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Agency

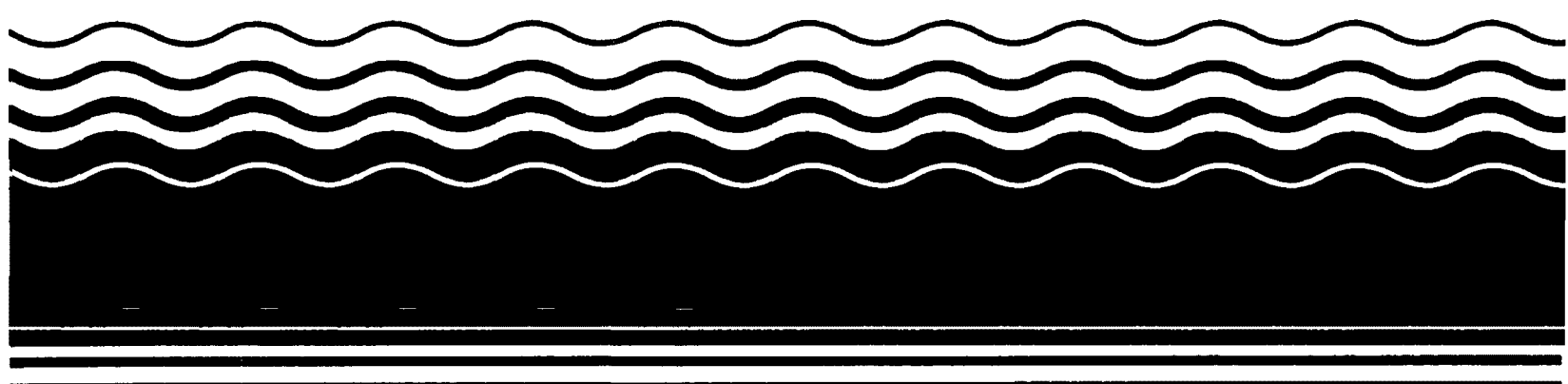
Office of
Emergency and
Remedial Response

EPA/ROD/R01-92/069
September 1992
PB93-963708



Superfund Record of Decision:

PSC Resources, MA



NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

REPORT DOCUMENTATION PAGE		1. REPORT NO. EPA/ROD/R01-92/069	2.	3. Recipient's Accession No.	
4. Title and Subtitle SUPERFUND RECORD OF DECISION PSC Resources, MA First Remedial Action - Final				5. Report Date 09/15/92	
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12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460				13. Type of Report & Period Covered 800/000	
				14.	
15. Supplementary Notes PB93-963708					
16. Abstract (Limit: 200 words) The 21.5-acre PSC Resources site is a former waste oil and solvent reclamation facility located in Palmer, Hampden County, Massachusetts. The PSC Resources Property is composed of approximately 20 acres of surrounding residential, commercial, recreational, woodland, and wetlands areas, including the Quaboag River. Site features include a concrete and brick frame building, a garage, multiple concrete tank cradles, storage tank pads, and a lagoon. The site is bordered by a recreational field, mixed woods and wetlands, residential and commercial property, and to the south by the Quaboag River. The PSC property is also located within the 100-year floodplain of the Quaboag River, which is part of the Chicopee River Basin. The site overlies a ground water aquifer that currently is not used for drinking water purposes. Since 1898, there have been several owners of the PSC property, most involved in oil industry functions. In 1974, PSC Resources, Inc., purchased the property to operate an oil storage and processing facility, and in 1976, the company name was changed to Ag-Met Oil Services, Inc. The company began accepting solvents and lacquers for collection and disposal. In late 1976, the company began operating under the name Newtown (See Attached Page)					
17. Document Analysis a. Descriptors Record of Decision - PSC Resources, MA First Remedial Action - Final Contaminated Media: soil, sediment, debris, gw, sw Key Contaminants: VOCs (benzene, PCE, TCE), other organics (PAHs, PCBs), metals (arsenic, lead) b. Identifiers/Open-Ended Terms c. COSATI Field/Group					
18. Availability Statement		19. Security Class (This Report) None		21. No. of Pages 188	
		20. Security Class (This Page) None		22. Price	

Abstract (Continued)

Refining Corporation; however, the state denied their permit renewals. Several state inspections conducted between 1974 and 1976 revealed improper maintenance along with waste oil and hazardous materials spills. In 1978, the facility was closed, and the state required Newtown Refining to begin removing 1.5 million gallons of waste oils and sludge from the site. By 1982, little of that waste had been removed and an estimated 500,000 gallons of waste remained onsite. Oil had discharged to adjacent wetlands and sampling of soil, sediment, and surface water revealed contamination by VOCs, metals, PAHs, and PCBs. In 1986, the state initiated two interim remedial measures (IRMs) to secure the property and remove oils, sludge, drums, tanks, and associated piping offsite. In 1991, EPA initiated a removal action, which involved construction of a new, full enclosure fence around the PSC property and the adjacent spill area in the wetland. This ROD addresses the final remedy for the site, which includes both source control and management of migration components. The primary contaminants of concern affecting the soil, sediment, debris, ground water, and surface water are VOCs, including benzene, PCE, and TCE; other organics, including PAHs and PCBs; and metals, including arsenic and lead.

The selected remedial action includes decontaminating, demolishing, and offsite disposal of debris and property structures at a RCRA landfill; consolidating the contaminated soil with lagoon and wetlands sediment onsite, and treating these materials using stabilization; constructing a permeable cap over the stabilized material; restoring affected wetlands; treating lagoon surface water onsite using filtration and a granular activated carbon (GAC) adsorption unit, followed by discharging the treated water into the Quaboag River or to an offsite facility; using natural attenuation to achieve ground water clean-up levels; monitoring ground water; conducting sediment and surface water sampling; and implementing institutional controls including deed, ground water and land use restrictions. The estimated present worth cost for this remedial action is \$3,420,747, which includes an annual O&M cost of \$731,913.

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific soil and sediment (lagoon only) clean-up levels are based on health-risk standards and SDWA MCLs, respectively, and include benzene 1 mg/kg to 3 mg/kg; TCE 2 mg/kg to 4 mg/kg; PCE 2 mg/kg to 12 mg/kg; lead 15 mg/kg to 500 mg/kg; total PAHs 151 mg/kg; and total PCBs 1 mg/kg. Chemical-specific wetlands sediment clean-up levels are based on health-risk standards and include total PAHs 10 mg/kg; total PCBs 1 mg/kg; arsenic 12 mg/kg; and lead 375 mg/kg. Chemical-specific ground water clean-up levels are based on SDWA MCLs and state standards and include benzene 5 ug/l, TCE 5 ug/l, PCE 5 ug/l, and lead 15 ug/l. An ARAR waiver will be issued for certain requirements of the chemical waste landfill regulations, which require construction of chemical waste landfills in low permeable clay conditions, the use of a synthetic membrane liner, and that the bottom of the landfill be 50 feet above the historic high water table.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

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

DECLARATION FOR THE RECORD OF DECISION

PSC RESOURCES SITE PALMER, MASSACHUSETTS

STATEMENT OF PURPOSE

This decision document represents the selected remedial action for the PSC Resources Site, in Palmer, Massachusetts, 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 Regional Administrator has been delegated the authority to approve this Record of Decision (ROD).

The Commonwealth of Massachusetts 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 Palmer Public Library at 455 N. Main Street, Palmer, Massachusetts and at the Region I Waste Management Division Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix F to the ROD) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

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



DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy for the PSC Resources Site, which includes both source control and management of migration components to obtain a comprehensive remedy.

The remedial action for the PSC Resources Site, as described in this ROD, addresses the principal threats to the human health and the environment posed by exposure of humans and biota to contaminated soils from the PSC Resources property, adjacent wetland sediments, and ground water. This remedy addresses all principal threats to human health and the environment posed by the sources of contamination at the PSC Resources Site and resulting from:

- 1) Dermal absorption and incidental ingestion of contaminants in surficial soils and sediments; and
- 2) Ingestion of groundwater.

The major components of the selected source control remedy include:

- Decontamination, demolition, and offsite disposal of property structures;
- Treatment and discharge of lagoon surface water;
- Consolidation of contaminated property soils with lagoon and wetland sediments on site property;
- In-situ mixing and stabilization of property soils/sediments with treatment agents to bind contaminants into a stable matrix;
- Construction of a permeable cap over stabilized property soils and sediments, and grading and planting of the cap's surface;
- Restoration of wetlands;
- Implementation of institutional controls on ground water use and land development; and
- Long-term monitoring of ground water, wetland sediments, and Quaboag River water and sediments.

The major components of the selected management of migration remedy include:

- Use of natural attenuation to achieve ground water cleanup levels;
- Ground water monitoring of existing wells on the PSC Resources, Inc. property and of monitoring wells adjacent to the property;
- Sediment sampling of portions of the wetland and the Quaboag River, and where ground water discharges to the wetland and the Quaboag River;

- ° Surface water sampling in areas adjacent to the wetland and in the Quaboag River; and
- ° Five-year site reviews to assess site conditions, contaminant distributions, and any associated site hazards.

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 adequate protection of human health and the environment.

Sept 15, 1992
Date

Paul G. Keough, Acting
Julie Belaga
Regional Administrator
U.S. EPA, Region I

ROD Decision Summary
PSC Resources, Inc. Superfund Site
Palmer, Massachusetts

September 15, 1992

U.S. Environmental Protection Agency

Region I

Boston, Massachusetts

PSC RESOURCES, INC. SUPERFUND SITE

TABLE OF CONTENTS

<u>Contents</u>	<u>Page Number</u>
I. SITE NAME, LOCATION AND DESCRIPTION	1
II. SITE HISTORY & ENFORCEMENT ACTIVITIES	2
A. Land Use & Response History	2
B. Enforcement History	5
III. COMMUNITY PARTICIPATION	6
IV. SCOPE & ROLE OF OPERABLE UNIT OR RESPONSE ACTION	7
V. SUMMARY OF SITE CHARACTERISTICS	8
A. Buildings and Structures.	8
B. Property Soils.	10
C. Site Soils.	12
D. Air	13
E. Surface Water and Sediment.	13
F. Ground Water.	17
G. Floodplain and Wetland Assessment	19
VI. SUMMARY OF SITE RISKS	25
A. Human Health Risk Assessment.	25
B. Ecological Risk Assessment.	29
VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES	32
A. Statutory Requirements/Response Objectives	32
B. Technology and Alternative Development and Screening	33
VIII. DESCRIPTION OF ALTERNATIVES	34
A. Source Control (SC) Alternatives Analyzed	34
B. Management of Migration (MM) Alternatives Analyzed	42
IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES	44
A. Evaluation Criteria	44
B. Summary of the Comparative Analysis of Alternatives	46
X. THE SELECTED REMEDY	51
A. Interim Ground Water Cleanup Levels	52
B. Soil and Sediment Cleanup Levels	55
C. Description of the Remedial Components	62

PSC RESOURCES, INC. SUPERFUND SITE

TABLE OF CONTENTS (Continued)

<u>Contents</u>	<u>Page Number</u>
XI. STATUTORY DETERMINATIONS	75
A. The Selected Remedy is Protective of Human Health and the Environment	75
B. The Selected Remedy Attains ARARs	76
C. The Selected Remedial Action is Cost Effective.	83
D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable.	86
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	87
XII. DOCUMENTATION OF SIGNIFICANT CHANGES	88
XIII. STATE ROLE	88

APPENDICES

Figures	Appendix A
Tables.	Appendix B
ARAR Tables	Appendix C
Massachusetts Letter of Concurrence	Appendix D
Responsiveness Summary	Appendix E
Administrative Record Index	Appendix F

ROD DECISION SUMMARY
September 15, 1992

I. SITE NAME, LOCATION AND DESCRIPTION

The PSC Resources property is located at 10 Water Street in Palmer, Massachusetts (Figure 1, Appendix A). Palmer is a community of approximately 12,000 residents and is located in Hampden County, in the south central portion of the state. The PSC Resources property refers to the former PSC Resources facility which is a fenced enclosure approximately 1.5 acres in size. The property is bordered to the west by a recreation field; to the east by mixed woods and wetlands; to the north by residential/commercial properties; and to the south by the Quaboag River which flows from east to west (Figure 2, Appendix A). The southern bank of the Quaboag River is located in the Town of Monson, Massachusetts.

The PSC Resources property currently contains one concrete and brick frame building (approximately 65 x 35 ft.), a wood and corrugated metal frame garage (approximately 65 x 25 ft.), and multiple concrete tank cradles. In addition, three (3) large storage tank pads and a lagoon (approximately 70 x 240 ft.) are located along the southwest boundary of the property (Figure 2, Appendix A). PSC Resources operated as a waste oil and solvent reclamation facility in the early 1970's. The reclamation process involved the addition of sulfuric acid to waste oils and solvents which were then heated using steam coils. Heating operations occurred in two buildings on the property which contained furnaces and boilers. The heated mixtures of waste oils, acids and solvents were transferred to holding tanks where particulates were allowed to settle out.

The "Site" is defined as the area including, but not limited to, the area of contamination. The Site includes the PSC Resources property and approximately 20 acres of surrounding residential, commercial, recreational, woodland, and wetland areas, as well as the Quaboag River (Figure 2, Appendix A).

The PSC Resources property is located within the 100-year flood zone of the Quaboag River floodplain (designated as Zone B on the National Flood Insurance Program Insurance Rate Map). The floodplain is located at an elevation of approximately 310 feet, National Geodetic Vertical Datum (NGVD). The Site area is flanked by steep-sided valley walls on the west bank of the Quaboag River which rise to an elevation of approximately 1,000 feet (Bald Peak). The eastern boundary of the Site is bordered by the Quaboag River floodplain which extends approximately 1,700 feet east to the eastern valley wall. The southwest corner of the property is located approximately 250 feet from the eastern bank of the Quaboag River. The Quaboag River is part of the Chicopee River Basin.

Surface water on the Site includes the Quaboag River, the wetland area adjacent to the southern and western boundaries of the property; standing water on the property contained in the concrete containment area and the lagoon, and drainage moving off the property, discharging to the Quaboag River. Of these water bodies, the Quaboag River is the only body of water which is considered to be available to active use. The Quaboag River is a

Class B surface water body and a tributary of the Chicopee River. Although the Quaboag River is not used as a municipal water supply, it is used for recreation and industrial purposes.

The ground water aquifer underlying the PSC property is currently not used for drinking water purpose by residents in the Town of Palmer. The Palmer Water District, a privately owned water supply company, currently supplies municipal water to the Town of Palmer. However, according to the Monson Water Department, approximately 60 percent of the Town of Monson is served by private wells. There is only one private supply well in the Town of Monson located within a one half-mile radius of the PSC Resources property. This well is located approximately one half-mile to the north/northwest of the PSC Resources property, and has been utilized by the same residence since 1896. In considering the proximity of this well to the Site with regard to the hydrogeology of the Site and the nature and extent of contamination on Site, it appears likely that this well is isolated from the influence of PSC Resources property.

The PSC Resources property is located on a low, broad, river valley flood plain comprised of thick sequences of highly permeable alluvial sand and gravel deposits. The river valley plain is flanked on either side by weathered silty, gravelly, sandy river terrace deposits with the topography rising sharply beyond these terraces due to the regional upland bedrock ranges that are thinly covered with poorly sorted, compact glacial till. The Quaboag River meanders across the alluvium; at the PSC Resources Site it flows along the westerly edge of the valley plain. The regional surface water runoff and ground water flow gradients were expected to be from the upland bedrock/till regions on both sides of the valley plain toward the Quaboag River, which serves as the regional surface water drainage system. Based on the ground water contour maps generated and studied, the dominant ground water flow direction in unconsolidated materials is to the southwest, towards the Quaboag River, opposite to the direction of dip of the bedrock surface. The predominant direction of ground water flow at the Site is towards the Quaboag River.

A more complete description of the Site can be found in the Remedial Investigation Report - PSC Resources Site (HMM Associates, Inc., January 1992) in Sections 1.0 and 2.0 of Volume I.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land Use and Response History

Current land uses in the vicinity of the Site are varied, including residential, municipal, commercial and industrial uses. Several small industries and commercial businesses, including a lumber yard, steel company, newspaper publisher and a home heating oil company (Kelley & Son Oil Company) are located to the north within 1,000 feet of the PSC Resources property along Water Street. Kelley & Son Oil Company,

located approximately 200 feet to the northwest of the Site at 11 Water Street, has reportedly experienced releases of home heating fuel (No. 2 fuel oil from storage tanks onsite, see (Figure 2, Appendix A)). Kelley & Son Oil Company is currently conducting site assessment activities associated with past releases of heating oil.

A future on-site property development scenario is deemed theoretically possible despite current zoning for non-residential development and the location of the PSC Resources property within the 100-year floodplain. Zoning regulations have changed twice in the area since 1970's and therefore may change in the future. In addition, once zoning allows residential construction, such construction could take place despite the 100-year flood plain and the builder's failure to obtain property insurance coverage. EPA considered this theoretical possibility in utilizing the future on-site property development scenario as the basis for this ROD.

Corporate owners of the PSC Resources property include:

<u>Ownership Period</u>	<u>Corporate Owner</u>
1898-1932	- Standard Oil Company of N.Y.
1932-1955	- Socony Vacuum Corporation
1955-1966	- Socony Mobil Oil Company
1966-1970	- Mobil Oil Corporation
1970-1973	- Elish Nye Peirce, Peirce Brothers Oil
1973-1974	- Phillips Resources, Inc.
1974-1976	- PSC Resources, Inc.
1976-1976	- Ag-Met Oil Services, Inc.
1976-present	- Newtown Refining Corporation

PSC Resources, Inc. purchased the property in 1974 to operate an oil storage and processing facility. In 1974, the Department of Environmental Protection (DEP, formerly the Department of Environmental Quality Engineering (DEQE)), issued the initial permit for collection and storage of waste oil materials. The DEQE became the DEP on July 1, 1989. In October, 1976, the DEP issued an amended permit in response to a change in title of the owner from PSC Resources, Inc. to Ag-Met Oil Services, Inc. This amended permit also allowed for the collection and disposal of "solvent, lacquers, etc." (Division of Water Pollution Control, 1976 (DWPC - a division of the DEQE, now the DEP)). In late 1976, Ag-Met Oil Services, Inc. changed its name to Newtown Refining Corporation. In 1977, Newtown Refining Corporation applied for renewal of its existing waste storage permits; however, the DEP did not renew the permits.

During the period from 1974 to 1977, the DWPC conducted several property inspections. Improper maintenance as well as waste oil and hazardous materials spills were among the violations cited by DWPC. In January 1978, DWPC requested assistance from the State Attorney

General's office to initiate legal action against the owners. Consequently, the facility was closed in 1978. DEP issued a subsequent Notice of Responsibility (NOR) to Newtown Refining Corporation requiring the removal of approximately 1.5 million gallons of waste materials consisting primarily of waste oil and sludges stored on the property in tanks and in diked areas. In 1979, Newtown Refining Corp., submitted a plan detailing provisions for disposal and cleanup of the waste materials on site. Initial removal activities were conducted by private firms under the direction of Refinemet International, a parent company of Newtown Refining Corporation. By mid-1980, an estimated one-quarter to one million gallons of waste materials had reportedly been removed from the property.

As a result of the limited progress made in cleanup and removal of waste materials following DEP's initial request in 1978, the state requested assistance from the federal government through the Superfund program in 1982. At that time, an estimated 500,000 gallons of waste materials remained on the property in storage tanks. State site inspections revealed evidence of oil discharges to the adjoining wetlands, as well as leakage of waste materials from the dikes on the property into the wetlands. Subsequent sampling programs performed by various investigators indicated elevated levels of polychlorinated biphenyls (PCBs), trichloroethylene (TCE), lead, and other hazardous materials in the soil and surface waters on the property. Based upon this information, state enforcement actions were initiated against the potentially responsible parties (PRPs) requiring the removal of waste materials and cleanup of the site. The PRPs identified for the PSC Resources Site include PSC Resources, Inc., Newtown Refining Co., Refinemet International, and Ag-Met Refining Co., among others.

Removal activities on the property proceeded between 1982 and 1984 by several contractors under the direction of Refinemet/Newtown Refining. However, numerous notifications to Refinemet/Newtown Refining from the DEP regarding inadequate progress in cleanup operations prompted a series of contractor replacements. During 1983 and 1984, DEP contractors removed the majority of the remaining waste materials from the tanks, and decontaminated and removed the storage tank structures.

In September, 1983, the PSC Resources Site was assigned a final listing on the EPA's National Priorities List (NPL) and thereby became eligible for Superfund funding.

In 1986, the Commonwealth of Massachusetts and EPA determined that Interim Remedial Measures (IRMs) were warranted at the PSC Resources Site in order to protect human health and the environment. IRM No. 1, implemented by DEP, included the repair of existing fencing and installation of additional fencing. Appropriate warning signs were also posted along the fenced perimeter. IRM No. 2 required the demolition and removal of 19 storage tanks. The following IRM activities were completed:

IRM No. 1

Construction of an additional 350 feet of chain link fence to adjoin the existing portion of fence to establish complete fencing (security) of the property.

IRM No. 2

Demolition and disposal of 19 storage tanks.

Bulk disposal of oil and water contained in storage tanks.

Disposal of drums of sludge and contaminated protective clothing generated during tank cleaning and removal operations.

Storage of miscellaneous piping associated with former tanks.

In the fall of 1991, EPA initiated a removal action at the PSC Resources Site. EPA decided that the removal action was warranted on the basis that the PSC Resources property posed a threat to those trespassers that were accessing the property through then existing, decaying fence and as a result being potentially exposed to contaminants in the property soils and in the lagoon sediments. The removal action consisted of constructing a new, full enclosure fence around the 1.5 acre PSC Resources property and the adjacent Spill Area in the wetland. The removal action was completed in October, 1991.

A more complete description of the Site history can be found in the Remedial Investigation Report - PSC Resources Site (HMM Associates, Inc., January 1992) in Sections 1.0 of Volume I.

B. Enforcement History

On March 18, April 1, and April 14, 1992, EPA notified over one hundred parties who either owned or operated the facility, generated wastes that were shipped to the facility, arranged for the disposal of wastes at the facility, or transported wastes to the facility of their potential liability with respect to the Site. Likewise, under the M.G.L. c.21E, the DEP notified approximately four hundred parties of their potential responsibility for cleanup of the PSC Resources Site. Negotiations are expected to commence with these potentially responsible parties (PRPs) in the fall of 1992 regarding the settlement of the PRPs' liability at the Site. Several of the PRPs have formed a steering committee in anticipation of the forthcoming negotiations with EPA and the DEP.

Several PRPs have participated in the remedy selection process for this Site by presenting comments during the public comment period. EPA summarized the comments, and included the summary and each written comment in the Administrative Record.

III. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement have been relatively low. EPA and the DEP have kept the community and other interested parties apprised of the Site activities through several informational meetings, press releases, and public meetings.

Formal community relations activities associated with the PSC Resources Site were initiated in 1986. EPA and the DEP have provided the local community with updates on site activities at project milestones through public meetings and mailings. EPA has also maintained information repositories at the EPA regional office in Boston, Massachusetts and the Palmer Public Library at 455 N. Main Street, Palmer, MA to provide easy access to reports and other documents pertaining to the Site. Public interest in the site had been described as low until recently, following the release of EPA's Proposed Plan and the identification and notification of potentially responsible parties.

The DEP prepared a community relations plan in 1986. In April of that year, EPA and DEP conducted a community briefing to discuss the planned Interim Remedial Measures. Attendance at the briefing included four community officials and one reporter. A decrease in public interest was noted following the removal of hazardous waste storage tanks from the site (one of the Interim Remedial Measures). On February 27, 1991, EPA and the DEP held an informational public meeting in Palmer, Massachusetts to describe the plans for the ongoing Remedial Investigation and Feasibility Study. The February 27, 1991 public meeting drew an audience of ten people. At this meeting, some concern was expressed regarding the length of the cleanup process. EPA revised the community relations plan in November of 1991 in anticipation of renewed community interest at the completion of the Remedial Investigation/Feasibility Study.

On March 20, 1992, EPA made the administrative record available for public review at EPA's regional office in Boston and at the Palmer Public Library. EPA published a notice and brief analysis of the Proposed Plan in the Springfield Union - News and the Palmer Journal Register on March 29, 1992 and March 26, 1992 respectively and made the plan available to the public at the Palmer Public Library. In the Proposed Plan, EPA specifically sought comments on the following: (1) site cleanup plans and (2) the impacts of site cleanup activities on the wetlands and floodplains found at the Site.

On March 31, 1992, EPA held an informational meeting to discuss the results of the Remedial Investigation and 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. The March 31, 1992 informational meeting drew an audience of approximately 70 people, including residents, potentially responsible parties (or their representatives), and reporters. A number of concerns were voiced, including the length of the cleanup process, potential health risks

associated with the site, the continued use of an adjacent athletic field, and the process of identifying potentially responsible parties. From April 1, 1992 to May 30, 1992, the Agency held a sixty day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. On April 21, 1992, the Agency held an informational public meeting and a public hearing to discuss the Proposed Plan and to accept any oral comments. Concerns and comments similar to those from the March 31, 1992 informational meeting were voiced again at the April 21, 1992 public hearing. A transcript of this meeting and the comments and the Agency's response to comments are included in the attached responsiveness summary.

IV. SCOPE AND ROLE OF OPERABLE UNIT OR 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 consists of the following components for Source Control and Management of Migration:

Source Control

- 1) Decontamination, demolition, and offsite disposal of property structures;
- 2) Treatment and discharge of lagoon surface water;
- 3) Consolidation of contaminated property soils with lagoon and wetland sediments on site property;
- 4) In-situ mixing and stabilization of property soils/sediments with treatment agents to bind contaminants into a stable matrix;
- 5) Construction of a permeable cap over stabilized property soils and sediments, and grading and planting of the cap's surface;
- 6) Restoration of wetlands;
- 7) Implementation of institutional controls on ground water use and land development; and
- 8) Long-term monitoring of ground water, wetland sediments, and Quaboag River water and sediments.

Management of Migration

- 1) Use of natural attenuation to achieve ground water cleanup levels;
- 2) Ground water monitoring of existing wells on the PSC Resources, Inc. property and of monitoring wells adjacent to the property;
- 3) Sediment sampling of portions of the wetland and the Quaboag River, and where ground water discharges to the wetland and the Quaboag River;
- 4) Surface water sampling in areas adjacent to the wetland and in the Quaboag River; and
- 5) Five-year site reviews to assess site conditions, contaminant distributions, and any associated site hazards.

The remedial action for the PSC Resources Site, as described in this ROD, addresses the principal threats to the human health and the environment posed by exposure of humans and biota to contaminated soils from the PSC Resources property, adjacent wetland sediments, and ground water. This remedy addresses all principal threats to human health and the environment posed by the sources of contamination at the PSC Resources Site and resulting from:

- 1) Dermal absorption and incidental ingestion of contaminants in surficial soils and sediments; and
- 2) Ingestion of ground water.

V. SUMMARY OF SITE CHARACTERISTICS

Section 1.0 of the Feasibility Study contains an overview of the Remedial Investigation. The significant findings of the Remedial Investigation are summarized below.

A. Buildings and Structures

Phase I and II building and structure sampling was performed with the primary objective being the identification of the types and concentrations of contaminants existing in buildings and structures. These analyses identify the types of contamination existing in buildings and structures on the property based on a representative sample population. The results provide the initial data necessary for performance of the risk assessment and evaluation of the potential need for additional investigation during the pre-design phase of the project to determine contaminant distributions in terms of areas and volumes.

Phase I and II structure sampling included the collection of core, auger, chip, and wipe samples from the three buildings (designated Buildings A, B and C), a concrete containment area, two sets of concrete tank stanchions, a concrete pad area, and an open platform area located next to the lagoon (**Figure 3, Appendix A**). Phase I samples were collected from stained areas where a suspected release or accumulation of waste materials had occurred. Phase II sampling was performed to further characterize the nature and extent of pesticides/PCBs and polychlorinated di-benzo-dioxins (PCDDs)/polychlorinated di-benzo furans (PCDFs) detected during Phase I building and structure sampling (**Figures 4 through 6, Appendix A**). Results of sampling and analyses are summarized below.

A variety of organic contaminants were detected in those building and structures on the property which were sampled. Volatile organic compounds (VOCs) detected include ketones (acetone), chlorinated hydrocarbons (dichloroethane (DCA), dichloroethylene (DCE),

1,1,1-trichloroethane (TCA), trichloroethylene (TCE), and tetrachloroethylene (PCE)), and aromatic hydrocarbons including benzene, toluene, ethylbenzenes and xylenes (BTEX). Concentrations of these contaminants generally range in the tens of parts per billion (ppb) or micrograms per kilogram (ug/kg), and exhibit a variable distribution. Semi-volatile organic compounds (SVOCs) detected consist predominantly of polynuclear aromatic hydrocarbons (PAHs) and phthalates, which were detected consistently throughout the buildings and structures sampled. Concentrations of PAHs generally ranged from tens to hundreds of thousands of ug/kg, with the highest concentrations being detected in chip samples. Chip samples represent residual sludge released from storage tanks which has accumulated on the surfaces of buildings and structures. Three pesticides were detected in the building and structure samples analyzed, at concentrations in the tens to low hundreds of ug/kg range. Detected pesticides are attributed to site related pest control operations, with the exception of gamma-chlordane, which was detected within Building B at 240 ug/kg. The elevated concentrations of gamma-chlordane detected from a sample collected from within Building B may be attributed to the release of a pesticide within the building. PCBs detected in the buildings and structures sampled were limited to Aroclor-1260, at concentrations ranging from tens to tens of thousands of ug/kg. The highest concentrations of Aroclor-1260 were detected in the sludge chip samples (up to 73,000 ug/kg).

Analyses of buildings and structures for inorganic analytes included Extraction Procedure (EP) Toxicity for Resource Conservation and Recovery Act (RCRA) 8 metals. These results indicated that none of the building materials sampled exhibit concentrations in excess of former Regulatory Levels (RLs) for EP Toxicity.

Quantifiable concentrations of individual polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs and PCDFs) were evaluated using the toxicity equivalence factor (TEF) method (EPA/625/3-89/016, March 1989). The TEF method is an interim procedure for assessing the risks associated with exposures to complex mixtures of PCDDs and PCDFs relative to the highly studied 2,3,7,8 tetrachlorodibenzo-p-dioxin (2,3,7,8 TCDD). Total PCDD and PCDF concentrations are expressed as 2,3,7,8 TCDD equivalents. Analyses of onsite buildings and structures for PCDDs/PCDFs indicate that the risks associated with auger, core, and chip samples are well below the ATSDR's recommended 1 ppb cleanup level for residential soils (ATSDR, 1988) and are also within EPA's acceptable risk range. Analyses of wipe samples are reported in concentration units of pg/cm² and therefore cannot be directly compared to the 1.0 ppb value. TEFs for wipe samples ranged from 0.01 pg/cm² to 0.12 pg/cm².

No patterns of contaminant distributions emerge which support the identification of one distinct source area within the buildings and structures on the property. Field observations and laboratory

analyses of organic contaminants suggest that the higher concentrations appear to be limited to the upper surfaces of the materials analyzed. Contamination of buildings and structures appears to be a result of random spills of waste oil and sludge contained in storage tanks on the property. Similar contaminants were detected in waste oil and sludge contained within on-site storage tanks during previous investigations. Higher concentrations of organic contamination were detected in areas where waste transfer and processing operations occurred, including Building B, the Containment Area and the Pad Area.

B. Property Soils

The field investigation included the excavation of ten test pits on the property, designated TP-1 through TP-10 (**Figure 7, Appendix A**). Test pits were excavated for multiple purposes, including: the investigation of the source of magnetic anomalies which could represent potential subsurface contaminant sources including drums, tanks, pipes; visual investigation of soil types and extent of subsurface soil staining; and initial characterization of contaminants in soil based on laboratory analysis of soil samples.

Additional soil sampling on the property included the collection of samples from borings and surficial samples. Soil samples were collected from five soil borings on the property designated SB-1 through SB-6 (note SB-5 by definition is not located on the property; **Figure 7, Appendix A**). The soil boring and sampling task was performed to investigate the type and distribution of PCB contamination at depth in property soil. Supplemental surficial soil samples were collected to investigate the presence/absence of PCDD/PCDFs. PCDD/PCDF sampling locations are designated SED-1 through SED-4 (**Figure 7, Appendix A**). A final round of soil sampling included collection of surficial composite samples of soil to a depth of six inches at twenty locations (designated SS-1 through SS-20 in (**Figure 8, Appendix A**)). These twenty soil samples were analyzed for lead.

Organic and inorganic contamination was detected in soil samples analyzed from the property. Property soil is identified as a primary source of ground water contamination. Soils in many of the test pits and borings were observed to be stained black from the ground surface to a depth of up to six feet below the ground surface. The black stained soil was also noted to have an oily odor, suggesting that the staining is a result of spills/releases of waste oils and/or sludges. **Figure 9 of Appendix A** summarizes the lateral and vertical distribution of soil staining based on observed soil conditions in test pit excavations, and in soil samples collected from property borings. These results suggest that accumulations of waste oil exist in subsurface soil and represent potential sources of contamination to ground water. In addition, a variety of subsurface piping and/or hoses, which in some instances were observed to contain residual

liquid waste, were noticed in test pit excavations TP-3, TP-5, and TP-7. These materials also represent potential subsurface contaminant sources.

VOC contamination was detected in property soils and included predominantly chlorinated hydrocarbons (DCE, TCA, TCE, and PCE) and BTEXs at total concentrations up to 864,000 ug/kg (**Figure 10, Appendix A**). Soil analyses and test pit observations indicate that the highest detected concentrations of constituent VOCs were coincident with liquid waste observed in residual piping and subsurface accumulations of viscous waste at the fill/alluvium interface. VOC concentrations were also significantly elevated in soils collected coincident with the water table. The variable lateral distribution of VOCs detected in soil is attributed to the random releases of waste oil and solvents. Partitioning of VOCs from soil to ground water may be inhibited due to the relatively high organic carbon content in property soil (10% TOC) which is attributed to the presence of waste oil in soil.

SVOCs detected in property soil were predominantly PAHs and phthalates; a suite similar to those detected in building and structure samples. Concentrations of PAHs in soil were detected in the hundreds of thousands of ug/kg range. The presence of PAHs in soil is attributed to the release of waste oils to the soil. SVOCs exhibit a distribution similar to VOCs in soil, extending over the majority of the property sampled (**Figure 11, Appendix A**).

Pesticides were not detected in soil analyzed on the property, however PCBs were detected (including Aroclor-1260 and Aroclor-1242). Aroclor-1260 was the predominant PCB detected in laboratory analyses and the only PCB detected in screening analyses. Total concentrations of PCBs in soil exceed 50,000 ug/kg in a limited area of the property, and are attributed to releases of sludge contained in an on-site storage tank removed from this area (**Figures 12 and 13, Appendix A**). PCB concentrations decrease with depth, and were not detected at depths of greater than ten feet below ground surface (**Figure 14, Appendix A**).

Lead appears to be the predominant metal detected in soil on the property at concentrations ranging from 596 mg/kg at SS-1 to 39,200 mg/kg at SS-16 (**Figure 15, Appendix A**). The distribution of lead contamination extends over the majority of the property sampled with seventeen of the twenty surficial soil samples collected containing lead at concentrations exceeding 1,000 mg/kg. Lower concentrations of zinc and copper were detected at concentrations exceeding the site upper reference limit. Copper was detected in six of eleven analyses, at concentrations ranging from 30 mg/kg to 53 mg/kg (TP-8). Zinc was detected in four of eleven analyses at concentrations ranging from 233 mg/kg to 1,750 mg/kg (TP-9). These three metals are attributed to the release of waste oil and sludge on the property.

Analyses of property soil for PCDDs/PCDFs indicate that none of the calculated TEFs exceed the ATSDR's recommended 1 ppb cleanup level for these analyses.

C. Site Soils

Characterization of the nature and extent of contamination in site area soils is based on the analyses of samples collected from borings advanced during the installation of Phase I ground water monitoring wells and surficial soil sampling in the athletic field. Soil boring locations B-101 through B-106 and athletic field sampling locations AS-1 through AS-5 are displayed in **Figure 16, Appendix A**.

Six borings, designated B-101 through B-106, were installed at monitoring well locations MW-101 through MW-106. The majority of soil boring samples were collected from below the water table, which ranges from depths of less than one foot below the ground surface at boring location B-103 to approximately eight feet below the ground surface at B-101. Soil boring analyses were evaluated with regard to the identification of, and contribution to, contaminant distributions in ground water.

Four (4) composite surficial soil samples were collected at a depth of up to six inches from the athletic field (locations AS-1 through AS-4). Samples AS-1 and AS-2 were collected from a gentle topographic scale and AS-3 and AS-4 were collected from heavily utilized areas in the athletic field.

Organic contamination detected in site soil boring samples consisted of VOCs (predominantly ketones), SVOCs (including PAHs, acid extractable compounds (AECs), and phthalates), and metals (predominantly lead). The highest concentrations of ketones, PAHs and AECs were detected in soil samples collected from soil borings B-104 and B-105 located immediately downgradient from the property. Elevated concentrations of these contaminants were also detected in ground water samples collected from monitoring wells installed in these borings. Surficial soil samples from the athletic field contained low concentrations of 1,1,1-TCA and PAHs. Organic contamination detected in athletic field soil may have migrated from the PSC Resources property by surface water drainage during flood events since both areas are located in the flood plain. Pesticides and PCBs were not detected in any of the site boring or athletic field samples analyzed, which suggests that PCBs detected in property soil are not migrating from the property in subsurface soil (or ground water as evidenced by ground water analyses). Metals were detected in site soil at elevated concentrations in surficial samples from borings B-102, B-103, and B-104. These borings are located within, or adjacent to, areas of fill emplaced adjacent to the northern boundary of the property. Based on a comparison to ground water analyses,

metals detected in site soil do not appear to be affecting ground water quality.

D. Air

The nature and extent of contamination in ambient air was investigated in a two phase ambient air sampling program. Phase I was conducted on July 6, 1988 and involved a site reconnaissance with real time air monitoring at 54 stations on, and surrounding, the property. Elevated concentrations of total VOCs ranged from 6 parts per million (ppm) to 125 ppm at stations where soil was disturbed. Based on the results of Phase I monitoring, a Phase II air sampling program was conducted to identify the nature and magnitude of constituent VOCs detected during Phase I monitoring.

The Phase II air sampling was conducted over a three day period from August 16-18, 1988 and involved quantitative analysis of air samples collected in glass cartridges containing Tenax and Ambersorb adsorbent media. In order to establish a base line set of conditions for the Phase II air program, the first day of air sampling (August 16, 1988) was conducted prior to any intrusive activities being performed on the property. The results from the first day of the Phase II air sampling indicated that there were low levels (up to 5.8 micrograms per cubic meter (ug/m^3)) of VOCs present in the ambient air on the property. However, subsequent air sampling performed on the second (August 17, 1988) and third days (August 18, 1988) of the sampling program indicated that intrusive activities on the property have the potential to cause an additional release of VOCs to the ambient air (total concentrations of VOCs exceeding $200 \text{ ug}/\text{m}^3$). A number of the VOC samples from the second and third days' air samples exceeded the current Allowable Ambient Limits (AALs). Locations of the sampling stations for the three days of air sampling are summarized in **Figure 17, Appendix A**.

Analyses of air samples collected during test pit excavation activities indicate that VOCs (PCE, TCE, and BTEX compounds) were detected at concentrations exceeding existing AALs and Threshold Effects Exposure Limits (TEELs), ranging from 1.3 to $21 \text{ ug}/\text{m}^3$. These contaminants have also been detected in property soil and are attributed to releases of waste oil and solvents. The results of air sampling indicate that intrusive soil activities on the property have the potential to cause a significant release of VOCs to ambient air.

E. Surface Water and Sediment

The nature and extent of contamination in surface water and sediment is summarized below by location including: Lagoon and Catch Basin Surface Water and Sediment; Wetland Sediment; Quaboag River Surface Water and Sediment; and Quaboag River Fish.

1) Lagoon and Catch Basin Surface Water and Sediment

The history of the site, past waste management practices, and interpretation of historic aerial photographs, suggest that the lagoon was originally utilized as a earthen bermed area, designed to contain a release of materials from the adjacent large vertical storage tanks on the property. Sediments within the lagoon appear to be a result of the disposal of sludge, originally contained in storage tanks, into the earthen bermed area. Repetitive sludge disposal resulted in the accumulation of a layer of sludge over the base of the earthen berm. The layer of sludge material formed an impediment to infiltration of rain water due to lowered permeability, which resulted in ponding in the bermed area and formation of a lagoon. Phase I, Phase II, and core sample locations in the lagoon and catch basin are displayed in **Figure 18, Appendix A**.

Elevated levels of a number of contaminants were detected in lagoon and catch basin sediments and include: VOCs (chlorinated hydrocarbons and BTEX); SVOCs (PAHs and phthalates); PCBs (Aroclor-1260 in the catch basin sediments); and total oil and grease (TOG) (at up to 40 percent in lagoon sediments).

Constituent contaminants detected in sediment analyses were similar to those detected in property soil for each parameter analyzed, suggesting similar sources (e.g. waste oil, sludge and solvents). VOCs detected included DCA, DCE, TCE, PCE, (at concentrations up to 1,700 mg/kg) and BTEXs (concentrations up to 1,850 mg/kg). SVOCs consisted of predominantly PAHs at total concentrations up to 10 percent. The absence of detected concentrations of PCBs in lagoon sediment is attributed to elevated instrument detection limits and sample dilution. Analyses of lagoon sediment for PCDDs/PCDFs indicate that none of the calculated TEFs exceed the ATSDR's recommended 1 ppb cleanup level for these analyses.

The predominance of chlorinated VOCs, BTEX, percent PAH levels, and a 40 percent concentration of TOG in lagoon sediments reflects the nature of these sediments as representing sludge released from the storage tanks. As a result, lagoon sediments may be expected to contain elevated concentrations of PCBs (in the tens of thousands of ug/kg range), although not quantified. Lagoon sediments are identified as a primary source of ground water contamination.

Lower concentrations of VOCs (at tens of ug/kg), SVOCs, and PCBs (catch basin surface water only) were detected in lagoon and catch basin surface water. Lead was detected in catch basin surface water at a concentration of 829 ug/l. A comparison of the relative concentrations of contaminants detected in surface

water and sediment suggests that sediments represent the source of contaminants detected in surface water.

2) Wetland Sediments

Characterization of the nature and extent of contamination in wetland sediments was performed during two phases of wetland sediment sampling. Phase I included the collection of 35 samples (N-1 through N-35). Phase II included collection and analysis of an additional 15 samples (N-36 through N-50). Wetland sediment sampling locations and delineation of wetland habitats and boundaries are displayed in **Figure 19, Appendix A**. Three supplemental sediment samples (at locations designated WSED-1, SS-2, and WSED-3 in **Figure 19, Appendix A**) were collected and analyzed for pesticides/PCBs and PCDDs/PCDFs. Wetland sediments are considered to be composed of the surficial soil materials surrounding the property to the east, west, and south which have a high organic content, and are generally six-inches to two-feet in thickness. The wetland sediments directly overlie, and are readily distinguishable from, the underlying glaciofluvial deposits. Within the wetlands portion of the site is an area where an approximately 4,000 gallon release of what has been described as a petroleum waste oil occurred. This area, which is referred to as the Spill Area, is located directly to the southeast of the lagoon, within the fenced property (**Figure 20, Appendix A**). The release has impacted the wetland sediments within the Spill Area. Organic and inorganic contamination was detected in wetland sediment samples analyzed from the Spill Area. In particular, the Spill Area is identified as a potential source of ground water and surface water contamination, and a primary source of sediment contamination in the wetlands.

VOCs detected in wetland sediment samples were restricted to those samples collected from the Spill Area. VOCs were not detected in any of the 17 wetland sediment samples located outside of the Spill Area. Constituent VOCs included BTEX compounds ranging in concentration from 510 ug/kg to 30,000 ug/kg. Patterns in the distribution of ground water contamination, ground water flow, and ground water recharge/discharge relationships suggest VOC contamination detected in the Spill Area may be a contributing source to ground water contamination. However, results of the Summers leaching model analyses suggest that contaminants in Spill Area do not contribute to ground water contamination.

SVOCs detected in wetland sediments were predominantly PAHs and phthalates, with lower concentrations of phenols. Total concentrations of PAHs in wetland sediments were detected in the tens to hundreds of thousands of ug/kg range (**Figure 21,**

Appendix A). Total concentrations of PCBs were detected at up to 32,000 ug/kg at sample location N-42 (**Figure 22, Appendix A**). The highest concentrations of SVOCs and PCBs were detected in the Spill Area, which appears to be the source for contaminants detected in other areas of the wetland.

Contaminated sediment in the Spill Area appears to be migrating to the wetlands by surface water drainage during storm or flood events. Higher concentrations of SVOCs and PCBs in wetland sediments outside of the Spill Area generally correlate with definable drainage ways and areas of lower elevation, which experience accumulation of contaminants by saltation and sedimentation.

Four pesticides were detected in the wetland sediment samples analyzed, at concentrations in the tens to low hundreds of ug/kg range. The pesticides detected (4,4-DDE, 4,4-DDD, 4,4-DDT, and alpha-chlordane) do not appear to correlate with contamination detected on the property, but may be attributable to random releases in disturbed soil areas of the up-land wetland or past insect spraying of the wetlands area.

Analyses of wetland sediments for PCDDs/PCDFs indicate that none of the calculated TEFs for these analyses exceed the ATSDR's recommended 1 ppb cleanup level. Metals, including lead and zinc, were detected at concentrations up to 50,100 mg/kg and 2,290 mg/kg, respectively in the wetland sediments. The detected concentrations were generally highest in the Spill Area and decrease in concentration along drainage pathways extending from the Spill Area toward the Quaboag River. Concentrations of these metals are also elevated in the property soil due to releases of waste oil on the property. Similarly, the occurrence of lead and zinc in wetland sediments is attributed to the release of waste oil within the Spill Area.

3) Quaboag River Surface Water and Sediment

Organic and inorganic contamination was detected in Quaboag River sediment, although contaminants were not detected in surface water analyses. The distribution of SVOCs and pesticides/PCBs detected in Quaboag River sediment samples suggests that contaminants are not attributed to releases from the site, as based on a comparison of detected concentrations in upstream, adjacent, and downstream analyses. However, low concentrations of VOCs (361 ug/kg) and high total oil and grease (TOG) (270,000 ug/kg) were detected at SED-6, located just downstream of the property (**Figure 23, Appendix A**). In addition, an oily odor was noted upon disturbing river sediments in this vicinity. These results suggest oil accumulation in river sediment at location SED-6, which may be attributable to a

release from the property (from either a past spill which migrated to the river and deposited in sediment, or a discharge pipe).

4) Quaboag River Fish

Fish samples from the Quaboag River were collected for analysis to determine whether site-related contamination was discernible in bottom-dwelling fish species. Fish were sampled from three reaches of the river designated FS-1, FS-2/FS-4, and FS-3, as depicted in **Figure 24, Appendix A**. Analyses of organic compounds (SVOCs, pesticides/PCBs) in fish samples collected from three reaches of the Quaboag River (upstream, adjacent to, and downstream of the site) do not suggest that fish in the river are being adversely affected by contamination migrating from the site to the river. Inorganic analyses indicate elevated concentrations of lead detected in fish samples from reach FS-3, located furthest downstream from the property. However, detected concentrations of lead in these samples are not directly attributable to contamination from the PSC Resources property since other sources (downtown Palmer and automobile emissions from the downstream bridge on Bridge Street) may have influenced the detected concentrations of lead in these samples. Results of the risk assessment suggest that the PSC Resources Site does not pose an ecological risk to fish communities and that human consumption of fish from the river does not pose a health risk to humans.

F. Ground Water

Analyses from five rounds of sampling indicate the contaminants of concern in ground water are VOCs and SVOCs. VOCs are the predominant contaminants detected in ground water, and consist of: chlorinated hydrocarbons (TCA, TCE, PCE, and degradation products); ketones (acetone and methyl ethyl ketone (MEK)); and aromatic hydrocarbons (BTEX). A variety of these contaminants exist in ground water at concentrations in the tens to thousands of micrograms per liter (ug/l) range, and exceed both state and federal maximum contaminant levels (MCLs) (**Figure 25, Appendix A**).

Detected concentrations of SVOCs range in the tens to hundreds of ug/l and include phthalates, phenols and PAHs. SVOCs are limited in extent to the following monitoring wells: PSC-108S located on the property, MW-104B, MW-104C, and MW-105B located adjacent to the western/downgradient property boundary. Vertically, SVOCs were not detected in samples from monitoring wells greater than 30 feet in depth, as might be predicted from the low mobility and solubility of these compounds.

Results of ground water sampling indicates an existence of a localized VOC contamination (PCE) at PSC-114S (at the extreme downgradient end of the Site). PCE was the only VOC detected in sampling Round IV from PSC-114S, at a concentration of 200 ug/l. Subsequent sampling of this well during Round V (October, 1990) confirmed the presence of PCE at a concentration of 160 ug/l. Given the significantly higher concentration of PCE contamination in PSC-114S, the lack of other detectable VOCs, the relative distance of PSC-114S from the property (approximately 550 feet), and the fact that this well is located outside the mapped ground water flow regime from the property to its point of discharge to the Quaboag River, the presence of PCE is not attributed to a site related source(s). Therefore, PCE contamination found at PSC-114S appears to be an isolated ground water problem and is not related to the VOC contaminated plume emanating from the PSC property. EPA will further examine this phenomenon during the Pre-Design stage of the source remediation.

The distribution of contaminants in ground water appears to be limited to the shallow overburden aquifer, and generally follows ground water flow patterns as modified by surface water/ground water recharge relationships (summarized in **Figures 26 through 28, Appendix A**). The detected distribution of contaminants, the ground water flow regime, and ground water uses suggests that contamination has not extended to surrounding public or private ground water sources (e.g., to the adjacent Town of Monson or the Galaxy Well Field located approximately one-half of a mile upgradient of the site). No ground water contamination has been detected in the bedrock aquifer, which correlates with hydraulic head measurements, indicating upward flow from bedrock to overburden aquifers, with recharge to the Quaboag River or wetlands.

