DRAFT
REMEDIAL ACTION PLAN

Union Pacific Railroad Yard
Sacramento, California

Submitted by

UNION PACIFIC
RAILROAD COMPANY
1416 Dodge Street, Room 930
Omaha, Nebraska 68179

Prepared by

DAMES & MOORE

JANUARY 1994

UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA
DRAFT REMEDIAL ACTION PLAN

JANUARY 1994

SUBMITTED BY:

UNION PACIFIC RAILROAD COMPANY
1416 DODGE STREET, ROOM 930
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PREPARED BY:
DAMES & MOORE

PROJECT NO. 00173-076-044

DAMES & MOORE

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February 1, 1994

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Site Mitigation Branch
Region 1, Department of Toxic Substances Control
California Environmental Protection Agency
10151 Croydon Way, Suite 3
Sacramento, CA 95827

Attention: Mr. Jose Salcedo
Project Manager

**Re: Transmittal of Draft
Remedial Action Plan
Union Pacific Railroad Yard
Sacramento, California
D&M Project No. 00173-080-044**

Dear Mr. Salcedo:

Union Pacific Railroad Company (UPRR) has requested that Dames & Moore transmit the above-referenced document. This Draft Remedial Action Plan (RAP) has been prepared pursuant to Enforceable Agreement No. HSA 86/87-015EA issued March 26, 1987 to UPRR by the California Environmental Protection Agency - Department of Toxic Substances Control (DTSC), as modified by DTSC correspondence. The organization and contents of the Revised Draft RAP conform to DTSC guidance for Remedial Action Plans (DTSC Official Policy/Procedure No. 87-2).

This Draft RAP incorporates DTSC comments on the Revised Draft RAP submitted in February 1993. If you have any questions or require further clarification, please contact Jim Brake at (916) 387-7530.

Sincerely,

DAMES & MOORE

Anne Olson

Anne L. Olson
Staff Engineer

Jim Brake, R.G.
Project Manager

Enclosure
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SACRAMENTO, CALIFORNIA

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STATE OF CALIFORNIA—ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, *Governor*

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SACRAMENTO, CA 95827-2106

January 31, 1994

UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA
DRAFT REMEDIAL ACTION PLAN

EXECUTIVE SUMMARY

This draft Remedial Action Plan (RAP) Executive Summary was prepared and approved by the Department of Toxic Substances Control (DTSC). This draft RAP is based upon investigations performed by Union Pacific Railroad Company (UP) and its consultants with the oversight of DTSC. This Executive Summary briefly describes the proposed actions to remediate the UP site and reasons for its selection. DTSC does not necessarily agree with all data, statements, and conclusions contained in the documents produced by UP and its consultants. Where there are conflicts between such documents and this Executive Summary, the information and conclusions in this Executive Summary shall be deemed as correct.

This draft RAP is consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations, Part 300 et seq.); Chapter 6.8, Section 25356.1 of the California Health and Safety Code (H&SC); and additional requirements contained in the March 26, 1987, Enforceable Agreement between UP and DTSC.

A. Site Description

Historical information indicates that the Western Pacific Railroad operated a railroad maintenance yard at the site beginning in 1910. From 1910 through the mid-1950s, the site was used for maintaining and rebuilding steam locomotives, boilers, refurbishing rail cars, and assembling trains. During the mid-1950s, diesel engine repair and maintenance began. In 1982 UP acquired Western Pacific Railroad. UP discontinued railroad maintenance operations at the site in 1983, and railroad maintenance buildings and structures on the site were demolished by UP in 1985 and 1986. Currently, no railroad maintenance activities are conducted at the site.

The site has been divided into an inactive eastern portion, and an active yard in the western portion. The inactive portion of the site is fenced, unoccupied, and is the area where most of the former railroad maintenance activities were conducted. The active yard is occupied by the main track, a switching area for transferring cars between trains, and an office building for Sacramento railroad operations.

B. Summary of Investigation Findings

A Remedial Investigation conducted at the site revealed the presence of contaminants and waste materials in soil. The soil contaminants include petroleum hydrocarbons, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, asbestos, and the metals arsenic and lead. The waste materials consist of slag (believed to be the primary source of arsenic and lead), construction rubble, debris, and buried drums. Elevated levels of metals were also detected off-site in one vacant lot and one residential lot adjacent to the west side of the site. Most of the slag and associated metals contamination is found in the upper one to two feet of soil. Petroleum hydrocarbons in soil extend to depths of up to 15 feet below ground surface in the inactive portion of the site. In the former Oil House location petroleum hydrocarbon as gasoline extends to the water table. In the Active Yard, petroleum hydrocarbons in soil extend to a depth of 29 feet below ground surface.

Contaminants were also found in groundwater underlying the site and off-site in the southern part of the Curtis Park area. Two groundwater contaminant plumes have been identified. Primary groundwater contaminants in both plumes are volatile organic compounds and nickel. Volatile aromatic compounds are also present in the on-site portion of the larger plume. Limited groundwater impact by petroleum hydrocarbons has been identified in the Active Yard.

Of the contaminants identified at the site, the metals arsenic and lead in soil, and the volatile organic compounds 1,1-dichloroethene and benzene in groundwater are considered to be the primary contaminants of concern.

Several Interim Remedial Measures have been conducted at and adjacent to the site to reduce health and safety risks and to minimize adverse environmental impacts. On-site Interim Remedial Measures include construction of a fence around the site, debris removal, planting vegetative cover over an area where asbestos was found in soil, underground storage tank removal, and removal of slag and metals-impacted soil. Off-site Interim Remedial Measures include removal of metals-contaminated soil from two adjacent off-site lots. Clean-up of groundwater contamination began as an Interim Remedial Measure starting in April 1993.

A Health Risk Assessment was conducted to study both the potential carcinogenic (cancer-causing) and non-carcinogenic (non cancer-causing) risks to the public from exposure to contaminants at the site under current conditions. The Health Risk Assessment predicted the potential for adverse health effects on people living adjacent to the site, trespassers, and potential future on-site residents if the site were not cleaned up.

The results of the Health Risk Assessment indicate that under current conditions, ingestion of contaminated soil, skin contact with contaminated soil, and inhalation of contaminated wind-blown dust from soil might be potential exposure pathways of concern for on-site trespassers. Inhalation of contaminated wind-blown dust is the potential exposure pathway of concern for off-site residents under current conditions.

The potential exposure pathways associated with future land use at the unremediated site are ingestion of contaminated soil, skin contact with contaminated soil, drinking contaminated groundwater, and inhalation of volatile organic compounds from contaminated soil. Vapor inhalation and dermal contact during showering, and ingestion of groundwater from off-site wells are potential pathways of concern for future on- or off-site residents if groundwater containing volatile organic compounds is not cleaned up. It was assumed that contaminated groundwater would be used as a public water supply.

A Feasibility Study was conducted for the site to identify the preferred site clean-up methods to reduce the potential threat to human health and the environment. Remedial Action Objectives (clean-up goals) were developed for each contaminant of concern in soil and groundwater, as identified in the Health Risk Assessment.

C. Establishment of Cleanup Criteria

A list of desirable potential future land uses for the site was developed by the Union Pacific Land Use Committee with input from the community and presented to the Sacramento City Council. The City then asked the DTSC to specify which land uses were appropriate for inclusion in each of two categories suggested by the DTSC (restricted and unrestricted). Two general categories of future land use were identified as follows:

- Unrestricted Future Land Use — Allows for completely unrestricted, post-remediation redevelopment including residences, schools, parks, open space, outdoor recreational facilities, and/or commercial establishments, if desired; and

- Restricted Future Land Use — Allows for future land uses after remediation that would be restricted to commercial public structures, and mixed use (residential/commercial) development.

These assumptions are not proposed as the final land uses for the site, but have been assumed in order to initiate cleanup of the site according to the DTSC schedule. The ultimate land uses at the site will be finalized through the formal land use planning process, which is not expected to be complete for several years. The future land use assumptions were used to develop soil clean-up levels appropriate for the two general categories of future land use described above. Cleanup levels for restricted land use were developed using the assumption that soil would be covered over the area with buildings, pavings or other landscape. Thus, future restricted area property users would not have a continual exposure to contaminated soil. However, the cleanup levels also take into account that the soil cover would occasionally be breached to repair or install underground utilities. Protection of groundwater quality was also considered during development of soil cleanup levels.

D. Remedial Alternative Analyses

Five Operable Units were established for soil (S-1 through S-5), and two operable units were established for groundwater (GW-1 and GW-2). Several potentially promising remedial technologies were identified for both soil and groundwater contamination. Those technologies were screened which determined three final candidate alternatives for soil and three final candidate alternatives for groundwater. All final candidate alternatives underwent a final detailed analysis in which they were evaluated in terms of nine criteria:

- Short-term effectiveness;
- Long-term effectiveness;
- Reduction of toxicity, mobility, and volume;
- Implementability;
- Cost;
- Compliance with applicable or relevant and appropriate requirements;
- Overall protection of human health and the environment;
- State acceptance; and
- Community acceptance.

The factors specified in the Health and Safety Code Section 25356.1 (c)(1)-(6) were also used in selecting a remedy.

The final candidate alternatives that were evaluated in the draft RAP were:

i. No Action

This alternative is required to be considered and was used to establish a baseline to which other alternatives were compared.

ii. Containment with Institutional Controls

This alternative would combine capping the soil in areas above the cleanup levels with deed and access restrictions. This alternative would also include periodic inspection of the cap to evaluate the potential for any water to migrate through the cap to groundwater, and groundwater monitoring.

iii. Excavation and off-site disposal of soil above cleanup levels

This alternative would include complete excavation and disposal of soils containing concentrations above the cleanup values in an off-site permitted landfill facility.

The results of this detailed analysis were used to select a proposed remedial alternative for each Operable Unit. The proposed remedial alternatives are the proposed methods for site clean-up.

E. Selected Remedial Alternatives

Excavation and off-site disposal of soil with contaminant concentrations exceeding clean-up levels (Soil Alternative 10), was selected as the remedial alternative for soil Operable Units S-1, S-2, S-3, and S-4. This alternative will: (1) effectively eliminate the primary exposure pathways; (2) provide adequate overall long-term protection of human health and the environment through reduction of mobility, toxicity, and volume of contaminants at the site; (3) be reasonably cost-effective; and (4) allow for many beneficial future land uses at the site. Deed restrictions will be used to control exposure to contaminants remaining after remediation in areas where future land use is to be restricted.

Because of the heavy industrial land use in Operable Unit S-5 and lack of complete exposure pathways, slag and petroleum hydrocarbons (diesel fuel) in soil in this operable unit do not pose a threat to human health. Groundwater impacts by diesel are at low levels and are contained within the property boundary. Remedial action for this operable unit will consist of characterization of groundwater contamination, groundwater monitoring, evaluation of feasible groundwater remedial alternatives, and placing and maintaining gravel cover over remaining slag in areas subject to vehicular traffic. If sustained groundwater concentrations of total petroleum hydrocarbons, benzene, toluene, ethylbenzene, xylene, or polycyclic aromatic hydrocarbon exceed the listed remedial action objectives a remedial action will be implemented which is protective of groundwater beneficial uses. Air sampling will be performed to confirm that uncovered slag does not present a health risk.

Groundwater Alternative 4 (extraction, treatment, and discharge) was selected as the remedial alternative for groundwater Operable Units GW-1 and GW-2. This alternative consists of the extraction of contaminated groundwater, treatment to remove contaminants, and discharge of the treated water to the City sewer system under permit. Deed restrictions will limit the use of groundwater on-site in the area of Operable Units GW-1 and GW-2 during groundwater remediation. This alternative will: (1) provide the greatest protection of human health and the environment; (2) reduce the toxicity, mobility, and volume of contaminants; (3) use demonstrated and proven technologies; (4) provide the long-term advantage of meeting remediation goals; and (5) allow the greatest future beneficial use of groundwater beneath the site after remediation.

F. Implementation of the Selected Alternative

Total implementation times (from issuance of the Final Remedial Action Plan to the end of construction activities) for the selected soil remedial alternatives for soil Operable Units S-1, S-2, S-3, and S-5 are anticipated to be approximately 22 months. The selected alternative for soil Operable Unit S-4 (excavation and off-site disposal of soil) has already been completed as an interim remedial measure. The total time (commencing with the issuance of the Final Remedial Action Plan to the end of construction activities) for the design and installation of the groundwater remediation system for groundwater Operable Units GW-1 and GW-2 is expected to require approximately 17 months. These implementation times do not include groundwater monitoring, which is discussed below.

Operation and maintenance (O&M) activities for the recommended remedial alternatives for groundwater (Alternative 4) include inspection and maintenance of groundwater monitoring wells and remediation systems, and long-term groundwater monitoring. An O&M plan will be prepared and incorporated into an O&M agreement between UP and DTSC. Under Alternative 10, soil contamination will be removed from the site, so long-term operation and maintenance would not be needed for the soil operable units S-1, S-2, and S-3. However, restrictions on future land use will apply to part of the site, and long-term inspection and maintenance of the gravel cover in Operable Unit S-5 will be implemented. Clean fill in excavated areas and fencing will be maintained in the restricted use area until the site is redeveloped.

G. Preliminary Nonbinding Allocation of Financial Responsibility

Section 25356.1(d) of the California Health and Safety Code requires a non-binding preliminary allocation of financial responsibility for the site clean-up. UP has been identified as having 100 percent financial responsibility for implementation, operation, and maintenance of all recommended remedial alternatives for this site.

James L. Tjosvold, P.E.
Acting Branch Chief
Site Mitigation Branch

Constituent	Remedial Action Objective		Basis for Selection
	Restricted Future Land Use[1]	Unrestricted Future Land Use[2]	
SOIL CONTAMINANTS (mg/Kg unless otherwise noted)			
Arsenic	55	8	DTSC/HR
Lead	950	220	HR/DTSC
Petroleum Hydrocarbons			
Diesel	1,000		LUFT
Gasoline (Former Oil House Area)	100		LUFT
Gasoline (Other Areas)	1,000		LUFT
Benzene	0.3		LUFT
Toluene	0.3		LUFT
Ethylbenzene	1.0		LUFT
Xylenes	1.0		LUFT
Chlorinated Volatile Organic Compounds	To Be Determined		Leachability
Polycyclic Aromatic Hydrocarbons			
Carcinogenic (sum of)	0.042		HR
Non-carcinogenic (sum of)	100		HR
Polychlorinated Biphenyls (PCBs)	**25**	**1**	**U.S. EPA[3]**
Asbestos	**1% by weight**		**ARAR**
GROUNDWATER CONTAMINANTS (μg/L)			
Arsenic	50		ARAR (MCL)
Chromium	50		ARAR (MCL)
Lead	15		ARAR (MCL)
Nickel	100		ARAR (MCL)
Chlorinated Volatile Organic Compounds			
Carbon tetrachloride	0.5		ARAR (MCL)
1,1-Dichloroethane	5		ARAR (MCL)
1,1-Dichloroethene	6		ARAR (MCL)
1,2-Dichloroethane	0.5		ARAR (MCL)
1,1,1-Trichloroethane	200		ARAR (MCL)
1,1,2-Trichloroethane	32		ARAR (MCL)
Tetrachloroethylene	5		ARAR (MCL)
Trichloroethylene	5		ARAR (MCL)
Vinyl Chloride	0.5		ARAR (MCL)
Aromatic Compounds			
Benzene	1		ARAR (MCL)
Toluene	1,000		ARAR (MCL)
Ethylbenzene	680		ARAR (MCL)
Xylenes	1,750		ARAR (MCL)
Diesel	100		SNARL

NOTES:

- mg/kg Milligrams of chemical per kilogram of soil - parts per million
- μg/L Micrograms of chemical per liter of groundwater - parts per billion
- [1] Restricted Future Land Use applies to Soil Operable Units S-1 and S-2
- [2] Unrestricted Future Land Use applies to Soil Operable Unit S-3
- [3] Recommended Soil Action Levels (U.S. EPA, 1990)

KEY TO BASIS FOR CLEAN-UP LEVELS:

- HR Health-risk-based
- ARAR Based on applicable or relevant and appropriate requirements
- DTSC Selected at the direction of the DTSC based on DTSC Risk Assessment.
- MCL Primary Maximum Contaminant Level (Cal-EPA or U.S. EPA, whichever is lower)
- LUFT Leaking Underground Fuel Tank Assessment
- SNARL Suggested No Adverse Response Level

DRAFT
REMEDIAL ACTION PLAN
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

1.0 INTRODUCTION

This Draft **Remedial Action Plan**[1] for the Union Pacific Railroad Company's (UPRR) Railroad Yard site (the site) located in Sacramento, California was prepared by Dames & Moore on behalf of UPRR, as required by Enforceable Agreement No. HSA 86/87-015EA. The Enforceable Agreement was issued by the California Environmental Protection Agency - Department of Toxic Substances Control (DTSC) on March 26, 1987. A Remedial Action Plan is required as a part of the **remediation** process for state-listed hazardous substance release sites.

1.1 PURPOSE OF THE REMEDIAL ACTION PLAN

The purpose of a Remedial Action Plan is to provide a conceptual **clean-up** plan for the site. A Remedial Action Plan includes a summary of the **remedial investigation** and **feasibility study** and describes the methods which have been and/or will be used to identify and subsequently design and implement a final remedial action for state-listed hazardous substance release sites. It also presents an assessment of environmental impacts potentially caused by the proposed clean-up. The Remedial Action Plan approval process is the means by which the public is provided an opportunity to be involved in the decision-making process for the selection of a remedy(s). Interested community members and government agencies will have 30 days to review and comment on the plan. A public meeting will be held during the public review period to present the Draft Remedial Action Plan and to provide a forum for interested community members.

Remedial Action Plans are not intended to contain specific engineering design details of the proposed clean-up option; however, they must clearly and concisely describe the selected and rejected options, so that interested members of the public, government agencies, and **Potentially Responsible Parties** can provide the DTSC with meaningful opinions and comments. Remedial Action Plans must clearly set out specific **remedial action objectives** and time frames for completion of actions. Once the DTSC adopts a final Remedial Action Plan, a commitment is made that if the Remedial Action Plan is fully implemented, the site will be certified for removal from the state list of hazardous substance release sites which require remedial action or that it will be transferred to a list of sites which require long-term **operation and maintenance.**

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[1] All terms shown in bold type are defined in the Glossary in Section 11.0.

The Remedial Action Plan is a specific requirement of California Health and Safety Code Section 25356.1. Other state and federal statutes, regulations, and guidance which may be applicable to Remedial Action Plans are presented below.

- **California Environmental Quality Act,** Public Resources Code, 21000 et seq. and Title 14, California Code of Regulations, Division 6, 1500 et seq.
- Title 8, 14, 22, 23, and 26 of California Code of Regulations
- California Site Mitigation Decision Tree Manual (Department of Health Services, 1986)
- **National Oil and Hazardous Substance Pollution Contingency Plan,** 40 CFR 300.61 et seq.
- Hazardous Substance Clean-up Bond Act of 1984
- Hazardous Substance Account Act (Division 20, Chapter 6.8, Sections 25356.1(c) - (h), 25356.3(a), 25358.7(a)-(d) and 25356.3(c) of the California Health and Safety Code)
- **Comprehensive Environmental Response, Compensation, and Liability Act** of 1980 (CERCLA), USC Sections 9601-9657 and 40 CFR 300
- CERCLA as amended, i.e., the Federal Superfund Amendments and Reauthorization Act (SARA) of 1986
- **Resource Conservation and Recovery Act,** Hazardous Waste Regulations, 40 CFR 260-270, as amended
- Clean Air Act, 42 USC 7401-7642
- Clean Water Act, 33 USC 1251 et seq. and 40 CFR 100-140, 400-470
- EPA Guidance for Preparation of Record of Decisions and Selection of Remedy for Superfund Sites
- Guidance for Conducting Remedial Investigations/Feasibility Studies under CERCLA (United States Environmental Protection Agency, 1988)
- Risk Assessment Guidance for Superfund (EPA, 1991).

1.2 SITE IDENTIFICATION

The site is located in the southern part of Sacramento, California and is shown on Figure 1. Residential neighborhoods border the site to the north and east; Western Pacific Avenue and Sutterville Road border the site to the south; and Sacramento City College, light industry and residential property border the site to the west. The site consists of an active railroad switching yard and an unused inactive portion, which are separated by a fence.

1.3 BACKGROUND

Preparation of this Draft Remedial Action Plan follows completion of a Remedial Investigation/ Feasibility Study Report for the site. The Remedial Investigation/Feasibility Study Report was accepted as final by the DTSC in May 1991. Subsequent site investigations resulted in preparation of an Addendum Remedial Investigation/Feasibility Study Report which was submitted to the DTSC in November 1991. A Draft Remedial Action Plan based on the analyses presented in the Addendum Remedial Investigation/Feasibility Study Report was also submitted to the DTSC in November 1991.

After the Draft Remedial Action Plan of 1991 was prepared, the City of Sacramento (City) provided comments on the Addendum Remedial Investigation/Feasibility Study Report, and the DTSC commented on the Draft Remedial Action Plan. The City and DTSC comments focused on two primary issues:

- The remedial alternatives for soil contamination proposed in the Addendum Remedial Investigation/Feasibility Study and the Draft Remedial Action Plan of 1991 would limit beneficial future land uses at the site; and

- The second, smaller groundwater contaminant plume should be extracted and treated instead of monitored as proposed in the Addendum Remedial Investigation/Feasibility Study and the Draft Remedial Action Plan of 1991.

