEVELS WERE DETERMINED IN SHALLOW (10-20 FEET) BEDROCK WELLS ON-SITE AND DEEP (450 FEET MAXIMUM) OPEN ROCK RESIDENTIAL WELLS
7. RESIDENTIAL WELLS SHOWN ARE WELLS FOR WHICH PERMISSION WAS GRANTED FOR SAMPLING. OTHER WELLS EXIST IN AREA.
8. REFER TO FIGURE 5-13 FOR ELEVATION OF GROUNDWATER FROM BEDROCK WELLS ON-SITE

LEGEND

206.1	GROUNDWATER ELEVATION
240	GROUNDWATER CONTOUR AND FLOW DIRECTION (CONTOUR DASHED, ARROW OPEN WHERE INFERRED)
I	INACTIVE WELL
A	ACTIVE WELL

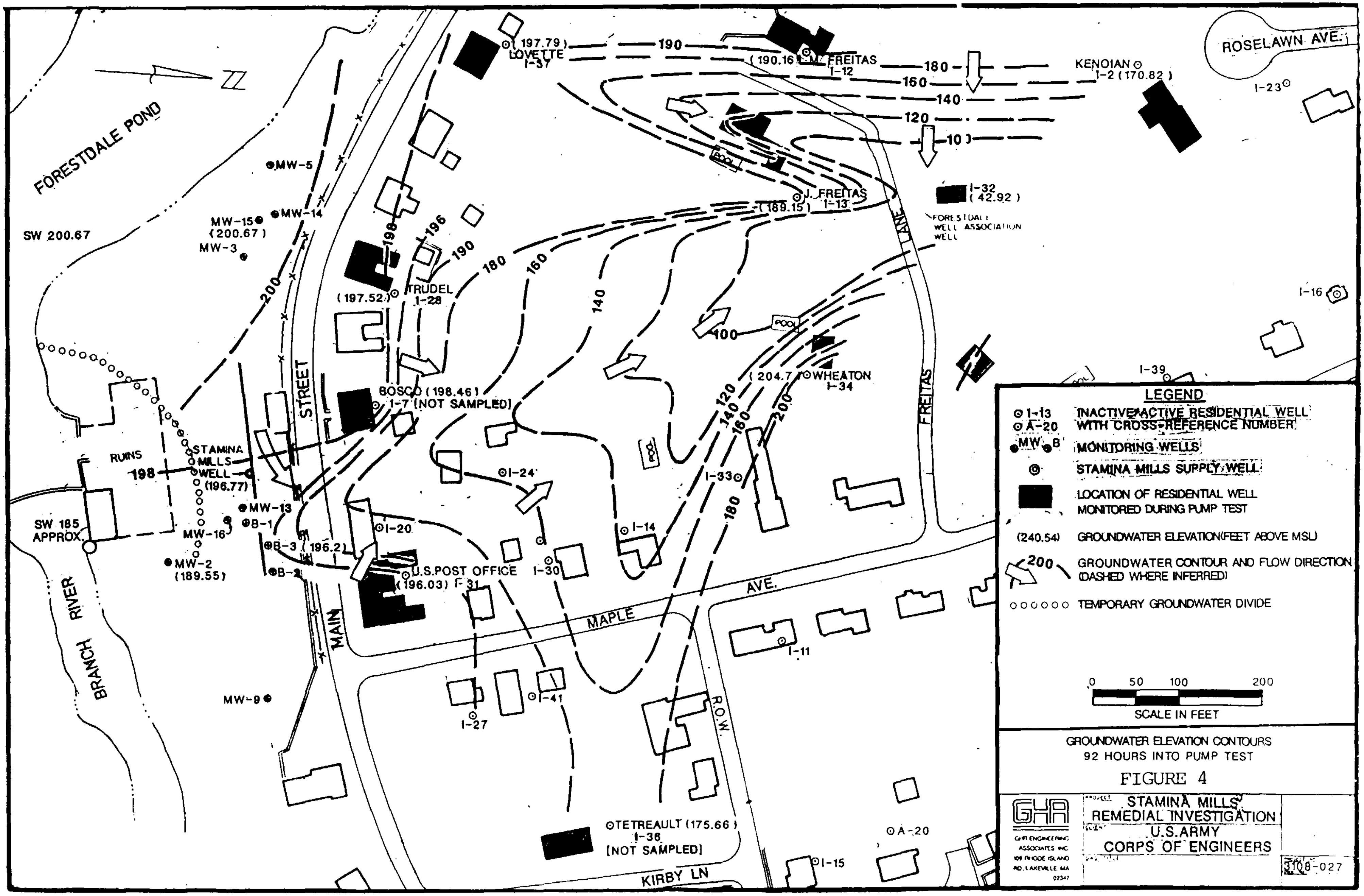
GHR
75 TARKILN HILL ROAD
NEW BEDFORD, MA 02745

DWN BY DD CHK BY WN
DSGN BY GM/MS APPD BY JG
SCALE 1" = 400'
DATE 12/19/86

PROJECT
STAMINA MILLS
REMEDIAL INVESTIGATION

CLIENT
FIGURE 3
U.S. ARMY CORPS OF ENGINEERS

DWG TITLE
REGIONAL GROUNDWATER CONTOUR ELEVATIONS IN BEDROCK (ELEVATIONS AS OF 9/15/86)



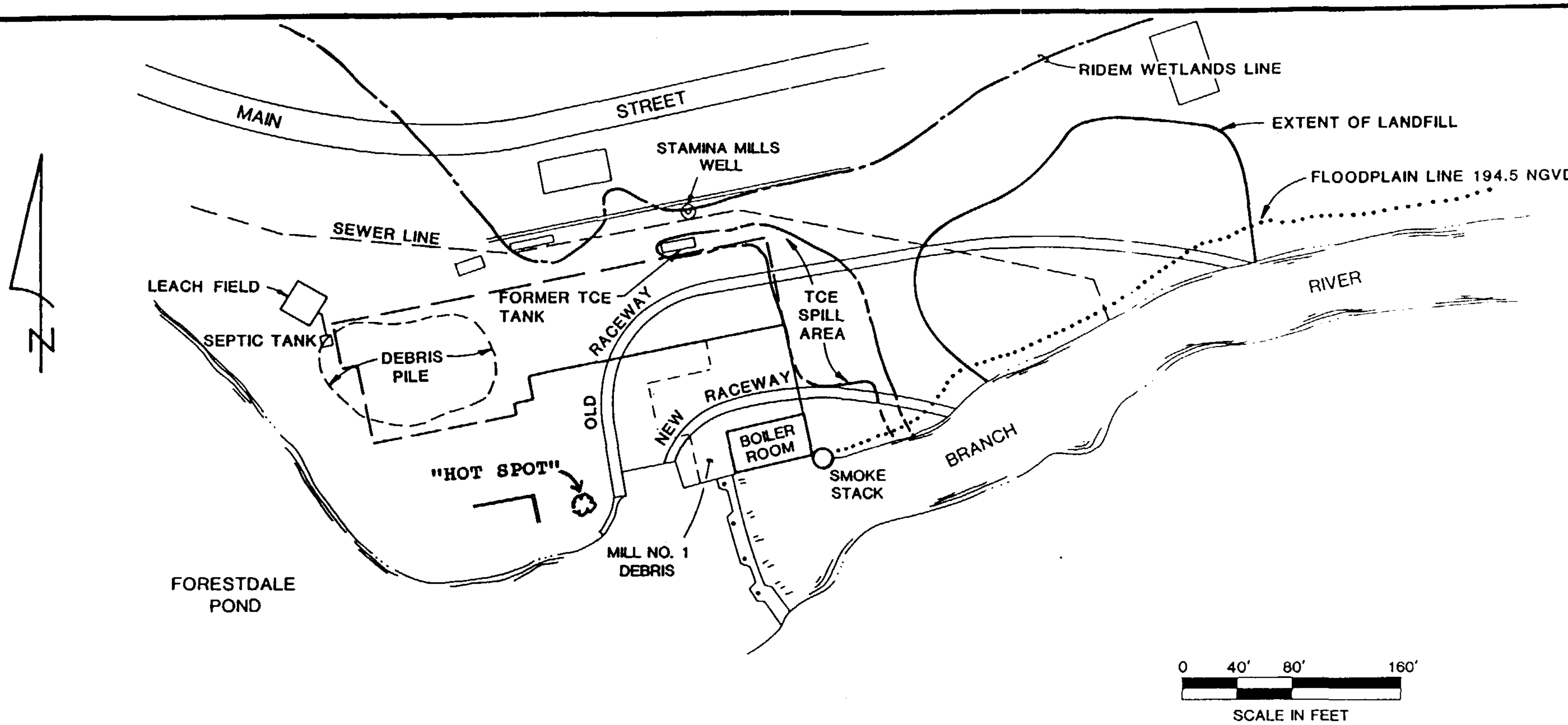
GROUNDWATER ELEVATION CONTOURS
92 HOURS INTO PUMP TEST

FIGURE 4

GHR ENGINEERING ASSOCIATES INC
109 RHODE ISLAND RD. LAKEVILLE MA 02347

STAMINA MILLS REMEDIAL INVESTIGATION
U.S.ARMY CORPS OF ENGINEERS

3108-027

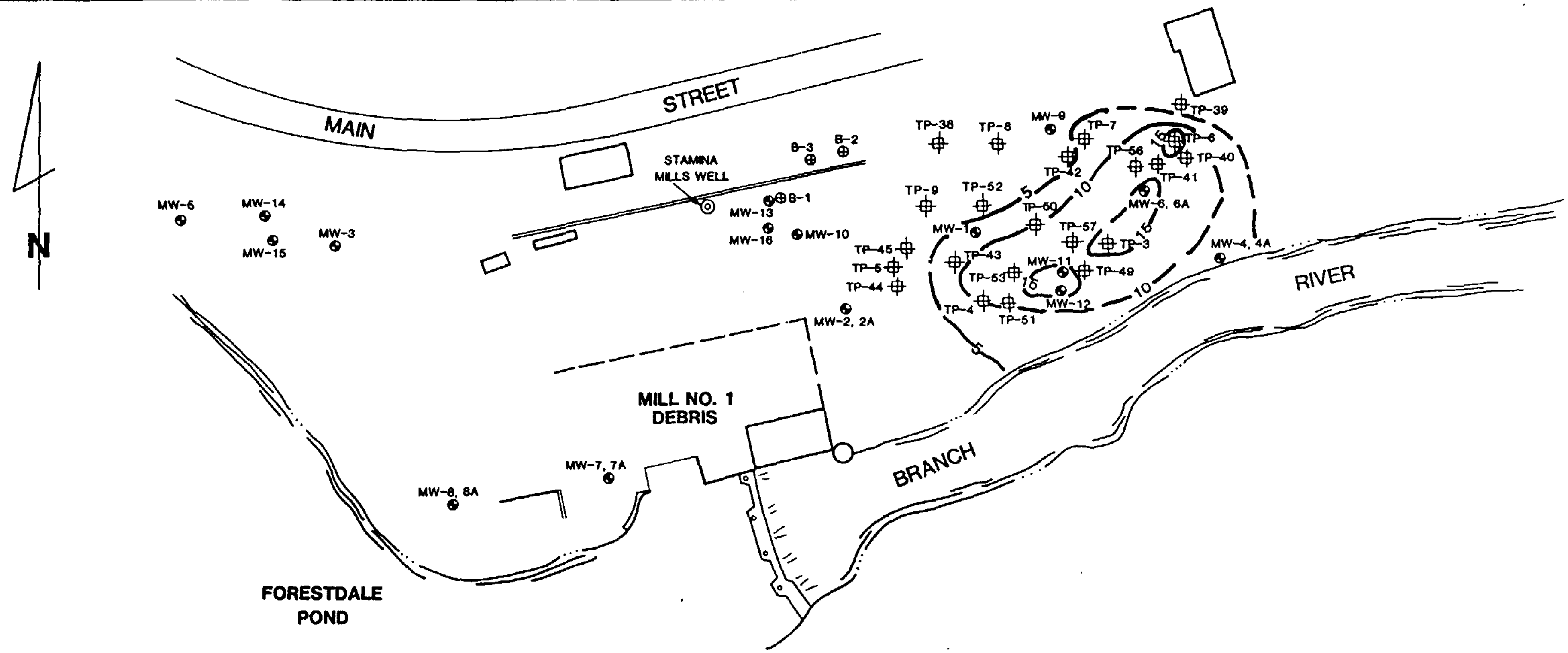


GHR ENGINEERING ASSOCIATES, INC.
109 RHODE ISLAND RD., LAKEVILLE, MA 02347

DRAWING TITLE
FIGURE 5
STAMINA MILLS SITE FEATURES

PROJECT
STAMINA MILLS
FEASIBILITY STUDY REPORT

CLIENT
U.S. ARMY CORPS OF ENGINEERS



NOTES:

1. THICKNESS OF LANDFILL DEBRIS DETERMINED FROM VISUAL OBSERVATIONS MADE DURING TEST PIT EXCAVATIONS AND MONITORING WELL INSTALLATIONS.
2. CONTOURS OF LANDFILL DEBRIS THICKNESS ARE BASED UPON WIDELY SPACED POINTS. ACTUAL SUBSURFACE CONDITIONS MAY VARY FROM THOSE SHOWN.
3. THICKNESS OF LANDFILL DEBRIS BASED ON TOTAL THICKNESS OF DEBRIS AT EACH POINT REGARDLESS OF DEPTH OF DEBRIS.
4. ONLY TEST PITS IN VICINITY OF LANDFILL ARE SHOWN, REFER TO SITE PLAN SP-6 FOR LOCATION OF ALL EXPLORATION AND SAMPLING POINTS.

LEGEND:

◎ STAMINA MILLS SUPPLY WELL

B-1 ⊕ MONITORING WELL INSTALLED BY GZA, 1982.

MW-12 ⊕ MONITORING WELL INSTALLED BY GHR, 1986 AND 1988. REFER TO BORING LOGS IN APPENDIX E FOR LANDFILL DEBRIS THICKNESSES

TP-57 ⊕ TEST PIT EXCAVATED DURING REMEDIAL INVESTIGATION REFER TO TEST PIT LOGS IN APPENDIX A FOR LANDFILL DEBRIS THICKNESS

—10— — CONTOUR OF THICKNESS OF LANDFILL DEBRIS (DASHED WHERE INFERRED) REFER TO TEST PIT LOGS IN APPENDIX A FOR LANDFILL DEBRIS THICKNESSES

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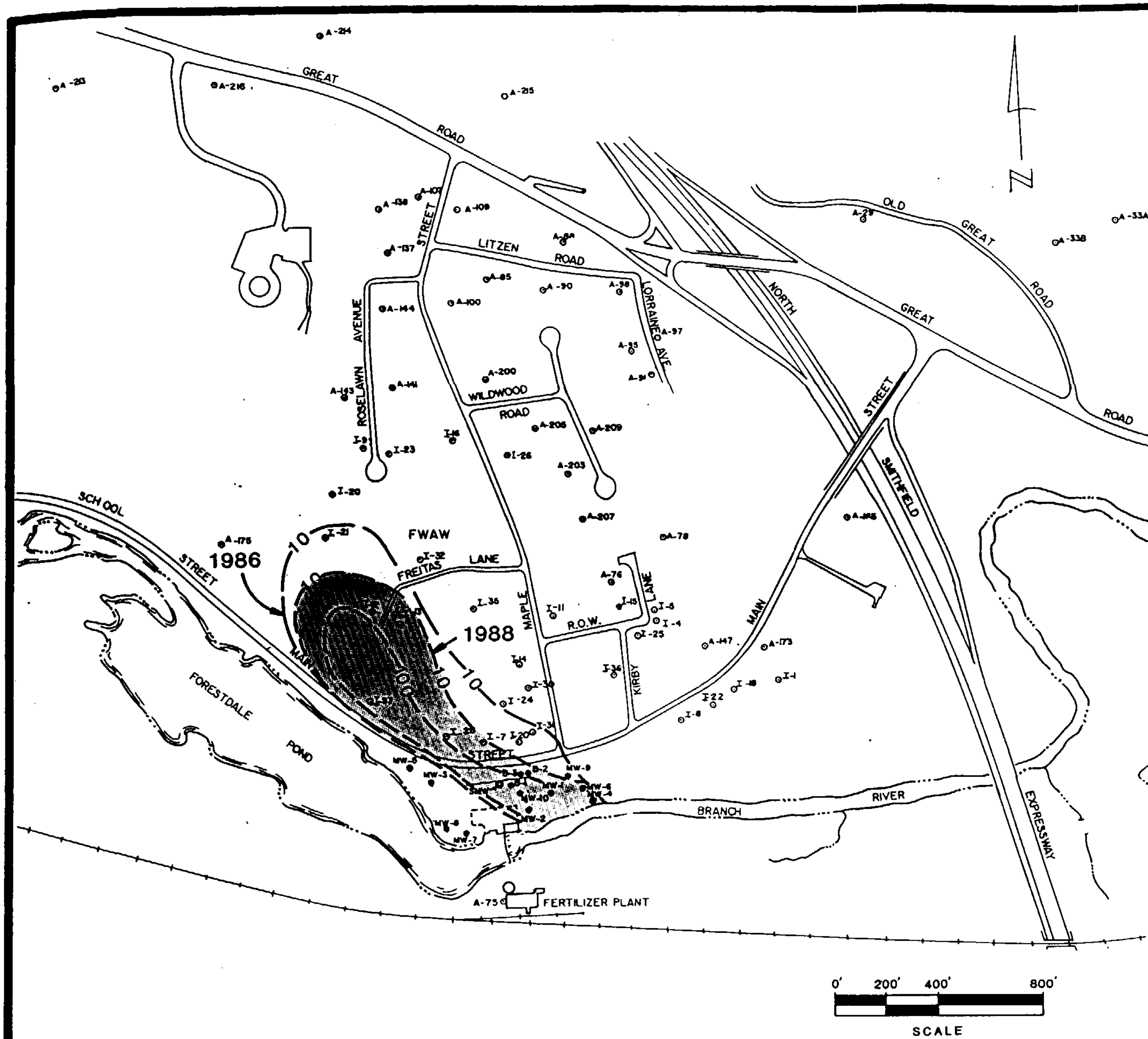
DRAWING TITLE **FIGURE 6**
AREAL EXTENT AND THICKNESS OF LANDFILL DEBRIS
STAMINA MILLS SITE
NORTH SMITHFIELD, RHODE ISLAND

PROJECT
STAMINA MILLS
REMEDIAL INVESTIGATION

CLIENT
U.S. ARMY CORPS OF ENGINEERS



LEGEND

- I-13 ○ IN ACTIVE RESIDENTIAL WELLS
- FWAW I-32 ● FORESTDALE WATER ASSOCIATION
- A-200 ● ACTIVE RESIDENTIAL WELLS
- 100 — CONTOUR OF TCE IN GROUNDWATER (ppb) (DASHED WHERE INFERRED)

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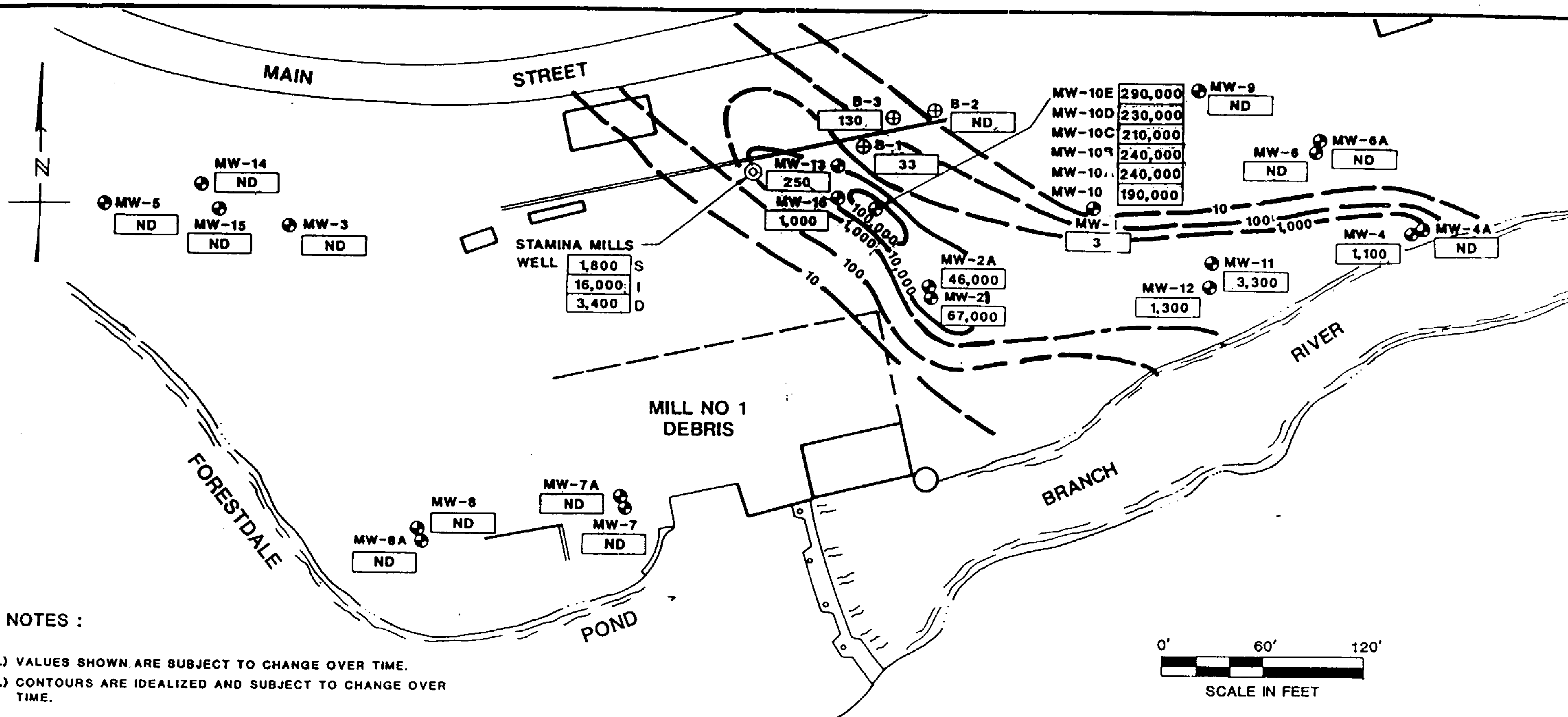
DWG TITLE: FIGURE 7
LOCATION OF OFF-SITE GROUNDWATER CONTAMINANT PLUME 1986 & 1988

PROJECT: STAMINA MILLS FEASIBILITY STUDY REPORT

CLIENT: U.S. ARMY CORPS OF ENGINEERS



NOTES :

1.) VALUES SHOWN ARE SUBJECT TO CHANGE OVER TIME.