The detected concentrations of VOCs in ground water are significantly below the solubility index, which indicates that these contaminants exist in the dissolved phase. The flow regime suggests advective flow is the primary mechanism in the transport of dissolved contaminants in ground water. Concentrations of contaminants appear to be decreasing, both vertically and laterally over time, which may suggest the plume is receding toward the property (**Figure 29, Appendix A**). Currently, contaminated ground water appears to be discharging to the wetlands adjacent to the Quaboag River or to the river. However, no site related contaminants have been detected in the water column of the Quaboag River and it appears that contaminant concentrations may be reduced through dilution and volatilization.

In comparing the types, concentrations, and distribution of contaminants detected in ground water to other media, three primary source(s)/areas which appear to contribute to ground water contamination include: the lagoon sediment, property soils, and wetland sediments in the Spill Area.

G. Floodplain and Wetland Assessment

The PSC Resources, Inc. property is located within the 100-year floodplain of the Quaboag River and is surrounded by wetlands to the south and to the east (**Figure 30, Appendix A**). Federal policy with respect to floodplain management and wetland protection is codified in Section 40 of the Code of Federal Regulations (CFR) Part 6, Appendix A, consistent with Executive Orders 11988 and 11990 on floodplain management and wetland protection, respectively. These regulations require that actions affecting floodplains and wetlands "avoid wherever possible the long and short term impacts associated with the occupancy and modification of floodplains and the destruction of wetlands." In defining the policy, the regulations indicate that when there is no practical alternative to locating in a floodplain and wetland, the proposed activity must minimize the impact which floods may have on human safety, health, and welfare, as well as the natural environment; and must minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands.

1) Floodplain Assessment

Bordering land subject to flooding is defined according to Section 10.57(2)(a) of the Commonwealth of Massachusetts Regulations 310 CMR 10.00 as:

- Bordering land subject to flooding is an area with low flat topography adjacent to and inundated by floodwaters rising from creeks, rivers, streams, ponds, or lakes. It extends from the banks of the water body;
- The boundary of bordering land subject to flooding is the estimated lateral extent of floodwater which will theoretically result from the statistical 100-year frequency storm. Said boundary shall be determined by reference to the most recently available flood profile data prepared for the community within which the work is proposed under the National Flood Insurance Program (NFIP), currently administered by the Federal Emergency Management Agency (FEMA).

The current FEMA Flood Insurance Rate Maps (FIRM) for the Town of Palmer, Community Panel No. 250147, November 1981, indicate that the PSC Resources property is within the 100-year floodplain (**Figure 30, Appendix A**). The potential impacts on the 100-year floodplain from the implementation of the selected Source Control Remedy as well as plans to mitigate such impacts are further discussed in Section X. of this ROD.

2) Wetland Assessment

Wetland Delineation

Wetland resource areas within the PSC Resources Site were identified in the field utilizing the criteria established under the "1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands" (federal methodology). The purpose of the manual is to provide, "mandatory technical criteria, field indicators and other sources of information, and recommended methods to determine whether or not an area is a jurisdictional wetland." **Figure 31 of Appendix A** shows the wetland and non-wetland boundaries, and the vegetative communities present based on the offsite and onsite wetland delineations.

In addition, the wetland resource area boundary determinations were also conducted in accordance with the Massachusetts Wetlands Protection Act (M.G.L. Chapter 131, Section 40) and Regulations (310 CMR 10.00). Within the site, there are four types of wetland resource areas regulated under the Massachusetts regulations. These include: bank, bordering vegetated wetlands, land under a water body and waterway, and bordering land subject to flooding. **Figure 32 of Appendix A** shows the location of these resources.

It was determined based on field observations, that the wetland edge met the criteria of both the Massachusetts Wetlands Protection Act (MWPA - M.G.L. Chapter 131, Section 40) and federal criteria. The mandatory federal criterion for vegetation and hydrology are essentially the same as those for the MWPA.

Wetland Functional Analysis

The existing conditions of the PSC Resources Site wetlands were evaluated by using the Wetland Evaluation Technique (WET), previously known as the FHWA Wetland Evaluation Method or Adamus Method. The overall approach of the method is to obtain a qualitative assessment of the current values of a wetland with respect to key wetland functions. The WET has been designed so that it can evaluate the existing conditions within a resource area, be used as a predictive tool in assessing the potential impacts of a proposed action that could affect the resource area, and to evaluate proposed mitigative actions. The assessment of wetland functions and values is performed using data and information obtained from field observations and/or available data files, maps, and photographs. WET evaluates wetland functions and values in terms of social significance, effectiveness, and opportunity. The wetlands on the property were divided into two Assessment Areas (AA's) for the purposes

of this evaluation (Figure 31, Appendix A). The wetland system surrounding the facility was evaluated as Assessment Area PSC, and the Quaboag River wetland system was evaluated as Assessment Area QR. The results of the existing conditions assessment are summarized for each wetland function as follows:

1. Ground Water Recharge - Recharge areas are considered to be those wetlands where recharge to the substrate or ground water exceeds discharge to the wetland on an annual basis, and those wetlands with a rate of recharge that typically exceeds the rate associated with terrestrial environments. The WET methodology indicates that few eastern wetlands are rated as "High", and most will receive a rating of "Uncertain". The AA's were rated as "Low" for this function. This can be attributed in part, to the presence of outlets within the AA's, which appears to reduce the wetlands effectiveness for recharging the ground water supply. Wetland areas which are most effective for recharge are those which contain at least one of the following conditions: are not permanently flooded, have favorable topography, have an impervious watershed, area soils have a slow infiltration rate, located upslope of a dam, have fine mineral soils or are in a karst region, or have expansive flooding or unstable flows.
2. Ground Water Discharge - Those areas where the rate of discharge from ground water into wetland resources exceeds the rate of recharge to underlying ground water on a net annual basis are considered ground water discharge areas. Due to the relatively small size (less than 200 acres) of the PSC Assessment Area and lack of a permanently flooded water regime which would indicate discharge, a "Low" rating for this function was assigned. Unlike the PSC Assessment Area, the QR Assessment Area is extensive in overall size and contains perennial stream flow characteristics. As a result, it is likely that ground water discharges to the Quaboag River on a net annual basis. The effectiveness of the QR Assessment Area to perform this function was, therefore, rated as "Moderate".
3. Floodflow Alteration - Floodflow alteration occurs in areas where surface water is stored or its velocity reduced. No judgment is made as to the value of floodflow alteration under the WET, as reduction in velocity may cause increased flooding due to flow synchronization. Both the PSC Assessment Area and the QR Assessment Area would be considered effective to some degree, at performing this function. The Quaboag River contains a large storage capacity which is effective in the initial synchronization of storm flows. The PSC Assessment Area can be considered effective at storing surface water due to its location adjacent to the Quaboag River and within its associated 100-year floodplain boundary as indicated by FEMA. The AA's received "Moderate" ratings for this function.

4. Sediment Stabilization - Areas effective at sediment stabilization are those wetlands which are more effective at binding soil and dissipating erosive forces than uplands. Both the AA's received "High" ratings for this function. The "High" rating can be attributed to the presence of the Quaboag River and existing vegetative structure which mitigate the effects of the potential erosive forces present within the AA's. The river confines stream flows and combined with the vegetated banks, reduces the velocity and subsequent erosion of the adjacent shorelines. The only type of wetland considered capable of being rated "Low" is one in which there is no flowing water, no open water wider than 100 feet, and no eroding areas abutting the wetland, as well as having no vegetation (erect or submerged) or rubble.

5. Sediment/Toxicant Reduction - Wetlands which physically or chemically trap and retain inorganic sediments and/or chemical substances generally toxic to aquatic life are considered high sediment/toxicant reduction areas. The Assessment Areas received a "High" rating for this function. The wetlands have the ability due to their plant species composition, relatively long duration and extent of seasonal flooding, and poorly drained soils; to trap runoff from the adjacent PSC Resources Site. By trapping runoff, the wetland areas are able to mitigate impacts to water quality and aquatic life.

6. Nutrient Removal/Transformation - Nutrient removal/transformation wetlands are those which retain or transform inorganic phosphorus and/or nitrogen into their organic forms, or remove nitrogen in its gaseous form during the growing season or on an annual basis more effectively than uplands. Assessment Area PSC received a "Moderate" rating for this function, while Assessment Area QR was rated as "Low". The differences in the ratings for the AA's can be attributed to the flow velocities within the Quaboag River. For a wetland to be considered effective for nutrient removal/transformation, it must possess minimal flow velocities and/or significant vegetative growth. Within the limits of the project area, the Quaboag River does not have the broad wetland areas, necessary to store runoff volumes and perform nutrient removal functions. In comparison, the PSC Assessment Area contains little or no stream flows. As a result, the wetland has the ability to store runoff and can be effective in performing the nutrient removal/transformation processes.

7. Production Export - The flushing of relatively large amounts of organic plant material from a resource area into downgradient waters is considered to be high production export. No judgment is made under the WET as to the value of this export as it may

reflect a nutrient loss or a source of water quality problems. Production export from the AA's was rated as "Moderate". The AA's were rated as "Moderate" because of the presence of primary productivity within the wetlands along with the existence of a permanent outlet associated with the Quaboag River. This permanent outlet functions to carry plant material to downstream wetlands.

8. Aquatic Diversity/Abundance - Wetlands which support great onsite diversity of fish or invertebrates, at least seasonally, receive "High" ratings. Under the WET, the PSC Assessment Area received a "Low" rating while the QR was rated "Moderate" for this function. The "Low" rating for the PSC Assessment Area is directly related to the lack of open water areas and presence of contamination from the PSC site. The most significant characteristic of the QR Assessment Area which contributes to the "Moderate" rating, is the existence of permanent stream flows. Although contaminants within portions of the PSC Assessment Area may potentially reach the river, the perennial outlet flows mitigate the effects through consistent flushing.

9. Wildlife Diversity/Abundance - High ratings are indicative of a resource area that supports onsite diversity and/or abundance of wetland dependent birds during the breeding season, migration or winter. The PSC Assessment Area was rated "Low" for breeding and "High" for migration and wintering. The Quaboag River Assessment Area received "High" ratings for each of these functions.

The "Low" rating for breeding for the PSC Assessment Area can be attributed to relatively small size of the wetland, location within an urban setting, and lack of connection to adjoining forested areas. The remaining "High" ratings for both the PSC Assessment Area and Quaboag River for these functions can be generally attributed to the location and presence of perennial stream flow characteristics associated with the river, existence of vegetational diversity and fact that the river does not completely freeze during the winter.

10. Recreation and Uniqueness/Heritage - This evaluation is site-specific and contingent on actual use of a wetland for passive and recreational activities such as swimming, boating, fishing, and hiking. Interpretation keys are not provided for assessing opportunity and effectiveness of these values since no scientific basis currently exists for a site-specific objective assessment without a collection of considerable site-specific data.

Of note in the evaluation of wetland functions is that both Assessment Areas received "High" ratings for sediment/toxicant

retention. Both Assessment Areas also received "High" ratings for sediment stabilization under social significance and effectiveness. This can be attributed to the gentle slopes and broad flat floodplain within the wetland areas, the intermittent nature of the site stream system with no direct discharge to the river, and the presence of a large area of vegetated wetland capable of attenuating contamination and sediments.

Habitat Suitability Evaluation

The Wetland Evaluation Technique (WET) provides a procedure to evaluate fish and wildlife habitat at the species group and individual species level. Specifically, WET evaluates habitat suitability of a wetland for 14 waterfowl species groups, 4 freshwater fish species groups, 120 species of wetland-dependent birds, and 133 species of saltwater fish and invertebrates. These evaluations are restricted to avian, fish, and invertebrate species that reside in the 48 contiguous states and are wetland-dependent throughout most of their range. WET does not evaluate for wetland-dependent furbearers and other mammals, reptiles, and amphibians (e.g., beaver, turtles, salamanders etc.). The habitat suitability ratings cannot be combined to give an overall probability rating of habitat suitability for the wetland. This would require weighting of species, which is both a social and biological judgment.

Habitat Suitability Evaluations were conducted for these wetlands with respect to several different species/groups of wildlife for both wetland Assessment Areas, regardless of the life history requirements for each in order to maintain consistency throughout the evaluation. These species were selected because they were either:

Observed during the field investigation;
Represent groups of species which would be expected to occur in the area; or
Expected to occur on the PSC Resources Site, based on habitat characteristics of wetlands.

Table 1 of Appendix B presents a summary of the habitat suitability for the selected species. The variability in ratings may be attributed to the lack of perennial open water within the PSC Resources Site and differences in vegetative composition. The site contains regions of wet meadow, shrub swamp and red maple swamp. The Quaboag River is primarily open water bordered by red maple swamp.

A complete description of site characteristics can be found in the Remedial Investigation Report - PSC Resources Site (HMM Associates, Inc., January 1992) in Section 4.0 of Volume I.

VI. SUMMARY OF SITE RISKS

A Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment were performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the PSC Resources Site.

The human health risk assessment followed a four step process: 1) contaminant identification, which identified those hazardous substances which, given the specifics of the site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and non-carcinogenic risks. The results of the public health risk assessment for the PSC Resources Site are discussed below followed by the conclusions of the environmental risk assessment.

A. Human Health Risk Assessment

Twenty-one contaminants of concern, listed in Table 2 Appendix B, were selected for evaluation in the risk assessment. These contaminants constitute a representative subset of one-hundred and eighteen organic and inorganic contaminants identified at the Site during the Remedial Investigation. The twenty-one contaminants of concern were selected to represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. A summary of the health effects of each of the contaminants of concern can be found in the Remedial Investigation Report - PSC Resources Site (HMM Associates, Inc., January 1992) in Section 6.0 - Human Health Risk Assessment of Volume I.

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. Groups of people associated with the current and/or future land uses include:

- Scenario 1 - neighborhood residents, including people who trespass on the property, visit the wetlands near the property, boat on the Quaboag River, and/or catch and eat fish from the river;
- Scenario 2 - residents in homes on the property under possible future residential land use; and

- Scenario 3 - commercial/industrial workers on the property under possible future commercial land use.

Residents currently live near the Study Area. The Study Area includes all locations where exposures may occur including the PSC Resources property. However, residents in homes on the site and commercial/industrial workers are hypothetical receptor groups who may or may not be exposed to contaminants in the Study Area during or following some possible redevelopment of the property. **Table 3 of Appendix B** summarizes the potential receptors, exposure points, exposure media and exposure routes that were evaluated in the human health risk assessment. The following is a summary of the exposure pathways evaluated.

The current land use of the property is an inactive facility. Exposures in the Study Area currently are associated with neighborhood residents who may trespass on the property and be exposed to contaminated media on the property (soil, lagoon sediment, lagoon surface water and building) and who may be exposed to contaminated media outside the property in the Study Area (wetland sediment, river sediment and fish) as a result of recreational activities.

As stated above, exposures related to future land uses were evaluated via residential and commercial/industrial workers scenarios. With respect to the future residential scenario, residents in homes on the property may be exposed to contaminants on the property in soil, lagoon sediment, lagoon surface water, buildings, and ground water. Exposure to contaminants in the Study Area by future residents may occur via contact with wetland sediment, river sediment, and fish. With respect to the future commercial/industrial workers scenario, workers on the property may be exposed to contaminants via contact with ground water, soil, lagoon sediment, lagoon surface water, and buildings on the property. Study Area exposures for this receptor to wetland sediments and river sediments would be limited.

Subgroups of the exposure populations have been defined for each of the cases considered, i.e., current trespassers (Scenario 1), future residents (Scenarios 2), and future commercial/industrial workers (Scenario 3). These subgroups reflect exposures for different age groups with varying levels of exposure and types of exposure. For example, the current trespassers' exposure scenario involves a young child (age 1-6 years), an older child/young adult (age 7-18 years), and an adult. The future residents have the same three age groups as Scenario 1. The future commercial/industrial workers scenario considers an adult only.

Not all subgroups are exposed to the same exposure media. For example, a young child in the current trespasser scenario is not likely to be exposed to lagoon sediment as much as the older child might be exposed to this exposure medium. A careful review of **Table 3**

of Appendix B reveals that only the older child/young adult (age 7-18 years) in the current trespasser scenario (Scenario 1) is considered to be potentially exposed to soil, wetland sediment, lagoon sediment, lagoon surface water, and buildings while trespassing on the property. The young child (age 1-6 years) is exposed to contaminants via fish consumption only, as trespassing for this age group is unlikely. The adult exposures for the current trespasser scenario include contact with river sediment and fish consumption only as adults are less likely to trespass on the property but may catch and eat fish from the river.

For Scenario 2, future residents, both the older child/young adult (age 7-18 years) and the young child (age 1-6 years) are considered to be potentially exposed to soil and wetland sediment. However, in the future residential scenario, only the older child/young adult (age 7-18 years) is exposed to lagoon sediment, lagoon surface water, river sediment, and buildings given the greater probability of contact with these media for an adolescent. Both the young child (age 1-6 years) and the adult are evaluated for fish exposures. Ground water exposures for the future residents are based on the adult.

The future commercial/industrial worker exposure scenario is based on an adult and was described previously.

Risks are calculated separately for individual age groups within a receptor group. For example, exposure doses and subsequent risk estimates are calculated for the current trespasser older child/young adult (age 7-18 years) exposure to soil and presented separately for this age group. Risks for current trespassers exposure to soil are represented by this one subgroup only. Receptors were selected for particular exposure pathways and the exposure assumptions were defined for each receptor and exposure medium. These exposure assumptions are listed by medium and receptor in Table 4 of Appendix B.

A more thorough description of the exposure pathways evaluated can be found in the Remedial Investigation Report - PSC Resources Site (HMM Associates, Inc., January 1992) in Section 6.0 - Human Health Risk Assessment of Volume I.

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 unlikely to be greater than the risk

predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. 1×10^{-6} for 1/1,000,000) and indicate (using this example) that an average individual is not likely to have greater 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 non-carcinogenic health effects. A hazard quotient is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects for an individual compound. 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 quotient is often expressed as a single value (e.g. 0.3) indicating the ratio of the stated exposure as defined to the reference dose value (in this example, the exposure as characterized is approximately one third of an acceptable exposure level for the given compound). The hazard quotient is only considered additive for compounds that have the same or similar toxic endpoint and the sum is referred to as the hazard index (HI). (For example: the hazard quotient for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage).

Table 5 of Appendix B depicts the carcinogenic and non-carcinogenic risk summary for the contaminants of concern in soil, ground water, wetland sediment, lagoon sediment, lagoon surface water, river sediment, and fish evaluated to reflect present and potential future exposure pathways corresponding to the average and the reasonable maximum exposure (RME) scenarios. These carcinogenic and non-carcinogenic risk estimates were calculated for each of the three receptor populations considered and for each subgroup of receptors. A more detailed summary of carcinogenic and non-carcinogenic estimates for each contaminant of concern for each exposure pathway can be found in the Remedial Investigation Report - PSC Resources Site (HMM Associates, Inc., January 1992) in Table 4-6 of Appendix I of Volume IV.

Carcinogenic and non-carcinogenic risk estimates as provided in Table 5 of Appendix B were evaluated relative to the EPA's risk management criteria. The carcinogenic risks or ILCRs (Incremental Lifetime Cancer Risks) are compared to a risk range of $1\text{E-}06$ ("point of departure") to $1\text{E-}04$. Non-carcinogenic risks, or HIs (Hazard Indices), are compared to a value of one (1), below which adverse health effects from exposures are not anticipated. Bolded values in

Table 5 of Appendix B represent those risk estimates which exceed the upper limit of the risk range ($1E-04$) for an ILCR or HI of one (1).

Of the exposure media for which risk estimates were calculated, exposures to property soil, ground water, wetland sediment, and lagoon sediment are associated with significant human health risks due to exceedance of EPA's risk management criteria for either the average or the reasonable maximum exposure scenarios. The carcinogenic risks were highest for exposures to lagoon sediment due to the high concentrations of carcinogenic polycyclic aromatic hydrocarbons (PAHs) detected in this medium. Non-carcinogenic risks were highest for exposure to wetland sediment due to high concentrations of lead detected in the Spill Area. Risks from exposure to property soil are considered significant due to the presence of a number of contaminants of concern in this medium including lead, trichloroethylene (TCE), tetrachloroethylene (PCE) and polychlorinated biphenyls (PCBs). In addition, a variety of these VOC contaminants exist in ground water at concentrations that were found to exceed both state and federal maximum contaminant levels (MCLs). Potential risks associated with ground water contamination are primarily attributed to the presence of VOCs in this medium. Risks from building exposures were not quantified due to the lack of reliable data regarding the magnitude of exposures to this medium. However, a qualitative risk evaluation indicates that adverse health effects may occur from exposure to building contaminants given the presence of traces of dioxins and furans, PCBs, and lead on building surfaces. Exposures to lagoon surface water, river sediment, and ingestion of fish are not considered to pose significant human health risks as the risks from exposure to these media are within EPA's acceptable risk range of 10^{-4} to 10^{-6} for ILCRs and less than one for HIs.

Therefore, based on the results of the human health risk assessment, EPA has determined that property soil, ground water, wetland sediment, and lagoon sediment media need to be targeted as the focus of the remedial actions.

B. Ecological Risk Assessment

Ecological risks were evaluated for several groups of environmental receptors including soil invertebrates, benthic invertebrates, fish, and mammals and birds. Property soils and soils in the Spill Area pose a risk to soil invertebrates. Wetland soils (exclusive of the Spill Area) pose a low risk to small mammals and birds that may consume soil invertebrates from the wetlands. Ecological risks from contaminants detected in wetland soils (exclusive of the Spill Area) are generally limited to a few sampling locations adjacent to the Spill Area in wetland access or drainage pathways. Risks to mammals and birds are similar to those for soil invertebrates (resulting from consumption of soil invertebrates) and are associated with contaminants in property soil and Spill Area sediment. Lagoon

sediments pose a risk to benthic invertebrate communities. Quaboag River surface water and sediment pose a low risk to benthic invertebrates and fish species.

Risks to soil invertebrates in property soils, Spill Area soils, and wetland soils/sediments were evaluated using three methods including an earthworm bioassay, the Equilibrium Partitioning (EP) Method, and comparison to acute and chronic No Observed Effect Level (NOEL) values.

The results of the field and laboratory earthworm bioassays indicate that soils/sediments in the wetland area were not acutely toxic to earthworms. The use of the Equilibrium Partitioning Method indicated that property soils (VOCs, PCBs), Spill Area soils (PCBs, PAHs), and wetland soils located along drainage pathways (PCBs, DDT residues, PAHs) pose a potential risk to soil invertebrates. A comparative method was used to evaluate potential risks associated with periodic discharge of ground water to surface soils/sediments. There is a potential for chronic effects to soil invertebrates based on a comparison of exposure concentrations in ground water to NOEL values. This risk is primarily due to the presence of iron, cadmium and a mixture of volatile organic compounds in ground water.

Risks to benthic invertebrates in the lagoon and the Quaboag River sediments were evaluated by comparison of contaminant concentrations in sediments to effects range-low (ER-L) and effects range-median (ER-M) values, by the EP Method, and by the assessment of the potential effects of contaminants in ground water. The only contaminants found to exceed ER-M values in Quaboag River sediment were PCBs and DDT. The ER-M values for these contaminants are generally lower than the detection limits for these samples. Contaminant concentrations in Quaboag River sediment exceed the ER-L values for lead, mercury, PCBs, DDT, anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, fluoranthene, 2-methylnaphthalene, phenanthrene, and pyrene. These results indicate that exposures to Quaboag River sediment could effect aquatic life, but observable effects are not likely. Results of the EP Method indicate the toxicity quotient values for SVOCs in lagoon sediments were very high (greater than 800). Toxicity Quotient values for organic contaminants (pesticides, PCBs, VOCs, and SVOCs) in Quaboag River sediment were greater than one (1) but less than ten (10), suggesting a low risk to benthic invertebrates. The potential risk to benthic invertebrates from contaminated ground water discharging to river sediment is low.

Risks to fish communities in the Quaboag River were evaluated by fish tissue sampling. Laboratory analyses of fish and fishbody burdens in the river did not indicate that the communities were being affected by the presence of contaminants detected at the PSC Resources Site. Communities appeared healthy and there were no differences between upstream and downstream samples which could be attributed to

contamination from the PSC Resources property. The site is not considered to pose an ecological risk to fish communities in the river under present conditions.

Risks to small mammals and birds were evaluated by estimating the body burdens of bioaccumulatable organic compounds by soil invertebrates. These estimated exposure levels were compared to dose-response thresholds for various biological endpoints (lethality, reproduction/development, other chronic effects). The results of this analysis indicate that some potential risk is associated with birds or small mammals feeding exclusively on soil invertebrates in property soils or the Spill Area soils due to the presence of PCBs, PAHs, and phthalate esters in these soils. There is also some low level risk for small mammals and birds exposed to contaminants in wetland soils/sediments. For larger mammals and birds of prey the risk from exposure to contaminants in the area as a whole is judged to be negligible.

As stated above, the ecological risk assessment uses the Equilibrium Partitioning (EP) approach to determine site specific Sediment Quality Criteria (SQC). This approach is developed for use with sediments and is not directly applicable for soils. The PSC Resources ecological risk assessment initially extended the use of this model to both saturated and unsaturated soils and sediments. The results of the ecological risk assessment, using this SQC approach, indicates that property soil, Spill Area sediment, wetland soil and sediment, and lagoon sediment should be targeted as the focus of the remedial actions. Specifically, the ecological risk assessment indicates that among the groups of environmental receptors evaluated, the site poses a potential risk to soil invertebrates in property soil, Spill Area sediment, wetland soil and sediment; to benthic invertebrates in lagoon sediment; and to birds and small mammals feeding on soil invertebrates in soils on the property and in the wetland areas.

However, subsequent field visits and observations indicated that the property soils and lagoon sediments are not good habitat for soil invertebrates or other animals. Rather, the property that consists of property soils and lagoon sediments reflects an industrial setting as a result of past waste oil and solvent reclamation activities. Specifically, the physical (dense and compact) and chemical (oil saturated) characteristics of the property soil and lagoon sediment do not provide a suitable habitat for, and significantly diminish the likelihood of exposure by ecological receptors in these media. Therefore, the development of risk-based cleanup levels in property soil and lagoon sediment are being based on the human health risk assessment. Because the wetlands, including the Spill Area, provide a potentially suitable habitat for ecological receptors of concern, cleanup levels are being developed based on the ecological risk assessment for those contaminants that are primary contributors to ecological risks in these areas. The SQC estimates also provide

information on the relative magnitude of risk that may occur in the Spill Area if the Spill Area, in its current conditions, is actually being used by the ecological inhabitants as part of the natural wetland system. Contaminants in the wetlands that are primary contributors to ecological risks include total PAHs, lead, and zinc. These three contaminants tend to follow a co-occurrence pattern at elevated concentrations in the wetland sediments. Therefore, ecologically based cleanup levels that would be protective of the environment are being developed for total PAHs, lead, and zinc in the wetland sediments, including the Spill Area.

In summary, EPA has determined that actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. The human health risk assessment identified the property soil, ground water, lagoon sediment, and wetland sediment media as posing probable health risks exceeding EPA risk management criteria and the ecological risk assessment identified only wetland sediment medium, including the Spill Area, due to the reasons provided above, as posing probable environmental risk to mammals and birds. Therefore, these four media are designated as media of concern and will be targeted as the focus of the remedial actions.

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, and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These remedial action objectives were developed for Source Control and Management of Migration to mitigate

existing and future potential threats to public health and the environment. These response objectives were:

Source Control Response Objectives

- Minimize the migration of contaminants from the property soils and lagoon sediment that could degrade ground water quality;
- Reduce risks to human health by preventing direct contact with, and ingestion of, contaminants in the property soils, wetland sediments, and lagoon sediment; and potential ingestion of contaminated ground water;
- Reduce risks to the environment by preventing direct contact with, and ingestion of, contaminants in the wetland sediments;
- Minimize the migration of contaminants (i.e., from property soils, lagoon sediments, and wetland sediments) that could result in surface water concentrations in excess of Ambient Water Quality Criteria.

Management of Migration Response Objectives

- Eliminate or minimize the threat posed to human health and the environment by preventing exposure to ground water contaminants;
- Prevent further migration of ground water contamination beyond its current extent; and
- Restore contaminated ground water to Federal and State applicable or relevant and appropriate requirements (ARARS), including drinking water standards, and to a level that is protective of human health and the environment within a reasonable period of time.

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 were developed for the site.

With respect to Source Control, the RI/FS developed a range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances is a principal element. This range included an alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long term management. This range also included alternatives that treat the principal threats posed by the site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and

untreated waste that must be managed; alternative(s) that involve little or no treatment but provide protection through engineering or institutional controls; and a no action alternative.

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

As discussed in Section 2.0 of the Feasibility Study, the RI/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 3.0 of the Feasibility Study 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 4.0 of the Feasibility Study.

In summary, of the 11 Source Control and 4 Management of Migration remedial alternatives screened in Section 3 of the Feasibility Study, 8 were retained for detailed analysis. **Table 6 of Appendix B** identifies the 8 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 in detail. A detailed assessment of each alternative can be found in Section 4.0 for Source Control and Management of Migration of the Feasibility Study (HMM Associates, Inc., January 1992).

A. Source Control (SC) Alternatives Analyzed

The Source Control alternatives that underwent detailed analysis for the PSC Resources Site include the following:

SC-1 - No Action: Long-term monitoring of ground water, wetland sediments, property soils, lagoon water, lagoon sediments, and Quaboag River water and sediments.

SC-4 - Impermeable Cap: Decontamination and demolition of property structures; Lagoon dewatering; Consolidate lagoon and wetland sediments with property soils; Earthen levee around property for flood control; Subsurface drain around property with vertical barrier wall;

Impermeable cap over consolidated residual source materials; Ground water collection from inside the barrier wall with treatment and discharge; Wetlands restoration/replication; Long-term monitoring of ground water, wetland sediments, and Quaboag River water and sediments; Institutional controls on ground water development and land use; Access restrictions (e.g., fencing) around residual source materials; Warning signs; and Public education program.

SC-5 - In-Situ Vitrification: Decontamination and demolition of property structures; Lagoon dewatering; Consolidate lagoon and wetland sediments with property soils; In situ vitrification of consolidated residual source materials; Permeable cap over vitrified mass; Wetlands restoration/replication; Monitoring of ground water, wetland sediments, and Quaboag River water and sediments; Institutional controls on ground water development and land use; Access restrictions (e.g., fencing) around residual source materials; Warning signs; and Public education program.

SC-6 - In-Situ Stabilization: Property structures decontamination and demolition; Lagoon dewatering; Consolidate lagoon and wetland sediments with property soils; In situ stabilization of consolidated residual source materials; Permeable cap over stabilized mass; Wetlands restoration/replication; Long-term monitoring of ground water, wetland sediments, and Quaboag River water and sediments; and Institutional controls on ground water development and land use.

SC-10 - Onsite Incineration: Decontamination and demolition of property structures; Lagoon dewatering; Construct on-site incinerator adjacent to Area of Contamination (AOC) which includes the PSC Resources property, adjacent wetland Spill Area (the area inside the site fence), and the limited area of the wetlands exclusive of the Spill Area, identified as drainage pathways; Construct temporary residual source material storage facility; Dewater beneath AOC, with ground water treatment and discharge; Excavate wetland sediment, lagoon sediment, and property soils, place in temporary storage facility; Construct Federal Resource Conservation and Recovery Act (RCRA) equivalent waste disposal facility; Incinerate residual source materials; Stabilize residual ash remaining; Place incinerator residuals into waste disposal facility and construct cap; Wetlands restoration/replication; Long-term monitoring of ground water, wetland sediments, and Quaboag River water and sediments; Institutional controls on ground water development and land use; Access restrictions to PSC Resources Property; Warning signs; and Public education program.

SC-11 - Offsite Treatment and Disposal: Decontamination and demolition of property structures; Lagoon dewatering; Dewater beneath AOC, with ground water treatment and discharge; Excavate and containerize property soils, wetland sediments and lagoon sediments; Offsite transport, treatment, and disposal at a RCRA TSD facility;

Backfill excavation with clean fill materials; Wetlands restoration/replication; Monitoring of ground water, wetland sediments, and Quaboag River water and sediments; and institutional controls on ground water development.

1) **SC-1 No-Action**

Alternative SC-1 was evaluated in detail in the FS to serve as a baseline for comparison with the other remedial alternatives under consideration. Under this alternative, no action would be taken except for long-term monitoring of ground water, wetland sediments, property soils, lagoon water, lagoon sediments, and Quaboag River surface water and sediments. No treatment or containment of contaminated media would be conducted and no effort, other than current site fencing, would be made to restrict site access. No restrictions on site use or access would be implemented.

Because contaminants would remain in place, the area would be monitored periodically, as stated above, to monitor contaminant concentrations over time and to trace the extent of possible contaminant migration. After five years, site conditions would be evaluated to determine whether cleanup activities would be required. A wetlands restoration program would not be implemented because, under this alternative, remedial activities would not be performed in wetland areas. Quarterly site inspections and monitoring would be conducted for the first two years and semi-annually for 30 years or until compliance is achieved with all ARARs, whichever comes first. Semi-annual monitoring data would be evaluated every five years.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: N/A

ESTIMATED TIME FOR MONITORING: 30 years

ESTIMATED CAPITAL COST: None

ESTIMATED LONG-TERM MONITORING COST (net present worth based on 30 years at a discount rate of 10%): \$648,800

ESTIMATED TOTAL COST (net present worth): \$648,800

2) **SC-4 Impermeable Cap**

Alternative SC-4 would include draining the lagoon; excavating the wetland (Spill Area) and lagoon sediments; consolidating the sediments with the contaminated property soil; and placing a multi-media impermeable cap over the area of consolidated materials. The cap would be designed and constructed in accordance with the Federal Resource Conservation and Recovery Act (RCRA). The cap would consist of a vegetative layer; topsoil; common fill; a drainage layer; a low-permeable flexible membrane liner; and low permeability soil placed over the residual waste material. Under this alternative, the lagoon's surface water would be collected, treated to remove contaminants, and discharged. The lagoon surface water would be pumped to a tank designed with baffles to promote the settling of

suspended materials. Water exiting the tank would be pumped to a flocculation/sedimentation unit to remove the inorganic materials. The effluent from the flocculation/sedimentation unit would be pumped through a filter bag and then passed through two granular activated carbon (GAC) contacts to remove organic materials. Treated water exiting the GAC units would be discharged to the Quaboag River. The lagoon dewatering/treatment process would be a short-term process. Alternative SC-4 would also include the decontamination, demolition, and disposal of existing property structures.

A ground water collection/extraction system would be constructed around the perimeter of the impermeable cap to collect ground water migrating from beneath the capped PSC Resources, Inc. property. The system would consist of an interceptor trench that would surround the property. The purpose of this trench is to lower the water table under the site to ensure that ground water under the cap does not come into contact with site wastes. Collected ground water would be treated as follows: metals would be removed by using a chemical precipitation and flocculation process to separate them from ground water; organic contaminants would be treated by utilizing an air stripper, with activated carbon treatment on the air stream. Treated ground water would be discharged to the Quaboag River.

Construction of an impermeable cap would require a flood control measure, which is required to prevent potential impacts of a flood on the impermeable cap (e.g., washout of the cap). To prevent potential impacts of a flood, an earthen levee would be constructed around the perimeter of the cap.

In addition, a long-term monitoring program would be conducted similar to that described for Alternative SC-1 except that monitoring of property or lagoon surface water or sediment would not be necessary. Also, affected wetlands would be restored, property structures would be decontaminated and removed, a public education program would be instituted, and access restrictions (e.g., fencing) and institutional controls on ground water use would be incorporated.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 6 to 12 months
ESTIMATED TIME FOR OPERATION: 1 year
ESTIMATED CAPITAL COST (including construction and operating expense): \$1,832,028
ESTIMATED LONG-TERM OPERATION AND MAINTENANCE COST (net present worth based on 30 years at a discount rate of 10%): \$845,787
ESTIMATED TOTAL COST (net present worth): \$2,677,815

3) SC-5 In Situ Vitrification

Under this alternative both organic and inorganic contaminants would be destroyed and immobilized through the process of vitrification. Vitrification would be achieved by the placement of electrodes into

the soil at a desired depth and creating an electric current between the electrodes, resulting in the heating of adjacent soils to temperatures in the range of 1,600° to 2,000° centigrade. At this temperature the soils become a molten mass and form a glass matrix once cooled. The vitrified material would be stable for several thousand years. The soils/sediments volume would be reduced by 20 to 40 percent. After vitrification, a permeable cap would be placed over the vitrified soils, and the surface would be regraded and planted.

Alternative SC-5 would require an off-gas treatment system to treat the highly volatile constituents that may be emitted during vitrification. In addition, dewatering and treatment of ground water beneath the contaminated soils/sediments would be necessary during vitrification.

Alternative SC-5 would include the consolidation of lagoon and wetland sediments with property soils prior to vitrification. This alternative would also include long-term monitoring of contaminated media, access restrictions (e.g., fencing) and institutional controls, decontamination and removal of property structures, lagoon dewatering and treatment, and wetland restoration.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 12 to 24 months

ESTIMATED TIME FOR OPERATION: 1 year

ESTIMATED CAPITAL COST (including treatment operating expense):
\$10,142,397

ESTIMATED LONG-TERM OPERATION AND MAINTENANCE COST (net present worth based on 5 years at a discount rate of 10%): \$241,006

ESTIMATED TOTAL COST (net present worth): \$10,383,403

4) SC-6 In Situ Stabilization

Alternative SC-6 includes an in-situ stabilization treatment process that would physically and chemically bind and immobilize the toxic and hazardous site materials with stabilization additives into a solid, cement-like mass or matrix. The stabilization additives would be selected according to their ability to immobilize the specific contaminants present at the PSC Resources, Inc. site. This process would significantly reduce the ability of contaminants to migrate from the PSC Resources, Inc. site. A bench scale treatability study conducted indicates that a Portland cement/organophillic clay mixture would effectively treat the property soils. In addition, an extensive literature search indicates that the above mixture would also effectively treat sediments. The Portland cement has been shown to create a stable matrix and provide a high level of resistance to leaching of inorganic contaminants. The organophillic clay has been shown to adsorb organic contaminants in the soils and reduce organic contaminant migration within the cement matrix. Additional pre-design studies will be required to ensure the effectiveness of in-situ stabilization prior to its full-scale implementation.

RECORD OF DECISION SUMMARY
PSC Resources Site

Prior to the in-situ stabilization treatment process, site structures would be decontaminated by sandblasting or using a solvent rinse. The total volume of site structures and demolition debris to be disposed would be approximately 74 cubic yards. Wastes generated by decontamination would be disposed offsite in accordance with applicable regulations. Subsequently, structures would be demolished and construction debris would be disposed offsite at a municipal landfill. Offsite disposal of the site structures is necessary in order to implement this alternative.

Concurrently with the decontamination, demolition, and offsite disposal of property structures, the lagoon surface water would be treated and discharged. The lagoon surface water would be pumped to a tank designed with baffles to promote the settling of suspended materials. Water exiting the tank would be pumped to a flocculation/sedimentation unit to remove the inorganic materials. The effluent from the flocculation/sedimentation unit would be pumped through a filter bag and then passed through two granular activated carbon (GAC) contacts to remove organic materials. Treated water exiting the GAC units would be discharged to the Quaboag River. The lagoon dewatering/treatment process would be a short-term process.

The in-situ stabilization treatment process would consist of a crane-mounted mixing system that would be used to combine the cement/clay mixture with the in-situ soils. The lagoon and wetland sediments would be consolidated with the property soils for treatment. The total volume of contaminated property soils and lagoon and wetland sediments that are targeted for treatment is estimated to be 12,695 cubic yards with the following breakdown: 11,000 cubic yards of property soils, 1,245 cubic yards of lagoon sediment, and 450 cubic yards of wetland sediment. The mixing system would consist of rotary blades contained within an open bottom cylinder. The result of the stabilization process would be a solidified end product. A vapor collection and treatment system would be used during the stabilization mixing process to capture any vapors and fugitive dusts. The treatment system would consist of a dust collector, followed by activated carbon canisters, and a fan to exhaust treated air to the environment.

After the completion of the in-situ stabilization treatment, a permeable cap would be placed over the stabilized soils and sediments. The cap would consist of a two foot thick gravel and sand drainage layer over the stabilized matrix, and a one foot thick layer of topsoils capable of supporting vegetation. The surface would be regraded to minimize infiltration into the stabilized matrix. The top layer would be vegetated to stabilize the soils, increase evaporation potential, and create an aesthetically acceptable appearance.

After the completion of the permeable cap construction, the following final elements of Alternative SC-6 would be implemented: wetland restoration and replication; the placement of institutional controls on ground water and land use; and long-term monitoring of ground water, wetland sediments, and Quaboag River water and sediments.

Alternative SC-6 would potentially increase emission of vapors and dusts during the construction/implementation period, but the emission would be short-term and would be mitigated and controlled through the use of an onsite air treatment system.

In-situ stabilization of the site soils would cause an increase in soil volume due to the addition of the stabilizing agents. This increase in volume, together with the construction of a permeable cap over the materials, would potentially result in a reduction of flood storage capacity. Construction of an area capable of retaining this reduced flood storage capacity during the 100-year flood event may be required in an area adjacent to the site in order to mitigate impacts from reducing flood storage capacity within the floodplain.

A limited area of the wetlands, primarily the Spill Area, would be affected due to excavation of contaminated sediment during implementation of Alternative SC-6. The affected wetland area that is damaged during the excavation activity would be restored to its original condition through a comprehensive restoration program once all construction and excavation activities associated with this alternative have been completed. Specifically, following site clean-up activities, affected wetlands would be backfilled with clean soil and organic material. The areas would be graded, stabilized, and then planted with vegetation appropriate to the type of wetland affected. In addition, a public education program would be instituted, and access restrictions (e.g., fencing) and institutional controls on ground water use would be incorporated.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 6 to 12 months

ESTIMATED TIME FOR OPERATION: 1 year

ESTIMATED CAPITAL COST (including treatment operating expense): \$2,688,834

ESTIMATED LONG-TERM OPERATION AND MAINTENANCE COST (net present worth based on 30 years at a discount rate of 10%): \$378,211

ESTIMATED TOTAL COST (net present worth): \$3,067,045

5) **SC-10 Onsite Incineration**

Under this alternative, property soils and wetland and lagoon sediments would be excavated and incinerated on site utilizing one of the following types of mobile incinerators: a rotary kiln incinerator, an infrared incinerator, or a circulating fluidized bed incinerator. The mobile incinerator would be located to the west (athletic field) of the PSC Resources, Inc. property. A temporary

waste storage facility would be constructed adjacent to the incinerator to store excavated sediments and soils. A RCRA-equivalent waste disposal facility would be constructed on site to handle the treated residual material. Prior to ultimate disposal in the RCRA-equivalent waste disposal facility, the treated residuals from the incinerator would have to pass the Toxicity Characteristic Leaching Procedures (TCLP) criteria. Those treatment residuals that do not pass the TCLP criteria would be stabilized using lime-cement-organophillic additives prior to disposal. The stabilized and unstabilized residuals would then be disposed within the RCRA-equivalent waste disposal facility. This disposal facility would be capped after the placement of incinerator's treated residuals is completed. In addition, dust control measures would be necessary during excavation.

As with other active Source Control alternatives, SC-10 would also include a long-term monitoring program; access restrictions and institutional controls; lagoon dewatering and treatment; decontamination, demolition, and offsite disposal of property structures; a public education program; and wetlands restoration.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 6 to 12 months
ESTIMATED TIME FOR OPERATION: 1 year
ESTIMATED CAPITAL COST (including treatment operating expense): \$14,616,420
ESTIMATED LONG-TERM OPERATION AND MAINTENANCE COST (net present worth based on 30 years at a discount rate of 10%): \$393,295
ESTIMATED TOTAL COST (net present worth): \$15,009,715

6) SC-11 Offsite Disposal at RCRA TSD Facility

Alternative SC-11 would include the excavation of contaminated property soils and lagoon and wetland sediments, and the subsequent treatment and disposal of these excavated materials at a RCRA Treatment, Storage and Disposal (TSD) Facility. The excavated areas would then be backfilled with clean fill materials. Dust control technologies would be implemented to protect site workers and the community from fugitive dust emissions during the excavation operations.

As described for the other Source Control alternatives, Alternative SC-11 would involve a long-term monitoring program; institutional controls on ground water use; lagoon dewatering; decontamination, demolition, and disposal of property structures; and wetlands restoration.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 4 to 8 months
ESTIMATED PERIOD OF OPERATION: 1 year
ESTIMATED CAPITAL COST (including construction and operating expense): \$36,020,790

ESTIMATED LONG-TERM OPERATION AND MAINTENANCE COST (net present worth based on 5 years at a discount rate of 10%): \$240,627
ESTIMATED TOTAL COST (net present worth): \$36,261,417

B. Management of Migration (MM) Alternatives Analyzed

Management of migration alternatives address contaminants that have migrated from the original source of contamination. At the PSC Resources Site, contaminants have migrated via ground water in a southerly direction from the PSC Resources property, a source area, and has discharged to the wetlands and to the Quaboag River. The Management of Migration alternatives evaluated for the Site include a no-action alternative (MM-1).

Under all MM alternatives, an examination of the extent of PCE contamination at and around monitoring well PSC-114S will be carried out. Based on the reasons provided in Section V.F. of this ROD, the localized VOC contamination (PCE) at PSC-114S appears to be an isolated ground water contamination and is not related to the VOC contaminated plume emanating from the PSC property. EPA will further examine this phenomenon during the Pre-Design stage of the source remediation.

The Management of Migration alternatives that underwent detailed analysis for the PSC Resources Site include the following:

MM-1 No-Action: Long-term monitoring of ground water, wetland sediment, and Quaboag River surface water and sediment.

MM-3/4 Ground Water Extraction/Treatment/Discharge: Ground water interceptor trench with hydraulic barrier, or several low flow extraction wells; Collection, extraction, and treatment of ground water; Discharge of fully treated ground water to the Quaboag River in accordance with the substantive requirements of an NPDES permit; Long-term monitoring of ground water, wetland sediment, and Quaboag River surface water and sediment; Wetlands restoration; Access restrictions (e.g., fencing) around residual source materials; Warning signs; and Public education programs.

1) **MM-1: No Action**

Alternative MM-1 relies on the process of natural attenuation to reduce offsite ground water contaminant concentrations. Alternative MM-1 will reduce existing contaminant levels to below MCLs in approximately four to eleven years if implemented in conjunction with any of the active Source Control alternatives. Ground water monitoring data suggest that ground water contaminant concentrations have been decreasing over time. Further, multiple rounds of ground water sampling suggest that the ground water contaminant plume is decreasing in size and is receding toward the PSC Resources property.

This "no action" alternative would require a comprehensive long-term monitoring program as part of a five year review which includes sampling of ground water, wetland surface water and sediment, and Quaboag River surface water and sediment. The monitoring would occur quarterly during the first two years of implementation, semi-annually for the following three years, and annually for all subsequent years of implementation. This alternative is easily implementable, utilizing available technologies and standard protocols for sampling, and would not result in the destruction of any additional wetlands.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: Not Applicable (N/A)
ESTIMATED TIME FOR MONITORING: 30 years
ESTIMATED CAPITAL COST: None
ESTIMATED LONG-TERM MONITORING COST (net present worth based on 30 years at a discount rate of 10%): \$353,702
ESTIMATED TOTAL COST (net present worth): \$353,702

2) MM-3/4 Ground Water Extraction/Treatment/Discharge

This alternative would include the construction of a ground water recovery system composed of either an interceptor/barrier recovery trench (MM-3) or ground water extraction recovery wells (MM-4) installed downgradient of the PSC Resources, Inc. property. Based on the development and screening of Management of Migration alternatives in the Feasibility Study, Alternatives MM-3 and MM-4 were combined into one ground water treatment alternative (MM-3/4) which includes two options as stated previously. Both systems would be installed to intercept and extract contaminated ground water from the property. The interceptor trench would be lined with an impermeable high density polyethylene-based plastic barrier on its downgradient side to prevent downgradient infiltration of ground water from the Quaboag River and to promote upgradient infiltration of contaminated ground water. Ground water extraction well recovery would require optimally four extraction wells downgradient of the PSC Resources, Inc. property and would act as sumps drawing and collecting contaminated ground water underlying the Site.

Alternative MM-3/MM-4 would also include the construction of an onsite treatment system for the contaminated ground water. The treatment system would consist of a metals and suspended solids removal pretreatment system followed by an organic removal system (an air stripper). Ground water would be treated to meet MCLs. The effluent would be discharged into the Quaboag River in accordance with the Federal National Pollutant Discharge Elimination System (NPDES) permit requirements. The estimated time to achieve ground water cleanup would be approximately three to seven years for both collection options if implemented in conjunction with any of the active Source Control alternatives. There would be environmental impacts which would include additional destruction of the wetlands to implement this

alternative, but these wetlands would subsequently be restored. Additionally, Alternative MM-3/MM-4 would include access restrictions and institutional controls, and long-term monitoring.

Interceptor/Barrier Recovery Trench

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 8 to 12 months
ESTIMATED PERIOD OF PERFORMANCE: 10 years
ESTIMATED CAPITAL COST: \$793,634
ESTIMATED OPERATION AND MAINTENANCE COST (net present worth):
\$821,177
ESTIMATED TOTAL COST (net present worth): \$1,614,811

Extraction Recovery Wells

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 6 to 8 months
ESTIMATED PERIOD OF PERFORMANCE: 10 years
ESTIMATED CAPITAL COST: \$425,130
ESTIMATED OPERATION AND MAINTENANCE COST (net present worth):
\$866,032
ESTIMATED TOTAL COST (net present worth): \$1,291,162

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Evaluation Criteria

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. 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 assessment of each alternative according to criteria 1) - 7) can be found in Section 4.0 of the Feasibility Study (HMM Associates, Inc., January 1992). The Commonwealth of Massachusetts' Letter of Concurrence, provided in **Appendix D** of the ROD, documents the State's position on the preferred alternative and is used by EPA in the evaluation of criterion 8). The Responsiveness Summary, provided in **Appendix E** of the ROD, documents EPA responses to the questions and comments raised during the public comment period and is used by EPA in the evaluation of criterion 9).

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 4-11 (Source Control) and Table 4-12 (Management of Migration) of Volume I of the Feasibility Study (HMM Associates, Inc., January 1992).