The Union Pacific Land Use Committee, a group of community members who live near the site, was asked by the Sacramento City Council to conduct a series of community workshops and identify desired future land uses for the site. The results of the Union Pacific Land Use Committee's evaluation are contained in a report that lists potential land use types and general recommendations for redevelopment at the site. The final Union Pacific Land Use Committee report (presented in Appendix A) was endorsed by the City Council in April 1992 under Resolution Number 92-255. The DTSC reviewed the desired future land uses listed in the report and recommended that UPRR develop two sets of clean-up levels for soil contaminants which would be protective of human health and the environment for two general types of future land use:

- Unrestricted Future Land Use; and

- Restricted Future Land Use.

In order to address comments by the City and the DTSC, and to provide for the beneficial future land uses desired by the members of the community, UPRR asked Dames & Moore to prepare a Feasibility Study Supplement which was submitted to the DTSC in October 1992. The Feasibility Study

Supplement presented general assumptions about future land use, soil clean-up levels for the two general land use types, and a re-evaluation of the remedial alternatives for soil and groundwater at the site. Remedial alternatives were then selected for the site which would allow for the beneficial future land uses identified by the City and members of the community (as contained in the final Union Pacific Land Use Committee report).

After reviewing the Feasibility Study Supplement, the DTSC recommended that some of the proposed clean-up levels for arsenic and lead in soil be reduced to more health-protective levels. Although UPRR's Risk Assessment (Dames & Moore, 1992b) showed that the proposed clean-up levels were adequate, UPRR has agreed to use the stricter clean-up levels recommended by the DTSC. In February 1993 a report was submitted to the DTSC presenting limited revisions to the Feasibility Study Supplement. These revisions were a result of the stricter clean-up levels for lead and arsenic in the inactive portion of the site. The modifications included:

- Revised volume estimates for soil with contaminant concentrations above the clean-up levels.
- Revised figures depicting the areas on-site where soil is contaminated above the clean-up levels.
- Revised cost estimates for some of the final candidate remedial alternatives for soil.

Incorporated in this Draft Remedial Action Plan are the results of the Feasibility Study Supplement (Dames & Moore, 1992c), the Revised Soil Volumes and Remedial Alternative Detailed Cost Estimates (Dames & Moore, 1993), and other work performed since the Draft Remedial Action Plan of 1991 was submitted.

1.4 INFORMATION PRESENTED IN THE REVISED DRAFT REMEDIAL ACTION PLAN

The format and contents of this Revised Draft Remedial Action Plan are consistent with the DTSC guidance provided in Official Policy/Procedure No. 87-2 dated October 5, 1987 titled "Remedial Action Plan Development and Approval Process." A copy of Official Policy/Procedure No. 87-2 is provided in Appendix C. This Revised Draft Remedial Action Plan is organized as follows:

Section 1.0 discusses the purpose of the Revised Draft Remedial Action Plan and provides an introduction to the site.

Section 2.0 presents a history of site ownership and activities leading to current contaminated conditions. This section also provides a site physical description of the site and its environment and information on land use, **demography, biological receptors, climatology,** and **hydrogeology.** Portions of this section have been updated to include additional investigations and interim remedial measures undertaken since completion of the Draft Remedial Action Plan of November 1991.

Section 3.0 discusses the results of the Remedial Investigation, including an evaluation of soil conditions beneath the site, identification and evaluation of **hazardous substances** encountered, evaluation of hydrogeological conditions (surface water and groundwater), and an evaluation of **contaminant mobility.**

Section 4.0 assesses current and potential risks posed by conditions at the site, including hazards to human health and the environment.

Section 5.0 discusses the effects of contamination upon present and probable future beneficial uses of land and water.

Section 6.0 summarizes the Feasibility Study and discusses future land use, remedial action objectives, and **final candidate alternatives.** This section also provides the rationale for the selection or rejection of each final candidate alternative considered. **Recommended remedial alternatives** are examined in terms of potential human health and environmental impacts and **compliance** with applicable regulations.

Section 7.0 discusses the proposed remedial action implementation schedule for the recommended remedial alternatives.

Section 8.0 contains a non-binding preliminary allocation of financial responsibility, describing who will pay for cleaning up the site.

Section 9.0 discusses requirements for operation and maintenance of the recommended remedial alternatives and performance assurance.

Section 10.0 is a list of reference documents which were used during preparation of this Draft Remedial Action Plan.

Section 11.0 is a glossary defining technical terms used in this Plan. Section 11.0 has a tab to provide easy reference.

Tables are included within the text. Each table is found in the text near its first reference. Figures are included in a separate tabbed section at the end of the text.

2.0 SITE DESCRIPTION

This section presents a history of site ownership and activities leading to current contaminated conditions, and provides a chronology of investigations and interim remedial measures conducted to date. This section also provides a physical description of the site and its environment with information on land use, demography, biological receptors, climatology, and hydrogeology.

2.1 SITE HISTORY

2.1.1 Site Location

The UPRR Yard is located in south Sacramento in Section 13 of Township 8 North, Range 4 East and in Section 18 of Township 8 North, Range 5 East, Mt. Diablo Base Meridian (Figure 1). The site encompasses an area of approximately 94 acres, consisting of two portions: the active yard, which makes up the western part of the site; and the inactive portion, which makes up the eastern part of the site (see Figure 2). Residential property borders the site to the north and east; Western Pacific Avenue and Sutterville Road border the site to the south; and Sacramento City College, commercial, light industrial, and residential properties border the site to the west. The primary roads closest to the site include Freeport Boulevard about one-fourth mile west, 24th Street thirty yards east, Portola Way thirty yards north, and Sutterville Road.

2.1.2 Nature of Business and Length of Operation

The railroad maintenance yard was established by Western Pacific Railroad in the early 1900s to maintain and rebuild steam locomotives and boilers, refurbish rail cars, and assemble trains. Activities conducted at the facility included sand-blasting, painting, machining, welding, dismantling, reassembly of locomotives and rail cars, and switching operations. Diesel engine repair and maintenance began in the mid-1950s. There is no information regarding the transition period from maintenance of steam locomotives to maintenance of diesel locomotive engines. UPRR purchased the operations in 1982, but discontinued maintenance yard operations at the site in 1983. Remaining buildings and structures in the maintenance yard were demolished by UPRR in 1985 and 1986. UPRR still maintains a switching yard operation in the active yard (the western portion of the site).

2.1.3 Type of Hazardous Substances

During operation of the site, a principal activity was refurbishing railroad cars and locomotives. This likely involved the use of various solvents, cleansers, and degreasers to clean and strip the cars.

Prior to 1951, maintenance activities also included removal of asbestos insulation from boilers and pipes of steam engines before stripping and cleaning.

Records regarding purchases of chemicals are unavailable. Based on current knowledge of the facilities that historically existed at the site and interviews with UPRR employees, past chemical use at the site is summarized below:

- A caustic solution, trisodium phosphate (TSP; Oakite), was used to prepare railcars for painting.
- Solvents and degreasers were used to clean and strip railcars and locomotive parts.
- Paints were used primarily in the Coach and Paint Shop. Paint pigments likely contained lead and other metals. Data regarding specific chemical constituents contained in the paints are not available. Solvents and mineral spirits were likely used in association with painting operations.
- **Lye** was used in a below-ground concrete vat south of the Main Shop.
- Two concrete lye pits existed in the area south of the Main Shop.
- Waste oil sumps were used for oil/water separation. These sumps were periodically cleaned out, and separated water was discharged to the combined sewer system.
- Fuels and oil were stored on-site in both above ground and below-ground tanks. Underground storage tanks included the subsurface gasoline and diesel tanks near the Oil House, a single 1,000-gallon tank north of the Main Shop building, and two concrete **bunker fuel** tanks.
- Oil was recycled at the Refined Oil Building.
- Asbestos was used for steam engine boiler insulation prior to 1951 and was stored in the Asbestos Storage Area.
- The rattler pit was located in the Main Shop Area and was used to shake mineral deposits out of the steam pipes removed from locomotives.
- If there was **electroplating** activity at the facility, as DTSC has suggested in correspondence, it was on a very small scale. Only the Coach and Paint Shop could have had electroplating facilities. No evidence of electroplating has been found.
- Copper ore smelting **slag** containing arsenic and lead was used as **track ballast** and yard cover material.
- Herbicides have been used to control weeds.

2.1.4 Events Leading to Contaminant Release

Based on a review of historical records and information on past operating practices at the site, eight areas where **contaminant** releases may have occurred have been identified. The approximate locations of these eight areas are described below, and their former locations are shown on Figure 2.

- Maintenance Facilities - These included the Main Shop and Transfer Table Area, the Coach and Paint Shop, the Car Repair Shed, and the Refined Oil Building. The primary chemicals used in these areas included waste oil, degreasing solvents, paints, and metals.

- Fuel Oil Handling Facilities - Fuel oils were used at the Fueling Area and Boiler House, and were stored at the Oil House.

- Underground storage tanks - The following underground fuel tanks were identified:

  1) A 72,000-gallon concrete bunker fuel tank west of the Main Shop.

  2) A 18,000-gallon concrete bunker fuel tank northwest of the Main Shop.

  3) Five former underground storage tanks north of the Oil House (removed in 1986).

  4) A 1,000-gallon underground storage tank partially filled with a mixture of fuel oil and **Stoddard Solvent.** This tank was located on the north side of the former Main Shop building.

- Existing and Previous Track Locations - These are frequently the location of slag which contains arsenic, lead, and other metals. Some petroleum hydrocarbons were also apparently spilled.

- Railroad Tie and Power Pole Storage Areas - Creosote-treated wood stored in this area was a potential source of hydrocarbons and metals.

- Former Pond - A **surface impoundment** was located in the middle of the property, contents of which are unknown.

- Central Fill Area - An area of fill material located in the middle of the inactive portion of the site.

- Asbestos Storage Area - An asbestos storage area was located in the southwest corner of the site.

With the exception of the surface impoundment, Central Fill Area and slag areas noted above, most of these areas were in the southern part of the inactive portion of the site. A review of site history indicates activities involving chemicals were not conducted in the undeveloped northern area.

2.1.5 Chronology of Historical Events

A chronology of key historical events at the site is summarized below:

- From the late 1800s to early 1900s, the area presently occupied by the site consisted of ranches, farms, and orchards.
- In the early 1900s, the rail yard was first established by Western Pacific Railroad for maintenance of steam locomotives and rail cars.
- Transition from repair and maintenance of steam locomotives to diesel engines began in the mid-1950s. No detailed information is available regarding the transition, but the change in operations may have resulted in a significant decrease in the use of asbestos, since most of its use was associated with steam engines. An increase in the use of degreasers and diesel fuel was probably also associated with the transition.
- In 1982, UPRR purchased the site from Western Pacific Railroad.
- In 1983, UPRR discontinued operations at the Sacramento yard.
- In 1985 and 1986, UPRR demolished buildings and structures on the site.

2.1.6 Previous Studies

Investigations of the nature and extent of contamination at the site were initiated in 1987. The final Remedial Investigation/Feasibility Study Report was completed in May 1991. Additional investigations were subsequently conducted to further assess impact to soils and groundwater, and were presented in an Addendum Remedial Investigation/Feasibility Study Report completed in November 1991. Major phases of the Remedial Investigation included:

- In 1987, remedial investigations were initiated in response to an Enforceable Agreement dated March 26, 1987, which was executed between UPRR and DTSC (then under the California Department of Health Services).
- In 1988, Phase I Remedial Investigation activities were conducted by Dames & Moore. Results were presented in a Draft Remedial Investigation Report submitted to the DTSC in 1988.
- In 1989, Phase II Remedial Investigations were conducted by Dames & Moore.
- In April 1990, Dames & Moore conducted additional groundwater investigations to evaluate potential off-site groundwater impacts.
- In August 1990, Dames and Moore conducted supplementary groundwater investigations to further evaluate the extent of off-site groundwater contamination.

- On August 31, 1990 a draft Remedial Investigation/Feasibility Study Report was submitted to the DTSC.

- In May 1991, off-site monitoring well installations and additional on-site soil and groundwater investigations were initiated.

- In December 1991, a supplementary remedial investigation was conducted in the active yard.

- During July and August 1992, an ambient air monitoring study was conducted at the site.

- In October 1993, additional subsurface soil and groundwater investigation activities were undertaken in the active yard.

- Groundwater monitoring continues on a quarterly basis.

The findings of completed investigations are documented in several reports prepared for UPRR and submitted to the DTSC. The reports listed below form the basis of this Draft Remedial Action Plan.

1. Draft Remedial Investigation Report for Union Pacific Railroad Sacramento Shops Area, Sacramento, California, Dames & Moore, June 1988.

2. Draft Remedial Investigation Report, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, February 1990.

3. Draft Soils Feasibility Study, Union Pacific Railroad Sacramento, Sacramento, California, Dames & Moore, May 1990.

4. Hydropunch and Groundwater Investigation Report, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, July 1990.

5. Draft Remedial Investigation/Feasibility Study Report, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, August 1990.

6. Baseline Health Risk Assessment, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, August 1990.

7. Supplementary Groundwater Investigation Report, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, February 1991.

8. Final Remedial Investigation/Feasibility Study Report, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, May 1991.

9. Addendum Remedial Investigation/Feasibility Study Report (including Revised Baseline Health Risk Assessment), Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, November 1991.

10. Draft Remedial Action Plan, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, November 1991.

11. Aquifer Pumping Test Results, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, February 1992.

12. Additional Off-Site Groundwater Investigation, Second Hydrostratigraphic Zone, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, July 1992.

13. Supplement to the Revised Baseline Health Risk Assessment, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, September 1992.

14. Development of Remedial Action Levels for the Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, September 1992.

15. Remedial Investigation Supplement, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, September 1992.

16. Ambient Air Assessment at the Union Pacific Railroad Yard, Sacramento, California, AeroVironment, September 1992.

17. Sources, Speciation, and Dissolution Kinetics of Arsenic and Lead, Union Pacific Railroad Yard, Sacramento, California, Walsh and Associates, September 1992.

18. Feasibility Study Supplement, Union Pacific Railroad, Sacramento, California, Dames & Moore, October 1992.

19. Revised Soil Volumes and Remedial Alternative Detailed Cost Estimates, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, February 1993.

20. Additional Subsurface Investigation, Operable Unit S-5, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, December 1993.

2.1.7 Interim Remedial Measures

Interim Remedial Measures are clean-up activities performed before the Remedial Action Plan has been approved. These activities are implemented with the approval of the DTSC. The purpose of an Interim Remedial Measure is to quickly reduce potential health and safety risks or to minimize adverse **environmental impacts.**

Several Interim Remedial Measures were carried out during the course of the contaminant investigation and characterization activities at the site. The locations of these activities are shown on Figure 3, and Interim Remedial Measures to date are summarized below.

- A fence separating the active and inactive portions of the site was installed in March 1987.

- Approximately 1,600 cubic yards of wood debris and asbestos in soil was removed and disposed off-site during August and September 1987. An additional 50 cubic yards of soil was disposed in the same manner in April 1988.

- The fluid contents and **rinsate** from the 18,000-gallon concrete underground storage tank were removed and disposed off-site in December 1987. The 18,000-gallon underground storage tank was cleaned, demolished, and removed from the site in January 1988.

- Removal and off-site disposal of the fluid contents and rinsate from the 1,000-gallon steel underground storage tank occurred in August 1989. The tank was removed from the site in September 1989.

- Asbestos-impacted soils were excavated and disposed of, and a grass vegetative cover was applied in the southwest portion of the inactive yard in September 1990.

- Soil and **petroleum hydrocarbons** contained within a 72,000-gallon concrete underground storage tank were removed in March 1988. Additional materials were removed from the tank prior to cleaning in September 1989.

- Approximately 900 tons of slag and metals-contaminated soil was removed from two off-site lots (Lot 1 and 2206 Sixth Avenue) in December 1991. One other lot (Lot 3) was covered with gravel and a seal coat. The locations of these off-site lots are shown on Figure 4.

- An out-of-service water supply well located in the southern inactive portion of the site was **abandoned** in March 1992. The **well casing** was perforated and filled with cement grout.

- The 72,000-gallon tank and associated piping were removed during May and June 1992. Approximately 2,500 cubic yards of asphalt, concrete and other non-hazardous debris were also removed at that time.

- Operation of a groundwater treatment system was begun in April 1993. The purpose of this Interim Remedial Measure is to treat contaminated groundwater and prevent further off-site migration of groundwater contaminants.

- Slag and metals-impacted soil were removed from the inactive portion of the site and the southeastern part of the active yard in November and December 1993. Levels of metals in soil in the inactive portion of the site will be reevaluated in early 1994 to determine the extent of additional cleanup needed, if any.

2.2 PHYSICAL DESCRIPTION

2.2.1 Topography

Elevation changes across the site are generally small, with the exception of a northwest-southeast trending berm that runs across the northern inactive portion of the site, and the north-south trending berm bordering the western site boundary (see Figure 3). Surface elevations range from approximately 12 feet above **mean sea level** (MSL) in the northern portion of the site, to 32 feet above MSL in the southern portion of the site. The surface of the site slopes generally to the north.

Past land uses have modified site topography over the span of railroad yard operations. Fill placement practices in the central inactive portion of the site are believed to have built this area up and made it higher in elevation than the surrounding area. The differences in elevation between the western site boundary and off-site areas is believed to have resulted from the addition of fill to the western active portion of the site to form the existing railroad track bed.

2.2.2 Areal Extent of Contamination

2.2.2.1 Soil Contamination

Soil investigations in the inactive portion of the site indicate that asbestos, arsenic, lead, petroleum hydrocarbon, and **polycyclic aromatic hydrocarbon** contamination exists in shallow soils distributed across the site.

Petroleum hydrocarbons and polycyclic aromatic hydrocarbons appear to be located in those areas where UPRR operations historically used, recycled and/or stored diesel fuel, motor oil, and other hydrocarbon products. Most of the petroleum hydrocarbon contamination is diesel fuel and is found in the upper five feet of soil in the southern inactive portion of the site. In the Central Fill Area of the inactive portion of the site, petroleum hydrocarbons occur primarily in the upper 15 feet of soil. Petroleum hydrocarbons as gasoline are also present in the southern inactive portion of the site, primarily in association with diesel-contaminated soil. Benzene, toluene, ethylbenzene, and xylene (commonly found in gasoline) were sporadically detected at low concentrations in some of these areas. There is also an area in the active yard where petroleum hydrocarbons (diesel fuel only) have been detected in soil. The approximate areal extent of petroleum hydrocarbon contamination is shown on Figure 5. Polycyclic aromatic hydrocarbons were not found in the active yard.

Track ballast is crushed rock or natural gravel used as a structural base for railroad tracks. Slag, a rock-like **by-product** of metallic ore refining industries was used as track ballast at the site. Slag track ballast is believed to be the primary source of arsenic and lead in soil. Prior to slag removal activities in late 1993, slag was distributed along existing track in the active yard and areas of the inactive portion of the site where track was formerly located, as shown on Figure 6A. Most arsenic and lead contamination was found in the upper 1.5 feet of soil in both the active yard and inactive portion of the site. The areal extent of slag following slag removal activities is shown on Figure 6B. Figure 7 depicts the approximate areal distribution of arsenic and lead requiring remediation before slag removal activities were undertaken. Post-removal sampling analytical data will be evaluated in early 1994 to determine the actual extent of additional remedial action needed to address metals in soil, if any.

Chlorinated volatile organic compounds are present in soil vapors in the Central Fill and former Oil House areas. Available data indicate these impacts extend to 10 feet below ground surface; however, no data are available for the interval between 10 feet and the groundwater table. Further investigation will be done to assess the vertical and lateral extent of these impacts. The data will be used to develop cleanup levels which will be protective of human health and groundwater quality.

Low levels of polychlorinated biphenyls are present in shallow soil near the former Transformer Vault area (see Figure 2). The areal extent of these impacts is limited.

2.2.2.2 Groundwater Contamination

Groundwater investigations have revealed the presence of two **plumes** of contaminated groundwater, shown on Figure 8. The largest plume (Plume A on Figure 8) contains **volatile organic compounds, volatile aromatic compounds** and nickel, and extends from the Central Fill Area approximately 4,800 feet southeast to 18th Avenue. The smaller plume (Plume B) extends from west of the former Main Shop approximately 1200 feet to the south, just past Sutterville Road. Plume B contains lower concentrations of volatile organic compounds and nickel than Plume A.

Additional subsurface investigation in late 1993 revealed the presence of minor groundwater impacts in the northeastern portion of the active yard. Low concentrations of diesel fuel were detected in groundwater samples from three of six locations. The samples were not reported to contain detectable concentrations of toxic hydrocarbon constituents. As shown on Figure 8, the diesel fuel groundwater impacts are contained within the property boundary. Further investigation work and groundwater monitoring will be done to verify that these impacts do not pose a threat to human health.

2.2.3 Description of Structures

2.2.3.1 Former Structures

As was discussed in Section 2.1.2, several structures were located in the inactive portion of the site prior to their demolition 1985. The locations of these former structures are shown on Figure 2. They include:

- Main Shop
- Transfer Table

- Lumber Shed
- Freight Car Repair Shed
- Store House
- Blacksmith Shop
- Coach and Paint Shop
- Oil House
- Brass House
- Fueling Station
- Asbestos Storage Building
- Office.

Some facilities were demolished when the maintenance yard was still active. All remaining maintenance facilities in what is now the inactive portion of the site were demolished in 1985 and 1986.