2.) CONTOURS ARE IDEALIZED AND SUBJECT TO CHANGE OVER TIME.

3.) CONTOURS AND INTERPOLATED BETWEEN DATA POINTS INFERRED IN OTHER AREAS.

4.) TCE CONCENTRATIONS ARE PRESENTED IN ORDER OF DEPTH BELOW GROUND SURFACE, FROM MW-10E (48 FEET) TO MW-10 (172 FEET). SAMPLER INTERVAL IS APPROXIMATELY 25 FEET. SAMPLES FROM STAMINA MILLS WELL ARE AS FOLLOWS : THE SHALLOW SAMPLE (S) IS AT THE WATER, INT. SAMPLE (I), 100 FEET BELOW THE WATER TABLE, THE DEEP SAMPLE (D), AT BOTTOM OF WELL (360 FEET).

5.) TCE CONCENTRATIONS IN GROUNDWATER FROM MW-1 THROUGH MW-10E, B-1 THROUGH B-3 AND THE STAMINA MILLS WELL ARE BASED ON DATA COLLECTED IN MARCH 1988. TCE CONCENTRATIONS FOR WELLS MW-11 THROUGH MW-16 AND ALL SURFACE WATER SAMPLES ARE BASED ON ANALYTICAL DATA COLLECTED IN JUNE 1988.

LEGEND:

⊕ B-2	MONITORING WELL INSTALLED BY GZA (1982)
MW-4 100,000	MONITORING WELL INSTALLED BY GHR (1986) WITH CONCENTRATIONS OF TCE IN GROUNDWATER (ppb)
ND	NOT DETECTED
100	CONTOUR OF TCE CONCENTRATIONS, (ppb) DASHED WHERE INFERRED

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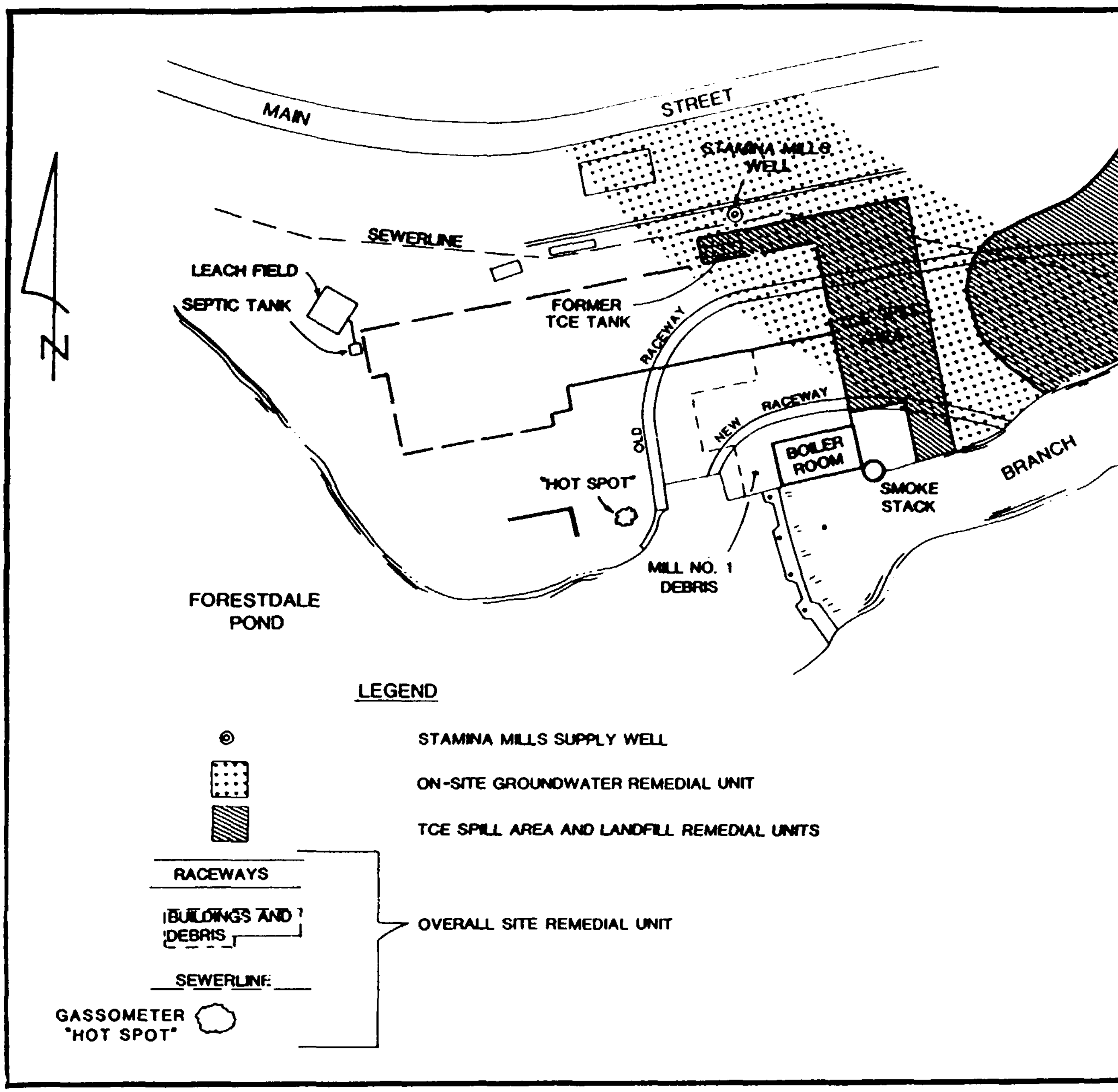
109 RHODE ISLAND RD., LAKEVILLE, MA 02347

DRAWING TITLE
FIGURE 8
AREAL DISTRIBUTION OF TCE IN GROUNDWATER IN 1988

PROJECT
STAMINA MILLS FEASIBILITY STUDY REPORT

CLIENT
U.S. ARMY CORPS OF ENGINEERS



GHR ENGINEERING ASSOCIATES, INC
109 RHODE ISLAND RD. LAKEVILLE, MA 02347

DRAWING TITLE FIGURE 9

REMEDIAL UNITS FOR THE STAMINA MILLS SITE NORTH SMITHFIELD, RHODE ISLAND

PROJECT

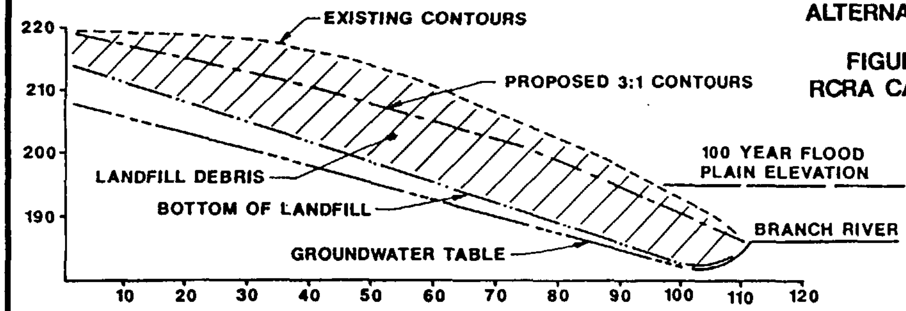
STAMINA MILLS FEASIBILITY STUDY REPORT

CLIENT

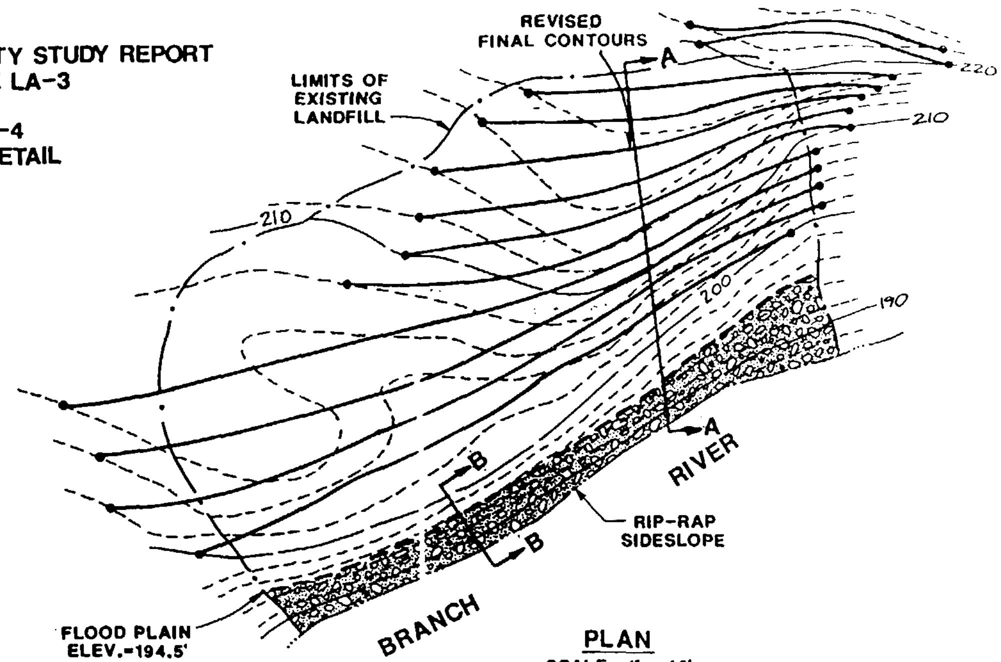
U.S. ARMY CORPS OF ENGINEERS

STAMINA MILLS FEASIBILITY STUDY REPORT
ALTERNATIVE LA-3

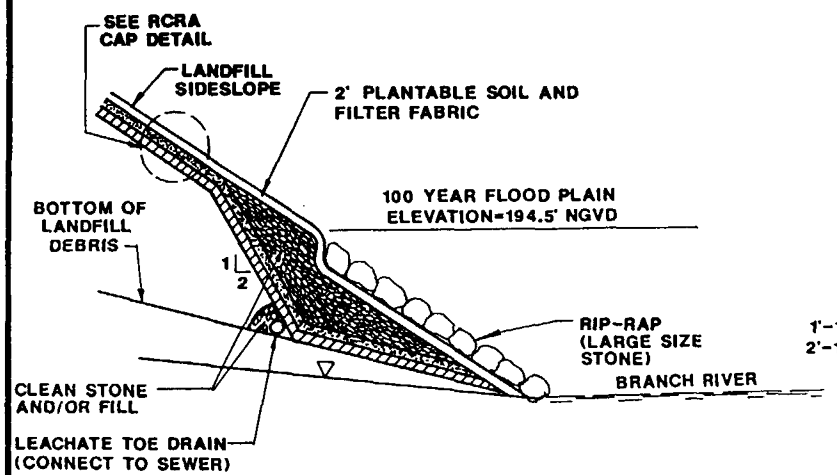
FIGURE 5-4
RCRA CAP DETAIL



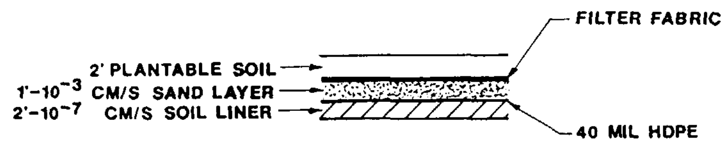
SECTION A-A
SCALE : 1" = 20'



PLAN
SCALE : 1" = 40'



SECTION B-B
NOT TO SCALE



RCRA CAP DETAIL
NOT TO SCALE

FIGURE 10

GHR ENGINEERING ASSOCIATES, INC.
109 RHODE ISLAND RD. LAKEVILLE, MA 02347

APPENDIX B

TABLES

TABLE 1: SUMMARY OF CONTAMINANTS OF CONCERN IN GROUND WATER ZONE 1

CONTAMINANTS OF CONCERN	AVERAGE CONCENTRATION (PPB)	MAXIMUM DETECTION (PPB)	FREQUENCY OF DETECTION
Arsenic	12.2	13.3	2/25
Chloroform	15.5	25	2/24
1,1-Dichloroethylene	20.7	36	3/24
Phthalate,bis(ethyl-hexyl)	98.9	420	9/22
Tetrachloroethylene	4.0	5.0	2/24
Trichloroethylene	171219.4	850000.0	34/34
Vinyl chloride	5.5	6.0	2/24
Barium	54.4	169	25/25
Copper	7.2	12	6/25
1,2-Dichloroethylene	7911.2	31000.0	15/24
Lead	3.4	10.5	7/25
Selenium	3.7	5	2/25
Zinc	46.5	270	22/24

TABLE 1A:
CARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF GROUND WATER Zone 1

CONTAMINANT OF CONCERN	CONCENTRATION (UG/1) AVG	MAX	CANCER POTENCY FACTOR $MG/KG/d^{-1}$	EXPOSURE FACTOR 1/MG/d	RISK ESTIMATE AVG	RISK ESTIMATE MAX
Arsenic	12.2	13.3	1.75E+00	2.9E-02	6E-04	7E-04
Chloroform	15.5	25	6.10E-03	2.9E-02	3E-06	5E-06
1,1 Dichloroethylene	20.7	36	6.00E-01	2.9E-02	4E-04	1E-01
Phthalate,bis(2 ethyl-hexyl)	98.9	420	1.40E-02	2.9E-02	1E-04	6E-04
Dieldrin	0.4	0.4	1.60E+01	2.9E-02	3E-04	4E-04
Tetrachloroethylene	4.0	5.0	5.10E-02	2.9E-02	7E-06	9E-06
Trichloroethylene	171219.4	850000.0	1.10E-02	2.9E-02	6E-02	2E-01
Vinyl chloride	5.5	6.0	2.30E+00	2.9E-02	4E-04	4E-04

TABLE 1B: NONCARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF GROUND WATER ZONE 1

CONTAMINANTS OF CONCERN	CONCENTRATION (UG/1) AVG	MAX	REFERENCE DOSE MG/KG/d	EXPOSURE FACTOR 1/KG/d	HAZARD INDEX AVG	HAZARD INDEX MAX	TOXICITY ENDOPOINT
Arsenic	12.2	13.3	1.00E-03	2.9E-02	5E-02	5E-02	Keratosis Hyperpigmen-tation
Chloroform	15.5	25	1.00E-02	2.9E-02	5E-02	8E-02	Liver lesions
1,1-Dichloro-ethylene	20.7	36	9.00E-03	2.9E-02	1E-01	3E-01	Liver lesions
Dieldrin	0.4	0.4	5.00E-05	2.9E-02	4E-01	5E-01	Liver lesions
Phthalate,bis-(2 ethylhexyl)	98.9	420.0	2.00E-02	2.9E-02	4E-01	2E+00	Liver
Tetrachloroethylene	4.0	5.0	1.00E--02	2.9E-02	2E-02	2E-02	Hepatotox-icity
Barium	54.4	169.0	5.00E-02	2.9E-02	3E-02	1E-01	Increased BP
Copper	7.2	12.0	1.30E+00	2.9E-02	6E-06	9E-06	GI distress
1,2-Dichloro-ethylene	7911.2	31000.0	2.00E-02	2.9E-02	5E+01	2E+02	Increased serum alk-alinephos-phatase
Lead	3.4	10.5	5.00E-02	2.9E-02	3E-02	1E-02	CNS effects
Selenium	3.7	5.0	2.00E-03	2.9E-02	2E-02	2E-02	Dermatitis
Zinc	46.5	270.0	2.00E-01	2.9E-02	9E-03	5E-02	Anemia

Hazard Index Sums	Average	Reasonable Maximum Exposure
Liver Lesions	5E+01	2E+02
Increased BP	5E-02	5E-02
CNS Effects	3E-02	1E-01
Dermatitis	2E-02	2E-02
Anemia	9E-03	5E-02

TABLE 2: SUMMARY OF CONTAMINANTS OF CONCERN IN GROUND WATER (ZONE 2 LANDFILL AREA)

CONTAMINANTS OF CONCERN	AVERAGE CONCENTRATION (PPB)	MAXIMUM DETECTION (PPB)	FREQUENCY OF DETECTION
Arsenic	9.0	10.0	2/10
Dieldrin	1.2	4.0	4/8
Phthalate,bis (2ethylhexyl)	80.5	100.0	2/7
Trichloroethylene	15101.7	100000.0	7/12
Vinyl chloride	131.7	220.0	3/12
Barium	103.2	187.0	6/10
Copper	23.9	56.0	8/10
Cresol,p-	8.0	8.0	1/10
Dichloroethylene, 1,2-	2922.5	7100.0	4/12
Lead	13.8	29.0	7/10
Nickel	29.2	29.2	1/5
Selenium	5.4	5.4	1/10
Zinc	187.9	710.0	5/5

TABLE 2A:
CARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF GROUND WATER Zone 1

CONTAMINANT OF CONCERN	CONCENTRATION (UG/1) AVG	MAX	CANCER POTENCY FACTOR $MG/KG/d^{-1}$	EXPOSURE FACTOR 1/MG/d	RISK ESTIMATE AVG	RISK ESTIMATE MAX
Arsenic	12.2	13.3	1.75E+00	2.9E-02	5E-04	5E-04
Dieldrin	1.2	4.0	1.60E+01	2.9E-02	1E-03	3E-03
Phthalate, bis(2 ethylhexyl)	80.5	100.0	1.40E-02	2.9E-02	8E-05	1E-04
Trichloroethylene	15101.7	100000.0	1.10E-02	2.9E-02	5E-03	3E-02
Vinyl chloride	131.7	220.0	2.30E+00	2.9E-02	9E-03	1E-02

TABLE 2B
NONCARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF GROUND WATER

CONTAMINANTS OF CONCERN	CONCENTRATION (UG/1) AVG	MAX	REFERENCE DOSE MG/KG/d	EXPOSURE FACTOR 1/KG/d	HAZARD INDEX AVG	HAZARD INDEX MAX	TOXICITY ENDOPOINT
Arsenic	9.0	10.0	1.0E-03	2.9E-02	4E-02	4E-02	Keratosis Hyperpig-mentation
Dieldrin	1.2	4.0	5.0E-05	2.9E-02	1E+00	4E+00	Liver lesions
Phthalate, bis (2 ethylhexyl)	80.5	100.0	2.0E-02	2.9E-02	3E-01	4E-01	Liver effects
Barium	103.2	187.0	5.0E-02	2.9E-02	6E-02	1E-02	Increased BP
Copper	23.9	56.0	1.3E+00	2.9E-02	2E-05	4E-05	GI distress
Cresol,p	8.0	8.0	5.0E-02	2.92E-02	5E-03	5E-03	Reduced body weight
1,2-Dichloro-ethylene	2922.5	7100.0	2.0E-02	2.9E-02	2E+01	5E+01	Liver effects
Lead	13.8	29.0	2.0E-01	2.9E-02	1E-01	3E-01	CNS effects
Nickel	29.2	29.0	2.0E-02	2.9E-02	4E-02	4E-02	Reduced body and organ wt.
Selenium	5.4	5.4	2.0E-03	2.9E-02	2E-02	2E-02	Dermatitis
Zinc	187.9	710.0	2.0E-01	2.9E-02	4E-02	1E-01	Anemia
Chromium	128.0	190.0	5.0E-03	2.9E-02	7.4E-01	1E+00	Liver lesions

Table 2B Cont'd

Hazard Index Sums	Average	Reasonable Maximum Exposure
Liver Effects	2E+00	5E+01
Keratosis	4E-02	4E-02
Increased BP	6E-02	1E-01
GI Distress	2E-05	4E-05
Reduced body weight	4E-02	4E-02
CNS Effects	1E-01	3E-01
Dermatitis	2E-02	2E-02
Anemia	4E-02	1E-01

TABLE 3: SUMMARY OF CONTAMINANTS OF CONCERN IN GROUND WATER ZONE 3

CONTAMINANTS OF CONCERN	AVERAGE CONCENTRATION (PPB)	MAXIMUM DETECTION (PPB)	FREQUENCY OF DETECTION
Benzo(a)anthracene	3.0	3.0	1/20
Benzo(b)flouoranthene	7.0	7.0	1/20
Phthalate,bis(2 ethylhexyl)	41.0	41.0	1/12
Trichloroethylene	20.0	130.0	5/25
Baruim	49.0	178.0	12/20
Copper	21.4	57.0	5/20
Lead	25.1	77.0	7/20
Nickel	16.4	19.8	2/12
Silenium	11.2	14.0	2/20
Zinc	31.0	53.9	12/13

TABLE 3A:
CARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF GROUND WATER Zone 1

CONTAMINANT OF CONCERN	CONCENTRATION (UG/1) AVG	CONCENTRATION (UG/1) MAX	CANCER POTENCY FACTOR $MG/KG/d^{-1}$	EXPOSURE FACTOR 1/MG/d	RISK ESTIMATE AVG	RISK ESTIMATE MAX
Benzo(a)anthracene	3.0	3.0	1.20E+01	2.9E-02	1E-01	1E-01
Benzo(b)fluoranthene	7.0	7.0	1.20E+01	2.9E-02	7E-01	7E-01
Phthalate, bis(2-ethylhexyl)	41.0	41.0	1.40E-02	2.9E-02	4E-05	4E-05
Trichloroethylene	20.0	130.0	1.10E-02	2.9E-02	7E-06	4E-05

TABLE 3B:
NONCARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF GROUND WATER