B. Summary of the Comparative Analysis of 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.

1) Overall Protection of Human Health and the Environment

Alternative SC-6 would provide overall protection to human health and the environment through stabilization which would prohibit and impede the mobility of contaminants in property soils and lagoon and wetland sediments. The alternative SC-6 would provide protection from direct contact with, and incidental ingestion of, site contaminants by encapsulating them in a stabilized mass, and covering them with a permeable cap. Overall protection would also be provided by Alternative SC-4 by providing containment of site contaminants, and by Alternatives SC-5, SC-10, and SC-11. Alternatives SC-5 and SC-10 would provide overall protection through destruction of organics and encapsulation of inorganics. Alternative SC-11 would provide the greatest overall protection through excavation and offsite disposal of all site contaminants that pose significant risk to human health and the environment. Alternative SC-1 (No Action) would not meet this criterion.

Alternative MM-1 would provide overall protection of human health and the environment through implementation in conjunction with any of the active SC alternatives, without the destruction of any additional wetlands. Natural attenuation would decrease current levels of ground

water contamination to levels below MCLs in four to eleven years after implementation. Alternative MM-3/MM-4 would also provide overall protection of human health and the environment by extracting contaminated ground water underlying and downgradient of the PSC Resources, Inc. property and treating it to meet MCLs, but with certain environmental impacts, including the destruction of additional wetlands.

2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

With the exception of the "No Action" SC alternative (SC-1), all of the other source control alternatives would ultimately meet Federal and State ARARs. Alternative MM-1 would comply with all ARARs if implemented in conjunction with any of the active SC alternatives. Implementation of Alternative MM-1 in conjunction with any of the active SC alternatives would achieve compliance with all ARARs in four to eleven years. Implementation of Alternative MM-3/MM-4 in conjunction with any of the active SC alternatives would achieve compliance with all ARARs in three to seven years. Based on a relative comparison of the estimated times to achieve ground water clean-up between the "No Action" Alternative MM-1 and Alternative MM-3/4, the maximum estimated difference between clean-up times is eight years (assuming a maximum time for "No Action" Alternative MM-1 and a minimum for the Alternative MM-3/4).

3) Long-term Effectiveness and Permanence

Alternative SC-6 would provide a long-term, effective reduction in risks associated with the site contaminants as well as permanence through the consolidation of property soils with contaminated lagoon and wetland sediments followed by stabilization and capping of the consolidated materials. In-situ stabilization has been successfully performed at several NPL sites. Alternatives SC-4, SC-5, SC-10, and SC-11 would also reduce or eliminate long-term risks associated with exposure to waste materials and leachate generation. The "no action" Source Control Alternative (SC-1) would not provide effective or permanent reductions to long-term risk. The long-term adequacy and reliability of SC-4, which is a containment alternative, may not be sufficient as there may be a potential future need for replacement of the technical components of this alternative, such as the cap, ground water collection trench/barrier wall, or ground water treatment system. The failure of any of these technical components over time may create human exposure pathways to contaminants resulting in human health risks.

The long-term risks associated with implementing Alternative MM-1 would be eliminated within four to eleven years by natural attenuation of contaminated ground water because any of the active SC alternatives, if implemented, would stop the release of contaminants

into the ground water from currently contaminated soils and sediments. Alternative MM-3/MM-4 would also provide a long-term effective reduction of ground water contamination, if implemented in conjunction with any of the active SC alternatives, through the extraction and treatment of ground water contaminants. Implementation of Alternative MM-3/MM-4 in conjunction with any of the active SC alternatives would achieve compliance with all ARARs in three to seven years.

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

Alternative SC-6 would not reduce the toxicity and volume of property soil and lagoon/wetland sediment contaminants. However, Alternative SC-6 would prohibit and impede the mobility of contaminants by formation of a stabilized matrix. Further, Alternative SC-6 would meet the CERCLA mandate for treatment and therefore would satisfy the statutory preference for treatment to reduce toxicity, mobility, or volume under Superfund. Alternatives SC-5 and SC-10 would also comply with CERCLA statutory preference for treatment of hazardous waste.

Alternative SC-5 would provide a significant reduction in the toxicity and volume of organic contaminants and mobility of inorganic contaminants through the vitrification process. Alternative SC-5 would also result in a 20 to 40 percent reduction in the volume of soils and sediments being treated. Alternative SC-10 would also provide a significant reduction in the toxicity and mobility of site contaminants through incineration of organic constituents, but may increase the overall volume due to post-incineration stabilization of some of the treated residuals.

Source control alternative SC-4 would reduce the mobility of site contaminants by containing and capping soils and sediments. However, the reduction in mobility of contaminants from implementation of Alternative SC-4 would not be as effective as that from Alternatives SC-5, SC-6, and SC-10 as Alternative SC-4 employs a containment, not treatment, technology. Therefore, Alternative SC-4 would not satisfy the statutory preference for treatment to reduce toxicity, mobility, or volume under Superfund.

Alternative SC-11 would provide the greatest reduction in toxicity, mobility, and volume of contaminants at the site due to excavation and offsite disposal of all contaminated soils and sediments. The "No Action" Source Control Alternative (SC-1) would not reduce the toxicity, mobility, or volume of the site contaminants.

The "No Action" Alternative MM-1 would not reduce toxicity, mobility, or volume of groundwater contaminants. Alternative MM-3/MM-4 would reduce the toxicity, mobility, and volume of groundwater contaminants by use of a groundwater extraction/treatment system. However, Alternative MM-3/MM-4 would result in destruction of limited areas of the wetlands and would require a wetlands restoration program.

5) Short-Term Effectiveness

The "No Action" alternative SC-1 would have high short-term effectiveness for protection of the community and workers during its implementation. Alternative SC-6 would present a minor short-term impact to the wetland during the excavation of contaminated wetland sediments. Accordingly, any wetlands destroyed during the implementation of this alternative would be restored or replaced with an area equal in size to the area destroyed. In addition, because of the potential for release of contaminants during the excavation activities, special engineering precautions would be taken to minimize the potential for contaminant emissions to ensure short-term protection of workers and area residents during cleanup related construction activities. Source control alternatives SC-4 and SC-5 would present similar short-term risks to the wetlands as would Alternative SC-6. Source control alternatives SC-10 and SC-11 would present much greater short-term risks as these alternatives would involve more intrusive activities.

The "No Action" Alternative (MM-1) would not present any adverse impacts on human health or the environment. Implementation of Alternative MM-3/MM-4 potentially could release vapors and fugitive dusts during construction of either the interceptor/barrier recovery trench system or the excavation recovery wells system.

6) Implementability

Alternative SC-6 utilizes a technically feasible remedial technology, "stabilization", that has been demonstrated to treat similar contaminants at other NPL sites. The "No Action" Alternative MM-1 is also easily implementable, using monitoring techniques which are readily available and standard sampling protocols. The extraction/treatment systems presented in Alternative MM-3/MM-4 are implementable, well-developed technologies, and have been used successfully at other sites.

Alternative SC-4 (impermeable cap) and SC-11 (off-site treatment and disposal) are well established technologies and are also highly implementable. However, there may be potential problems in finding a RCRA Treatment, Storage and Disposal (TSD) Facility that is available for implementation of Alternative SC-11. Alternative SC-5 (in-situ vitrification) is considered an innovative technology because it has not been used in any commercial applications, and is therefore of questionable implementability. Furthermore, the implementation of the vitrification process requires very high amounts of electricity not currently available at the site. Alternative SC-10 (onsite incineration) is technically feasible but would be difficult to implement due to the limited availability of land around the site. The "No Action" Source Control Alternative (SC-1) can be accomplished

with little difficulty and uses well established and reliable monitoring and analytical procedures.

In EPA's analysis, Alternative SC-6 (In-Situ Stabilization) is more readily implementable than other active SC alternatives considered with the exception of Alternative SC-4 (Impermeable Cap). Alternative SC-6 and Alternative SC-4 are equally implementable.

7) Cost

Alternative SC-11 would be the most expensive of all the alternatives with an estimated total cost of approximately \$36,260,000. The next two most expensive Source Control alternatives would be Alternatives SC-10 and SC-5 with estimated total costs of approximately \$15,010,000 and \$10,380,000 respectively. Both Alternatives SC-10 and SC-11 would be equally effective in reducing contaminant concentrations to clean-up levels. Alternatives SC-6 and SC-4 with estimated total costs of approximately \$3,070,000 and \$2,680,000 respectively would be much less expensive than Alternatives SC-11, SC-10, and SC-5. Alternative MM-3/4 would require a estimated total cost of approximately \$1,600,000 for the interceptor/barrier recovery trench system and \$1,260,000 for extraction recovery wells system. The "No Action" Alternatives SC-1 and MM-1 would require the least amount of money to implement with estimated total costs of approximately \$650,000 and \$353,000 respectively.

The estimated present worth value of each Source Control alternative and each Management of Migration alternative is listed below. It should be noted that these costs are estimates made during the Feasibility Study that are expected to provide accuracy of +50 percent to -30 percent.

	<u>Capital Costs</u>	<u>O & M</u>	<u>Present Worth</u>
SC-1	None	\$648,800	\$ 648,800
SC-4	\$ 1,832,028	\$845,787	\$ 2,677,815
SC-5	\$10,142,397	\$241,006	\$10,383,403
SC-6	\$ 2,688,834	\$378,211	\$ 3,067,045
SC-10	\$14,616,420	\$393,295	\$15,009,715
SC-11	\$36,020,790	\$240,627	\$36,261,417
MM-1	None	\$353,702	\$ 353,702
MM-3	\$ 793,634	\$821,177	\$ 1,614,811
MM-4	\$ 425,130	\$866,032	\$ 1,291,162

8) State Acceptance

Based on its review of the RI/FS and Proposed Plan, the Commonwealth of Massachusetts concurs with Alternative SC-6 and MM-1 as the selected remedy. A copy of the declaration of concurrence is attached as **Appendix D** to this ROD.

9) Community Acceptance

A number of comments from the community addressed the evaluation of risks posed by the Site and the safety of the residents who live nearby. There was a general concern that it is not safe to live near the Site and that past disposal activities may have had an adverse effect on the health of the residents. Two representatives of a local environmental group expressed concern regarding fishing in the river near the site. One asked if any studies have been conducted to determine the safety of eating fish caught in the river downstream of the site. The other suggested that stocking activities should be suspended, especially during the time when lagoon surface waters are being discharged to the river, and that all fishing should be prohibited, at least temporarily. In addition, a representative of a local environmental group asked how the on-site buildings would be decontaminated and which landfill would be used for the disposal of debris generated by the demolition of buildings, and if EPA considered above-ground as opposed to in-ground stabilization as a treatment technology.

Written comments were also received from the DEP stating its concerns regarding compliance with ARARs during remedial activities.

A group of potentially responsible parties also submitted technical and administrative comments, prepared by a law firm and a consulting firm respectively. Comments from the law firm expressed concern that the PRPs were not notified of their potential liability in a more timely manner. Comments from the consulting firm were of technical nature and focused on EPA's Preferred Alternative on Source Control and Management of Migration. These technical comments call for the need to conduct additional Pre-Design studies prior to full-scale cleanup and in general support EPA's Preferred Alternative. Comments received during the public comment period on the Proposed Plan and the FS are summarized in the attached document entitled "The Responsiveness Summary" (**Appendix E**).

X. THE SELECTED REMEDY

The selected remedy for the PSC Resources Site includes Source Control alternative SC-6 and Management of Migration alternative MM-1 to address all contamination at the Site. A detailed description of the cleanup levels and the selected remedy is presented below. **Table 7 of Appendix B**

provides clean-up levels for each chemical identified as posing significant potential risk to human health and the environment, for each environmental medium.

A. Interim Ground Water Cleanup Levels

Interim cleanup levels have been established in ground water for all contaminants of concern identified in the Baseline Risk Assessment found to pose an unacceptable risk to either public health or the environment. Interim cleanup levels have been set based on the ARARs (e.g., Drinking Water Maximum Contaminant Level Goals (MCLGs) and MCLs) as available, or other suitable criteria described below. Periodic assessments of the protection afforded by remedial actions will be made as the remedy is being implemented and at the completion of the remedial action. At the time that Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by exposure to ground water (e.g., ingestion of ground water). If, after review of the risk assessment, the remedial action is determined not to be protective by EPA, the remedial action shall continue until either protective levels are achieved, and are not exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

Because the aquifer under the Site is classified as a Class IIB aquifer under the Federal Ground Water Protection Strategy and Class I by the Commonwealth of Massachusetts, which is a potential source of drinking water, MCLs and non-zero MCLGs established under the Safe Drinking Water Act are ARARs.

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

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

In situations where a promulgated State standard is more stringent than values established under the Safe Drinking Water Act, the State standard was used as the interim cleanup level. In the absence of an MCLG, an MCL, a proposed MCLG, proposed MCL, State standard, or other suitable criteria to be considered (i.e., health advisory, state guideline) an interim cleanup level was derived for each compound having carcinogenic potential (Classes A, B, and C compounds) based on a 10^{-6} excess cancer risk level per compound considering the exposure to ground water (e.g., ingestion of ground water). In the absence of the above same standards and criteria, interim cleanup levels for all other compounds (Classes D and E) were established based on a level that represent an acceptable exposure level to which the human population including sensitive subgroups may be exposed without adverse affect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (hazard quotient = 1) considering the exposure to ground water (e.g., ingestion of ground water). If a value described by any of the above methods was not capable of being detected with good precision and accuracy or was below what was deemed to be the background value, then the practical quantitation limit or background value was used as appropriate for the Interim Ground Water Cleanup Level.

Table I below summarizes the Interim Cleanup Levels for carcinogenic and non-carcinogenic contaminants of concern identified in ground water.

TABLE I
PSC RESOURCES SITE
INTERIM GROUND WATER CLEANUP LEVELS

Carcinogenic Contaminants of Concern	Cleanup Level (ppb)	Basis	Level of Risk
Bis(2-ethylhexyl)phthalate (B2)	6	MCL	1E-06
Vinyl Chloride (A)	2	MCL	5E-05
Methylene Chloride (B2)	5	MCL	5E-07
Trichloroethene (B2)	5	MCL	7E-07
Tetrachloroethene (B2)	5	MCL	3E-06
Benzene (A)	5	MCL	2E-06
		SUM	6E-05

TABLE I (Continued)
PSC RESOURCES SITE
INTERIM GROUND WATER CLEANUP LEVELS

Non-carcinogenic Contaminants of Concern	Cleanup Level (ppb)	Basis	Target Endpoint of Toxicity	Hazard Quotient
1,1,1-Trichloroethane (D)	200	MCLG	liver	6E-02
Cis-1,2-Dichloroethylene (D) ^a	70	MCL	blood	2E-01
Trans-1,2-Dichloroethylene (D) ^a	100	MCL	liver	1E-01
1,1-Dichloroethane (D)	3,600	Risk	none reported	1E+00
2-Butanone (MEK) (D)	350	GWS ^b	fetotoxicity	2E-01
Acetone (D)	3,500	Risk	liver	1E+00 ^d
Lead (B2)	15	Policy	CNS ^c	
HAZARD INDEX				
SUM				
			liver	1E+00
			blood	2E-01
			fetotoxicity	2E-01
			none reported	1E+00

Footnotes

a - In the Remedial Investigation studies, a distinction between trans- and cis- isomers was not made in the analysis of 1,2-dichloroethylene. The analysis was made instead for total 1,2-dichloroethylene. As part of the implementation of the Management of Migration remedy as defined in this ROD, an identification of an appropriate cleanup level for 1,2-dichloroethylene will be made. If this identification is not made, the more stringent of the two MCLs, i.e., 70 ppb for cis-1,2-dichloroethylene, will be set as the cleanup level for total 1,2-dichloroethylene.

b - Massachusetts Groundwater Standard, 314 CMR 6.07.

c - Central Nervous System (CNS)

d - A hazard quotient is not available for lead as EPA has not issued a reference dose for this compound. The cleanup level for lead comes from a June 21, 1990 EPA memorandum from Henry Longest and Bruce Diamond to Patrick Tobin.

(end of footnotes)

These interim cleanup levels are consistent with ARARs or suitable TBC criteria for ground water, attain EPA's risk management goal for remedial actions and are determined by EPA to be protective. However, the true test of protection cannot be made until residual levels are known. Consequently, at the time that Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment will be performed on residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by exposure to ground water (e.g., ingestion of ground water). If, after review of the risk assessment, the remedial action is determined not to be protective by EPA, then remedial actions shall continue until either protective levels are achieved and are not exceeded for three consecutive years or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

All Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy and protective levels determined as a consequence of the risk assessment of residual contamination, must be met at the completion of the remedial action at the points of compliance at the boundary of the Waste Management Area (defined here as approximately the existing fence line or the PSC Resources property/Spill Area boundary). EPA has estimated that these levels will be obtained within four to eleven years after completion of the source control component.

B. Soil and Sediment Cleanup Levels

Cleanup levels for property soils and lagoon and wetland sediments were developed to reduce human health and/or environmental risks associated with two potential exposure scenarios. The first of these is the potential direct contact with and incidental ingestion of surficial soils and sediments. The second is the potential future ingestion of contaminated ground water. Available data suggest that property soils and lagoon sediments are a source of release of contaminants to ground water. This phenomenon may result in an unacceptable risk to those who ingest contaminated ground water.

1) Surficial Soils and Sediments

Cleanup levels for known and suspect carcinogens (Classes A, B, and C compounds) have been set at a 10⁻⁶ to 10⁻⁴ excess cancer risk level considering exposures via incidental ingestion. Cleanup levels for

compounds in soils having non-carcinogenic effects (Classes D and E compounds) were derived for the same exposure pathway and correspond to a level that represents an acceptable exposure level to which the human population including sensitive subgroups may be exposed without adverse affect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (hazard quotient = 1). Exposure parameters for the soil ingestion pathways for the soils and sediments have been described in Table 4-2 of Appendix I of Volume IV of the RI. If a cleanup value described above is not capable of being detected with good precision and accuracy or is below background values, then either the practical quantitation limit or a background value was used as appropriate for the soil cleanup level.

Based on the above approach to protect human health, cleanup levels were developed for total PCBs for property soil; total carcinogenic PAHs for lagoon sediment; and total PCBs and arsenic for wetland sediment. It was determined in the risk assessment that the human health risk assessment-based cleanup levels for total PCBs and arsenic in the wetlands would also be protective of the environment. These cleanup levels were derived for incidental ingestion by presumed receptors associated with future residential and industrial land use scenarios, as summarized in Section 1.2.5 of the FS. It should be noted that 1 ppm cleanup level derived for PCB for property soil and wetland sediment is also consistent with the guidance established under the Federal Toxic Substance Control Act (TSCA). Under TSCA, EPA has issued a remediation goal of 1 ppm for PCBs at Superfund Sites where land use is residential in nature (exposures occur to residents). This level is considered by EPA to be protective of human health and the environment.

To evaluate site risks from exposure to lead in property soil and lagoon sediment, Uptake/Biokinetic model (biokinetic model) was used to predict blood lead levels in children aged zero to six years. Based on that model's results, 500 ppm lead in property soil and lagoon sediment was determined to be a protective cleanup level. Additional detail regarding the methods and assumptions used in the biokinetic model are summarized in Appendix I of the FS.

As explained and concluded in Section VI. B. of this ROD, the ecological risk assessment identified only wetland sediment medium, including the Spill Area, as posing probable environmental risk to mammals and birds. Contaminants in the wetlands that are primary contributors to ecological risks include total PAHs, lead, and zinc. These three contaminants tend to follow a co-occurrence pattern at elevated concentrations in the wetland sediments. Therefore, ecologically based cleanup levels that would be protective of the environment are being developed for total PAHs, lead, and zinc in the wetland sediments, including the Spill Area.

Table II summarizes the cleanup levels for carcinogenic and non-carcinogenic contaminants of concern in soils and sediments.

TABLE II
PSC RESOURCES SITE
SURFICIAL SOIL/SEDIMENT CLEANUP LEVELS

Carcinogenic Contaminants of Concern	Soil/Sediment Cleanup Level (ppm)	Basis	Level of Risk	
<u>Property Soil</u>				
Total PCBs (B2)	1	HHRA ^a	1E-06	
		SUM	1E-06	
<u>Lagoon Sediment</u>				
Total cPAHs (B2)	100	HHRA	1E-04 ^b	
		SUM	1E-04	
<u>Wetland Sediment</u>				
Total PCBs (B2)	1	HHRA	1E-06	
Arsenic (A)	12 ^c	HHRA	1E-05	
		SUM	1E-05	
Non-carcinogenic Contaminant of Concern	Cleanup Level (ppm)	Basis for Model Input	Target Endpoint of Toxicity	Hazard Quotient
<u>Property Soil</u>				
Lead (B2)	500	UBKM ^d	CNS ^e	f
		<u>HAZARD INDEX SUM</u>		N/A
<u>Lagoon Sediment</u>				
Lead (B2)	500	UBKM	CNS	f
		<u>HAZARD INDEX SUM</u>		N/A

TABLE II (Continued)
PSC RESOURCES SITE
SURFICIAL SOIL/SEDIMENT CLEANUP LEVELS

Non-carcinogenic Contaminant of Concern	Cleanup Level (ppm)	Basis for Model Input	Target Endpoint of Toxicity	Hazard Quotient
<u>Wetland Sediment</u>				
Total PAHs	10	ERA ^{g,h}	N/A	N/A
Lead	375	ERA ^h	N/A	N/A
Zinc	550	ERA ^h	N/A	N/A
HAZARD INDEX SUM				N/A

Footnotes

a - Human Health Risk Assessment (HHRA)

b - In the development of a target cleanup level for cPAH for all environmental media, EPA used a target risk criterion of 1E-04 ILCR instead of 1E-06 ILCR, the point of departure. Initially, EPA determined that a target cleanup level that corresponds to 1E-06 ILCR would result in the excavation and consequent disruption of large areas of wetlands which would conflict with the Agency's goal of protection and preservation of wetlands. Specifically, EPA's risk management decision in utilizing the target risk criterion of 1E-04 ILCR for the wetlands involved weighing the reduction in the long-term human health risks afforded by the remedial action against the short-term impacts (i.e., destruction of wetlands and human health impacts related to remedy implementation), the long-term environmental benefits, the level of confidence in the success of the remedial action, the costs of the remedial action, and most importantly meeting EPA's acceptable ILCR risk range of 1E-06 to 1E-04. Therefore, EPA moved to the lower end of the acceptable risk range, 1E-04 ILCR, to reduce the area of wetlands to be impacted, while still providing adequate protection of human health and the environment. EPA used the target risk criterion of 1E-04 ILCR for cPAH for all those media for which the baseline human health risk assessment indicates exceedance of 1E-04 ILCR for cPAH.

c - Recent studies indicate that many skin tumors arising from oral exposure to arsenic are non-lethal and that the dose-response curve for the skin cancers may be sublinear (in which case the cancer potency factor used to generate risk estimates will be overstated). It is Agency policy to manage these risks downward by as much as a factor of ten. As a result, the carcinogenic risk for arsenic at this Site has been managed as if it were 1×10^{-5} . (See EPA memorandum,

"Recommended Agency Policy on the Carcinogenic Risk Associated with the Ingestion of Inorganic Arsenic" dated June 21, 1988.)

d - Uptake/Biokinetic Model (UBKM)

e - Central Nervous System (CNS)

f - A hazard quotient is not available for lead as EPA has not issued a reference dose for this compound. The cleanup level for lead is based on OSWER Directive 9355.4-02, "Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites" (9/7/89), and the Biokinetic Model.

g - Ecological Risk Assessment (ERA)

h - Cleanup levels for lead and zinc correspond to values established in the ecological risk assessment studies which ensure the protection (growth and reproduction) of birds. The cleanup level for total PAHs corresponds to the lower end in the range of values which result in a Toxicity Quotient of one as derived by the Equilibrium Partitioning (EP) method applied in the ecological risk assessment. In addition, the ERA-based cleanup level for Total PAHs is protective of human health for carcinogenic PAHs (cPAHs); therefore, a separate cleanup level was not developed for cPAHs in wetland sediment.

(end of footnotes)

These cleanup levels must be met at the completion of the remedial action at the points of compliance through in-situ stabilization of the contaminated soils and sediments under a permeable cap. The stabilization treatment of all contaminated soils and sediments followed by construction of a permeable cap over the stabilized materials will prevent exposure to contaminated soils on the PSC Resources property and will also meet all Source Control objectives. These cleanup levels attain EPA's risk management goal for remedial actions and have been determined by EPA to be protective.

2) Unsaturated Soils and Saturated (Lagoon) Sediments

Based upon data developed in the RI and the Baseline Risk Assessment, remedial measures to address risk associated with possible exposure to VOC contaminants in source unsaturated soils and saturated sediments are not warranted because present and future risks are within or below EPA's acceptable carcinogenic risk range or for the non-carcinogens generally below a Hazard Index of one. However, available data suggest that area soils and sediments are a source of release of VOCs to ground water. This phenomenon may result in an unacceptable risk to those who drink contaminated ground water in the foreseeable future. Therefore, cleanup levels for soils and sediments were

established to protect the aquifer from potential soil leachate. The Summers Leaching Model (EPA/540/2-89/057) was used to estimate residual soil and sediment levels that are not expected to impair future ground water quality. The interim cleanup levels for ground water were used as input into the leaching model. If the predicted protective soil level was not capable of being detected with good precision and accuracy, then the practical quantitation limit was selected as the cleanup level for soils.

Ground water was identified as the only medium of concern containing contaminant concentrations in excess of existing ARARs (maximum contaminant levels (MCLs) for ground water). Section 5.0 Contaminant Fate and Transport of the RI identified property soil, lagoon sediment, and Spill Area in the wetland as the three potential sources of ground water contamination. The potential for these media to leach contaminants of concern to ground water was evaluated using the Summers leaching model, details of which are provided in Appendix F of the FS. The Summers leaching model confirmed that only the property soil and the lagoon sediment maintain the potential to impair future ground water quality. Therefore, results of the model were used to develop cleanup levels for contaminants of concern in only property soil and lagoon sediment, as appropriate, which are protective of ground water.

The unsaturated zone consists of property soils which has an approximate area of 1.1 acres and an approximate depth of 6 ft. The saturated zone consists of the lagoon sediments which has an approximate area of 14,000 ft² and an approximate depth of 2 ft.

The Table III, below, summarizes the soil cleanup levels required to protect public health and the aquifer and were developed for the ground water contaminants of concern detected above the interim ground water cleanup levels.

TABLE III
PSC RESOURCES SITE
UNSATURATED SOIL AND SATURATED SEDIMENT CLEANUP LEVELS

<u>Carcinogenic Contaminants of Concern</u>	<u>Soil Cleanup Level (ppm)</u>	<u>Basis for Model Input</u>	<u>Level of Residual GW Risk</u>
<u>Property Soil</u>			
Trichloroethylene (B2)	1	MCL	7E-07
Tetrachloroethylene (B2)	2	MCL	3E-06
Benzene (A)	1	MCL	2E-06
		SUM	6E-06

TABLE III (Continued)
PSC RESOURCES SITE
UNSATURATED SOIL AND SATURATED SEDIMENT CLEANUP LEVELS

Carcinogenic Contaminants of Concern	Soil Cleanup Level (ppm)	Basis for Model Input	Level of Residual GW Risk	
<u>Lagoon Sediment</u>				
Bis(2-ethylhexyl) phthalate (B2)	368	MCL	1E-06	
Trichloroethylene (B2)	4	MCL	7E-07	
Tetrachloroethylene (B2)	12	MCL	3E-06	
Methylene Chloride (B2)	1	MCL	5E-07	
Benzene (A)	3	MCL	<u>2E-06</u>	
		SUM	7E-06	
Non-carcinogenic Contaminants of Concern	Cleanup Level(ppm)	Basis for Model Input	Target Endpoint of Toxicity	Residual GW Hazard Quotient

SUM HAZARD INDEX

Liver: 2E-01
Decreased Weight (DW): 1E+00
None Reported (none rptd): 1E+00
blood: 2E-01

Lagoon Sediment

1,1,1-Trichloroethane (D)	200	MCLG	liver	6E-02
Total ncPAHs (D)	1,206	Risk	DW	1E+00
1,1-Dichloroethane (D)	1	Risk	none reported	1E+00
Acetone (D)	10	Risk	liver	1E+00

SUM HAZARD INDEX

Liver: 1E+00
Decreased Weight (DW): 1E+00
None Reported: 1E+00

Footnote)

a - In the Remedial Investigation studies, a distinction between trans- and cis- isomers was not made in the analysis of 1,2-dichloroethylene. The analysis was made instead for total 1,2-dichloroethylene. As part of the implementation of the Management of Migration remedy as defined in this ROD, an identification of an appropriate cleanup level for 1,2-dichloroethylene will be made. If this identification is not made, the more stringent of the two cleanup levels, i.e., 5 ppm for cis-1,2-dichloroethylene, will be set as the cleanup level for total 1,2-dichloroethylene.

(end of footnote)

These cleanup levels in soils and sediments are consistent with ARARs for ground water, attain EPA's risk management goal for remedial actions, and have been determined by EPA to be protective. These cleanup levels must be met at the completion of the remedial action throughout the unsaturated zone and saturated zone as defined above. Further, these cleanup levels must be met at the completion of the remedial action at the points of compliance through in-situ stabilization of the contaminated soils and sediments under a permeable cap. The stabilization treatment of all contaminated soils and sediments followed by construction of a permeable cap over the stabilized materials will prevent exposure to unsaturated soils and saturated sediments, minimize the mobility to ground water of the residual waste left on the PSC Resources Site, and ultimately will meet all Source Control objectives.

C. Description of Remedial Components

1) Source Control

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

1. Decontamination, demolition, and offsite disposal of property structures;
2. Treatment and discharge of lagoon surface water;
3. Consolidation of contaminated property soils with lagoon and wetland sediments on site property;
4. In-situ mixing and stabilization of property soils/sediments with treatment agents to bind contaminants into a stable matrix;
5. Construction of a permeable cap over stabilized property soils and sediments, and grading and planting of the cap's surface;
6. Restoration of wetlands;
7. Implementation of institutional controls on ground water use and land development; and

8. Long-term monitoring of ground water, wetland sediments, and Quaboag River water and sediments.

Details of each of the above major components are provided below:

1. Decontamination, demolition, and offsite disposal of property structures

Prior to the in-situ stabilization treatment process, site abandoned buildings and structures would be decontaminated by sandblasting or using a solvent rinse. Sand blasting involves the removal of contaminants from the surfaces of the structures by blasting with sand in a high-pressure air stream. The technology does not remediate the surfaces of the structures but removes the contaminants by wearing away the contaminated layers. Solvent wash technology involves the extraction of inorganic and organic contaminants from contaminated property structures using solvents. The surfaces of the property structures are treated with an extractant solution. The supernatant containing contaminants are further treated for removal and recovery. The surfaces are rinsed and neutralized, if necessary. These two surface decontamination technologies were studied in the FS and were found to be effective for implementation during the Remedial Action. Therefore, either or both of these surface decontamination techniques will be used in the full-scale remediation until the buildings and the structures are deemed non-hazardous and suitable for offsite disposal at a Subtitle D solid waste facility.

In order to implement the selected Source Control remedy to remediate the Site contamination, the existing abandoned property buildings and structures would need to be demolished and disposed offsite to provide space for the onsite remediation equipment. The demolishing and disposal activities would take place once the surface decontamination work is completed. The total volume of site structures and demolition debris to be disposed would be approximately 74 cubic yards. This volume estimate would be further refined during the Pre-Design study that will precede Remedial Design. Wastes generated by the decontamination activities would also be disposed offsite. A determination would be made as to whether the wastes generated by the decontamination activities are hazardous. If the wastes are determined to be hazardous, they would be disposed offsite at a Subtitle C hazardous waste facility in accordance with applicable Federal and State regulations.

2. Treatment and discharge of lagoon surface water

Concurrently with the decontamination, demolition, and offsite disposal of property structures, the lagoon surface water would be treated and discharged. Draining the lagoon would require an interim surface water treatment system. This would allow the water from the lagoon to be treated and discharged. This system would consist of a filter and granular activated carbon (GAC) adsorption unit to remove organic contaminants, and possibly more sophisticated treatment equipment to remove the inorganic contaminants in the surface water. Discharge of the treated water would comply with all substantive permit requirements.

Specifically, a 40 to 60 gpm pump would be used to remove surface water from the bottom of the lagoon. The lagoon surface water would be pumped to a 3,000 to 5,000 gallon frac tank designed with baffles to promote settling of suspended material. Water exiting the tank would be pumped to a flocculation/sedimentation unit to remove the inorganic materials. The partially treated effluent from the flocculation/sedimentation unit would be pumped through a 100 mesh bag filter prior to entering the GAC contactors. The effluent would then pass through two GAC contactors where the organic constituent would be removed through adsorption. The GAC contactors would be connected in series to provide for the most efficient use of GAC. The empty bed contact time (EBCT) would be approximately 10 minutes. It is anticipated that the treated effluent exiting the GAC units would be discharged into the Quaboag River provided that all substantive permit requirements are met. However, EPA will consider disposing of the treated lagoon surface water at an EPA-approved offsite disposal facility if the substantive requirements cannot be met or the discharge into the Quaboag River is not consistent with the overall goals of the remedy. The lagoon surface water treatment/discharge activity would be expected to take approximately 21 working days to complete.

3. Consolidation of contaminated property soils with lagoon and wetland sediments on site property

Prior to stabilization treatment, the contaminated sediment present in the lagoon and the wetlands would be excavated and consolidated with the property soils in-situ within the Area of Contamination (AOC). PSC Resources site has only one AOC which includes the PSC Resources property, adjacent wetland Spill Area (the area inside the site fence), and the limited area of the wetlands exclusive of the Spill Area, identified as drainage pathways. This AOC was delineated based on the areal extent (or boundary) of contiguous contamination that contain varying types of and concentrations of hazardous substances.

The total volume of contaminated property soils and lagoon and wetland sediments that are targeted for treatment is estimated to be 12,695 cubic yards with the following breakdown: 11,000 cubic yards of property soils, 1,245 cubic yards of lagoon sediment, and 450 cubic yards of wetland sediment. However, these volume estimates would be further refined based on additional sampling to be conducted during the Pre-Design study.

4. In-situ mixing and stabilization of property soils/sediments with treatment agents to bind contaminants into a stable matrix

The selected Source Control remedy includes an innovative in-situ stabilization treatment process that would physically and chemically bind and immobilize the toxic and hazardous site materials with stabilization additives into a solid, cement-like mass or matrix. In general, the stabilization technology, which is one of the types of treatment technologies that fall within the Superfund program's definition of "immobilization", is considered by EPA a proven technology for immobilization of inorganics. However, the stabilization technology, which is being selected as the principal element of the selected Source Control remedy, is considered innovative for the primary reasons that this technology will be applied "in-situ" and will also immobilize various organics at the PSC Resources Site. In the treatment process, the stabilization additives would be selected according to their ability to immobilize the specific contaminants present at the PSC Resources, Inc. site. This process would significantly reduce the ability of contaminants to migrate from the PSC Resources Site.

In-situ stabilization would consist of shallow mixing of the source materials with the appropriate stabilization additives. A crane mounted mixing system would be utilized to combine the portland cement/clay mixture with the in-situ soils. The mixing system consists of rotary blades contained within an open bottom cylinder. The open bottom shallow soil mixing system would be utilized in order to provide control over the volumes of soils and sediments mixed with the cement/clay additive. The cylinder also acts to prevent the migration of contaminants during the mixing process (Figure 33, Appendix A).

The cement/clay mixture would be combined as a slurry and pumped into the system as the mixing blades are started and the cylinder is lowered into the waste. The appropriate slurry mixture has not been determined and would require frequent adjustment due to the heterogeneous nature of the on-site soils. The volume of water to be added to the mixture would be dependent upon the initial soil moisture content. Since stabilization would be ongoing both above and below the water table, estimated at a depth of 4 feet to 6 feet below the

surface, continuous monitoring of the slurry would be required. Adjustments to the admixture proportions would be required to maintain the proper moisture levels when treatment extends below the water table. It is anticipated that with the proper oversight and adjustments, ground water dewatering below the AOC would not be necessary. The need for potential ground water dewatering during the soil and sediment treatment would be further evaluated during the Pre-Design study. Because the in-situ stabilization treatment process will also partially be conducted in the saturated environment and therefore the curing will be affected, treatability studies to be conducted as part of Pre-Design will include saturated curing. In addition, the nature of the soil itself varies over the site requiring implementation of an intensive quality control program in order to ensure a homogeneous mixture.

The mixing would be conducted in an up and down motion in order to create a negative pressure on the head space of the bottom opened cylinder. This would be done in order to induce any vapors or dusts into the vapor treatment system. At the completion of a mixed cylinder of waste, the blades would continue to rotate as they are retracted in order to ensure a homogeneous mixture. An overlapping process would be conducted until the entire area has been stabilized. The soils would be mixed to a depth of between 4 and 6 feet below the site surface.

The shallow soil mixing system would incorporate a vapor collection and treatment system in order to capture any vapors and fugitive dust emanating from the soils during treatment. The treatment system typically would consist of a dust collector followed by activated carbon canisters and then an induced draft fan. The fan would exhaust the treated air to the atmosphere. An in-line organic vapor detector monitors the air prior to its being emitted to the atmosphere.

The in-situ stabilization of the site soils would reduce the void space ground water storage capacity. This may cause a small rise in the ground water table elevation of the surrounding areas. The extent (areal and vertical) of the changes to the ground water table is expected to be minimal; nevertheless, appropriate controls (culvert, interceptor trench, etc.) could be installed, as necessary, to prevent impacts to building foundations and roadways in the area. This potential effect of the treatment on the void space ground water storage capacity would be further evaluated during the Pre-Design study.

Run-on/run-off (RO/RO) controls would be employed to prevent siltation of the wetlands both during and after treatment and construction activities. The installation of a vegetation layer would act to reduce runoff from the site and promote

evapotranspiration. A grassed drainage swale would be constructed to direct runoff toward the wetland, reduce erosion, and prevent siltation. The installation of the drainage layer above the stabilized material would direct the remaining rainfall percolating through the top layer to the appropriate discharge points. It may be necessary to employ infiltration basins/trenches in order to prevent flooding of the wetlands.

In-situ stabilization of the site soils would cause an increase in soil volume due to the addition of the stabilizing agents. This increase in volume, together with the construction of a permeable cap over the materials, would potentially result in a reduction of flood storage capacity. Construction of an area capable of retaining this reduced flood storage capacity during the 100-year flood event may be required in an area adjacent to or on the PSC Resources property in order to mitigate impacts from reducing flood storage capacity within the floodplain. In accordance with Section 40 of the Code of Federal Regulations (CFR) Part 6, Appendix A, EPA has already made a determination that there is no practical alternative to the construction of the treatment plant in the 100-year floodplain and the excavation of limited area in the wetland. Further assessment of the 100-year flood plain impacts as well as measures to mitigate such impacts would be made during the Pre-Design studies.

A bench scale treatability study conducted as part of the FS indicates that a Portland cement/organophillic clay mixture and the proprietary cold-mix asphalt emulsion mixture would effectively stabilize contaminated soil at the PSC Resources Site. Results of the bench scale treatability study on the soil stabilization/solidification can be found in Appendix A of the FS, Volume II. In addition, an extensive literature search indicates that the above mixture would also effectively treat sediments. The Portland cement has been shown to create a stable matrix and provide a high level of resistance to leaching of inorganic contaminants. In addition, the Portland cement has been shown to provide a higher resistance to organic contaminant leaching than do lime-fly ash and pozzolanic systems. The organophillic clay has been shown to adsorb organic contaminants in the soils and reduce organic contaminant migration within the cement matrix. The organophillic clay addition overcomes the problem of contaminant migration through the relatively porous cement matrix via the actual adsorption of organic materials. Organophillic clay is produced through the ionic exchange of metallic cations normally present in the clay with a catocin surfactant.

Due to the limited scope of the bench scale treatability study conducted on a variety of soil types from PSC Resources Site and

stabilization mixtures as part of the FS, more detailed pilot studies would need to be conducted as part of the Pre-design studies. These additional Pre-Design studies would ensure the effectiveness of in-situ stabilization prior to its full-scale implementation. Details of the Pre-Design studies are provided below.

Additional Pre-Design studies on the nature of the physical and chemical characteristic of both treated and untreated soils and sediments would be conducted. At minimum, the physical parameters would include: (1) description of materials to determine waste handling methods; (2) particle size analysis (only for untreated soils and sediments) to determine the surface area available for binder contact and leaching; (3) moisture content; (4) oil and grease content; (5) presence of halides, soluble metal salts, and phenol; (6) density testing; (7) strength testing; (8) permeability; and (9) durability testing. Chemical parameters, at minimum, would include: (1) pH to evaluate changes in leaching as a function of pH; (2) alkalinity to evaluate changes in leaching as a function of alkalinity; (3) interfering compounds to evaluate visibility of the stabilization process; (4) indicator compounds to evaluate performance of the stabilization process; (5) leach testing to evaluate performance of the stabilization process; and (6) heat of hydration to measure temperature changes during mixing. A thorough investigation of subsurface barriers would also be made to assess feasibility of adequately delivering and mixing the stabilization agents and the determination of the depth to first confining layer to determine required depth of treatment. In the FS, it was estimated that soils would be mixed and treated to a depth of between 4 and 6 feet below the site surface. Therefore, this FS estimated mixing depth would be confirmed or refined, if warranted, in the Pre-Design studies.

To evaluate and ensure the effectiveness of the in-situ stabilization treatment in meeting all Source Control objectives, a set of technical criteria would be met. These technical criteria are contaminant mobility, based on leaching and permeability tests; and the structural integrity of the solidified/stabilized soils and sediments, based on measurements of physical and microstructural properties described above. The average permeability of the treated soils and sediments would meet minimum 10^{-6} cm/s and the unconfined compressive strength (UCS) would meet EPA guideline minimum of 50 psi that would be needed to support the overburden and the permeable cap. Further, the minimum 50 psi UCS would be verified in the Remedial Design as being able to support the specific cap design and the equipment that will be used on the PSC Resources property.

To evaluate the effectiveness of the in-situ stabilization and leaching potential of soils and sediments, leaching tests will be conducted on both the treated and untreated soils and sediments. The pH of each leachate would be measured at the conclusion of each leach test.

For inorganic hazardous waste, two types of leaching tests will be conducted. These two leaching tests are TCLP and American Nuclear Society Test (ANS-16.1) or equivalent method. Results of the TCLP tests will be used to determine whether certain soils and sediments will be RCRA-characteristic waste after stabilization. For lead which is one of the metal contaminants of concern, the TCLP test will be conducted to determine whether the lead concentration in the TCLP extract is less than the regulatory limit of 5 mg/l above which the stabilized material would be considered a RCRA-characteristic waste. This regulatory limit of 5 mg/l for lead would be considered a performance criterion for stabilization of soils and sediments that are contaminated with lead. Leach test method ANS-16.1 would be conducted for pilot tests and subsequently for field implementation to achieve a minimum leachability index of 6.0 and a maximum leachate concentration of lead less than 5 mg/l. Either of the two leach tests would be conducted with deionized water, synthetic area rain, or synthetic ground water.

For organic hazardous waste, Total Waste Analysis (TWA) and TCLP will be conducted before and after the stabilization treatment of soils and sediments. Prior to the post-stabilization treatment conduct of TWA, an acid extraction procedure would be employed in order to effectively break up the solidification/stabilization matrix so an organic solvent, to be approved by EPA, can extract the organic contaminants. This added procedure would prove that the organic contaminants are still in the solidification/stabilization matrix but are immobilized. The TCLP tests will also be conducted to determine whether certain soils and sediments will be RCRA-characteristic waste for regulated organic contaminants after stabilization. As for inorganic hazardous waste, the regulatory limits that have been promulgated by EPA and are available for organic contaminants of concern would be considered performance criteria for stabilization of contaminated soils and sediments. These regulatory limits are provided in Table 1. of 40 CFR § 261.24 - Toxicity Characteristic.

For those organic contaminants of concern for which regulatory limits are not provided in Table 1. of 40 CFR § 261.24, alternate concentration limits, designated as the maximum concentration of the infiltrate, C_i , will be met as the performance criteria in the laboratory analysis of the leachate of the stabilized materials. The maximum concentration of the

infiltrate or leachate, C_p , is the maximum allowable concentration which will not result in exceedance of groundwater quality requirements (i.e., MCLs, MCLGs, or risk-based concentrations). These C_p values were calculated as part of the Summers leaching modelling study that was conducted, details of which are provided in Appendix F of the FS. Leach test method ANS-16.1, which uses an intact monolith and water leachant, would be utilized as the extraction method. Leach test method ANS-16.1 is being selected for the extraction procedure as it is expected to simulate more realistically the field conditions than the regulatory TCLP extraction procedure which crushes the stabilized matrix and utilizes acetate solution as the leachant. **Table 8 of Appendix B** provides the C_p performance criteria for each of the organic contaminants of concern for the property soil and lagoon sediment media.

Based on the results of physical, chemical, and leaching analyses and tests described above, the optimum formulation(s) of the admixes and optimum reagent usage would be determined. For optimized stabilization treatment effects, a subset of performance measurements may be instituted if a large number of formulations is initially tested. Subsequently, the full range of performance measurements would be required and instituted on a few formulations that are determined to be most effective.

In addition, as part of the pilot-scale studies, volatile and particulate emissions would be trapped and analyzed for potential fugitive emissions of contaminants. Measurements of total as well as leachable metal would also be made. The data would be adjusted to eliminate any apparent reduction of the contaminants due to dilution. This is a result of various additives and binders that are used in the stabilization treatment of untreated soils and sediments which result in the dilution of the original untreated materials. To account for this dilution effect, dilution factors, developed on a water free basis, would be calculated and would be multiplied by the uncorrected analytical values for a realistic assessment of the performance of the stabilization treatment. The determination of laboratory mixing equivalent to the field mixing would also be made as the field-used augers are not anticipated to perform mixing of soils and sediments as efficiently as batch mixers. For field quality assurance/quality control (QA/QC), cone penetrometers readings would be taken after a few days of curing or on a periodical basis as needed for the purpose of determining the strength index. Either grab samples or shallow cores would be collected for laboratory analysis to verify the effectiveness.

Stabilization treatment would meet all the Source Control objectives by consolidating all contaminated sediments and soils from around the site into a solidified mass, and capping the stabilized material. It would be protective of human health and the environment because the stabilization process would prohibit and impede the mobility of contaminants and the cap would reduce the potential for direct contact with the treated material. This Source Control remedy would also meet all chemical-, location-, and action-specific ARARs.

5. Construction of a permeable cap over stabilized property soils and sediments, and grading and planting of the cap's surface

A permeable cap would be required over the stabilized materials once the full-scale remediation has been completed. This would be necessary in order to reduce the potential for erosion due to weathering of the stabilized material which in turn reduces the integrity of the stabilized mass creating the potential for leaching contaminants. The permeable cap would consist of a two-foot gravel and sand drainage layer overlain by 12 inches of soil borrow capable of supporting vegetation (Figure 34, Appendix A). The cap is graded to drain away from the source material to minimize the infiltration of any precipitation into the stabilized material. The top layer would be vegetated in order to stabilize the soils, to increase evaporation potential, and to create a more aesthetic final appearance.

6. Restoration of wetlands

EPA has determined that, for this Site, there are no practicable alternatives to the selected Source Control remedy that would achieve site goals but would have less adverse impacts on the ecosystem. Unless the sediments in the wetlands with contaminant concentrations greater than the cleanup levels are excavated and treated in-situ with the property soils and lagoon sediments, the contaminants in the sediment would continue to pose unacceptable human health and environmental risks. A limited area of the wetlands, primarily the Spill Area and the drainage pathways, would be affected due to excavation of contaminated sediment during implementation of the selected Source Control remedy.

Excavation and treatment of contaminated wetland sediments, and any ancillary activities would result in unavoidable impacts and disturbance to wetland resource areas. Such impacts may include the destruction of vegetation and the loss of certain plants and aquatic organisms. Impacts to the fauna and flora would be mitigated through a comprehensive restoration program, described below.

During implementation of the remedy, steps would be taken to minimize the destruction, loss and degradation of wetlands, including the use of sedimentation basins or silt curtains to prevent potential transport of contaminated sediment/soils from the PSC Resources property during the stabilization treatment activities. In particular, the wetlands restoration program for the excavated portions of wetlands would be designed to mitigate any future impacts of such activities to those areas. Measures to be used would include adequate sloping of stream banks to prevent excessive sediment/soil erosion into the drainage pathways. All excavated areas would be backfilled, graded, stabilized and planted. The area would be restored to appropriate elevation contours and similar vegetation would be planted. Organic fill material would be distributed throughout the excavated areas to create grading, elevation and drainage approaching original patterns and to serve as substrate for replacement of vegetation.

A variety of mitigating measures would be implemented during and after remedial action including protection of sensitive species, erosion control and turbidity control. Upon completion of remedial action, any wetland areas impacted by excavation, treatment, and/or associated activities performed would be restored or enhanced, to the maximum extent feasible, to similar hydrological and botanical conditions existing prior to these activities.

The restoration program would be developed during Remedial Design of the selected Source Control remedy to replace wetland functions and habitat areas. This restoration program would identify the factors which are key to a successful restoration of the altered wetlands. Factors would include, but not necessarily be limited to, replacing and regrading hydric soils, provisions for hydraulic control and provisions for vegetative reestablishment, including transplanting, seeding or some combination thereof. Quality assurance measures shall include; (1) detailed topographic and vegetative surveys to ensure replication of proper surface elevations and vegetation; (2) engagement of a wetland replication specialist; (3) establishment of work area limits for equipment to prevent inadvertent placement of fill; (4) production of a reproducible base map and a detailed planting scheme; and (5) photographic documentation. The restoration program would also include monitoring requirements to determine the success of the restoration. Periodic maintenance (i.e. planting) may also be necessary to ensure final restoration of the designated wetland areas.

EPA, in consultation with MADEP, will determine when restoration is to be performed.

7. Implementation of institutional controls on ground water use and land development

EPA's choice of the selected Source Control remedy is based on the assumption that the future land use of PSC Resources property would be primarily residential. Cleanup levels for sediments and soils have been derived based on such future land use. However, institutional controls, such as deed restrictions, would be implemented to ensure that future use of ground water and future development of land are prohibited until cleanup standards, specified above, have been attained.

The effectiveness of institutional controls would be reevaluated during the five year reviews described above. If, at the five year review, or at any time during or after completion of remedial action, EPA determines that additional or alternative institutional controls are necessary to protect human health, then such additional or alternative institutional controls will be implemented.