2.2.3.2 Present Structures

The only structure on-site today is in the active yard. This structure is the Yard Office, which is occupied by UPRR personnel responsible for switching yard operations.

2.2.4 Current Land Uses

Current land use at the site is restricted to the active yard (Figure 2). Activities in this portion of the site include assembling trains, off-loading rail cars, and train passage along the main line. The Yard Office described above is located in this area. The inactive eastern portion of the site is vacant.

Land uses adjacent to the site currently include single family homes, schools, and light industrial and commercial businesses. Current City of Sacramento Planning Division zoning designations for properties in the immediate vicinity of the site are shown on Figure 9. General land uses in the site vicinity are shown on Figure 10 and described below.

Directly adjacent to the north, northwest, and west sides of the site are residential neighborhoods. The Franklin Boulevard commercial district and State Highway 99 are located beyond these residences approximately one-half mile east of the site. The Interstate 80 Business Route freeway is approximately one mile north of the site. Adjacent to the northwest side of the site there is a mixture of single-family residences and commercial buildings, housing, fast-food restaurants, dry cleaners, an appliance store, and a natural food store. Slightly further northwest, approximately 1/8 mile from the site, is McClatchy High School. U.S. Cold Storage Co. maintains a large cold storage warehouse facility adjacent to the west side of the site. Located beyond U.S. Cold Storage are single-family residences. Hughes Stadium and the campus of Sacramento City College are adjacent to the southwest side of the site. William Land Park lies beyond Sacramento City College approximately 1/3 mile west of the site. There is a complex of light industrial buildings on the south side of Sutterville Road, across the southern site boundary. Approximately 1/8 mile south of the site there are more residential neighborhoods. The Sacramento Children's Home is approximately 1/8 mile southeast of the site. Beyond the Children's Home, approximately 1/4 mile from the site, are additional residential neighborhoods.

2.2.5 Demography

The site is located in the southern part of the City of Sacramento, California. According to the United States Department of Commerce Bureau of Census 1990 Census of Population and Housing, approximately 370,000 people reside within the City limits (Department of Commerce, 1991). The median family income for Sacramento at the time of the census was about $33,000, and over 86 percent of families residing in Sacramento had incomes above the poverty level in 1989. Approximately 76% of Sacramento residents 25 years and older are high school graduates, and about 23% percent possess a bachelor's degree or higher (Department of Commerce, 1992). Racial characteristics measured by the 1990 Census indicate that approximately 60% of City residents are Caucasian, 15% are African-American, 15% are Asian or Pacific Islander, and 10% are American Indian or other. Approximately sixteen percent of the City's population is of Hispanic origin, regardless of race (Department of Commerce, 1991).

The Department of Commerce has defined ten census tracts in the area within approximately one mile of the site (Department of Commerce, 1990). For these ten tracts, 1990 census figures identify 32,100 people living in 14,335 households. Ethnic background of people living within one mile of the site is mixed, with 51 percent Caucasian, 21 percent Hispanic, 16 percent Asian, 11 percent African-American, and 1 percent American Indian or Eskimo. The 1990 Census socio-economic information for individual census tracts has not yet been published.

2.2.6 Non-Human Biological Receptors

The site is located in a highly urbanized area. Opportunities for animals to forage or inhabit the site are limited, since it is only sparsely vegetated. Some grasses occupying a strip along the eastern and northern edges of the property may provide **habitat** for rodents, transient raccoons, opossums, skunks, or foraging raptors, but this area is relatively limited in its ability to support a diverse wildlife community. According to the California Department of Fish and Game's **California Natural Diversity Data Base** (CNDDB) for the Sacramento East and Sacramento West Quadrangles, no sensitive species have been noted in the immediate vicinity of the site (California Department of Fish and Game, 1991). Most of the species listed in the CNDDB were sighted along the **riparian** corridors of the American or

Sacramento Rivers, which are at least 1 mile away. A more detailed discussion of wildlife and plant habitats is presented in Section 3.4 of this Draft Remedial Action Plan.

2.2.7 Climatology

The Sacramento climate is characterized by warm summers and mild winters. The mean annual precipitation for Sacramento is 16.9 inches with nearly 90 percent of the precipitation occurring between November and April. The mean annual temperature is 60°F with a mean range of 45°F in January to 75°F in July (National Oceanic Atmospheric Administration (NOAA), 1986). The annual average wind speed is 8 mph with the prevailing wind direction from the southwest. Climatology data has been obtained from several downtown Sacramento weather recording stations and Sacramento Executive Airport weather station approximately two miles south of the site.

2.2.8 Hydrogeology, Groundwater Occurrence and Water Wells

2.2.8.1 Hydrogeologic Setting

The site is located in the southern portion of the Sacramento Valley **groundwater basin,** approximately one mile to the east of the Sacramento River. The site geology consists of **sediments** characteristic of **flood plain deposits** laid down by continually shifting streams. The subsurface sediments consist of a mixture of clays, silts, and sands, although the upper two feet of the site contains native and non-native fill, including man-made debris. A 10- to 40- foot thick layer of clay and silty clay first encountered at a depth of approximately 50 to 60 feet below ground surface at the site forms the bottom of the first **water-bearing zone.** Groundwater in this zone extends upward through sands, silts and clays to a depth of 25 to 35 feet below the surface of the site.

2.2.8.2 Groundwater Occurrence

Groundwater beneath the site is first encountered at a depth of approximately 25 to 35 feet below the surface of the site (Dames & Moore, 1991c). Site topography causes part of this variation. In general, groundwater beneath the site ranges from 2 feet below mean sea level at the northeast corner of the site to 8 feet below mean sea level at the southeast corner of the site. Groundwater flows to the southeast. The depth to groundwater measured at the site has dropped approximately 2.5 feet since 1988, due to prolonged drought conditions that have affected California for the last 6 years.

2.2.8.3 Water Supply Wells

Based on a review of records at the California Department of Water Resources, a total of seven off-site water wells are present within one mile of the contaminant plumes, excluding wells used to monitor groundwater quality at and near the site. Water supply wells are shown on Figure 11 and listed in Table 1. These wells are currently used for irrigation purposes only. Based on available well logs, the total depth of these wells ranges from about 200 to 300 feet (Malmy, 1989). They typically pump water from approximately 100 to 300 feet below ground surface. It appears unlikely that these wells could be impacted by groundwater contamination from the site because of their depth and location (all are either cross-gradient or upgradient of the contaminant plumes).

The Fruitridge Vista Water Company operates several drinking water wells approximately two miles downgradient of the site, south of Fruitridge Road and generally east of Highway 99. The closest of these wells is approximately 7,400 feet from the downgradient plume boundary. The nearest City of Sacramento public drinking water supply well **downgradient** of the site is located on Mace Road, approximately five miles south of the site (Malmy, 1990).

TABLE 1
NEARBY OFF-SITE GROUNDWATER SUPPLY WELLS
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

DWR Well No.	Depth of Completion (ft.)	Distance from Site (ft.)	Distance from Nearest Plume Boundary (ft.)	Direction from Site	Current Owner	Current Use
24A1	95	2,400	3,200	Northeast	—	Unknown
18K1	213	2,800	2,400	East	CalTrans	Irrigation and Dewatering
WLP4	300	2,300	2,800	Southwest	City of Sacramento	Irrigation
18Q1	240	3,000	1,100	Southeast	CalTrans	Irrigation and Dewatering
24C1	210	3,800	4.500	Southwest	City of Sacramento	Irrigation
13m	307	4,300	4,700	West	City of Sacramento	Irrigation
14H1	330	4,700	4,600	Southwest	City of Sacramento	Irrigation
24M1	—	5,700	5,400	Southwest	—	None
FV5	320	9,200	7.400	Southeast	Fruitridge Vista Water Company	Public Water Supply
FV6	—	9,300	7,700	Southeast	Fruitridge Vista Water Company	Public Water Supply
FV4	—	9,900	8,100	Southeast	Fruitridge Vista Water Company	Public Water Supply
FV1	321	10,900	9,300	Southeast	Fruitridge Vista Water Company	Public Water Supply
FV3	315	11,100	9,300	Southeast	Fruitridge Vista Water Company	Public Water Supply
FV2	224	11,600	9,900	Southeast	Fruitridge Vista Water Company	Public Water Supply
FV12	292	12,200	10,500	Southeast	Fruitridge Vista Water Company	Public Water Supply

Wells located over one mile from the nearest plume boundary.

NOTES:

— Not available.
Source: Meyer, 1990; Stockton, 1990.
Figure 11 shows the locations of wells listed here.

3.0 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

This section summarizes site-specific data obtained during the Remedial Investigation, including:

- Evaluation of soil conditions at the site
- Identification and evaluation of hazardous substances encountered
- Evaluation of hydrogeological conditions and groundwater contamination
- Evaluation of contaminant mobility and fate in the environment

3.1 GEOLOGICAL INVESTIGATIONS

Geological conditions at the site have been investigated by excavating pits with a backhoe and drilling into the subsurface with a drilling rig. Soil samples were collected from over 470 locations across the site and evaluated for physical and chemical properties. Soil samples were collected at one or more depth intervals at each location. Over 710 soil samples were analyzed for metals, more than 370 soil samples were analyzed for organic compounds (petroleum hydrocarbons and solvents), 187 soil samples were analyzed for asbestos, and approximately 60 soil samples were analyzed for physical characteristics.

3.1.1 Surface Soil Conditions

The Soil Survey of Sacramento County, California (United States Department of Agriculture Soil Conservation Service (SCS), 1991) has mapped three different soil units underlying the site. All three soils were developed from sediments deposited by rivers. The following descriptions of SCS-mapped soil units is included to describe the native soils which are still intact under most areas of the site.

The surface soil in the southern half and northwestern part of the inactive portion of the site is a strong brown silt loam (clayey silt). The subsoil is a **claypan** composed of yellowish red clay loam (silty clay). Underlying this is a **hardpan,** a soil horizon cemented naturally during soil development. Beneath the hardpan is a light yellowish brown loam (silty clay or clayey silt). Water may become trapped above the claypan subsoil following heavy rains in winter and early spring, forming temporary **perched groundwater tables**.

The surface soil in the north central part of the inactive portion of the site is a brown and light brown silt loam (clayey silt). The subsoil is a claypan composed of brown and strong brown clay (clay). Underlying the claypan is brown sandy clay loam (sandy clay) and sandy loam (sandy silt). Water may remain perched above the claypan of this soil for short periods after heavy rains.

The surface soil in the northeastern part of the inactive portion of the site is a pale brown silt loam (clayey silt). This is underlain by a pale brown silty clay loam (silty clay). Beneath this is a buried surface soil of gray clay (clay). The next layer is gray and pale brown clay loam. Seasonally high water tables may occur in this soil where not artificially drained.

Surface soil investigations and interpretation of historical aerial photos and maps reveal that extensive soil cutting and filling operations have occurred in the inactive portion of the site. These operations have resulted in the deposition of fill containing natural and man-made materials. Fill occurs from ground surface to an average depth of 1.5 to 2.0 feet over most of the southern half of the inactive portion of the site. In the northern half of the site, fill occurs from ground surface to a depth of 8 to 12 feet below ground surface. The deepest zones of fill appear to be in the mid-northern and northwestern part of the inactive portion of the site.

Fill material present at the site consists of soil, wood, concrete, rubble, drywall fragments, coal and cinders, iron and iron slag, and other metal debris. Fill soils are generally well compacted, except for the northwestern portion of the site where loose gravels and railroad track ballast predominate the fill.

3.1.2 Subsurface Soil Conditions

Subsurface soils at the site consist of an approximately 150-foot thick **assemblage** of clays, silts, and sands characteristic of flood-plain deposits laid down by continually shifting streams. The typical subsurface soil profile beneath the site can be summarized as:

Typical Depth (ft)	Material
0-2	Fill; mainly derived from native soils at the site (see Section 3.1.1). Also contains man-made materials. In the active yard, fill materials contain slag track ballast and a heterogeneous mixture of sands, gravel, and disturbed native soils.
2-25	Silty clay and clayey silt; contains a hardpan layer near the surface over much of the site.
25-35	Sands, silts and clays; interbedded fine-grained materials, becoming less fine-grained with increasing depth. The water table can extend into this material.
35-50	Sand; fine- to medium-grained, maximum thickness 25 feet, thinning to 4 feet in the southwestern corner of the site. The base of the sand is the base of the shallow water-bearing zone.
50-60	Clay and silty clay which form the bottom of the water-bearing zone. This layer varies in thickness from 10 feet to 40 feet and becomes siltier with depth.

60-150 Interbedded sands, silts and clays including lower water-bearing zone.

3.1.3 Off-Site Soil Sampling

Off-site soil sampling was conducted in the vicinity of the site. The purpose of the sampling was to evaluate normal **background concentrations** of metals in soils, and to evaluate the impact which metals from the site may have had on adjacent properties not owned by UPRR.

Nine soil samples were collected from Curtis Park and William Land Park with the purpose of evaluating natural background levels of arsenic, copper and lead occurring in soils near (but not impacted by) the site. Average background soil concentrations of arsenic and lead near the site are higher than the average reported background concentration in the United States. Average background soil concentrations of copper near the site are lower than the average reported background concentration in the United States (Shacklette, 1984). The results of background soil chemical analyses are summarized in Table 2.

TABLE 2
BACKGROUND LEVELS OF SELECTED METALS IN SOIL
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

	Measured Soil Concentration (mg/Kg)			
	Site-Specific Background Samples[1]		U.S. Background Concentrations[2]	
Constituent	Range	Average	Range	Average
Arsenic	6.36-8.36	7.75	0.1-97.0	7.2
Lead	7.80-30.0	22.0	10-300	15.0
Copper	16.4-26.2	22.9	< 1.0-700	25.0

NOTES:

1 A total of 9 samples were collected in Curtis Park and William Land Park. (Dames & Moore, 1990d).

2 Shacklette, 1984.

An additional 94 samples were collected from three residential lots and four vacant lots adjacent to the west side of the site, and from three residential lots adjacent to the east side of the site, as shown on Figure 4. These samples were collected and analyzed for the purpose of evaluating the potential impact which arsenic, lead, and copper from the site may have had on adjacent residential lots.

3.2 SOIL CONTAMINATION ASSESSMENT

3.2.1 Nature and Extent

Results from extensive soil sampling conducted during the Remedial Investigation indicate that soils at the site contain metals (primarily arsenic and lead), organic compounds (petroleum hydrocarbons, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and solvents), and asbestos. The distribution of each type of soil contaminant present in site soils is discussed below.

Metals

Based on the **chemical analysis** of soil samples collected during Phase 1 and Phase 2 of the Remedial Investigation, and additional soil investigations in both the inactive portion of the site and the active yard, several areas were found to contain concentrations of arsenic and lead elevated with respect to background values. These areas are shown on Figure 7. Elevated levels of arsenic and lead occur primarily in the upper 1.5 feet of soil and in some of the railroad track ballast containing slag. The distribution of slag at the site prior to slag removal activities in late 1993 is shown on Figure 6A.

Based on the analysis of soil samples collected from the adjacent residential and vacant lots, two areas adjacent to the west side of the site were found to contain elevated levels of arsenic and lead. These areas (Lot 1 and 2206 Sixth Avenue) are shown on Figure 4. Elevated levels of arsenic and lead were found primarily in the upper 1/2 foot of soil throughout Lot 1 and part of 2206 Sixth Avenue. Slag used as gravel cover is believed to have been the source of the arsenic and lead.

Organic Contaminants

Organic contaminants were detected in soils in both the inactive portion of the site and the active yard. These contaminants consist of petroleum hydrocarbons (diesel fuel, gasoline, benzene, toluene, ethylbenzene, and xylenes), volatile organic compounds (solvents), and polycyclic aromatic hydrocarbons. Volatile organic compounds were not detected in soil samples collected at the site; however, low levels of volatile organic compounds were detected in soil vapor samples collected in the Central Fill and former Oil House areas. Polycyclic aromatic hydrocarbons were generally found in the same areas as petroleum hydrocarbons, but were not detected in the active yard. Figure 5 is a map depicting the approximate area of soil impacted by petroleum hydrocarbons.

Soil samples collected near the former transformer vault area contained low levels of polychlorinated biphenyls (PCBs).

Asbestos

Asbestos-impacted soils have been found in the vicinity of the former Asbestos Storage Building in the southern corner of the inactive portion of the site (see Figure 12). The results of investigations conducted in this area indicate that asbestos is present in soil at concentrations between one and five percent by volume. Asbestos appears to be distributed unevenly in shallow soils and extends from ground surface to a depth of approximately 2 feet. Asbestos-containing building materials, pipe insulation, and **lagging material** have also been found in this area. The area has been planted with grass to prevent wind-blown asbestos until implementation of site-wide remediation.

3.2.2 Soil Contaminant Mobility

Mobility refers to the ways contaminants can move from the area where they were originally released. In general, soil contaminants could be transported by the following mechanisms:

- Small (dust- or sand-size) particles of contaminated soil or solid contaminants could be carried by wind;
- Contaminants that are soluble in water can dissolve in rain water (or irrigation water, if used) and travel on the surface in the form of contaminated run-off or travel downward through soil as rain water **infiltrates;**
- Liquid contaminants can infiltrate through soil with or without the addition of water; and
- Solid and liquid contaminants in soil can be transported by the activities of man, such as tilling, earthmoving, or fill practices.

There are also several natural processes which can slow or stop contaminants from moving. These processes include:

- Some contaminants that are soluble in water (especially metals) can adsorb, or stick, to certain types of soil (usually clay);
- Some liquid contaminants such as solvents may volatilize (turn into vapor form);

- Organic contaminants (solid or liquid) can be broken down into harmless compounds by bacteria that occur naturally in soil;
- Thick (viscous) liquids tend to move more slowly through soil than thin liquids; and
- Natural clay layers may slow the downward movement of liquids because of low **permeability**.

Both organic and inorganic contaminants of concern have been found in soils at the site. Organic contaminants of concern include petroleum hydrocarbons (primarily diesel fuel), volatile organic compounds, and polycyclic aromatic hydrocarbons associated with diesel fuel. Inorganic contaminants of concern include lead, arsenic, and asbestos.

The potential for petroleum hydrocarbons to move through soil to groundwater was addressed through a **leachability** study (Dames & Moore, 1991d). This study used a series of mathematical equations to calculate the rate at which a selected petroleum hydrocarbon constituent (naphthalene) could migrate to the groundwater. Naphthalene was chosen because it is the most mobile of the **Priority Pollutant** compounds generally found in diesel fuel and detected at the site. The study was performed using site-specific data, as well as several **conservative assumptions** where site-specific data were not available.

The results of the leachability study showed that, depending on depth and concentration, petroleum hydrocarbons may constitute a threat to groundwater. Petroleum hydrocarbons at soil depths close to the **water table** represent a greater threat to groundwater than petroleum hydrocarbons closer to the ground surface. This is due to the fact that petroleum hydrocarbons are known to break down through bacterial activity into non-harmful carbon dioxide and water in soils when given enough time. The farther the contamination is from the groundwater table, the longer it will take for the contamination to reach groundwater, increasing the time during which natural break-down may occur. The purpose of the leachability study was to provide a basis for selecting clean-up levels for petroleum hydrocarbons in soil. The DTSC subsequently directed a more protective clean-up level for petroleum hydrocarbons.

Volatile organic compounds such as the chlorinated solvents found in soil vapor in the Central Fill Area generally move by infiltration through soils. The rate of movement can be affected by **dilution, dispersion, volatilization,** and **adsorption** to soil particles and organic carbon. The low organic carbon content of soils at the site suggests that chlorinated solvents should be relatively mobile in site soils. Groundwater monitoring results suggest that chlorinated solvents found in the Central Fill Area have infiltrated and are probably the source of the larger groundwater plume at the site.

In order to learn more about the potential for the inorganic contaminants arsenic and lead to migrate through the soil to groundwater, the **dissolution kinetics** of slag found at the site was assessed (Walsh & Associates, 1992). Samples of slag from the site were subjected to a variety of acidic water solutions. The resulting **leachate** was then tested to assess dissolved metal concentrations. The study results indicate that the chemical forms of arsenic and lead present in the slag are relatively **insoluble** over a wide range of pH. Based on this study, it is believed that lead and arsenic from slag at the site are not highly mobile in soils and therefore do not appear to present a threat to groundwater quality. Although nickel was generally not found in soil at concentrations exceeding the local background level, it has been found in groundwater below the site. There is no obvious explanation for the presence of nickel in groundwater.

3.3 HYDROGEOLOGICAL INVESTIGATIONS

Hydrogeological conditions have been investigated by the installation of 35 on-site and seven off-site groundwater monitoring wells, as well as **in-situ groundwater sampling**. To evaluate groundwater flow direction, depth to the water table has been measured in groundwater monitoring wells every three months since 1988. Groundwater samples have been collected from both permanent groundwater monitoring wells, and temporary groundwater monitoring points. These groundwater samples were collected at about 60 on-site and 70 off-site locations. Since 1988, over 500 groundwater samples have been analyzed for volatile organic compounds, and over 300 groundwater samples have been analyzed for metals.

3.3.1 Groundwater Conditions

3.3.1.1 Physical Characteristics

Groundwater beneath the site occurs at a depth of 25 to 35 feet below ground surface, which corresponds to an elevation of 2 to 8 feet below mean sea level. The **groundwater gradient** is approximately 0.002 to 0.003, and groundwater flow velocity is approximately 200 to 300 feet per year to the southeast.