CONTAMINANTS OF CONCERN	CONCENTRATION (UG/1) AVG	MAX	REFERENCE DOSE MG/KG/d	EXPOSURE FACTOR 1/KG/d	HAZARD INDEX AVG	HAZARD INDEX MAX	TOXICITY ENDOPOINT
Phthalate, bis-2 ethylhexyl	41.0	41.0	2.00E-02	2.9E-02	2E-02	2E-01	Liver effects
Barium	49.0	178.0	5.00E-02	2.9E-02	3E-02	1E-01	Increased BP
Copper	21.4	57.0	1.3E+00	2.9E-02	2E-05	4E-05	GI Distress
Lead	25.1	77.0	2.00E-01	2.9E-02	3E-01	8E-01	CNS effects
Nickel	16.4	19.8	2.00E-02	2.9E-02	2E-02	3E-02	Reduced body weight
Selenium	11.2	14.0	2.00E-03	2.9E-02	5E-02	6E-02	Dermatitis
Zinc	31.0	53.9	2.00E-01	2.9E-02	6E-03	1E-02	Anemia

Hazard Index Sums	**Average**	**Reasonable Maximum Exposure**
Liver effects	2E-01	2E-01
Increased BP	3E-02	1E-01
GI distress	2E-05	4E-05
CNS effects	3E-01	8E-01
Reduced body wt.	2E-02	3E-02
Dermatitis	5E-02	6E-02
Anemia	6E-03	1E-02

TABLE 4:SUMMARY OF CONTAMINANTS OF CONCERN IN SHALLOW SOILS (ZONE 2 LANDFILL AREA)

CONTAMINANTS OF CONCERN	AVERAGE CONCENTRATION (PPB)	MAXIMUM DETECTION (PPB)	FREQUENCY OF DETECTION
Arsenic	7262.5	49000.0	15/20
Benzo(a)anthracene	1329.3	5000.0	15/20
Benzo(a)pyrene	1246.1	4900.0	15/20
Benzo(a)fluoranthene	2092.1	8300.0	15/20
Chrysene	1314.8	5100.0	16/20
Dibenzo(a,h)anthracene	277.7	840.0	7/20
Dieldrin	1892.0	10750.0	17/19
Phthalate,bis (2 ethylhexyl)	173.4	240.0	5/16
Trichloroethylene	24.8	98.0	14/31
Barium	61356.7	247000.0	20/20
Copper	167748.9	213000.0	20/20
Cresol,p	1292.2	4100.0	4/20
Dichloroethylene	12.2	25.0	5/31
Lead	93904.4	457000.0	20/20
Nickel	9313.6	20000.0	14/20
Selenium	800	800	1/20
Zinc	76144.4	244000.0	20/20

TABLE 4A:
CARCINOGENIC RISKS FOR CHILDREN EXPOSED TO SHALLOW SOILS
Zone 2

CONTAMINANT OF CONCERN	CONCENTRATION (UG/1) AVG	CONCENTRATION (UG/1) MAX	CANCER POTENCY FACTOR $MG/KG/d^{-1}$	RISK ESTIMATE AVG	RISK ESTIMATE MAX
Arsenic	7262.5	49000.0	1.75E+00	1E-07	1E-06
Benzo(a)anthracene	1329.3	5000.0	1.20E+01	4E-07	3E-06
Benzo(a)pyrene	1246.1	4900.0	1.20E+01	3E-07	3E-06
Benzo(a)fluoranthene	2092.1	8300.0	1.20E+01	6E-01	4E-06
Chyrsene	1314.8	5100.0	1.20E+01	4E-07	3E-06
Dibenzo(a,h) anthracene	277.7	840.0	1.20E+01	7E-08	5E-07
Dieldrin	1892.0	10750.0	1.60E+01	7E-07	8E-06
Phthalate,bis (2,ethylhexyl)	173.4	240.0	1.40E-02	5E-11	2E-10
Trichloroethylene	24.8	98.0	1.10E-02	3E-11	3E-10

TABLE 4B:
NONCARCINOGENIC RISKS FOR CHILDREN EXPOSED TO SHALLOW SOILS ZONE 2

CONTAMINANTS OF CONCERN	CONCENTRATION (UG/1) AVG	CONCENTRATION (UG/1) MAX	REFERENCE DOSE MG/KG/d	HAZARD INDEX AVG	HAZARD INDEX MAX	TOXICITY ENDOPOINT
Arsenic	7262.5	49000.0	1.00E-03	5E-03	3E-02	Keratosis Hyperpigmentation
Dieldrin	1892.0	10750.0	5.00E-05	5E-01	3E+00	Liver lesions
Phthalate,bis (2 ethylhexyl)	173.4	240.0	2.00E-02	1E-04	2E-04	Liver
Barium	61356.7	247000.0	5.00E-02	6E-03	2E-02	Increased BP
Copper	167748.9	213000.0	7.40E-05	2E-05	3E-04	GI irritation
Cresol,p	1292.2	4100.0	5.00E-02	3E-04	1E-03	Reduced body weight
1,2-Dichloroethylene	12.2	25.0	2.00E-02	9E-05	2E-04	Increased serum alkaline phosphatase
Lead	93904.4	457000.0	5.70-04	5E-02	2E-01	CNS effects
Nickel	9313.6	20000.0	2.00E-02	2E-03	5E-03	Reduced body weight
Selenium	800.0	800.0	3.00E-03	6E-04	6E-04	Dermatitis
Zinc	76144.4	244000.0	2.00E-01	3E-03	9E-03	Anemia

Hazard Index Sums	**Average**	**Reasonable Maximum Exposure**
Liver Effects	5E-01	3E+00
Reduced body weight	2E-03	6E-03
Keratosis	5E-03	3E-02
Increased BP	6E-03	2E-02
GI irritation	2E-05	3E-04
Anemia	3E-03	9E-03
Dermatitis	6E-04	6E-04

TABLE 5:SUMMARY OF CONTAMINANTS OF CONCERN IN DEEP SOIL (ZONE 2 LANDFILL AREA)

CONTAMINANTS OF CONCERN	AVERAGE CONCENTRATION (PPB)	MAXIMUM DETECTION (PPB)	FREQUENCY OF DETECTION
Arsenic	7093.1	71000.0	38/39
Benzo(a)anthracene	1005.9	3200.0	19/38
Benzo(b)fluoranthene	1384.3	8300.0	18/39
Chloroform	8.5	15.0	2/38
Chrysene	1124.9	34.00.0	21/38
Dibenzo(a,h)anthracene	247.5	1100.0	11/39
Dieldrin	1462.8	17000.0	17/33
Phthlate bis (2 ethylhexyl)	3132.2	41000.0	16/39
Tetrachloroethylene	2.5	3	2/49
Trichloroethylene	1207.7	51000.0	24/50
Barium	99859.9	964000.0	38/39
Copper	59167.6	452000.0	39/39
Cresol,p	7051.6	100000.0	10/39
Dichloroethylene 1,2-	82.5	980.0	11/50
Lead	82010.8	1380000.0	39/39
Nickel	19207.1	252000.0	31/39
Selenium	1752.5	2700.0	3/39
Zinc	108970.6	1900000.0	39/39

TABLE 5A:
CARCINOGENIC RISKS FOR CHILDREN EXPOSED TO DEEP SOILS
ZONE 2

CONTAMINANT OF CONCERN	CONCENTRATION (UG/1) AVG	MAX	CANCER POTENCY FACTOR $MG/KG/d^{-1}$	RISK ESTIMATE AVG	RISK ESTIMATE MAX
Arsenic	7093.1	71000.0	1.75E+00	1E-07	2E-06
Benzo(a)anthracene	1005.9	3200.0	1.20E+01	3E-07	2E-06
Benzo(a)pyrene	1180.7	4500.0	1.20E+01	3E-07	2E-06
Benzo(b)fluoranthene	1384.3	8300.0	1.20E+01	4E-07	4E-06
Chloroform	8.5	15.0	6.10E-03	7E-12	2E-11
Dibenzo(a,h)anthracene	247.5	1100.0	1.20E+01	7E-08	6E-07
Dieldrin	1462.8	17000.0	1.60E+01	5E-07	1E-05
Phthalate,bis (2 ethylhexyl)	3132.2	41000.0	1.40E-02	1E-09	3E-08
Tetrachlorethylene	2.5	3.0	5.1E-02	2E-11	4E-11
Trichloroethylene	1207.7	51000.0	1.10E-02	2E-09	1E-07

TABLE 5B:
NONCARCINOGENIC RISKS FOR CHILDREN EXPOSED TO DEEP SOILS ZONE 2

CONTAMINANTS OF CONCERN	CONCENTRATION (UG/1) AVG	CONCENTRATION (UG/1) MAX	REFERENCE DOSE MG/KG/d	HAZARD INDEX AVG	HAZARD INDEX MAX	TOXICITY ENDOPOINT
Arsenic	7093.1	71000.0	1.00E-03	5E-03	5E-02	Keratosis
Chloroform	8.5	15.0	1.00E-02	6E-05	1E-04	Liver lesions
Dieldrin	1462.8	17000.0	5.00E-05	4E-01	5E+00	Liver lesions
Phthalate,bis (2 ethylhexyl)	3132.2	41000.0	2.00E-02	2E-03	3E-02	Liver effects
Tetrachloroethylene	2.5	3.0	1.00E-02	2E-05	2E-05	Liver effects
Barium	99859.9	964000.0	5.00E-02	1E-02	1E-01	Increased BP
Copper	59167.6	452000.0	7.40E-05	8E-06	6E-05	GI distress
Cresol,p	7051.6	100000.0	5.00E-02	2E-03	3E-02	Reduced body wt.
1,2-Dichloro-ethylene	82.5	980.0	2.00E-02	6E-04	7E-03	Increased serum alkaline phos-phatase
Lead	82010.8	138000.0	5.70E-04	4E-02	7E-01	CNS effects
Nickel	19207.1	252000.0	2.00E-02	5E-03	6E-02	Reduced body wt.
Selenium	1752.5	2700.0	3.00E-03	1E-03	2E-03	Dermatitis
Zinc	108970.6	190000.0	2.00E-01	4E-03	7E-02	Anemia

Hazard Index Sums	**Average**	**Reasonable Maximum Exposure**
Liver Effects	4E-01	5E+00
Reduced Body Wt.	7E-03	9E-02
Keratosis	5E-03	5E-02
Increased BP	1E-02	1E-01
GI Distress	8E-06	6E-05
CNS Effects	4E-02	7E-01
Dermatitis	1E-03	2E-03
Anemia	4E-03	7E-02

TABLE 6:SUMMARY OF CONTAMINANTS OF CONCERN IN SHALLOW SOIL (ZONE 3 Other On Site Soil AREA)

CONTAMINANTS OF CONCERN	AVERAGE CONCENTRATION (PPB)	MAXIMUM DETECTION (PPB)	FREQUENCY OF DETECTION
Arsenic	4312.5	16000.0	16/21
Benzo(a)anthracene	850.2	4500.0	7/22
Benzo(a)pyrene	715.0	2900.0	7/22
Benzo(b)fluoranthene	1074.8	7500.0	9/22
Chloroform	27	27	1/37
Chrysene	659.9	3200.0	10/22
Dibenzo(a,h)anthracene	219.5	340.0	2/22
Phthalate,bis(2 ethyl-hexyl)	434.8	1600.0	7/20
Tetrachloroethylene	1.3	1.3	1/39
Trichloroethylene	11.6	32.0	9/40
Barium	245333.3	70000.0	20/22
Copper	24181.3	255000.0	21/21
Lead	102062.5	2340000.0	21/21
Nickel	9687.5	1600.0	6/21
Selenium	3123.0	3700.0	3/22
Zinc	32823.5	11600.0	22/22

TABLE 6A:
CARCINOGENIC RISKS FOR CHILDREN EXPOSED TO SHALLOW SOILS
ZONE 3

CONTAMINANT OF CONCERN	CONCENTRATION (UG/1) AVG	CONCENTRATION (UG/1) MAX	CANCER POTENCY FACTOR MG/KG/d-1	RISK ESTIMATE AVG	RISK ESTIMATE MAX
Arsenic	4312.5	16000.0	1.75E+00	6E-08	5E-07
Benzo(a)anthracene	850.2	450.0	1.20E+01	2E-07	2E-06
Benzo(a)pyrene	715.0	2900.0	1.20E+01	2E-07	2E-06
Benzo(b)fluoranthene	1074.8	7500.0	1.20E+01	2E-07	4E-06
Chloroform	27.0	27.0	6.10E-03	2E-11	4E-11
Chrysene	659.9	3200.0	1.20E+01	2E-07	2E-06
Dibenzo(a,h)anthracene	219.5	340.0	1.20E+01	6E-08	2E-07
Phthalate,bis (2 ethyl-hexyl)	434.8	1600.0	1.40E-02	1E-10	1E-09
Tetrachlorethylene	1.3	1.3	5.10E-02	8E-12	2E-11
Trichloroethylene	11.6	32.0	1.10E-02	2E-11	9E-11

TABLE 6B:
NONCARCINOGENIC RISKS FOR CHILDREN EXPOSED TO SHALLOW SOILS ZONE 3

CONTAMINANTS OF CONCERN	CONCENTRATION (UG/1) AVG	CONCENTRATION (UG/1) MAX	REFERENCE DOSE MG/KG/d	HAZARD INDEX AVG	HAZARD INDEX MAX	TOXICITY ENDOPOINT
Arsenic	4312.5	16000.0	1.00E-03	3E-03	1E-02	Keratosis
Chloroform	27.0	27.0	1.00E-02	2E-04	2E-04	Liver lesions
Phthalate,bis (ethylhexyl)	434.8	1600.0	2.00E-02	3E-04	1E-03	Liver effects
Tetrachloro-ethylene	1.3	1.3	1.00E-02	1E-05	1E-05	Liver effects
Barium	24533.3	70000.0	5.00E-02	2E-03	7E-03	Increased BP
Copper	24181.3	255000.0	7.40E-05	3E-06	3E-05	GI Distress
Lead	102062.5	2340000.0	5.70-04	5E-02	1E+00	CNS effects
Nickel	9687.5	16000.0	2.00E-02	2E-03	4E-03	Reduced body wt.
Selenium	3125.0	3700.0	3.00E-03	2E-03	3E-03	Dermatitis
Zinc	32823.5	116000.0	2.00E-01	1E-03	4E-03	Anemia

Hazard Index Sums	**Average**	**Reasonable Maximum Exposure**
Liver Effects	5E-04	1E-03
Keratosis	3E-03	1E-02
Increased BP	2E-03	7E-03
GI Distress	3E-06	3E-05
CNS Effects	5E-02	1E+00
Reduced body wt.	2E-03	4E-03
Dermatitis	2E-03	3E-03
Anemia	1E-03	4E-03

TABLE 7:SUMMARY OF CONTAMINANTS OF CONCERN IN SEDIMENT (ZONE 6 DOWNSTREAM)

CONTAMINANTS OF CONCERN	AVERAGE CONCENTRATION (PPB)	MAXIMUM DETECTION (PPB)	FREQUENCY OF DETECTION
Arsenic	1865.7	6200.0	8/10
Benzo(a)anthracene	2130.0	10070	13/16
Benzo(a)pyrene	2071.0	9160.0	12/16
Benzo(b)fluoranthene	1422.2	6500.0	10/16
Chloroform	110.5	202.0	2/15
Chrysene	2193.2	7860.0	14/16
Dibenzo(a,h)anthracene	505.0	1470.0	4/16
Dichloroethylene 1,1-	740.0	740.0	1/17
Dieldrin	425.7	1700.0	5/15
Trichloroethylene	129.1	920.0	9/17
Vinyl Chloride	170.5	290.0	2/17
Barium	33810.0	174000.0	12/13
Copper	27768.8	93000.0	10/10
Dichloroethylenes 1,2	114.2	230.0	7/17
Lead	27862.5	56000.0	10/10
Nickel	6225.0	9300.0	9/10
Zinc	90045.0	544000.0	13/13

TABLE 7A:
CARCINOGENIC RISKS FOR ADULTS EXPOSED TO SIDEMENTS VIA RISK
(ZONE 6) DOWNSTREAM OF SITE

CONTAMINANT OF CONCERN	CONCENTRATION (UG/1) AVG	CONCENTRATION (UG/1) MAX	CANCER POTENCY FACTOR MG/KG/d-1	RISK ESTIMATE AVG	RISK ESTIMATE MAX
Benzo(a)anthracene	2130.0	10070.0	1.20E+01	2E-03	9E-03
Benzo(a)pyrene	2071.0	9160.0	1.20E+01	2E-03	8E-03
Benzo(b)fluoranthene	1422.2	6500.0	1.20E+01	1E-03	6E-03
Chloroform	110.5	202.0	6.10E-03	5E-08	9E-08
Chrysene	2193.2	7860.0	1.20E+01	2E-03	7E-03
Dibenzo(a,h)anthracene	505.0	1470.0	1.20E+01	4E-04	1E-03
Dichloroethylene - 1,1	740.0	740.0	6.00E-01	3E-05	3E-05
Dieldrin	425.7	1700.0	1.60E+01	5E-04	2E-03
Trichloroethylene	129.1	920.0	1.10E-02	1E-07	7E-07
Vinyl chloride	170.5	290.0	2.30E+00	3E-05	5E-05

TABLE 7B:
NONCARCINOGENIC RISKS FOR ADULTS EXPOSED TO FISH VIA SEDIMENTS

CONTAMINANTS OF CONCERN	CONCENTRATION (UG/1) AVG	MAX	REFERENCE DOSE MG/KG/d	HAZARD INDEX AVG	MAX	TOXICITY ENDOPOINT
Chloroform	110.5	202.0	1.00E-02	8E-04	1E-03	Liver Lesions
Dichloro-ethylene,1,1	740.0	740.0	9.00E-03	6E-03	6E-03	Liver Lesions
Dieldrin	425.7	1700.0	5.00E-05	6E-01	2E+00	Liver Lesions
Dichloro-ethylene 1,2	114.2	230.0	2.00E-02	8E-04	2E-03	Lung & Liver

Hazard Index Sums	Average	Reasonable Maximum Exposure
Liver Effects	6E-01	2E+00

TABLE 8: SUMMARY OF CONTAMINANTS OF CONCERN IN SEDIMENT (ZONE 8 UPSTREAM OF SITE)

CONTAMINANTS OF CONCERN	AVERAGE CONCENTRATION (PPB)	MAXIMUM DETECTION (PPB)	FREQUENCY OF DETECTION
Arsenic	910	910	1/5
Benzo(a)anthracene	898.3	1000.0	4/5
Benzo(a)pyrene	1000.0	1000.0	3/5
Benzo(b)fluoranthene	1100.0	1400.0	3/5
Chrysene	1225.0	1400.0	3/5
Pthalate,bis(2 ethyl hexyl	510.0	600.0	2/4
Barium	20400.0	21300.0	3/5
Copper	32075.0	54000.0	5/5
Lead	54275.0	79000.0	5/5
Nickel	7450.0	7700.0	3/5
Selenium	740.0	800.0	2/5
Zinc	94625.0	118000.0	5/5

TABLE 8A:
CARCINOGENIC RISKS FOR ADULTS EXPOSED TO SEDIMENTS VIA FISH
(ZONE 8) UPSTREAM OF SITE

CONTAMINANT OF CONCERN	CONCENTRATION (UG/1) AVG	CONCENTRATION (UG/1) MAX	CANCER POTENCY FACTOR MG/KG/d-^{1}	RISK ESTIMATE AVG	RISK ESTIMATE MAX
Benzo(a)anthracene	898.3	1000.0	1.20E+01	8E-04	9E-04
Benzo(a)pyrene	1000.0	1000.0	1.20E+01	9E-04	9E-04
Benzo(b)fluoranthene	1100.0	1400.0	1.20E+01	9E-04	1E-03
Chrysene	1225.0	1400.0	1.20E+01	1E-03	1E-03
Phthalate-bis(2 ethyl-hexyl)	510.0	600.0	1.40E-02	5E-07	6E-07

TABLE 8B
NONCARCINOGENIC RISKS FOR ADULTS EXPOSED TO SEDIMENTS VIA FISH ZONE 8

CONTAMINANTS OF CONCERN	CONCENTRATION (UG/1) AVG	MAX	REFERENCE DOSE MG/KG/d	HAZARD INDEX AVG	MAX	TOXICITY ENDOPOINT
Phthalate - bis (2 ethylhexyl)	510.0	600.0	2.00E-02	2E-03	2E-03	Liver effects

Hazard Index Sums	Average	Reasonable Maximum Exposure
Liver effects	2E-03	2E-03

TABLE 9

SUMMARY OF POTENTIAL CHEMICAL SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
FEDERAL REQUIREMENTS			
RCRA Maximum Concentration Limits 40 CFR 264 Subpart F	Applicable	MCLs have been established for 14 toxic compounds under RCRA groundwater protection standards. A compliance monitoring program is included for RCRA facilities.	Pertains to identified hazardous materials that are treated, stored, or disposed on-site
Safe Drinking Water Act Maximum Contaminant Levels (MCLs) 40 CFR 141.11 - 141.16	Relevant and Appropriate	MCLs have been set for toxic compounds as enforceable standards for public drinking water systems. SMCLs are unenforceable goals regulating the asthetic quality of drinking water.	Aquifer below the Stamina Mills site is a source of drinking water. Some contaminants in plume below site are above MCLs and SMCLs.
Safe Drinking Water Act Maximum Contaminant Levels Goals (MCLGs) 40 CFR 141.50 - 141.51	Relevant and Appropriate	MCLGs are unenforceable goals under the SDWA.	Aquifer below the Stamina Mills site is a source of drinking water. Some contaminants in plume below site are above MCLGs.
Clean Water Act Federal Water Quality Criteria 51 Federal Register 43665	Relevant and Appropriate	Effluent limitations must meet BAT. Water Quality Criteria for ambient water quality are provided for toxic chemicals.	Current discharges from site may cause degredation of Branch River in excess of AWQCs. Discharges to the Branch River associated with groundwater remediation or other activities would have AWQCs as potential goal.
STATE REQUIREMENTS			
R.I. Rules and Regulations Pertaining to Public Drinking Water R46-13-DWS, Amended January, 1983	Relevant and Appropriate	Establishes MCLs, limits, and requirements for current and future public water supply systems.	Aquifer below site is source of drinking water but not a current public water supply.