8. Long-term monitoring of ground water, wetland sediments, and Quaboag River surface water and sediments

Because contaminated materials would remain on Site in stabilized form, long-term monitoring and five-year reviews would need to be implemented. Long-term monitoring of ground water, wetland sediments, and Quaboag River surface water and sediments would be required. The 1986 CERCLA amendments require that conditions be reviewed every five years at NPL sites where wastes remain on Site. All data obtained in the monitoring program would be evaluated in the five-year reviews. These reviews will consider all relevant data and determine if additional remedial actions are necessary.

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.

2) Management of Migration

The Management of Migration portion of the remedial alternative will include the following major components:

1. Use of natural attenuation to achieve ground water cleanup levels;
2. Ground water monitoring of existing wells on the PSC Resources, Inc. property and of monitoring wells adjacent to the property;
3. Sediment sampling of portions of the wetland and the Quaboag

- River, and where ground water discharges to the wetland and the Quaboag River;
4. Surface water sampling in areas adjacent to the wetland and in the Quaboag River; and
 5. Five-year site reviews to assess site conditions, contaminant distributions, and any associated site hazards.

Selected Management of Migration remedy is a No Action remedy that would rely on the process of natural attenuation to reduce offsite ground water contaminant concentrations. Therefore, this No Action remedy involves no remedial action components except for the long term monitoring of the contaminated ground water, wetland surface water and sediments, and the Quaboag River surface water and sediments. These media would be monitored quarterly for an indefinite period of time. Monitoring would be terminated once the site specific remedial response objectives and compliance with all ARARs had been attained. Monitoring could be terminated prior to all site specific ARARs and remedial response objectives being met if, during one of the 5-year SARA site reviews, a determination was made by the appropriate regulatory agencies that the remaining site contaminants did not present a significant risk to human health and/or the environment.

Implementation of this No Action remedy would not reduce migration of contaminants in ground water from the PSC Resources property. Contaminated ground water would continue to migrate from the PSC Resources property and discharge to the wetlands and/or the Quaboag River. However, VOCs have not been detected at significantly elevated concentrations in wetland sediment samples collected in areas of ground water discharge. In addition, discharge to the Quaboag River, and subsequent dilution of ground water contamination by river surface water is expected to decrease contaminant levels below MCLs. VOCs have not been detected in the analysis of Quaboag River surface water. The human health and ecological risk assessments have not found Quaboag River surface water, sediment, or VOCs in wetland sediments to pose a significant risk to human health or the environment. Therefore, the No-Action Management of Migration remedy is not expected to result in potential adverse risks to human health and the environment based on the discharge of contaminated ground water to the Quaboag River or wetland sediment.

Results from the ground water sampling conducted indicates that ground water is contaminated primarily with VOCs at concentrations above Federal and State MCLs. Without implementation of an active Source Control remedy, the time for ground water contamination to be reduced to below MCLs is estimated to be decades. With implementation of a Source Control remedy, such as the one selected in this ROD, ground water contamination will be reduced to concentrations below MCLs in approximately four to eleven years under the selected No-Action Management of Migration remedy.

In addition, ground water monitoring data suggest that contaminant concentrations are currently decreasing, and that the contaminant plume is currently regressing toward the property. Therefore, clean-up times may be reduced further in response to the existence of a potential source/ground water equilibrium condition. The effectiveness of the No Action alternative in achieving ground water clean-up within the estimated time (four to eleven years) will also depend on the effectiveness of the implemented selected Source Control remedy.

In summary, the No-Action Management of Migration alternative combined with an active selected Source Control remedy is expected to achieve the Management of Migration objectives.

As required by law, EPA will review the state of ground water contamination at least once every five years after the initiation of Source Control remedial action at the PSC Resources Site if any hazardous substances, pollutants or contaminants remain in the ground water to assure that the selected Source Control remedial action continues to protect human health and the environment. EPA will also evaluate risk posed by contaminants in all environmental media, including ground water, at the completion of the remedial action (i.e., before the Site is proposed for deletion from the NPL). Future remedial action for Management of Migration will be considered if the environmental monitoring program to be conducted as part of the No Action Management of Migration remedy determines that unacceptable risks to human health and/or the environment are posed by exposure to site contaminants in the ground water.

XI. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the PSC Resources 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; more specifically decontamination/demolition and offsite disposal of

property structures, treatment and discharge of lagoon surface water, in-situ stabilization treatment of contaminated soils and sediments, and capping of the treated soils and sediments. The stabilized waste deposited on the PSC Resources property will remain in place. Potential direct contact and ingestion of contaminated soils and sediments will be eliminated through treatment and capping. Continued migration of contaminants to the ground water will be eliminated in approximately four to eleven years as a result of the implementation of the selected Source Control remedy. The selected remedial actions will be protective of human health and the environment. Stabilizing and capping the contaminated soils and sediments will significantly reduce further migration (leaching) of those contaminants into the ground water. A long-term monitoring program will ensure the remedy remains protective of human health and the environment.

Moreover, the selected remedy will achieve potential human health risk levels that attain the 10^{-4} to 10^{-6} incremental cancer risk range and a level protective of noncarcinogenic endpoints, and will comply with suitable ARARs and "to be considered" criteria. At the time that the Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by ingestion of ground water. If, after review of the risk assessment, the remedial action is determined not to be protective by EPA the remedial action shall continue until protective levels are achieved and have not been exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

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 ARARs for the selected remedial action are derived from substantive portions of environmental laws, and the specific ARARs include, among others, those listed below.

Appendix D of this ROD contains a table of all ARARs identified for this Site and whether they are applicable, relevant and appropriate or to be considered. Within the table is also presented a brief synopsis of the requirements and the action to be taken to meet them.

i. Chemical Specific

Massachusetts Ground Water Quality Standards - Applicable

- Standards include Ground Water Classification; Water Quality Criteria to Sustain the Designated Uses; and Regulations to Achieve Uses and Maintain Ground Water Quality - 314 CMR 6.00.

Massachusetts Operation and Maintenance and Pretreatment Standards for Waste Water, Treatment Works, and Indirect Discharges, 314 CMR 12.00 - Applicable

Massachusetts Surface Water Discharge Permit Requirements - Applicable

- Regulates discharges to surface waters and any treatment works associated with discharges. Applicable if the treated lagoon surface water is discharged to the Quaboag River - 314 CMR 3.00.

Federal Safe Drinking Water Act (SDWA) - Relevant and Appropriate

- National Primary Drinking Water Regulations (NPDWR) 40 CFR 141.
- Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLG).

Massachusetts Drinking Water Regulations - Relevant and Appropriate

- Massachusetts Maximum Contaminant Levels (MMCLs).
- MMCLs for compounds detected at the PSC Resources Site are Federal MCLs Adopted by DEP - 310 CMR 22.00.

Massachusetts Surface Water Quality Standards - Applicable

- Regulations recommend the use of Federal Ambient Water Quality Criteria (FAWQCs) to establish water quality for toxic pollutants. Applicable if the treated lagoon surface water is discharged to the Quaboag River - 314 CMR 4.00.

Clean Air Act (CAA) - Applicable

- National Ambient Air Quality Standards (NAAQS) - 40 CFR Part 50.
- National Emission Standards for Hazardous Air Pollutants (e.g., benzene and vinyl chloride) - 40 CFR Part 61.

Federal Executive Order 11988, Floodplain Management - Applicable

Federal Executive Order 11990, Protection of Wetlands - Applicable

ii. Location Specific

Massachusetts Wetlands Protection Act (WPA) Regulations - Applicable

- 100 foot buffer zone of wetlands is regulated under WPA - 310 CMR 10.00.

iii. Action Specific

Clean Water Act (CWA) - Applicable

- National Pollution Discharge Elimination System (NPDES) A NPDES permit is required if the treated lagoon surface water is discharged off-site, as defined in the NCP, to the surface waters of the Quaboag River - 40 CFR Parts 122 and 125.

Massachusetts Air Pollution Control Regulations - Applicable

- 310 CMR 6.0, 7.0, and 8.0.

Toxic Substances Control Act (TSCA) - Applicable

- Regulates the Disposal and Storage of PCBs.

Massachusetts Operation and Maintenance and Pretreatment Standards for Waste Water, Treatment Works, and Indirect Discharges, 314 CMR 12.00 - Applicable

Massachusetts Hazardous Waste Regulations, 310 CMR 30.00 - relevant and appropriate

Clean Air Act (CAA) - Applicable

- National Ambient Air Quality Standards (NAAQS) - 40 CFR Part 50.
- National Emission Standards for Hazardous Air Pollutants (e.g., benzene and vinyl chloride) - 40 CFR Part 61.
- Utilize Best Available Control Technologies for emissions.

Resource Conservation and Recovery Act - Applicable

- RCRA Subtitle C, 40 CFR 260 et seq. - Regulates the Generation, Transport, Storage, Treatment and Disposal of Hazardous Waste.
- General RCRA Part 264 requirements that are relevant and appropriate to this remedial action involving on-site treatment, storage and disposal of hazardous waste include standards for ground water protection (Subpart F); closure and post-closure requirements (Subpart G); and landfills (cap).

Massachusetts Surface Water Discharge Permit Requirements - Applicable

- Regulates discharges to surface waters and any treatment works associated with discharges. Applicable if the treated lagoon surface water is discharged to the Quaboag River - 314 CMR 3.00.

To Be Considered

The following policies, criteria, and guidance (among others) are also to be considered (TBCs) during the implementation of the remedial action:

American Conference of Governmental Industrial Hygienists (ACGIH)

- Threshold Limit Value (TLV), Time Weighted Average (TWA) and Short-Term Exposure Limit (STELs).

Clean Water Act (CWA) - Federal Ambient Water Quality Criteria (FAWQCs).

EPA Reference Doses (RfD) - For Noncarcinogens.

EPA Lifetime Health Advisories - Office of Drinking Water.

EPA Risk Specific Doses - For Carcinogens.

EPA Directive for Lead - OSWER Directive 9355.4-02.

Massachusetts Allowable Ambient Limits (AALs) and Threshold Effects Exposure Limits (TEELs).

Massachusetts Office of Research and Standards Drinking Water Guidelines (ORSGLs).

i(a). Chemical Specific

Federal and State Drinking Water Standards

The ground water aquifer at the compliance boundary is classified as Class IIB under the Federal Ground Water Protection Strategy and Class I by the Commonwealth of Massachusetts, which is a source of potable water. While Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) promulgated under the Federal Safe Drinking Water Act are not applicable to ground water, they are relevant and appropriate to ground water cleanup or to the attainment of ground water cleanup levels because the ground water may be used as a drinking water source in the foreseeable future. In addition, the NCP requires that usable ground water be restored to their beneficial uses whenever practicable. See 40 CFR 300.430(a)(iii)(F).

Massachusetts ground water quality standards for Class I ground water issued in 314 CMR 6.00 are applicable requirements for the PSC Resources Site. The state drinking water standards that are relevant and appropriate for ground water as a potential drinking water supply are the Massachusetts Maximum Contaminant Levels (MMCLs) issued under 310 CMR 22.00. MMCLs for compounds detected at the PSC Resources Site are federal MCLs and MCLGs adopted by DEP.

In addition to the Federal and State regulatory standards and guidelines for drinking water and ground water, risk-based criteria are to be considered. These criteria include concentrations derived from EPA Reference Doses (RfDs) and risk-specific doses based on Carcinogenic Potency Factors (CPFs) and standard exposure assumptions for the ingestion of drinking water.

This remedy will attain these ARARs as well as those identified in **Appendix D**, and will comply with those regulations which have been identified as TBCs by meeting the ground water cleanup levels at the compliance points in approximately four to eleven years as a result of the implementation of the selected Source Control remedy. Removing the VOCs from the soil and sediments with an on-site air treatment system, stabilizing the contaminants in soils and sediments and capping of the PSC Resources property will further reduce the volume of leachate generated. The soil and sediment treatment system will reduce levels of contamination at the Site to the interim cleanup levels identified in this ROD. Treated lagoon surface water will also meet the discharge requirements to the Quaboag River which include Massachusetts Surface Water Discharge Permit Requirements (314 CMR 3.00), and Massachusetts Surface Water Quality Standards (314 CMR 4.04, 314 CMR 4.06(2)).

Federal and State Air Quality Standards

Federal Primary and Secondary National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (CAA) exist for emissions of sulfur oxides, carbon monoxide, ozone, nitrogen oxides, lead and particulate matter (PM₁₀). PSC Resources Site is located in a non-attainment area for ozone. Generation of fugitive dusts and air emissions from sediment excavation and soil/sediment consolidation and treatment facilities (air and stabilization treatment systems) are subject to NAAQS. Best available control technologies will be utilized to promote and maintain public health and welfare.

Massachusetts air regulations include Ambient Air Quality Standards (310 CMR 6.00), Air Pollution Control Regulations (310 CMR 7.00) and requirements for the Abatement of Episodic and Incidental Air Pollution Emergencies (310 CMR 8.00). Certain provisions of 310 CMR 7.00 which require the best available emissions controls and specify ambient air quality standards are applicable and will be met. The remaining State standards for fugitive emissions from excavation and

consolidation, and emissions from treatment equipment associated with this remedy are relevant and appropriate, and the substantive requirements will be met.

These Federal and State air standards will guide mitigation measures designed to control the release of fugitive dust and particulate matter during excavations and consolidations at the Site as well as limit VOC emissions from the onsite air treatment system at the Site.

ii(a). Location Specific

Areas immediately adjacent to the east and south of the PSC Resources property are wetlands under the Massachusetts Wetlands Protection Act (WPA) Regulations (310 CMR 10.00). PSC Resources Site lies within the 100-foot buffer zone under jurisdiction of the WPA for the wetlands. Activities associated with selected Source Control remedy within the 100-foot buffer zone are subject to the applicable requirements of the WPA and will be met.

iii(a). Action Specific

Federal Primary and Secondary National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (CAA) and Massachusetts air pollution regulations (310 CMR 6.00-8.00) are also action specific ARARs. The discussion of these requirements is found above under section i(a), Chemical Specific ARARs.

These Federal and State air standards will guide mitigation measures designed to control the release of fugitive dust and particulate matter during excavations and consolidations at the Site as well as limit VOC emissions from the onsite air treatment system.

Under the Clean Water Act (CWA), substantive permit requirements of the National Pollution Discharge Elimination System (NPDES) for point-source discharges are relevant and appropriate if the treated lagoon surface water is discharged to the Quaboag River. These requirements include compliance with technology-based standards, water quality criteria, and discharge monitoring systems. Federal water quality standards will be complied with.

Discharges to surface waters of Massachusetts and the outlets for such discharges and any treatment works associated with these discharges are regulated. These regulations include the Massachusetts Surface Water Discharge Permit Requirements (314 CMR 3.00) and Massachusetts Surface Water Quality Standards (314 CMR 4.04, 314 CMR 4.06(2)). As discussed above under Chemical Specific ARARs, these regulations are ARARs and will be met through treatment and proper controls on the remedial components.

RCRA regulations are relevant and appropriate to the Source Control portions of the remedy. The portions of RCRA Subtitle C that are relevant and appropriate to on-site treatment, storage or disposal include ground water protection (Subpart F); closure and post-closure requirements (Subpart G); and waste piles (Subpart L). Massachusetts Hazardous Waste Regulations that pertain to above ground storage containers and tanks used to treat or store hazardous waste is applicable and will be met (310 CMR 30.680 and 30.690). Additional Massachusetts Hazardous Waste Regulations that pertain to handling, storage, treatment and disposal of hazardous waste on-site are relevant and appropriate requirements and will be met through proper design and implementation of the remedial components. The off-site treatment and disposal of wastes generated from the soil and sediment treatment systems at this Site must meet all Federal and State requirements (administrative requirements are not ARARs, however, the substantive requirements must be met). Because the Massachusetts Hazardous Waste Program is authorized to administer the RCRA regulations listed above, the state regulations will be the operative requirements to be met.

The Land Disposal Restrictions (40 CFR 268) of Hazardous and Solid Waste Amendments of RCRA do not apply to characteristic RCRA hazardous waste at the Site. Under the Land Disposal Restrictions (LDRs), placement occurs for an on-site disposal when wastes are moved from one AOC into another AOC; wastes are moved outside of the AOC (for treatment or storage, for example); or when wastes are excavated from the AOC, placed in a separate unit (such as an incinerator or tank that is within the AOC) and redeposited into the same AOC. Placement does not occur when wastes are treated in-situ, capped in place, consolidated within the AOC, or processed within the AOC (but not in a separate unit, such as a tank) to improve their structural stability. And, since the selected Source Control remedy involves consolidation of soils and sediments within the same AOC accompanied by an "in-situ" treatment technology, the in-situ stabilization treatment of the hazardous waste materials would not constitute placement of restricted RCRA hazardous waste, and the LDRs would not apply. In addition, a treatability variance would not be required. Nevertheless, it was determined in the stabilization/solidification bench scale treatability study that this technology would be able to render any characteristic waste uncharacteristic.

The PCB Disposal Requirements promulgated under TSCA are applicable to the remedy because the selected remedy involves storage and disposal of soils contaminated with PCBs in excess of 50 ppm. Under the Disposal Requirements, soils and sediments contaminated with PCBs may be disposed of in an incinerator meeting the standards of 40 CFR Section 761.69 or a landfill meeting the requirements of 40 CFR Section 761.75. Under the provisions of 40 CFR Section 761.75(c)(4), the EPA Regional Administrator may waive one or more of the specified landfill requirements upon finding that the requirement is not

necessary to protect against an unreasonable risk of injury to human health or the environment from PCBs. In this case, an in-situ stabilization treatment of soils with PCBs will provide a permanent and protective remedy that satisfies the requirements of the Part 761 landfill regulations. Long-term monitoring of ground water wells will also be instituted, as required by the management of migration portion of the remedy.

The Regional Administrator is exercising the waiver authority contained within the TSCA regulations at 40 CFR Section 761.75(c)(4), and is waiving certain requirements of the chemical waste landfill regulations. The provisions to be waived require construction of chemical waste landfills in certain low permeable clay conditions [Section 761.75(b)(1)], the use of a synthetic membrane liner [Section 761.75(b)(2)], and that the bottom of the landfill be 50 feet above the historic high water table [Section 761.75(b)(3)].

The Regional Administrator hereby determines that, for the following reasons, the requirements of 40 CFR Sections 761.75(b)(1), (2), and (3) are not necessary to protect against an unreasonable risk of injury to human health or the environment from PCBs in this case. Among the primary reasons that the waived specifications are not necessary is the low frequency of detection and concentrations of PCBs detected in Site soils. PCBs are not the primary threat at this Site. Although there were a limited number of samples (2 samples - one 54 ppm and the other 65 ppm) analyzed with total PCBs over 50 ppm, the majority had concentrations below 1 ppm or at non-detectable levels. In contrast, the landfill requirements that are waived are designed to protect against the risk from disposal of PCBs at levels no lower than 50 ppm. The specifications regarding liners, soil conditions and depth to ground water were designed to protect against the risks that high levels of PCBs will migrate into ground water or be released to air or surface water.

Low permeability clay conditions, a synthetic membrane liner for the underlying substrate, and 50 foot soil barrier to the water table are unnecessary requirements at this Site to prevent migration of PCBs. The soils and sediments will be stabilized in-situ. Stabilization of the contaminants in the soils and sediments followed by capping of the treated materials will minimize the hydraulic connection between the treated soils/sediments and ground water and subsequent migration of PCBs in ground water. Furthermore, given the low mobility of PCBs in stabilized soils, migration of PCBs to ground water would be minimal.

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 the selected remedial alternatives for Source Control and Management of Migration are:

	<u>Capital Costs</u>	<u>O & M</u>	<u>Present Worth</u>
SC-6	\$2,688,834	\$378,211	\$3,067,045
MM-1	None	\$353,702	\$353,702

Of the five Source Control alternatives evaluated and considered protective (SC-4, SC-5, SC-6, SC-10, and SC-11), SC-4 and the selected Source Control remedy (SC-6) have the most cost-effective components.

Alternatives SC-5 (in-situ vitrification), SC-10 (onsite incineration), and SC-11 (onsite excavation and offsite disposal) do not provide overall effectiveness and protectiveness proportional to their respective costs. SC-11 is the most expensive of all the alternatives with an estimated total cost of approximately \$36,260,000. Alternatives SC-10 and SC-5 are the next two most expensive with estimated total costs of approximately \$15,010,000 and \$10,380,000 respectively. Alternatives SC-10 and SC-11 would present much greater short-term risks than the rest as these alternatives would involve more intrusive activities due to extensive excavation. Therefore, the adverse impacts (e.g., inhalation risks) resulting from low short-term effectiveness associated with Alternatives SC-10 and SC-11 that include large-scale excavations prior to treatment or offsite disposal, and the very high costs of implementation in proportion to the added long-term protection to human health and the environment are not considered proportionately cost-effective. Alternative SC-5 is considered an innovative technology because it has not been used in any commercial applications, and is therefore of questionable implementability and reliability. Furthermore, the implementation of the vitrification process requires very high amounts of electricity not currently available at the site. These uncertainties and the very high cost of implementation for Alternative SC-5 in proportion to the added long-term protection to human health and the environment are also not considered proportionately cost-effective.

The selected Source Control remedy SC-6 and Alternative SC-4 are equally implementable and have similar cost effectiveness. However, Alternative SC-4 would not comply with the CERCLA statutory preference for treatment of hazardous waste. Specifically, whereas SC-4 meets

ARARs and is considered reasonably protective against exposures such as direct contact and ingestion of soils and sediments, it is less protective than the selected remedy because none of the contaminants are eliminated, reduced or stabilized; therefore the costs are less effective for the level of protection. In summary, the selected remedy provides adequate protection against all potential exposures to those contaminants by stabilizing and capping the residual waste at a reduced cost.

For Management of Migration, both the selected remedy MM-1 and Alternative MM-3/MM-4 attain ARARs and are protective. Both MM-1 and MM-3/MM-4 would provide overall protection of human health and the environment through implementation in conjunction with the selected Source Control remedy. The "No Action" MM-1, which calls for natural attenuation to attain cleanup levels, would decrease current levels of ground water contamination to levels below MCLs in four to eleven years after implementation. Alternative MM-3/MM-4 would decrease current levels of ground water contamination to levels below MCLs in three to seven years after implementation. Based on a relative comparison of the estimated times to achieve ground water clean-up between the No Action alternative and MM-3/4, the maximum estimated difference between clean-up times is eight years (assuming a maximum time for No Action and a minimum for the Alternative MM-3/4).

In selecting the management of migration remedy, EPA weighed the eight-year maximum estimated time difference against the cost and the short-term effectiveness of MM-1 and MM-3/4. The estimated total cost is much less for MM-1 at \$353,000 than for MM-3/MM-4 (\$1,600,000 for the interceptor/barrier recovery trench system and \$1,260,000 for extraction recovery wells system. Short-term effectiveness for MM-1 is very high as it is a "No Action" alternative and does not require any onsite cleanup work other than sampling. Short-term effectiveness for MM-3/MM-4 is considered low. Implementation of MM-3/MM-4 would pose risk to both the community and workers. Risks to the community would include potential exposure to contaminated fugitive dust and vapors during construction of the trench and hydraulic barrier and off-site transportation of excavated soils. Risks to workers would include potential inhalation of dust and vapors and potential direct contact with the property soil or sediments, surface water and ground water. There would also be environmental impacts which would include additional destruction of the wetlands to implement this alternative. Based on these consideration, EPA has determined that the selected Management of Migration remedy MM-1 provides a greater overall effectiveness and protectiveness proportional to its costs than does Alternative MM-3/MM-4.

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.

Except for the No Action Alternative SC-1, all of the Source Control alternatives (SC-4, SC-5, SC-6, SC-10, and SC-11) evaluated in detail would provide overall protection of human health and the environment and meet their corresponding ARARs. All of these five Source Control alternatives offer good protection against the principle exposure risks including direct contact and ingestion of soils and sediments and risks associated with potential ingestion of contaminated ground water in the foreseeable future resulting from the leaching of contaminants from unsaturated-zone soils into ground water and the transport of these contaminants to a receptor.

Whereas SC-11 offers the most permanent protection on-site because all contaminated soils and sediments would be excavated and disposed of offsite, it is unreliable as a result of the uncertainty of securing a RCRA Treatment, Storage and Disposal (TSD) Facility to accept contaminated waste, and poses potential serious short-term risks related to the major onsite excavation and the transport of wastes off site. The other consideration which makes SC-11 less attractive is its estimated implementation cost of \$36,260,000, the highest of all the alternatives. Alternatives SC-5 and SC-10 would also be very effective in reducing or eliminating long-term risks associated with exposure to waste materials and leachate generation. However, aside from these two alternatives being the next two most expensive Source Control alternatives to implement, SC-5 and SC-10 would have some significant implementability problems. Alternative SC-5 (in-situ vitrification) is considered an innovative technology because it has not been used in any commercial applications, and is therefore of questionable implementability. Furthermore, the implementation of the vitrification process requires very high amounts of electricity not

currently available at the site. Alternative SC-10 (onsite incineration) is technically feasible but would be difficult to implement due to the limited availability of land around the site.

In EPA's analysis, the selected Source Control remedy (SC-6) and Alternative SC-4 are more readily implementable and cost effective than the above SC alternatives (SC-5, SC-10, and SC-11). Selected Source Control remedy (SC-6) and Alternative SC-4 are equally implementable and have similar cost effectiveness. However, Alternative SC-4 would not comply with the CERCLA statutory preference for treatment of hazardous waste. Whereas SC-4 meets ARARs and is considered reasonably protective against exposures such as direct contact and ingestion of soils and sediments, it is less protective than the selected Source Control remedy because none of the contaminants are eliminated, reduced or stabilized; therefore the costs are less effective for the level of protection. In summary, the selected remedy provides adequate protection against all potential exposures to those contaminants by stabilizing and capping the residual waste at a reduced cost.

Both the "No Action" Alternative MM-1, selected Management of Migration remedy, and Alternative MM-3/MM-4 would provide overall protection of human health and the environment and attain all ARARs through implementation in conjunction with any of the Action SC alternatives. The estimated total cost is much less for MM-1 at \$353,000 than for MM-3/MM-4 (\$1,600,000 for the interceptor/barrier recovery trench system and \$1,260,000 for extraction recovery wells system). Short-term effectiveness for MM-1 is very high as it is a "No Action" alternative and does not require any onsite cleanup work other than sampling. Short-term effectiveness for MM-3/MM-4 is considered low. Implementation of MM-3/MM-4 would pose risk to both the community and workers. Risks to the community would include potential exposure to contaminated fugitive dust and vapors during construction of the trench and hydraulic barrier and off-site transportation of excavated soils. Risks to workers would include potential inhalation of dust and vapors and potential direct contact with the property soil or sediments, surface water and ground water. There would also be environmental impacts which would include additional destruction of the wetlands to implement this alternative. Based on these consideration, EPA has determined that the selected Management of Migration remedy MM-1 provides a greater overall effectiveness and protectiveness than does Alternative MM-3/MM-4.

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

The principal element of the selected Source Control portion of the remedy is the in-situ stabilization of the contaminants in the soils and sediments followed by capping of the treated materials. The

principal element of the selected Management of Migration portion of the remedy is "No Action" remedy which would rely on natural attenuation to attain cleanup levels, in conjunction with the selected Source Control remedy, in four to eleven years after implementation. These elements address the primary threat at the Site, contamination of soils and sediments and ground water. The selected remedy satisfies the statutory preference for treatment as a principal element by: permanently reducing the volume of VOCs through an onsite vapor collection and treatment system as part of the selected Source Control remedy; reducing the mobility of the remaining organics and metals in the soils and sediments through in-situ stabilization; and reducing the contaminant concentrations of currently contaminated ground water, which poses a potential threat to a future potential drinking water supply, to within safe levels as a results of the treatment of the source materials.

XII. DOCUMENTATION OF NO SIGNIFICANT CHANGES

EPA presented a proposed plan (preferred alternative) for remediation of the Site on March 31, 1992. The source control portion of the preferred alternative included in-situ stabilization of soils and sediments and construction of a permeable cap over the stabilized soils and sediments. The management of migration portion of the preferred alternative included "No Action" natural attenuation as a means of attaining ground water cleanup levels. No significant changes from the Proposed Plan have been made to the selected remedies as detailed in the Record of Decision.

It should be noted that some discrepancies in analysis exist among documents in the Administrative Record, but that this Record of Decision represents EPA's final position with regard to these discrepancies. This position was reached after carefully reviewing and considering all information presented to EPA. Any discrepancies noted would not affect EPA's decision on the remedy.

XIII. STATE ROLE

The Commonwealth of Massachusetts, Department of Environmental Protection 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. Massachusetts concurs with the selected remedy for the PSC Resources Site. A copy of the declaration of concurrence is attached as **Appendix D**.

APPENDIX A

FIGURES

- FIGURE 1 PROPERTY LOCATION MAP
- FIGURE 2 SITE BASE MAP/PROPERTY BOUNDARY & EXISTING FEATURES
- FIGURE 3 PROPERTY BUILDINGS AND STRUCTURES
- FIGURE 4 PROPERTY BUILDING AND STRUCTURE CORE AND AUGER SAMPLE LOCATIONS
- FIGURE 5 PROPERTY BUILDING AND STRUCTURE CHIP SAMPLE LOCATIONS
- FIGURE 6 PROPERTY BUILDING AND STRUCTURE WIPE SAMPLE LOCATIONS
- FIGURE 7 PHASE I & PHASE II SOIL SAMPLING LOCATIONS ON THE PSC RESOURCES PROPERTY
- FIGURE 8 PROPERTY SURFICIAL SOIL SAMPLING LOCATIONS FOR LEAD ANALYSES ON THE PSC RESOURCES PROPERTY
- FIGURE 9 DEPTH OF OBSERVED SOIL STAINING IN TEST PIT EXCAVATIONS AND SOIL BORINGS
- FIGURE 10 TOTAL CONCENTRATIONS OF VOCs DETECTED IN PROPERTY SOIL SAMPLES
- FIGURE 11 TOTAL CONCENTRATION OF SVOCs DETECTED IN PROPERTY SOIL SAMPLES
- FIGURE 12 MAXIMUM DETECTED TOTAL CONCENTRATION OF PCBs IN PROPERTY SOIL
- FIGURE 13 TOTAL CONCENTRATIONS OF PCBs (AROCLOs 1260 & 1242) DETECTED IN STORAGE TANK SLUDGE
- FIGURE 14 DEPTH DISTRIBUTION OF PCB (AROCLO 1260) CONCENTRATIONS DETECTED IN PROPERTY SOIL BORINGS
- FIGURE 15 DISTRIBUTION OF LEAD (TOTAL) DETECTED IN SURFICIAL SOIL SAMPLES
- FIGURE 16 SITE SOIL SAMPLING LOCATIONS
- FIGURE 17 AIR SAMPLING STATIONS
- FIGURE 18 PHASE I AND PHASE II PROPERTY SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS

APPENDIX A (Continued)

FIGURES

- FIGURE 19 WETLAND HABITAT DELINEATION AND PHASE I & II
WETLAND SEDIMENT SAMPLING LOCATION IN THE PSC
RESOURCES SITE**
- FIGURE 20 LOCATIONS OF WETLAND AND SEDIMENT SAMPLES AND
APPROXIMATE LIMITS OF SPILL AREA**
- FIGURE 21 TOTAL PAH CONCENTRATIONS AT THE PSC RESOURCES SITE**
- FIGURE 22 TOTAL PCB AND PESTICIDE CONCENTRATIONS AT THE PSC
RESOURCES SITE**
- FIGURE 23 TOTAL CONCENTRATIONS OF VOCs: PHASE I SAMPLING
RESULTS**
- FIGURE 24 FISH SAMPLING REACH LOCATIONS**
- FIGURE 25 SUMMARY OF VOCs DETECTED IN SAMPLING ROUNDS 1-5**
- FIGURE 26 PSC RESOURCES GROUNDWATER ELEVATION CONTOUR MAP -
MAY 23, 1990**
- FIGURE 27 PSC RESOURCES GROUNDWATER ELEVATION CONTOUR MAP -
AUGUST 9, 1990**
- FIGURE 28 ESTIMATED VERTICAL EXTENT OF GROUNDWATER
CONTAMINATION**
- FIGURE 29 TVOC PLUME SAMPLING ROUNDS 1 (10/88), 2 (11/89),
AND 4 (5/90)**
- FIGURE 30 FEMA FLOODPLAIN MAP**
- FIGURE 31 WETLAND CLASSIFICATION BASED ON AERIAL PHOTOGRAPHY
AND FIELD INVESTIGATION**
- FIGURE 32 MASSACHUSETTS WETLAND RESOURCE AREAS**
- FIGURE 33 ALTERNATIVE SC-6 IN-SITU STABILIZATION**
- FIGURE 34 CONCEPTUAL PERMEABLE CAP CROSS SECTION**

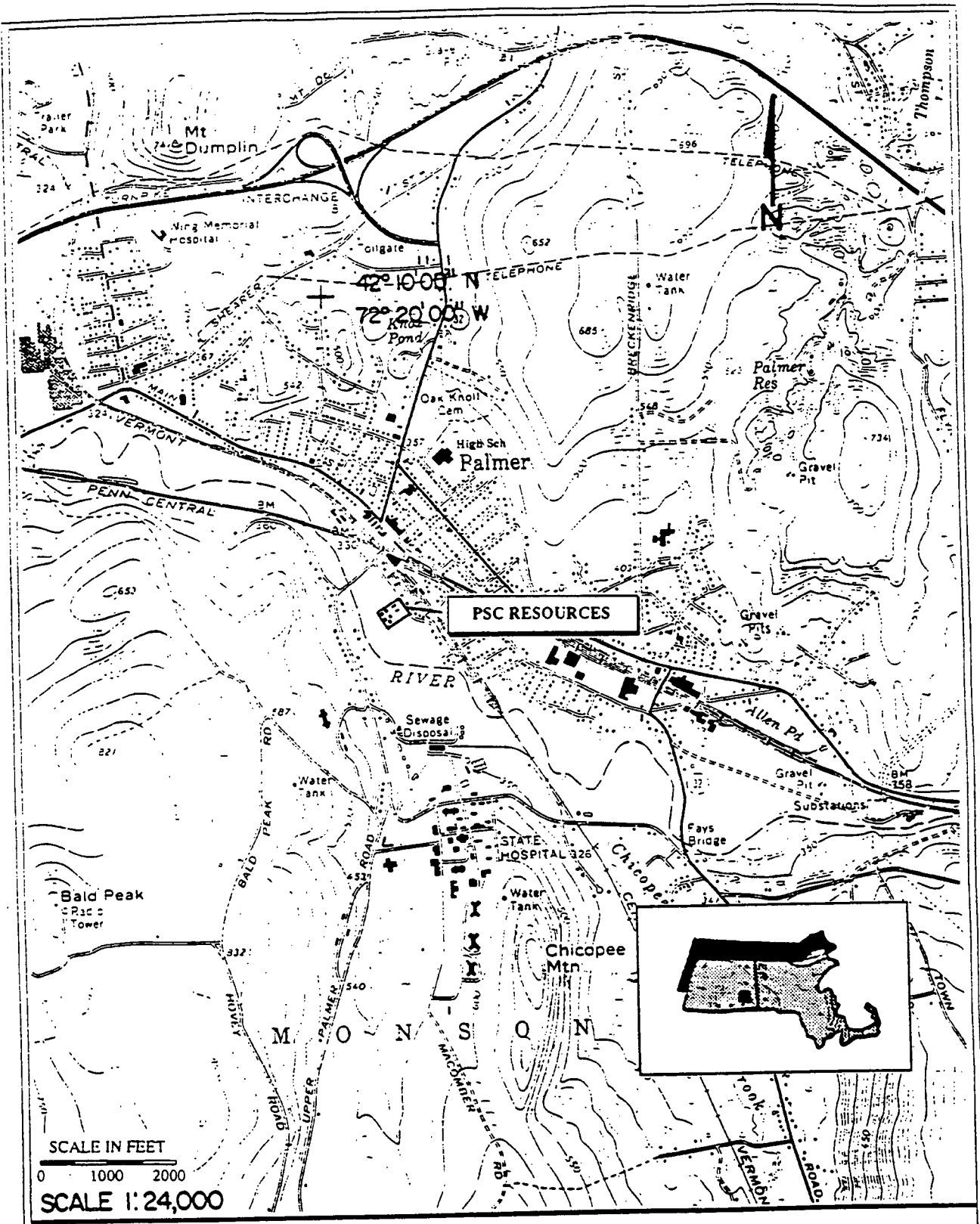


FIGURE 1
PROPERTY LOCATION MAP



POOR QUALITY
ORIGINAL

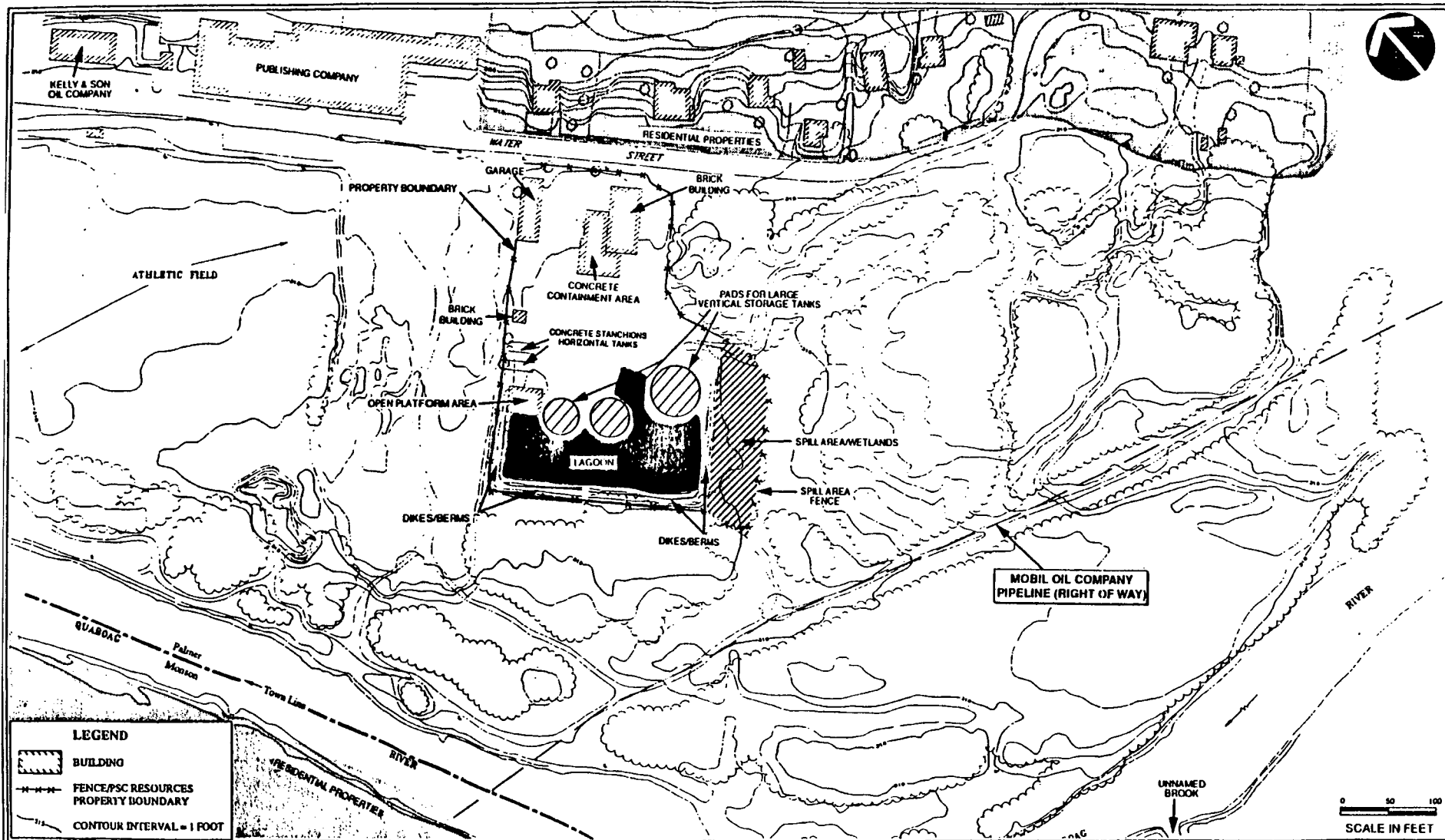


TABLE 4
Exposure Assumptions
PSC Resources Superfund Site, Palmer, MA

VARIABLE		PROPERTY SOIL/WETLAND SEDIMENT				LAGOON SEDIMENT		
		Current Trespasser Older Child	Future Resident Young child	Future Resident Older child	Future Worker Adult	Current Trespasser Older Child	Future Resident Older child	Future Worker Adult
Exposure Frequency	EF	50 days/yr	150 days/yr	150 days/yr	250 days/yr	50 days/yr	150 days/yr	250 days/yr
Exposure Duration	ED	11 yrs	6 yrs	11 yrs	25 yrs	11 yrs	11 yrs	25 yrs
Body Weight	BW	45 kg	15 kg	45 kg	70 kg	45 kg	45 kg	70 kg
Receptor age		7-18 yrs	1-6 yrs	7-18 yrs		7-18 yrs	7-18 yrs	
Averaging Period*	AP*	4015 days	2190 days	4015 days	9125 days	4015 days	4015 days	9125 days
Average Lifetime	LT	70 years	70 years	70 years	70 years	70 years	70 years	70 years
Dermal Contact Rate	D.CR	500 mg/day	500 mg/day	500 mg/day	74.25 mg/day	500 mg/day	500 mg/day	74.25 mg/day
Surface Area Exposed	SA	2000 cm ² /day	2000 cm ² /day	2000 cm ² /day	2000 cm ² /day	2000 cm ² /day	2000 cm ² /day	2000 cm ² /day
Fraction Exposed	FracExp	50%	50%	50%	75%	50%	50%	75%
Soil to Skin Adherence Factor	AF	0.5 mg/cm ²	0.5 mg/cm ²	0.5 mg/cm ²	0.5 mg/cm ²	0.5 mg/cm ²	0.5 mg/cm ²	0.5 mg/cm ²
Exposure Time	ET							
Dermal Absorption	D.ABS	50% VOCs 5% PAHs 5% PCBs 0% Inorganic 5% TEDFs 5% Phthalates	50% VOCs 5% PAHs 5% PCBs 0% Inorganic 5% TEDFs 5% Phthalates	50% VOCs 5% PAHs 5% PCBs 0% Inorganic 5% TEDFs 5% Phthalates	50% VOCs 5% PAHs 5% PCBs 0% Inorganic 5% TEDFs 5% Phthalates	50% VOCs 5% PAHs 5% PCBs 0% Inorganic 5% TEDFs 5% Phthalates	50% VOCs 5% PAHs 5% PCBs 0% Inorganic 5% TEDFs 5% Phthalates	50% VOCs 5% PAHs 5% PCBs 0% Inorganic 5% TEDFs 5% Phthalates
Ingestion Rate	IR	100 mg/day	200 mg/day	100 mg/day	50 mg/day	100 mg/day	100 mg/day	50 mg/day
Ingestion Absorption	I.ABS	100% VOCs 100% PAHs 30% PCBs 30% Lead 100% Other Inorg 30% TEDFs 100% Phthalates	100% VOCs 100% PAHs 30% PCBs 50% Lead 100% Other Inorg 30% TEDFs 100% Phthalates	100% VOCs 100% PAHs 30% PCBs 30% Lead 100% Other Inorg 30% TEDFs 100% Phthalates	100% VOCs 100% PAHs 30% PCBs 30% Lead 100% Other Inorg 30% TEDFs 100% Phthalates	100% VOCs 100% PAHs 30% PCBs 30% Lead 100% Other Inorg 30% TEDFs 100% Phthalates	100% VOCs 100% PAHs 30% PCBs 30% Lead 100% Other Inorg 30% TEDFs 100% Phthalates	100% VOCs 100% PAHs 30% PCBs 30% Lead 100% Other Inorg 30% TEDFs 100% Phthalates
Fraction of fish from river	FracFish							
Permeability Coefficient	PC							
Benzene								
Toluene								
Dibutylphthalate								
Ethylbenzene								
Inorganics								
All other organics = water								

* Averaging Period (AP) is applicable only to the evaluation of non-carcinogenic exposure dose

TABLE 3 (Cont'd)

Exposure Scenarios*

PSC Resources Superfund Site, Palmer, MA

RECEPTOR	ACTIVITY	EXPOSURE POINT	EXPOSURE MEDIA	EXPOSURE ROUTES	ANALYSIS	DATA
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*Exposure Scenarios defined by the U.S. Environmental Protection Agency as detailed in Scope of Work, August 7, 1991.

FUTURE EXPOSURE

3 Commercial/Industrial Workers Adult (duration: 25 years)	Working on site	Dinking Water	Groundwater	Ingestion	Quantitative	all data
		On Property	Soil	Dermal, ingestion	Quantitative	0-12" depth
			Wetland Sediment	Dermal, ingestion	Quantitative	0-12" depth
			Lagoon Sediment	Dermal, ingestion	Quantitative	0-1" depth
			Lagoon Surface Water	Dermal, ingestion	Qualitative	all data
		Quaboag River	River Sediment	Dermal, ingestion	Qualitative	0-1" depth
		Buildings	Sludge, Bldg. Materials	Dermal	Qualitative	primarily wipe samples

TABLE 3

Exposure Scenarios*

PSC Resources Superfund Site, Palmer, MA

RECEPTOR	ACTIVITY	EXPOSURE POINT	EXPOSURE MEDIA	EXPOSURE ROUTES	ANALYSIS	DATA
----------	----------	----------------	----------------	-----------------	----------	------

*Exposure Scenarios defined by the U.S. Environmental Protection Agency as detailed in Scope of Work, August 7, 1991.