3.3.1.2 Local Groundwater Quality

In the site vicinity, groundwater is reported to be greater than 250 **parts per million** in **total dissolved solids,** which is a moderate level (United States Geological Survey, 1985). Local groundwater is reportedly moderately hard, low in chloride, sodium, manganese, and sulfate, as summarized in Table 3. Nearby wells located in William Land Park were originally used for public water supply until iron and **coliform bacteria** were detected at concentrations above drinking water standards. At this time, use of water from these wells is limited to irrigation.

3.3.1.3 Beneficial Uses

Groundwater in the Sacramento Valley groundwater basin is used for municipal and domestic supply, agricultural supply, and industrial process and service supply (California Regional Water Quality Control Board, 1991). Recent estimates indicate that nearly one-half of the total water supply for Sacramento County comes from groundwater (USGS, 1985). Groundwater accounts for 15 percent of the public drinking water supply in the City of Sacramento (Malmy, 1989).

3.3.2 Surface Water Conditions

3.3.2.1 Physical Characteristics

There are no bodies of surface water on the site. The only surface water bodies present in the vicinity of the site are the Sacramento River approximately 1 mile to the west and the American River approximately 3 miles to the north.

3.3.2.2 Surface Water Quality

Water quality in the American and Sacramento River is tested by the City of Sacramento periodically prior to treatment and distribution to local water users. The quality of surface water from the Sacramento River is considered good 11 months out of the year (Meyer, 1991). Copper and iron levels are sometimes slightly elevated, but not above levels of concern. In the spring for one month water quality is typically impacted by low levels of herbicides from farms upstream of Sacramento. American River water quality is also said to be of better quality than Sacramento River water (Meyer, 1991).

TABLE 3
QUALITY AND BENEFICIAL USES OF LOCAL WATER RESOURCES
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Name of Surface (S) or Groundwater (GW) Resource	Distance From or Depth Below Site	Quality of Resource in the Sacramento Area	Present Beneficial Use	Future Beneficial Use
Sacramento River (S)	1 mile to the west	Not applicable; no surface water resources located at site.	Municipal and domestic supply, irrigation, contact and non-contact recreation, freshwater habitat and navigation.	Municipal and domestic supply, irrigation, contact and non-contact recreation, freshwater habitat and navigation.
American River (S)	3 miles to the north	Not applicable; no surface water resources located at site.	Municipal and domestic supply, irrigation, industrial service supply, industrial power supply, contact and non-contact recreation, freshwater habitat/spawning/migration for warm and cold-water fish and wildlife habitat.	Municipal and domestic supply, irrigation, industrial service supply, industrial power supply, contact and non-contact recreation, freshwater habitat/spawning/ migration for warm and cold-water fish and wildlife habitat.
Sacramento River Basin (GW)	21 to 35 feet below surface of site	Moderate total dissolved solids; moderately hard	Irrigation and dewatering within a one-mile radius. Public water supply approximately 2 miles to the southeast.	Community and military water systems, domestic use.

Source: RWQCB, 1991; USGS, 1985.

3.3.2.3 Beneficial Uses

Beneficial uses listed for the segment of the American River in the vicinity of the site include municipal and domestic supply, irrigation, industrial service supply, industrial power, contact and non-contact recreation, freshwater habitat/migration/spawning for warm- and cold-water fish and wildlife habitat (RWQCB, 1991). Beneficial uses listed for the segment of the Sacramento River in the vicinity of the site include municipal and domestic supply, irrigation, contact and non-contact recreation, freshwater habitat/migration/spawning for warm- and cold-water fish, wildlife habitat and navigation (RWQCB, 1991). Beneficial uses of surface water are listed in Table 3. Treated surface water from both the American River and the Sacramento River accounts for 85 percent of the public drinking water supply in the City of Sacramento (Malmy, 1989).

3.4 GROUNDWATER CONTAMINATION ASSESSMENT

This section discusses how Remedial Investigation information concerning groundwater was interpreted.

3.4.1 Nature and Extent

Analytical results from extensive sampling conducted during the Remedial Investigation indicate that groundwater beneath the southern two-thirds of the site and areas southeast of the site has been impacted by volatile organic compounds and nickel. There are no known surface water quality impacts due to activities at the site.

Groundwater investigations have evaluated the apparent lateral extent of contaminants in the first two water-bearing zones beneath the site. These investigations have found two plumes of impacted groundwater in the shallow water-bearing zone:

- Plume A (shown on Figure 8) extends from the Central Fill Area approximately 4,800 feet to the southeast and ranges in width from approximately 250 to 500 feet. Plume A contains volatile organic compounds and nickel, and extends into the second shallow water-bearing zone. Additional groundwater investigation work is planned to demonstrate whether this plume also extends into the third water-bearing zone.

- Plume B (also shown on Figure 8) extends from west of the former Main Shop area approximately 1,200 feet to the southeast across Sutterville Avenue. This groundwater plume contains volatile organic compounds and nickel and is believed to be contained within the first shallow water-bearing zone.

Volatile organic compounds impacting groundwater in Plume A appear to have originated in the Central Fill Area. Two potential sources have been identified. An aerial photograph taken in 1953 indicates a surface impoundment was present near the northern part of the Central Fill Area. The contents of the former impoundment are not known. Additionally, exploratory excavations conducted in the Central Fill Area revealed the presence of buried debris, including drums.

Additional subsurface investigation in late 1993 revealed the presence of minor groundwater impacts in the northeastern portion of the active yard (see Figure 8, Plume C). Low concentrations of diesel fuel were detected in groundwater samples from three of six samples. The samples were not reported to contain detectable concentrations of toxic hydrocarbon constituents. As shown on Figure 8, the diesel fuel groundwater impacts are contained within the property boundary. Further investigation work and groundwater monitoring will be done.

3.4.2 Groundwater Contaminant Mobility

Mobility refers to the ways contaminants can move from the area where they were originally released. In general, groundwater contaminant transport is controlled by **advection** and dispersion. Advection is the process of movement of the contaminant due to the movement of groundwater. Dispersion is the tendency of the contaminant to spread away from the point of origin. Dispersion causes the contaminant to be diluted due to mixing with non-contaminated groundwater and, to a lesser degree, diffusion of the contaminant.

Volatile organic compounds degrade naturally in groundwater over time. Additionally, they become diluted in groundwater as the plume spreads. The overall effect of degradation and dilution of volatile organic compounds in groundwater will be to lower concentrations over time. Dissolved metals in groundwater often become adsorbed to soil particles, thereby reducing their concentrations in groundwater.

Volatile organic compounds in Plume A have moved approximately 4,800 feet to the southeast of the suspected on-site source. Preliminary **groundwater modeling** was completed early in the groundwater investigation. The model was used to simulate the transport of groundwater contaminants for two scenarios: 10 years after release and 30 years after release. Information from subsequent groundwater investigations indicates that the current extent of Plume A is approximately the same as was predicted during modeling using a 30-year release scenario. These preliminary results suggest that volatile organic compounds present in Plume A were released to groundwater approximately 30 years ago.

3.5 AIR INVESTIGATION

Air quality impacts that might be caused by contaminants present in soil at the site were also investigated. There are two potential sources of air contamination for this site: dust contaminated with metals or asbestos, and vapors from volatile organic soil contaminants. Each potential source is discussed separately below.

3.5.1 Investigation of Air Quality

Two separate **ambient** air quality studies have been conducted at the site. The first study was conducted in 1988 as part of the original Remedial Investigation. Air samples collected over an eleven-day period were analyzed for arsenic, copper, lead, and dust. Also, air samples collected for 12 hours per day over a five-day period were analyzed for asbestos. Wind speed and direction were monitored during the study.

During the first study, no detectable levels of arsenic, copper or lead were found. Of thirty samples analyzed for asbestos, one sample was found to contain asbestos at a concentration of 0.0016 fibers per cubic centimeter of air (approximately 2 fibers per quart of air). This asbestos concentration is considered normal for urban areas (California Air Resources Board, 1990). The DTSC considers the first air quality study invalid.

A second air quality study was conducted at the site in July and August 1992. For this study, 24-hour air samples were collected each day at six stations over a 14-day study period. Three sampling stations were located **upwind** of the site to measure background air contaminant concentrations, and three were positioned **downwind** to provide an indication of how soil contaminants affect air quality near the site. Wind speed and direction were monitored at an on-site **meteorological station**. Air samples were tested for arsenic, lead, asbestos, and dust. A total of 79 air samples were tested for arsenic and lead. Forty-two samples came from the upwind stations, and 37 were collected at the downwind stations. Eighty air samples were tested for asbestos. For lead and arsenic, the average concentrations were slightly higher at the upwind sampling stations. The average of the asbestos test results was slightly higher for the downwind stations.

Based on the results of the second sampling and analysis study, air quality in the site vicinity does not appear to be impacted by dust, asbestos, arsenic, copper, or lead present in soil at the site.

3.5.2 Investigation of Soil Vapors

A **soil vapor study** was conducted in the former Oil House Area and Central Fill Area of the inactive portion of the site. The purpose of the study was to assess potential health risks due to vapors released from the soil to the air. Soil vapors were extracted from between three and 10 feet below ground surface. Vapor samples were analyzed for selected volatile organic compounds.

In the former Oil House Area, eight vapor samples were collected from six locations. At two of the sampling locations, samples were collected at two different depths. Low levels of volatile organic compounds were detected in four of eight samples.

In the Central Fill Area 26 samples were collected from 19 locations. Samples were collected at two depths from seven of the locations. Low levels of volatile organic compounds were detected in 19 of 26 samples collected.

The low levels of volatile organic compounds in detected soil vapors do not currently pose a risk to human health or air quality. However, additional investigation work will be done to assess the potential for these compounds to impact groundwater quality. Data from the investigation will be used to develop cleanup levels for chlorinated volatile organic compounds, and will serve as a basis for developing a cleanup strategy which will be protective of human health and groundwater quality for future beneficial uses.

3.6 AIR CONTAMINATION ASSESSMENT

The release of volatile organic compound vapors into air could occur at the site. The soil vapor study described above suggests that these emissions would be minimal, and they are therefore not considered significant.

It is also possible that contaminated dust from the site could become suspended in air. The potential for dust to become suspended depends upon particle size, the extent of crust or aggregate formation in surface soils, and the extent of vegetation or non-erodible elements (such as rocks or concrete foundations) in the soil. Vegetation on the site is sparse, although the ground surface contains numerous non-erodible elements, including paving, debris and track ballast. Arsenic and lead occur in surface soils distributed across the site and have the greatest potential for emissions to the air in the form of resuspended dust. Asbestos contamination is limited to a much smaller area, which has been revegetated to reduce potential air transport. The results of an ambient air quality study suggest that arsenic, lead, and asbestos present in site soils are not currently causing air quality impacts.

3.7 BIOLOGICAL INVESTIGATION

An investigation of potential biological receptors at and in the vicinity of the site was conducted using information gathered from the California Natural Diversity Database (CNDDB) (California Department of Fish and Game, 1991) and the California Wildlife Habitat Relationships (WHR) Database (California Department of Fish and Game, 1989).

The CNDDB is a computerized inventory of species of special concern that contains information on more than 1,200 species in over 18,000 locations throughout the state. The CNDDB is maintained by the California Department of Fish and Game and The Nature Conservancy. The WHR Database contains information on 644 species of terrestrial vertebrates and where these species have been found in the State.

General observations of the site were made during a site visit, but no detailed field studies were undertaken.

3.7.1 Description of Habitats

The site is located in an urban residential area where potential wildlife habitats are limited. Most of the site is devoid of vegetation due to paving, railroad track ballast, gravel, debris, and land disturbances such as extensive grading. **Flora** (plant life) is limited to grasses along the eastern and northern boundaries and in the northeast quarter of the site. There are also some exotic **forbes** (herbs other than grasses). Vegetation includes mixed grasses, upland sedge, and a variety of **weedy species,** such as wild oat, rye-grass, bermuda grass, dock, Russian thistle, and dandelion. A few scattered shrubs are present, as well as one large Valley Oak, and a cottonwood located near the northern boundary of the site. No rare or endangered plant species were observed (Dames & Moore, 1991b), although the Valley Oak is on the California Native Plant Society Watch List and is protected under California Senate Concurrent Resolution #17 (1989) and the Sacramento County Tree Preservation Ordinance (Resolution #31-1007, 1981).

No mammals or reptiles were observed on the site, although the site could potentially support rodents or other small mammals along the eastern boundary (the location of the above-described vegetation). Bird species observed included a variety of common songbirds: sparrows, blackbirds, and starlings. Crows and an American kestrel were observed during later phases of the Remedial Investigation (Dames & Moore, 1991b). A burrowing owl was observed on-site in late 1993. Due to site disturbance, sparse cover, and limited varieties of plant species, the site constitutes poor quality animal habitat.

The results of the CNDDB survey (extending in a 5-mile radius in all directions from the site) indicate that several species of particular concern have been sighted in the general vicinity of the site. These species and the location(s) of sightings are as follows:

Great Valley Cottonwood Riparian Forest

- Yolo County side of Sacramento River at Broderick from river mile 59.8 to river mile 62.

Elderberry Savanna

- California State Exposition (Cal Expo) on American River Floodplain from the Southern Pacific Railroad tracks east to just beyond Highway 80.

Swainsons Hawk (<u>Buteo Swainsoni</u>)

- Sacramento River at Chickory Bend (east side of river);
- Natomas Drainage Canal 0.5 mile north of Discovery Park, south side of the Sacramento River;
- Sacramento River, 1 mile northwest of I-80; and
- Discovery Park.

Western Yellow Billed Cuckoo (<u>Coccyzus Americanus Occidentalis</u>)

- Sacramento Bypass (none observed since 1965).

Burrowing Owl (<u>Athene Cunicularia</u>)

- Vicinity of McKinley Park, southwest of Cal Expo;
- Southwest of junction of Howe Avenue and Fair Oaks Boulevard; and
- Sacramento State College and adjacent levee areas along the American River.

Bank Swallow (<u>Riparia Riparia</u>)

- South side of the American River, upstream of Cal Expo, near Business 80 bridge.

Tricolared Blackbird (<u>Agelaius Tricolar</u>)

- Near Port of Sacramento, just south of Highway 80, Interstate 80 junction.

Valley Elderberry Longhorn Beetle (<u>Desmocerus Californicus Dimorphus</u>)

- Just south of Highway 160 at Del Paso Boulevard;
- South bank of the American River, west of Hall Park (across from Cal Expo) river mile 5;
- Bushy Lake, Cal Expo;
- American River floodplain parcel between railroad track overpasses (between I-80 and Highway 160);
- Between mileage markers 6 and 7 on American River Parkway bike trail;

- Sacramento River mile 62.5 west at I-80;
- Sacramento River opposite mouth of American River, at river mile 60.3 and 59.8, west bank; and
- Sacramento River, opposite junction with Natomas, main drainage canal, river mile 61.

Dwarf Downingia (Downingia Humilis)

- Keithly Ranch, Rio Linda, north of Sacramento.

Most of these species were sighted along the riparian corridors of the American or Sacramento Rivers. Table 4 provides a summary of the distance between the site and the nearest observation of each species and the type of cover, food, and foraging opportunities that these species require. The site itself does not provide an adequate habitat for these identified species of concern.

3.7.2 Food Chain Analysis

A **food chain** analysis was conducted because of the potential for transfer of contaminants from organisms which are lower on the food chain (such as insects), to those higher on the food chain (such as birds of prey, mammalian predators, and man). In order for this transfer to be significant, accumulation of contaminants would have to occur in organisms living at a site with contaminants present. However, because of the limited quantity and poor quality of vegetation and habitat, contaminants found at the site are not likely to impact land-based animals. Exposure to contaminants is likely to be restricted to invertebrates, earthworms, insects, and the plants on the site. Animals who forage on these substances may be exposed. However, their exposures are likely to be transitory because the site apparently provides little food and cover. This diminishes the ability of the site to attract species of concern.

3.7.3 Contamination Assessment

Because of the absence of suitable habitat at and in the vicinity of the site, it is not likely that plants or animals will be significantly impacted by contaminants found on the site.

TABLE 4
NON-HUMAN BIOLOGICAL RECEPTORS:
SUMMARY OF CALIFORNIA NATURAL DIVERSITY DATABASE
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Species	Approximate Distance to Nearest Sighting (miles)	Cover	Food/Foraging Habits
Swainson's Hawk	3.5	Oak savannah, roosts in large trees, but will roost on ground if none available.	Forages in grasslands or adjacent grain or alfalfa fields. Eats mice, gophers, ground squirrels, rabbits, large arthropods, amphibians, reptiles, birds, and rarely fish.
Yellow-billed Cuckoo	5.9	Densely foliaged, deciduous trees and shrubs, especially willows, required for roosting.	Gleans large insects from foliage.
Burrowing Owl	2.0*	Rodent or other burrows for roosting and nesting cover.	Mostly insects, also small mammals, reptiles, birds, and carrion.
Bank Swallow	3.2	Holes in cliffs in river banks for cover. Frequents near bodies of water.	Forages by hawking insects during long gliding flights. Feeds predominantly over open riparian areas, but also over brushland, grasslands, and cropland.
Tricolored Blackbird	4.3	Breeds near emergent wetlands, especially areas with cattails, and tules, also in trees and shrubs.	Feeds on insects, seeds, and cultivated grains. Forages on ground in croplands, grassy fields, flooded land, and along edges of ponds.
Valley Elderberry Longhorn Beetle	3.2	Found only in Elderberry Savannah.	Larvae are borers, adults feed on foliage.
Dwarf Downinga	8.5	Flowering plant species associated with vernal pools.	Needs conditions required for vernal pools.

Source: Zeiner *et al.*, 1990.

* A burrowing owl was observed on-site in late 1993; however, no burrow was found.

4.0 HEALTH AND SAFETY RISKS

A **Health Risk Assessment** was performed to evaluate the potential for adverse human health and environmental effects at the site under current conditions using the results and information presented in the Remedial Investigation. The Remedial Investigation concluded that the most common contaminants at the site were:

- Metals in soil (arsenic and lead)
- Petroleum hydrocarbons and polycyclic aromatic hydrocarbons in soil
- Volatile organic compounds and nickel in groundwater.

This section presents a summary of the Health Risk Assessment conducted at the UPRR Sacramento yard site.

The purpose of a Health Risk Assessment is to:

- Evaluate potential means of exposure to site contaminants under current site conditions and in the future (assuming the site is not cleaned up).

- Estimate potential health risks associated with exposure to contaminants detected in soil, air, and groundwater for current and future site occupants.

- Identify contaminants of potential human health and environmental concern which will need to be addressed in the site remedial action.

A Health Risk Assessment, conservative by design in order protect human health and the environment, tends to overstate the potential for human contact with chemicals detected in site soil and groundwater, and may overestimate the risk of adverse health effects associated with chemical contact.

The Health Risk Assessment for the site was prepared according to guidelines provided by the U.S. Environmental Protection Agency (EPA) and the DTSC, and is contained in several reports. The Supplement to the Revised Baseline Health Risk Assessment (Dames & Moore, 1992a) was used as the basis for this discussion of risks posed by the site in its present condition. A chronologic list of Health Risk Assessment reports and related DTSC correspondence follows:

- The Health Risk Assessment was submitted to DTSC in August 1990.

- Comments on the Health Risk Assessment were received from DTSC in March 1991.

- Comments were addressed in the Revised Baseline Health Risk Assessment (Appendix J of the Addendum Remedial Investigation/Feasibility Study Report).

- Comments by the DTSC on the Revised Baseline Health Risk Assessment were received in March 1992.
- Comments were addressed and presented to the DTSC in the Supplement to the Revised Baseline Health Risk Assessment and Development of Remedial Action Objectives for the Union Pacific Railroad Yard in September 1992.
- Comments of the DTSC on the Supplement to the Revised Health Risk Assessment and the Development of Remedial Action for the Union Pacific Railroad Yard, and DTSC-acceptable cleanup levels were received from the DTSC in January 1993 .

4.1 EXPOSURE SCENARIOS AND PATHWAYS

To evaluate exposure, the physical characteristics and current and future land use at and near the site were evaluated. This information helps identify potential points of contact between humans and chemicals associated with the site. Individuals that could become exposed to contaminants detected at the site (receptors) and possible means of exposure (pathways) associated with the site are summarized in Table 5.

The **exposure scenarios** describe the activities and site conditions through which receptors could become exposed to contaminants at the site. An **exposure pathway** is the means by which individuals could become exposed to contaminants detected at the site. An exposure pathway links the source of environmental release with population locations and activity patterns to assess the significant pathways of human exposure. Potential pathways other than those described above were also examined, but judged not likely to exist for this site.

Trespassers are individuals who could gain access to the site and have contact with contaminants in the soil. For the purposes of the Health Risk Assessment, it was assumed that off-site residents live directly adjacent to the site at the location where the highest levels of contaminants in air (from wind-blown dust) are expected to be found. Future development of the site will probably prevent wind-blown dust by covering much of the site with buildings, landscaping, and roads. However, the exposure scenarios associated with future land use in the Health Risk Assessment assumed the presence of hypothetical on-site residents on the unremediated site. This is the most health-protective approach and would tend to provide the highest risk estimates.

Considering the exposure pathways and scenarios listed in Table 5, conservative assumptions regarding exposure duration and contaminant intake were used to calculate numerical estimates of health risks based on site-specific information and regulatory guidance. These assumptions provide a conservative estimate of risks associated with exposure to site contaminants. A summary of selected assumptions used in the Health Risk Assessment is provided in Table 6.