TABLE 9

SUMMARY OF POTENTIAL CHEMICAL SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
R.I. Water Quality Regulations for Water Pollution Control RI GL 46-12, 42-17.1, 42-35	Applicable	Provides water classification for surface waters in R.I. Sets effluent limitations and RIPDES Permit requirements for discharges to the waters.	Branch River classified as B; present condition C. Effluents to Branch River from site must meet requirements for class B.
Regulations for the R.I. Pollutant Discharge Elimination System (RIPDES) R.I.G.L. 46-12, 42-17, 42-35	Applicable	Sets forth the requirements and applicability for the RIPDES Permit for discharge to State Waters.	Discharges associated with groundwater treatment or other remedial activities to off-site outfalls to Branch River would require RIPDES permit, on-site outfall would be required to meet substantive requirements but would not need a permit.
Draft Groundwater Classification under the R.I. Groundwater protection ACT R.I.G.L. 46-13.1	To Be Considered	Classification for R.I. groundwater. Four classes of water are designated according to suitability for use as a drinking water source.	The Stamina Mills Site groundwater is preliminarily designated as GAA, "... suitable for drinking water use without treatment". Standards for Class GAA are federal MCLs and applicable state limits.
R.I. Air Pollution Control Regulations Regulations No. 22, Air Toxics RI GL 23-23, 42-35	Applicable	Stationary air emission sources generating listed toxic substances shall not exceed given concentrations of toxics at or beyond property	On-site remediation may include the use of technologies that would produce air emissions.

TABLE 10

SUMMARY OF POTENTIAL LOCATION SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
FEDERAL REQUIREMENTS			
RCRA Location Requirements 40 CFR 264.18(c)	Relevant and Appropriate	Sets forth minimum requirements for design, construction, and operation of a facility where treatment, storage, or disposal of hazardous waste will be located within a 100-year floodplain.	Treatment, disposal, and storage of hazardous materials may take place during remediation of the site. Some wastes are located within the 100-year floodplain.
National Historic Preservation Act of 1966. 16 U.S.C. 470 et seq. 36 CFR Part 800	Not ARAR	Requires that the action not effect or cause harm to registered Historic Places or Historic Landmarks.	**None of the alternatives would have an adverse effect on the Forestdale Historic District**
Endangered Species Act 16 U.S.C. 1531 et seq. 50 CFR Part 402	Not ARAR	Action must avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	No endangered species or habitats are in existance on-site.
Coastal Zone Management Act 16 U.S.C 1451 et seq. 15 CFR Part 930	Not ARAR	Activities affecting land or water uses in a coastal zone required to certify noninterference with coastal zone management.	Site not located on or near coastal zone.
Fish and Wildlife Coordination Act 16 U.S.C. 661 et seq.	Applicable	Requires actions to protect fish and wildlife from actions modifying streams or areas affecting streams.	On-site remediation activities may include modifications to the Branch River adjacent to the site.
Clean Water Act, Section 404 Pertaining to Wetlands 33 U.S.C. 1251 et seq.	Relevant and Appropriate	Prohibits discharge of dredged or fill material into navigable waters without a permit.	On-site remediation activities may include discharge of dredge or fill material into the Branch River. On-site activities do not require permitting, but substantive

TABLE 10

SUMMARY OF POTENTIAL LOCATION SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
			portion must be met.
Executive Order 11990 Wetlands Protection Policy	To be considered	Sets forth policy for the protection of wetlands.	To the extent that the Executive Order provides additional guidance to State requirements for wetland activities, they will be considered
Executive Order 11988 Floodplain Management Policy	To be considered	Sets forth policy for the protection of floodplains.	A portion of the site is located in a 100 year floodplain; however, Executive Order sets forth policy and is not enforceable.
STATE REQUIREMENTS			
State of Rhode Island DEM Rules and Regulations Governing the Enforcement of the Fresh Water Wetlands Act RI GL 2-1-18 - 27	Applicable	Sets forth requirements for the approval of permits for the alteration of freshwater wetlands.	The majority of the Stamina Mills site is located in an area designated as a freshwater wetlands under the R.I. definition.

TABLE 11

SUMMARY OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
FEDERAL ENVIRONMENTAL ARARS			
RCRA Identification of Hazardous Waste 40 CFR 261	Applicable	Criteria for identifying those solid wastes subject to regulation as hazardous substances under RCRA.	Suspected hazardous wastes on the Stamina Mills site should be identified as RCRA hazardous substances or non-hazardous substances prior to remedial activities. Jurisdiction is under R.I. RCRA program.
RCRA Identification of Hazardous Waste 40 CFR 261.33(d)	Applicable	A material is hazardous waste if it is a residue or contaminated soil, water or other debris resulting from the cleanup of a spill into or on any land or water of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in the section.	Soils and groundwater on the Stamin Mills site are a result of a spill of Trichloroethene, a listed chemical in the section. Jurisdiction is under R.I. RCRA program.
RCRA Facility Standards, Preparedness and Prevention, Contingency Plan and Emergency Procedures 40 CFR 264, Subparts B, C, D	Applicable	Establishes minimum standards for the acceptable management of RCRA hazardous wastes. Includes preparedness and prevention measures, general facility standards, and contingency and emergency procedures.	Treatment, storage, and/or disposal of RCRA hazardous wastes may occur on the Stamina Mills site during remediation. Jurisdiction is under R.I. RCRA program.
RCRA Manifest System, Recordkeeping, and Reporting 40 CFR 264 Subpart E	Applicable	Establishes the rules and recordkeeping requirements for off-site transportation of RCRA hazardous materials for treatment and/or disposal.	Off-site transportation of RCRA hazardous wastes for treatment and/or disposal may be included in the site remediation. Jurisdiction is under R.I. RCRA program.
RCRA Groundwater Monitoring Requirements 40 CFR Subpart F	Applicable	Establishes minimum requirements for groundwater monitoring and protection standards for RCRA facilities.	On-site treatment, storage, and/or disposal of RCRA wastes may be included in the remediation of the Stamina Mills site. Jurisdiction is under R.I. program.

TABLE 11

SUMMARY OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
RCRA Closure and Post Closure Requirements 40 CFR 264 Subpart G	Applicable	Establishes minimum requirements for closure and post-closure care of a RCRA facility engaging in treatment, storage, and/or disposal of hazardous wastes. Closure requirements include in-place wastes and remediated areas.	At the conclusion of a remedial action involving the treatment, storage, disposal, removal of hazardous wastes, closure procedures and post-closure care would be required. Jurisdiction is under R.I. program.
RCRA Storage Requirements 40 CFR 264 Subparts I, J, and L	Applicable	Establishes minimum requirements for the storage of hazardous wastes.	RCRA hazardous waste may be stored on-site prior to off-site disposal or on-site treatment. Jurisdiction is under R.I. RCRA program.
RCRA Landfill Requirements 40 CFR 264 Subpart N	Relevant and Appropriate	Establishes minimum requirements for the design and construction, operation and maintenance, monitoring and inspection, closure and post closure care for a hazardous waste landfill.	RCRA hazardous waste may be landfilled on-site. Jurisdiction is under R.I. RCRA program.
RCRA Treatment Requirements 40 CFR 264 Subparts O and X	Applicable	Establishes minimum requirements for the permit approval, operation, and standards for incineration and other treatment for hazardous wastes.	Remediation may include incineration and/or treatment of hazardous wastes.
RCRA Land Disposal Restrictions 40 CFR 268	Relevant and Appropriate	Certain classes of waste are restricted from land disposal without acceptable treatment.	Removal of soils and other solvent- containing materials from the Stamina Mills site for land disposal may trigger the regulation after its effective date for CERCLA wastes on 11/8/90.
Clean Water Act Discharge Limitations- NPDES Permit 40 CFR 122, 125, 129, 136	Applicable	Prohibits unpermitted discharge of any pollutant or combintaion of pollutants to waters of the U.S. from any point source. Standards and limitations are established for these discharges.	Remedial actions may include the discharge of treated groundwater, runoff, or other flows.

TABLE 11

SUMMARY OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
Clean Water Act Wetlands Regulations, Part 404 40 CFR 230	Relevant and Appropriate	Controls the discharge of dredged or fill materials into waters of the U.S. such that the physical and biological integrity is maintained.	Remedial actions may occur along the Branch River.
Executive Order 11990 Wetlands Protection Policy	Not ARAR	Establishes guidelines for identification and protection of wetlands.	No wetlands defined by these guidelines are present on the Stamina Mills site.
Executive Order 11988 Floodplain Management Policy	To Be Considered	Establishes guidelines for activities conducted within a 100-year floodplain.	A small portion of the site is located within a 100-year floodplain.
Safe Drinking Water Act Underground Injection Control Program 40 CFR 144	Applicable	Regulates the use of five classes of underground injection wells for the purpose of disposal of hazardous substances.	Remediation of the Stamina Mills site may include the subsurface discharge of treated groundwater
Clean Air Act New Source Performance Standards, Section 111 40 CFR 60.	Applicable	Establishes standards of performance for new air emission sources.	Remedial actions may include technologies that have air emissions.
National Emission Standards for Hazardous Air Pollutants 40 CFR 161	Applicable	Establishes emissions standards, monitoring and testing requirements, and reporting requirements for 8 pollutants in air emissions.	One or more of the listed pollutants may be released via air emissions during site remediation.
Department of Transportation rules for the transport of hazardous substances 49 CFR	Applicable	Regulates the labelling, packaging, placarding, and transportation of solid and hazardous wastes off-site.	Remedial actions may include the off-site transport and disposal of solid and hazardous wastes.

TABLE 11

SUMMARY OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
Occupational Safety and Health Standards, 29 CFR 1910.120 for Hazardous Waste Operations and Emergengy Responses, Part 1926 for General Safety and Health Standards, and Reporting Requirements	Applicable	Sets limits on exposure to workers on hazardous site or emergency responses, sets forth minimum health and safety requirements such as personal protection and training, and reporting requirements.	All activities taking place on the Stamina Mills site including remediation, construction, and monitoring are subject to OSHA health and Safety regulations.
STATE OF RHODE ISLAND ENVIRONMENTAL ARARS			
R.I. Rules and Regulations for Hazardous Waste Generation, Transportation, Storage and Disposal R.I.G.L. 23-19-1 - 10	Applicable	Establishes minimum requirements for the generation, transportation, storage, treatment, and disposal of hazardous wastes.	On 01/31/1986 R.I. was granted authority to administer the state rules and regulations for hazardous waste generation, transportation, treatment, storage, and disposal. Remediation at the Stamina Mills site will include some of these activities.
R.I. Rules and Regulations for Solid Waste Management Facilities R.I.G.L. 23-18.9, 23-19, 42-17.1	Applicable	Establishes minimum requirements for the operation of solid waste management facilities and the specifications for design and construction of new facilities.	Remediation of the Stamina Mills site may include the management of solid waste.
R.I. Underground Injection Control Program R.I.G.L. 42-17.1, 46-12	Applicable	Establishes the minimum requirements for the location, design, construction, maintenance and operation of injection wells and other subsurface disposal systems to prevent groundwater	Remediation of the Stamina Mills site may include the subsurface discharge of treated groundwater.
R.I. Water Quality Regulations for Water Pollution control R.I.G.L. 46-12, 42-17.1, 42-35	Applicable	Classifies surface waters in R.I., and limits discharges to such waters.	Remediation of the Stamina Mills site may include a surface water discharge.

TABLE 11

SUMMARY OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
R.I. Pollutant Discharge Eimination System (RIPDES) R.I.G.L. 46-12, 42-17.1, 42-35	Applicable	Establishes the requirements for the approval of a RIPDES surface water discharge permit.	Remediation of the Stamina Mills site may include a surface water discharge.
R.I. Pretreatment Regulations R.I.G.L. 46-12,42-17.1, 42-45	Applicable	Controls the pollutants which pass through or interfere with treatment processes in POTW or which may contaminate sewage sludge.	Remediation of the Stamina Mills site may include discharge to the Woonsocket POTW.
R.I. Air Pollution Control Regulations: No.1 Visable Emissions	Applicable	No person shall emit into the atomosphere from any source any air contaminant for a period or periods aggregating more than 3 minutes in any 1 hour which is greater than or equal to 20% opacity.	Remediation of the Stamina Mills site may include air emissions.
No.5 Fugitive Dust	Applicable	Reasonable precautions shall be taken to prevent particulate matter from becoming airborne during materials handling, storage, building construction, demolition.	Remediation of the Stamina Mills site may include materials handling, construction, and demolition.
No.7 Emission of Air Contaminants Detrimental to Person or Property	Applicable	No person shall emit any contaminant which, either alone, or in combination with other contaminants, by reason of their concentration and duration, may be injurous to human, plant, or animal life, or cause damage to property or which unreasonably interferes with the enjoyment of life and property.	Air emissions may be produced during the remediation of the Stamina Mills site.
No.9 Approval to Construct, Install, Modify, or Operate	Applicable	Establishes the minimum criteria for and procedure in obtaining approval to install, modify, or operate an emission source.	Remedial actions at the Stamina Mills site may include the installation and operation of remedial equipment which may be a potential air emission source.

TABLE 11

SUMMARY OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO STAMINA MILLS SITE

REQUIREMENTS	STATUS	REQUIREMENT SYSOPSIS	APPLICATION TO THE RI/FS
No.14 Record Keeping and Reporting	Applicable	The owner or operator of any source of air contaminants shall provide operational data on the air emission source.	Remedial actions at the Stamina Mills site may include air emissions and pollution control equipment.
No.15 Control of Organic Solvent Emissions	Not ARAR	Regulates emissions from installations using organic solvents or VOCs.	The Stamina Mills site would not be categorized as an installation using solvents or VOCs.
No.16 Operation of Air Pollution Control Systems	Applicable	Requires that any air pollution control system shall be operated according to the design specifications whenever the source on which it is installed is in operation or is emitting air contaminants.	Air pollution control systems may be used during remediation of the Stamina Mills site.
No.17 Odors	Applicable	Restricts emissions of any air contaminant or combination of contaminants which create an objectionable odor beyond the property line.	Remedial activities on the Stamina Mill site may cause a release of objectionable odors, such as disturbance of the landfill area.
No.22 Air Toxics	Applicable	Air emission limits are established for any stationary source using or generating a listed toxic substance.	Remedial activities may include the potential for release of listed toxics.
Division of Air and Hazardous Materials Policy on Permitting Air Strippers, April 20, 1989	To be considered	Establishes submittal policy prior to the installation of an air stripper.	Remedial actions may include the installation of an air stripper.

TABLE 12

ATTAINMENT OF POTENTIAL CHEMICAL SPECIFIC ARARS WITH RESPECT TO ALTERNATIVES

REQUIREMENTS Y = WILL BE ATTAINED N = WILL NOT BE ATTAINED	ON-SITE GROUNDWATER REMEDIAL UNIT				TCE SPILL AREA REMEDIAL UNIT			LANDFILL AREA REMEDIAL UNIT			OVERALL SITE REMEDIAL UNIT		
	GW-1	GW-2	GW-4	GW-5	TSA-1	TSA-3	TSA-4	LA-1	LA-3	LA-5	OS-3	OS-4	OS-5
FEDERAL REQUIREMENTS													
RCRA Maximum Concentration Limits 40 CFR 264 Subpart F					Y	Y							
Safe Drinking Water Act Maximum Contaminant Levels (MCLs) 40 CFR 141.11 - 141.16	Y	Y	Y	N	Y	Y	N						
Safe Drinking Water Act Maximum Contaminant Levels Goals (MCLGs) 40 CFR 141.50 - 141.51	Y	Y	Y	N	Y	Y	N						
Clean Water Act Federal Water Quality Criteria 51 Federal Register 43665	Y	Y	Y		Y	Y					Y	Y	N
STATE REQUIREMENTS													
R.I. Rules and Regulations Pertaining to Public Drinking Water R46-13-DWS, Amended January, 1983	Y	Y	Y	N	Y	Y	N						
R.I. Water Quality Regulations for Water Pollution Control RI GL 46-12, 42-17.1, 42-35	Y	Y	Y		Y	Y		Y	Y	N	Y	Y	N
Regulations for the R.I. Pollutant Discharge Elimination System (RIPDES) R.I.G.L. 46-12, 42-17, 42-35					Y	Y	Y	Y	Y	Y	Y	Y	
Draft Groundwater Classification under the R.I. Groundwater protection ACT R.I.G.L. 46-13.1	Y	Y	Y	N	Y	Y	Y	Y	Y	Y			
R.I. Air Pollution Control Regulations Regulations No. 22, Air Toxics RI GL 23-23, 42-35	Y				Y	Y		Y					

TABLE 13

ATTAINMENT OF POTENTIAL LOCATION SPECIFIC ARARS WITH RESPECT TO REMEDIAL UNITS

REQUIREMENTS Y = WILL BE ATTAINED N = WILL NOT BE ATTAINED	ON-SITE GROUNDWATER REMEDIAL UNIT				TCE SPILL AREA REMEDIAL UNIT			LANDFILL AREA REMEDIAL UNIT			OVERALL SITE REMEDIAL UNIT		
	GW-1	GW-2	GW-4	GW-5	TSA-1	TSA-3	TSA-4	LA-1	LA-3	LA-5	OS-3	OS-4	OS-5
FEDERAL REQUIREMENTS													
RCRA Location Requirements 40 CFR 264.18(c)	Y	Y	Y		Y	Y		Y					
National Historic Preservation Act of 1966. 16 U.S.C. 470 et seq. 36 CFR Part 800													
Endangered Species Act 16 U.S.C. 1531 et seq. 50 CFR Part 402													
Coastal Zone Management Act 16 U.S.C 1451 et seq. 15 CFR Part 930													
Fish and Wildlife Coordination Act 16 U.S.C. 661 et seq.													
Clean Water Act, Section 404 Pertaining to Wetlands 33 U.S.C. 1251 et seq.											Y	Y	
Executive Order 11990 Wetlands Protection Policy													
Executive Order 11988 Floodplain Management Policy					Y	Y	Y	Y	Y		Y	Y	
STATE REQUIREMENTS													
State of Rhode Island DEM Rules and Regulations Governing the Enforcement of the Fresh Water Wetlands Act RI GL 2-1-18 - 27	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	

TABLE 14

ATTAINMENT OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO ALTERNATIVES

REQUIREMENTS Y = WILL BE ATTAINED N = WILL NOT BE ATTAINED	ON-SITE GROUNDWATER REMEDIAL UNIT				TCE SPILL AREA REMEDIAL UNIT			LANDFILL AREA REMEDIAL UNIT			OVERALL SITE REMEDIAL UNIT		
	GW-1	GW-2	GW-4	GW-5	TSA-1	TSA-3	TSA-4	LA-1	LA-3	LA-5	OS-3	OS-4	OS-5
FEDERAL REQUIREMENTS													
RCRA Identification of Hazardous Waste 40 CFR 261	Y	Y			Y	Y		Y			Y	Y	
RCRA Facility Standards, Preparedness and Prevention, Contingency Plan and Emergency Procedures 40 CFR 264, Subparts B, C, D	Y	Y	Y		Y	Y		Y					
RCRA Manifest System, Recordkeeping, and Reporting 40 CFR 264 Subpart E	Y	Y			Y	Y		Y			Y	Y	
RCRA Groundwater Monitoring Requirements 40 CFR Subpart F					Y	Y	Y	Y	Y	N			
RCRA Closure and Post Closure Requirements 40 CFR 264 Subpart G					Y	Y		Y	Y				
RCRA Storage Requirements 40 CFR 264 Subparts I, J, and L					Y			Y				Y	
RCRA Landfill Requirements 40 CFR 264 Subpart N					Y			Y	Y				
RCRA Treatment Requirements 40 CFR 264 Subparts O and X					Y			Y				Y	
RCRA Land Disposal Restrictions 40 CFR 268					Y			Y				Y	
Clean Water Act Discharge Limitations- NPDES Permit 40 CFR 122, 125, 129, 136					Y	Y		Y	Y				
Clean Water Act Wetlands Regulations, Part 404 40 CFR 230													
Executive Order 11990 Wetlands Protection Policy											Y	Y	
Executive Order 11988 Floodplain Management Policy					Y	Y	Y	Y	Y		Y	Y	

TABLE 14

ATTAINMENT OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO ALTERNATIVES

REQUIREMENTS Y = WILL BE ATTAINED N = WILL NOT BE ATTAINED	ON-SITE GROUNDWATER REMEDIAL UNIT				TCE SPILL AREA REMEDIAL UNIT			LANDFILL AREA REMEDIAL UNIT			OVERALL SITE REMEDIAL UNIT		
	GW-1	GW-2	GW-4	GW-5	TSA-1	TSA-3	TSA-4	LA-1	LA-3	LA-5	OS-3	OS-4	OS-5
Safe Drinking Water Act Underground Injection Control Program 40 CFR 144													
Clean Air Act New Source Performance Standards, Section 111 40 CFR 60.	Y				Y			Y					
National Emission Standards for Hazardous Air Pollutants 40 CFR 161	Y				Y	Y		Y					
Department of Transportation rules for the transport of hazardous substances 49 CFR	Y	Y			Y	Y		Y			Y	Y	
Occupational Safety and Health Standards 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Occupational Safety and Health Standards 29 CFR Part 1926 Safety and Health Standards	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	
Occupational Safety and Health Reporting and Related Regulations	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
STATE REQUIREMENTS													
R.I. Rules and Regulations for Hazardous Waste Generation, Transportation, Storage and Disposal R.I.G.L. 23-19-1 - 10	Y	Y			Y	Y		Y			Y	Y	
R.I. Rules and Regulations for Solid Waste Management Facilities R.I.G.L. 23-18.9, 23-19, 42-17.1					Y			Y	Y	Y	Y	Y	
R.I. Underground Injection Control Program R.I.G.L. 42-17.1, 46-12	Y	Y	Y										
R.I. Water Quality Regulations for Water Pollution control R.I.G.L. 46-12, 42-17.1, 42-35					Y			Y	Y		Y	Y	