CURRENT EXPOSURE

1. Trespassers						
1a. older child/young adult (age 7-18 years)	Playing	On Property	Soil	Dermal, ingestion	Quantitative	0-1' depth
			Wetland Sediment	Dermal, ingestion	Quantitative	0-1' depth
			Lagoon Sediment	Dermal, ingestion	Quantitative	0-1' depth
			Lagoon Surface Water	Dermal	Quantitative	all data
				Ingestion	Qualitative	all data
		In Buildings	Sludge, Bldg. Materials	Dermal	Qualitative	primarily wipe samples
1b. older child/young adult (age 7-18 years)	Wading, playing	In Quabog River	River Sediment	Dermal	Quantitative	0-1' depth
				Ingestion	Qualitative	0-1' depth
1c. young child (age 1-6 years)	Fish Consumption		Fish	Ingestion	Quantitative	lead only
1d. adult (duration: 30 years)			Fish	Ingestion	Quantitative	lead only

FUTURE EXPOSURE

2. Residents						
2a. young child (age 1-6 years)	Home on site	On Property	Soil	Dermal, ingestion	Quantitative	0-12' depth
			Wetland Sediment	Dermal, ingestion	Quantitative	0-12' depth
			Soil	Dermal, ingestion	Quantitative	0-12' depth
2b. older child/young adult (age 7-18 years)			Wetland Sediment	Dermal, ingestion	Quantitative	0-12' depth
2c. older child/young adult (age 7-18 years)	Home on site	On Property	Lagoon Sediment	Dermal, ingestion	Quantitative	0-1' depth
			Lagoon Surface Water	Dermal	Quantitative	all data
				Ingestion	Qualitative	all data
		In Buildings	Sludge, Bldg. Materials	Dermal	Qualitative	primarily wipe samples
	Wading, playing	In Quabog River	River Sediment	Dermal	Quantitative	0-1' depth
				Ingestion	Qualitative	0-1' depth
2d. young child (age 1-6 years)	Fish Consumption		Fish	Ingestion	Quantitative	lead only
2e. adult (duration: 30 years)			Fish	Ingestion	Quantitative	lead only
2f. adult (duration: 30 years)	Home on site	Drinking Water	Groundwater	Ingestion	Quantitative	all data

TABLE 2 (Cont'd)

Summary Statistics for Study Chemicals

in Building Samples

PSC Resources Superfund Site, Palmer, MA

Core Samples					
	Times Detected	Times Sought	Minimum Concentration of Detects	Average Concentration nd = 0	Maximum Concentration of Detects
Study Chemical	n	n	µg/kg	µg/kg	µg/kg
TEDEs	3	3	1.20E-03	2.27E-02	6.00E-02
Total PCBs	3	14	370	590.71	4300
bis (2-ethylhexyl) phthalate	5	7	48	2014.00	8100
di-n butylphthalate	0	7	0	0.00	0
Total cPAHs	6	7	95	5898.57	33510
Total ncPAHs	7	7	230	9010.71	46790
vinyl chloride	0	8	0	0.00	0
1,1 - dichloroethane	0	8	0	0.00	0
1,2 - dichloroethylenes	0	8	0	0.00	0
methylene chloride	0	8	0	0.00	0
1,1,1 - trichloroethane	0	8	0	0.00	0
trichloroethylene	0	8	0	0.00	0
tetrachloroethylene	1	8	11	1.38	11
2 - butanone	0	8	0	0.00	0
acetone	0	8	0	0.00	0
benzene	0	8	0	0.00	0
ethylbenzene	2	8	3	2.75	19
toluene	0	8	0	0.00	0
xylene	4	8	21	23.13	62
arsenic	0	0	0	0.00	0
lead	0	0	0	0.00	0

TABLE 2 (Cont'd)

Summary Statistics for Study Chemicals
in Building Samples
PSC Resources Superfund Site, Palmer, MA

Study Chemical	Chip Samples				
	Times Detected	Times Sought	Minimum Concentration of Detects	Average Concentration nrl = 0	Maximum Concentration of Detects
	n	n	µg/kg	µg/kg	µg/kg
TEDFs	5	5	1.50E-02	5.30E-02	1.20E-01
Total PCBs	6	16	2600	12325.00	73000
bis (2-ethylhexyl) phthalate	6	6	8200	104533.33	250000
di-n-butylphthalate	2	6	1800	700.00	2400
Total cPAHs	6	6	3490	87015.00	440000
Total ncPAHs	6	6	21340	115148.33	562000
vinyl chloride	0	10	0	0.00	0
1,1 - dichloroethane	0	10	0	0.00	0
1,2 - dichloroethylenes	0	10	0	0.00	0
methylene chloride	0	10	0	0.00	0
1,1,1 - trichloroethane	0	10	0	0.00	0
trichloroethylene	0	10	0	0.00	0
tetrachloroethylene	0	10	0	0.00	0
2 - butanone	1	10	54	5.40	54
acetone	0	10	0	0.00	0
benzene	1	10	3	0.30	3
ethylbenzene	1	10	14	1.40	14
toluene	0	10	0	0.00	0
xylene	1	10	20	2.00	20
arsenic	0	0	0	0.00	0
lead	0	0	0	0.00	0

TABLE 2 (Cont'd)

Summary Statistics for Study Chemicals
in Building Samples
PSC Resources Superfund Site, Palmer, MA

Study Chemical	Wipe Samples				
	Times Detected	Times Sought	Minimum Concentration of Detects	Average Concentration nd = 0	Maximum Concentration of Detects
	n	n			
TEDFs (pg/cm ²)	6	6	1.00E-02	1.55E-01	6.78E-01
Total PCBs (ug/cm ²)	5	19	0.0001	0.01	0.22
bis (2-ethylhexyl) phthalate	0	0	0	0.00	0
di n butylphthalate	0	0	0	0.00	0
Total cPAHs	0	0	0	0.00	0
Total ncPAHs	0	0	0	0.00	0
vinyl chloride	0	0	0	0.00	0
1,1 - dichloroethane	0	0	0	0.00	0
1,2 - dichloroethylenes	0	0	0	0.00	0
methylene chloride	0	0	0	0.00	0
1,1,1 - trichloroethane	0	0	0	0.00	0
trichloroethylene	0	0	0	0.00	0
tetrachloroethylene	0	0	0	0.00	0
2 - butanone	0	0	0	0.00	0
acetone	0	0	0	0.00	0
benzene	0	0	0	0.00	0
ethylbenzene	0	0	0	0.00	0
toluene	0	0	0	0.00	0
xylene	0	0	0	0.00	0
arsenic (ug/l)	3	11	2	0.69	3.6
lead (ug/l)	11	11	11	672.64	2070

TABLE 2 (Cont'd)
Summary Statistics for Study Chemicals for Groundwater
PSC Resources Superfund Site, Palmer, MA

	Times Detected	Times Sought	Minimum Concentration of Detects	Average Concentration nd = 0	Maximum Concentration of Detects
Study Chemical	n	n	µg/l	µg/l	µg/l
TEDEs	0	0	0	0.00	0
Total PCBs	0	21	0	0.00	0
bis (2-ethylhexyl) phthalate	15	50	3	2.12	10
di-n-butylphthalate	2	50	2	0.00	2
Total cPAHs	0	50	0	0.00	0
Total ncPAHs	6	50	4	7.46	154
vinyl chloride	6	75	2	3.72	140
1,1 - dichloroethane	31	75	2	87.25	1000
1,2 - dichloroethylenes	24	75	2	53.21	790
methylene chloride	4	75	94	5.79	130
1,1,1 - trichloroethane	10	75	31	75.76	1100
trichloroethylene	11	75	2	12.01	190
tetrachloroethylene	8	75	2	6.37	220
2 - butanone	10	75	14	55.05	1400
acetone	9	75	8	289.29	6200
benzene	22	75	4	42.57	600
ethylbenzene	21	75	2	15.59	99
toluene	16	75	3	51.19	610
xylene	19	75	4	41.39	400
arsenic	5	31	5	2.47	27.4
lead	3	31	6	1.00	13

TABLE 2 (Cont'd)
Summary Statistics for Study Chemicals in Fish
PSC Resources Superfund Site, Palmer, MA

	Times Detected	Times Sought	Minimum Concentrations of Detects	Average Concentrations nd = 0	Maximum Concentrations of Detects
Study Chemical	n	n	µg/g	µg/g	µg/g
TEDFs	0	0	0	0.00	0
Total PCBs	0	4	0	0.00	0
bis (2-ethylhexyl) phthalate	0	4	0	0.00	0
di-n-butylphthalate	0	4	0	0.00	0
Total cPAHs	0	4	0	0.00	0
Total ncPAHs	0	4	0	0.00	0
vinyl chloride	0	0	0	0.00	0
1,1 - dichloroethane	0	0	0	0.00	0
1,2 - dichloroethylenes	0	0	0	0.00	0
methylene chloride	0	0	0	0.00	0
1,1,1 - trichloroethane	0	0	0	0.00	0
trichloroethylene	0	0	0	0.00	0
tetrachloroethylene	0	0	0	0.00	0
2 - butanone	0	0	0	0.00	0
acetone	0	0	0	0.00	0
benzene	0	0	0	0.00	0
ethylbenzene	0	0	0	0.00	0
toluene	0	0	0	0.00	0
xylene	0	0	0	0.00	0
arsenic	0	4	0	0.00	0
lead	4	4	0.44	2.28	7.5

TABLE 2 (Cont'd)
Summary Statistics for Study Chemicals in River Surface Water
PSC Resources Superfund Site, Palmer, MA

	Times Detected	Times Sought	Minimum Concentration of Detects	Average Concentration nd = 0	Maximum Concentration of Detects
Study Chemical	n	n	µg/l	µg/l	µg/l
TEDFs	0	0	0	0.00	0
Total PCBs	0	4	0	0.00	0
bis (2-ethylhexyl) phthalate	0	4	0	0.00	0
di-n-butylphthalate	0	4	0	0.00	0
Total cPAHs	0	4	0	0.00	0
Total ncPAHs	0	4	0	0.00	0
vinyl chloride	0	4	0	0.00	0
1,1 - dichloroethene	0	4	0	0.00	0
1,2 - dichloroethene (total)	0	4	0	0.00	0
methylene chloride	0	4	0	0.00	0
1,1,1 - trichloroethane	0	4	0	0.00	0
trichloroethene	0	4	0	0.00	0
tetrachloroethene	0	4	0	0.00	0
2 - butanone	0	4	0	0.00	0
acetone	0	4	0	0.00	0
benzene	0	4	0	0.00	0
ethylbenzene	0	4	0	0.00	0
toluene	0	4	0	0.00	0
xlenes (total)	0	4	0	0.00	0
arsenic	0	4	0	0.00	0
lead	0	4	0	0.00	0

TABLE 2 (Cont'd)
Summary Statistics for Study Chemicals in River Sediments
PSC Resources Superfund Site, Palmer, MA

	Times Detected	Times Sought	Minimum Concentration of Detects	Average Concentration nd = 0	Maximum Concentration of Detects
Study Chemical	n	n	mg/kg	mg/kg	mg/kg
TEDFs	0	0	0	0.00	0
Total PCBs	1	11	0.71	0.06	0.71
bis (2-ethylhexyl) phthalate	2	10	0.12	0.05	0.42
di-n-butylphthalate	0	10	0	0.00	0
Total cPAHs	9	10	0.1	1.50	4.61
Total ncPAHs	10	10	0.214	1.96	5.949
vinyl chloride	0	4	0	0.00	0
1,1 - dichloroethane	0	4	0	0.00	0
1,2 - dichloroethylenes	0	4	0	0.00	0
methylene chloride	0	4	0	0.00	0
1,1,1 - trichloroethane	0	4	0	0.00	0
trichloroethylene	0	4	0	0.00	0
tetrachloroethylene	0	4	0	0.00	0
2 - butanone	0	4	0	0.00	0
acetone	1	4	0.35	0.09	0.35
benzene	1	4	0.009	2.25E-03	0.009
ethylbenzene	0	4	0	0.00	0
toluene	0	4	0	0.00	0
xylenes	0	0	0	0.00	0
arsenic	6	6	1.6	2.55	3.9
lead	6	6	3.7	35.12	91.2

TABLE 2 (Cont'd)
Summary Statistics for Lagoon Surface Water
PSC Resources Superfund Site, Palmer, MA

	Times Detected	Times Sought	Minimum Concentration of Detects	Average Concentration nd = 0	Maximum Concentration of Detects
Study Chemical	n	n	µg/l	µg/l	µg/l
TEDFs	0	0	0	0.00	0
Total PCBs	0	3	0	0.00	0
bis (2-ethylhexyl) phthalate	0	3	0	0.00	0
di-n-butylphthalate	0	3	0	0.00	0
Total cPAHs	3	3	11	17.67	23
Total ncPAHs	3	3	13	28.33	42
vinyl chloride	0	3	0	0.00	0
1,1 - dichloroethane	3	3	8	11.33	16
1,2 - dichloroethane (total)	3	3	3	3.67	5
methylene chloride	1	3	3	1.00	3
1,1,1 - trichloroethane	3	3	2	2.67	4
trichloroethene	0	3	0	0.00	0
tetrachloroethene	0	3	0	0.00	0
2 - butanone	0	3	0	0.00	0
acetone	0	3	0	0.00	0
benzene	0	3	0	0.00	0
ethylbenzene	0	3	0	0.00	0
toluene	0	3	0	0.00	0
xylene (total)	0	3	0	0.00	0
arsenic	3	3	8.7	9.03	9.3
lead	3	3	34.8	58.33	76.8

TABLE 2 (Cont'd)
Summary Statistics for Lagoon Sediments
PSC Resources Superfund Site, Palmer, MA

	Times Detected	Times Sought	Minimum Concentration of Detects	Average Concentration nd = 0	Maximum Concentration of Detects
Study Chemicals	n	n	mg/kg	mg/kg	mg/kg
TEDFs	0	2	0	0.00	0
Total PCBs	0	19	0	0.00	0
bis (2-ethylhexyl) phthalate	7	16	6.6	100.79	580
di-n-butylphthalate	4	16	5.2	23.51	160
Total cPAHs	14	16	9.9	1902.82	7250
Total ncPAHs	16	16	20.1	16392.53	97350
vinyl chloride	0	19	0	0.00	0
1,1 - dichloroethane	5	19	0.015	0.58	9.8
1,2 - dichloroethylenes	4	19	0.015	0.66	8.4
methylene chloride	2	19	1.6	1.14	20
1,1,1 - trichloroethane	8	19	23	106.16	1700
trichloroethylene	6	19	0.012	2.72	33
tetrachloroethylene	9	19	0.066	1.95	21
2 - butanone	0	19	0	0.00	0
acetone	3	19	0.57	2.35	43
benzene	15	19	0.08	84.02	340
ethylbenzene	19	19	2.2	80.62	300
toluene	19	19	1.7	194.96	750
xylene	19	19	4.8	133.93	460
arsenic	14	14	1.45	10.69	36.93
lead	14	14	186	4559.71	12600

TABLE 2 (Cont'd)

Summary Statistics for Study Chemicals in Wetland Sediments
PSC Resources Superfund Site, Palmer, MA

Study Chemicals	Surface Samples Depth = 0-1 foot					Deep Samples Depth = 0-12 feet				
	Times Detected	Times Sought	Minimum Concentration of Detects mg/kg	Average Concentration nd = 0 mg/kg	Maximum Concentration of Detects mg/kg	Times Detected	Times Sought	Minimum Concentration of Detects mg/kg	Average Concentration nd = 0 mg/kg	Maximum Concentration of Detects mg/kg
	n	n				n	n			
TEDFs	1	1	5.00E-05	5.00E-05	5.00E-05	1	1	5.00E-05	5.00E-05	5.00E-05
Total PCBs	15	43	0.088	2.06	32	15	62	0.088	1.43	32.00
bis (2-ethylhexyl) phthalate	25	39	0.070	0.61	11	33	54	0.07	0.57	11.00
di-n-butylphthalate	13	39	0.097	0.11	1.7	19	54	0.027	0.10	1.70
Total cPAHs	33	39	0.201	5.22	38.4	33	54	0.201	3.77	38.40
Total ncPAHs	35	39	0.316	11.48	128.7	36	54	0.211	8.30	128.70
vinyl chloride	0	23	0.000	0.00	0	0	39	0	0.00	0
1,1 - dichloroethane	0	23	0.000	0.00	0	2	39	0.002	3.08E-04	0.010
1,2 - dichloroethylenes	0	23	0.000	0.00	0	1	39	0.002	5.13E-05	0.002
methylene chloride	2	23	0.005	0.00	0.009	11	39	0.003	2.67E-03	0.025
1,1,1 - trichloroethane	0	23	0.000	0.00	0	1	39	0.004	1.03E-04	0.004
trichloroethylene	0	23	0.000	0.00	0	0	39	0	0.00	0
tetrachloroethylene	0	23	0.000	0.00	0	0	39	0	0.00	0
2 - butanone	1	23	0.003	0.00	0.003	5	39	0.002	1.10E-03	0.024
acetone	1	23	0.014	0.00	0.014	3	39	0.014	2.38E-03	0.045
benzene	0	23	0.000	0.00	0	1	39	0.001	2.56E-05	0.001
ethylbenzene	0	23	0.000	0.00	0	0	39	0	0.00	0
toluene	0	23	0.000	0.00	0	2	39	0.002	1.54E-04	0.004
xylones	0	23	0.000	0.00	0	3	38	0.003	3.95E-04	0.008
arsenic	37	38	0.800	6.74	21.8	50	59	0.36	4.58	21.80
lead	42	42	1.700	1821.99	50100	63	63	0.8	1215.37	50100.00

TABLE 2
Summary Statistics for Study Chemicals in Soil
PSC Resources Superfund Site, Palmer, MA

Study Chemicals	Surface Samples Depth = 0-1 foot					Deep Samples Depth = 0-12 feet				
	Times Detected	Times Sought	Minimum Concentration of Detects mg/kg	Average Concentration nd = 0 mg/kg	Maximum Concentration of Detects mg/kg	Times Detected	Times Sought	Minimum Concentration of Detects mg/kg	Average Concentration nd = 0 mg/kg	Maximum Concentration of Detects mg/kg
TEDFs	3	3	1.00E-07	4.00E-06	1.00E-05	5	5	1.00E-07	4.32E-06	1.00E-05
Total PCBs	14	25	4.30E-02	17.12	58.00	36	62	4.30E-02	7.34	65
bis (2-ethylhexyl) phthalate	8	11	0.046	3.86	26.00	13	24	0.046	1.55	26
di-n-butylphthalate	3	11	0.11	0.31	0.41	5	24	0.076	0.04	0.41
Total cPAHs	11	11	0.469	4.75	29.1	20	24	0	4.09	46
Total ncPAHs	11	11	1.13	8.05	32.7	20	24	0	63.59	953
vinyl chloride	0	14	0	0.00	0	0	27	0	0.00	0
1,1 - dichloroethane	5	14	0.004	0.02	0.043	9	27	0.004	0.51	6.6
1,2 - dichloroethylenes	7	14	0.003	0.07	0.41	12	27	0.003	7.35	190
methylene chloride	0	14	0	0.00	0	0	27	0	0.00	0
1,1,1 - trichloroethane	4	14	0.004	0.01	0.028	8	27	0.004	11.86	200
trichloroethylene	4	14	0.004	0.07	0.17	8	27	0.004	14.95	390
tetrachloroethylene	4	14	0.004	0.01	0.033	8	27	0.004	2.88	63
2 - butanone	5	14	0.017	0.41	1.9	5	27	0.017	0.08	1.9
acetone	2	14	0.034	0.72	1.4	6	27	0.033	0.07	1.4
benzene	3	14	0.005	0.40	1.2	7	27	0.005	1.37	16
ethylbenzene	1	14	0.29	0.29	0.29	6	27	0.29	7.21	78
toluene	1	14	2.8	2.80	2.8	7	27	0.006	9.83	130
xylene	1	14	26	26.00	26	8	27	0.002	12.60	100
arsenic	3	3	2.3	4.57	7.1	16	16	0.8	3.67	9.5
lead	19	19	155	10910.00	39200.00	32	32	1	7043.98	39200.00

TABLE 1

HABITAT SUITABILITY EVALUATION

<u>Species/Group</u>	<u>PSC Assessment Area Ratings*</u>	<u>Quaboag River Assessment Area Ratings*</u>
Warmwater Fish	M	M
Wood Duck Breeding	H	H
Wood Duck Migration	L	H
Wood Duck Wintering	L	L
Alder Flycatcher	H	H
Black-crowned Night Heron	H	M
Great Blue Heron	H	H
Green Heron	M	M
Tree Swallow	M	M

* Ratings:

H = High Probability

M = Medium Probability

L = Low Probability

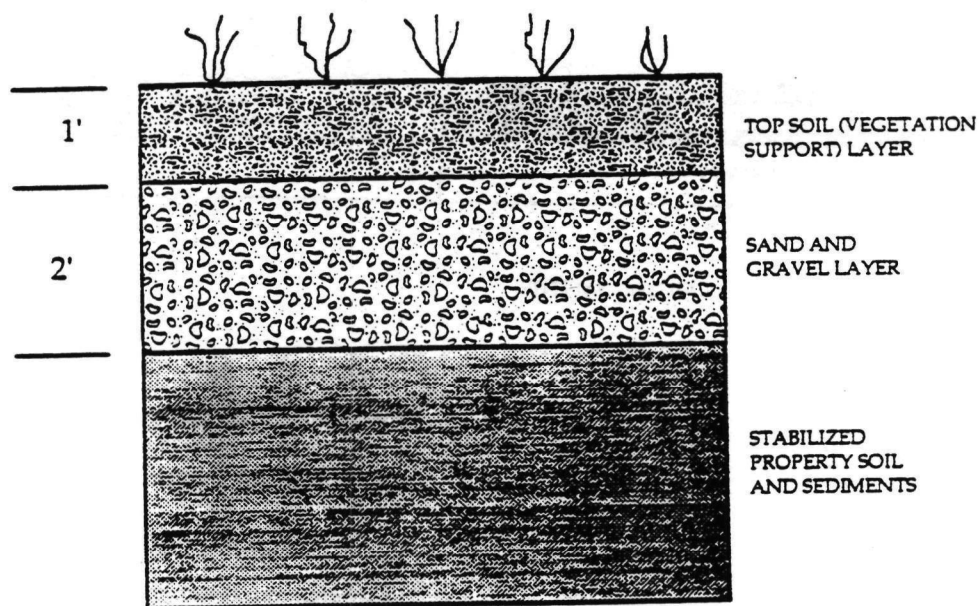
APPENDIX B

TABLES

TABLE 1	HABITAT SUITABILITY EVALUATION
TABLE 2	SUMMARY OF STATISTICS FOR STUDY CHEMICALS IN SOILS, WETLAND SEDIMENTS, LAGOON SEDIMENTS, LAGOON SURFACE WATER, QUABOAG RIVER SEDIMENTS, QUABOAG RIVER SURFACE WATER, FISH, GROUNDWATER, AND BUILDING SAMPLES
TABLE 3	EXPOSURE SCENARIOS
TABLE 4	EXPOSURE ASSUMPTIONS FOR PROPERTY SOIL/WETLAND SEDIMENTS, LAGOON SEDIMENTS, LAGOON SURFACE WATER, QUABOAG RIVER SEDIMENTS, GROUNDWATER, FISH, AND BUILDINGS
TABLE 5	SUMMARY OF RISK ESTIMATES BY MEDIUM
TABLE 6	SOURCE CONTROL AND MANAGEMENT OF MIGRATION ALTERNATIVES RETAINED FOR EVALUATION
TABLE 7	CLEANUP LEVELS
TABLE 8	C _p -CONCENTRATIONS OF THE INFILTRATION (LEACHATE-PPB)

FIGURE 34

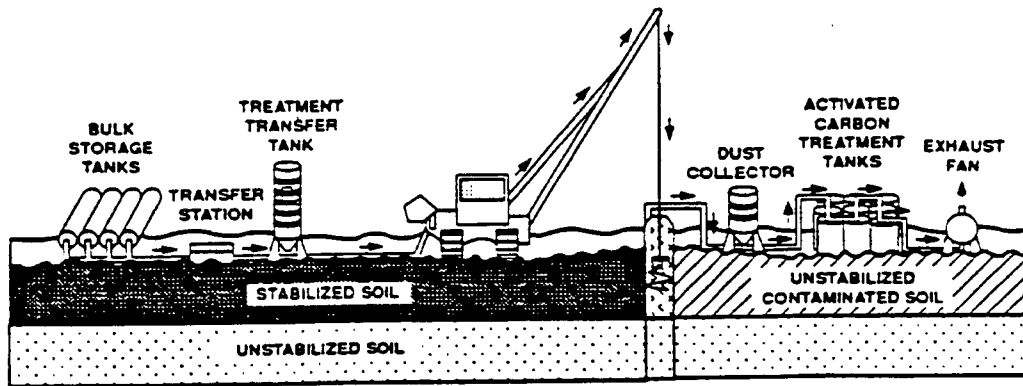
Conceptual Permeable Cap Cross Section



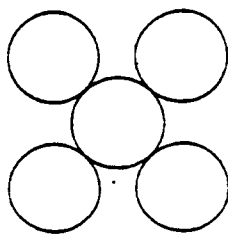
NOT TO SCALE

Source: HMM Associates, Inc., Feasibility Study, January 1992

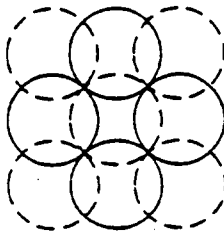
FIGURE 33
Alternative SC-6
In-Situ Stabilization



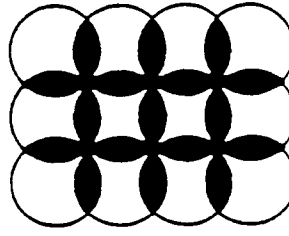
DRILLING PATTERN



PRIMARY



SECONDARY



COMPLETED OVERLAPPING
AND COMPLETE TREATMENT

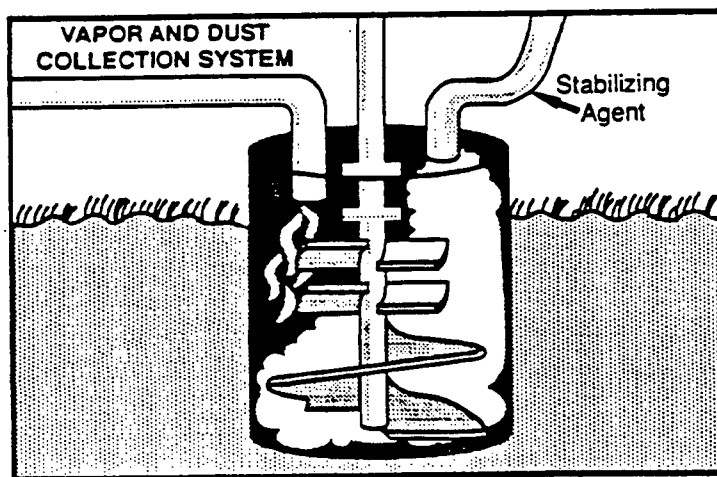




FIGURE 32
 MASSACHUSETTS WETLAND RESOURCE AREAS
 BASED ON FIELD INVESTIGATION

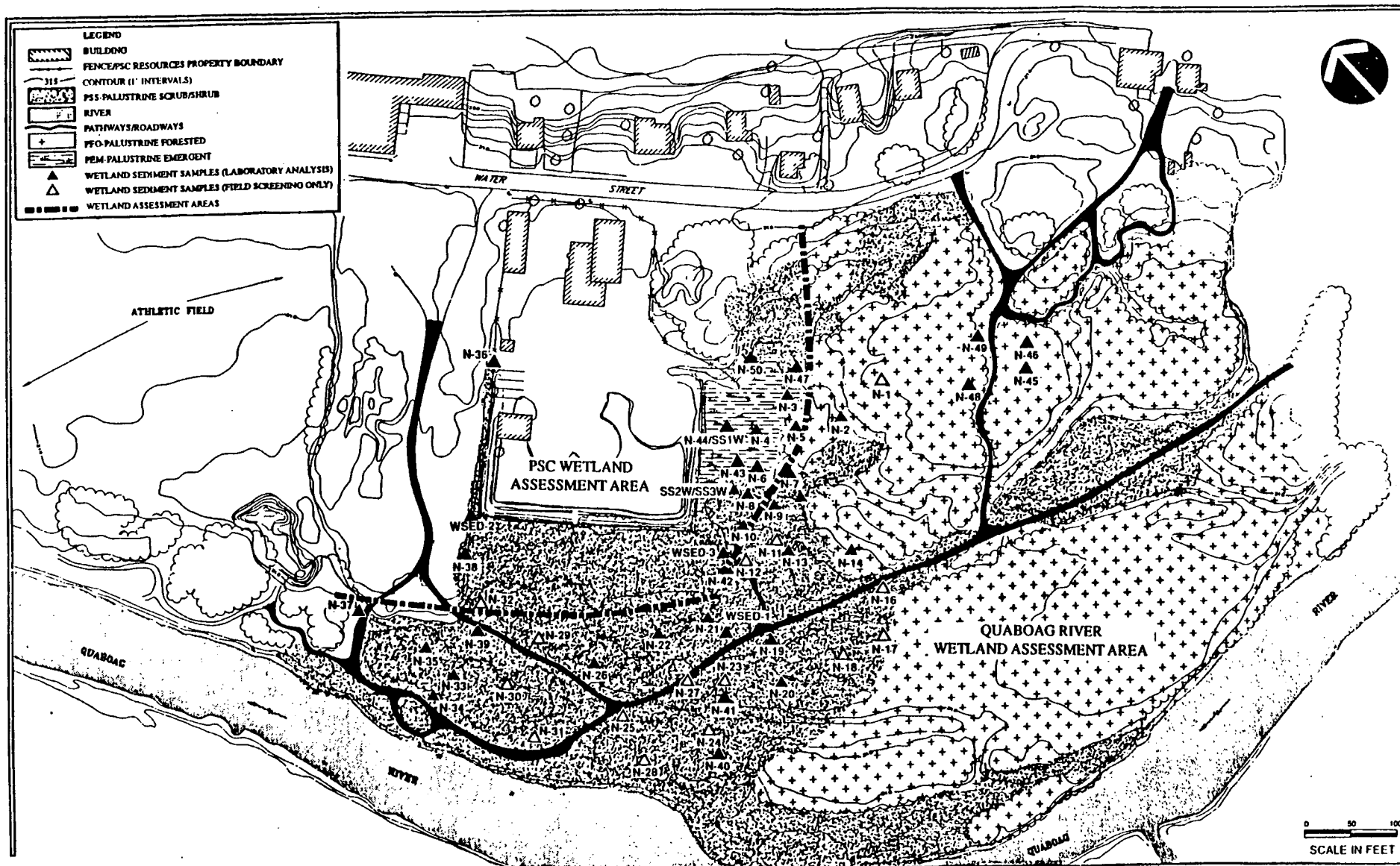
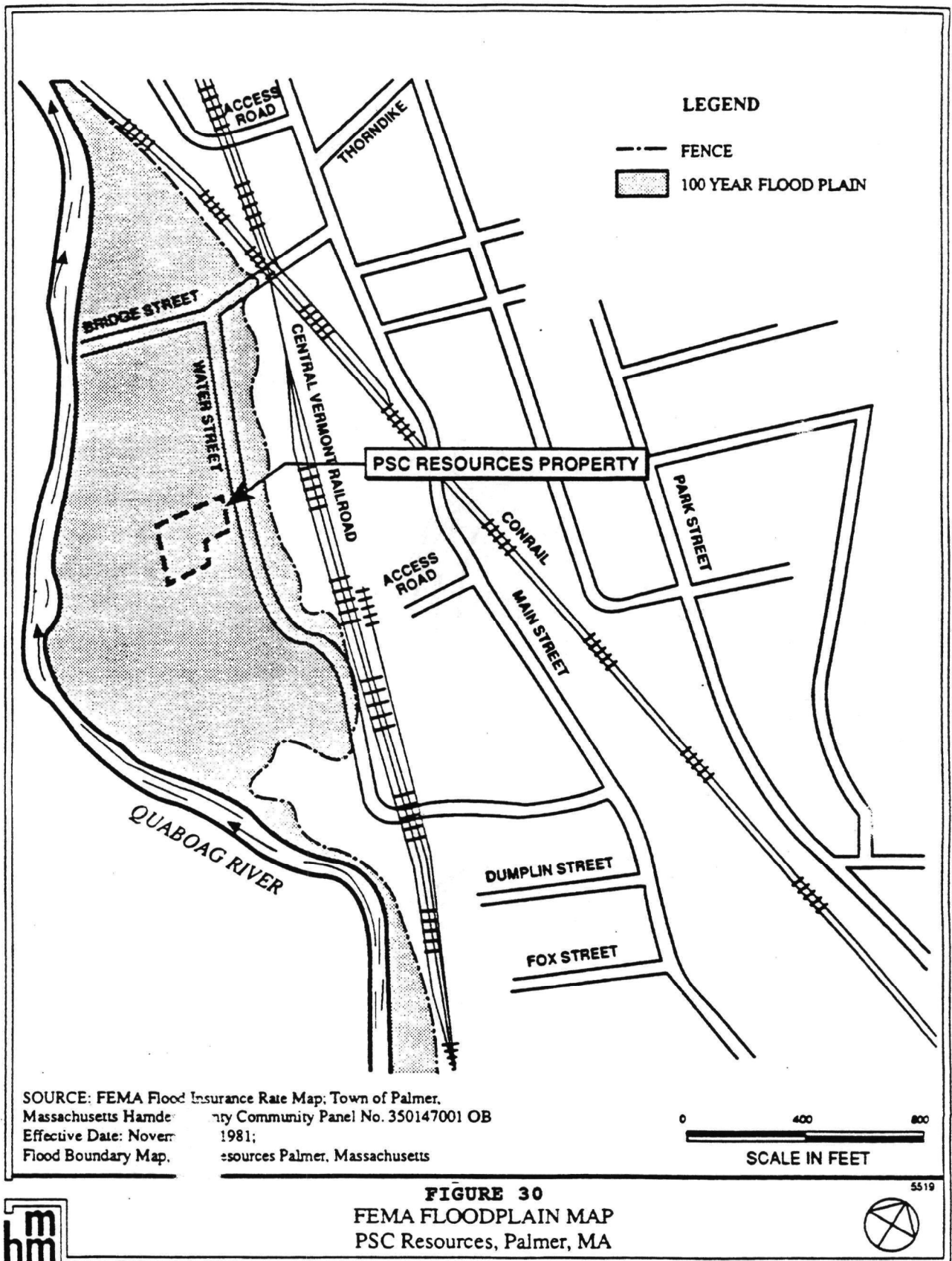


FIGURE 31
WETLAND CLASSIFICATION BASED ON AERIAL PHOTOGRAPHY AND FIELD INVESTIGATION





STREET
BRIDGE

ATHLETIC FIELD

PC-1148
(220)

QUABOAG

RIVER

QUABOAG

RIVER

LEGEND	
⊕	SINGLE MONITORING WELL
⊕⊕	COUPLET OF MONITORING WELLS
⊕⊕⊕	TRIPLET OF MONITORING WELLS
▒	BUILDING
—	FENCE/PSC RESOURCES SITE BOUNDARY
—	CONTOUR (1' INTERVALS)
CONTOURS	
-----	1988
-----	1989
-----	1990
DATA	
518	1988
227	1989
(142)	1990

0 50 100
SCALE IN FEET

PSC RESOURCES
Palmer, Massachusetts
FIGURE 29
TVOC PLUME SAMPLING
ROUNDS 1 (10/88), 2 (11/89),
4 (5/90)

hmm

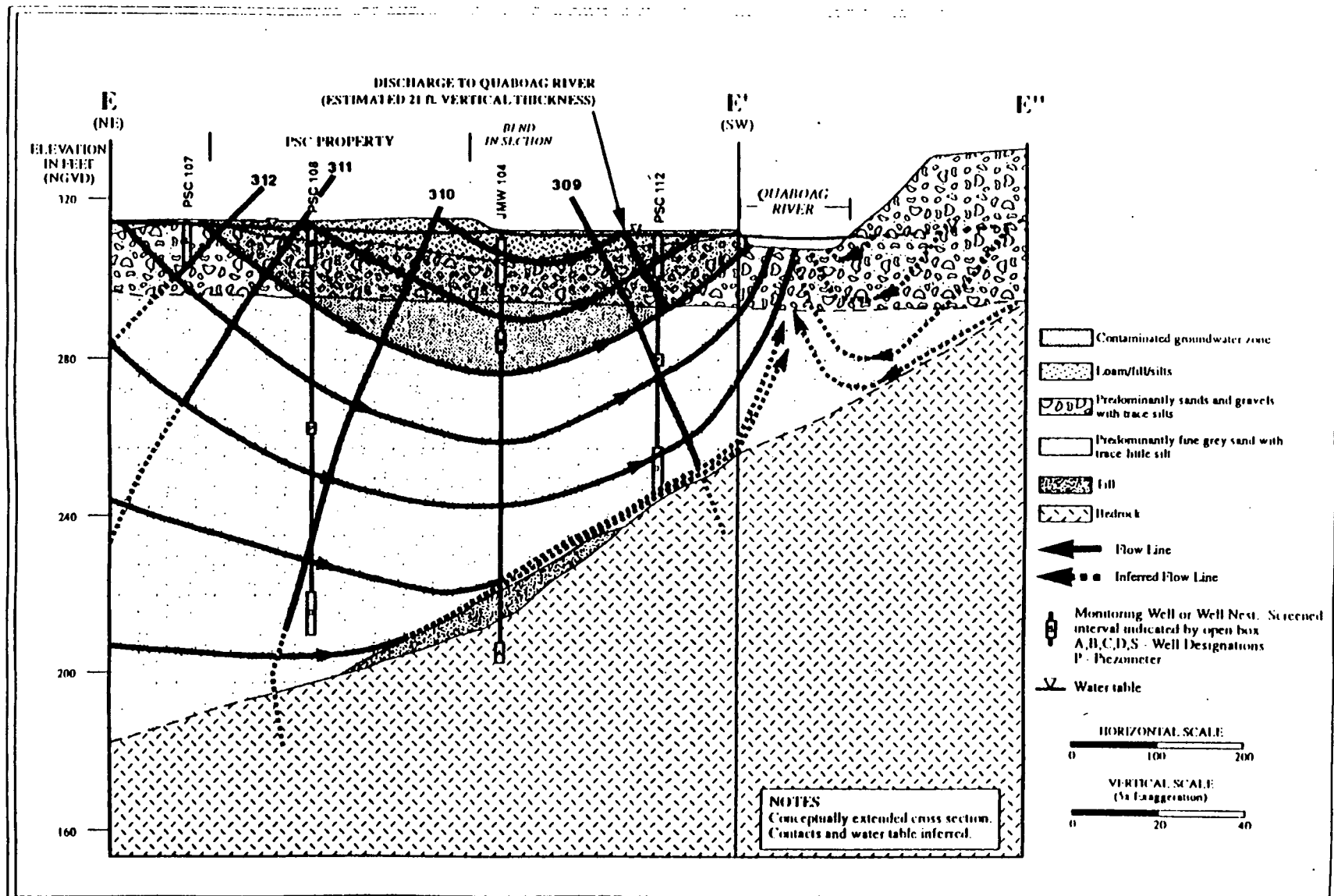


FIGURE 28

ESTIMATED VERTICAL EXTENT OF GROUNDWATER CONTAMINATION

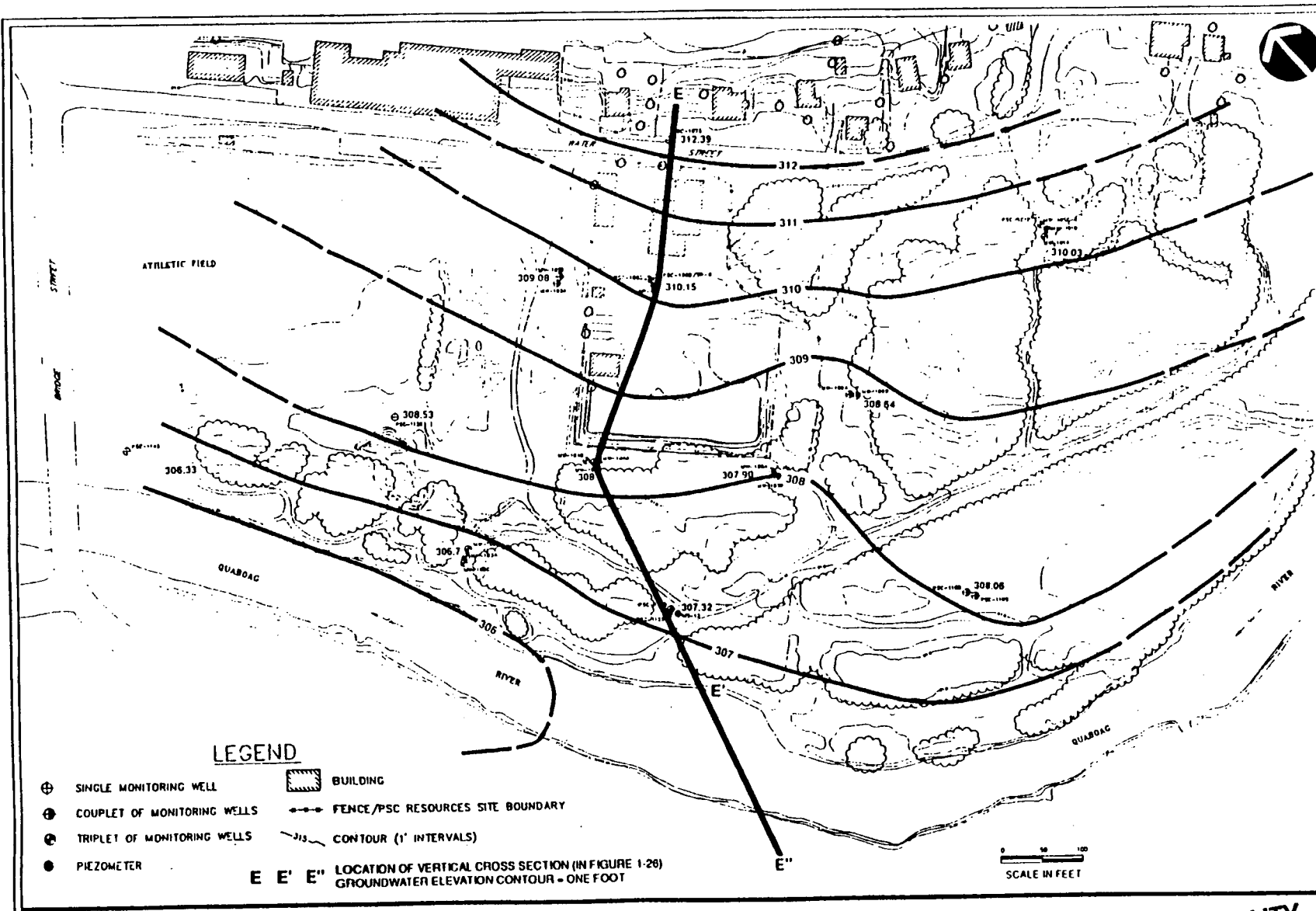


FIGURE 27
PSC RESOURCES GROUNDWATER ELEVATION CONTOUR MAP - August 9, 1990

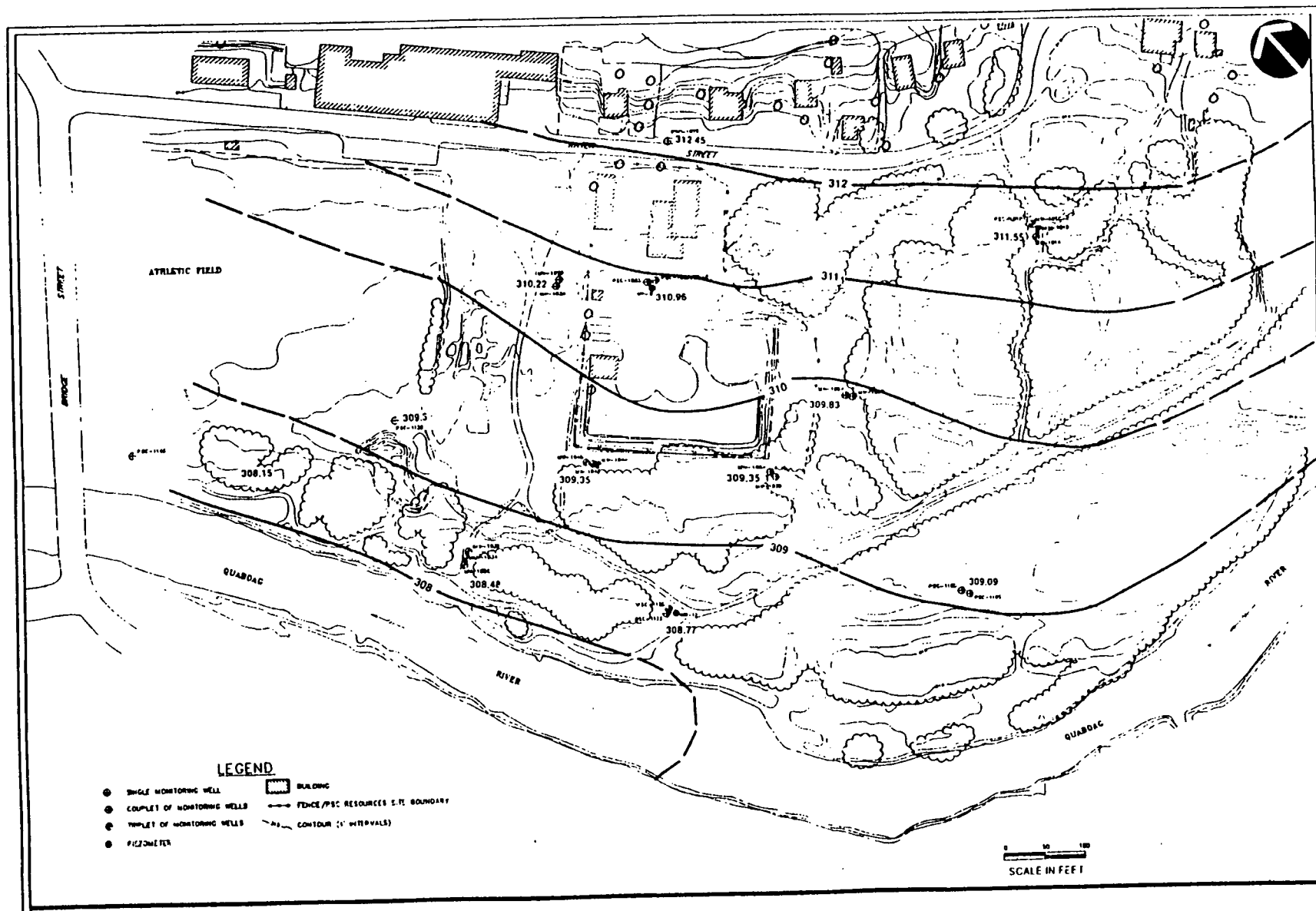


FIGURE 26
PSC RESOURCES GROUNDWATER ELEVATION CONTOUR MAP - May 23, 1990

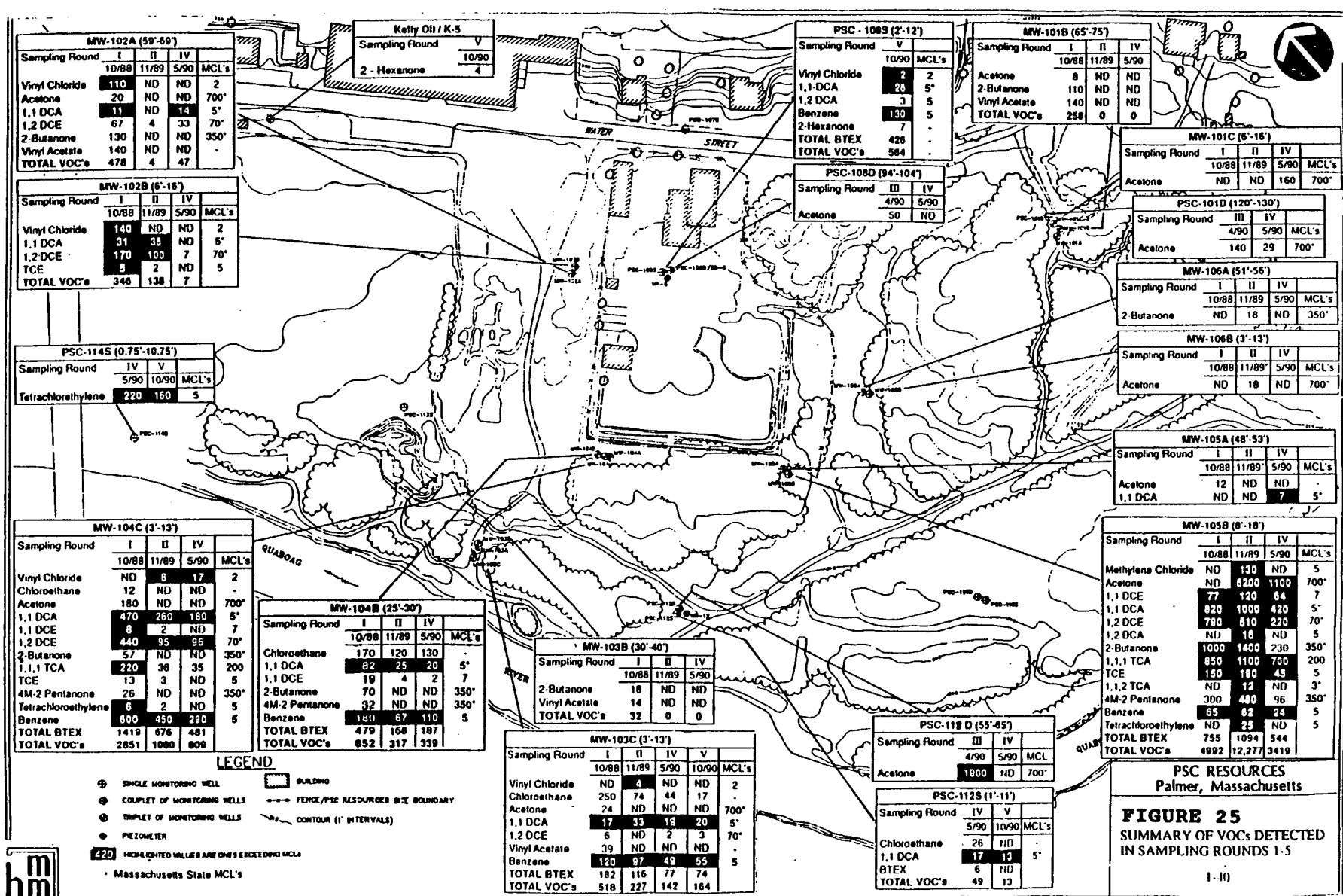
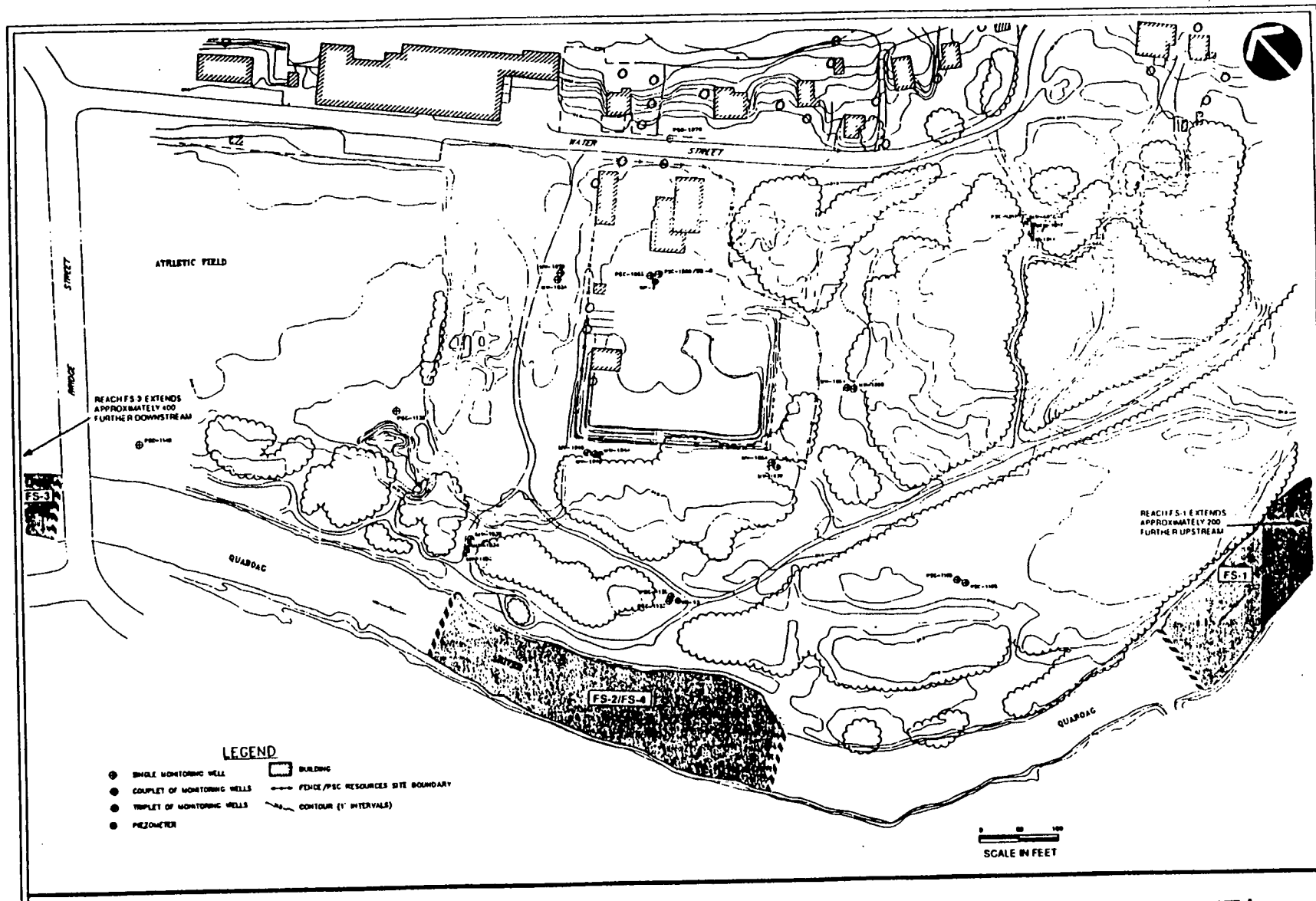