4.2 RISK CHARACTERIZATION

Risk characterization provides numerical estimates of the existence and magnitude of potential human health risk concerns related to contamination at the site. Carcinogenic (cancer-causing) and non-carcinogenic health effects due to chemical exposure are characterized in two different ways:

- Calculation of a **Hazard Quotient** (for non-carcinogenic chemicals); and
- Calculation of the **estimated lifetime cancer risk** (for carcinogenic chemicals).

The cancer risks and hazard quotients for each particular chemical were summed to provide an estimate of total risks. Health risks associated with the site are discussed in the following sections. A summary of the risk characterization is provided in Table 7.

4.2.1 Non-carcinogenic Effects

Non-carcinogenic health effects were estimated by calculating a hazard quotient for each non-carcinogenic contaminant. A hazard quotient is the ratio of the predicted intake of a particular chemical and the intake limit established by either the DTSC or the U.S. EPA. Hazard quotients are grouped by similar effects (such as liver disease or kidney disease) and the sum of these quotients is referred to as the Hazard Index. A Hazard Index less than one indicates there is very little chance of adverse health effects. It should be noted that a Hazard Index is not utilized to calculate health effects from exposure to lead. Instead, mathematical models are used to predict blood lead levels based on exposure to **upper bound concentrations** of contaminants at the site. The following summarizes the major non-carcinogenic risks:

- The hazard quotient for 1,1-dichloroethene (in groundwater) exceeded one in all future scenarios, indicating that the estimated intake would exceed regulatory criteria. In addition, arsenic and thallium exceeded one in the future on-site resident scenario.

- When hazard quotients were summed by critical effect to calculate the hazard index, only the hazard index for liver damage exceeded one.

TABLE 5
BASELINE HEALTH RISK ASSESSMENT
EXPOSURE SCENARIOS AND PATHWAYS
UNION PACIFIC RAILROAD
SACRAMENTO, CALIFORNIA

EXPOSURE SCENARIO	POSSIBLE EXPOSURE PATHWAYS
Current Land Use	
Trespassers (on the site)	Dermal (skin) contact with contaminated soil Ingestion of contaminated soil Inhalation of contaminated dust (from wind-blown soil)
Off-site residents	Inhalation of contaminated dust
Future Land Use (assuming site is not cleaned up)	
Off-site residents	Inhalation of contaminated dust Dermal contact (showering/bathing) with contaminated groundwater from off-site wells Vapor inhalation (showering) with contaminated groundwater from off-site wells Ingestion of contaminated groundwater from off-site wells
Hypothetical on-site residents	Dermal contact with contaminated soil Ingestion of contaminated soil Dermal contact (showering/bathing) with contaminated groundwater from on-site wells Vapor inhalation (showering) with contaminated groundwater from on-site wells Ingestion of contaminated groundwater from on-site wells

TABLE 6
SELECTED ASSUMPTIONS USED IN THE HEALTH RISK ASSESSMENT
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Variable	Assumed Value	Applicable Exposure Pathways
Exposure Frequency		
Adult Resident	350 days per year	
Child Resident	350 days per year	All
Trespasser	104 days per year	
Exposure Duration		
Adult Resident	24 years	
Child Resident	6 years	All
Trespasser	8 years	
Body Weight		
Adult	154 pounds	
Child	33 pounds	All
Trespasser	111 pounds	
Soil Ingestion Rate		
Adult	1/300 ounce per day (1/8 teaspoon)	Soil Ingestion Only
Child	1/150 ounce per day (1/4 teaspoon)	
Exposure Time		
Adult Resident	24 hours per day	
Child Resident	24 hours per day	Particulate (Soil) Inhalation Only
Trespasser	8 hours per day	
Groundwater Ingestion Rate		
Adult	1 3/4 quarts per day	Groundwater Ingestion Only
Child	1 1/4 quarts per day	
Exposure Time		**During bathing only:**
Adult	15 minutes per day	Groundwater Skin Contact/Vapor Inhalation Only
Child	15 minutes per day	Groundwater Skin Contact Only

Notes: Other assumptions used in the Health Risk Assessment include skin surface area, inhalation volumes, and other more technical assumptions.

For each exposure scenario and pathway examined in the Health Risk Assessment, the assumptions are combined when calculating estimates of health risks.

Example 1: When estimating risks associated with childhood ingestion of soil, it was assumed that a child weighing 33 pounds swallows 1/150 ounce (1/4 teaspoon) of contaminated soil per day (350 days per year) for six years. This is equivalent to swallowing 2 1/4 ounces per year for six years.

Example 2: Risk estimates for adverse health effects on adults drinking contaminated groundwater were calculated assuming an adult weighing 154 pounds drinks 1 3/4 quarts of contaminated groundwater per day (350 days per year) for 24 years.

Example 3: Risk estimates for trespassers assume the trespasser is a child weighing 111 pounds who spends 8 hours per day at the unremediated site 104 days per year for 8 years. The trespasser's exposure is assumed to begin when he is 9 years old, and continues until he is 17.

Example 4: Life-time cancer risk estimates for children were calculated assuming that the childhood exposure lasts for 6 years and that the individual continues to be exposed for an additional 24 years as an adult.

- The primary concern for lead exposure is the potential for learning deficits in children under five years old. A direct indication of intake can be obtained from the level of lead in blood. The U.S. EPA and the DTSC consider blood lead levels exceeding 10 **micrograms per deciliter** (μg/dL) to be a level of concern. This blood lead level is associated with ingesting soil with a concentration of 300 parts per million or more (Dames & Moore, 1991d). Although the average lead concentration in soil at the UPRR site is 477 parts per million (ppm), the distribution of lead contamination at the site is uneven (*i.e.*, **"hot spots"** exist). This suggests that blood lead levels may be lower than predicted in the Health Risk Assessment. At the concentration examined, blood lead levels should not exceed 10 micrograms per deciliter in more than five percent of exposed children. It should be noted that in urbanized areas, blood lead levels above 10 micrograms per deciliter are not uncommon and may be attributable to a number of potential lead sources (including house paint, glazed ceramic dishes, and lead solder used in household plumbing).

4.2.2 Carcinogenic Effects

As a means of predicting possible carcinogenic effects, the Health Risk Assessment included estimating the lifetime cancer risk for each receptor. For carcinogenic effects, the U.S. EPA requires remedial action when conditions at a site cause a calculated cancer risk of 1×10^{-6} (one in one million) or greater, although action may depend on site-specific conditions.

- Estimated lifetime cancer risks potentially associated with trespassers or off-site residents (current land use) range from nine-in-one million (9×10^{-6}) to nine-in-one hundred thousand (9×10^{-5}).

- Estimated lifetime cancer risks potentially associated with future on- or off-site residents range from six-in-one hundred thousand (6×10^{-5}) to two-in-one thousand (2×10^{-3}).
- The chemicals providing the greatest contribution to the estimated cancer risks are arsenic in soil, and benzene, 1,2-dichloroethane, and carbon tetrachloride in groundwater.

- Most of the cancer risk associated with contact with soil can be attributed to the presence of arsenic. It should be noted that site activities are not believed to be the only source of arsenic in soil at the site. Average background concentrations of arsenic in natural soil in the area of the site (approximately 8 mg/kg) represent a lifetime cancer risk of two in ten thousand (2×10^{-4}). The primary source of arsenic due to site activities is slag. The metals in the slag are bound tightly to the slag matrix and are therefore not very **bioavailable.** The low bioavailability was not accounted for in the risk analysis, and the potential health risk from exposure to arsenic in slag may therefore have been overestimated by a factor of four.

4.2.3 Effects on Non-Human Receptors

No significant effects on plants and animals from chemicals found on the site were anticipated due to the lack of substantial wildlife habitat in the site vicinity.

TABLE 7
SUMMARY OF HUMAN HEALTH RISKS
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Carcinogenic Effects				Non-Carcinogenic Effects	
Estimated Lifetime Cancer Risk	**Chemicals with Highest Contribution to Cumulative Cancer Risks**	**Exposure Pathways with Cancer Risks Exceeding 1 x 10^{-6}**	**Exposure Scenario (Receptor and Activity)**	**Non-Carcinogenic Hazard Index**	**Chemicals Whose Hazard Index Exceeds 1**
9 x 10^{-6}	Arsenic, carcinogenic PAHs	Soil ingestion; none	Current On-Site Trespasser	<1	None
			Current Off-Site Residents		
4 x 10^{-5}	Arsenic	Inhalation of Outdoor Air	Adult	<1	None
5 x 10^{-5}	Arsenic	Inhalation of Outdoor Air	Child	<1	
9 x 10^{-5}	Arsenic	Inhalation of Outdoor Air	Adult and Child (total)	<1	
			Future Off-site Residents		
4 x 10^{-5}	Arsenic; 1,2-dichloroethane; carbon tetrachloride	Inhalation of Outdoor Air; dermal contact (showering); dermal contact (showering)	Adult	>1	1,1-dichloroethene
5 x 10^{-5}	Arsenic; 1,2-dichloroethane; carbon tetrachloride	Inhalation of Outdoor Air; dermal contact (showering); dermal contact (showering)	Child	>1	1,1-dichloroethene
1 x 10^{-4}	Arsenic; 1,2-dichloroethane; carbon tetrachloride	Inhalation of Outdoor Air; dermal contact (showering); dermal contact (showering)	Adult and Child (total)	>1	1,1-dichloroethene
			Future On-Site Residents		
1 x 10^{-3}	Benzene, arsenic	Vapor inhalation (showering); groundwater ingestion; groundwater ingestion	Adult	>1	1,1-dichloroethene
7 x 10^{-4}	Benzene, arsenic	Dermal contact (bathing); groundwater ingestion; ground water ingestion	Child	>1	Thallium; 1,1-dichloroethene
2 x 10^{-3}	Benzene, arsenic	Dermal contact (bathing); groundwater ingestion; groundwater ingestion	Adult and Child (total)	>1	Arsenic; thallium; 1,1-dichloroethene

NOTES: **Estimated Lifetime Cancer Risk** is the sum of all cancer risks associated with contaminants at the site.

5.0 EFFECTS OF CONTAMINATION

This section presents a discussion of the potential effects of soil and groundwater contamination upon uses of land and water at the site. It is organized to discuss land and groundwater separately in terms of present uses and potential beneficial future uses.

5.1 PRESENT AND FUTURE USES OF LAND

5.1.1 Present Uses

The site is divided into an inactive portion and the active yard, as described in Section 2.1.1. The inactive portion covers approximately 63 acres, is fenced and unoccupied. The active yard covers approximately 31 acres, and is currently in use as a railroad switching yard. The General Plan of the City of Sacramento (City of Sacramento, 1988) designates the site for transportation/utilities use. The entire site is currently zoned for heavy industrial use (M-2) under the City Zoning Ordinance, which is consistent with the use of the site as a railroad switching yard. Current zoning and land uses at and near the site are shown on Figures 9 and 10.

The majority of land uses surrounding the site are low-density residential (single family dwellings). A cold storage facility borders the site to the southwest, and one major educational institution (Sacramento City College) is adjacent to the southwest corner of the site. Additionally, some commercial and manufacturing facilities are present to the south along Sutterville Road, and to the west along Freeport Boulevard.

5.1.2 Future Uses

5.1.2.1 Active Yard

There are no plans to change land use in the 31-acre active yard portion of the site, which is operated as a railroad switching yard by UPRR.

5.1.2.2 Inactive Portion of the Site

A potential health risk is posed by the inactive portion of the site in its present state. Future land uses at the site will depend partly on the degree of risk reduction achieved through remediation of soil and groundwater contamination.

No formalized land use designations or redevelopment strategies have been approved for the inactive portion of the site. Approval of a finalized land use plan will require the same procedures typically required of other land use applications within the City of Sacramento. Typical land use planning procedures are summarized below.

- Initial reviews with the Planning and Development Department (including Policy Committee review and requests for plan/project re-design, if warranted).

- Preparation of an environmental document to assess potential impacts and mitigation associated with or required by the proposed development project.

- Review and decision by the City Planning Commission (with assistance from planning staff in the form of a staff report).

- Review and decision by the City Council, if warranted.

- Opportunities for public involvement in the process, including written comments on the project plans solicited from community organizations, combined meetings with planning staff, community organizations and the applicant (if necessary), public notice of hearings and the determination of environmental impacts, defined public review periods during preparation of the environmental document, and attendance at public hearings.

The Sacramento City Council appointed the Union Pacific Land Use Committee (UPLUC) to prepare land-use recommendations for the inactive portion of the site. Members of the UPLUC include twelve residents of neighborhoods near the site. Based on information gathered from public meetings and land use planners, the UPLUC prepared recommendations on future land use in February 1992. A series of community workshops were held in March 1992 to give members of the public an opportunity to comment on the recommendations. The UPLUC recommendations were then finalized and presented in a report to the Sacramento City Council in April 1992. The City Council adopted Resolution Number 92-255 endorsing the report and directed the City Planning Division to incorporate the UPLUC recommendations into future land-use planning activities. Appendix A contains a copy of the resolution and the UPLUC report.

Potential future land uses identified by UPLUC for the inactive portion of the site include:

- <u>Residential Use</u> - single family homes, higher density housing (for seniors, families, or students), mixed use (combined residential and light commercial), and low/moderate income housing.

- <u>Open Space and Recreational Use</u> - parks, open space, town square, bike paths, pedestrian walkways, and community recreational facilities.

- Commercial Use - community- and neighborhood-serving business, office spaces, and mixed commercial/residential development with emphasis on pedestrian patronage rather than automobiles.

- Schools - additional schools may be needed because of residential growth in the area. Also, the expansion needs of Sacramento City College will be considered.

- Light Rail - The UPLUC supports extension of the City's light rail service to the southern part of the city along the UPRR route and the establishment of one or more light rail stations on the site. Pedestrian-oriented stations with limited parking areas are preferred.

The report emphasized the desire to plan redevelopment of the site to be compatible with existing residential, educational, and commercial land uses in the vicinity, The UPLUC also recommended that clean-up levels for the site be developed based on these future land uses. In general, the UPLUC identified preferred future land uses for the northern area as being residential, open space/town square, and neighborhood commercial. For the southern portion of the site, it prefers mixed commercial/residential, commercial, urban open space, and other special uses (such as City College expansion).

The DTSC met with the Sacramento Planning Department and UPRR in March 1992 to discuss future land use. Following the meeting, the DTSC sent a letter to the Planning Department which discussed how clean-up levels for the site would relate to future land uses (see Appendix B). The DTSC recommended that future land uses be broken down into two general categories:

- Restricted Land Use - mixed use (with non-residential on the ground floor), other non-residential use, recreational facilities, community center, town square, and infrastructure (such as underground sewer storage). Areas designated for restricted land use would have a permanent deed restriction to prevent future land uses other than those specified and improper future excavation and disposal of contaminated materials. Clean-up levels would be developed based on conservative exposure scenarios and the land would be developed to prevent exposure to residual contaminated materials. This would be achieved through a combination of buildings, pavement, and controlled landscaping to cover the impacted soil.

- Unrestricted Land Use - any type of land use including those listed under restricted land use, as well as residential, schools, open space, and bike/pedestrian pathways. The DTSC recommended that areas planned for unrestricted future land use should be those portions of the site least impacted by past industrial activities (i.e., the northeastern portion of the site) or areas where the soil is cleaned up to an acceptable level. The clean-up levels for the unrestricted land use would be developed to be protective of human health for the land uses specified.

Based on the past industrial uses and the distribution of contaminants in soil at the site, the DTSC prepared a general map showing potential future land uses (restricted and unrestricted). A copy of the letter and map are presented in Appendix B. Future land-use recommendations of the UPLUC and the DTSC were used to develop generalized assumptions about future land use at the site and soil clean-up levels applicable for each type of land use. The land-use assumptions and clean-up levels used in the feasibility study are discussed in Section 6.1.

5.1.3 Potential Effects

Existing soil contamination adversely affects potential land uses of the site. If the site were left unremediated, portions of the site would not be suitable for most beneficial land uses. Because the current industrial use of the active yard is not expected to change, the effects on future land use would be most pronounced in the eastern inactive portion, which is currently vacant.

Remediation of soil contamination would have a beneficial effect on future land use. Depending on clean-up levels, many types of future development could be allowed.

5.2 PRESENT AND FUTURE USES OF WATER

5.2.1 Surface Water

5.2.1.1 Present Uses

There are no surface water resources at the site. The closest surface water resources in the area are the Sacramento River approximately one mile to the west, and the American River almost three miles to the north. Beneficial uses and water quality for the Sacramento and American Rivers were discussed in Section 3.2.2.

Surface flow at the site is limited to storm water. Storm water at the site generally drains to the east along the middle part of the inactive portion of the site next to residences along 24th Street, and to the southwest towards the tracks in the active yard. Drainage along the western boundary of the site is directed to street culverts. The flow from both portions of the site is directed into combined sewer/storm drains which carry the storm water to the Sacramento Regional Wastewater Treatment Plant. The storm water is treated at the plant before being discharged into the Sacramento River.

5.2.1.2 Future Uses

Present beneficial uses for the Sacramento and American Rivers are expected to continue indefinitely. No future uses other than those described in Section 3.2.2.3 have been identified by the Regional Water Quality Control Board at this time (RWQCB, 1991).

5.2.1.3 Potential Effects

Under current conditions, storm water run-off from the site may potentially come in contact with soil contaminants, and contaminated run-off and sediments may be transported off-site to City storm drains. The proposed remediation for site soils includes removing or covering sources of contamination, thus preventing run-off on the site from coming into contact with contaminants after site remediation.

Because there are no surface water resources at the site and potentially contaminated storm water would be collected by a wastewater treatment plant permitted to release to surface waters, conditions at the site do not currently impact surface water quality. Because the proposed site remediation will minimize surface water run-off from coming into contact with contaminants, future uses of surface water in the vicinity of the site will not be significantly impacted.

5.2.2 Groundwater

5.2.2.1 Present Uses

In general, groundwater in the Sacramento River Basin is used for municipal, domestic, and industrial purposes (RWQCB, 1991). There are seven off-site water wells present within one mile of the contaminant plumes (see Figure 11). These wells are reportedly used for irrigation only. The nearest drinking water wells in the site area are approximately two miles to the southeast, and belong to the Fruitridge Vista Water Company (Stockton, 1990).

5.2.2.2 Future Uses

The groundwater in the vicinity of the site is not specifically listed as a groundwater resource in the Sacramento River Basin Plan (RWQCB, 1991). According to the Basin Plan, the potential beneficial uses for groundwater in this area include community and military water systems and domestic uses associated with individual water supply systems.

5.2.2.3 Potential Effects

Contamination has been detected in groundwater beneath the site, and presently groundwater contamination extends to the southeast approximately 4,800 feet from its on-site source area. The results of the Health Risk Assessment (Section 4.0) indicate that contaminated groundwater poses a potential health risk if ingested. However, there are no drinking water supply wells or water supply wells of any other type located within the contaminant plumes. Therefore, the groundwater contamination does not impact existing beneficial uses of groundwater.

Groundwater contamination from the site, if not controlled or cleaned up, could potentially impact existing downgradient groundwater users. Groundwater contamination could also prevent future development of the potential beneficial uses listed above. Future industrial or military uses might be an exception because these uses typically have lower water quality standards (that is, can tolerate higher contaminant concentrations).

6.0 FEASIBILITY STUDY SUMMARY

This section summarizes the Feasibility Study and discusses final candidate remedial alternatives. The purpose of a feasibility study is to identify applicable remedial technologies and select recommended remedial alternatives which will provide adequate protection of public health and the environment, comply with applicable laws and regulations, and be cost-effective.

In general, after a remedial investigation is completed, potential remedial technologies are identified and screened for applicability to contaminants and contaminated **media** (such as soil and groundwater) at the site. Applicable technologies are combined as necessary to form alternatives. Each alternative should address all contaminants of concern. The alternatives are then screened on the basis of their ability to reduce contaminant concentrations to acceptable levels, ability to obtain agency approval, and cost-effectiveness. The most promising alternatives survive the screening and are selected as final candidate alternatives. The final candidate alternatives then undergo a detailed analysis where their ability to satisfy the following nine **criteria** are evaluated:

- short-term effectiveness;
- long-term effectiveness;
- implementability;
- compliance with laws and regulations;
- reduction of **toxicity**, mobility, and volume;
- cost;
- overall protection of human health and the environment;
- state acceptance; and
- community acceptance.

The detailed analysis is used to compare the relative advantages and disadvantages of the final candidate alternatives and to select a recommended remedial alternative for each **operable unit**.

As discussed in Section 3.0, several phases of remedial investigation work were conducted at the site to assess the nature and extent of contamination in soil and groundwater. The Feasibility Study for the site was initially conducted after completion of the Phase II Remedial Investigation. The Feasibility Study has been modified as new information about the nature and extent of contamination, contaminant mobility, and state and community acceptance of the selected remedial alternatives became available.

The Feasibility Study is presented in the following documents:

- Remedial Investigation/Feasibility Study Report, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, May 1991.

- Addendum Remedial Investigation/Feasibility Study Report, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, November 1992.

- Feasibility Study Supplement, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, September 1992.

- Revised Soil Volumes and Remedial Alternative Detailed Cost Estimates — Feasibility Study Supplement, Union Pacific Railroad Yard, Sacramento, California, Dames & Moore, February 1993.