TABLE 14

ATTAINMENT OF POTENTIAL ACTION SPECIFIC ARARS WITH RESPECT TO ALTERNATIVES

REQUIREMENTS Y = WILL BE ATTAINED N = WILL NOT BE ATTAINED	ON-SITE GROUNDWATER REMEDIAL UNIT				TCE SPILL AREA REMEDIAL UNIT			LANDFILL AREA REMEDIAL UNIT			OVERALL SITE REMEDIAL UNIT		
	GW-1	GW-2	GW-4	GW-5	TSA-1	TSA-3	TSA-4	LA-1	LA-3	LA-5	OS-3	OS-4	OS-5
R.I. Pollutant Discharge Eimination System (RIPDES) R.I.G.L. 46-12, 42-17.1, 42-35					Y	Y	Y	Y	Y	Y	Y	Y	
R.I. Pretreatment Regulations R.I.G.L. 46-12,42-17.1, 42-45					Y	Y		Y	Y		Y	Y	
R.I. Air Pollution Control Regulations:													
No.1 Visable Emissions	Y				Y			Y					
No.5 Fugitive Dust					Y	Y	Y	Y	Y	Y	Y	Y	
No.7 Emission of Air Contaminants Detrimental to Person or Property	Y				Y	Y		Y					
No.9 Approval to Construct, Install, Modify, or Operate	Y				Y	Y		Y					
No.14 Record Keeping and Reporting	Y				Y	Y		Y					
No.15 Control of Organic Solvent Emissions													
No.16 Operation of Air Pollution Control Systems	Y				Y	Y		Y					
No.17 Odors					Y	Y		Y	Y				
No.22 Air Toxics	Y				Y	Y		Y					
Division of Air and Hazardous Materials Policy on Permitting Air Strippers, April 20, 1989	Y												

TABLE 15

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

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

ADDENDUM TO THE FEASIBILITY STUDY REPORT FOR THE STAMINA MILLS SUPERFUND SITE, NORTH SMITHFIELD, RHODE ISLAND

Lloyd Selbst
Office of Regional Counsel
USEPA, Region I

July 10, 1990

In addition to the ARARs discussed in the text and tables in sections 4 and 5 of the Feasibility Study, the following are ARARs for remedial alternatives at the Site:

- The Rhode Island Pollutant Discharge Elimination System (RIPDES) requirements are applicable to GW-1, GW-2, and GW-4.
- The Rhode Island analogues of the RCRA facility requirements at 40 CFR Part 264, Subparts B, C, and D are applicable to OS-3, OS-4, and LA-3.
- The Rhode Island analogues of the the RCRA groundwater monitoring requirements at 40 CFR Part 264, Subpart F are applicable to GW-1, GW-2, and GW-4; they are relevant and appropriate to GW-5.
- The Rhode Island analogues of the RCRA location requirements at 40 CFR 264.18(c) are applicable to OS-3 and OS-4; they are relevant and appropriate to LA-3.
- The Rhode Island analogues of the RCRA treatment requirements at 40 CFR Subparts O and X are applicable to GW-1, GW-2, and TSA-3. They are also an ARAR for OS-3.
- The Rhode Island analogues of the RCRA storage requirements at 40 CFR Part 264, Subparts I, J, and L are applicable to GW-1, GW-2, and TSA-3. They are also an ARAR for OS-3.
- The National Pollution Discharge Elimination System requirements are applicable to GW-1, GW-2, and GW-4.
- The Rhode Island Pretreatment Regulations are applicable to GW-1, GW-2, and GW-4.
- The Occupational Safety and Health Standards at 29 CFR Part 1926 are applicable to GW-5 and OS-5.

The following laws were incorrectly described in the Feasibilty Study as ARARs:

- The RIPDES requirements are not ARARs for TSA-3 or LA-5.
- The Rhode Island Pretreatment Regulations are not ARARs for TSA-3.

APPENDIX C

RESPONSIVENESS SUMMARY

United States
Environmental Protection Agency
Region I

S U P E R F U N D

Responsiveness Summary
Stamina Mills Site
North Smithfield, Rhode Island

September 1990

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Preface

The U.S. Environmental Protection Agency (EPA) held a 30-day comment period from 11 July 1990 to 9 August 1990 to provide an opportunity for interested parties to comment on the Feasibility Study (FS) and the proposed plan prepared for the Stamina Mills Superfund Site (the Site) in North Smithfield, Rhode Island. The FS examined and evaluated various options, called remedial alternatives, to address each area of contamination at the Site. EPA identified its preferred alternative for addressing each area of Site contamination in the Proposed Plan issued July 10, 1990, before the start of the public comment period.

The purpose of this Responsiveness Summary is to document EPA responses to the questions and comments raised during the public comment period on the FS and Proposed Plan. EPA considered all of these questions and comments before selecting a final remedial alternative to address the contamination at the Stamina Mills site.

This Responsiveness Summary is organized in the following sections:

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

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

III. *Summary of Comments Received During the Public Comment Period and EPA Responses* — This section summarizes and provides EPA responses to the oral and written comments received from the public during the public comment period. In Part I, the comments received from citizens are presented. In Part II, comments from the state are organized by subject. Part III summarizes comments received from PRPs.

IV. *Remaining Concerns* — This section describes issues that may continue to be of concern to the community during the design and implementation of EPA's selected remedy for the Site. EPA will address these concerns during the Remedial Design and Remedial Action (RD/RA) phase of the cleanup process.

In addition, two attachments are included in this Responsiveness Summary. Attachment A provides a list of the community participation activities that EPA has conducted to date at the Site. Attachment B contains a copy of the transcript from the informal public hearing held on 31 July, 1990.

I. Overview of Remedial Alternatives Considered in the Feasibility Study, Including the Preferred Alternative

Contamination at the Site is divided into four areas: 1) trichloroethylene (TCE) spill area, 2) landfill area, 3) groundwater, and 4) overall Site. Using information gathered during the Remedial Investigation, EPA identified specific cleanup objectives for each area of the Site that will be protective of public health and the environment. The remedial alternative selected for the Site must achieve EPA's cleanup levels for soil and groundwater and achieve EPA's goal of eliminating physical and chemical risks to public health and the environment.

In the Feasibility Study (FS) EPA has screened and evaluated several potential cleanup alternatives for each area of contamination at the Stamina Mills site. Additional information on each of the remedial alternatives can be found in the Record of Decision (ROD), copies of which are located in the North Smithfield Public Library at 20 Main Street, in North Smithfield, Rhode Island (the information repository that EPA has established for the Site), and the EPA Records Center at 90 Canal Street in Boston, Massachusetts. The treatment alternatives are described briefly below by contamination area.

TCE Spill Area (TSA)

- *TSA-1: On-site Incineration.* Soils in the TCE spill area would be excavated and incinerated in a rotary kiln incinerator that would be constructed on-site specifically to treat contaminants from the Stamina Mills site. All air emissions from the incinerator would be treated to ensure that air quality standards are met and that public health and the environment are protected. Because incineration may not destroy all contaminants, ash resulting from the incineration process would be tested and disposed of in compliance with state and federal regulations.

- *TSA-3: Soil Vacuum Extraction.* TCE and related compounds would be removed by installing a number of shallow wells throughout the spill area soils. A pump attached to the wells would extract air containing TCE from the soil by creating a vacuum. The air would be collected through one central pipe and the TCE and other volatile organic compounds (VOCs) would be captured on activated carbon filters. The treated air would then be released to the atmosphere and the spent activated carbon filters would be transported off-site for treatment and disposal.

  In the Proposed Plan issued prior to the public comment period, EPA recommended this alternative as its preferred remedy for addressing the TCE spill area contamination.

- *TSA-4: No-Action.* No treatment of TCE spill area soils would be conducted. Instead, the area would be graded to encourage surface run-off, covered with clean fill, and seeded with grass.

Landfill Area (LA)

- *LA-1: On-Site Incineration.* Soil and waste in the landfill area would be excavated and incinerated to destroy the contaminants. Incinerator emissions would be treated prior to release to the atmosphere. Incinerator ash would be tested for residual contamination and disposed of in compliance with state and federal regulations.

- *LA-3: Capping.* Landfill area contamination would be treated by constructing an impermeable cap over the landfill area to prevent rainwater and snow melt from reaching the wastes and contaminating groundwater and surface water. Landfill wastes located in the floodplain would be excavated and placed under the landfill cap. A leachate collection system would also be installed, and any leachate collected would be piped to the existing on-site sewer for treatment at the Woonsocket wastewater treatment plant.

  In the Proposed Plan issued prior to the public comment period, EPA recommended this alternative as its preferred remedy for addressing the Landfill Area contamination.

- *LA-5: No-Action.* The landfill area would be graded, covered with clean fill, and planted to stabilize the area.

Groundwater

- *GW-1: Air Stripping.* Groundwater would be extracted through bedrock wells and pumped to the top of an air stripping tower, where contaminants would be transferred from the groundwater into air being forced up through the tower. Both the contaminated air stream and the treated groundwater would be further treated by passing them through separate activated carbon filters to prevent the emission of contaminants into the air and remove residual contamination in the groundwater. Spent carbon would be transported off-site for treatment and disposal.

- *GW-2: Carbon Treatment.* Groundwater would be extracted through bedrock wells and pumped through a series of tanks containing activated carbon. Contaminants would be adsorbed onto the activated carbon and removed from the groundwater. Spent carbon would be transported off-site for treatment and disposal.

- *GW-4: Ultraviolet Light (UV) and Hydrogen Peroxide.* Contaminated groundwater would be extracted through bedrock wells and treated on-site using a UV and hydrogen peroxide system. EPA will monitor system performance and make an evaluation of the performance of the system annually to determine the effectiveness of extracting and treating the contaminated bedrock groundwater.

In the Proposed Plan issued prior to the public comment period, EPA recommended this alternative as its preferred remedy for addressing the groundwater contamination.

- *GW-5: No-Action.* No groundwater treatment would be conducted. Groundwater would be sampled annually to determine the remaining level of contamination and to define the extent of the contaminant plume. Institutional controls would be implemented to limit future use of the Site and groundwater.

Overall Site (OS)

- *OS-3: Demolition, Sealing Raceways, Location and Removal of Septic Tank Contents, Site Grading.* On-site structures including the mill building ruins and the smokestack would be demolished and disposed of in accordance with Rhode Island Solid Waste Regulations. The entrance and exits of the old and new raceways would be sealed with concrete, and then the raceways would be backfilled with building debris from the Site or other suitable fill material. The septic tank would be located and its contents tested and disposed of off-site. The overall Site would be graded (except for the capped landfill area) and planted with vegetation. In addition, institutional controls in the form of future land use restrictions would be placed over the entire Site.

  In the Proposed Plan issued prior to the public comment period, EPA recommended this alternative as its preferred remedy for addressing the overall Site contamination.

- *OS-4: Demolition, Excavating and Sealing Raceways, Location and Removal of Septic Tank Contents, Site Grading, Excavation of PAHs.* This alternative is identical to alternative OS-3, with the addition of excavation of raceway sediments and excavation of an area of elevated PAH concentrations referred to as the "hot spot". Excavated sediments would be treated and disposed of off-site.

- *OS-5: No-Action.* The Site would be left in its current state. Institutional controls to limit land and groundwater use and tighter Site security measures in terms of improved fencing would be implemented.

II. Background on Community Involvement and Concerns

The 5-acre Stamina Mills Superfund site is located in the Village of Forestdale, within the Town of North Smithfield, Rhode Island, approximately 1 mile south of the Rhode Island/ Massachusetts border and 14 miles northwest of Providence, Rhode Island. Between 1824 and 1975, the Stamina Mills site operated as a textile weaving and finishing facility. A major fire at the Site destroyed the mill complex in 1977, and the debris-strewn Site was abandoned. Rubble, piles of debris, and foundation remains (including a deteriorating smokestack), currently occupy the Site. Waste disposal practices at the Site included use of an on-site landfill, which is believed to have contributed to site-related contamination problems.

Shortly after a new solvent-based scouring system was installed in 1969, a spill of the solvent TCE occurred during the filling of an above ground storage tank. The area where the spill occurred is referred to as the "TCE spill area". Based on the advice of the Rhode Island Department of Health (RIDOH), the Stamina Mills Company discontinued use of its well as a drinking water source.

During a statewide groundwater survey conducted by RIDOH in 1979, TCE was detected off-site in the Forestdale Water Association well, a community water system located north of the Site and serving approximately 25 homes. As a result of these findings, RIDOH expanded the sampling program and tested 51 private residential wells in the Forestdale area, the Forestdale Water Association well, and the Stamina Mills well. RIDOH found TCE in 18 residential wells. At that time, RIDOH advised area residents to boil water used for drinking and cooking.

In 1981, the State of Rhode Island Water Resources Board and the Town of North Smithfield financed the construction of a municipal water main to serve the residential area north of the Site that had been affected or had the potential to be affected by contamination from the Site. Between 1981 and 1984, only seven of approximately 50 affected or potentially affected residences had connected to the new municipal water supply, reportedly due to costs associated with connecting to the water main.

In 1983, the Stamina Mills Site was placed on EPA's Final National Priorities List making it eligible for Federal cleanup funds. In September 1984, EPA began to supply bottled water to residents not connected to the municipal water supply. Later that year EPA funded an extension of the existing water line as well as the costs for the connection of homes to the municipal water supply. All affected or potentially affected residences are now receiving municipal water.

Community interest in the Stamina Mills site has been moderate during the FS and public comment period. Approximately 20 residents attended a public informational meeting held on 10 July 1990 by EPA. The principal community concerns expressed at that meeting are summarized below.

- *Operation of EPA's Preferred Alternative.* Residents' major concerns included the impact of the remediation on the aquifer, the discharge of the treated water, and the effectiveness of the treatment technologies proposed.

- *Selection of the Remedial Alternative.* Residents questioned why EPA had not included removal of the landfill contents in the preferred alternative, whether PRPs would have input into the final selection process, and whether comments from the state would be published.

- *Project Schedule.* Residents were concerned with the amount of time taken by the cleanup process and the schedule for the start and the completion of the Site remediation.

- *Financing of the Cleanup.* Residents were concerned over who would pay the cost of cleanup and whether the town would bear any of the cost.

- *Final Disposition of Stamina Mills Property.* Residents were concerned over the potential long-term uses of the property and who would control the Site's future development.

- *Groundwater Quality.* Residents were concerned over the possibility of homeowners in the contaminant plume reactivating their wells, whether these homeowners could ever use their wells again, and whether homeowners could recover costs associated with the loss of their wells from potentially responsible parties (PRPs).

III. Summary of Comments Received During the Public Comment Period and EPA Responses

This Responsiveness Summary addresses the comments received by EPA during the public comment period concerning the FS and EPA's Proposed Plan for the Stamina Mills site. Two sets of written comments were received during the public comment period (11 July 1990 - 9 August 1990), one from the Rhode Island Department of Environmental Management and one from the Kayser-Roth Corporation, a named PRP. Five persons submitted oral comments at the informal public hearing. The individuals commenting at the public hearing were either government officials or representatives of the PRPs. A copy of the public hearing transcript is included as Attachment B. Copies are also available at the North Smithfield Public Library at 20 Main Street, Slatersville, Rhode Island, and at the EPA Records Center at 90 Canal Street in Boston, Massachusetts, as part of EPA's Administrative Record for the Site.

Part I — Citizen Comments

Commentors at the public hearing were Senator Paul Kelly and North Smithfield Town Councilor Lynda Masnyk. No written comments were submitted from the general public.

Comment #1: Senator Kelly stated that a principal concern of area homeowners is that EPA, RIDEM, or the Town of North Smithfield take steps to ensure that homeowners whose wells were affected by the contamination plume will not reactivate their wells and potentially cause the plume to begin again to move away from the Site.

EPA Response: EPA's authority under CERCLA does not allow EPA to prohibit the use of private wells that are located off-site. EPA does, however, strongly recommend that wells previously identified as contaminated by the Stamina Site not be reactivated.

Comment #2: Senator Kelly asked EPA or RIDEM to address whether residents who had lost the use of their wells due to Site related contamination had any legal rights by which they could recover their financial losses, and whether EPA or RIDEM could assist them in any effort to recover such losses.

EPA Response: EPA is not authorized to counsel individuals about their private rights of recovery against PRPs. EPA can assist residents by providing information requested by residents that is contained in EPA's Administrative Record for the Stamina Mills Site.

Comment #3: Councilor Masnyk stated that, while she agrees that the preferred alternative would meet EPA's goals for the Site, she would like the Site returned to a pristine condition. She stated that this would require the removal rather than the capping of the landfill contents.

EPA Response: EPA believes that removing the landfill wastes from the Site would not be protective of human health and the environment because of the short-term risks posed by air emissions during the materials handling and operational phases and would not provide a degree of protectiveness proportionate to its cost. The excavation of landfill wastes would only transfer these wastes to another facility and location which would require similar containment and monitoring as proposed for the Site. Therefore, EPA has selected capping of the landfill as the landfill remedy because it limits the extent of short-term risks, it is more cost-effective and it is protective of human health and the environment.

Comment #4: Councilor Masnyk urged EPA to proceed toward a total cleanup of the aquifer, noting that the Branch River groundwater aquifer is considered a potential water supply for the Town of North Smithfield. She also requested that the groundwater quality be monitored as the cleanup progresses.

EPA Response: EPA's goal is to return the groundwater within the contaminant plume to its beneficial use (drinking water quality) as rapidly as technically practicable. EPA will monitor the groundwater quality during the cleanup process to assess the performance of the cleanup system in reaching the drinking water quality goal.

Comment #5: Councilor Masnyk stated that the existing Site condition constituted an eyesore. She requested that the buildings be torn down and the Site's appearance improved as quickly as possible, preferably in less than the two years that EPA estimated it would take to begin remediation work at the Site.

EPA Response: As part of the overall remedy for the Stamina Mills Site, the buildings will be torn down. EPA will pursue the implementation of the remedy within the shortest possible time frame. Also, during the design of the remedy EPA will consider the feasibility and necessity of demolishing the structures first. Because of the potential negotiations with the responsible party, EPA is unable to predict with any accuracy when Site remediation may begin.

Part II — State Comments

The Rhode Island Department of Environmental Management (RIDEM) provided oral comments at the public hearing and written comments in a letter from James Fester, Assistant Director for Regulation, dated 31 July 1990.

Comments Regarding Groundwater Remediation

Comment 1: RIDEM stated that the ROD should: 1) include a performance review of the groundwater remediation to be conducted within five years of the initiation of the remedy, 2) specify an alternative or contingent remedy to be implemented if the performance review indicates that the groundwater remedy is not making satisfactory progress towards meeting the remedial objective, and 3) state that the remedial objective is interim in nature and may be contingent on the result of the performance review.

EPA Response: EPA will conduct periodic review and evaluation of the groundwater extraction and treatment system to determine the cleanup system's contaminant removal efficiency. A complete evaluation of the system will be made within five years of the start up of the extraction and treatment system. If the evaluation reveals that the remedy cannot achieve the stated cleanup levels, or that the cleanup levels cannot be achieved in a reasonable time frame, consideration will be given to making changes in the remedy. The remedy selected in this Record of Decision is meant to be a permanent and complete groundwater cleanup remedy. EPA realizes that the groundwater pump and treat system may not be able to achieve the final increment of the cleanup goals in the estimated time frame (10-15 years). In recognition of the system limitations, EPA will conduct periodic evaluations of the system performance as described above.

Comment 2: RIDEM stated that the groundwater remedy should be implemented in a staged process that defines the parameters needed to optimize the operation of the system as more information becomes available. During the design phase and pump test, the number, locations, pumping rates, and construction specifications of the extraction wells should be chosen to achieve cleanup objectives as quickly as is technically practicable, preferably in less than 10 years.

EPA Response: EPA is in agreement with this comment. EPA intends to use the information generated during the pre-design, design and operational phases of the system to optimize the efficiency of the extraction system. The goal will be to achieve the cleanup objectives as rapidly as technically practicable.

Comment 3: RIDEM questioned the ability and appropriateness of leaching galleys to discharge effluent at the proposed rates of extraction.

EPA Response: The results of the pre-design pump test and pilot testing of the groundwater treatment system will be used to evaluate the appropriateness and/or feasibility of the three discharge options being considered by EPA for the treated groundwater. The options being considered include subsurface disposal through on-site leaching galleries, on-site surface water discharge, and discharge to an on-site sewer line with off-site treatment at the Woonsocket publicly owned treatment works

(POTW). During the FS, the on-site subsurface discharge using leaching galleys was selected as the initial disposal option, but EPA believes at this time that the on-site surface water discharge may be the most appropriate and feasible alternative. The final decision on which disposal option will be used for treated groundwater will be made during the design stage using information obtained during pre-design activities.

Comment 4: RIDEM questioned the exclusion of metals treatment in the FS and Proposed Plan given the occurrence of metals in concentrations above MCLs.

EPA Response: Chromium was detected in 2 out of 32 on-site monitoring wells at concentrations above the MCL. The occurrence of chromium in these two wells, which are in the vicinity of the landfill, is believed to be associated with the migration of landfill leachate. The proposed remediation of the landfill includes capping and collection and treatment of leachate from the landfill. The proposed remedy is designed to mitigate the further migration of chromium into the Branch River and groundwater. Chromium levels above the MCL have not been detected in any other monitoring wells across the Site. Therefore, a separate treatment system for the removal of chromium from the groundwater is not believed to be required for remediation of the Site. One other trace metal, lead, has been detected at concentrations slightly exceeding MCLs in the groundwater from scattered locations across the Site. It is not anticipated that the concentrations of lead or chromium in groundwater extracted for treatment will increase or exceed MCLs during the operational period of the groundwater extraction and treatment system. Rather, these concentrations are expected to decrease during extraction as a result of the reduction in leachate generation due to the RCRA capping and installation of a leachate collection system in the landfill and the natural dilution that will occur as groundwater from the entire Site is extracted. Further monitoring of the levels of metals found in the groundwater will be conducted during pre-design. In the event that the monitoring indicates the need for additional pretreatment of metals, either to meet groundwater cleanup ARARs or disposal ARARs for treated groundwater, then further laboratory bench-scale or pilot testing will be completed during pre-design and design phases.