FIGURE 25
SUMMARY OF VOCs DETECTED
IN SAMPLING ROUNDS 1-5



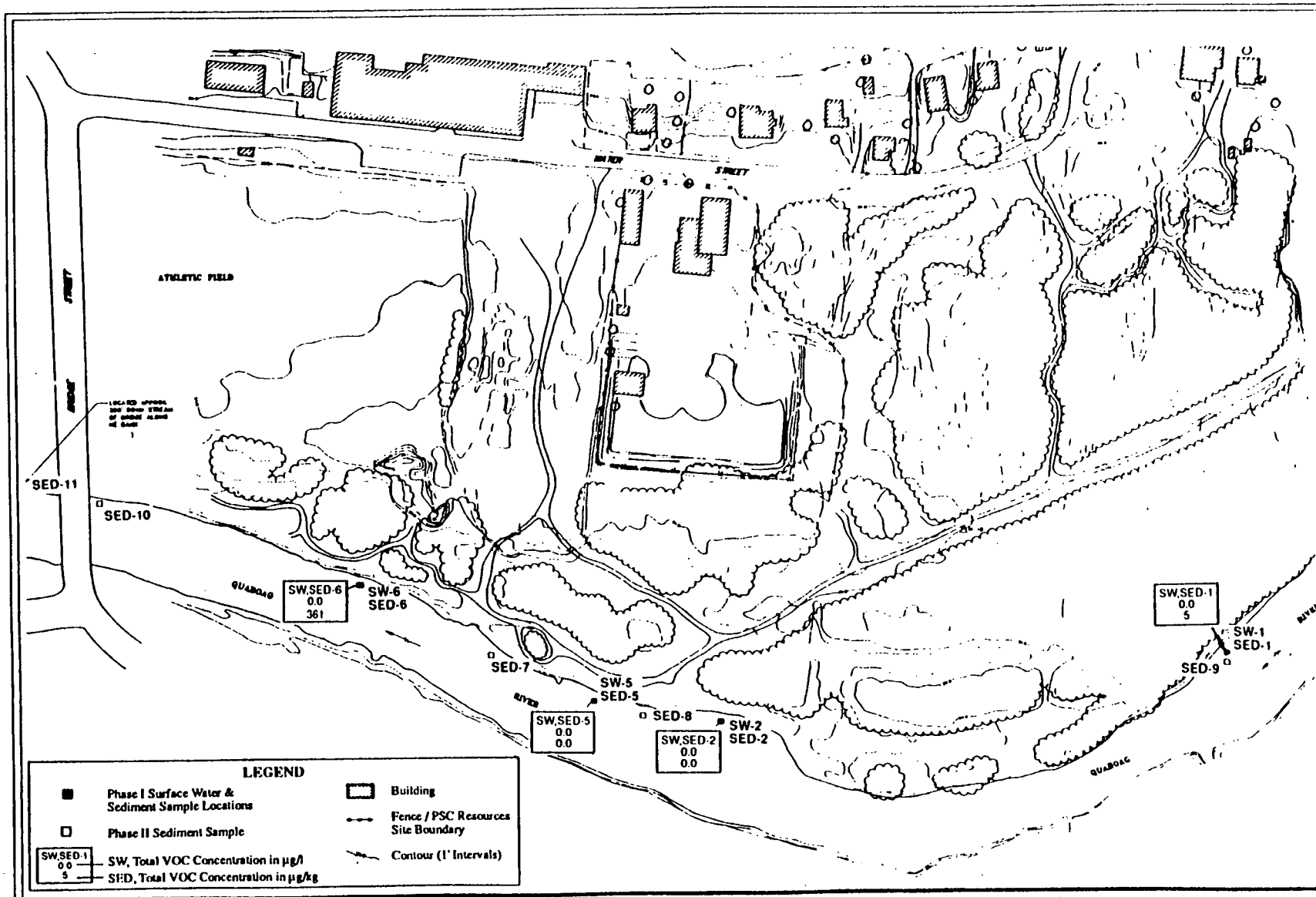


FIGURE 23
TOTAL CONCENTRATIONS OF VOC'S: PHASE I SAMPLING RESULTS
PSC Resources

POOR QUALITY
ORIGINAL

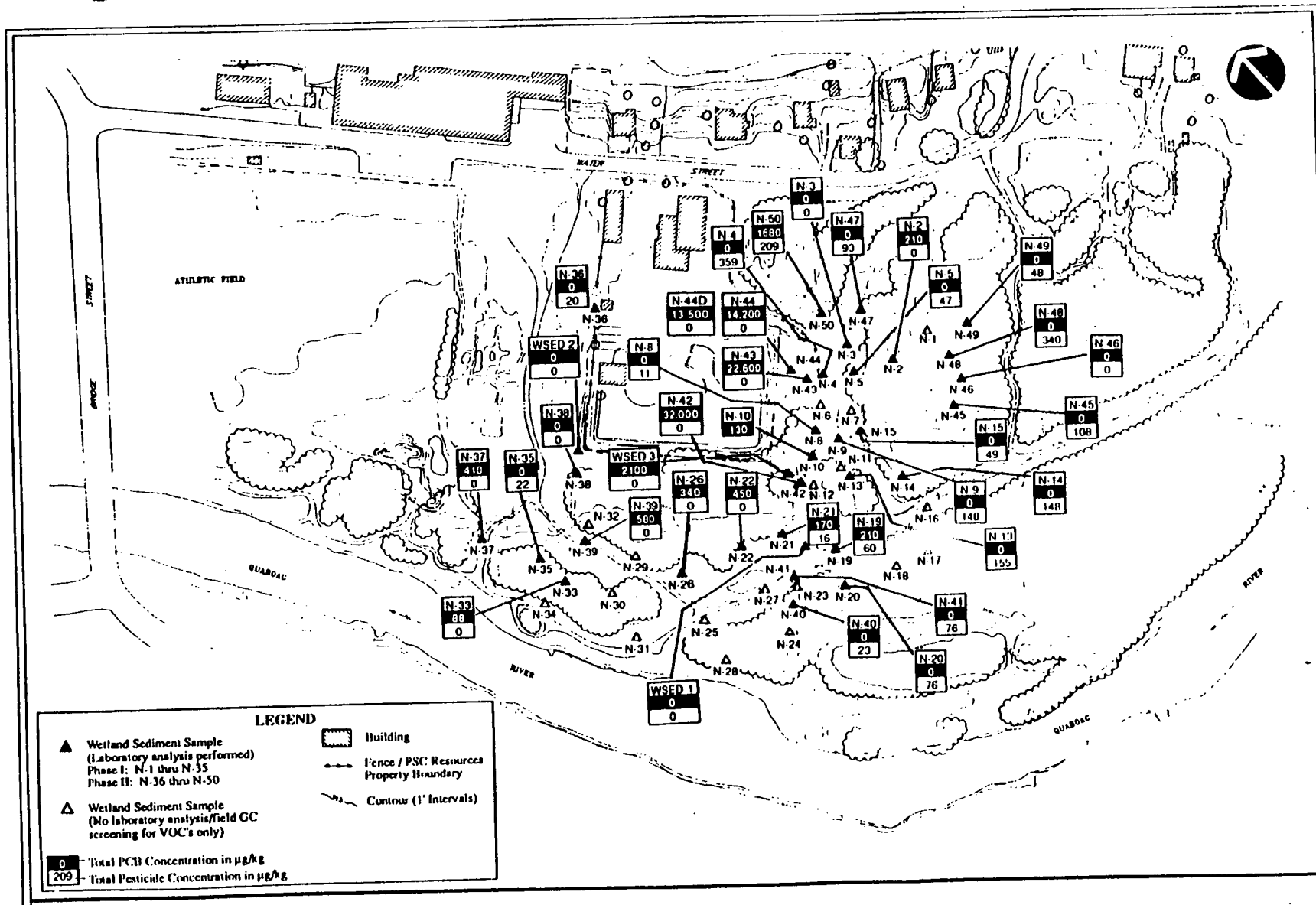


FIGURE 22
TOTAL PCB AND PESTICIDE CONCENTRATIONS AT THE PSC RESOURCES SITE

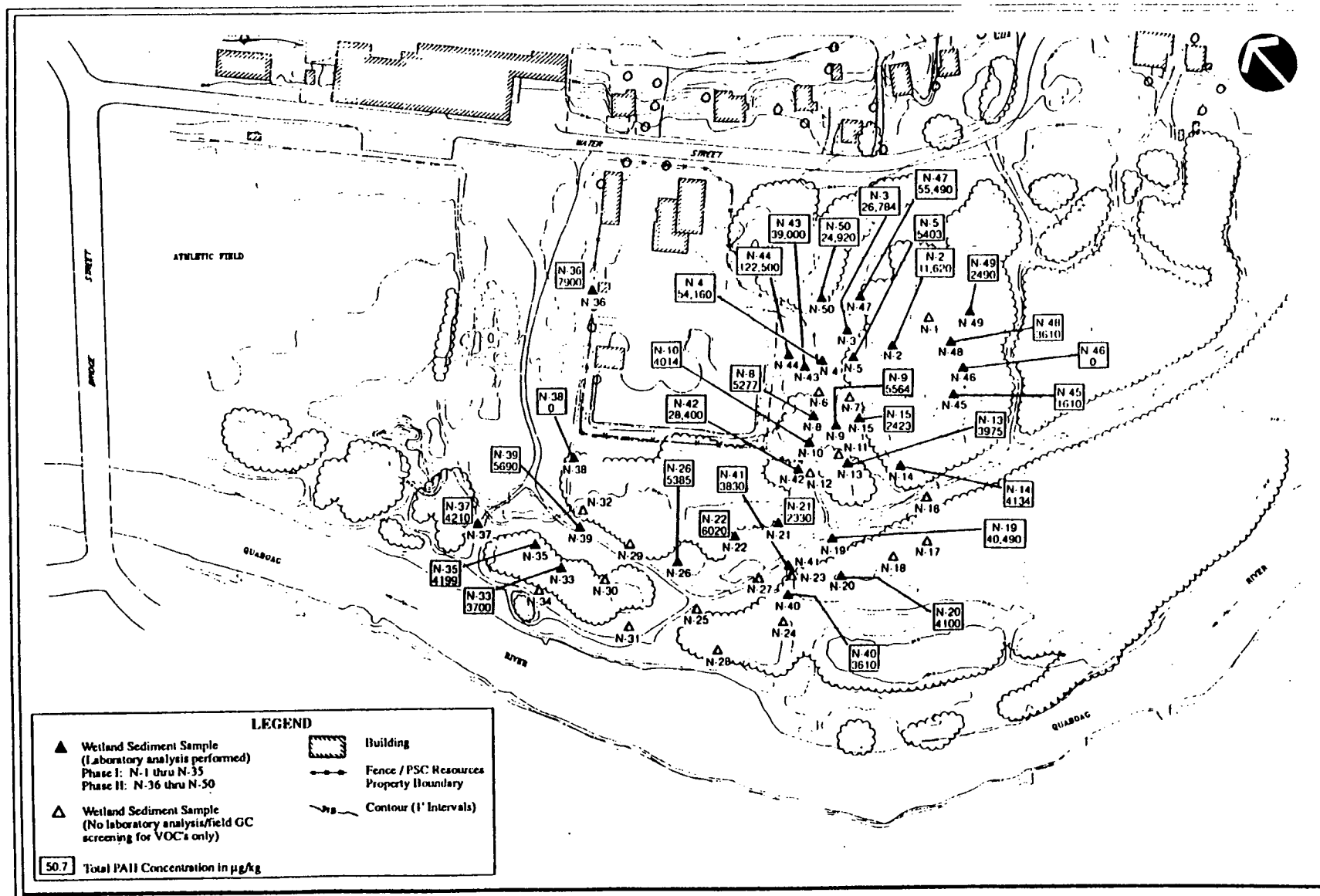


FIGURE 21
TOTAL PAH CONCENTRATIONS AT THE PSC RESOURCES SITE

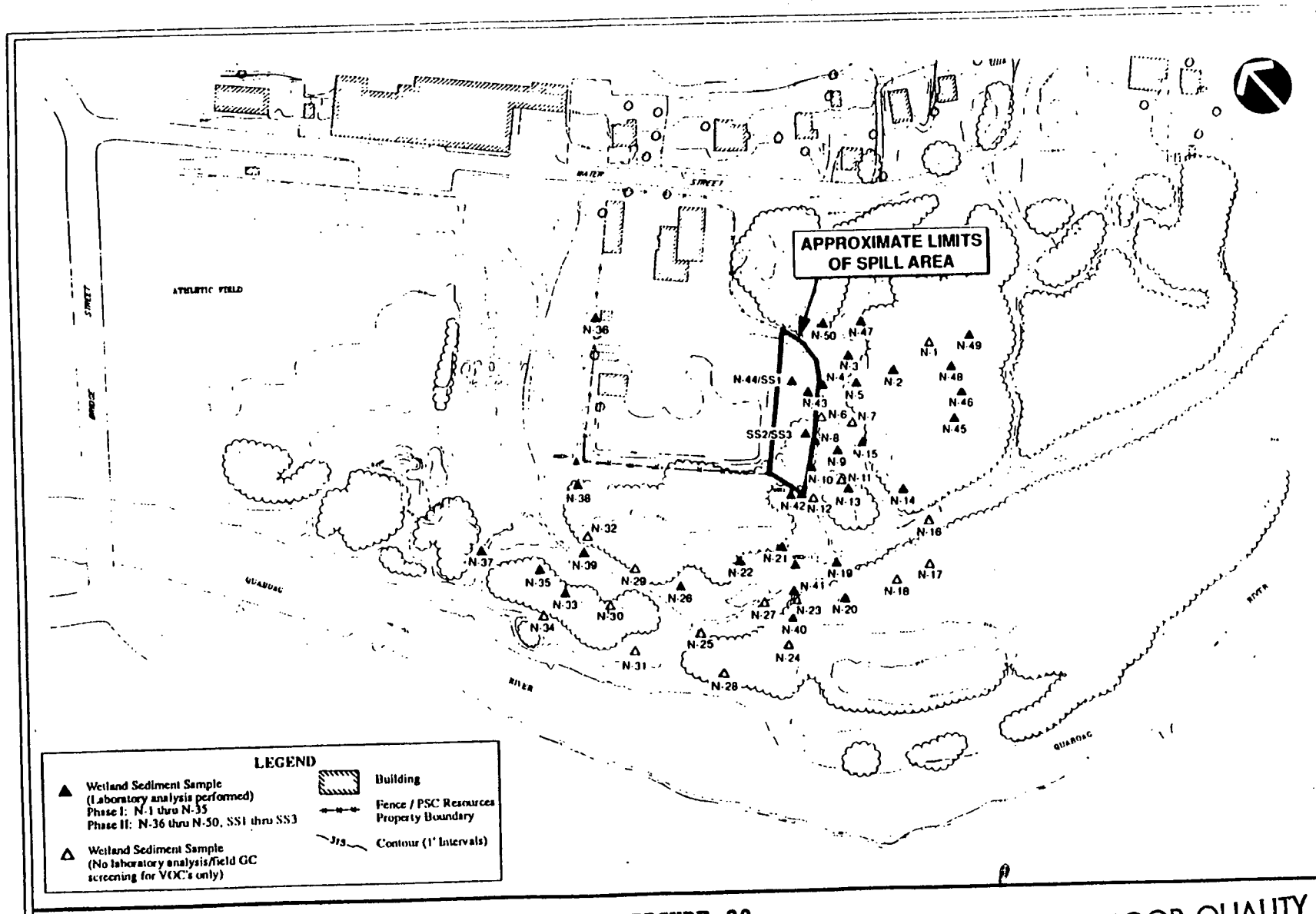


FIGURE 20
LOCATIONS OF WETLAND SEDIMENT SAMPLES AND
APPROXIMATE LIMITS OF SPILL AREA

POOR QUALITY
ORIGINAL

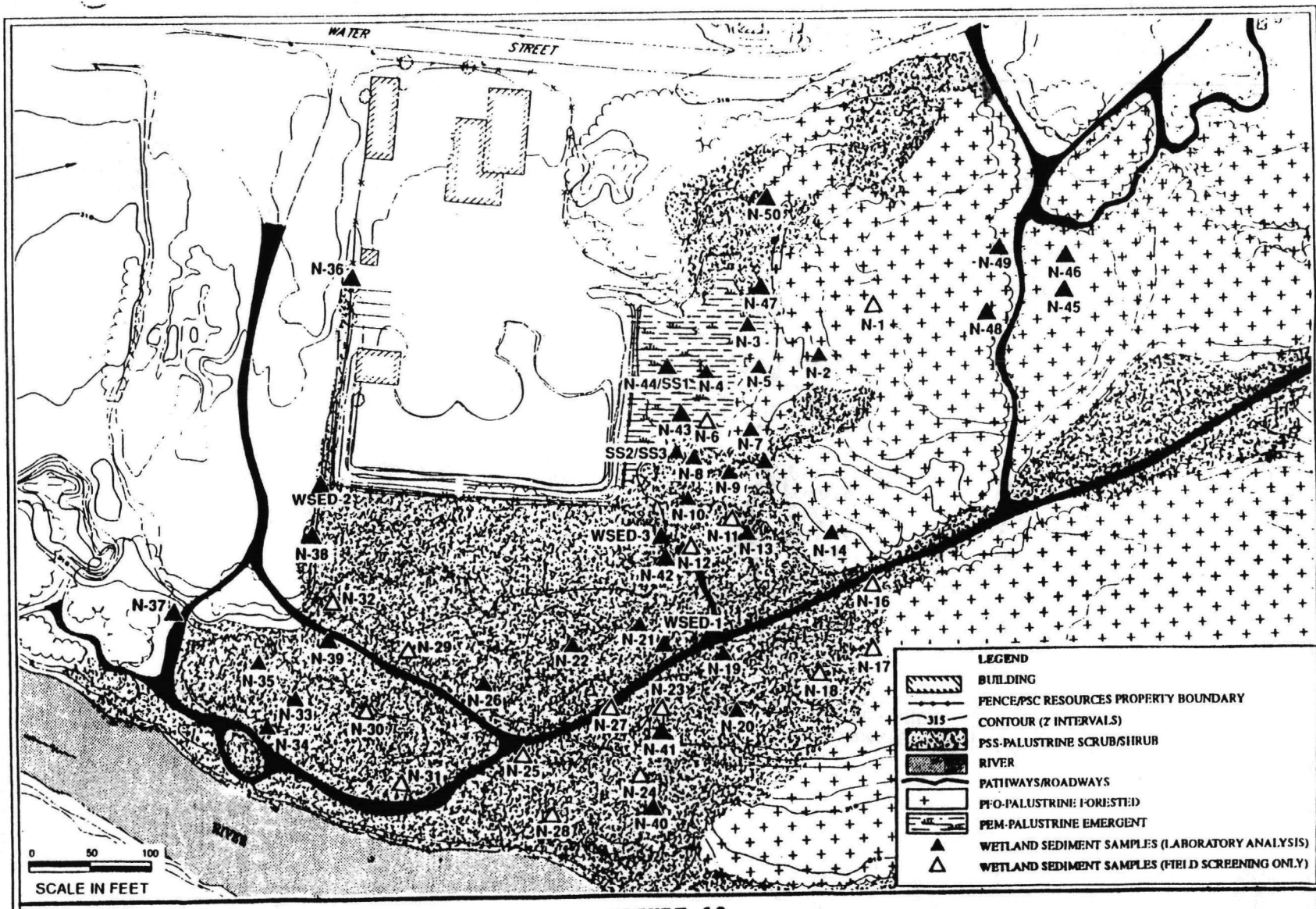


FIGURE 19
WETLAND HABITAT DELINEATION AND PHASE I & II WETLAND SEDIMENT
SAMPLING LOCATION IN THE PSC RESOURCES SITE

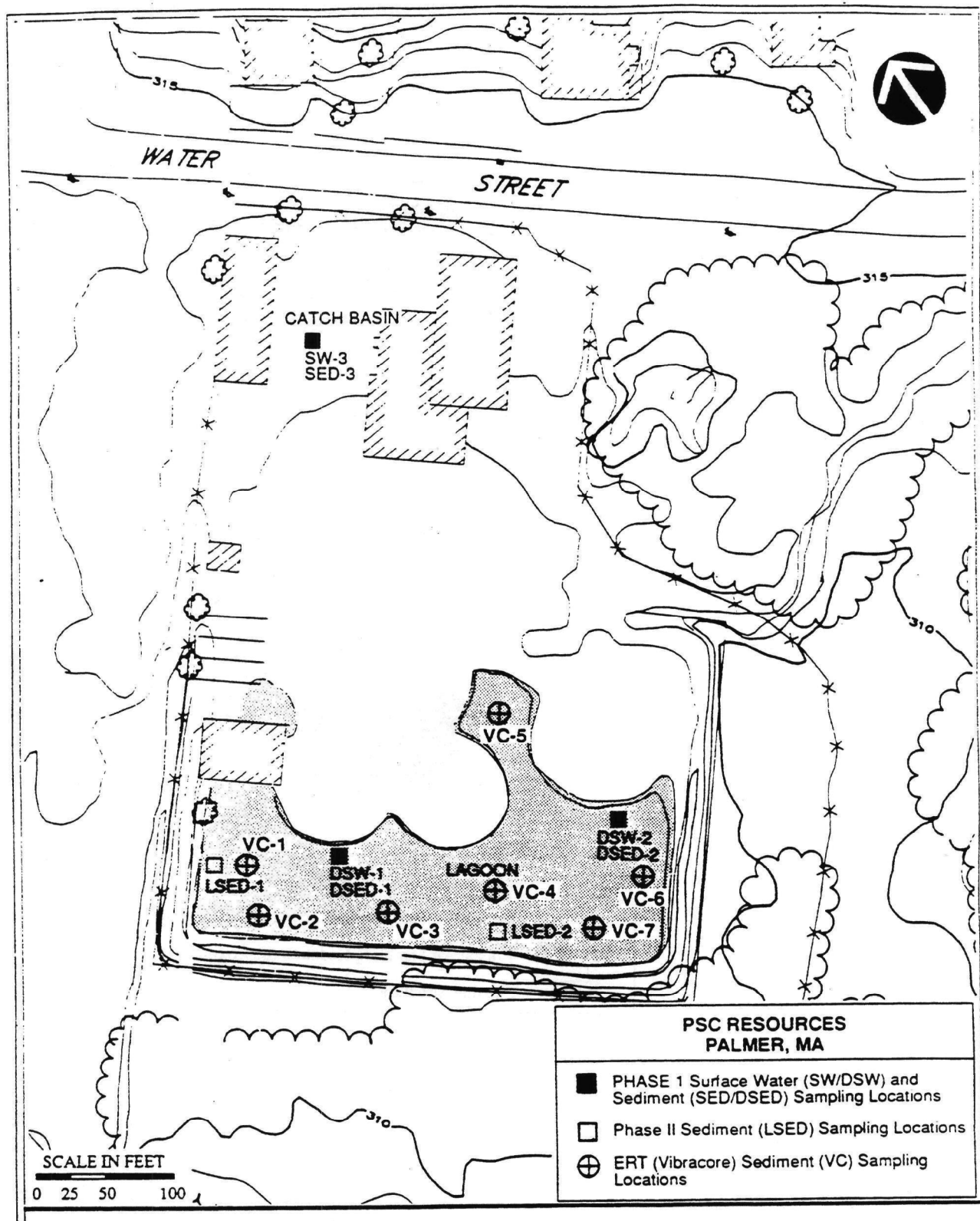
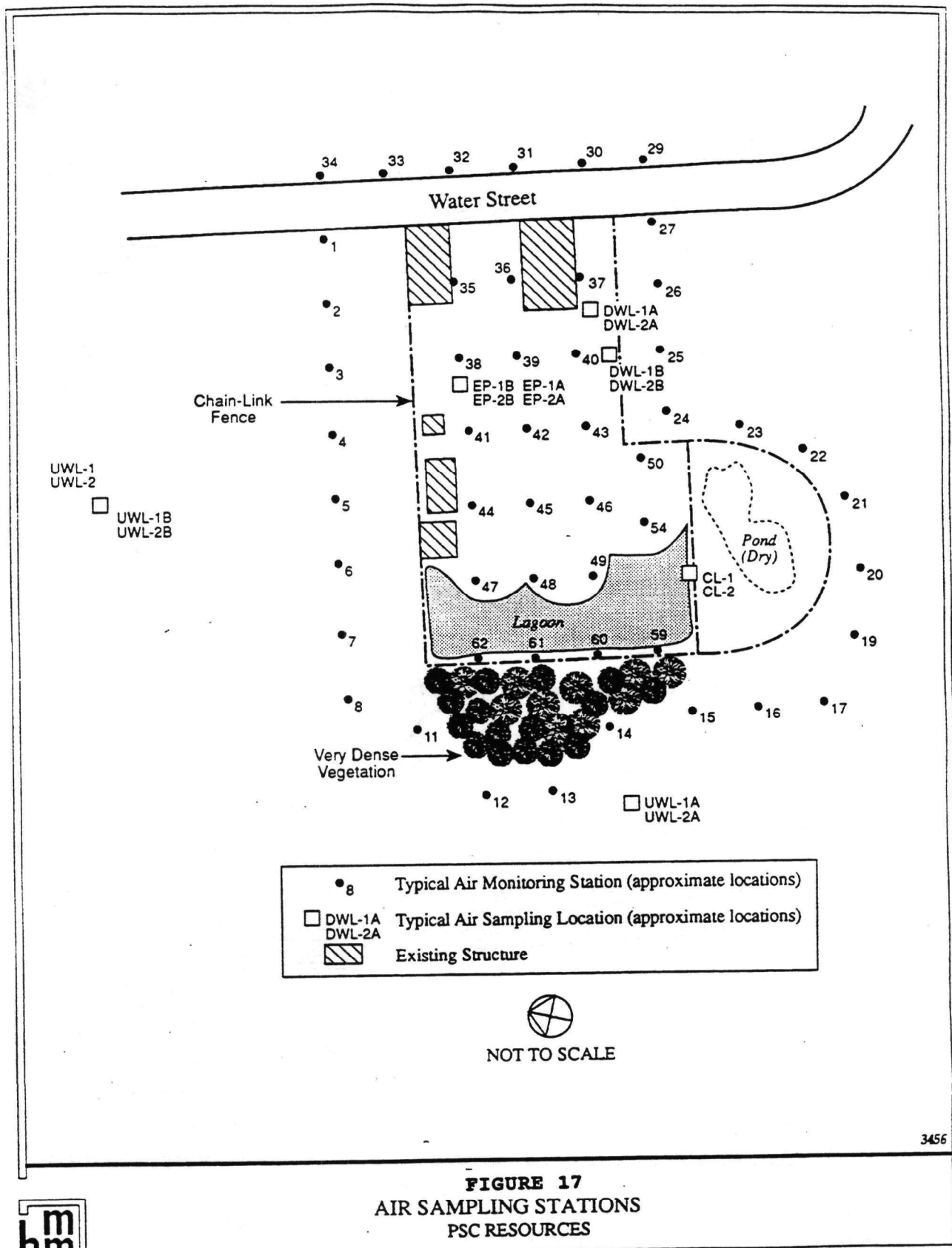


FIGURE 18
PHASE I AND PHASE II PROPERTY SURFACE WATER
AND SEDIMENT SAMPLING LOCATIONS





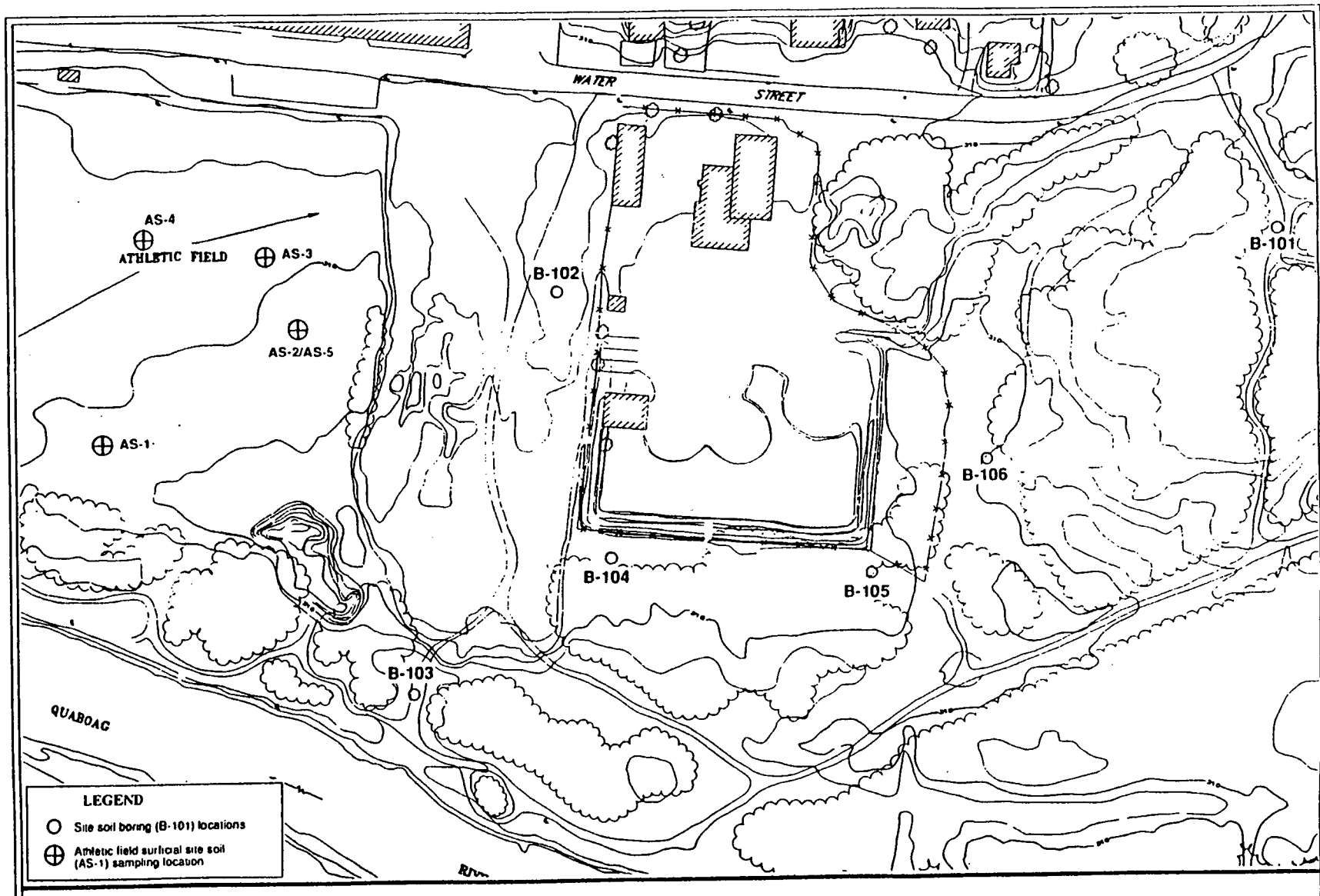


FIGURE 16
SITE SOIL SAMPLING LOCATIONS

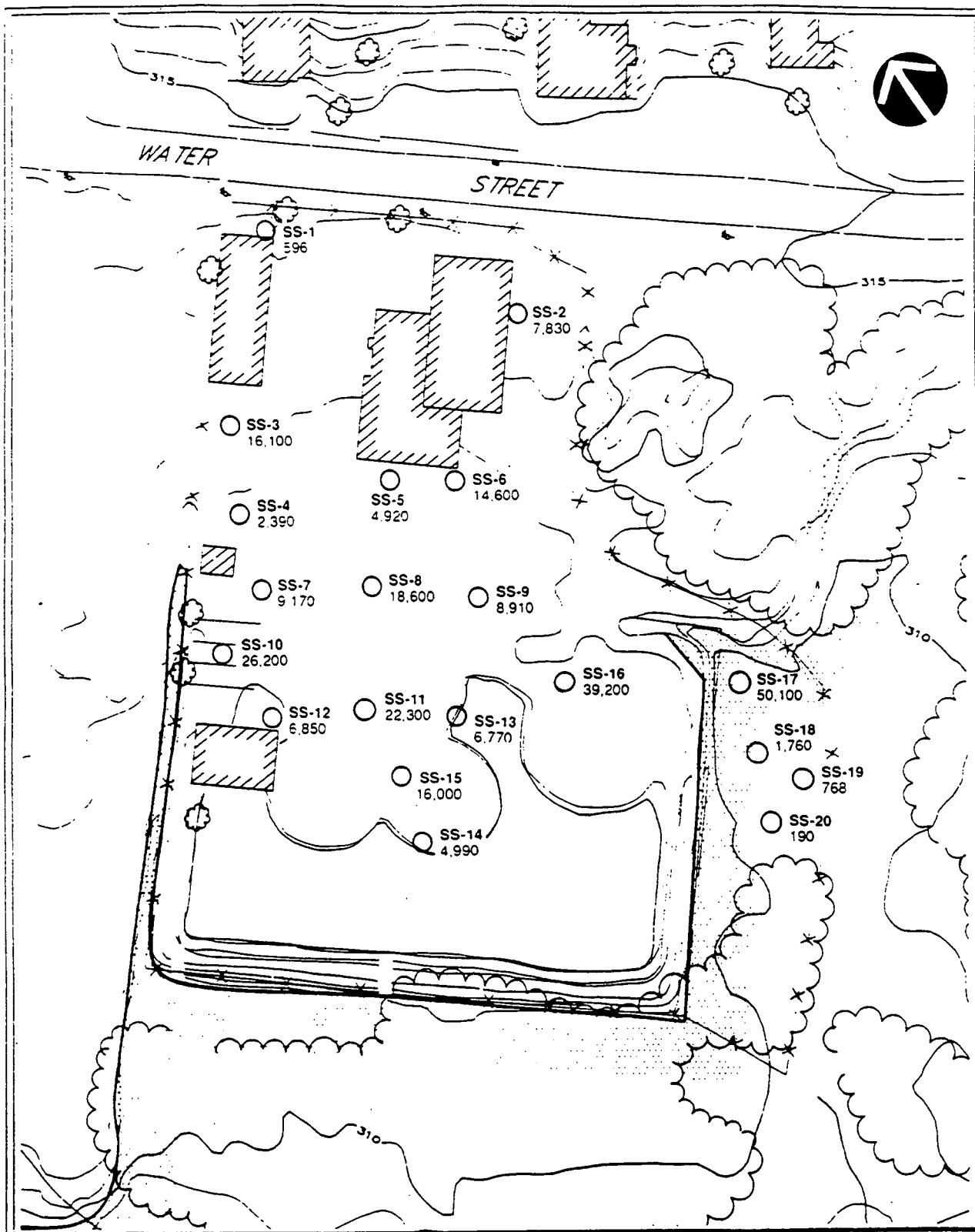


FIGURE 15

DISTRIBUTION OF LEAD (TOTAL) DETECTED IN SURFICIAL SOIL SAMPLES

(Concentration in mg/kg) PSC Resources, Palmer, Massachusetts



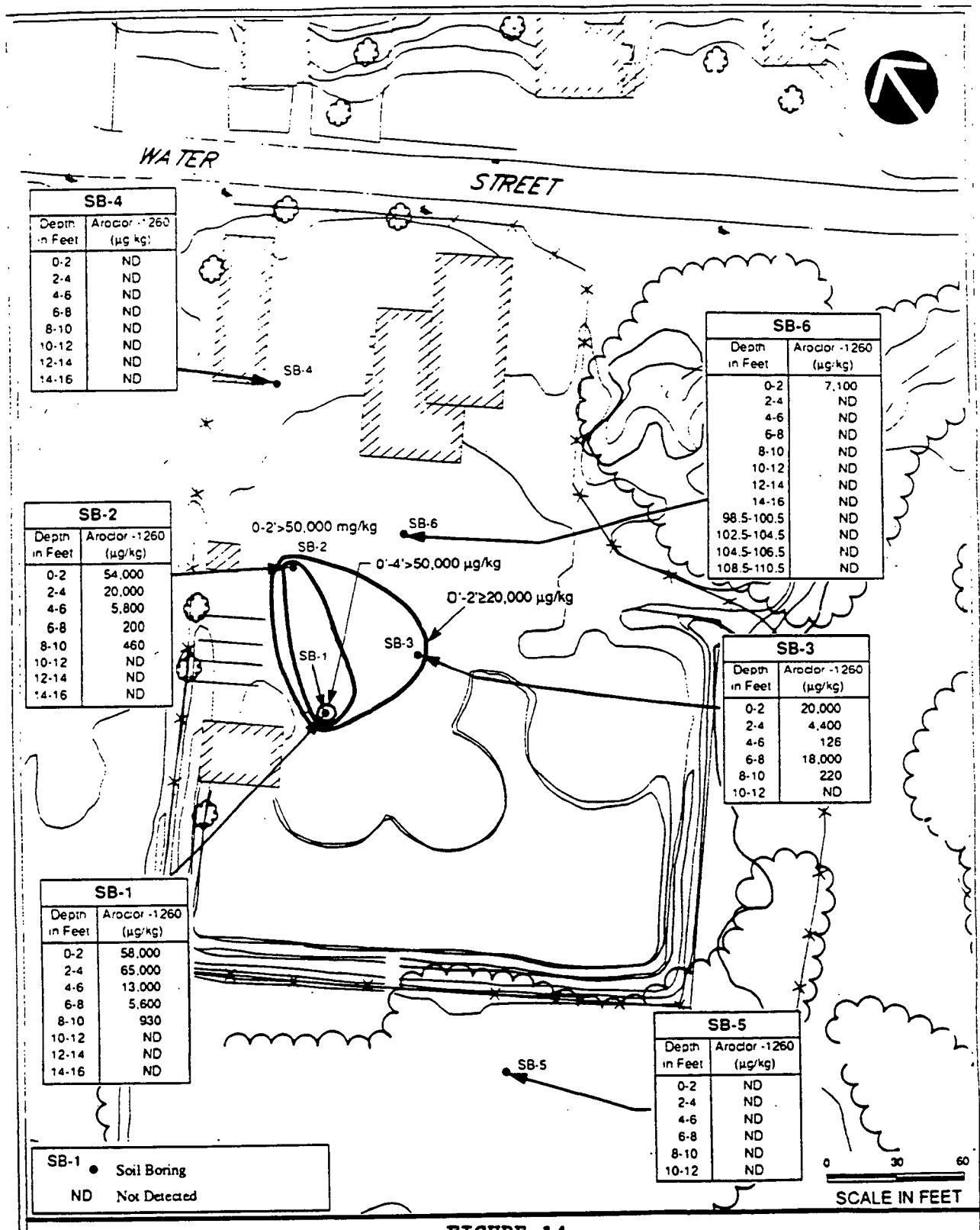


FIGURE 14
 DEPTH DISTRIBUTION OF PCB (AROCLOR - 1260) CONCENTRATIONS
 DETECTED IN PROPERTY SOIL BORINGS
 (Result Based on PCB Screening Procedures) PSC Resources, Palmer, Massachusetts





FIGURE 13
TOTAL CONCENTRATIONS OF PCBs (mg/kg) (AROCOR - 1260 & 1242)
DETECTED IN STORAGE TANK SLUDGE
PSC Resources, Palmer, Massachusetts

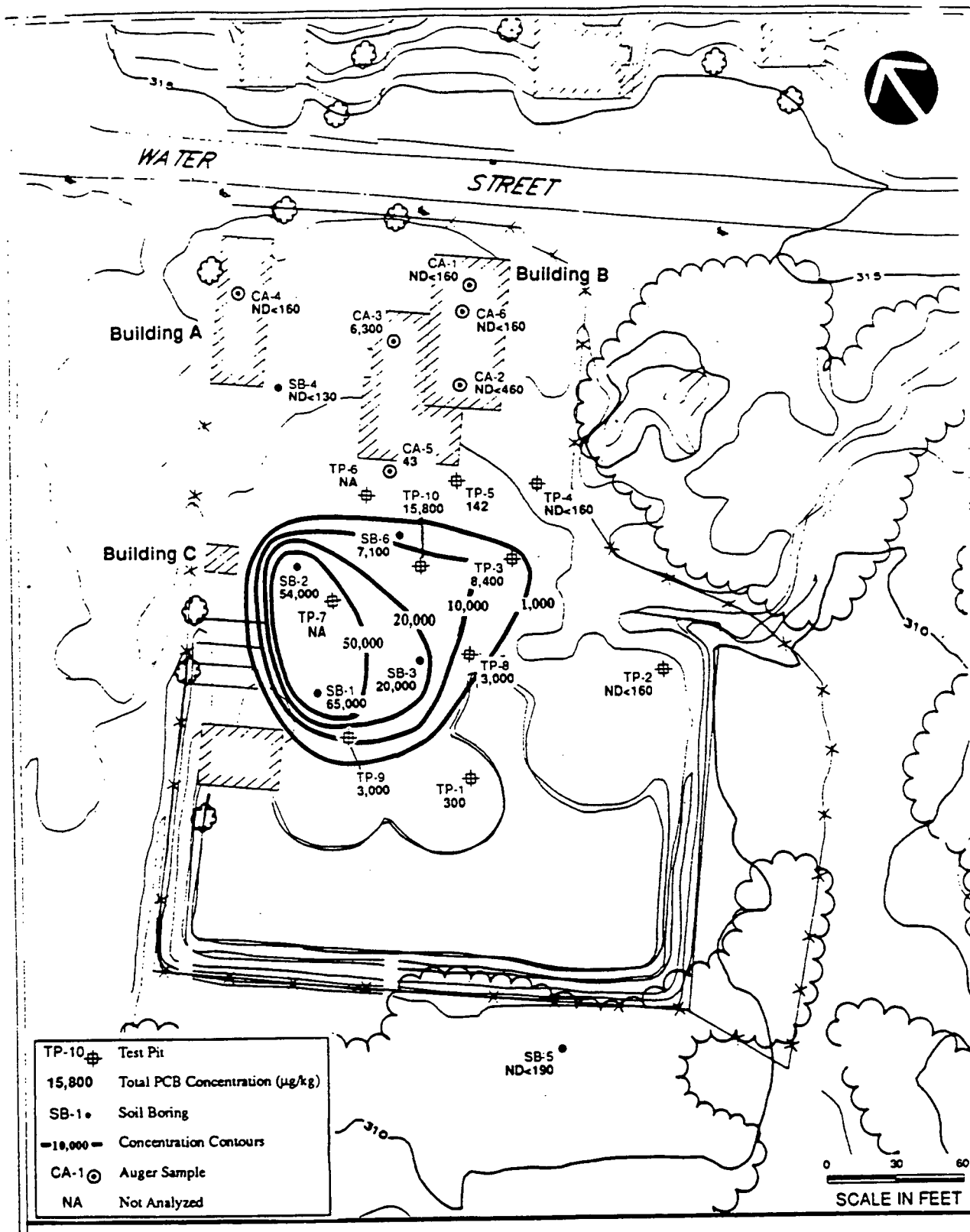


FIGURE 12

MAXIMUM DETECTED TOTAL CONCENTRATION OF PCBs IN PROPERTY SOIL (µg/kg)
 PSC Resources, Palmer, Massachusetts



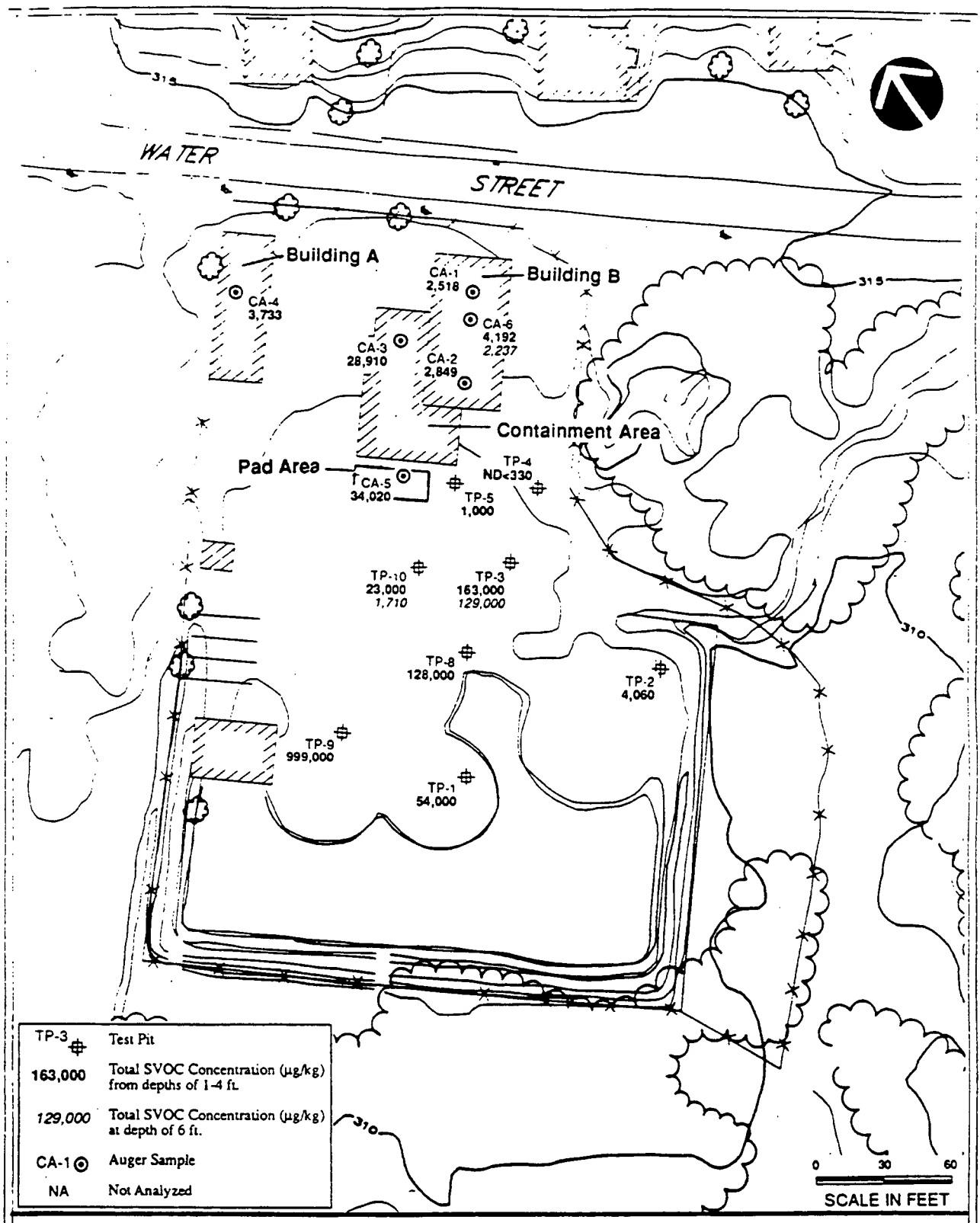


FIGURE 11
TOTAL CONCENTRATION OF SVOCs DETECTED IN PROPERTY SOIL SAMPLES
 PSC Resources, Palmer, Massachusetts



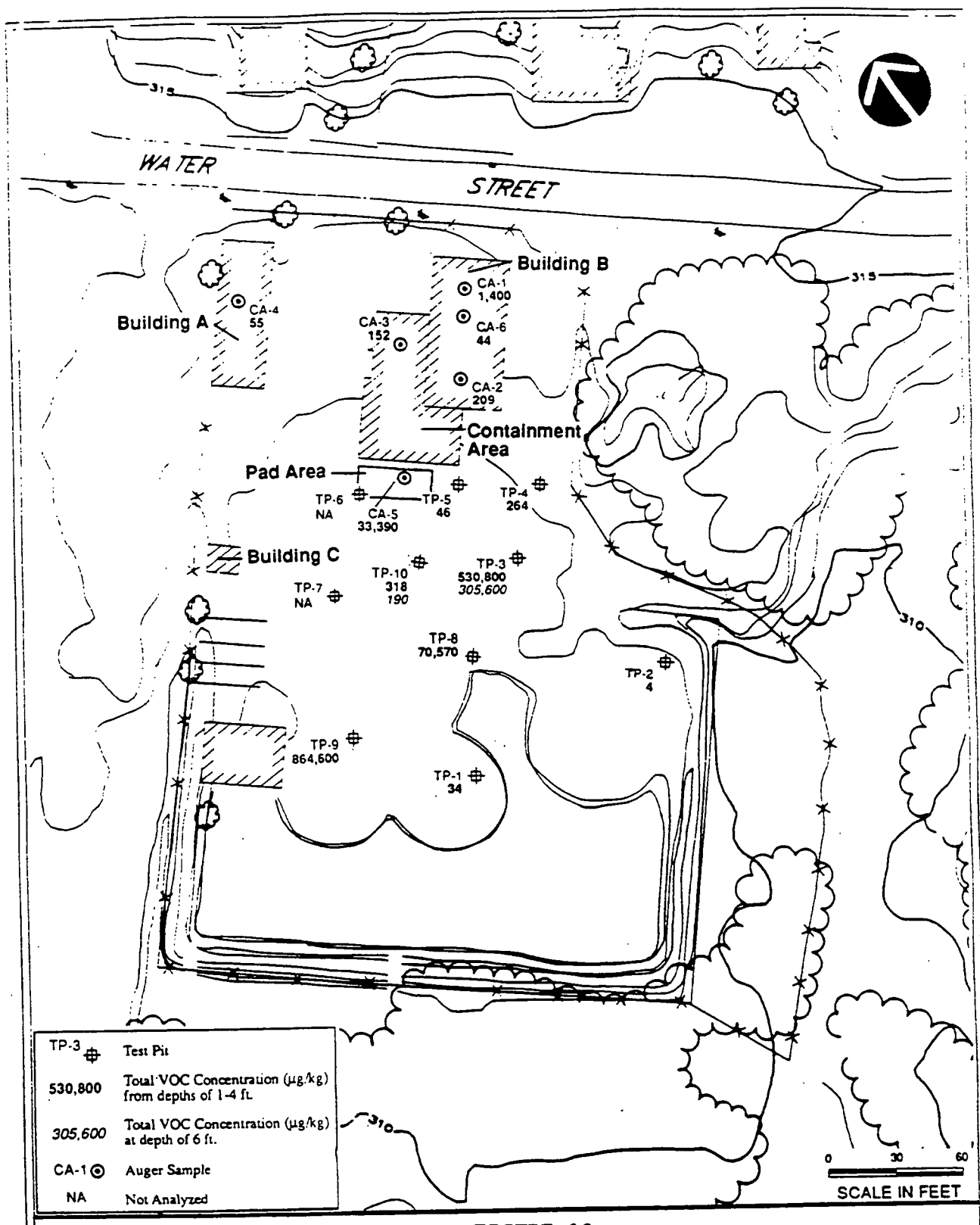


FIGURE 10
TOTAL CONCENTRATION OF VOCs DETECTED IN PROPERTY SOIL SAMPLES
 PSC Resources, Palmer, Massachusetts