The following sections describe the remedial action objectives, operable units, and final candidate alternatives for contaminated soil and groundwater at the site. Each final candidate alternative is described and discussed in terms of cost-effectiveness, implementation time (the length of time required to put the alternative into effect), effect on future land and groundwater use, the potential environmental impacts that may result from remedial action, and reason for selection or rejection as the recommended remedial alternative. One recommended remedial alternative is selected for each operable unit and its selection is justified. The design and construction activities required for the recommended remedial alternatives, as well as **applicable or relevant and appropriate requirements** with which these alternatives must comply are then discussed for each medium of concern (soil and groundwater).

A feasibility study analysis was not performed for Soil Operable Unit S-5; however, a separate plan for further investigation of groundwater impacts and remedial action to address soil impacts in this operable unit is presented separately in Section 6.4.

6.1 REMEDIAL ACTION OBJECTIVES

Remedial action objectives are goals for protecting human health and the environment from potential risks caused by the presence of chemicals at the site. Remedial action objectives are developed through health risk assessment analyses, consideration of applicable or relevant and appropriate requirements, and consideration of other non-technical factors.

The Remedial Action Objectives developed for the site would limit exposure to soil and groundwater contaminants through removal, destruction, and/or containment of contaminants. If the Remedial Action Objectives are achieved during site clean-up and a new Health Risk Assessment was performed after site clean-up, it would show that estimated human health risks have been reduced to levels acceptable to the DTSC. Based on these objectives, specific cleanup levels have been established for each contaminant of concern in soil and groundwater at the site.

6.1.1 Future Land Use Assumptions

In order to develop clean-up levels which could be applied to specific areas according to planned future land use in those areas, it was necessary to make assumptions about future land use at the site. In the Feasibility Study, the assumptions about general land use types used were based on the recommendations of the DTSC and the Union Pacific Land Use Committee, as discussed in Section 5.1.2.2. Assumed future land use types associated with particular areas of the site are shown on Figure 13 and summarized below:

- Future land use in the northeastern part of the inactive portion of the site is assumed to be unrestricted;
- Future land use in the southern and central parts of the inactive portion of the site is assumed to be restricted to commercial and mixed land uses, as described in Section 5.1.2.2; and
- The active switching yard (the western portion of the site) will be restricted to heavy industrial land uses. UPRR plans to maintain the current switching yard operation indefinitely.

6.1.2 Soil Clean-Up Levels

The remedial action objectives for soil contaminants at the site are expressed in terms of clean-up levels for soil. The clean-up levels are target chemical concentrations which may be left in place on-site without treatment to reduce toxicity, mobility, or volume. Soils containing concentrations of contaminants higher than the clean-up levels (based on statistical analysis of test results) must be either removed from the site or treated. The clean-up levels for soil contaminants at the site are summarized in Table 8 and discussed below.

In order to select soil clean-up levels that are protective of human health, future land use (and therefore, future exposure scenarios) must be known. The future land use assumptions described in the previous section were used to develop risk-based clean-up levels for arsenic and lead at the site. Separate clean-up levels were selected for the two land use types: unrestricted land use levels and restricted land use levels. In areas where future land use will be restricted, the clean-up levels for arsenic and lead are

TABLE 8
REMEDIAL ACTION CLEAN-UP LEVELS
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Constituent	Remedial Action Objective: Restricted Future Land Use[1]	Remedial Action Objective: Unrestricted Future Land Use[2]	Basis for Selection
SOIL CONTAMINANTS (mg/Kg unless otherwise noted)			
Arsenic	55	8	DTSC/HR
Lead	950	220	HR/DTSC
Petroleum Hydrocarbons			
Diesel	1,000		LUFT
Gasoline (Former Oil House Area)	100		LUFT
Gasoline (Other Areas)	1,000		LUFT
Benzene	0.3		LUFT
Toluene	0.3		LUFT
Ethylbenzene	1.0		LUFT
Xylenes	1.0		LUFT
Chlorinated Volatile Organic Compounds	To Be Determined		Leachability
Polycyclic Aromatic Hydrocarbons			
Carcinogenic (sum of)	0.042		HR
Non-carcinogenic (sum of)	100		HR
Polychlorinated Biphenyls (PCBs)	25	1	U.S. EPA[3]
Asbestos	1% by weight		ARAR
GROUNDWATER CONTAMINANTS (μg/L)			
Arsenic	50		ARAR (MCL)
Chromium	50		ARAR (MCL)
Lead	15		ARAR (MCL)
Nickel	100		ARAR (MCL)
Chlorinated Volatile Organic Compounds			
Carbon tetrachloride	0.5		ARAR (MCL)
1,1-Dichloroethane	5		ARAR (MCL)
1,1-Dichloroethene	6		ARAR (MCL)
1,2-Dichloroethane	0.5		ARAR (MCL)
1,1,1-Trichloroethane	200		ARAR (MCL)
1,1,2-Trichloroethane	32		ARAR (MCL)
Tetrachloroethylene	5		ARAR (MCL)
Trichloroethylene	5		ARAR (MCL)
Vinyl Chloride	0.5		ARAR (MCL)
Aromatic Compounds			
Benzene	1		ARAR (MCL)
Toluene	1,000		ARAR (MCL)
Ethylbenzene	680		ARAR (MCL)
Xylenes	1,750		ARAR (MCL)
Petroleum Hydrocarbons			
Diesel	100		ARAR (SNARL)

NOTES:
- mg/kg Milligrams of chemical per kilogram of soil - parts per million
- μg/L Micrograms of chemical per liter of groundwater - parts per billion
- [1] Restricted Future Land Use applies to Soil Operable Units S-1 and S-2
- [2] Unrestricted Future Land Use applies to Soil Operable Unit S-3
- [3] Recommended Soil Action Levels (U.S. EPA, 1990)

KEY TO BASIS FOR CLEAN-UP LEVELS:
- HR Health-risk-based
- ARAR Based on applicable or relevant and appropriate requirements
- DTSC Selected at the direction of the DTSC based on DTSC's risk assessment
- MCL Primary Maximum Contaminant Level (Cal-EPA or U.S. EPA, whichever is lower)
- LUFT Leaking Underground Fuel Tank Assessment
- SNARL Suggested No-Adverse-Response Level

higher (i.e., require less remedial action) than in areas where future land use will be unrestricted. Concentrations of arsenic and lead in the active yard were generally below the allowable exposure concentrations calculated for heavy industrial land use, so arsenic and lead clean-up levels were not selected for the active yard (Dames & Moore, 1992b).

Separate health-risk-based clean-up levels were also developed for carcinogenic and non-carcinogenic polycyclic aromatic hydrocarbons. The clean-up levels for polycyclic aromatic hydrocarbons in soil are conservative enough to allow unrestricted future land use, and will be applied to all areas of the inactive portion of the site regardless of planned future land use.

The cleanup level for diesel was selected at the direction of the DTSC. Cleanup levels for gasoline, benzene, toluene, ethylbenzene, and xylenes were developed using the State Water Resources Control Board's Leaking Underground Fuel Tank Field Manual (SWRCB, 1989), as directed by the DTSC. Cleanup levels for petroleum hydrocarbons using the manual are intended to be protective of groundwater quality.

Cleanup levels for polychlorinated biphenyls were selected from risk-based concentrations developed by the United States Environmental Protection Agency (US EPA, 1990), and the asbestos cleanup level is based on applicable or relevant and appropriate regulatory requirements.

Because data for chlorinated volatile organic compounds in soil vapor were not collected below a depth of 10 feet, it is not possible to specify quantitative cleanup levels for these compounds at this time. Following additional soil vapor investigation in the Central Fill and former Oil House areas, site-specific soil vapor concentrations and soil physical parameters will be used to model transport of volatile organic compounds to groundwater. Information supplied by the model will be used to calculate cleanup levels which will be protective of groundwater quality.

No toxic or carcinogenic chemicals were detected in Operable Unit S-5 at levels that would pose a health risk. Furthermore, no complete direct exposure pathways exist because impacted soils are not exposed at the ground surface. However, at the direction of the DTSC, the cleanup level for diesel in soil will be the same as in other operable units (1,000 mg/Kg).

6.1.3 Groundwater Clean-Up Levels

Clean-up levels for contaminants of concern found in groundwater on- and off-site were selected to coincide with Maximum Contaminant Levels (MCLs). MCLs are regulatory requirements established by the either the California Environmental Protection Agency (Cal-EPA) or the U.S. EPA. Primary MCLs are protective of human health. For a chemical whose human health risks are unknown or insignificant, a secondary MCL based on taste and odor criteria is the applicable requirement. Groundwater clean-up levels for the site are all based on primary MCLs (except petroleum hydrocarbons as diesel), and are summarized in Table 8. The clean-up level for diesel in groundwater of 100 μg/L (Table 8) is based on a U.S. EPA Suggested No-Adverse-Response Level (SNARL).

6.2 DEFINITION OF OPERABLE UNITS

This section describes contamination at the site in terms of operable units which were defined in the feasibility study. An operable unit is any contaminated area or medium (such as soil or groundwater) which requires special remediation techniques. A separate operable unit may also be defined in order to provide an opportunity for simpler or more cost-effective remedial action. The feasibility study established five operable units for soil and two operable units for groundwater. The locations of these operable units are shown on Figures 8 and 14. The following sections describe each operable unit in terms of:

- defining characteristics
- contaminants present
- applicable clean-up levels
- area and volume of material contaminated above the clean-up levels.

6.2.1 Soil Operable Units

The site has been divided into five separate soil operable units (S-1 through S-5). The geographic boundaries of the soil operable units are shown on Figure 14, and the volume of soil contaminated above clean-up levels is summarized for each soil operable unit in Table 9. Volume estimates of arsenic- and lead-impacted soil were prepared prior to slag removal activities in late 1993, and therefore do not reflect current site conditions. Levels of arsenic and lead in soil will be re-evaluated in early 1994 to determine the extent of additional cleanup needed, if any.

TABLE 9
SOIL OPERABLE UNIT VOLUMES
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Depth Interval (feet bgs)	0-0.5	>0.5-1.5	>1.5-5	>5-10	>10-15	Total
Soil Operable Unit S-1						
Volume Above RAOs (cubic yards)						
As ≥55 mg/kg and/or Pb ≥950 mg/kg*	4,000	2,000	1,500	1,000	—	8,500
Asbestos > 1%		1,500	—	—	—	1,500
TPH **		1,500	2,000	500	—	4,000
					S-1 Subtotal	14,000
Soil Operable Unit S-2						
Volume Above RAOs (cubic yards)						
As ≥55 mg/kg and/or Pb ≥950 mg/kg*	<500	0	5,000	500	—	5,500
TPH **		500	8,000	6,500	1,000	16,000
					S-2 Subtotal	21,500
Soil Operable Unit S-3						
Volume Above RAOs (cubic yards)						
As ≥8 mg/kg and/or Pb ≥220 mg/kg*	4,000	500	13,500	1,000	—	19,000
TPH **		< 500	< 500	—	—	500
					S-3 Subtotal	19,500
Depth Interval (feet bgs)		**0-4**	**>4-9**	**>9-15**	**>15-20**	**Total**
Soil Operable Unit S-5						
Volume Above RAOs (cubic yards)						
TPH ***	0	0	20	640	840	1,500
					S-5 Subtotal	1,500
TOTAL ALL SOIL OPERABLE UNITS:						**56,500**

KEY

bgs — below ground surface
As — Arsenic
Pb — Lead
TPH — Total Petroleum Hydrocarbons (as diesel and/or gasoline)
PAH — Polycyclic Aromatic Hydrocarbons
ND — None detected.

* Volume presented represents distribution before slag removal activities in late 1993 (see Section 6.2.1).

** PAH contamination is associated with areas where TPH contamination is also present. Separate volumes for PAHs above the RAOs were therefore not estimated.

*** No PAH contamination is associated with TPH in this operable unit.

6.2.1.1 Soil Operable Unit S-1

Operable Unit S-1 covers a 36-acre area in the southern part of the inactive portion of the site. As described in Section 5.1.2.2, future land use in soil Operable Unit S-1 is assumed to be restricted. The contaminants of concern for this operable unit are arsenic, lead, petroleum hydrocarbons as diesel and gasoline), polycyclic aromatic hydrocarbons, and asbestos. They are locally present in soils above the restricted future land use clean-up levels, and extend to depths of five to ten feet below ground surface. Figures 5, 7, and 12 show areas totalling approximately 6.7 acres within operable unit S-1 where soil contaminant concentrations exceed the clean-up levels. The total volume of soil in Operable Unit S-1 which exceeds the restricted future land use clean-up levels is estimated to be 14,000 cubic yards.

6.2.1.2 Soil Operable Unit S-2

Soil Operable Unit S-2 covers approximately 7 acres in the central inactive portion of the site (see Figure 14). The contaminants of concern for this operable unit are arsenic, lead, petroleum hydrocarbons (as diesel and gasoline), polycyclic aromatic hydrocarbons and chlorinated volatile organic compounds. This operable unit includes the former Central Fill Area where miscellaneous debris and drums were found during Remedial Investigation activities. Future land use in this operable unit is assumed to be restricted as described in Section 5.1.2.2; therefore, the restricted future land use clean-up levels apply. Operable Unit S-2 contains approximately 21,500 cubic yards of soil with contaminant concentrations greater than the restricted future land use clean-up levels. Soil contaminated above the clean-up levels is distributed over an area totalling approximately 2.7 acres, and extends to a maximum depth of approximately 15 feet below ground surface. These contaminated areas are shown on Figures 5 and 7.

6.2.1.3 Soil Operable Unit S-3

Soil Operable Unit S-3 is a 17-acre area in the northern part of the inactive portion of the site. Arsenic, lead, petroleum hydrocarbons (as diesel), and polycyclic aromatic hydrocarbons are present in soil at concentrations lower than the other soil operable units. The clean-up levels for this operable unit were developed to allow for unrestricted future land uses. This operable unit contains approximately 19,500 cubic yards of soil contaminated above the unrestricted future land use clean-up levels. Soil contamination above the clean-up levels is distributed over areas totalling approximately 5.5 acres, and is found primarily in the upper five feet of soil. Figures 5 and 7 depict areas within S-3 where soil contamination levels exceed the unrestricted future land use clean-up levels.

6.2.1.4 Soil Operable Unit S-4

Two off-site lots adjacent to the west side of the active yard were defined as Operable Unit S-4 (see Figure 14). Soils in S-4 contained levels of arsenic and lead that exceed local background levels. These off-site areas were remediated in 1991 under an Interim Remedial Measure which was approved by the DTSC. The affected soils were excavated and disposed of off-site. Based on testing completed after the remedial activities, residual concentrations of arsenic and lead are now at or below local background levels. A fence was constructed to separate the active yard from adjacent residential lots, and gravel was placed to reduce the potential for wind-blown dust. No additional remedial action is proposed for Operable Unit S-4, and it is therefore not discussed further in this Draft Remedial Action Plan.

6.2.1.5 Soil Operable Unit S-5

Soil Operable Unit S-5 is defined as contaminated soil in the active switching yard (see Figure 14). This operable unit contains arsenic and lead associated with slag track ballast. The results of the contaminant exposure calculations performed during development of clean-up levels indicate that remedial action to remove or treat arsenic and lead in this area is not needed to protect human health, given current land use conditions. Also, the dissolution kinetics study (Walsh & Associates, 1992) described in Section 3.1.4.2 suggests that these metals do not pose a threat to groundwater.

Operable Unit S-5 also contains diesel impacts in soil and shallow groundwater. Soil hydrocarbon impacts comprise an area of approximately 10,000 square feet, and the total impacted voume is approximately 1,500 cubic yards. The associated shallow groundwater impacts currently appear to cover less than 7,000 square feet (Plume C on Figure 8). No polycyclic aromatic hydrocarbons were found in soil or groundwater.

6.2.2 Groundwater Operable Units

Two groundwater operable units were defined for the feasibility study. The locations of these operable units are shown on Figure 8 and each is discussed separately below. Groundwater operable unit areas and volumes of contaminated groundwater are summarized in Table 10.

6.2.2.1 Groundwater Operable Unit GW-1

The Operable Unit GW-1 plume (Plume A on Figure 8) extends from the first water-bearing zone into the second water-bearing zone under the southeastern part of the site. The plume extends from the Central Fill Area of the site southeast approximately 4,800 feet to 18th Avenue. Groundwater in

Operable Unit GW-1 contains nickel, chlorinated volatile organic compounds and volatile aromatic compounds. The aromatic compounds are restricted to the on-site portion of the plume under the Former Oil House area. The plume has a surface area of approximately 35 acres and contains approximately 150 million gallons of contaminated groundwater.

6.2.2.2 Groundwater Operable Unit GW-2

Groundwater Operable Unit GW-2 is defined as a smaller plume (Plume B on Figure 8) limited to the first water-bearing zone beneath the southern inactive portion of the site. Operable Unit GW-2 groundwater contains chlorinated volatile organic compounds and nickel. The plume has a surface area of approximately 5 acres and contains approximately 7 million gallons of contaminated groundwater.

TABLE 10
GROUNDWATER OPERABLE UNIT AREAS AND VOLUMES
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Groundwater Operable Unit	Plume Area Above Remedial Action Objectives (acres)	Plume Thickness (feet)	Plume Aquifer Porosity (%)	Volume Above Remedial Action Objectives (gallons)
GW-1	35	20-35	25-30	150 million
GW-2	5	15	30	7 million

6.3 FINAL CANDIDATE REMEDIAL ALTERNATIVES

The Addendum Remedial Investigation/Feasibility Study report (Dames & Moore, 1991d) presented a total of ten remedial alternatives for soil and six for groundwater. Following the preliminary screening, there remained five final candidate alternatives to address soil contamination and three final candidate alternatives for groundwater. Those final candidate alternatives were discussed in the Draft Remedial Action Plan.

Based on the new analyses conducted for the Feasibility Study Supplement in 1992, this section of the Draft Remedial Action Plan has been revised to reflect new information about the effectiveness of two soil remedial alternatives. It has also been revised to reflect new recommended remedial alternatives for three soil operable units and one of the groundwater operable units. A new section has been added which presents the plan for further investigation of groundwater impacts and remedial action to address soil impacts in Operable Unit S-5 (Section 6.4). Specific revisions are discussed below.

Two final candidate remedial alternatives developed to address soil contamination at the site were eliminated from consideration in the Feasibility Study Supplement. Soil Alternative 5 included excavation and on-site treatment using soil washing to remove metals. This alternative was eliminated because the results of the recently completed dissolution kinetics study (Walsh & Associates, 1992) suggests that soil washing technology would not be effective in achieving the remedial action objectives for the chemical forms of arsenic and lead which are found at the site.

Soil Alternative 6 included excavation and off-site disposal of soils with contaminant concentrations exceeding the hot spot concentrations. The hot spot concentrations were defined in the Addendum Remedial Investigation/Feasibility Study Report (Dames & Moore, 1991d) to provide an intermediate clean-up level between "No Action" and full remediation. The hot spot clean-up levels for arsenic and lead were higher (less strict) than the new unrestricted future land use clean-up levels recommended by the DTSC, meaning less contaminated soil would be addressed during site remediation. Under Alternative 6, following disposal of the hot spot soils, other areas where residual contaminants might pose a threat to human health or the environment would be covered with an engineered asphalt cap. Alternative 6 also included deed restrictions which would have strictly limited future land uses. Alternative 6 was eliminated from consideration in the Feasibility Study Supplement because the new clean-up levels were developed so that clean-up levels are tied to specific land use types. The new clean-up levels include provisions for restrictions on future land use in areas where residual metals are left in place. With the new land use specific remedial action objectives, the concept of Alternative 6 is contained within another of the final candidate alternatives. Alternative 6 was therefore redundant and was eliminated.

The Feasibility Study Supplement presented a re-evaluation of the remaining final candidate remedial alternatives for soils and groundwater. The re-evaluation focused on the state and community acceptance criteria and whether the alternatives were compatible with desired future land uses identified by the Union Pacific Land Use Committee and the DTSC. The re-evaluation resulted in the selection of new remedial alternatives for soil Operable Units S-1, S-2 and S-3, and groundwater Operable Unit GW-2. The following sections discuss the final candidate alternatives for each operable unit, and the reasons for selection (or rejection) as the recommended remedial alternative. In the case of Operable Unit S-5, a feasibility study analysis was not completed; however, a plan for further investigation of groundwaer impacts and remedial action to address soil impacts is described in Section 6.4.

6.3.1 Soil Operable Unit S-1

Soil Operable Unit S-1 is in the southern part of the inactive portion of the site (see Figure 14). This operable unit contains arsenic, lead, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and asbestos at concentrations above the clean-up levels. Future land use in operable unit S-1 is assumed to be restricted as described in Section 6.1.1; therefore, the restricted future land use clean-up levels are applicable for this area (see Table 8).

There are three final candidate alternatives for Operable Unit S-1:

- Alternative 1 - No Action
- Alternative 4 - Containment with Institutional Controls
- Alternative 10 - Excavation and Off-site Disposal of Soils Above Clean-Up Levels.

A summary of the analysis of these alternatives from the Feasibility Study Supplement is presented in the following sections. Table 11 contains a summary comparison of the final candidate alternatives for Soil Operable Unit S-1, and Table 12 summarizes the costs.