Comment 5: RIDEM asked whether the potential for added treatment of groundwater prior to discharge had been considered in the evaluation of the groundwater treatment alternatives.

EPA Response: As described in EPA's response to Comment 4, above, pretreatment for soluble metal ions is not anticipated to be needed at this time. Monitoring of the groundwater for soluble metal ions will be completed during the pre-design pump test and pilot testing of the UV/hydrogen peroxide system. In the event that the monitoring indicates the need for further pretreatment of soluble metals, either to meet groundwater cleanup ARARs or disposal ARARs for treated groundwater, additional laboratory bench-scale or pilot testing will be completed during pre-design and design phases.

Comment 6: RIDEM asked whether the costs of installing and operating the proposed pressure filtration unit and the iron and manganese removal units had been included in the cost estimates for each groundwater alternative, and if not, what these added costs would be.

EPA Response: Costs for iron and manganese removal using a pressurized filtration system were included in all of the groundwater treatment alternatives evaluated. Further pre- or post-treatment requirements will be determined during the pre-design and design stages for the final remedial alternative. Significant cost differences between the alternatives for groundwater treatment would not result from the additional treatment, nor would the overall cost be significantly altered given the available information.

Comment 7: RIDEM questioned whether the UV/hydrogen peroxide oxidation system would affect the dissolved metals found in the Site groundwater. RIDEM specifically questioned whether trivalent chromium would be oxidized to hexavalent chromium.

EPA Response: EPA discussions with the designers of the UV/hydrogen peroxide system indicate that the system would have little effect on dissolved metals in the groundwater. Specifically, trivalent chromium would not be oxidized to hexavalent chromium during the treatment process. Also, EPA believes that the chromium detected in the monitoring wells in the vicinity of the landfill is associated with leachate migration from the landfill and is not reflective of levels that would be found in extracted groundwater. The remediation of the landfill should effectively eliminate any further migration of chromium into the groundwater and the Branch River.

Comment 8: RIDEM questioned how EPA will address the potential for drawing contaminated groundwater during the Site pump test from sources other than Stamina Mills.

EPA Response: The pre-design pumping test will be designed to gather the information necessary for designing and evaluating the recovery system which includes delineating the draw down distribution and the capture zones. The recovery system will be designed to minimize the extraction of clean groundwater and any induced infiltration from the Branch River. The design also will seek to minimize the potential for causing the migration of any contaminants from off-site areas such as the industrial area south of the Branch River. This will be done by evaluating the predicted draw down distribution. Monitoring of well water levels will also be conducted during operation of the recovery system to verify that capture zones are being maintained to minimize the infiltration of water from outside of the capture zone.

Comments Regarding the Landfill

Comment 9: RIDEM questioned whether the leachate collection system discharge would be continuous or in batches.

EPA Response: Because of the difficulty in predicting the precise effects of a RCRA cap on the quantity and physical characteristics of any leachate that would be generated, it is likely that the initial quantities of leachate generated, after the construction of the cap, will be collected, tested, stored on-site, and treated if necessary, until it has been established that the leachate will meet pre-treatment requirements of the POTW. Therefore, the initial discharge from the leachate collection system is likely to be in a batch mode but this may be changed to a continuous discharge at a later date, pending the characterization of the landfill leachate.

Comment 10: RIDEM questioned what measures will be necessary to prevent infiltration from the river during flood conditions.

EPA Response: The construction of the cap and the nature of the capping material (40 mil high-density polyethylene) will minimize infiltration of water from precipitation and/or any possible flood waters. Much of the landfill material within the 100-year flood plain will be excavated and rip-rap will be placed on top of the cap in the flood plain areas to provide scouring protection during flooding.

Comment 11: RIDEM questioned whether EPA is proposing to limit access to the sewer line under the landfill for maintenance or replacement of the line and thereby protect the integrity of the cap.

EPA Response: EPA proposes to allow access to the manholes currently existing in the landfill by including in the cap design provisions to extend the manholes to the new surface of the cap. The manholes would allow access to the line for repairs in the future. The remedy must remain protective; therefore, the integrity of the cap must not be impaired by any work performed by the Town on the sewerline.

Comment 12: RIDEM questioned why the feasibility of excavating the landfill was not evaluated in-depth other than in the off-site incinerator alternative.

EPA Response: The alternative for excavation and removal of landfill wastes to an off-site facility did not receive detailed analysis because it was determined by EPA to not be protective of human health and the environment because of the short-term risks posed by air emissions during the materials handling and operational phases and would not provide a degree of protectiveness proportional to its cost. The excavation of landfill wastes would only transfer these wastes to another facility and location which would require similar containment and monitoring as proposed for the Site.

Comments Regarding the Overall Site

Comment 13: RIDEM asked whether EPA had developed contingency plans to address any areas of the raceways found to be intact during remediation.

EPA Response: The exits of the old and new raceways will be sealed with concrete and then the raceways will be backfilled with suitable fill material. Site investigations indicate that the raceway beneath the landfill has collapsed. Further test pit activity during the design phase of remediation will be necessary to determine the integrity of the raceways. Procedures for filling the sections of the raceways that are found to be intact will be developed during design and implemented during construction.

Comment 14: RIDEM stated that EPA's references to coal gasification operations at the Site are inappropriate, given that semi-volatile contaminants found in an area referenced as a "gasometer" are not consistent with coal gasification operations.

EPA Response: EPA's references to coal gasification operations at the Site are based upon the 1899 plan of the Stamina Mills (Forestdale Manufacturing Company) (Site Plan SP-1 of the RI) which shows the location of a 34' diameter, one-story stone "gasometer". The plan shows the gasometer to be located near the banks of the Branch River between the raceway inlet and the extension of Mill Building No. 1. A 6' x 16' coal shed is also indicated on the plan. The type of compounds detected in this area, polycyclic aromatic hydrocarbons (PAHs), are associated with a variety of natural and synthetic processes, one of which is coal gasification. EPA agrees with RIDEM that the levels of PAHs detected in the area near the former gasometer are lower than those typically associated with a coal gasification facility. The lower levels seen in this area may be the result of the fire which took place in 1977 or some other site-related activity. In addition, other compounds which are typically found associated with a coal gasification facility, such as iron, and whose presence at elevated levels are used to confirm a coal gasification operation, were not detected in this area.

Comment 15: RIDEM suggested that grouting of the sewer line trench could significantly limit contaminant migration along the trench and would enhance the effectiveness of the groundwater remedy for the bedrock aquifer.

EPA Response: Grouting of the sewerline trench may limit contaminant migration along the trench. However, EPA believes a more effective way of limiting this migration pathway would be by maintaining groundwater levels below the bottom of the trench. Groundwater elevations are expected to be lowered as a result of the operation of the groundwater extraction system. During the pre-design and design phases, the use of the groundwater extraction system will be considered to help eliminate the sewerline trench as a potential migration pathway.

Comment 16: RIDEM asked whether the installation of physical barriers at the points where raceways enter and exit the landfill had been evaluated.

EPA Response: EPA has evaluated the installation of physical barriers at the entrance and exits of the raceways. These locations will be sealed using a concrete barrier and areas of the raceways which are not already collapsed will be back filled with suitable fill material. EPA believes that these remedial activities along with the landfill cap construction will minimize the migration of ground and surface water into the landfill. The construction of an additional concrete barrier in the old raceway, directly upgradient of the landfill will also be considered as a means of reducing the flow of water through the landfill in the event that there is evidence of a continued flow through the old raceway after the raceway entrance has been sealed.

Comments Regarding the TCE Spill Area

Comment 17: RIDEM questioned whether a lowered groundwater table resulting from the operation of the groundwater extraction system would allow placement of the vent systems so that the entire overburden in the TCE spill area could be treated.

EPA Response: Measurements taken during the remedial investigation indicate that only a small zone of seasonally saturated overburden soils exist at the Site (approximately the lower 2 feet of the overburden). The cone of depression which will ultimately result from the pumping of groundwater from the bedrock aquifer at the Site will likely cause the groundwater found in overburden soils to be lowered. The wells installed as part of the vacuum extraction system would be placed above the bedrock surface and the seasonally saturated overburden to insure that they are above any possible saturated conditions. Should this 2' zone become dewatered, the zone of influence for the extraction system, as proposed, would likely remove VOCs from the entire overburden soils including the lower few feet.

Comment 18: RIDEM questioned what is the maximum time expected to meet the objectives for the TCE spill area given the expected decrease in contaminant removal rates and the possibility of pulsed flow in the venting system.

EPA Response: It is estimated that it will take approximately one year to achieve the soil cleanup levels in the TCE spill area using the soil venting system. Monitoring of the system's performance during the operational period will demonstrate the effectiveness of the vacuum extraction system in achieving the cleanup goals and the need, if any, for extending the period of operation. It is anticipated that initially during the cleanup period the soil venting system would be operated on a continuous basis. As cleanup levels in the soil are approached, it may be more effective to change to an intermittent type of operation to allow for the equilibration of soil and air-pore concentrations. The estimate of one year is believed to reflect, at present, EPA's best estimate for the total time to achieve cleanup assuming both a continuous and intermittent operation of the soil venting system. Further refinement of the cleanup time would only be available after the operation of the system had been initiated and field data was available.

Comments Regarding Applicable or Relevant and Appropriate Requirements

Comment 19: In discussions of the overall Site remedy the Rhode Island Rules and Regulations for Solid Waste Management Facilities are not consistently referenced. These regulations will govern the sorting and disposal of the building debris during this stage of the remedy. RIDEM asked if the extensive sorting and characterization operations anticipated at the Site were considered in the estimates of the costs for the overall Site clean-up alternatives

EPA Response: The sorting and separating of building debris were considered during the preparation for cost estimates for the overall Site remedy.

Comment 20: RIDEM stated that EPA should reference EPA surface water discharge limitations on total residual chlorine when evaluating compliance.

EPA Response: Information available from the designers of the UV/hydrogen peroxide treatment system indicates that very small amounts of free chloride ions are generated during the treatment process which likely go on to form simple salts. The vendor has indicated that no residual chlorine is produced by the process. Therefore, residual chlorine levels in the effluent from the groundwater treatment unit are not expected to change for levels found in the influent. Any discharges from the system to surface waters will meet all applicable discharge limitations.

Comments Regarding Operation and Maintenance Responsibilities and Costs

Comment 21: RIDEM questioned the scope and breadth of long-term sampling, inspection, and maintenance programs for the Site and the cost estimates for those programs.

EPA Response: The costs associated with operation and maintenance, which include sampling, inspection, and other maintenance activities, and which are presented in the Feasibility Study are preliminary in nature and will be refined during the remedial design phase. The costs and costing procedures were developed from the selected references tabulated on the last page of Appendix C to the Feasibility Study. Annual O&M cost and present worth O&M cost are enumerated in Appendix C, along with sample calculations. The cost estimating assumptions are listed in the Basic Column of each table in Appendix C. For example, quarterly monitoring is assumed and groundwater monitoring sampling parameters included the target compound list for volatile organic compounds, the target analyte list for metals, dieldrin, pH, temperature, specific conductance, and chlorides. The O&M contingency costs for each alternative were assumed to be 1 percent of the capitol cost. Equipment, labor and material cost estimates are detailed in Appendix C.

Comment 22: RIDEM questioned what type of insurance would be necessary and/or is planned for the remedial activities.

EPA Response: In general, the contractor should procure and maintain the following types of insurance:

- Workmen's compensation insurance in amounts to satisfy State law;
- Comprehensive general liability insurance for bodily injury, death or loss of or damage to property of third persons in the minimum amount at $1,000,000 per occurrence.

Subject to certain restrictions, Section 119 of the Superfund Amendments and Reauthorization Act of 1986, authorizes EPA to provide indemnification to response action contractors working at Superfund sites for EPA, States and potentially responsible parties. Response action contractors must demonstrate to EPA that they have made diligent efforts to obtain insurance coverage from non-Federal sources to cover pollution liability before they can receive Federal indemnification.

Comment 23: RIDEM asked what degree of project management is anticipated and noted that the cost estimated for project management by EPA seems high.

EPA Response: EPA anticipates that during construction and startup of the remedy, day to day on-site project management by EPA's oversight contractor or principal contractor will be necessary. The cost estimated for project management is appropriate for the cost comparisons conducted during the Feasibility Study and falls below the average annual oversight cost for remedial design and construction projects conducted in Region I.

Comments Regarding Future Use of the Site

Comment 24: RIDEM questioned the extent to which the future use of the Stamina Mills property would be restricted, and what specific administrative controls were envisioned for the Site and/or surrounding area.

EPA Response: Institutional controls would be implemented to maintain the overall protection of human health and the environment believed to be afforded by this remedy. EPA has proposed, in a consent decree lodged in Federal Court, institutional controls with the current owner -- Hydro-Manufacturing -- to protect the remedy. It should also be noted that the local government may have the authority to implement and enforce institutional controls such as deed restrictions, notices, and building permit restrictions.

Part III — Summary of Potentially Responsible Party Comments

Kayser-Roth, the principal PRP at the Site, provided written and oral comments which are summarized below:

1. Ex-situ bioremediation was not addressed during the analysis of possible groundwater treatment alternatives. Kayser-Roth recommended that bioremediation be formally analyzed as a treatment alternative.

EPA Response: EPA, consistent with the NCP, developed a limited number of remediation alternatives that would attain site-specific remediation levels for the groundwater response action. Ex-situ bioremediation was not one of the technologies considered in the FS as a potential alternative because it would not attain site-specific remediation levels. Pilot testing completed at other sites has shown that ex-situ bioremediation is not effective in degrading TCE and other chlorinated solvents which were the principal contaminants found in the groundwater plume at the site. In these studies, chlorinated solvents were found to be primarily removed through uncontrolled volatilization rather than through treatment. Recently pilot-scale studies have been completed using a variation of ex-situ biodegradation, in which an anaerobic environment is maintained and a co-substrate is added. This process has been shown to be effective in destroying TCE and other chlorinated solvents through biodegradation for ex-situ and in-situ applications. Because the anaerobic ex-situ bioremediation still requires extensive pilot-work before it would be available for a full-scale operation at the Site, it was not considered for the site.

2. Selection of the UV/peroxide technology for the preferred alternative is based on extremely limited testing. No pilot studies were conducted for pretreatment. No provision for pH adjustment at either the influent or effluent has been made, nor have the costs associated with these adjustments been considered.

EPA Response: Costs estimated for the UV/hydrogen peroxide groundwater treatment system were calculated using the high end of the range of treatment costs provided by the vendor after conducting a treatability study for this purpose. Pilot testing would be conducted prior to full scale start-up to assure that groundwater ARARs and disposal option ARARs for treated groundwater would be met using the recommended pressure-filtration system for pretreatment. The pilot test would occur during pre-design and would use the UV/hydrogen peroxide system to treat contaminated groundwater generated during the on-site pump test. The costs for pH adjustment were not considered in the total costs estimated for the UV/hydrogen peroxide system because the results of the treatability test, using groundwater from the Site, indicated that the system would meet groundwater cleanup levels in a reasonable time frame without the need for pH adjustment. Cost estimates in the Feasibility Study are judged to be within the +50 percent to -30 percent accuracy range, recommended in EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004)* for alternatives under consideration.

3. Preliminary groundwater modeling used to determine groundwater cleanup times may be inaccurate and result in significantly underestimated costs.

EPA Response: A pump test, conducted using a community well system near the Site, indicated that a maximum yield of 10 gallons per minute (gpm) could be obtained from the existing well located in the bedrock aquifer on a long term basis. This flow rate of 10 gpm was used in the preliminary modeling effort to estimate the cleanup time for the groundwater contaminant plume. The groundwater extraction system has been conceptualized to consist of more than one extraction well with combined pumping rates that may exceed 10 gpm. Because of the subsurface conditions existing at the Site and the difficulty they present in obtaining a high groundwater yield over an extended period of time, a short duration-high yield pumping activity, known as pulsed-pumping was also considered for the Site. Using a pulsed-pumping scenario, a combined pumping rate of as high as 40 gpm was considered feasible for the Site for short durations. Therefore, for costing purposes, it was assumed that the treatment system should be designed to handle a potential maximum combined pumping rate, assumed at this stage to be 40 gpm. EPA believes that the information used to estimate the cleanup time frame and the cost of the groundwater extraction and treatment system is reasonable given the information currently available. EPA will update its estimates for cleanup time and cost as more information becomes available upon completing the pre-design pump test.

4. A risk assessment should be undertaken to determine if air discharges from the proposed treatment technologies which have air emissions are in compliance with Applicable or Relevant and Appropriate Requirements before a decision is made on whether to use or not to use control devices.

EPA Response: A risk assessment is not necessary to determine if air emissions will meet the RI ARARS without the use of air emission control devices (e.g., vapor phase activated carbon) because the acceptable limits for air emissions are clearly identified in these regulations and untreated air emissions from an air stripper would exceed them. Calculations for air emissions from an air stripping tower are included in Appendix B of the FS and are based upon the levels at which TCE and other VOCs found in the groundwater on-site would be discharged to the atmosphere. The discharge levels exceed RI ARARs established to regulate the emissions of these compounds and require the use of some type of control device to reduce discharge levels. An additional State ARAR requires that a "new source" of air emissions use best available control technology (BACT) to control any emissions. As the air stripper would be considered a "new source" it would be required to use BACT which at present time is a vapor phase carbon filter as proposed in the FS.

5. The soil vacuum extraction system proposed for the TCE spill area should be readdressed after pilot study data are available to estimate the operation time required. If a longer operation time is required, more operations and maintenance funds need to be allocated.

EPA Response: Site-specific technical data will be obtained as part of the soil vapor extraction system design. The shake-down operational period of the system prior to full scale operation will better define the estimated time to reach the cleanup goals and help optimize the system. During the time frame the system is to be operated, its performance will be evaluated and the time to achieve cleanup levels will be re-examined as operational data becomes available.

6. All potentially hazardous on-site demolition debris and excavated material should be placed under the cap for the landfill, unless they are subject to the landfill ban, in order to reduce the expenses of off-site transport and disposal.

EPA Response: As suggested in this comment, disposing of rubble and other potentially hazardous materials in the landfill could result in lower disposal costs than off-site disposal. However, the State solid and hazardous waste regulations place limitations on what disposal may take place at the Site. Movement and disposal of the hazardous waste from outside the landfill into the landfill area would constitute designation as a new land disposal facility and would be prohibited under the State hazardous waste regulations. Rhode Island Solid Waste Regulations allow for rubble consisting of materials of an earthen origin (i.e., bricks, concrete) to be disposed of on-site. However, all other non-hazardous debris must be disposed of off-site at a RIDEM approved facility.

7. A higher interest rate than recommended in EPA guidance documents was used for calculating the net present worth of operation and maintenance, thereby resulting in an underestimate of the cost.

EPA Response: The Feasibility Study cost estimates are expected to provide an accuracy of +50 percent to -30 percent and fall within the range recommended in EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004)* for alternatives under consideration. Although EPA Guidance dated October 1988, recommends a discount rate of 5 percent, it also notes that a rate of 3 percent to 10 percent may be used to compare alternative costs. EPA in this case followed OMB Circular A-94 as specified in the National Contingency Plan, effective April 9, 1990. OMB Circular A-94 prescribes a standard discount rate of 10 percent which represents an estimate of the average rate of return on private investment before taxes and after inflation. Since the ten percent discount rate was used in the cost estimates for each alternative, the relative estimated costs are appropriate for comparison of alternatives.

8. Conclusions drawn from the results of the aquifer testing were vague and contradictory. No water-level information was obtained from the south side of the Branch River to demonstrate possible hydraulic interconnection. The aquifer test results were used in groundwater modeling for estimating pumping rates and cleanup times. These misleading conclusions may affect the overall cost of the cleanup.

EPA Response: EPA believes that the conclusions drawn from the results of the aquifer test were not vague, contradictory or misleading. EPA also believes the results of the aquifer testing confirm the hydraulic connection between the Site and the residential area to the north of the Site.

For the preliminary evaluation of the remediation system, it was assumed that a continuous pumping rate of 10 gpm or total daily withdrawal of 14,400 gpd would not result in river water being captured by the recovery system and undergoing treatment. A simplified analysis of the potential downgradient stagnation point for a single well pumping at 10 gpm was conducted. This analysis suggested that the capture zone for a well positioned at the location of MW-2 would not extend to the Branch River. The final design and operation of the recovery system will be based on the results and analysis of the pre-design pump test. The system will be designed to maximize the volume of contaminated water extracted and minimize the capture and treatment of clean water, thereby minimizing cleanup times.

IV. Remaining Concerns

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

1. The effectiveness of the groundwater monitoring program.

2. Site appearance and future potential use of the Site.

3. Treatment of leachate at the local wastewater treatment plant and potential impacts on the local sewer line on-site.

4. Effectiveness of the remediation and any effects of the remediation on the aquifer.

5. Timing of the start of the remediation and the time to meeting the cleanup goals for the Site.

Attachment A

Community Relations Activities Conducted at the Stamina Mills Superfund Site

14 September 1984	**Press Release** announcing 24 September public meeting
24 September 1984	**Public Meeting** announcing availability of bottled water and well test results
27 November 1984	**Press Release** on alternate water supply and EPA funding
.. February 1986	**Press Release** announcing 10 March public meeting
.. March 1986	**Fact Sheet** on start of Remedial Investigation
10 March 1986	**Public Meeting** on start of Remedial Investigation
.. May 1986	**Fact Sheet** on progress and continuing activities of Remedial Investigation
.. December 1986	**Community Relations Plan** completed
.. February 1990	**Fact Sheet** on results of Remedial Investigation
21 February 1990	**Public Meeting** on results of Remedial Investigation
29 June 1990	**Public Notice** of Proposed Plan and Public Comment Period
5 July 1990	**Proposed Plan** published
10 July 1990	**Public Meeting** on Proposed Plan and Feasibility Study
31 July 1990	**Informal Public Hearing** on Proposed Plan and Feasibility Study
11 July 1990 - 9 August 1990	**Public Comment Period**
28 September 1990	**Responsiveness Summary** for Record of Decision

Attachment B

Transcript of the 31 July 1990 Informal Public Hearing

UNITED STATES OF AMERICA

ENVIRONMENTAL PROTECTION AGENCY

BOSTON REGION

In the Matter of:

INFORMAL PUBLIC HEARING
STAMINA MILLS SUPERFUND SITE

Municipal Annex
575 Smithfield Road
North Smithfield, Rhode Island

Tuesday
July 31, 1990

The above entitled matter came on for hearing, pursuant to Notice at 7:35 p.m.