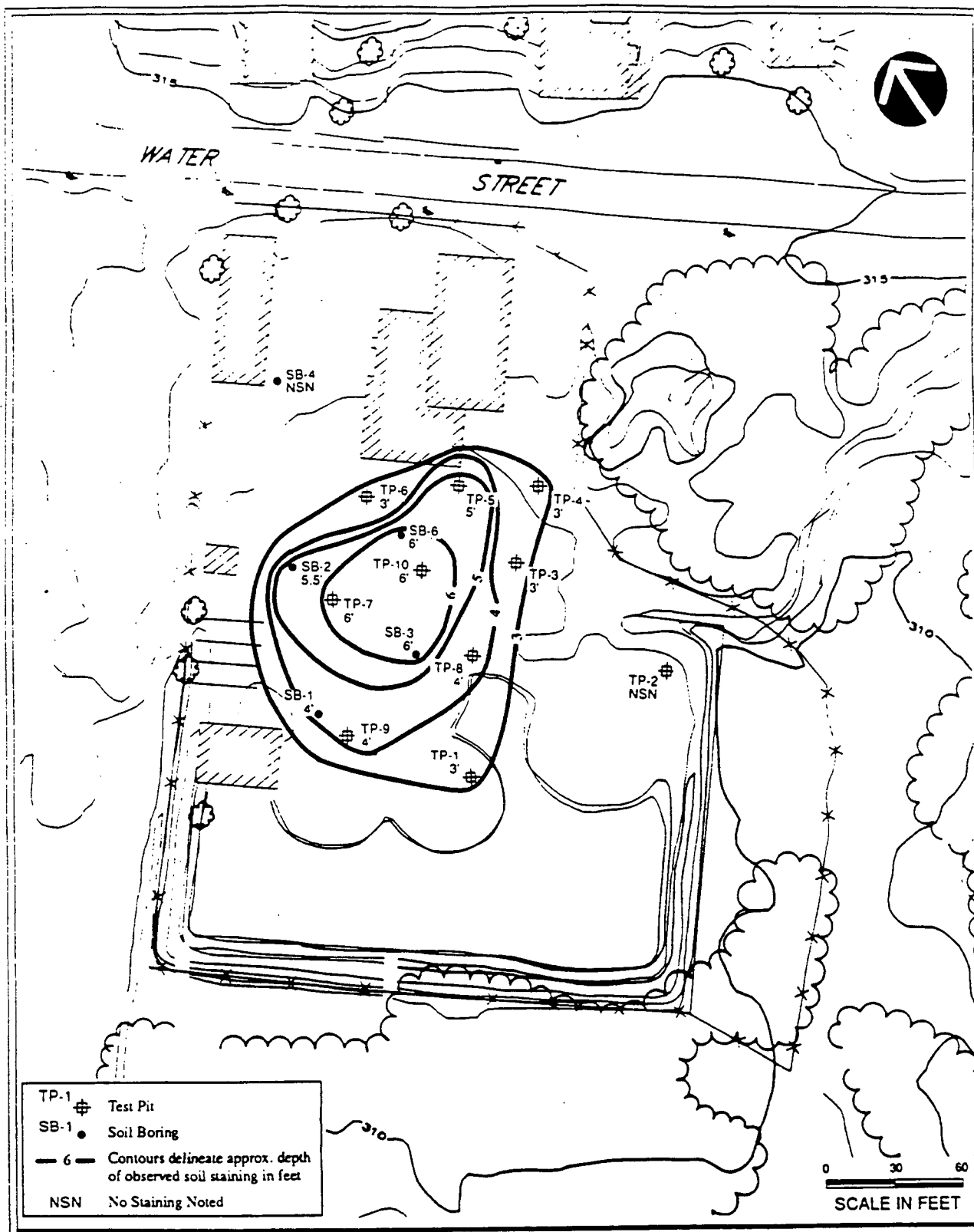


FIGURE 9
DEPTH OF OBSERVED SOIL STAINING
IN TEST PIT EXCAVATIONS AND SOIL BORINGS

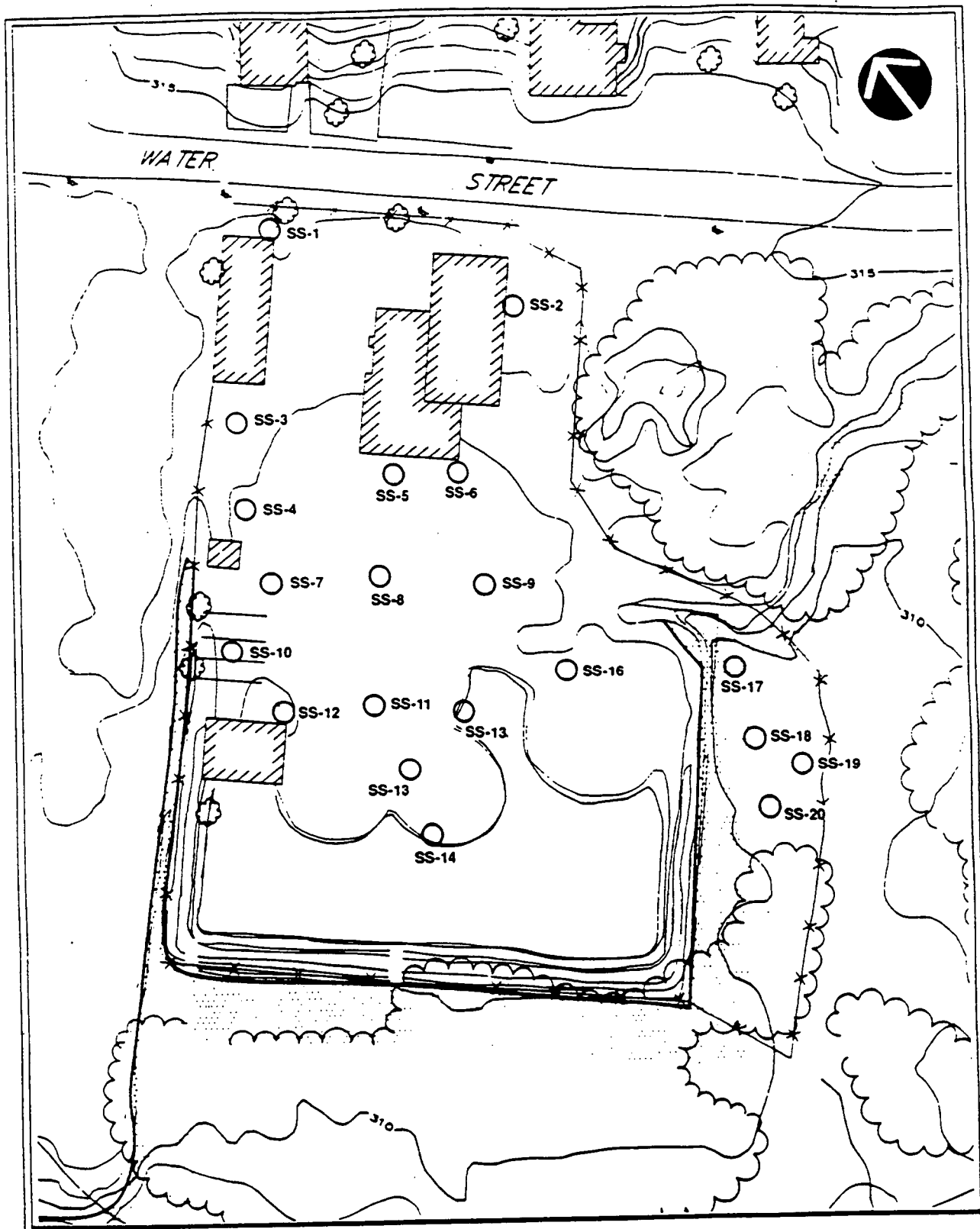


FIGURE 8
 PROPERTY SURFICIAL SOIL SAMPLING LOCATIONS
 FOR LEAD ANALYSES ON THE PSC RESOURCES PROPERTY

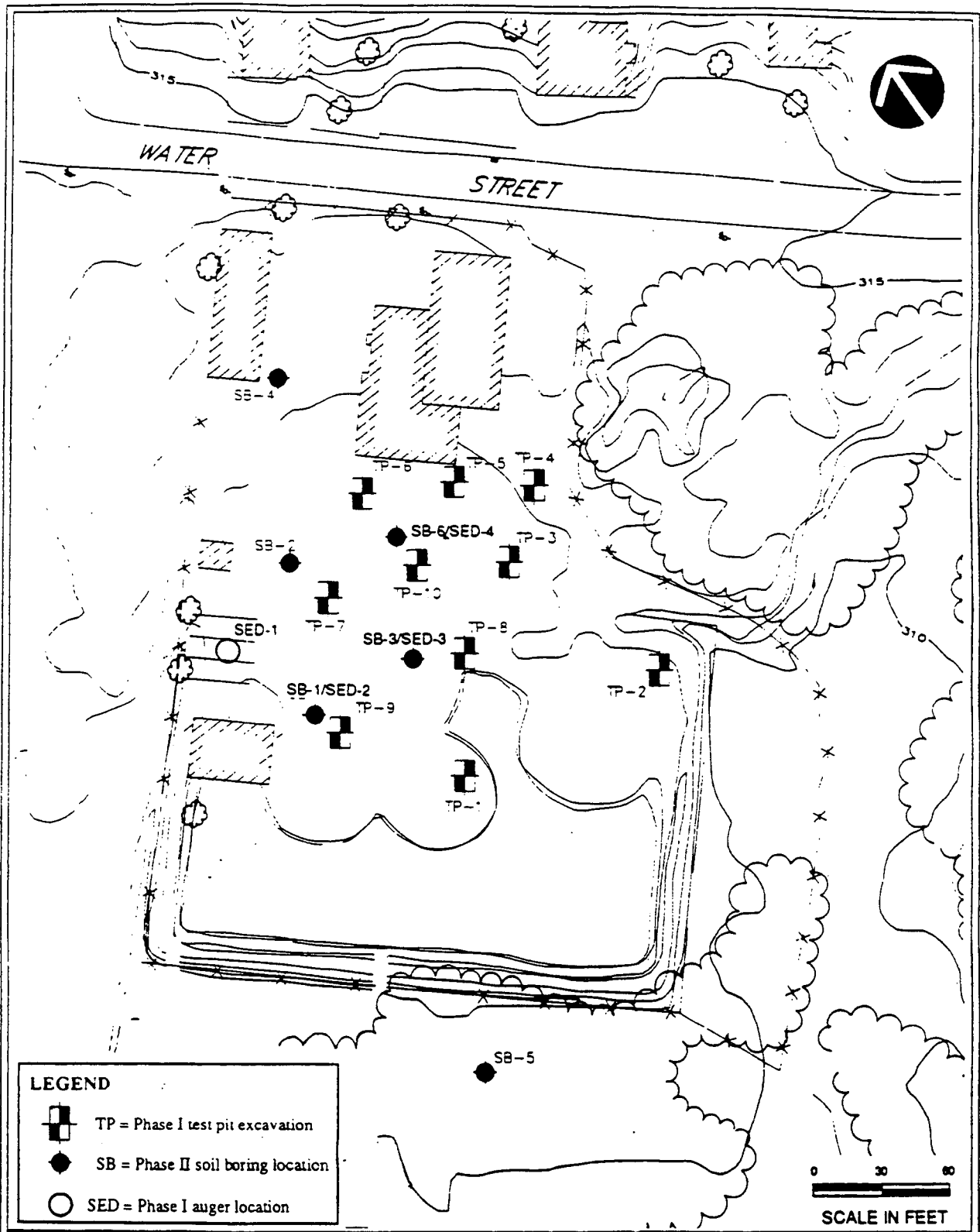


FIGURE 7
PHASE I & PHASE II SOIL SAMPLING LOCATIONS
ON THE PSC RESOURCES PROPERTY

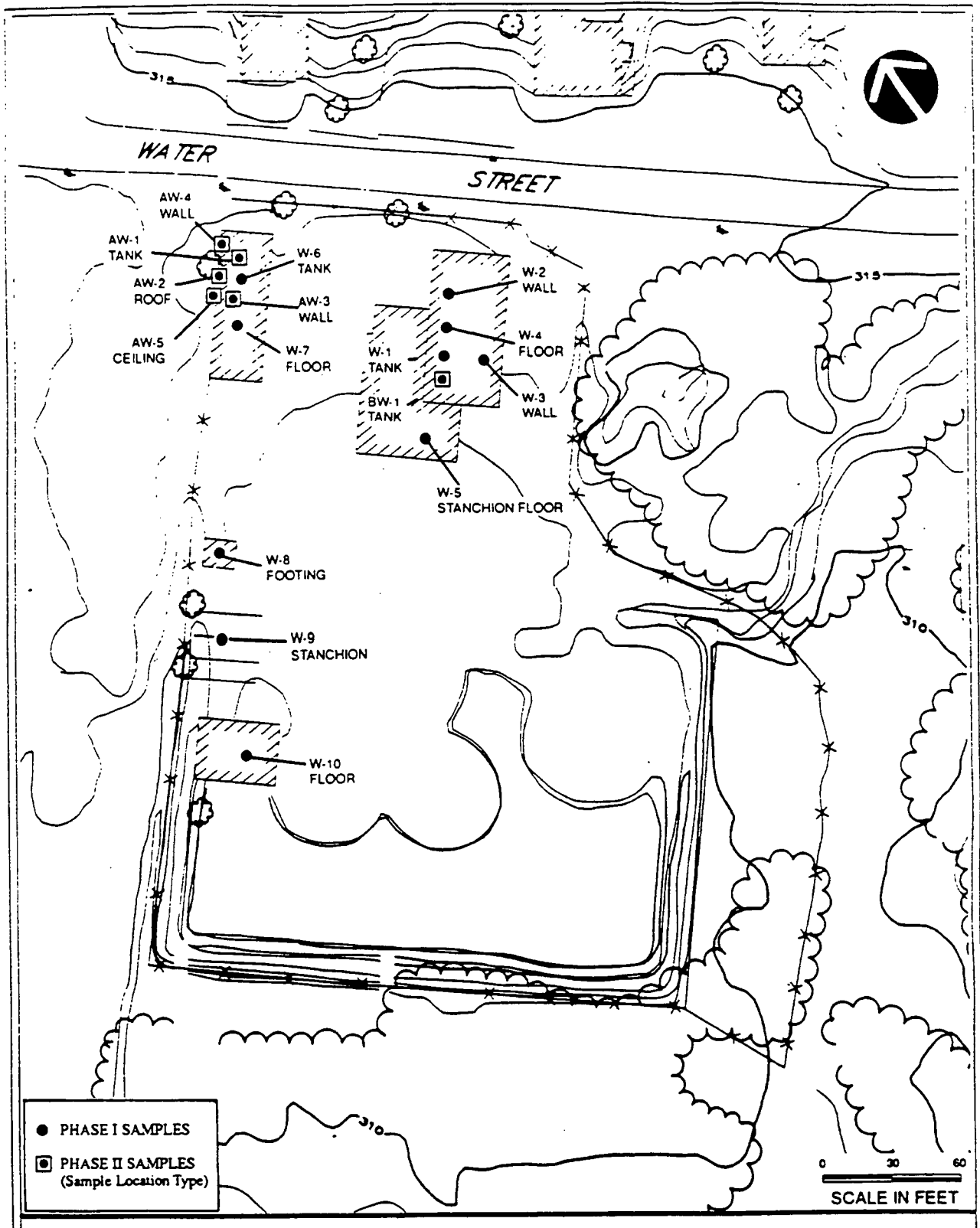


FIGURE 6
PROPERTY BUILDING AND STRUCTURE WIPE SAMPLE LOCATIONS



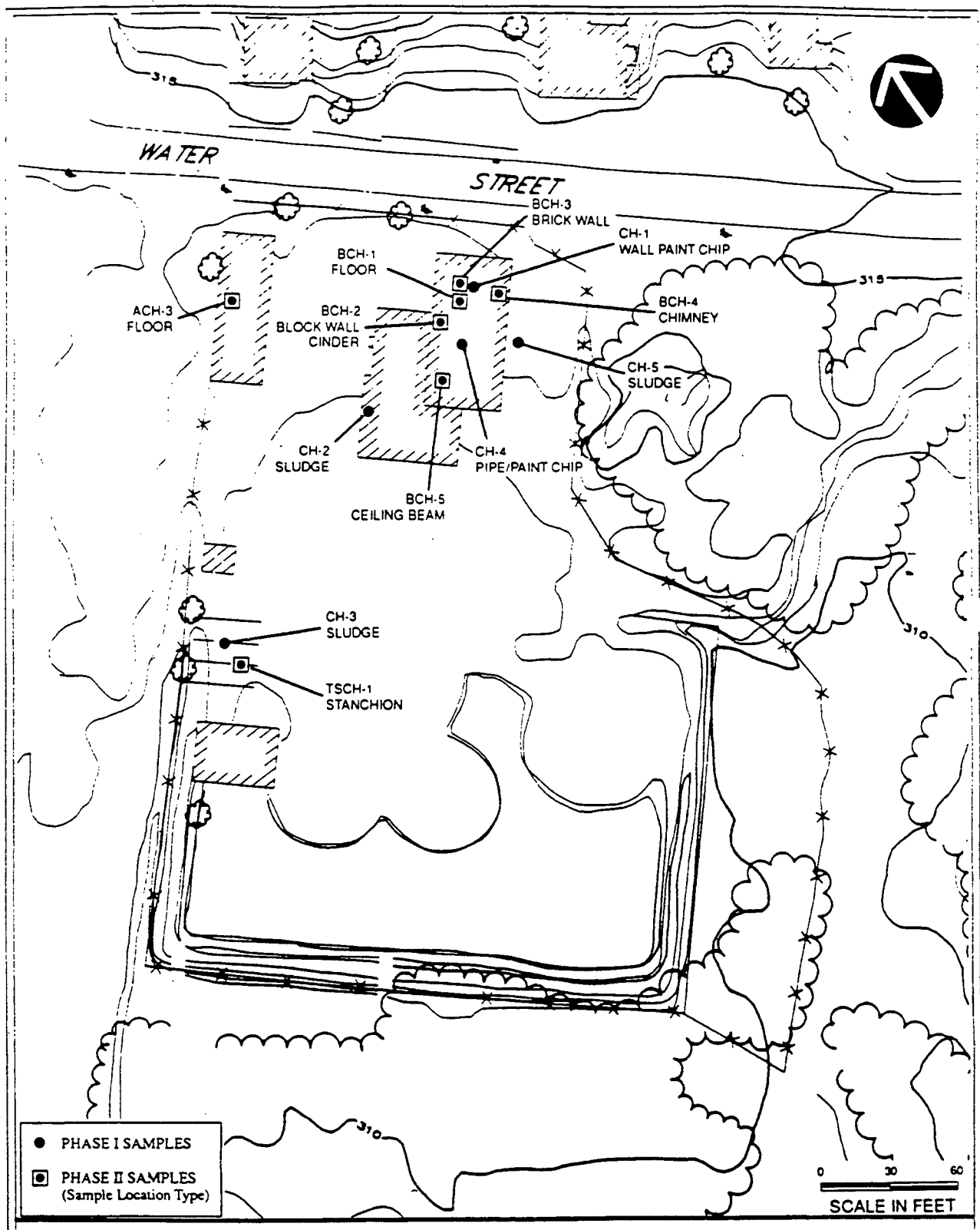


FIGURE 5
PROPERTY BUILDING AND STRUCTURE CHIP SAMPLE LOCATIONS



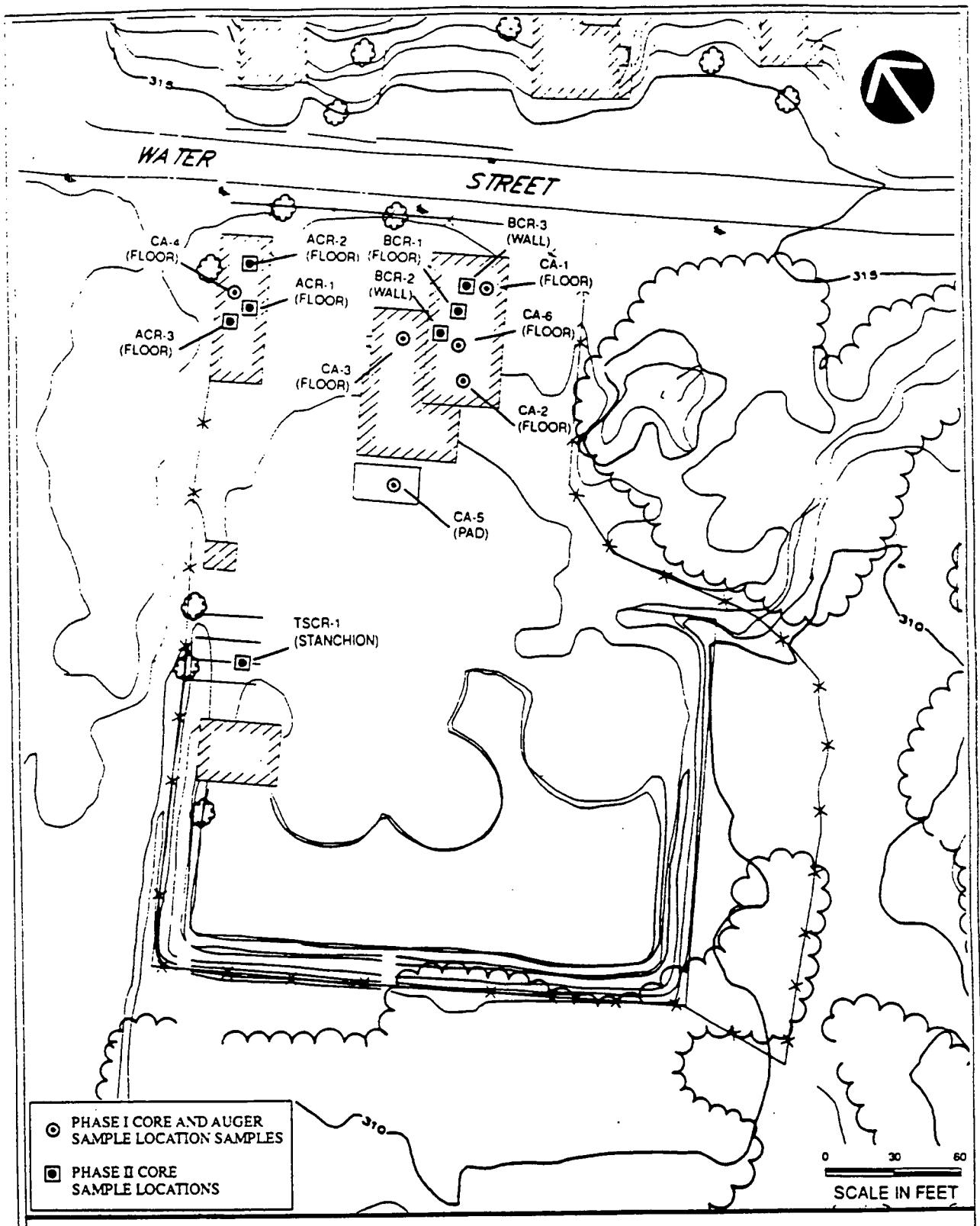


FIGURE 4

PROPERTY BUILDING AND STRUCTURE CORE AND AUGER SAMPLE LOCATIONS



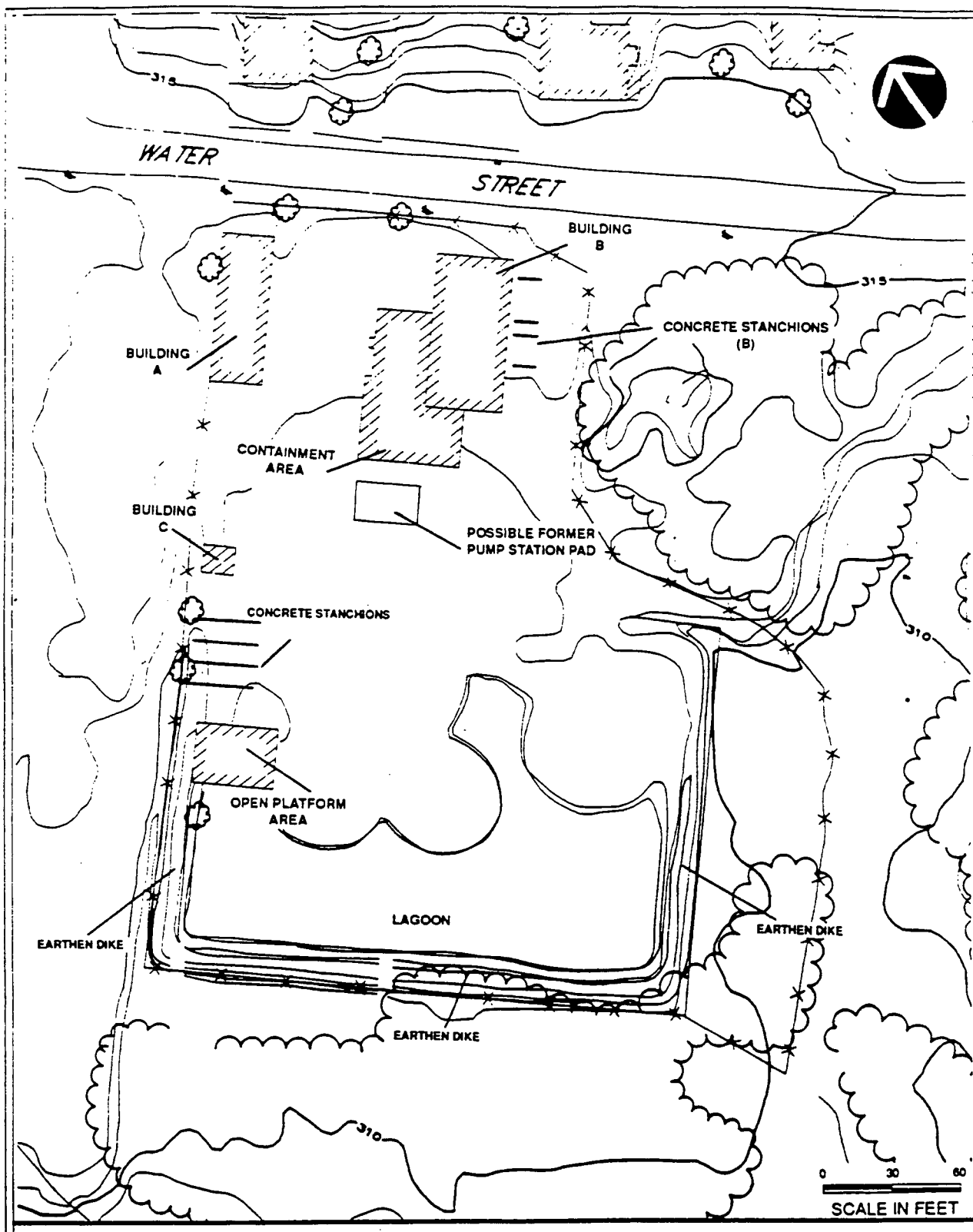


FIGURE 3
PROPERTY BUILDINGS AND STRUCTURES

TABLE 4 (Cont'd)
Exposure Assumptions
PSC Resources Superfund Site, Palmer, MA

VARIABLE		LAGOON SURFACE WATER			RIVER SEDIMENT			GROUNDWATER	
		Current Trespasser Older Child	Future Resident Older child	Future Worker Adult	Current Trespasser Older child	Future Resident Older child	Future Worker Adult	Future Resident Adult	Future Worker Adult
Exposure Frequency	EF	50 days/yr	150 days/yr	Qualitative analysis only	25 days/yr	50 days/yr	Qualitative analysis only	365 days/yr	250 days/yr
Exposure Duration	ED	11 yrs	11 yrs		11 yrs	11 yrs		30 yrs	25 yrs
Body Weight	BW	45 kg	45 kg		45 kg	45 kg		70 kg	70 kg
Receptor age		7-18 yrs	7-18 yrs			7-18 yrs			
Averaging Period*	AP*	4015 days	4015 days		4015 days	4015 days		10950 days	9125 days
Average Lifetime	LT	70 years	70 years		70 years	70 years		70 years	70 years
Dermal Contact Rate	D.CR				500 mg/day	500 mg/day			
Surface Area Exposed	SA	2000 cm2/day	2000 cm2/day		2000 cm2/day	2000 cm2/day			
Fraction Exposed	FracExp	PC cm/hr	PC cm/hr		0.5	50%			
Soil to Skin Adherence Factor	AF				0.5 mg/cm2	0.5 mg/cm2			
Exposure Time	ET	0.333 hr/day	0.333 hr/day						
Dermal Absorption	D.ABS				50% VOCs	50% VOCs			
					5% PAHs	5% PAHs			
					5% PCBs	5% PCBs			
					0% Inorganic	0% Inorganic			
					5% TEDFs	5% TEDFs			
					5% Phthalates	5% Phthalates			
Ingestion Rate	IR	Qualitative	Qualitative		Qualitative	Qualitative	Qualitative	2 L/day	1 L/day
Ingestion Absorption	I.ABS	analysis only	analysis only		analysis only	analysis only	analysis only		
Fraction of fish from river	FracFish								
Permeability Coefficient	PC	cm/hr							
Benzene		1.11E-01							
Toluene		1.01							
Dibutylphthalate		2.30E-06							
Ethylbenzene		1.37							
Inorganics		0							
All other organics = water		1.50E-03							

* Averaging Period (AP) is applicable only to the evaluation of non-carcinogenic exposure dose

TABLE 4 (Cont'd)

Exposure Assumptions

PSC Resources Superfund Site, Palmer, MA

VARIABLE		FISH			BUILDING		
		Current Trespasser Young child	Current Trespasser Adult	Future Resident Young child & Adult	Current Trespasser Older child	Future Resident Older child	Future Worker Adult
Exposure Frequency	EF	365 days/yr	365 days/yr	Same as current case	Qualitative analysis only	Qualitative analysis only	Qualitative analysis only
Exposure Duration	ED	6 yrs	30 yrs				
Body Weight	BW	15 kg	45 kg				
Receptor age		1-6 yrs					
Averaging Period*	AP*	2190 days	10950 days				
Average Lifetime	LT	70 years	70 years				
Dermal Contact Rate	D.CR						
Surface Area Exposed	SA						
Fraction Exposed	FracExp						
Soil to Skin Adherence Factor	AF						
Exposure Time	ET						
Dermal Absorption	D.ABS						
Ingestion Rate	IR	6.5 g/day	6.5 g/day				
Ingestion Absorption	I.ABS	100% VOCs	100% VOCs				
		100% PAHs	100% PAHs				
		30% PCBs	30% PCBs				
		50% Lead	30% Lead				
		100% Other Inorg	100% Other Inorg				
		30% TEDFs	30% TEDFs				
		100% Phthalates	100% Phthalates				
Fraction of fish from river	FracFish	10%	10%				
Permeability Coefficient	PC						
Benzene							
Toluene							
Dibutylphthalate							
Ethylbenzene							
Inorganics							
All other organics = water							

* Averaging Period (AP) is applicable only to the evaluation of non carcinogenic exposure dose

TABLE 5

Summary of Risk Estimates* by Medium
PSC Resources Superfund Site, Palmer, MA

RECEPTOR	EXPOSURE MEDIA	Carcinogenic		Non-Carcinogenic	
		Average	Reasonable Maximum	Average	Reasonable Maximum*
CURRENT TRESPASSER-older child/young adult	Soil	7E-06	3E-05	7E-01	2E-00(c)
FUTURE RESIDENT-young child (age 1-6 yrs.)	Soil	4E-05	4E-04	1E-01	7E-01(c)
FUTURE RESIDENT-older child/young adult (age 7-18 yrs.)	Soil	1E-05	1E-04	1E-00	7E-00(c)
FUTURE COMMERCIAL/INDUSTRIAL WORKER-adult (duration: 25 yrs.)	Soil	2E-05	2E-04	7E-01	4E-00(c)
FUTURE RESIDENT-adult (duration: 30 yrs.)	Groundwater	2E-04	4E-03	4E-01	7E-00(b)
FUTURE COMMERCIAL/INDUSTRIAL WORKER-adult (duration: 25 yrs.)	Groundwater	5E-05	1E-03	1E-01	2E-00(b)
CURRENT TRESPASSER-older child/young adult (age 7-18 yrs.)	Wetland Sediment	5E-06	4E-05	1E-01	3E-00(c)
FUTURE RESIDENT-young child (age 1-6 yrs.)	Wetland Sediment	3E-05	3E-04	2E-00	9E-01(c)
FUTURE RESIDENT-older child/young adult (age 7-18 yrs.)	Wetland Sediment	1E-05	1E-04	2E-01	9E-00(c)
FUTURE COMMERCIAL/INDUSTRIAL WORKER-adult (duration: 25 yrs.)	Wetland Sediment	2E-05	2E-04	1E-01	5E-00(c)
CURRENT TRESPASSER-older child/young adult (age 7-18 yrs.)	Lagoon Sediment	1E-03	5E-03	2E-00	1E-01(a)
FUTURE RESIDENT-older child/young adult (age 7-18 yrs.)	Lagoon Sediment	4E-03	1E-02	6E+00	4E-01(a)
FUTURE COMMERCIAL/INDUSTRIAL WORKER-adult (duration: 25 yrs.)	Lagoon Sediment	7E-03	2E-02	5E+00	2E-01(a)
CURRENT TRESPASSER-older child/young adult (age 7-18 yrs.)	Lagoon Surface Water	1E-07	1E-07	4E-05	5E-05(a)
FUTURE RESIDENT-older child/young adult (age 7-18 yrs.)	Lagoon Surface Water	3E-07	4E-07	1E-04	2E-04(a)
FUTURE COMMERCIAL/INDUSTRIAL WORKER-adult (duration: 25 yrs.)	Lagoon Surface Water	q	q	q	q
CURRENT TRESPASSER-older child/young adult (age 7-18 years)	River Sediment	1E-07	3E-07	1E-05	4E-05(a,e)
FUTURE RESIDENT-older child/young adult (age 7-18 yrs.)	River Sediment	2E-07	7E-07	7E-05	2E-04(a)
FUTURE COMMERCIAL/INDUSTRIAL WORKER-adult (duration: 25 yrs.)	River Sediment	q	q	q	q
CURRENT TRESPASSER-older child/young adult (age 7-18 yrs.)	Sludge, Bldg. Materials	q	q	q	q
FUTURE RESIDENT-older child/young adult (age 7-18 yrs.)	Sludge, Bldg. Materials	q	q	q	q
FUTURE COMMERCIAL/INDUSTRIAL WORKER-adult (duration: 25 yrs.)	Sludge, Bldg. Materials	q	q	q	q
CURRENT TRESPASSER-young child (age 1-6 yrs.)	Fish	nq	nq	3E-02	1E-01(c)
CURRENT TRESPASSER-adult	Fish	nq	nq	7E-03	2E-02(c)
FUTURE RESIDENT-young child (age 1-6 yrs.)	Fish	nq	nq	3E-02	1E-01(c)
FUTURE RESIDENT-adult (duration: 30 yrs.)	Fish	nq	nq	7E-03	2E-02(c)

Bolded values exceed EPA Risk Management Criteria

q = qualitative analysis performed; see text.

nq = cancer risks associated with fish consumption not quantified as only lead was detected in fish tissue samples and a cancer potency factor is currently not available for this compound

* = Reasonable maximum non-carcinogenic risk by endpoint (see Table E-3 for details)

(a) Developmental, (b) Hepatorenal, (c) Neurobehavioral, (d) Dermal, (e) Other.

TABLE 6
SOURCE CONTROL ALTERNATIVES
RETAINED FOR DETAILED EVALUATION

SC-1	No Action	<ul style="list-style-type: none"> • Long-term monitoring of groundwater, wetland sediments, property soils, lagoon water, lagoon sediments, and Quaboag River water and sediments.
SC-4	Impermeable Cap	<ul style="list-style-type: none"> • Long-term monitoring of groundwater, wetland sediments, and Quaboag River water and sediments. • Deed restrictions on groundwater development and land use. • Access restrictions (fencing) around residual source materials. • Warning signs. • Public education program. • Lagoon dewatering. • Consolidate lagoon and wetland sediments with property soils. • Decontamination and demolition of property structures. • Impermeable cap over consolidated residual source materials. • Earthen levee around property for flood control. • Subsurface drain around property with vertical barrier wall. • Groundwater collection from inside the barrier wall with treatment and discharge. • Wetlands restoration/replication.
SC-5	In Situ Vitrification	<ul style="list-style-type: none"> • Monitoring of groundwater, wetland sediments, and Quaboag River water and sediments. • Deed restrictions on groundwater development and land use.

TABLE 6 (Cont'd)
SOURCE CONTROL ALTERNATIVES
RETAINED FOR DETAILED EVALUATION

SC-5 (cont'd)

- Access restrictions (fencing) around residual source materials.
- Warning signs.
- Public education program.
- Lagoon dewatering.
- Consolidate lagoon and wetland sediments with property soils.
- Decontamination and demolition of property structures.
- In situ vitrification of consolidated residual source materials.
- Permeable cap over vitrified mass.
- Wetlands restoration/replication.

SC-6 In Situ Stabilization

- Long-term monitoring of groundwater, wetland sediments, and Quaboag River water and sediments.
- Deed restrictions on groundwater development and land use.
- Lagoon dewatering.
- Consolidate lagoon and wetland sediments with property soils.
- Property structures decontamination and demolition.
- In situ stabilization of consolidated residual source materials.
- Permeable cap over stabilized mass.
- Wetlands restoration/replication.

SC-10 On-Site Incineration

- Long-term monitoring of groundwater, wetland sediments, and Quaboag River water and sediments.

5519-3/HAZ-5813

TABLE 6 (Cont'd)
SOURCE CONTROL ALTERNATIVES
RETAINED FOR DETAILED EVALUATION

SC-10 (cont'd)

- Deed restrictions on groundwater development and land use.
- Access restrictions to PSC Resources Property.
- Warning signs.
- Public education program.
- Lagoon dewatering.
- Construct on-site incinerator adjacent to Area of Contamination (AOC).
- Construct temporary residual source material storage facility.
- Dewater beneath AOC, with groundwater treatment and discharge.
- Decontamination and demolition of property structures.
- Excavate wetland sediment, lagoon sediment, and property soils, place in temporary storage facility.
- Construct RCRA equivalent waste disposal facility.
- Incinerate residual source materials.
- Stabilize residual ash remaining.
- Place incinerator residuals into waste disposal facility and construct cap.
- Wetlands restoration/replication.

SC-11 Off-Site Treatment and Disposal

- Monitoring of groundwater, wetland sediments, and Quaboag River water and sediments.
- Deed restrictions on groundwater development and land use.
- Lagoon dewatering.

TABLE 6 (Cont'd)
SOURCE CONTROL ALTERNATIVES
RETAINED FOR DETAILED EVALUATION

SC-11 (cont'd)

- Dewater beneath AOC, with groundwater treatment and discharge.
- Decontamination and demolition of property structures.
- Excavate and containerize property soils, wetland sediments and lagoon sediments.
- Off-site transport, treatment, and disposal at a RCRA TSD facility.
- Backfill excavation with clean fill materials.
- Wetlands restoration/replication.

TABLE 6 (Cont'd)
MANAGEMENT OF MIGRATION ALTERNATIVES
RETAINED FOR DETAILED EVALUATION

MM-1	No-Action	<ul style="list-style-type: none">• Long-term monitoring of groundwater, wetland sediment, and Quaboag River surface water and sediment.
MM-3/4	Groundwater Extraction/ Treatment/Discharge	<ul style="list-style-type: none">• Long-term monitoring of groundwater, wetland sediment, and Quaboag River surface water and sediment.• Access restrictions (fencing) around residual source materials.• Warning signs.• Public education programs.• Groundwater interceptor trench with hydraulic barrier, or several low flow extraction wells.• Collection, extraction, and treatment of groundwater.• Discharge of fully treated groundwater to the Quaboag River in accordance with the substantive requirements of an NPDES permit.

TABLE 7 - CLEANUP LEVELS		
Medium	Contaminant of Concern	Cleanup Level
Property Soil	Total PCBs	1 ppm ^a
	Total ncPAHs ^b	151 ppm
	1,1-Dichloroethane	243 ppm
	Cis-1,2-Dichloroethylene ^c	5 ppm
	Trans-1,2-Dichloroethylene ^c	7 ppm
	1,1,1-Trichloroethane	135 ppm
	Trichloroethylene (TCE)	1 ppm
	Tetrachloroethylene (PCE)	2 ppm
	Benzene	1 ppm
	Lead	500 ppm
Ground Water	Bis(2-ethylhexyl)phthalate	6 ppb ^d
	Vinyl Chloride	2 ppb
	1,1-Dichloroethane	3,600 ppb
	Cis-1,2-Dichloroethylene	70 ppb
	Trans-1,2-Dichloroethylene	100 ppb
	1,1,1-Trichloroethane	200 ppb
	Methylene Chloride	5 ppb
	Trichloroethylene (TCE)	5 ppb
	Tetrachloroethylene (PCE)	5 ppb
	Benzene	5 ppb
	2-Butanone (MEK)	350 ppb
	Acetone	3,500 ppb
	Lead	15 ppb
Lagoon Sediment	Bis(2-ethylhexyl)phthalate	368 ppm
	Total cPAHs ^e	100 ppm
	Total ncPAHs	1,206 ppm
	1,1-Dichloroethane	1 ppm
	1,1,1-Trichloroethane	200 ppm
	Trichloroethylene (TCE)	4 ppm
	Tetrachloroethylene (PCE)	12 ppm
	Methylene Chloride	1 ppm
	Benzene	3 ppm
	Acetone	10 ppm
	Lead	500 ppm
Wetland Sediment	Total PCBs	1 ppm
	Total PAHs	10 ppm
	Arsenic	12 ppm
	Lead	375 ppm
	Zinc	550 ppm

a - ppm = parts per million

b - ncPAH = noncarcinogenic PAH

TABLE 7 (Cont'd)

c - In the Remedial Investigation studies, a distinction between trans- and cis- isomers was not made in the analysis of 1,2-dichloroethylene. The analysis was made instead for total 1,2-dichloroethylene. As part of the implementation of the Management of Migration remedy as defined in this ROD, an identification of an appropriate cleanup level for 1,2-dichloroethylene will be made. If this identification is not made, the more stringent of the two MCLs, i.e., 70 ppb for cis-1,2-dichloroethylene, will be set as the cleanup level for total 1,2-dichloroethylene.

d - ppb = parts per billion

e - cPAH = carcinogenic PAH

TABLE 8 - C _p -CONCENTRATIONS OF THE INFILTRATION (LEACHATE-PPB)		
Medium	Contaminant of Concern	C _p
Property Soil	Trichloroethylene	59 ppb ^a
	Tetrachloroethylene	59 ppb
	Benzene	59 ppb
	1,1,1-Trichloroethane	8,857 ppb
	Total ncPAHs	1,158 ppb
	1,1-Dichloroethane	81,165 ppb
	Cis-1,2-Dichloroethylene	827 ppb ^b
	Trans-1,2-Dichloroethylene	1,181 ppb ^b
Lagoon Sediment	Bis(2-ethylhexyl)phthalate	97 ppb
	Trichloroethylene	82 ppb
	Tetrachloroethylene	82 ppb
	Methylene Chloride	82 ppb
	Benzene	82 ppb
	1,1,1-Trichloroethane	3,292 ppb
	Total ncPAHs ^c	2,321 ppb
	1,1-Dichloroethane	59,304 ppb
	Acetone	57,657 ppb

a - ppb = parts per billion

b - In the Remedial Investigation studies, a distinction between trans- and cis- isomers was not made in the analysis of 1,2-dichloroethylene. The analysis was made instead for total 1,2-dichloroethylene. As part of the implementation of the Management of Migration remedy as defined in this ROD, an identification of an appropriate C_p value for 1,2-dichloroethylene will be made. If this identification is not made, the more stringent of the two C_p values, i.e., 827 ppb for cis-1,2-dichloroethylene, will be set as the C_p value for total 1,2-dichloroethylene.

c - ncPAH = noncarcinogenic PAH

APPENDIX C
ARARS TABLES

TABLE SC-6
CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Medium/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Groundwater/ SDWA	Federal - SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16) and non-zero Maximum Contaminant Level Goals (MCLGs)	Relevant and Appropriate	Standards (MCLs - Maximum Contaminant Levels) have been adopted as enforceable standards for public drinking water systems; goals (MCLGs) are non-enforceable levels for such systems.	Remediation of contaminated material in soils and sediment will eliminate ongoing discharges of contaminants to groundwater. MCLs and non-zero MCLGs will be attained in groundwater at the point of compliance.
Surface Water/CWA	Federal - CWA - Ambient Water Quality Criteria (AWQC)- Protection of Freshwater Aquatic Life, Human Health, Fish Consumption	Relevant and Appropriate	AWQC are developed under the Clean Water Act (CWA) as guidelines from which states develop water quality standards. CERCLA §121(d)(2) requires compliance with such guidelines when they are relevant and appropriate. A more stringent AWQC for aquatic life may be found relevant and appropriate rather than an MCL, when protection of aquatic organisms is being considered at a site. Federal AWQC are health-based criteria which have been developed for 95 carcinogenic compounds; these criteria consider exposure to chemicals from drinking water and/or fish consumption; acute and chronic exposure levels are established.	The selected remedy will attain AWQC in the wetland surface waters and river water after completion of remedial activities.
Groundwater/ CWA	State Department of Environmental Protection (DEP) - Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Applicable	Massachusetts Groundwater Quality Standards have been promulgated for a number of contaminants. When the state levels are more stringent than federal levels, the state levels will be used.	The selected remedy will attain Massachusetts standards in the groundwater at the point of compliance after completion of remedial activities.
Groundwater/ SDWA	State - 310 CMR 22.06 Maximum Contaminant Levels for Inorganic Chemicals in Drinking Water.	Relevant and Appropriate	Maximum contaminant levels are established for Inorganic Chemical Contaminants under 310 CMR 22.06. All public water systems must comply with the levels of inorganic contaminants which are listed in Table 1 of 310 CMR 22.06.	The selected remedy will attain Massachusetts MCLs for inorganics in the groundwater at the point of compliance.

TABLE SC-6 (Cont'd)
CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Medium/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Groundwater/ SDWA	State - 310 CMR 22.07 Maximum Organic Chemical Contaminant Levels in Drinking Water	Relevant and Appropriate	310 CMR 22.07 establishes maximum contaminant levels for selected chlorinated hydrocarbons, pesticides and herbicides.	The selected remedy will attain Massachusetts MCLs for organic contaminants in the groundwater at the point of compliance.
Surface Water/CWA	DEP - Massachusetts Surface Water Quality Standards (314 CMR 4.00) (M.G.L. c. 21, s.27)	Applicable	DEP Surface Water Quality Standards are established for dissolved oxygen, temperature, pH, total coliform bacteria, turbidity, total dissolved solids, color, tainting substances, radioactive substances, oil and grease and nutrients.	Discharges of lagoon water to the Quaboag River associated with this selected remedy will meet the criteria set for a Class B surface water body (Quaboag River).
Air/CAA	Federal - CAA - National Emissions Standards for Hazardous Air Pollutants (NESHAP)(40 CFR 61)	Applicable	NESHAP standards have been promulgated for two organic compounds present at the site, benzene and vinyl chloride.	Remediation technologies which emit air contaminants regulated under NESHAPs will attain the appropriate standard during operation.
Sediments/ RCRA	Federal - Resource Conservation and Recovery Act (RCRA) - Criteria for Classification of Solid Waste Disposal and Practices (40 CFR Part 257)	Relevant and Appropriate	Solid wastes containing PCBs greater than 10 ppm must not be incorporated into the soil (or mixed with surface soil) applied to land used for food chain or pasture crop production.	Any debris, soil, or sediment which contains greater than 10 ppm PCBs will be excavated and stabilized. Institutional controls will prohibit the use of the site for agriculture.
Soils/RCRA	Federal - Resource Conservation and Recovery Act (RCRA) - Criteria for Classification of Solid Waste Disposal and Practices (40 CFR Part 257)	Relevant and Appropriate	Solid wastes containing PCBs greater than 10 ppm must not be incorporated into the soil (or mixed with surface soil) applied to land used for food chain or pasture crop production.	Any debris, soil, or sediment which contains greater than 10 ppm PCBs will be excavated and stabilized. Institutional controls will prohibit the use of the site for agriculture.
Air/CAA	Federal - CAA - National Ambient Air Quality Standards (NAAQS) (40 CFR 50)	Applicable	NAAQS define levels of primary and secondary levels for six common air contaminants (sulfur dioxide, partic- ulate matter "PM ₁₀ ", carbon monoxide, ozone, nitrogen dioxide and lead).	The levels established for these six air contaminants will be used as target levels which may not be exceeded by air release from on-site activities.

TABLE SC-6 (Cont'd)
CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Medium/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Surface Water/ CWA	Massachusetts Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharge 314 CMR 12.00	Applicable	Regulations to ensure proper operation and maintenance of wastewater treatment facilities and sewer systems within the Commonwealth.	Remedial activities will comply with all provisions of this regulation.
Air/OSHA	Federal - Occupational Health and Safety Act (OSHA)(29 CFR Section 1910.1000 - Air Contaminants)	To be Considered	Acceptable employee exposure levels have been promulgated for an extensive list of materials to control air quality in workplace environments.	Action levels for volatile and semi-volatile air contaminants will be established for implementation during on-site remedial actions. Exposure levels will also be used in the risk assessment to determine overall site risk.
Air/CAA	State - Massachusetts Guidance on Allowable Ambient Levels (AALs), cited in <u>Chemical Health Effects Assessment Methodology and Methodology to Derive Allowable Ambient Levels</u> , DEP, 1989.	To be Considered	This guidance evaluates acute and chronic toxicity and sets draft AALs for volatile and semi-volatile chemicals. AALs have been issued by the DEP for 108 chemicals to date. The AAL's to be considered, modeled and monitored for are considered in conjunction with BACT to meet the action specific applicable requirements at 310 CMR 6.0 through 8.0 in "not causing a condition of air pollution...".	AALs will be attained during all on-site remediation activities if technically feasible.
Groundwater/ CWA	Federal - (Guidance) Groundwater Classification Guidelines	To be Considered	Classifies groundwater by its potential beneficial uses such as special groundwater (Class 1) which are groundwaters that are "highly vulnerable to contamination because of the hydrological characteristics of the areas in which it occurs, and characterized by either of the following factors:	The groundwater aquifer will meet the standards under the Federal Safe Drinking Water Act for the appropriate classification of groundwater after completion of remedial activities.