6.3.1.1 Alternative 1: No Action

Objectives and Scope

The National Oil and Hazardous Substances Pollution Contingency Plan requires that the No Action Alternative be considered. The amount of risk reduction provided by each of the other final candidate alternatives is compared to the No Action Alternative to assess how effective they are. This alternative involves no remediation (clean-up) of contaminated soil; it consists primarily of constructing and maintaining a fence around the entire site to prevent unauthorized access. A **land use covenant** would be entered into by UPRR and DTSC. The land use covenant would be recorded on the deed to provide notice of prohibited land uses and activities on the property which might disturb soil contaminants and cause human health risks and/or adverse environmental impacts. In addition, groundwater beneath the site would be monitored for a period of thirty years to check for changes in groundwater quality which might be caused by the migration of contaminants in soil. A report which discusses groundwater monitoring results would be submitted to the DTSC on a yearly basis.

TABLE 11
COMPARISON OF SOIL FINAL CANDIDATE ALTERNATIVES
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Operable Unit	Alternative	Short-term Effectiveness	Long-term Effectiveness	Reduction of Toxicity, Mobility, and Volume	Implement-ability	Cost*	Compliance with ARARs	Overall Protection of Public Health and Environment	State Acceptance	Community Acceptance
S-1	1	Fair	Poor	Poor	Fair	$800,000	Poor	Poor	Poor	Poor
	4	Fair	Good	Fair	Fair	$4.5 million	Good	Good	Poor	Poor
	10	Poor	Good	Fair	Fair	$3.7 million	Good	Good	Good	Good
S-2	1	Fair	Poor	Poor	Fair	$730,000	Poor	Poor	Poor	Poor
	10	Poor	Good	Fair	Good	$6.8 million	Good	Good	Good	Good
S-3	1	Fair	Poor	Poor	Fair	$750,000	Poor	Poor	Poor	Poor
	4	Fair	Good	Fair	Fair	$1.5 million	Good	Good	Poor	Poor
	10	Fair	Good	Fair	Good	$1.9 million	Good	Good	Good	Good

* Net present worth cost of the alternative as calculated over a 30-year span using a 5% interest rate.

Alternative 1 No Action
Alternative 4 Containment with Institutional Controls
Alternative 10 Excavation/Off-Site Disposal of Soil Above Clean-up Levels

TABLE 12
SUMMARY OF ESTIMATED COSTS
SOIL ALTERNATIVES
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Operable Unit	Alternative	Capital Costs*	Operation and Maintenance Costs**	Total Costs	Total Present Worth Cost ***
S-1	1	$105,000	$1,170,000	$1,275,000	$803,000
	4	$3,317,000	$2,483,000	$5,800,000	$4,514,000
	10	$3,866,000	$0	$3,866,000	$3,682,000
S-2	1	$30,000	$1,170,000	$1,200,000	$731,000
	10	$7,158,000	$0	$7,158,000	$6,817,000
S-3	1	$53,000	$1,170,000	$1,223,000	$753,000
	4	$659,000	$1,469,000	$2,128,000	$1,480,000
	10	$2,035,000	$0	$2,035,000	$1,938,000

* All capital costs are expended in the first year of the project life.

** O&M costs are not constant over the project life.

*** Net present worth cost at 5% annual interest rate.

Cost Effectiveness

This alternative has the lowest **total present worth cost** of all the alternatives being considered for Operable Unit S-1, but it provides the least protection of human health and the environment. The total present worth cost of this alternative is about $800,000. This total includes both **capital costs** and Operation and Maintenance (O&M) costs. Capital costs (for equipment, labor, and materials) are approximately $100,000. This includes the cost of repairing and/or replacing the existing fence which surrounds the site, if necessary. Operation and maintenance costs would total about $1.2 million over thirty years. This includes the costs for groundwater monitoring and preparation of an annual monitoring and maintenance report.

Implementation Time

Since this alternative does not include any remediation of contaminated soil, the time needed to put this alternative into effect (implementation time) is expected to be approximately four months. This includes time needed to prepare (and obtain DTSC approval for) a groundwater monitoring work plan, repair the existing fence as needed, develop the land use covenant, and record the requirements on the property deed.

Groundwater Use

Of all the final candidate alternatives which were considered, this alternative presents the greatest risk to present and future groundwater use because none of the contaminated soil in S-1 would be removed or treated to reduce the level of contamination in this area. As a result, some contaminants (primarily petroleum hydrocarbons) could migrate to groundwater and adversely impact future beneficial uses of this resource. If uncontrolled over a long period, groundwater contamination could migrate to an area where groundwater is used as a public water supply and thus pose a threat to human health and the environment. The thirty-year groundwater monitoring program included in Alternative 1 would be designed to provide an early warning of any additional groundwater contamination which might occur.

Environmental Impact

Because this alternative does not include any remediation of contaminated soil, implementation would not cause significant environmental impact. However, environmental impacts which have already occurred or might occur as the result of contaminant migration either to groundwater or off-site in the form of airborne dust would not be addressed. Of all the final candidate alternatives, this alternative provides the least long-term protection of the environment.

Justification for Rejection or Selection

This alternative was rejected from consideration as the recommended remedial alternative because it would not meet remedial action objectives and would not provide adequate protection of human health and the environment. It would not reduce the toxicity, mobility, or volume of the contaminants at the site, nor would it eliminate the need for long-term access restrictions, strict land use restrictions, or long-term operation and maintenance.

6.3.1.2 Alternative 4: Containment with Institutional Controls

Objectives and Scope

This alternative would include leaving waste and contaminated soil in place, clearing away remaining debris, grading surface soil, and constructing an asphalt cap over soil contaminated above the clean-up levels. In order to protect human health, the cap would be designed to cover all soils contaminated at levels exceeding the unrestricted land use clean-up levels. The purpose of the cap would be to reduce movement of rainwater downward through the contaminated soil and prevent contaminated soil from being blown off-site by wind. The cap would be sloped to direct water away from the capped areas into a collection system. A conceptual plan for Alternative 4 is shown on Figure 15.

During construction (especially at those times when contaminated soil is being moved or otherwise disturbed), soil would be wetted to minimize the amount of dust raised by these activities. Air monitoring would be conducted during construction activities to assess the effectiveness of dust minimization measures. If results of air monitoring indicate dust emissions are unacceptable, corrective action would be taken to reduce dust emissions. An air monitoring report would be prepared at the conclusion of the remedial action activities.

The completed asphalt cap would be inspected yearly to identify any necessary repairs. Regular maintenance of the asphalt surface would include re-sealing one-fourth of the cap every year in rotation so that the entire cap is resealed every four years. Additionally, the cap surface would be replaced with fresh asphalt every ten years. This maintenance program is designed to keep the cap in good condition.

In addition to construction of the cap over areas where soil is contaminated above clean-up levels, a land use covenant would be entered into by DTSC and UPRR. The land use covenant would be recorded on the deed to prohibit land uses and activities on the property which might disturb soil contaminants and cause human health risks or adverse environmental impacts. The site would be fenced to restrict unauthorized access. Groundwater quality would be monitored for a period of thirty years after the cap is finished. A report which discusses the results of groundwater monitoring would be submitted to DTSC on a yearly basis.

Cost Effectiveness

This alternative has the highest total present worth cost of all the alternatives being considered for Operable Unit S-1. The total present worth cost of this alternative is approximately $4.5 million. This total includes both capital costs and Operation and Maintenance costs. Capital costs (for equipment, labor, and materials) are approximately $3.3 million and include the cost of all construction activities and repairing and/or replacing the existing fence which surrounds the site. Operation and maintenance costs would be approximately $2.5 million over a thirty-year period. This includes the cost for cap maintenance and replacement, the groundwater monitoring program and yearly monitoring reports.

Implementation Time

The time needed to implement this alternative is expected to be ten months, provided no difficulties are encountered. This includes three months for engineering design of the cap, three months to obtain the necessary permits, and seven months to clear and grade the site and construct the asphalt cap and fence. It is expected that design of the cap would be performed during the permitting period.

Groundwater Use

Future groundwater use will not be significantly affected by this alternative. One purpose of the cap is to reduce the amount of water moving downward through contaminated soil and into groundwater. This alternative is therefore more likely to protect groundwater than Alternative 1, but less likely to do so than Alternative 10. The thirty-year groundwater monitoring program would be designed to provide an early warning of any additional groundwater contamination which might occur because of the downward movement of soil contaminants.

Environmental Impact

Dust control measures would be used during site clearing, grading, and construction activities to minimize problems caused by contaminated airborne dust. Due to the nature of asphaltic material, there would likely be some air emissions and associated odor during paving of the asphalt cap. The expected levels of emission would not exceed normal urban activity or result in significant environmental impacts. There would also be increases in noise and vehicular traffic at and near the site during the hours when site work is underway. However, the noise and traffic impacts will be temporary and will be limited to daylight hours during the week. Following remediation, contaminants available to environmental receptors would be limited. This is a result of reduced potential contaminant migration, as well as isolation of the contaminated material from sensitive environmental receptors.

Justification for Rejection or Selection

This alternative would reduce the mobility of the soil contaminants. Although it would not reduce the toxicity of the contaminants or the volume of contaminated soil through treatment, it would effectively eliminate the most significant means of human exposure to the soil contaminants. Thus, it would provide adequate protection of human health and the environment. However, Alternative 4 would require strict limitations on future land use in Operable Unit S-1 and would require long-term maintenance and monitoring. The short-term environmental impacts associated with this alternative are expected to be about the same as the short-term impacts caused by Alternative 10. This alternative is more expensive than Alternative 10, and would not allow for most of the beneficial future land uses identified by the Union Pacific Land Use Committee and the DTSC. Therefore, this alternative was rejected as the recommended remedial alternative for Operable Unit S-1.

6.3.1.3 Alternative 10: Excavation/Off-Site Disposal of Soil Above Clean-Up Levels

Objectives and Scope

This alternative consists of excavation and off-site disposal of soil contaminated with arsenic, lead, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and asbestos at or above clean-up levels established for restricted future land use. After the site is cleared and construction debris is disposed off-site, excavated soil would be loaded onto rail cars and/or trucks and taken off-site and disposed of in an appropriately licensed and permitted landfill. Clean soil brought from off-site would be placed as fill to restore grade in excavated areas, if needed. Figure 16 is a conceptual plan for Alternative 10.

If significant concentrations of chlorinated volatile organic compounds are found in the deeper portion of the Oil House Area, it may be more health-protective and cost-effective to combine in-situ treatment (such as vapor extraction) with excavation and off-site disposal. This will be determined after completion of additional soil gas investigation activities.

Air monitoring would be conducted during all construction activities to assess the effectiveness of dust minimization measures. If results of air monitoring indicate that dust emissions are unacceptable, corrective action would be taken to reduce dust emissions. An air monitoring report would be prepared at the conclusion of the remedial action activities.

To verify that the remedial action objectives have been achieved, confirmatory soil samples would be taken from the bottom and sides of excavated areas. The samples would be sent to a laboratory and tested for the appropriate contaminants. If statistical analysis of the test results shows that the remedial action objectives have not been achieved, excavation would continue until test results indicate that affected soils have been cleaned up to the appropriate levels.

Because this alternative provides for the removal of soil contaminated above clean-up levels, a fence and groundwater monitoring are not included as part of this alternative. After completion of final remedial action, future land use in the area of Operable Unit S-1 would be restricted to commercial and/or mixed use development as described in Section 6.1.1. A land use covenant would be entered into by the DTSC and UPRR. The land-use covenant would be recorded on the deed to the property. Following remedial action, the existing fence will be maintained until site redevelopment is complete.

Cost Effectiveness

This is the second most expensive alternative being considered for Operable Unit S-1. The total present worth cost of this alternative is approximately $3.7 million. This includes capital costs for equipment, materials, labor, and related construction activities to excavate and dispose of soil contaminated above clean-up levels. There would be no operation and maintenance costs associated with this alternative.

Implementation Time

The time needed to implement this alternative is expected to be 7 months, provided no unplanned delays occur and no difficulties are encountered. This includes two months for engineering design, three months to obtain the necessary permits, and four months to clear and grade the site, excavate and dispose of the soil, and backfill the pits. It is expected that design and permitting activities would begin at the same time.

Groundwater Use

Groundwater use would not be affected by this alternative. Disposing of the soil contaminated above the restricted future land use remedial action objectives would effectively reduce contaminants that could move downward into groundwater. Furthermore, based on a recent laboratory study, the forms of arsenic and lead present in soils at the site are not considered to be a potential threat to groundwater quality (Walsh & Associates, 1992). This alternative is therefore likely to protect the groundwater more than the other final candidate alternatives.

Environmental Impact

Dust generation is expected to be higher for this alternative than for the other alternatives because of the large volume of soil that would need to be excavated and disposed of. Dust control measures would be used during site clearing, grading, excavation, and construction activities to reduce the generation of airborne dust. There would also be some increased noise and traffic at and near the site during the hours when site work is underway. However, the impact of noise and traffic is expected to be low because site work is planned for daylight hours during the week when most people are away from their homes. Following remediation, soil contaminants available to environmental receptors at and near the site would be limited. Soil contaminated above the restricted future land-use clean-up levels and waste would be disposed in a facility specifically designed for the long-term management of such wastes. Exposure to remaining soil contaminants (above unrestricted future land-use clean-up levels) would be limited by covering those areas with paving and buildings.

Justification for Rejection or Selection

This alternative would reduce both the volume and mobility of soil contaminants present at the site. This alternative would effectively eliminate the most significant pathway for human exposure to soil contaminants and environmental exposure, and would thus provide adequate protection of human health and the environment.

The implementation time for this alternative is longer than Alternative 1, but less than Alternative 4 for this operable unit. This is the second most expensive of the alternatives for this operable unit. The potential benefits of removing the soil contaminated above clean-up levels include many beneficial future land uses, as well as protection of human health and the environment. The greater short-term environmental impacts and implementation time are justified. This alternative was therefore selected as the recommended remedial alternative for Operable Unit S-1.

6.3.1.5 Recommended Remedial Alternative

The recommended remedial alternative for Operable Unit S-1 is Alternative 10, excavation and off-site disposal of soils contaminated above the restricted future land use clean-up levels.

Justification for Selection

Alternative 10 was selected as the recommended remedial alternative for Operable Unit S-1 for the following reasons:

- It would effectively eliminate the primary exposure pathways (inhalation of contaminated dust and ingestion of contaminated soil).
- It provides adequate overall long-term protection of human health and the environment by reducing the volume and mobility of contaminants at the site.
- It is reasonably cost-effective.
- It provides for many beneficial future land uses.

Following approval of this Draft Remedial Action Plan, a **Remedial Action Design Work Plan** will be prepared. It will provide detailed design specifications for the recommended remedial alternative for this Operable Unit. After the Remedial Action Design Work Plan is prepared, it will be submitted to the DTSC for review and approval. Design and construction activities associated with the recommended remedial alternative are discussed in Section 6.5.1.

6.3.2 Soil Operable Unit S-2

Soil Operable Unit S-2 includes approximately seven acres in the central part of the inactive portion of the site (see Figure 14). Soils in this operable unit contain arsenic, lead, petroleum hydrocarbons, and polycyclic aromatic hydrocarbons at concentrations above clean-up levels. Operable Unit S-2 also includes the former Central Fill Area, the geographic source of the groundwater contamination in groundwater Operable Unit GW-1. Miscellaneous debris and buried drums were found in the Central Fill Area during the remedial investigation. Future land use in Operable Unit S-2 is assumed to be restricted to commercial or mixed use development as described in Section 6.1.1; therefore, the restricted future land use remedial action objectives are applicable for this area.

There are two final candidate remedial alternatives for Operable Unit S-2:

- Alternative 1 - No Action; and
- Alternative 10 - Excavation and Off-site Disposal of Soils Above the Remedial Action Objectives.

This section is a summary of the feasibility study detailed analysis performed for these alternatives during preparation of the Feasibility Study Supplement. The final candidate alternatives for Soil Operable Unit S-2 are also compared in Tables 11 and 12.

6.3.2.1 Alternative 1: No Action

Objectives and Scope

The National Oil and Hazardous Substances Pollution Contingency Plan requires that the No Action Alternative be considered. The amount of risk reduction provided by each of the other final candidate alternatives is compared to the No Action Alternative to assess how effective they are. This alternative involves no clean-up of contaminated soil; it consists primarily of maintaining the existing fence around the entire site to prevent unauthorized access. A land use covenant would be entered into by DTSC and UPRR. The land use covenant would be recorded on the deed to the property to prohibit future land uses and activities which might disturb soil contaminants and potentially cause human health risks and/or adverse environmental impacts. In addition, groundwater beneath the site would be monitored for a period of thirty years to check for changes in groundwater quality caused by potential migration of contaminants from soil. Groundwater monitoring for this soil operable unit would be integrated with other soil and groundwater operable unit groundwater monitoring programs. A report which discusses groundwater monitoring results would be submitted to the DTSC on a yearly basis.

Cost Effectiveness

This alternative has the lowest total present worth cost of the alternatives being considered for Operable Unit S-2, but it provides the least protection of human health and the environment. The total present worth cost of this alternative is approximately $730,000. This total includes both capital costs and Operation and Maintenance costs. Capital costs (for equipment, labor, and materials) are approximately $30,000. This includes the cost of repairing the existing fence which surrounds the site, if necessary. Operation and maintenance costs total approximately $1.2 million over a thirty-year period. This includes the costs for groundwater monitoring and preparation of an annual groundwater monitoring report.

Implementation Time

Since this alternative does not include any remediation of contaminated soil, the time needed to put this alternative into effect (implementation time) is expected to be approximately three months. This includes time needed to prepare (and obtain DTSC approval for) a groundwater monitoring work plan, repair the existing fence, develop the land use covenant, and record the requirements on the property deed.

Groundwater Use

Of the final candidate alternatives which were considered, this alternative presents the greatest risk to present and future groundwater use because none of the contaminated soil or buried debris in S-2 would be removed or treated to reduce the level of contamination in this area. As a result, contaminants (primarily petroleum hydrocarbons) could migrate to groundwater and thus prevent future use of groundwater in the area. The soil contaminants and/or buried wastes in this Operable Unit are believed to be the primary source of existing groundwater contamination beneath the site. The thirty-year groundwater monitoring program would be designed to monitor the spread of additional groundwater contamination which might occur with this alternative.

Environmental Impact

Because this alternative does not include any remediation of contaminated soil or buried drums, implementing it would not cause significant environmental impact. However, it could result in potentially adverse long-term environmental impacts including contaminant migration either to groundwater or off-site in the form of airborne dust and does not represent a remedy for impacts which have already occurred. Of the final candidate alternatives, this alternative provides the least long-term protection of the environment.

Justification for Rejection or Selection

This alternative was rejected from consideration as the recommended remedial alternative because it would not meet remedial action objectives and would not provide adequate protection of human health and the environment. It would not reduce the toxicity, mobility, or volume of the contaminants at the site, nor would it eliminate the need for long-term access restrictions, strict land use restrictions, groundwater monitoring, or long-term operation and maintenance.

6.3.2.2 Alternative 10: Excavation/Off-Site Disposal of Soil Above Clean-Up Levels

Objectives and Scope

This alternative consists of excavation and off-site disposal of the soil contaminated with arsenic, lead, petroleum hydrocarbons, and polycyclic aromatic hydrocarbons above the restricted future land use clean-up levels. After the site is cleared and construction debris disposed off-site, excavated soil would be loaded onto rail cars and/or trucks and taken off-site and disposed in an appropriately licensed and permitted landfill. Any drums excavated during remedial activities in this operable unit would be located, brought to the surface, and placed in protective **overpack containers** unless empty and dry. The drum contents, if any, would be catalogued and tested as necessary to characterize the drummed material. Following characterization of the drum contents, the drums would be transported to an appropriate waste disposal facility. Depending on the drum contents, disposal may consist of off-site incineration, recycling, and/or disposal in an appropriately licensed and permitted landfill. Clean soil brought from off-site would be placed as fill to restore grade in excavated areas, if needed. Figure 16 shows a conceptual plan for Alternative 10.

If significant concentrations of chlorinated volatile organic compounds are found in the deeper portion of the Central Fill Area, it may be more health-protective and cost-effective to combine in-situ treatment (such as vapor extraction) with excavation and off-site disposal. This will be determined after completion of additional soil gas investigation activities. Cleanup levels will be established to be protective of groundwater quality.

Air monitoring would be conducted during all construction activities to assess the effectiveness of dust control measures. If results of air monitoring indicate that dust emissions are unacceptable, corrective action would be taken to reduce dust emissions. An air monitoring report would be prepared at the conclusion of the remedial action activities.

To verify that the soil contaminated above the remedial action objectives has been removed, confirmatory soil samples would be taken from the bottom and sides of the excavations. The samples would be sent to a laboratory and tested for arsenic, lead, and/or petroleum hydrocarbons, as appropriate. If statistical analysis of the test results shows that the remedial action objectives have not been achieved, excavation would continue until test results indicate that the affected soils have been cleaned up to the appropriate levels.

Because this alternative provides for the removal of the buried wastes and soil contaminated above the remedial action objectives, a fence and groundwater monitoring are not included as part of this alternative. However, because of the less strict clean-up levels selected for Operable Unit S-2, future land uses would be restricted as described in Section 6.1.1 in order to protect human health. A land-use covenant would be entered into by the DTSC and UPRR. The land-use covenant would be recorded on the deed to the property to provide notice of restrictions on land use. Following remedial action, the existing fence will be maintained until site redevelopment is complete.

<u>Cost Effectiveness</u>

This is the most expensive alternative being considered for Operable Unit S-2; however, it also provides the greatest protection of human health and the environment. The total present worth cost of this alternative is approximately $6.8 million. This includes capital costs for equipment, labor, and materials to excavate and dispose of soil contaminated above the clean-up levels, as well as related construction activities. There would be no operation and maintenance costs associated with this alternative.