BEFORE: RICHARD C. BOYNTON
NEIL HANDLER
U.S. Environmental Protection Agency

TERRENCE GRAY
R.I. Department of Environmental Management

INDEX

PROCEEDINGS

7:35 P.M.

MR. BOYNTON: Good evening. My name is Richard C. Boynton, and I'm the chief of EPA Rhode Island Superfund Section. I have supervisory responsibilities for EPA response actions at Superfund sites in Rhode Island.

Tonight we are here to conduct an informal public hearing, to receive all comments on the Stamina Mills feasibility study and proposed clean up grant for the site.

I will serve as a hearing officer. Also on the hearing panel with me, to my far right Neil Handler, the EPA project manager for the Stamina Mills site. And to my immediate right Terry Gray of the Rhode Island Department of Environmental Management.

I would also like to introduce Jim Sabastian, our Office of Public Affairs Community Relations Coordinator, who is in the rear of the room. And also Nancy Andrews of the Army Corps of Engineers, sitting in the front right.

EPA held an informational meeting on Tuesday evening, July 10th in this room, to present information about the evaluation of alternatives for the clean up of the Stamina Mills site, and the preferred plan for the clean up of the site.

The public comment period began on the next day, July 11, and will run for 30 days, and close on August 9th.

Now I would like to describe the hearing format for you. We will begin with a brief presentation by Neil Handler, describing the proposed clean up plan. Following Neil's presentation we will accept all comments, any and all comments you wish to make for the record. The panel may also ask some questions, in order to clarify the comments.

We will prepare a written response to each and every comment received tonight, and include the written responses with EPA's final decision.

When all comments have been heard I will close tonight's hearing. If you wish to submit written comments, you may submit them until August 9th, to the address on page two of the proposed clean up plan document. Copies of the plan are available at the rear of the room, if you need them.

At the conclusion of the hearing please feel free to address any questions you may have about the clean up plan or the decision making process to the EPA representatives that are here tonight.

For those of you wishing to make a comment tonight, you should have filled out an index card, available at the rear of the room. If you have not completed a card and wish to make a comment, please see Jim Sebastian at the rear of the room, and complete an index card.

I will call upon those who wish to make a comment in the order in which they filled out the index cards. When called upon, please come forward to the microphone on the podium, and state your name and affiliation. I ask you to do this because we are transcribing the hearing for the record, and this will help our recorder to keep an accurate record of the proceedings.

If you have a prepared statement with you, please submit it to the panel.

The transcript of tonight's hearing will be made available, with the administrative record, at the North Smithfield Public Library at 20 Main Street, and at the EPA Record Center, 90 Canal Street, Boston, Mass. A transcript will be available in one or two weeks after tonight's hearing.

As I mentioned, EPA will prepare a response to all written comments received during the comment period, and will include the response summary with a record of decision.

Now I'd like to ask Neil to give an over of the proposed clean up plan. Neil.

MR. HANDLER: As Dick mentioned, my name is Neil Handler, and I'm the project manager for EPA, for the Stamina Mills Superfund site. And I'd like to briefly describe to you just what the EPA's proposed preferred alternative, which addresses dealing with the clean up of this Stamina Mills Superfund site, is.

So I guess the place to start then is just to briefly identify the areas that EPA focused in on during their remedial investigation and feasibility study, and came up with clean up alternatives for.

First of all, there are primarily four areas of the site. The first area is a spill area, which was located directly east of the former mill building number one. In that location an unknown quantity of TCE, or trichlorethylene, was spilled.

Another area that is addressed as part of this preferred alternative is the landfill area, which is located in the eastern section of the site, adjacent to the Branch River there.

And the third area of the site is the overall site itself, which consists of rubble piles, partially standing buildings, deteriorating smokestack adjacent to the river, and two physical structures known as race ways, which run through the site, and used to convey water through the site for hydro-mechanical power.

In addition to those three areas, the final area which has been impacted by the site is the groundwater beneath the site, which the TCE which was spilled at the site, ended up infiltrating through the soil, and getting into the bedrock aquifer beneath the site, and ended up being pulled offsite by the pumping action of some of the residential wells north of the site.

So, with these areas identified, EPA put together a feasibility study, and from the feasibility study evaluated all the alternatives for the site, and came up with a series of final alternatives that we evaluated in detail. And these alternatives address the different areas that I just mentioned. And I'd like to briefly go through them, to give you some idea of what alternatives we looked at.

Just one note. On this overhead you will see that some of the alternatives have a little asterisk next to them, and that's to indicate that those are the proposed preferred alternatives that EPA has previously mentioned, and we're interested in your comments on.

For the TCE, or the trichlorethylene spill area, EPA looked at on-site incineration for this area. The final alternatives that were evaluated for this area came down to these two alternatives, and these included the on-site incineration and the soil treatment by vacuum extraction, as well as the no action alternative, which serves as a baseline alternative, which we compare all other alternatives to for that treatment.

For the landfilled area, we considered on-site incineration. And again the preferred alternative that is being proposed by EPA is an impermeable cap for the landfill area.

In addition, again, for each one of these alternatives, we are required by the statutes to carry through a no-action alternative.

For the groundwater at the site, the treatment technologies that EPA evaluated in detail were air-stripping, carbon treatment, and then, again, the proposed preferred alternative was treatment by ultra-violet light and hydrogen peroxide. And then the final, the no-action for the groundwater.

For the overall site, in dealing with the buildings and race ways, and the septic tank at the site, the alternatives that EPA considered were to demolish the site structures, seal and fill the race ways, and backfill the race ways. To locate the septic tank and treat its contents, and then grade and seed on the site, and improve the fencing. This was EPA's proposed preferred alternative there.

And the other final alternative for dealing with the overall site pretty much follows the first overall site alternative, except in addition we would look at addressing an area where there were some elevated levels of PH's, which are poly-cyclic aromatic hydrocarbons, which are a compound, which we found some elevated levels, in an area adjacent to the dam. And then there is the no-action.

So, to briefly summarize EPA's preferred alternative, and what it's attempting to deal with, we have for the trichlorethylene spill area, which has been identified as an area which is the source of contamination to the groundwater beneath the site, as well as off-site. EPA is proposing to use soil treatment by vacuum extraction. And this would consist of installing a number of wells into that area, and then withdrawing the air from the soil, the air that's in contact with the soil, and treating this air, which would contain the compound trichlorethylene.

And for the landfill area, EPA is proposing to use an impermeable cap in that area, to prevent the migration of contaminants from the landfill into the Branch River, as well as to reduce the amount of groundwater, which is infiltrating through the landfill, and impacting the groundwater beneath, the site.

For the groundwater itself, on-site and off-site, EPA is proposing to install a number of extraction wells, in the vicinity of the site, and the exact number and location will be determined once we've completed a pump test at the site.

But this technology, ultra-violet light, and hydrogen peroxide, completely destroys the compounds that we're seeing at the site, and basically would just leave carbon dioxide and water, and chloride salts as the residue from the chlorinated solvents, trichlorethylene and some of its breakdown products, that we are seeing at the site in the groundwater.

For the overall site, EPA's preferred alternative considers demolishing all the site structures, sealing and backfilling the race ways, and locating the septic tank at the site, and treating its contents.

I guess I should just point out that the septic tank, the reason why we haven't located it, it's beneath one of the large piles of rubble at the site. We believe it's beneath that pile.

In addition, once all the activities at the site are completed, we would grade these areas and seed them, and improve the site fencing.

And the total cost for the proposed preferred alternative is approximately $4.3 million.

As I said, I briefly just tried to present this. More details can be found in the feasibility study and in the remedial investigation, which are available at the Smithfield Public Library.

MR. BOYNTON: Thank you, Neil.

Now I would like to begin comments with Terry Gray, representing the Rhode Island Department of Environmental Management.

MR. GRAY: Hi. Good evening. My name is Terrance Gray. I'm a principal engineer with the Department's Division of Air and Hazardous Materials.

Initially, I would like to state that the Department agrees that EPA's preferred remedial alternatives have addressed the different aspects of site contamination, and will be protective of human health in the environment.

We do, however, have some issues which we'd like to see addressed as part of the record of this hearing for the site.

Our primary concern is directed at the implementation of the proposed groundwater remediation. The Department agrees that groundwater remedial action should progress toward achieving appropriate groundwater quality standards.

In the case of the Stamina Mills site, attainment of drinking water quality standards is our desired initial objective. However, based on the information presented to date, there are many uncertainties associated with the technical feasibility and associated costs of achieving drinking water quality standards in the bedrock aquifer at this site.

Specifically, the uncertainties here associated with the technical ability to reach and maintain drinking water quality standards, and the time frame that may be necessary to achieve that clean up goal.

We believe the preferred alternative, and record of decision, should reflect these uncertainties by specifically including a performance review to be conducted sometime within five years of the initiation of the chosen groundwater remedy. And an alternate or contingent remedy to be implemented if the performance review indicates that the initiation of the chosen groundwater remedy is not making satisfactory progress towards meeting the remedial objective.

This is consistent with language proposed in the RIDEM draft groundwater regulations, which allow for the reclassification of an aquifer, should it become apparent that it is not technical feasible or financially beneficial to continue actively treating the groundwater.

Given the aforementioned uncertainties, this Department will commit state resources, provided there is an adequate degree of flexibility to amend clean up goals, as additional information is obtained.

We also have specific comments and questions on the alternatives evaluated in the feasibility study in the preferred alternative, included in a letter submitted to the EPA for the administrative record. I have copies of that letter available tonight, if anyone wishes to see one.

Thank you.

MR. BOYNTON: Thank you, Terry. Now I'd like to call Deming Sherman.

MR. SHERMAN: Yes. My name is Deming (spelled D-e-m-i-n-g) Sherman (Sh-e-r-m-a-n). I'm attorney for Kayser Roth Corporation.

This evening I have with me Mr. Michael Hauptman (H-a-u-p-t-m-a-n) of the consulting firm of Gerrity and Miller, who has been retained by Kayser Roth Corporation to review the proposed clean up plan, and comment on it.

It is our intention tonight for Mr. Hauptman to make certain comments. These comments will be followed by a formal written presentation to the EPA on or before August 9, 1990.

I wish to state at the outset that Kayser Roth Corporation has been held liable for past and future clean up costs relating to the Stamina Mills site. Kayser Roth has appealed the judgment of the district court in which liability was found, and that appeal is pending.

By making the comments tonight, on or before August 9, Kayser Roth Corporation is not in any way conceding its liability for the expenses for this plan. So that these comments are offered without prejudice to our legal position that is being asserted in the courts. However, we thought it would be prudent and useful to present our comments on the proposed plan, despite the fact that the final adjudication is not complete.

So, with that caveat, I would like to present Mr. Hauptman, who will make some comments at this point.

MR. HAUPTMAN: Thank you. Good evening, everyone. My name is Michael Hauptman from Gerrity Miller, and on behalf of Kayser Roth Corporation I'd like to give you a few technical comments. These are just the highlights. We will be presenting the formal written comments at a later date.

First of all, in general, I'd like to say that there are a lot of data gaps in the feasibility study, which we'd like to see filled at some time.

Now specifically one of the technologies that was not considered, and we didn't understand why, for the groundwater, was bio-remediation, ex situ bio-remediation, which means you would withdraw the groundwater from the aquifer. And instead of treating it with carbon or with the UV system, you would treat it with a biological reactor.

As far as the UV/peroxide, this is where one of the data gaps occurred. We weren't sure why the recommended alternative proceeded with this particular part, because there was only one sample sent to the laboratory in the pilot test. The Tucson Laboratory only performed their testing on one sample.

Another aspect to the UV/peroxide system is that there will be pre-treatment required to remove iron and manganese, and other metals occurring naturally. And the feasibility study, as well as the report by the Tucson firm, stated this. But there was no pilot testing or pre-treatment testing done for this. And we feel that the costs may be under-estimated because of that.

Moving on to the overall site, the preferred alternative says that the rubble will be carted off-site. And we think that there is really no reason not to put it into the landfill.

Another comment, as far as clean up time is concerned. The modelling that was done in the FS was an analytical model. It was very simplistic, and we think that the time was too short, because they used an exponential model that went to zero. In most cases we've seen that those concentrations become asyntotic at some level. And if this level is above ARARs for example, then carbon treatment would have to be continued. And we didn't see this reflected in the cost estimate.

As far as turning to the cost estimate, the feasibility study used a ten percent discount factor in calculating the present worth of the operation and maintenance costs. I believe it's true that EPA recommends using a five percent discount factor. The effect of using at ten percent is that the actual cost is much lower -- I mean, the estimate of the actual cost is much lower than it will be.

Continuing with the groundwater. The pumping rate that was used in the feasibility study, to determine the clean up time, was at ten gallons a minute. We feel that that is too low for this situation. And again it probably led to a lower cost estimate.

The other thing that wasn't considered was potential induced infiltration from the Branch River.

Lastly, as far as the carbon treatment of the air emissions, this was eliminated. But it seems that the feasibility study assumes that 100 percent of the emissions for an air stripper would have to be removed. Rhode Island allows a certain amount of emissions, and we thought we would see at least a preliminary risk assessment, as to what the effect would be if some of what was stripped was allowed to enter the atmosphere.

And that's all the comments I have. Thank you.

MR. BOYNTON: Thank you, Mr. Hauptman. I'd like to call on Gerry Chrisman to make comments.

MS. CHRISMAN: I have no comments.

MR. BOYNTON: Senator Paul Kelly.

MR. KELLY: I'm Senator Paul Kelly. I represent North Smithfield.

The comments I have to make are not as technical as the comments we've heard, but they do represent some concerns that the residents have. I'm not sure whether to place these in the form of a question or comment. So I'll try to place them both ways.

At the last hearing it was our understanding that the capped wells, that the contaminants that were emanating from the site, had receded back toward the site because the wells had been capped, and the affected homeowners had been tied into the water system.

At the time I asked the question, what steps were being taken, or what steps should be taken to assure that these wells are not reactivated, because it was our understanding that night that if these wells were reactivated, that the contaminants could then reactivate themselves. And it was my impression that night that no steps had been taken.

So again, gentlemen, I don't know whether to put this in the form of a question or just make it as part of this report.

I think the concern on the part of the homeowners surrounding the contaminated sites is what steps would be taken, either by EPA, or DEM, or by the town, that would not cause this site to erupt again.

The second is more of a legal question. We have several people in town who spent many thousands of dollars to sink wells. And these aren't wells that have been in existence for twenty years or more, these were new wells. And found that they could not use the wells. They are finding that EPA siting a culprit to pay for the clean up. And from a very local point of view, these people are wondering if there is any way, either as a class, or as individuals, that EPA or DEM could assist them in some sort of ability to recoup their financial losses.

Because they sunk wells, and found out that the wells had to be capped, and they couldn't use them. Their out of pocket expenses, from a personal point of view, were proportionately every bit as great as the town, or as EPA is looking at through Kayser Roth.

So these are comments that I would like addressed, or at least like to be considered. And if we could receive some answers, as far as what steps would or should be taken, and do the people have any rights to recover losses they had, we'd be more than grateful.

MR. BOYNTON: I think we'll hold the questions until after I close the hearing. Thank you, Senator.

Lynda Masnyk.

MS. MASNYK: My name is Lynda (L-y-n-d-a) Masnyk (M-a-s-n-y-k). And I'm on the town council in North Smithfield.

And after reviewing several times the feasibility study that EPA and the preferred alternatives that EPA has come up, not being an expert, and listening to the comments from DEM, I certainly would agree that for both what EPA and DEM hope to achieve in that area, certainly would be covered by the alternative that was chosen.

My only problem with the alternative, specifically in the landfill area, is that like the other site that we have, that's a Superfund site in North Smithfield, LR and R, we

Smithfield in the future.

We have heard that this has not done anything to our particular water source now, that serves the municipal system, but knowing that there is a possibility that the groundwater could be cleaned up in this area, certainly would be the best alternative to me.

I notice that all three different alternatives, results are not particularly promised that everything would be cleaned up in the time frame, and it's about the same, 10 to 15 years.

So, as the gentleman from DEM said, I certainly would like that situation monitored as time goes on.

As far as the overall area, one of the comments I made the last time was that the people in this area have been living with the rubble that's present there for quite some time. That particular area of town, as far as the Branch River and the Slatersville Reservoir, could be a beautiful part of North Smithfield, and yet they've had to look at these buildings.

So I would certainly hope that that particular part of the clean up is achieved as soon as possible, and we did discuss how long a time frame it would be, as far as beginning this project, and the comment was made that it would be possibly two years.

I, as a town council member, would like to see that period speeded up, so that at least the structures on the site would be taken care of, so at least they wouldn't have to look at the buildings they've been looking at for the last fifteen years.

MR. BOYNTON: Thank you. Are there any further comments for the record? Does the hearing panel have any comments they wish to make?

Thank you for attending this hearing, and for your comments. I'd like to remind you that EPA will accept written comments postmarked before August 9th at the address in the proposed plan.

Also, if you have any questions about the decision-making process, you can call Jim Sebastian. Jim's phone number and address are in the proposed plan.

Thank you again for your comments and for attending the hearing. This hearing is closed.

(Whereupon, the hearing in the above captioned matter ended at 8:05 P.M.)

CERTIFICATE OF REPORTER AND TRANSCRIBER

This is to certify that the attached proceedings before: U.S. ENVIRONMENTAL PROTECTION AGENCY in the Matter of:

INFORMAL PUBLIC HEARING
STAMINA MILLS SUPERFUND SITE

Place: North Smithfield, Rhode Island

Date: July 31, 1990

were held as herein appears, and that this is the true, accurate and complete transcript prepared from the notes and/or recordings taken of the above entitled proceeding.

Lester Marshak Reporter	8/10/1990 Date
Pamela Sullivan Transcriber	8/10/1990 Date

APPENDIX D

STATE CONCURRENCE

State of Rhode Island and Providence Plantations
Department of Environmental Management
Office of the Director
9 Hayes Street
Providence, RI 02908

27 September 1990

Ms. Julie Belaga
Regional Administrator
Environmental Protection Agency
John F. Kennedy Federal Building
Boston, MA 02203

Dear Ms. Belaga:

The purpose of my writing is to express the State of Rhode Island's concurrence with the remedy detailed in the Record of Decision, dated 28 September 1990, for the Stamina Mills Superfund site.

This concurrence is based upon all aspects of the abovementioned Record of Decision being adequately addressed and implemented during the design, construction and operation of the remedy. The Department wishes to particularly emphasize the following aspects of the Record of Decision:

> The remedy as proposed and implemented must meet all applicable and relevant and appropriate State and federal statutes, regulations and policies.
>
> The ground water remedial objective is to restore the ground water to federal and state drinking water quality standards as rapidly as possible. Should the clean up objective not be met within ten years of the implementation of the remedy, EPA will reevaluate the technical feasibility and associated costs of continuing the remedial action. Based upon that evaluation, EPA will consider making changes in the remedy.
>
> In order to maintain the overall protection of human health and the environment believed to be afforded by the remedy, institutional controls, in the form of deed restrictions regulating land use, will have to be implemented. These institutional controls, which are necessary to protect the long-term integrity of the remedy, must be put in place prior to the completion of construction of the remedy. This Department cannot unilaterally impose the necessary controls on a landowner. Also, it is the Department's understanding

that should the installation or operation of any off-site wells adversely impact the operation of any portion of the remedy, the EPA will take action within the scope of their authority to correct the problem.

Also included with this letter are the State Acceptance sections for each of the four areas of the site. Please include these sections in the final Record of Decision.

Finally, I urge EPA to make every effort to ensure that the responsible parties in this case will implement the remedy in a timely and efficient manner.

Sincerely,

Michael Annarummo, Director
Department of Environmental Management

cc: Merrill Hohman, Director, EPA Waste Management Division
Richard Boynton, EPA, RI Superfund Section
James Fester, Assistant Director for Regulation
Thomas Getz, Chief, Division of Air and Hazardous Materials
Claude Cote, Esq., Office of Legal Services

State Acceptance(TSA-3): The Rhode Island Department of Environmental Management (RI DEM) concurs with the selection of a soil vacuum extraction system as the source control alternative for the TCE spill area.

State Acceptance(LA-3): The Rhode Island Department of Environmental Management (RI DEM) would have preferred excavation and off-site disposal of the material found in the landfill. However the Department understands the uncertainty as to whether any or all of that material is actually hazardous waste and, if so, the corresponding difficulty and expense in disposing of those materials.

RI DEM concurs with the selection of a multi-layer cap and leachate collection system, with institutional controls in place, as the source control alternative for the Landfill area. RI DEM has informed the EPA that the Department cannot unilaterally impose the institutional controls necessary to protect the integrity of the landfill.

State Acceptance(GW-4): The Rhode Island Department of Environmental Management (RI DEM) concurs with the selection of a UV/Hydrogen Peroxide treatment system as the management of migration alternative for the ground water. It is estimated that this alternative should achieve the clean up levels after ten to fifteen years of operation. The Department is concerned, however, with the uncertainties associated with the technical feasibility and associated costs of achieving drinking water standards in the bedrock aquifer at the site. RI DEM has emphasized, as specified in the Record of Decision, that periodic reviews be conducted to evaluate the performance of the system and, the feasibility and cost effectiveness of continued operation of the system in achieving the clean up levels. Revisions to the remedy should be made as necessary.