TABLE SC-6 (Cont'd)
CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Medium/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Groundwater/ CWA (Cont'd)			<ul style="list-style-type: none"> • The groundwater is irreplaceable; no reasonable alternative source of drinking water is available to substantial populations. • The groundwater is ecologically vital; the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat." <p>Class 2 groundwaters are classified as current and potential sources of drinking water and waters having other beneficial uses. All groundwaters which do not fit under Class 1 and which are not heavily saline (total dissolved solids (TDS) >10,000 mg/l) are considered Class 2 groundwaters.</p>	
Air/OSHA	Federal Guidance - American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLV), Time Weighted Averages (TWAs), and Short Term Exposure Limits (STELs)	To be Considered	TLVs-TWAs and TLV-STELs are issued as consensus standards for controlling air quality in workplace environments.	TLVs will be used to set action levels for on-site workers during remediation activities. Action levels will identify instances when respiratory protection will have to be upgraded.
Sediments/ CWA	Federal - NOAA Technical Memorandum NOS OMA 52	To be Considered	The memorandum identifies reference doses for various contaminants in sediments and their potential biological effects on biota exposed to the contaminants.	Contaminated sediments will be remediated.

TABLE SC-6 (Cont'd)
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE
MEDIUM: GROUNDWATER
RELEVANT AND APPROPRIATE

Chemical	Safe Drinking Water Act Maximum Contaminant Levels (MCLs)(ug/l) Federal 40 CFR 141 & State (MCL's) 310 CMR 22.00	Safe Drinking Water Act Maximum Contaminant Levels Goals (MCLGs)(ug/l) Federal 40 CFR 141 ^(b)	Resource Conservation and Recovery Act (RCRA) Maximum Contaminant Levels Federal 40 CFR 264.94 (ug/l)
<u>Potential Chemicals of Concern</u>			
<u>Volatile Organic Compounds</u>			
Acetone	-	-	-
Benzene	5	0	-
Chloroethane	-	-	-
Dichloroethylene (cis-1,2)	70	70	-
Dichloroethylene (trans-1,2)	100	100	-
1,1-Dichloroethylene	7	7	-
1,2-Dichloroethane	5	0	-
Ethylbenzene	700	700	-
Methylene Chloride	5	0	-
Methyl Ethyl Ketone	-	-	-
Methyl Isobutyl Ketone	-	0	-
Tetrachloroethylene	5	0	-
Toluene	1000	1,000	-
Trichloroethylene	5	0	-
1,1,1-Trichloroethane	200	200	-
Tetrahydrofuran	-	-	-
Vinyl Chloride	2	0	-
<u>Acid & Base/Neutral Extractable Organics</u>			
Anthracene	-	-	-
Benzo(a)anthracene	0.1	0	-
Benzo(a)pyrene	0.2	0	-
Chrysene	0.2	0	-
Di(ethylhexyl)phthalate	4	0	-
Diethylphthalate	6	0	-
Fluoranthene	-	-	-
<u>Metals</u>			
Antimony	6	6	-
Arsenic	50	0	50
Beryllium	4	0	-
Cadmium	5	5	10
Chromium	100	100	50
Copper	1,300 ^(a)	1,300 ^(a)	-
Cyanide	200	200	-
Lead	15 ^(a)	-	50
Mercury	2	2	2
Nickel	100	100	-
Selenium	50	50	10
Silver	-	-	50
Thallium	2	0.5	-
Zinc	-	-	-

- ^a EPA action level - source: June 20, 1990 EPA memorandum from Henry Longest and Bruce Diamond to Patrick Tobin.
^b The remedy will comply with only non-zero MCLGs.

TABLE SC-6 (Cont'd)
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE
CLEAN AIR ACT (CAA)
APPLICABLE

MEDIA: AIR

National Ambient Air
Quality Standards
(40 CFR 50)(ug/m³)/(ppm)

Pollutant

Carbon Monoxide (CO)	40000 (1-hour average)/35 (1 hour average) 10000 (8-hour average)/9 (8 hour average)
Lead (Pb)	1.5 (3 months)
Nitrogen Dioxide (NO ₂)	100 (annual)/0.05 (annual)
Ozone (O ₃)	235 (1-hour)/0.12 (1 hour)
Particulate Matter (PM-10)	150 (24-hour)/ NA 50 (annual)/ NA
Sulfur Dioxide (SO ₂)	1300 (3-hour)/0.5 (3 hour) 365 (24-hour)/0.14 (24 hour) 80 (annual)/0.036 (annual)

a This maximum 24-hr level may not be exceeded more than once per year.

b This maximum 8-hr level may not be exceeded more than once per year.

NA Not Applicable.

TABLE SC-6 (Cont'd)
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE
MEDIUM: SURFACE WATER
CLEAN WATER ACT (CWA) - WATER QUALITY CRITERIA
TO BE CONSIDERED

Chemical Potential Chemicals of Concern	For Protection of Human Health		For Protection of Aquatic Life ^(a)
	Water and Fish Ingestion (ug/l)	Fish Consumption Only (ug/l)	Freshwater Acute/ Chronic (ug/l)
<u>Volatile Organic Compounds</u>			
Acetone	-	-	-
Benzene	0.66	40	5,300/-
Chloroethane	-	-	-
Dichloroethylenes	-	-	11,600/-
1,1-Dichloroethylene	0.033	1.85	-
1,2-Dichloroethane	0.94	243	11,800/20,000
Ethylbenzene	1,400	3,280	32,000/-
Methylene Chloride	-	-	-
Methyl Ethyl Ketone	-	-	-
Methyl Isobutyl Ketone	-	-	-
Tetrachloroethylene	0.80	8.85	5,280/840
Toluene	14,300	424,000	17,500/-
Trichloroethylene	2.7	80.7	45,000/21,900
1,1,1-Trichloroethane	18,400	1,030,000	-
Tetrahydrofuran	-	-	-
Vinyl Chloride	2	525	-
<u>Acid & Base/Neutral Extractable Organics</u>			
Anthracene	-	-	-
Benzo(a)anthracene	-	-	-
Benzo(a)fluoranthracene	-	-	-
Benzo(a)pyrene	-	-	-
Bis(2-ethylhexyl) phthalate	-	-	-
Chrysene	-	-	-
Di(ethylhexyl)phthalate	-	-	-
Diethylphthalate	350,000	1,800,000	-
Fluoranthene	42	54	3,980/-
Fluorene	-	-	-
Phenanthrene	-	-	30/6.3 ^(b)
Pyrene	-	-	-
<u>Metals</u>			
Antimony	146	45,000	88/30 ^(b)
Arsenic	0.0022	0.0175	-
Beryllium	0.0037	0.0641	130/5.3
Cadmium	10	-	3.9/1.1
Chromium	170,000	3,433,000	1,700/210
Copper	-	-	18/12
Cyanide	200	-	22/5.2
Lead	50	-	83/3.2
Mercury	0.144	0.146	2.4/0.012
Nickel	13.4	100	1,400/160
Selenium	10	-	20/5
Silver	50	-	4.1/0.12
Thallium	13	48	1400/40
Zinc	-	-	120/110

(a) Value shown corresponds to a hardness of 100 mg/l as CaCO₃.

(b) Proposed criteria.

TABLE SC-6 (Cont'd)
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE
TO BE CONSIDERED

Chemicals Detected In Groundwater and Surface Water Sample	USEPA Drinking Water Health Advisories ¹				Cancer Potency Factors ³ (mg/kg/day)		Noncarcinogenic Effects - Acceptable Intakes (mg/kg/day)				RfDs ⁴ (mg/kg/day)	
	1-day Child	10-day (ug/l/10 kg)	Long-Term ² (ug/l/10 kg)	Life Time (ug/l/70 kg)	Oral Route	Inhalation Route	Oral Route		Inhalation Route		Oral Route	Inhalation Route
						(AIS)	Subchronic	Chronic	Subchronic	Chronic		
Volatiles Organics						(AIS)	(AIC)	(AIS)	(AIC)			
Acetone		NA	NA	NA	NA	NA	1.00	.100	30.00	3.00	.100	NA
Chloroethane		NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02	NA
Methylene Chloride	10,000	2,000	NA	NA	.013	.0063	NA	.060	NA	NA	.06	3 mg/m ³
1,1-Dichloroethane		NA	NA	NA	NA	NA	1.20	.120	1.38	.138	1E-1	NA
trans-1,2-Dichloroethylene	20,000	2,000	2,000	100	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	100,000	40,000	40,000	200	NA	NA	3.1	.09	3.1	3.1	.09	NA
Trichloroethylene		NA	NA	NA	.0110	.0172	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane		NA	NA	NA	.0573	.057	NA	NA	NA	NA	.004	NA
Benzene	200	200	NA	NA	.029	.029	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	2,000	2,000	1,000	NA	(.0510)	5.2E-7	NA	.02	NA	NA	.010	NA
Toluene	20,000	3,000	3,000	1,000	NA	NA	.430	.300	1.5	1.5	.2	NA
Ethylbenzene	20,000	3,000	1,000	700	NA	NA	.970	.100	NA	NA	.100	NA
Methyl Isobutyl Ketone		NA	NA	NA	NA	NA	.5	.050	.23	.029	.050	NA
Xylenes (Total)	40,000	40,000	40,000	10,000	NA	NA	4.0	2.0	.44	.44	2.0	NA
o-xylene		NA	NA	NA	NA	NA	4.0	2.0	.44	.44	NA	NA
m-xylene		NA	NA	NA	NA	NA	4.0	2.0	.44	.44	2.0	NA
p-xylene		NA	NA	NA	NA	NA	4.0	2.0	.44	.44	2.0	NA
Semi-Volatile Organics												
PCBs (Total)		NA	NA	NA	7.7 (Policy)	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260		NA	NA	NA	7.7	NA	NA	NA	NA	NA	NA	NA
Metals												
Cadmium	40	0	5	5	NA	6.10	NA	.013	NA	NA	.0005	NA
Chromium	1,000	1,000	240	100	NA	41.0 ⁵	14.0 ⁶	1.00 ⁶	NA	NA	1.00	NA
Lead		NA	20 ug/day	20 ug/day	NA	NA	NA	.00140	NA	NA	NA	NA

¹ USEPA Drinking Water Health Advisories, formerly SNARLs, are non-enforceable criteria established by the Office of Drinking Water. They are set for levels at which adverse health effects are not expected. These draft criteria consider only toxic effects, and not the cumulative effects of other chemicals in drinking water.

² Longer term health advisories are for exposures ranging from several months to several years and should generally be compared only to estimated short-term concentrations (STC).

³ Potency Factors are based on toxicity data for potential carcinogenic effects and are derived from Integrated Risk Information System (IRIS) 1990-1991.

⁴ RfD (Reference Dose) is an estimate (with an uncertainty of one order of magnitude or more) of a lifetime dose which is likely to be without significant risk to human population. Values were developed by the EPA Environmental Criteria and Assessment Office, Cincinnati, Ohio in mg/kg/day. RfDs are established for specific exposure routes.

⁵ MCL and potency factor given are for chromium.

⁶ Concentration shown is for chromium III (trivalent) and compounds.

TABLE SC-6 (Cont'd)
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE
TO BE CONSIDERED

<u>Air Contaminants</u> ⁽¹⁾	<u>PEL</u> ⁽⁶⁾ ($\mu\text{g}/\text{m}^3$ /ppm)	<u>Allowable Ambient</u> <u>Levels (AALs)</u> ⁽²⁾ ($\mu\text{g}/\text{m}^3$)	<u>TLV-TWA</u> ⁽⁴⁾ ($\mu\text{g}/\text{m}^3$)	<u>TLV-STEL</u> ⁽⁵⁾ ($\mu\text{g}/\text{m}^3$)
Acetone	2,400,000/1,000 ppm	160.54	20,000	
Benzene	-----/10	0.12	30,000	NA ⁽³⁾
Ethyl Benzene	435,000/100	118.04	435,000	545,000
Methylene Chloride	1,736,809/100	2.4	350,000	1,740,000
Xylene	435,000/100	11.8	435,000	655,000
Trichloroethylene	--/100	0.61	270,000	1,080,000
1,1-Dichloroethane	--/--	NA ⁽³⁾	810,000	1,010,000
Tetrachloroethylene	-----/100	0.02	335,000	1,340,000
Chloroethane	--/--	358.78	--	--
4 Methyl-2 Pentanone	--/--	55.70	205,000	300,000
2 Butanone	--/--	32.07	590,000	885,000
Pentane	295,000/1,000	NA ⁽³⁾	1,800,000	2,250,000
Toluene	--/200	10.24	375,000	560,000
1,1,1-Trichloroethane	1,900,000/350	1,638.37	1,900,000	2,450,000
1,1,2-Trichloroethane	45,000/10	0.06	45,000	--

¹ These air contaminants were detected on-site in samples collected during the three-day August 1988 Air Sampling Program.

² These levels are cited in the Draft version of the Chemical Health Effects Assessment Methodology and the Method to Derive Allowable Ambient Levels (Chem/AAL), DEP, Air Toxics Program, 1989.

³ NA - No concentrations available for these chemicals.

⁴ TLV - TWA - The Threshold Limit Value - Time Weighted Average is the time-weighted average concentration for a normal 8-hour work day and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect. The Threshold Limit Values, as issued by ACGIH, are recommendations and should be used as guidelines for good practices. (Threshold Limit Values and Biological Exposure Indices for 1987-1988).

⁵ TLV - STEL - The Threshold Limit Value - Short-Term Exposure Limit is the concentration to which workers can be exposed continuously for a short period of time without suffering from: 1) irritation; 2) chronic or irreversible tissue damage; or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency, and provided that the daily TLV - TWA is not exceeded. The Threshold Limit Values, as issued by ACGIH, are recommendations and should be used as guidelines for good practices. (Threshold Limit Values and Biological Exposure Indices for 1987-1988).

⁶ PEL - Permissible Exposure Limit - These are enforceable limits based on 8-hour time-weighted average concentrations an employee may be exposed to in a work environment without adverse effect. Limits obtained from NIOSH Pocket Guide to Chemical Hazards, September 1985.

TABLE SC-6 (Cont'd)
LOCATION-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

<u>Location/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Wetlands/CWA	Federal - Clean Water Act (CWA) Section 404(b)(1); 40 CFR part 230, 33 CFR parts 320-330	Applicable	Requirements under these codes prohibit the discharge of dredged or fill material into wetlands unless those actions comply with the substantive requirements which are identified under these regulations.	Discharges to wetlands around the site will comply with these requirements.
Floodplains/ CWA	Federal Executive Orders 11988 Floodplain Management 40 CFR Part 6 Appendix A	Applicable	Federal agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial values of flood plains.	Floodplain considerations will be incorporated into the planning and implementation of this selected remedy.
Wetlands/CWA	Federal Executive Orders 11990 Protection of Wetlands	Applicable	Under this regulation, Federal agencies are required to minimize the destruction, loss or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands.	Wetlands protection considerations will be incorporated into the planning and implementation of this selected remedy.
Floodplains/ RCRA	Federal - 40 CFR Part 264.18 Location Standards	Relevant and Appropriate	<p>This regulation identifies geological features which a proposed location for a RCRA hazardous waste treatment and/or disposal facility must avoid. Three specific geologic features are identified of which two apply to the PSC Resources site. These geologic features and their significance are:</p> <ul style="list-style-type: none"> • Floodplain - A facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste unless the owner or operator can demonstrate to the EPA regional administrator that he can meet the criteria established under this subpart which exempts him from complying with this requirement. 	PSC Resources is located within a 100-year floodplain and a portion of the site may be within 200 feet of a fault. On-site remediation activities will comply with the requirements of 40 CFR 264.18(a) and (b).

TABLE SC-6 (Cont'd)
LOCATION-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

<u>Location/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Floodplains/ RCRA (Cont'd)			<ul style="list-style-type: none"> • Seismic Considerations - Portion of facilities where treatment, storage or disposal of hazardous waste will be conducted must not be located within 200 feet of a fault which has displaced in Holocene time. 	
Rivers/ CWA	Federal - 16 USC 661 et. seq. Fish and Wildlife Coordination Act	Applicable	Mitigative actions must be taken to minimize potential adverse impacts to natural sources such as wetlands. Restoration of damaged natural features are required.	Relevant federal agencies will be contacted to help analyze impacts of the implementation of remedial alternatives on wildlife in wetlands and rivers. Restoration of impacted wetlands will occur once all excavation and stabilization activities are completed.
Wetlands/ CWA	State - Department of Environmental Protection (DEP) - Wetlands Protection (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, altering or polluting inland wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation types and requires that effects on wetlands be mitigated.	The selected remedy will include measures to mitigate and/or replace loss of habitat or hydraulic capacity in accordance with 310 CMR 10.00.
Wetlands/ RCRA	State - Hazardous Waste Facility Siting Regulations (990 CMR 1.00)	Applicable	These regulations outline the criteria for the construction, operation, and maintenance of a new facility or increase in an existing facility for the storage, treatment, or disposal of hazardous waste, and require that no portion of the facility may be located within a wetland or on land bordering a vegetated wetland, unless approved by the State.	The remedy will comply with all of the substantive requirements of 990 CMR 1.00, and no portion of the facility will be located within a wetland or on land bordering a vegetated wetland, unless approved by the State.

TABLE SC-6 (Cont'd)
ACTION-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Action/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Floodplains/ RCRA	State-Hazardous Waste Facility Siting Regulations (990 CMR 1.00)	Applicable	These regulations outline the criteria for the construction, operation, and maintenance of a new facility or increase in an existing facility for the storage, treatment, or disposal of hazardous waste, and require that no portion of the facility may be located within a 100-year floodplain, unless approved by the State.	The remedy will comply with all of the substantive requirements of 990 CMR 1.00, and no portion of the facility will be located within a 100-year floodplain unless approved by the State.
Impoundment/ RCRA	FEDERAL - RCRA 40 CFR Sections 264.220 -264.230 265.220 - 265.230 (Sub K) Design, operation and closure of surface impoundments.	Relevant and Appropriate	General requirements for surface impoundments. Requirements include design standards, operational requirements, monitoring and record keeping requirements and closure requirements.	The existing lagoon will be closed in accordance with the substantive requirements of this regulation.
Off-site Shipment Disposal/ RCRA	FEDERAL - 40 CFR Part 262.11- .33, .40-.42	Applicable	Regulations apply to generators and other initiators of hazardous waste shipments from disposal facilities, including identification of hazardous waste, manifesting requirements, packaging and pre-transport standards, and record-keeping requirements.	All off-site shipments of hazardous wastes will comply with these requirements.
Off-site Shipment Disposal/ RCRA	FEDERAL - 40 CFR Part 262.50 (Subpart E) Export of Hazardous Waste.	Applicable	Establishes requirements applicable to exports of hazardous wastes. Primary exporter of hazardous waste must comply with special manifesting and reporting requirements.	Any hazardous waste shipped from the PSC Resources site and exported out of the country will comply with the requirements of this section.
Off-site Shipment Disposal/RCRA	FEDERAL - 40 CFR Part 263.10 263.22 (Subparts A and B) Compliance with the Manifest	Applicable	Identifies manifesting procedures to be followed by transporters for all shipments of hazardous waste.	All off-site shipments will comply with these requirements.

TABLE SC-6 (Cont'd)
ACTION-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Action/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Off-site Shipment Disposal/ RCRA	FEDERAL - 40 CFR Part 264.70 (Subpart E) Manifest System, Recordkeeping and Reporting	Applicable	Regulations apply to owners and operators of facilities receiving wastes from off-site. Requirement identifies procedures to be followed in filling out, filing and submitting hazardous waste manifests for all shipments of hazardous waste sent from and received by a facility.	Off-site shipments of hazardous wastes will comply with this requirement.
Treatment Facility Operations/ RCRA	FEDERAL - 40 CFR Part 264.10- 264.18 (Subpart B) General Facility Standards	Relevant and Appropriate	This subpart applies to all owners and operators of hazardous waste facilities. The subpart identifies procedures which must be followed for the operation and maintenance of a hazardous waste TSD facility.	The selected remedy will comply with all substantive portions of this requirement during on-site treatment of contaminated materials.
TSD Facility Preparedness and Prevention/ RCRA	FEDERAL - 40 CFR Part 264.30-37 (Subpart C) Preparedness and Prevention	Relevant and Appropriate	Identifies requirements which must be met during design, construction, and operation of TSD Facilities to minimize possibility of fires, explosions or unplanned releases of waste.	Any waste shipped off-site will be shipped to a facility which meets this standard.
Incineration/Soil Remediation/ CAA	FEDERAL CAA - National Ambient Air Quality Standards 40 CFR Part 50	Relevant and Appropriate	These requirements establish maximum primary and secondary 24-hour concentrations for particulate matter.	Particulate matter will be contained during any on-site excavation and stabilization activities, and will not exceed these levels.
National Pollutant Discharge Elimination System/CWA	FEDERAL - 40 CFR Parts 122 and 125 National Pollutant Discharge Elimination System.	Applicable	EPA administered permit program which allows private parties to discharge pollutants from a point source into the "waters of the United States."	All discharges of treated groundwater or surface water to the Quaboag River, will comply with all NPDES substantive requirements.
Treatment and Disposal/ RCRA	STATE - 310 CMR 30.00 Hazardous Waste Regulations. 310 CMR 30.00 is enforceable under M.G.L. Ch. 21C ss. 4 and 6, and M.G.L. Ch. 211 s. 6.	Relevant and Appropriate	The Hazardous Waste Regulations 310 CMR 30.00 govern the generation of, listing, handling, storage, transporting and disposal of hazardous wastes.	The selected remedy will comply with the substantive requirements under each sub-part that pertains to on-site or off-site activities.

TABLE SC-6 (Cont'd)
ACTION-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Action/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Surface Impoundments/ RCRA	STATE - 310 CMR 30.610 Surface Impoundment Requirements	Relevant and Appropriate	All sites or facilities where surface impoundments are located must have a groundwater monitoring system installed and operating which meets the requirements of 310 CMR 30.660. During closure of surface impoundments any waste to be left on-site must be solidified and the impoundment capped in a manner which minimizes infiltration of surface water. Post-closure requirements identified in 310 CMR 30.590 must be followed.	Remediation of the on-site lagoon will comply with the requirements of this regulation.
Groundwater Protection/ RCRA	STATE - 310 CMR 30.660 Groundwater Protection. This citation includes the requirements of 310 CMR 30.661 through 30.673.	Relevant and Appropriate	<p>Groundwater Protection requirements (310 CMR 30.660) apply to the following regulated hazardous waste treatment units:</p> <ul style="list-style-type: none"> • surface impoundments, • land treatment units, and • landfills. <p>Groundwater protection programs must be conducted during the active life of the treatment units identified above, or after closure if required by the approved operating permit. Groundwater monitoring or corrective action monitoring (310 CMR 30.672) are required any-time concentrations of chemicals in the groundwater exceed levels established by the department in accordance with 310 CMR 30.667.</p> <p>In accordance with 30.672, groundwater which contains chemical constituents in excess of established concentration limits must be removed or treated so that maximum concentration limits are attained.</p>	A groundwater monitoring program which meets the requirements of 310 CMR 30.660 and 310 CMR 30.672 will be implemented throughout the post-closure period for the site. Elimination of contaminant leaching via stabilization of the on-site soils will allow natural processes to treat the existing contaminated groundwater.

TABLE SC-6 (Cont'd)
ACTION-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Action/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Groundwater Protection/ CWA	STATE - 314 CMR 6.00 (Promulgated under MGL Chapter 21, ss. 27(5), 27(6), 27(12)) Massachusetts Groundwater Quality Standards	Applicable	314 CMR 6.00 establishes groundwater quality standards which must be met for various classes of groundwater in the State of Massachusetts. 314 CMR 6.03 designates the three classes of groundwater. 314 CMR 6.06 defines the groundwater quality criteria which must be met for each class of groundwater.	Discharges (direct or indirect) of effluent to the groundwaters of Massa- chusetts will meet the appropriate groundwater quality criteria during and subsequent to implementation of this remedy.
PCB Disposal Requirements/ TSCA	TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.65, 761.79)	Applicable if PCB concentra- tions are >50 ppm; Relevant and appropriate if PCB con- centrations are <50 ppm	All dredged materials that contain PCBs at concentrations of 50 ppm or greater shall be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. On-site storage fac- ilities for PCBs shall meet, at a minimum, the following criteria: <ul style="list-style-type: none"> • Adequate roof and walls to prevent rain • Adequate floor with continuous curbing • No openings that would permit liquids to flow from curbed area 	Disposal of soils/sediments under the cap at the Disposal Area will comply with chemical waste landfill requirements except requirements waived by the Regional Administrator pursuant to 40 CFR § 761.75(c)(4) in the ROD. These regulations have been considered by U.S. EPA Region I in the selection of this remedy and will be considered in the design of storage facilities. Solid debris, excluding trees and bushes, shall be decontaminated prior to off- site transport or off-site disposal in accordance with 40 CFR 761.79; storage facilities shall be designed consistent with 40 CFR 761.65 (b)(1)(i), (ii) and (iii).
Asbestos Removal/	STATE - 310 CMR 7.15 Asbestos Removal	Applicable	Asbestos removal from any building or facility must be done in accordance with this regulation. Removal or sealing in place of mate- rials which contain asbestos must be conducted by qualified individuals or firms. Removal work must be performed in accordance with 7.15 (1)(c)(d) and (e).	Any asbestos removal or abatement activities in or around the buildings on-site or on other portions of the site will be conducted in accordance with these requirements.

TABLE SC-6 (Cont'd)
ACTION-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Action/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Air Discharges/ CAA	STATE - 310 CMR 6.0-8.0 Air Quality Control Regulations	Applicable	These regulations govern emissions to the air from new sources. Sources must not cause a condition of air pollution. In addition there are specific standards for PICs, CO _x , O ₃ , Pb and SO _x . The state applies this standard by examining AALs and other air modeling and monitoring data and by requiring standard controls available for some of the more common remedial technologies.	The selected remedy will comply with the use of Best Available Control Technologies (BACT) and will not contribute to a condition of air pollution.
Noise	STATE - 310 CMR 7.10 Noise	Applicable	This regulation requires that all equipment, machinery and/or operations which generate noise (sound), be operated in a manner which minimizes the generation of sound or be fitted and accommodated with noise reducing equipment and measures.	On-site construction/remediation activities will be conducted during normal working hours and comply with the requirements of this regulation.
Air/ Discharges	STATE - 310 CMR 7.09 Dust, Odor, Construction, and Demolition	Applicable	Any operation which generates dust and odors shall be performed in a manner which does not generate significant quantities of dust which if generated would cause or contribute to a condition of air pollution.	On-site remedial activities will be performed in a manner which minimizes dust generation. If significant quantities of dust are generated, then mitigative measures will be employed to reduce the levels of dust generated.
Surface Water Protection/ CWA	STATE - 314 CMR 3.00 (Promulgated under MGL Chapter 21, s. 27 and s. 43)	Applicable	Discharges of any pollutant to any surface water in the State of Massachusetts must have a valid discharge permit from the Division of Water Pollution Control (DWPC) - 314 CMR 3.04. This discharge permit (called a National Pollutant Discharge Elimination System (NPDES) permit) is issued jointly by the EPA and the DEP.	Any remedial activities conducted on-site at the PSC Resources site will be conducted under CERCLA Sections 104 or 106; therefore, no federal or state permits will be required. However, the selected remedy will comply with the standards or discharge limits and activities covered by any permits which would normally be required.

TABLE SC-6 (Cont'd)
ACTION-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Action/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Surface Water/ CWA	Massachusetts Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharge 314 CMR 12.00	Applicable	Regulations to ensure proper operation and maintenance of wastewater treatment facilities and sewer systems within the Commonwealth.	Remedial activities will comply with all provisions of this regulation.
Air/CAA	Federal - CAA - National Ambient Air Quality Standards (NAAQS) (40 CFR 50)	Applicable	NAAQS define levels of primary and secondary levels for six common air contaminants (sulfur dioxide, particulate matter "PM ₁₀ ", carbon monoxide, ozone, nitrogen dioxide and lead).	The levels established for these six air contaminants will be used as target levels which may not be exceeded by air release from on-site activities.
Air Discharges/ CAA	STATE - Massachusetts Guidance on Allowable Ambient Levels (AALs), cited in <u>Chemical Health Effects Assessment Methodology and Methodology to Derive Allowable Ambient Levels</u> , DEP, 1989.	To be Considered	This guidance evaluates acute and chronic toxicity and sets draft AALs for volatile and semi-volatile chemicals. AALs have been issued by the DEP for 108 chemicals to date. The AALs to be considered, modeled, and monitored for are considered in conjunction with BACT to meet the action specific applicable requirements at 310 CMR 6.0 through 8.0 in "not causing a condition of air pollution."	The selected remedy will attain AALs during on-site remediation activities if technically feasible.

TABLE MM-1
CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Groundwater/ SDWA	Federal - SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16) and non-zero Maximum Contaminant Level Goals (MCLGs)	Relevant and Applicable	Standards (MCLs - Maximum Contaminant Levels) have been adopted as enforceable standards for public drinking water systems; goals (MCLGs) are non-enforceable levels for such systems.	In conjunction with the implementation of SC-6, the remedy will attain MCLs.
Surface Water/CWA	Federal - CWA - Ambient Water Quality Criteria (AWQC)- Protection of Freshwater Aquatic Life, Human Health, Fish Consumption	Relevant and Appropriate	AWQC are developed under the Clean Water Act (CWA) as guidelines from which states develop water quality standards. CERCLA §121(d)(2) requires compliance with such guidelines when they are relevant and appropriate. A more stringent AWQC for aquatic life may be found relevant and appropriate rather than an MCL, when protection of aquatic organisms is being considered at a site. Federal AWQC are health-based criteria which have been developed for 95 carcinogenic compounds; these criteria consider exposure to chemicals from drinking water and/or fish consumption; acute and chronic exposure levels are established.	The selected remedy will attain AWQC in the wetland surface water and Quaboag River water after completion of the remedial activities.
Groundwater/ CWA	State Department of Environmental Protection (DEP) - Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Applicable	Massachusetts Groundwater Quality Standards have been promulgated for a number of contaminants. When the state levels are more stringent than federal levels, the state levels will be used.	In conjunction with the implementation of SC-6, the remedy will attain Massachusetts MCLs in the groundwater at the point of compliance.

TABLE MM-1 (Cont'd)
CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Groundwater/ SDWA	State - 310 CMR 22.06 Maximum Contaminant Levels for Inorganic Chemicals in Drinking Water.	Relevant and Appropriate	Maximum contaminant levels are established for Inorganic Chemical Contaminants under 310 CMR 22.06. All public water systems must comply with the levels of inorganic contaminants which are listed in Table 1 of 310 CMR 22.06.	In conjunction with the implementation of SC-6, the selected remedy will attain Massachusetts MCLs for inorganics at the point of compliance.
Groundwater/ SDWA	State - 310 CMR 22.07 Maximum Organic Chemical Contaminant Levels in Drinking Water	Relevant and Appropriate	310 CMR 22.07 establishes maximum contaminant levels for selected chlorinated hydrocarbons, pesticides and herbicides.	In conjunction with the implementation of SC-6, the selected remedy will attain Massachusetts MCLs for organic contaminants at the point of compliance.
Surface Water/CWA	DEP - Massachusetts Surface Water Quality Standards (314 CMR 4.00) (M.G.L. c. 21, s.27)	Applicable	DEP Surface Water Quality Standards are established for dissolved oxygen, temperature, pH, total coliform bacteria, turbidity, total dissolved solids, color, tainting substances, radioactive substances, oil and grease and nutrients.	In conjunction with the implementation of SC-6, the discharge of lagoon water to the Quaboag River associated with the selected remedy will meet the criteria set for a Class B surface water body (Quaboag River).
Air/CAA	State - Massachusetts Guidance on Allowable Ambient Levels (AALs), cited in <u>Chemical Health Effects Assessment Methodology and Methodology to Derive Allowable Ambient Levels</u> , DEP, 1989.	To be Considered	This guidance evaluates acute and Chronic toxicity and sets draft AALs for volatile and semi-volatile chemicals. AALs have been issued by the DEP for 108 chemicals to date. The AAL's to be considered, modeled and monitored for are considered in conjunction with BACT to meet the action specific applicable requirements at 310 CMR 6.0 through 8.0 in "not causing a condition of air pollution...".	AALs should not be exceeded during implementation of the remedy because no remedial actions will be conducted with the exception of long term monitoring.

TABLE MM-1 (Cont'd)
CHEMICAL-SPECIFIC
ARARs, CRITERIA, ADVISORIES AND GUIDANCE

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Groundwater/ CWA	Federal - (Guidance) Groundwater Protection Strategy	To be Considered	<p>EPA's groundwater protection strategy [as identified in <u>Groundwater Protection Strategy</u>. EPA Office of Groundwater Protection, August, 1984], includes the following components:</p> <ul style="list-style-type: none"> • Assessing the problems that may exist from unaddressed sources - of contamination-in particular, leaking storage tanks, surface impoundments, and landfills; • Issuing guidelines for EPA decisions affecting groundwater protection and cleanup. 	The groundwater quality in the vicinity of the site and adjacent wetlands will be restored under the remedy.
Groundwater	State - Massachusetts Drinking Water Health Advisories	To be Considered	DEP Health Advisories are guidance criteria for drinking water.	The selected remedy will address risks to human health.

TABLE MM-1 (Cont'd)
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE
MEDIUM: GROUNDWATER
RELEVANT AND APPROPRIATE

Chemical	Safe Drinking Water Act Maximum Contaminant Levels (MCLs)(ug/l) Federal 40 CFR 141 & State (MCL's) 310 CMR 22.00	Safe Drinking Water Act Maximum Contaminant Levels Goals (MCLGs)(ug/l) Federal 40 CFR 141 ^(b)	Resource Conservation and Recovery Act (RCRA) Maximum Contaminant Levels Federal 40 CFR 264.94 (ug/l)
Potential Chemicals of Concern			
<u>Volatile Organic Compounds</u>			
Acetone	-	-	-
Benzene	5	0	-
Chloroethane	-	-	-
Dichloroethylene (cis-1,2)	70	70	-
Dichloroethylene (trans-1,2)	100	100	-
1,1-Dichloroethylene	7	7	-
1,2-Dichloroethane	5	0	-
Ethylbenzene	700	700	-
Methylene Chloride	5	0	-
Methyl Ethyl Ketone	-	-	-
Methyl Isobutyl Ketone	-	-	-
Tetrachloroethylene	5	0	-
Toluene	1000	1,000	-
Trichloroethylene	5	0	-
1,1,1-Trichloroethane	200	200	-
Tetrahydrofuran	-	-	-
Vinyl Chloride	2	0	-
<u>Acid & Base/Neutral Extractable Organics</u>			
Anthracene	-	-	-
Benzo(a)anthracene	0.1	0	-
Benzo(a)pyrene	0.2	0	-
Chrysene	0.2	0	-
Di(ethylhexyl)phthalate	4	0	-
Diethylphthalate	6	0	-
Fluoranthene	-	-	-
<u>Metals</u>			
Antimony	6	6	-
Arsenic	50	0	50
Beryllium	4	0	-
Cadmium	5	5	10
Chromium	100	100	50
Copper	1,300 ^(a)	1,300 ^(a)	-
Cyanide	200	200	-
Lead	15 ^(a)	-	50
Mercury	2	2	2
Nickel	100	100	-
Selenium	50	50	10
Silver	-	-	50
Thallium	2	0.5	-
Zinc	-	-	-

- a EPA action level - source: June 21, 1990 EPA memorandum from Henry Longest and Bruce Diamond to Patrick Tobin.
b The remedy will comply with only non-zero MCLGs.

TABLE MM-1 (Cont'd)

CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE
MEDIUM: SURFACE WATER
CLEAN WATER ACT (CWA) - WATER QUALITY CRITERIA
TO BE CONSIDERED

<u>Chemical</u> <u>Potential Chemicals</u> <u>of Concern</u>	<u>For Protection of Human Health</u>		<u>For Protection of Aquatic Life^(a)</u>
	<u>Water and Fish</u> <u>Ingestion (ug/l)</u>	<u>Fish Consumption</u> <u>Only (ug/l)</u>	<u>Freshwater Acute/</u> <u>Chronic (ug/l)</u>
<u>Volatile Organic Compounds</u>			
Acetone	-	-	-
Benzene	0.66	40	5,300/-
Chloroethane	-	-	-
Dichloroethylenes	-	-	11,600/-
1,1-Dichloroethylene	0.033	1.85	-
1,2-Dichloroethane	0.94	243	11,800/20,000
Ethylbenzene	1,400	3,280	32,000/-
Methylene Chloride	-	-	-
Methyl Ethyl Ketone	-	-	-
Methyl Isobutyl Ketone	-	-	-
Tetrachloroethylene	0.80	8.85	5,280/840
Toluene	14,300	424,000	17,500/-
Trichloroethylene	2.7	80.7	45,000/21,900
1,1,1-Trichloroethane	18,400	1,030,000	-
Tetrahydrofuran	-	-	-
Vinyl Chloride	2	525	-
<u>Acid & Base/Neutral Extractable Organics</u>			
Anthracene	-	-	-
Benzo(a)anthracene	-	-	-
Benzo(a)fluoranthracene	-	-	-
Benzo(a)pyrene	-	-	-
Bis(2-ethylhexyl) phthalate	-	-	-
Chrysene	-	-	-
Di(ethylhexyl)phthalate	-	-	-
Diethylphthalate	350,000	1,800,000	-
Fluoranthene	42	54	3,980/-
Fluorene	-	-	-
Phenanthrene	-	-	30/6.3 ^(b)
Pyrene	-	-	-
<u>Metals</u>			
Antimony	146	45,000	88/30 ^(b)
Arsenic	0.0022	0.0175	-
Beryllium	0.0037	0.0641	130/5.3
Cadmium	10	-	3.9/1.1
Chromium	170,000	3,433,000	1,700/210
Copper	-	-	18/12
Cyanide	200	-	22/5.2
Lead	50	-	83/3.2
Mercury	0.144	0.146	2.4/0.012
Nickel	13.4	100	1,400/160
Selenium	10	-	20/5
Silver	50	-	4.1/0.12
Thallium	13	48	1400/40
Zinc	-	-	120/110

(a) Value shown corresponds to a hardness of 100 mg/l as CaCO₃.

(b) Proposed criteria.

TABLE MM-1 (Cont'd)
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE
TO BE CONSIDERED

Chemicals Detected In Groundwater and Surface Water Sample	USEPA Drinking Water Health Advisories ¹				Cancer Potency Factors ³ (mg/kg/day)		Noncarcinogenic Effects - Acceptable Intakes (mg/kg/day)				RfDs ⁴ (mg/kg/day)	
	1-day Child	10-day (ug/l/10 kg)	Long-Term ² (ug/l/10 kg)	Life Time (ug/l/70 kg)	Oral Route	Inhalation Route	Oral Route Subchronic	Chronic	Inhalation Route Subchronic	Chronic	Oral Route	Inhalation Route
Volatile Organics						(AIS)	(AIC)	(AIS)	(AIC)			
Acetone		NA	NA	NA	NA	NA	1.00	.100	30.00	3.00	.100	NA
Chloroethane		NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02	NA
Methylene Chloride	10,000	2,000	NA	NA	.013	.0063	NA	.060	NA	NA	.06	3 mg/m ³
1,1-Dichloroethane		NA	NA	NA	NA	NA	1.20	.120	1.38	.138	1E-1	NA
trans-1,2-Dichloroethylene	20,000	2,000	2,000	100	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	100,000	40,000	40,000	200	NA	NA	3.1	.09	3.1	3.1	.09	NA
Trichlorethylene		NA	NA	NA	.0110	.0172	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane		NA	NA	NA	.0573	.057	NA	NA	NA	NA	.004	NA
Benzene	200	200	NA	NA	.029	.029	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	2,000	2,000	1,000	NA	(.0510)	5.2E-7	NA	.02	NA	NA	.010	NA
Toluene	20,000	3,000	3,000	1,000	NA	NA	.430	.300	1.5	1.5	.2	NA
Ethylbenzene	20,000	3,000	1,000	700	NA	NA	.970	.100	NA	NA	.100	NA
Methyl Isobutyl Ketone		NA	NA	NA	NA	NA	.5	.050	.23	.029	.050	NA
Xylenes (Total)	40,000	40,000	40,000	10,000	NA	NA	4.0	2.0	.44	.44	2.0	NA
o-xylene		NA	NA	NA	NA	NA	4.0	2.0	.44	.44	NA	NA
m-xylene		NA	NA	NA	NA	NA	4.0	2.0	.44	.44	2.0	NA
p-xylene		NA	NA	NA	NA	NA	4.0	2.0	.44	.44	2.0	NA
Semi-Volatile Organics												
PCBs (Total)		NA	NA	NA	7.7 (Policy)	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260		NA	NA	NA	7.7	NA	NA	NA	NA	NA	NA	NA
Metals												
Cadmium	40	0	5	5	NA	6.10	NA	.013	NA	NA	.0005	NA
Chromium	1,000	1,000	240	100	NA	41.0 ⁵	14.0 ⁶	1.00 ⁶	NA	NA	1.00	NA
Lead		NA	20 ug/day	20 ug/day	NA	NA	NA	.00140	NA	NA	NA	NA

¹ USEPA Drinking Water Health Advisories, formerly SNARLs, are non-enforceable criteria established by the Office of Drinking Water. They are set for levels at which adverse health effects are not expected. These draft criteria consider only toxic effects, and not the cumulative effects of other chemicals in drinking water.

² Longer term health advisories are for exposures ranging from several months to several years and should generally be compared only to estimated short-term concentrations (STC).

³ Potency Factors are based on toxicity data for potential carcinogenic effects and are derived from Integrated Risk Information System (IRIS) 1990-1991.

⁴ RfD (Reference Dose) is an estimate (with an uncertainty of one order of magnitude or more) of a lifetime dose which is likely to be without significant risk to human population. Values were developed by the EPA Environmental Criteria and Assessment Office, Cincinnati, Ohio in mg/kg/day. RfDs are established for specific exposure routes.

⁵ MCL and potency factor given are for chromium.

⁶ Concentration shown is for chromium III (trivalent) and compounds.

TABLE MM-1 (Cont'd)
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE
TO BE CONSIDERED

Air Contaminants ⁽¹⁾	PEL ⁽⁶⁾ (ug/m ³ /ppm)	Allowable Ambient Levels (AALs) ⁽²⁾ (ug/m ³)	TLV-TWA ⁽⁴⁾ (ug/m ³)	TLV-STEL ⁽⁵⁾ (ug/m ³)
Acetone	2,400,000/1,000 ppm	160.54	20,000	
Benzene	-----/10	0.12	30,000	NA ⁽³⁾
Ethyl Benzene	435,000/100	118.04	435,000	545,000
Methylene Chloride	1,736,809/100	2.4	350,000	1,740,000
Xylene	435,000/100	11.8	435,000	655,000
Trichloroethylene	--/100	0.61	270,000	1,080,000
1,1-Dichloroethane	--/--	NA ⁽³⁾	810,000	1,010,000
Tetrachloroethylene	-----/100	0.02	335,000	1,340,000
Chloroethane	--/--	358.78	--	--
4 Methyl-2 Pentanone	--/--	55.70	205,000	300,000
2 Butanone	--/--	32.07	590,000	885,000
Pentane	295,000/1,000	NA ⁽³⁾	1,800,000	2,250,000
Toluene	--/200	10.24	375,000	560,000
1,1,1-Trichloroethane	1,900,000/350	1,638.37	1,900,000	2,450,000
1,1,2-Trichloroethane	45,000/10	0.06	45,000	--

- ¹ These air contaminants were detected on-site in samples collected during the three-day August 1988 Air Sampling Program.
- ² These levels are cited in the Draft version of the Chemical Health Effects Assessment Methodology and the Method to Derive Allowable Ambient Levels (Chem/AAL), DEP, Air Toxics Program, 1989.
- ³ NA - No concentrations available for these chemicals.
- ⁴ TLV - TWA - The Threshold Limit Value - Time Weighted Average is the time-weighted average concentration for a normal 8-hour work day and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect. The Threshold Limit Values, as issued by ACGIH, are recommendations and should be used as guidelines for good practices. (Threshold Limit Values and Biological Exposure Indices for 1987-1988).
- ⁵ TLV - STEL - The Threshold Limit Value - Short-Term Exposure Limit is the concentration to which workers can be exposed continuously for a short period of time without suffering from: 1) irritation; 2) chronic or irreversible tissue damage; or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency, and provided that the daily TLV - TWA is not exceeded. The Threshold Limit Values, as issued by ACGIH, are recommendations and should be used as guidelines for good practices. (Threshold Limit Values and Biological Exposure Indices for 1987-1988).
- ⁶ PEL - Permissible Exposure Limit - These are enforceable limits based on 8-hour time-weighted average concentrations an employee may be exposed to in a work environment without adverse effect. Limits obtained from NIOSH Pocket Guide to Chemical Hazards, September 1985.

TABLE MM-1
LOCATION-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

<u>Location/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Wetlands/CWA	Federal - Clean Water Act (CWA) Section 404(b)(1); 40 CFR part 230, 33 CFR parts 320-330	Applicable	Requirements under these codes prohibit the discharge of dredged or fill material into wetlands unless the actions comply with the substantive requirements which are identified under these regulation.	Discharges to wetlands around the site will comply with these requirements.
Floodplains/ CWA	Federal Executive Orders 11988 Floodplain Management 40 CFR Part 6 Appendix A	Applicable	Federal agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial values of flood plains.	Mitigative measures will be taken to minimize the impacts of the implementation of the remedy on the 100-year floodplain.
Wetlands/CWA	Federal Executive Orders 11990 Protection of Wetlands	Applicable	Under this regulation, Federal agencies are required to minimize the destruction, loss or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands.	Wetland protection considerations will be incorporated into the planning and implementation of the selected remedy.
Groundwater Protection/ RCRA	STATE - 310 CMR 30.660 Groundwater Protection. This citation includes the requirements of 310 CMR 30.661 through 30.673.	Relevant and Appropriate	<p>Groundwater Protection requirements (310 CMR 30.660) apply to the following regulated hazardous waste treatment units:</p> <ul style="list-style-type: none"> • surface impoundments, • land treatment units, and • landfills. <p>Groundwater protection programs must be conducted during the active life of the treatment units identified above, or after closure if required by the approved operating permit. Groundwater monitoring or corrective action monitoring (310 CMR 30.672) are required anytime concentrations of chemicals in the groundwater exceed levels established by the department in accordance with 310 CMR 30.667.</p>	A groundwater monitoring program which meets the requirements of 310 CMR 30.660 and 310 CMR 30.672 will be implemented throughout the monitoring period for the site.

TABLE MM-1 (Cont'd)
ACTION-SPECIFIC ARARs, CRITERIA, ADVISORIES AND GUIDANCE

<u>Action/ Authority</u>	<u>ARAR</u>	<u>Status</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARAR</u>
Groundwater Protection/ CWA	STATE - 314 CMR 6.00 (Promulgated under MGL Chapter 21, ss. 27(5), 27(6), 27(12)) Massachusetts Groundwater Quality Standards	Applicable	<p>314 CMR 6.00 establishes groundwater quality standards which must be met for various classes of groundwater in the State of Massachusetts.</p> <p>314 CMR 6.03 designates the three classes of groundwater.</p> <p>314 CMR 6.06 defines the groundwater quality criteria which must be met for each class of groundwater.</p>	In conjunction with the implementation of SC-6, discharges (direct or indirect) of effluent to the groundwaters of Massachusetts will meet the appropriate groundwater quality criteria during and subsequent to implementation of the selected remedy.

APPENDIX D
MASSACHUSETTS LETTER OF CONCURRENCE



Commonwealth of Massachusetts
Executive Office of Environmental Affairs

Department of Environmental Protection

William F. Weld
Governor

Daniel S. Greenbaum
Commissioner

September 11, 1992

Ms. Julie Belaga
Regional Administrator
U.S. Environmental Protection Agency
J.F.K. Building
Boston, MA

Re: State concurrence with
the ROD for the PSC
Resources Superfund site.

Dear Ms. Belaga:

The Department of Environmental Protection (Department) has reviewed the preferred alternative recommended by the U.S. EPA for the PSC Resources Superfund site in Palmer, Massachusetts. The Department concurs with the selected remedy.

The Department has evaluated EPA's preferred alternative for consistency with the Massachusetts General Law Chapter 21E and the Massachusetts Contingency Plan (MCP). The preferred alternative addresses the total site clean-up and includes the following components:

- In-situ stabilization of consolidated lagoon sediment, wetland sediment, and property soil;
- installation of a permeable cap;
- decontamination/demolition of the property structures;
- deed restrictions and institutional controls;
- natural attenuation of contaminated ground water and long term monitoring.

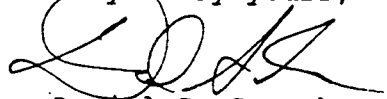
The Department has reviewed all the alternatives including the preferred remedy for consistency with M.G.L. CH. 21E and other state ARARs. As a result of this review, the Department concurs with the selection of the preferred remedy. Under this remedy, the reduction of contaminant concentrations in ground water are expected to achieve drinking water standards through natural

attenuation, when implemented in conjunction with the source control component of the preferred remedy. Based on this, the Department has determined that at this time the preferred alternative will be considered a temporary solution as defined in M.G.L. CH 21E and other state ARARs.

As required by the MCP, a temporary solution must include a plan for developing a permanent solution, include systems to monitor its effectiveness, and remain effective until a permanent solution is implemented. The Department, therefore, suggests that the implementation of the monitoring provisions and institutional controls be evaluated on a continuing basis, until ground water attains drinking water standards.

The Department looks forward to working with you in implementing the preferred alternative. If you have any questions or require additional information, please contact Martin J. Horne, Project Manager, at (617) 292-5716.

Very truly yours,



Daniel S. Greenbaum
Commissioner

cc: John Higgins, DEP WERO
Jim Colman, DEP BWSC
Steve Winslow, DEP OGC
Lorenzo Thantu, EPA
Tony Kurpaska, DEP WERO
Helen Waldorf, DEP BWSC