State Acceptance(OS-3): The Rhode Island Department of Environmental Management (RI DEM) concurs with the selection of the combination of demolition of the remaining structures on the site, sealing of the remaining raceways, location and removal of the septic tank and final site grading as the management of migration alternative selected for the overall site. The Department has raised concerns about potential routes of migration through the sewer line trench and through potentially uncollapsed sections of the raceway underneath the landfill. This issue will be further evaluated during the predesign, design and operation of the remedy

APPENDIX E

ADMINISTRATIVE RECORD INDEX

Stamina Mills

NPL Site Administrative Record

Index

Compiled: February 12, 1990
Updated: July 10, 1990
ROD Signed: September 28, 1990

Prepared for

Region I
Waste Management Division
U.S. Environmental Protection Agency

With Assistance from

AMERICAN MANAGEMENT SYSTEMS, INC.
One Kendall Square, Suite 2200 • Cambridge, Massachusetts 02139 • (617) 577-9915

Introduction

This document is the Index to the Administrative Record for the Stamina Mills National Priorities List (NPL) site. Section I of the Index cites site-specific documents, and Section II cites guidance documents used by EPA staff in selecting a response action at the site.

The Administrative Record is available for public review at EPA Region I's Office in Boston, Massachusetts, and at the North Smithfield Public Library, 20 Main Street, Slatersville, Rhode Island 02895. Questions concerning the Administrative Record should be addressed to the EPA Region I site manager.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Section I

Site-Specific Documents

ADMINISTRATIVE RECORD INDEX

for the

Stamina Mills NPL Site

1.0 Pre-Remedial

Please refer to the 1984 - 1985 Removal Administrative Record for additional documents which are included in this section by reference only.

1.18 FIT Technical Direction Documents (TDDs) and Associated Records

1. Letter Report from Mark Radville, NUS Corporation to Donald Smith, EPA Region I (July 28, 1986). Concerning Halliwell Boulevard Site Discovery.

2.0 Removal Response

Please refer to the 1984 - 1985 Removal Administrative Record for additional documents which are included in this section by reference only.

2.4 Pollution Reports (POLREPs)

1. POLREP 1, EPA Region I (August 28, 1990).

2.5 On-Scene Coordinator Reports

1. "On-Scene Coordinator's Report," EPA Region I (March 6, 1990).

3.0 Remedial Investigation (RI)

Please refer to the 1984 - 1985 Removal Administrative Record for additional documents which are included in this section by reference only.

3.2 Sampling and Analysis Data

1. "Attachment 1 - Final Volatile Organics Sampling and Analytical Plan," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (August 14, 1987).
2. "Memorandum Report on Results of Ambient Air Monitoring for Volatile Organics," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (January 29, 1988).

The map associated with the record cited in entry number 3 is oversized and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

3. "Report of Pump Test of the Forestdale Water Association Well," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (March 1989).

3.4 Interim Deliverables

1. "Final - Site Operations, QA/QC and Site Health and Safety Plans," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (April 1986).
2. "Report of the Assessment of Soil and Groundwater Conditions in the Landfill Area," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (April 1989).

3.5 Applicable or Relevant and Appropriate Requirements (ARARs)

1. Cross-Reference: Letter from James Fester, State of Rhode Island Department of Environmental Management to Merrill S. Hohman, EPA Region I (June 7, 1990). Concerning transmittal of the attached Applicable or Relevant and Appropriate Requirements identified by the State of Rhode Island [Filed and cited as entry number 1 in 4.5 Applicable or Relevant and Appropriate Requirements (ARARs)].

3.6 Remedial Investigation (RI) Reports

1. "Remedial Investigation Report - Volume I - Main Text," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (January 1990).
2. "Remedial Investigation Report - Volume IIA - Appendices," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (January 1990).
3. "Remedial Investigation Report - Volume IIB - Appendices," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (January 1990).
4. "Remedial Investigation Report - Volume III - Presentation of Analytical Data," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (January 1990).

3.7 Work Plans and Progress Reports

1. Letter from Robert F. Smart for S.L. Carlock, U.S. Army Corps of Engineers to John Hartley, Rhode Island Department of Environmental Management (July 24, 1985). Concerning the attached Trip Report on a Visit to Stamina Mills, Randy Petersen, U.S. Army Corps of Engineers (June 12, 1985).
2. "Additional Field and Laboratory Work Beyond the Existing Scope of the Final RI/FS Work Plan dated March 18, 1986," GHR Engineering Associates, Inc. (September 15, 1987).

3.10 Endangerment Assessments

1. "Endangerment Assessment - Revised Phase II Draft Final Report," GCA Corporation (July 1985).

4.0 Feasibility Study (FS)

4.1 Correspondence

1. Memorandum from Karen J. Wilson, EPA Region I to Neil Handler, EPA Region I (May 31, 1990). Concerning ground water classification.
2. Memorandum from Stephen Mangion, EPA Region I to Neil Handler, EPA Region I (May 31, 1990). Concerning evaluation of the soil clean-up level.
3. Memorandum from Maureen R. McClelland, EPA Region I to Neil Handler, EPA Region I (June 22, 1990). Concerning review of the "hot spot" area soil sample results.

4.5 Applicable or Relevant and Appropriate Requirements (ARARs)

1. Letter from James Fester, State of Rhode Island Department of Environmental Management to Merrill S. Hohman, EPA Region I (June 7, 1990). Concerning transmittal of the attached Applicable or Relevant and Appropriate Requirements identified by the State of Rhode Island.

4.6 Feasibility Study (FS) Reports

Reports

1. "Feasibility Study Report," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (June 29, 1990).
2. "Feasibility Study Report - Appendices," GHR Engineering Associates, Inc. for U.S. Army Corps of Engineers (June 29, 1990).
3. Letter from Lloyd Selbst, EPA Region I to Beulah Richer (July 10, 1990). Concerning attached addendum to the Feasibility Study Report.

Comments

Comments on the Feasibility Study received by EPA Region I during the formal public comment period are filed and cited in 5.3 Responsiveness Summaries.

4.9 Proposed Plans for Selected Remedial Action

Reports

1. "EPA Proposes Cleanup Plan to Address Contamination at the Stamina Mills Superfund Site," EPA Region I (July 1990).

Comments

Comments on the Proposed Plan received by EPA Region I during the formal public comment period are filed and cited in 5.3 Responsiveness Summaries.

5.0 Record of Decision (ROD)

5.1 Correspondence

1. Memorandum from Don R. Clay, EPA Headquarters to EPA Regions I-X Regional Administrators (January 29, 1990). Concerning the twenty-first remedy delegation report authorizing EPA Region I to proceed with a 1990 Record of Decision for the Stamina Mills NPL site.
2. "Field Investigation Report," State of Rhode Island Department of Environmental Management (July 5, 1990).
3. Letter from Susan C. Svirsky, EPA Region I to Neil Handler, EPA Region I (July 9, 1990). Concerning comments on the Ecological Risk Assessment.
4. Memorandum from Mark D. Sprenger, EPA Environmental Response Branch to Neil Handler, EPA Region I (August 22, 1990). Concerning the attached "Analytical Report," Roy F. Weston, Inc. (June 15, 1990).
5. Letter from Edward F. Sanderson, Historical Preservation Commission to Lloyd Selbst, EPA Region I (August 28, 1990). Concerning impact of the remedy on listing of the site on the National Register of Historic Places.
6. Letter from Gordon E. Beckett, U.S. Department of the Interior Fish and Wildlife Service to Neil Handler, EPA Region I (September 19, 1990). Concerning comments on 1990 "Draft Record of Decision."
7. Memorandum from Neil Handler, EPA Region I to File (September 27, 1990). Concerning procedures used by Region I to calculate soil cleanup levels.

5.3 Responsiveness Summaries

1. Cross-Reference: Responsiveness Summary, EPA Region I (September 28, 1990) [Filed and included as Appendix C in entry number 1 in 5.4 Record of Decision (ROD)].

The following citations indicate written comments received by EPA Region I during the formal public comment period.

2. Cross-Reference: Transcript, Informal Public Hearing Summary, EPA Region I (July 31, 1990) [Filed and included in Appendix C in entry number 1 in 5.4 Record of Decision (ROD)].
3. Comments Dated July 31, 1990 from James Fester, State of Rhode Island Department of Environmental Management on the July 1990 "EPA Proposes Cleanup Plan to Address Contamination at the Stamina Mills Superfund Site," EPA Region I.
4. Letter from Bruce H. Edelson, Kayser-Roth Corporation to Neil Handler, EPA Region I (August 8, 1990). Concerning transmittal of the attached August 1990 "Review of Remedial Investigation and Feasibility Study Reports for the Stamina Mills Site," Geraghty & Miller, Inc. for Kayser-Roth Corporation.

5.4 Record of Decision (ROD)

1. Record of Decision, EPA Region I (September 28, 1990).

11.0 Potentially Responsible Party (PRP)

11.9 PRP-Specific Correspondence

1. Letter from Merrill S. Hohman, EPA Region I to James I. Speigel, Kayser-Roth Corporation (September 19, 1984). Concerning notice of potential liability.
2. Letter from Merrill S. Hohman, EPA Region I to Henry Richards, Hydro-Manufacturing, Inc. (October 23, 1984). Concerning notice of potential liability.

13.0 Community Relations

Please refer to the 1984 - 1985 Removal Administrative Record for additional documents which are included in this section by reference only.

13.1 Correspondence

1. Memorandum from Wendy Rundle, ICF Corporation to Patty D'Andrea, Susan Patz and Debra Prybyla, EPA Region I (March 14, 1986). Concerning community relations on-site discussions.

13.2 Community Relations Plans

1. "Final Community Relations Plan," ICF Corporation (December 15, 1986).

13.3 News Clippings/Press Releases

News Clippings

1. "N. Smithfield Hoping DEM Won't Levy Fines," The Woonsocket Call - Woonsocket, RI (December 23, 1989).
2. "Meeting Will Air Stamina Mills Contamination," The Woonsocket Call - Woonsocket, RI (February 14, 1990).
3. "Investigation Confirms Contamination Of Ground Water, Soil Near Stamina Site," Evening Bulletin - Providence, RI (February 16, 1990).
4. "Investigation Confirms Contamination Of Ground Water, Soil Near Stamina Site," The Providence Journal - Providence, RI (February 16, 1990).
5. "Residents Near Stamina Shouldn't Use Wells," The Woonsocket Call - Woonsocket, RI (February 22, 1990).
6. "Stamina Cleanup May Take 5 Years," The Woonsocket Call - Woonsocket, RI (February 22, 1990).
7. "Tainted Wells May Never Be Safe, EPA Says," Evening Bulletin - Providence, RI (February 22, 1990).
8. "The United States Environmental Protection Agency Invites Public Comment On The Proposed Plan and Feasibility Study For The Stamina Mills Superfund Site in North Smithfield, Rhode Island," The Woonsocket Call - Woonsocket, RI (July 2, 1990).
9. "Showing The Stamina For Cleanup," The Observer - Greenville, RI (July 5, 1990).
10. "Agency Seeks Input On Cleanup," The Evening Bulletin - Providence, RI (July 6, 1990).
11. "Agency Seeks Input On Cleanup," The Providence Journal - Providence, RI (July 6, 1990).
12. "EPA To Discuss $4.3 Million Plan For Stamina Mills Superfund Cleanup," The Woonsocket Call - Woonsocket, RI (July 10, 1990).
13. "Stamina Mills Cleanup May Be Delayed Two Years," The Woonsocket Call - Woonsocket, RI (July 11, 1990).
14. "Residents Want Action On Cleanup Of Toxic-Waste Site," The Providence Journal - Providence, RI (July 11, 1990).
15. "Cleanup Of Toxic Waste Under Way At Stamina," The Woonsocket Call - Woonsocket, RI (August 18, 1990).

Press Releases

16. "Public Meeting Announced on Stamina Mills Hazardous Waste Site," EPA Region I (September 14, 1984).
17. "Environmental News," EPA Region I (November 27, 1984). Concerning U.S. Environmental Protection Agency announcement that it has allocated $700,000 from Superfund to provide an alternate water supply to residents of the Stamina Mills area of Forestdale.
18. "Public Meeting to Explain Plans for the Stamina Mills Superfund Site Announced," EPA Region I (February 24, 1986).
19. "Environmental News - EPA to Hold Meeting on Stamina Mills Cleanup Plan," EPA Region I (June 26, 1990).
20. "EPA Selects Cleanup Plan at Stamina Mills Superfund Site," EPA Region I (September 28, 1990).

13.4 Public Meetings

1. EPA Region I Attendance List, Public Hearing for the Stamina Mills Superfund Site (September 24, 1984).
2. EPA Region I Meeting Agenda, Public Meeting for the Stamina Mills Superfund Site (March 10, 1985). Concerning overview of Superfund program and schedule of events for the site.
3. "Final Public Meeting Summary," Camp Dresser & McKee Inc. (April 4, 1986).
4. Letter from Richard K. Quateman, ICF Kaiser Engineers to James Sebastian, EPA Region I (April 19, 1990). Concerning transmittal of the attached February 21, 1990 "Summary of the Public Informational Meeting on the Remedial Investigation and Risk Assessment."
5. EPA Region I Meeting Notes, Public Meeting for the Stamina Mills Site (July 10, 1990). Concerning release of the Proposed Plan and Feasibility Study.
6. Cross-Reference: Transcript, Informal Public Hearing Summary, EPA Region I (July 31, 1990) [Filed and included in Appendix C in entry number 1 in 5.4 Record of Decision (ROD)].

13.5 Fact Sheets

1. "Superfund Program Fact Sheet - Stamina Mills Site," EPA Region I (March 1986). Concerning remedial investigation and feasibility study activities to be carried out by EPA.
2. "Stamina Mills Superfund Site - Progress and Plans," EPA Region I (May 1986). Concerning EPA activities and investigations underway at the site.

16.0 Natural Resource Trustee

16.4 Trustee Notification Form and Selection Guide

1. Letter from Merrill S. Hohman, EPA Region I to William Patterson, U.S. Department of the Interior (June 17, 1987) with attached trustee notification form. Concerning notification of potential damage to natural resources at the site.

16.5 Technical Issue Papers

1. Letter from Robert Pavia, U.S. Department of Commerce National Oceanic and Atmospheric Administration to Dennis P. Gagne, EPA Region I (May 17, 1990). Concerning transmittal of the attached May 17, 1990 "National Oceanic and Atmospheric Administration Preliminary Natural Resource Survey."

17.0 Site Management Records

Please refer to the 1984 - 1985 Removal Administrative Record for documents which are included in this section by reference only.

Section II

Guidance Documents

GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at EPA Region I, Boston, Massachusetts.

General EPA Guidance Documents

1. U.S. Environmental Protection Agency. Office of Research and Development. Municipal Environmental Research Laboratory. Biodegradation and Treatability of Specific Pollutants (EPA-600/9-79-034), October 1979.

2. U.S. Environmental Protection Agency. Office of Research and Development. Municipal Environmental Research Laboratory. Carbon Adsorption Isotherms for Toxic Organics (EPA-600/8-80-023), April 1980.

3. U.S. Environmental Protection Agency. Office of Water and Waste Management. Evaluating Cover Systems for Solid and Hazardous Waste, 1980.

4. U.S. Environmental Protection Agency. Office of Research and Development. Municipal Environmental Research Laboratory. Handbook for Evaluating Remedial Action Technology Plans (EPA-600/2-83-076), August 1983.

5. U.S. Environmental Protection Agency. Office of Ground-Water Protection. Ground-Water Protection Strategy, August 1984.

6. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response, Office of Emergency and Remedial Response, and Office of Research and Development. Review of In-Place Treatment Techniques for Contaminated Surface Soils - Volume 1: Technical Evaluation (EPA-540/2-84-003a), September 1984.

7. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Final Rule and Interim Final Rule and Proposed Rule" (40 CFR Part 136), October 26, 1984.

8. U.S. Environmental Protection Agency. Office of Research and Development. Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites (EPA-600/2-85/028), March 1985.

9. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Hazardous Response Support Division. Standard Operating Safety Guides, November 1984.

10. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance Document for Cleanup of Surface Tank and Drum Sites (OSWER Directive 9380.0-3), May 28, 1985.

11. U.S. Environmental Protection Agency. Office of Research and Development. Environmental Research Laboratory. EPA Guide for Minimizing the Adverse Environmental Effects of Cleanup of Uncontrolled Hazardous Waste Sites, (EPA-600/8-85/008), June 1985.

12. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Guidance on Feasibility Studies under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) (EPA/540/G-85/003, OSWER Directive 9355.0-05C), June 1985.

13. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Guidance on Remedial Investigations under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) (EPA/540/G-85/002, OSWER Directive 9355.0-06B), June 1985.

14. Memorandum from Gene Lucero to the U.S. Environmental Protection Agency, August 28, 1985 (discussing community relations at Superfund Enforcement sites).

15. U.S. Environmental Protection Agency. Office of Waste Programs Enforcement. The Endangerment Assessment Handbook, August 1985.

16. U.S. Environmental Protection Agency. Office of Waste Programs Enforcement. Toxicology Handbook, August 1985.

17. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

18. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Handbook of Remedial Action at Waste Disposal Sites (EPA/625/6-85/006), October 1985.

19. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Handbook: Remedial Action at Waste Disposal Sites (Revised) (EPA/625/6-85/006), October 1985.

20. "National Oil and Hazardous Substances Pollution Contingency Plan," (40 CFR Part 300), November 20, 1985.

21. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Handbook for Stabilization/Solidification of Hazardous Wastes (EPA/540/2-86/001), June 1986.

22. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (OSWER Directive 9283.1-2), September 20, 1986.

23. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response and Office of Emergency and Remedial Response. Mobile Treatment Technologies for Superfund Wastes (EPA 540/2-86/003 (f)), September 1986.

24. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, amended October 17, 1986.

25. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Public Health Evaluation Manual (OSWER Directive 9285.4-01), October 1986.

26. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Federal-Lead Remedial Project Management Handbook (EPA/540/G-87/001, OSWER Directive 9355.1-1), December 1986.

27. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund State-Lead Remedial Project Management Handbook, (EPA/540/G-87/002), December 1986.

28. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Technology Briefs: Data Requirements for Selecting Remedial Action Technology (EPA/600/2-87/001), January 1987.

29. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Data Quality Objectives for Remedial Response Activities: Development Process (EPA/540/G-87/003), March 1987.

30. Letter from Lee M. Thomas to James J. Florio, Chairman, Subcommittee on Consumer Protection and Competitiveness, Committee on Energy and Commerce, U.S. House of Representatives, May 21, 1987 (discussing EPA's implementation of the Superfund Amendments and Reauthorization Act of 1986).

31. Memorandum from J. Winston Porter to Addressees ("Regional Administrators, Regions I-X; Regional Counsel, Regions I-X; Director, Waste Management Division, Regions I, IV, V, VII,and VIII; Director, Emergency and Remedial Response Division, Region II; Director, Hazardous Waste Management Division, Regions III and VI; Director, Toxics and Waste Management Division, Region IX; Director, Hazardous Waste Division, Region X; Environmental Services Division Directors, Region I, VI, and VII"), July 9, 1987 (discussing interim guidance on compliance with applicable or relevant and appropriate requirements).

32. Memorandum from David P. Ryan, EPA Headquarters to Addressees (Assistant Regional Administrators; Management Division Directors; Senior Budget Officers; Regional Comptrollers; Waste Management Division Directors; ESD Directors of Regions I, VI, and VII; Director, Office of Emergency and Remedial Response; Director, Office of Waste Programs Enforcement; Financial Management Officers), July 15, 1987 (Discussing determination of indirect costs in Superfund Removal project ceilings (Comptrollers Policy Announcement No. 87-15)).

33. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Alternate Concentration Limits Guidance (OSWER Directive 9481.00-6C, EPA/530-SW-87-017), July 1987.

34. U.S. Environmental Protection Agency. Office of Health and Environmental Assessment. A Compendium of Technologies Used in the Treatment of Hazardous Waste (EPA/625/8-87/014), September 1987.

35. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Draft Guidance on CERCLA Compliance with Other Laws Manual (OSWER Directive 9234.1-01), November 25, 1987.

36. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. A Compendium of Superfund Field Operations Methods (EPA/540/P-87/001, OSWER Directive 9355.0-14), December 1987.

37. U.S. Environmental Protection Agency. Office of Research and Development. Treatment Potential for 56 EPA Listed Hazardous Chemical in Soils (EPA-600/6-88-001), February 1988.

38. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on Conducting Remedial Investigations and Feasibility Studies under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act), March 1988.

39. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on Remedial Actions for Contaminated GroundWater at Superfund Sites (OSWER Directive 9283.1-2), April 1988.

40. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Community Relations in Superfund: A Handbook (Interim Version) (EPA/HW-6, OSWER Directive 9230.0-3A), June 1988.

41. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on CERCLA Compliance with Other Laws Manual - Part I (EPA/540/G-89/006), August 1988.

42. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Interim Final Guidance on Conducting Remedial Investigations and Feasibility Studies under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act), October 1988.

43. U.S. Environmental Protection Agency. Office of Research and Development. Site Program Demonstration Test Terra Vac In Situ Vacuum Extraction System, Groveland, Massachusetts - Technology Evaluation Report (EPA/540/5-89/003a), April 1989.

44. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Final Covers on Hazardous Waste Landfills and Surface Impoundments (EPA/530-SW-89-047), July 1989.

45. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on CERCLA Compliance with Other Laws Manual - Part II (EPA/540/G-89/009, OSWER Directive 9234.1-02), August 1989.

46. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Determining Soil Response Action Levels Based on Potential Contaminant Migration to Ground Water: A Compendium of Examples (EPA/540/2-89/057), October 1989.

47. U.S. Environmental Protection Agency. Office of Research and Development. Site Program Demonstration of the Ultrox International Ultraviolet Radiation/Oxidation Technology - Technology Evaluation Report (EPA/540/5-89/012), January 1990.

48. "National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule" (40 CFR Part 300), March 8, 1990.

49. U.S. Environmental Protection Agency. Office of Research and Development. Basics of Pump-and-Treat Ground-Water Remediation Technology (EPA/600/8-90/003), March 1990.

50. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Personnel Protection and Safety.