Implementation Time

The time needed to implement this alternative is expected to be nine months, provided no difficulties or unforeseen delays are encountered. This includes two months for engineering design, three months to obtain the necessary permits, and six months to clear the site, excavate and dispose of the soil and wastes, and backfill the pits. It is expected that design and permitting would begin at the same time.

Groundwater Use

Potential future groundwater use would be beneficially affected by this alternative. By excavating soil contaminated above the clean-up levels and removing other buried wastes which may be providing a continuing source of groundwater contamination, the mass of contaminants that could move downward into groundwater would be reduced. This alternative is therefore more likely to protect the groundwater than the other final candidate alternative.

Environmental Impact

Dust generation is expected to be higher for this alternative than for the No Action Alternative because of the large volume of soil that would need to be excavated and transported off site. Standard construction industry dust control measures would be used during site clearing, grading, excavation, and construction activities to reduce the generation of contaminated airborne dust. There would also be a temporary increase in noise and traffic at and near the site during the hours when site work is underway. Site work is planned for daylight hours during the week when most people are away from their homes. Following remediation, soil contaminants available to environmental receptors at and near the site would be limited. Soil contaminated above the restricted future land-use clean-up levels and waste would be disposed in a facility specifically designed for the long-term management of such wastes. Exposure to remaining soil contaminants (above unrestricted future land-use clean-up levels, but below the restricted future land use clean-up levels) would be limited by covering those areas with paving and buildings.

Justification for Rejection or Selection

This alternative would reduce both the volume and mobility of soil contaminants in Operable Unit S-2. Combined with controlled future development, this alternative would effectively eliminate most of the potential for human exposure to soil contaminants and environmental impacts, and would thus provide adequate protection of human health and the environment.

The implementation time for Alternative 10 is higher than Alternative 1, and it is the most expensive of the alternatives for this operable unit. The potential benefits obtained by removing waste materials and soil contaminated above the clean-up levels include preventing further groundwater contamination, protecting human health, and allowing a variety of beneficial future land uses. These benefits are believed to justify the cost, short-term environmental impacts and short-term human health risk. Alternative 10 was therefore selected as the recommended remedial alternative for Operable Unit S-2.

6.3.2.3 Recommended Remedial Alternative

Justification for Selection

Alternative 10 was selected as the recommended remedial alternative for Operable Unit S-2 for the following reasons:

- It would eliminate the primary source of present and potential future groundwater contamination.
- It would effectively eliminate the primary exposure pathways (inhalation of contaminated dust and ingestion of contaminated soil) for people and other biological receptors.
- It provides adequate overall long-term protection of human health and the environment.
- It will allow for many of the beneficial future land uses identified by the Union Pacific Land Use Committee and the DTSC.

Following approval of this Draft Remedial Action Plan, a Remedial Action Design Work Plan will be prepared. It will provide detailed design specifications for the recommended remedial alternative for this Operable Unit. After the Remedial Action Design Work Plan is prepared, it will be submitted to the DTSC for review and approval. Design and construction activities associated with the recommended remedial alternative are discussed in Section 6.5.1.

6.3.3 Soil Operable Unit S-3

Soil Operable Unit S-3 is in the northeastern part of the inactive portion of the site (see Figure 14). This operable unit includes approximately 17 acres and contains soils contaminated with arsenic, lead, petroleum hydrocarbons, and polycyclic aromatic hydrocarbons above the remedial action objectives identified for this area. Future land use in Operable Unit S-3 is assumed to be unrestricted; therefore, the unrestricted future land use remedial action objectives are applicable for this area.

There are three final candidate remedial alternatives for Operable Unit S-3:

- Alternative 1 - No Action
- Alternative 4 - Containment with Institutional Controls
- Alternative 10 - Excavation and Off-site Disposal of Soils Above Clean-Up Levels.

Table 11 contains a summary comparison of the final candidate alternatives for Soil Operable Unit S-3, and Table 12 summarizes costs. This section discusses detailed analysis of these alternatives which was performed during preparation of the Feasibility Study Supplement.

6.3.3.1 Alternative 1: No Action

Objectives and Scope

The National Oil and Hazardous Substances Pollution Contingency Plan requires that the No Action Alternative be considered. The amount of risk reduction provided by each of the other final candidate alternatives is compared to the No Action Alternative to assess how effective they are. This alternative involves no clean-up of contaminated soil. It consists primarily of maintaining the existing fence around the entire site to prevent unauthorized access. A land use covenant would be entered into by DTSC and UPRR. The land use covenant would be recorded on the deed to the property to prohibit future land uses and activities which might disturb soil contaminants and cause human health risks and/or adverse environmental impacts. In addition, groundwater beneath the site would be monitored for a period of thirty years to check for changes in groundwater quality caused by the migration of contaminants in soil. Groundwater monitoring for this soil operable unit would be integrated with other soil and groundwater operable unit groundwater monitoring programs. A report which discusses groundwater monitoring results would be submitted to the DTSC on a yearly basis.

Cost Effectiveness

This alternative has the lowest total present worth cost of the alternatives being considered for Operable Unit S-3, but provides the least protection of human health and the environment. The total present worth cost of this alternative is approximately $750,000. This total includes both capital costs and Operation and Maintenance costs. Capital costs (for equipment, labor, and materials) are approximately $53,000. This includes the cost of repairing and/or replacing the existing fence which surrounds the site. Operation and maintenance costs are approximately $1.2 million over a thirty-year period. This includes the costs for groundwater monitoring and preparation of an annual report.

Implementation Time

Since this alternative does not include remediation of contaminated soil, the time needed to put this alternative into effect (implementation time) is expected to be approximately three months. This includes time needed to prepare (and obtain DTSC approval for) a groundwater monitoring work plan, repair the existing fence (if necessary), develop the land use covenant and, record the changes on the property deed.

Groundwater Use

Of the final candidate alternatives which were considered, this alternative presents the greatest risk to present and potential future groundwater use, because none of the contaminated soil in S-3 would be removed or treated to reduce the level of contamination in this area. As a result, some contaminants (primarily petroleum hydrocarbons) could migrate to groundwater and thus pose a threat to human health and the environment. The thirty-year groundwater monitoring program would be designed to monitor the potential for additional groundwater contamination which might occur.

Environmental Impact

Because this alternative does not include remediation of contaminated soil, implementing it would not cause significant short-term environmental impact. However, environmental impacts which have already occurred would not be remedied. In the long term, this alternative could result in potentially significant adverse environmental impacts including contaminant migration either to groundwater or off-site in the form of airborne dust. Of the final candidate alternatives, this alternative provides the least long-term protection of the environment.

Justification for Rejection or Selection

This alternative was rejected from consideration as the recommended remedial alternative because it would not meet remedial action objectives and would not provide adequate protection of human health and the environment. It would not reduce the toxicity, mobility, or volume of the contaminants at the site, nor would it eliminate the need for long-term access restrictions, strict future land use restrictions, groundwater monitoring, or long-term operation and maintenance.

6.3.3.2 Alternative 4: Containment with Institutional Controls

Objectives and Scope

This alternative would include leaving waste and contaminated soil in place, clearing away remaining debris, grading surface soil, and constructing an asphalt cap over soil contaminated above the unrestricted future land use clean-up levels. The cap would be designed to reduce infiltration of rainwater downward through contaminated soil to groundwater and prevent contaminated soil from being blown off-site by wind. The caps would be sloped so that water drains away from the capped areas into a collection system (see Figure 15).

During construction (especially at those times when contaminated soil is being moved or otherwise disturbed), soil would be wetted to minimize the amount of dust raised by these activities. Air monitoring would be conducted during construction activities to assess the effectiveness of dust minimization measures. If results of air monitoring indicate that dust emissions are unacceptable, corrective action would be taken to reduce dust emissions. An air monitoring report would be prepared at the conclusion of the remedial action activities.

The completed asphalt caps would be inspected yearly to identify necessary repairs. Regular maintenance of the asphalt surface would include re-sealing one-fourth of each cap every year in rotation so that each cap is completely resealed every four years. Additionally, the cap surface would be replaced with fresh asphalt every ten years. This maintenance program is designed to keep the caps in good condition.

In addition to construction of caps over areas where soil is contaminated above the unrestricted future land use clean-up levels, a land use covenant would be entered into by DTSC and UPRR. The land use covenant would be recorded on the deed to the property to prohibit future land uses and activities which might disturb soil contaminants and potentially cause human health risks or adverse environmental impacts. The site would be fenced to restrict unauthorized access. Groundwater quality would be monitored for a period of thirty years after the cap is finished and a report which discusses the results of groundwater monitoring would be submitted to DTSC yearly. Groundwater monitoring for this soil operable unit would be integrated with other soil and groundwater operable unit groundwater monitoring programs.

Cost Effectiveness

This alternative has the second highest total present worth cost of the alternatives being considered for Operable Unit S-3, but would not provide for many of the beneficial future land uses that

Alternative 10 would allow. The total present worth cost of this alternative is approximately $1.5 million. This total includes both capital costs and Operation and Maintenance costs. Capital costs (for equipment, labor, and materials) are approximately $660,000 and include the cost of all construction activities and repairing and/or replacing the existing fence which surrounds the site. Operation and maintenance costs would be approximately $1.5 million over a thirty-year period. This includes the cost for cap maintenance and replacement, the groundwater monitoring program and yearly monitoring reports.

Implementation Time

The time needed to implement this alternative is expected to be six months, provided there are no unforeseen delays or difficulties encountered. This includes three months for engineering design of the cap, three months to obtain the necessary permits, and three months to clear and grade the site and construct the asphalt cap and fence. The design and permitting periods would begin at the same time.

Groundwater Use

Future groundwater use will not be significantly affected by this alternative. One purpose of the cap is to reduce the amount of water moving downward through contaminated soil and into groundwater. This alternative is therefore more likely to protect groundwater than Alternative 1, but somewhat less likely to do so than Alternative 10. The thirty-year groundwater monitoring program would be designed to provide an early warning of additional groundwater contamination which might occur because of the downward movement of soil contaminants.

Environmental Impact

Dust control measures would be used during site clearing, grading, and construction activities to reduce generation of contaminated airborne dust. Due to the nature of asphaltic material, there would be some air emissions and associated odor during paving of the asphalt cap. The expected levels of emissions would not exceed normal urban activity or result in significant environmental impacts. There would also be some increased noise and traffic at and near the site during the hours when site work is underway. However, these impacts would be temporary and would be limited to daylight hours during the week when most people are away from their homes. Following remediation, soil contaminants available to environmental receptors would be limited. This is a result of reduced contaminant migration, as well as isolation of the contaminated material from sensitive environmental receptors.

Justification for Rejection or Selection

Alternative 4 would reduce the mobility of contaminants at the site. Although it would not reduce the toxicity of the contaminants or the volume of contaminated soil, it would effectively eliminate the most significant pathway for human and environmental exposure to the soil contaminants. Thus, it would provide adequate protection of human health and the environment.

This alternative is more expensive than both Alternatives 1 and 10. It would require about the same time to implement as Alternative 10 and would cause similar short-term environmental impacts during implementation. However, this Operable Unit would be relatively easy to reclaim for beneficial future land uses identified by the Union Pacific Land Use Committee and the DTSC, if another remedial alternative were chosen. Alternative 4 would allow for only very limited future land use. Therefore, this alternative was rejected as the recommended remedial alternative for Operable Unit S-3.

6.3.3.3 Alternative 10: Excavation/Off-Site Disposal of Soil Above Clean-Up Levels

Objectives and Scope

This alternative consists of excavation and off-site disposal of the soil contaminated with arsenic, lead, petroleum hydrocarbons, and/or polycyclic aromatic hydrocarbons at or above the unrestricted future land use clean-up levels. After the site is cleared and construction debris disposed off-site, excavated soil would be loaded onto rail cars and/or trucks and taken off-site and disposed in an appropriately licensed and permitted landfill. Clean soil brought from off-site would be placed as fill to restore grade in excavated areas, if needed. A conceptual plan for Alternative 10 is shown on Figure 16.

During construction (especially at those times when contaminated soil is being moved or otherwise disturbed), soil would be wetted to minimize the amount of dust raised by these activities. Air monitoring would be conducted during construction activities to assess the effectiveness of dust minimization measures. If results of air monitoring indicate that dust emissions are unacceptable, corrective action would be taken to reduce dust emissions. An air monitoring report would be prepared at the conclusion of the remedial action activities.

To verify that the soil contaminated above the remedial action objectives has been removed, confirmatory soil samples would be taken from the bottom and sides of the excavations. The samples would be sent to a laboratory and tested for arsenic and/or lead, as appropriate. If statistical analysis of the test results shows that the remedial action objectives have not been achieved, excavation would continue until test results indicate that the affected soils have been cleaned up to the appropriate level.

Because this alternative provides for the removal of the soil contaminated above the unrestricted future land use remedial action objectives, a fence, land use covenants, deed notices, and groundwater monitoring would not be required to protect human health and the environment.

Cost Effectiveness

This is the most expensive alternative being considered for Operable Unit S-3, but it provides for the widest range of beneficial future land uses, as well as good protection of human health and the environment. The total present worth cost of this alternative is approximately $1.9 million. This includes capital costs for equipment, labor, and materials needed to accomplish excavating and disposing of the soil contaminated above the remedial action objectives and all related construction activities. There would be no operation and maintenance costs associated with this alternative.

Implementation Time

The time needed to implement this alternative is expected to be seven months, provided no unforeseen delays or difficulties are encountered. This includes two months for engineering design, three months to obtain the necessary permits, and four months to clear and grade the site, excavate and dispose of the soil, and backfill the pits. It is expected that design and permitting would begin at the same time.

Groundwater Use

Future groundwater use would be beneficially affected by this alternative. Disposing of the soil contaminated above the clean-up levels would reduce contaminants that could move downward into groundwater. This alternative is therefore likely to protect the groundwater more than the other final candidate alternatives considered for Operable Unit S-3.

Environmental Impact

Dust generation is expected to be higher for this alternative than for other alternatives because of the large volume of soil that would need to be excavated and disposed. Standard construction industry dust control measures would be used during site clearing, grading, excavation, and construction activities to reduce generation of airborne dust. There would also be some increased noise and traffic at and near the site during the hours when site work is underway. However, these impacts will be temporary and would be limited to daylight hours during the week when most people are away from their homes. Following remediation, soil contaminants available to environmental receptors would be limited. Soil contaminated above the unrestricted site clean-up levels would be disposed in a facility specifically designed for the long-term management of such wastes.

Justification for Rejection or Selection

Alternative 10 would reduce the volume of soil contaminants at the site. This alternative would effectively eliminate the most significant pathway for human exposure to soil contaminants and would thus provide adequate protection of human health.

The implementation time for this alternative is longer than Alternative 1, but about the same as Alternative 4. The magnitude of short-term environmental impacts would be about the same for this alternative as those associated with Alternative 4. This alternative would provide for virtually unlimited future beneficial land uses, and is reasonably cost-effective. Because the potential benefits of removing the soil contaminated above the clean-up levels justify the short-term environmental impacts and cost, Alternative 10 was selected as the recommended remedial alternative for Operable Unit S-3.

6.3.3.4 Recommended Remedial Alternative

Justification for Selection

Alternative 10 was selected as the recommended remedial alternative for Operable Unit S-3 for the following reasons:

- It would effectively eliminate the primary exposure pathways (inhalation of contaminated dust and ingestion of contaminated soil).
- Alternative 10 provides adequate overall long-term protection of human health and the environment through reduction of mobility, toxicity, and volume of contaminants at the site.
- It is reasonably cost-effective.
- It provides for unlimited future land uses, including all desirable land use types identified by the Union Pacific Land Use Committee and the DTSC at a reasonable cost.

Following approval of this Draft Remedial Action Plan, a Remedial Action Design Work Plan will be prepared. It will provide detailed design specifications for the recommended remedial alternative for this Operable Unit. After the Remedial Action Design Work Plan is prepared, it will be submitted to the DTSC for review and approval. Design and construction activities associated with the recommended remedial alternative are discussed in Section 6.5.1.

6.3.4 Groundwater Operable Unit GW-1

Groundwater Operable Unit GW-1 consists of an approximately 35-acre groundwater plume which extends off-site (Plume A on Figure 8). This plume contains nickel, chlorinated volatile organic compounds, and volatile aromatic hydrocarbons at concentrations above the groundwater clean-up levels.

There are two final candidate alternatives for Operable Unit GW-1:

- Alternative 1 - No Action
- Alternative 4 - Extract, Treat, and Discharge.

This section presents a summary of the detailed analysis performed for these alternatives during preparation of the Addendum Feasibility Study. This analysis is also summarized in Table 13, and Table 14 is a cost summary.

6.3.4.1 Alternative 1: No Action

Objectives and Scope

The No Action Alternative involves neither clean-up of contaminated groundwater, nor groundwater monitoring. Consideration of the No Action Alternative is required by the National Oil and Hazardous Substances Pollution Contingency Plan. The amount of risk reduction provided by each of the other final candidate alternatives is compared to the No Action Alternative to assess how effective they are.

Cost Effectiveness

The No Action Alternative is the least expensive of the groundwater alternatives being considered for Operable Unit GW-1. There are no costs associated with this alternative. However, this alternative provides no protection of human health or the environment.

Implementation Time

Since the No Action alternative does not include any activities, it does not require any time to implement.

Groundwater Use

If implemented, this alternative will adversely affect future groundwater use at and in the vicinity of the site because existing contamination would continue to move off-site and may affect downgradient groundwater which is not currently impacted.

Environmental Impact

Since there are no clean-up activities associated with this alternative, there are no short term-impacts to the environment due to construction. However, this alternative may result in significant adverse environmental impacts as contaminants continue to migrate off-site. Of the final candidate alternatives for operable unit GW-1, this alternative provides the least protection of the environment.

Justification for Rejection or Selection

This alternative was rejected from consideration as the recommended remedial alternative because it would not meet remedial action objectives and would not provide adequate protection of human health and the environment. It would not reduce the toxicity, mobility, or volume of contaminants in groundwater.

6.3.4.2 Alternative 4: Extract, Treat, and Discharge

Objective and Scope

The objective of this alternative is to remove and treat contaminated groundwater until contaminant concentrations are below groundwater clean-up levels. This alternative consists of extraction, treatment of contaminated groundwater, and discharge of treated water to the sewer, monitoring groundwater to evaluate the effectiveness of remediation, and limiting the potential exposure to groundwater during remedial action by prohibiting permits for drilling of groundwater supply wells in Operable Unit GW-1. Groundwater monitoring for this operable unit would be integrated with other soil and groundwater operable unit groundwater monitoring programs. It also includes preparation of a report of groundwater monitoring results which would be submitted to the DTSC yearly.

TABLE 13
COMPARISON OF GROUNDWATER FINAL CANDIDATE ALTERNATIVES
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Operable Unit	Alternative	Short-term Effectiveness	Long-term Effectiveness	Reduction of Toxicity, Mobility and Volume	Implementability	Cost*	Compliance with ARARs	Overall Protection of Human Health and Environment	State Acceptance	Community Acceptance
GW-1	1 No Action	Poor	Poor	Poor	Fair	0	Poor	Poor	Poor	Poor
	4 Extract/ Treat/ Discharge	Good	Good	Good	Good	$980,000 - $3.1 million	Good	Good	Good	Good
GW-2	1 No Action	Poor	Poor	Poor	Poor	0	Poor	Poor	Poor	Poor
	2 Limited Action	Poor	Fair	Fair	Poor	$180,000	Poor	Poor	Poor	Poor
	4 Extract/ Treat/ Discharge	Good	Good	Good	Good	$170,000 - $280,000	Good	Good	Good	Good

*When range of costs is presented for GW-1, the lower cost is based on 2 wells pumping at 10 gpm each for 30 years. Higher costs are based on 10 wells pumping at 20 gpm each for 30 years. For GW-2, lower cost is for air stripping; higher cost is for UV/Oxidation.

TABLE 14
SUMMARY OF ESTIMATED COSTS
GROUNDWATER ALTERNATIVES
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Operable Unit	Alternative	Capital Costs*	Operation and Maintenance Costs**	Total Costs	Total Present Worth Cost ***
GW-1	1	$0	$0	$0	$0
	4	$320,000 to $1.7 Million	$1.2 to $2.4 Million	$1.5 Million to $4.1 Million	$980,000 to $3.1 Million
GW-2	1	$0	$0	$0	$0
	2	$0	$293,000	$293,000	$180,000
	4	$64,000	$115,000 to $231,000	$187,000 to $303,000	$170,000 to $280,000

* All capital costs are expended in the first year of the project life.

** O&M costs may not be constant over the project life.

*** Net present worth cost at 5% annual interest rate.

To remove contaminated groundwater, **extraction wells** would be placed on- and off-site. The exact number and location of the wells is not currently known, but will be determined before completion of the Remedial Action Design Work Plan, or during final design of the groundwater remedial system.

Extracted groundwater would be pumped through a piping system to a treatment system which will be located near the east central side of the site. Piping and wiring would need to be installed in a trench to connect the wells with the treatment system. Soil would be wetted, as necessary, during construction of the trench and treatment system foundation to minimize the amount of dust generated during construction. A conceptual plan of a groundwater extraction and treatment system is shown on Figure 17.

In order to improve efficiency, extend the operating life, and enhance the cost-effectiveness of the groundwater treatment system, some form of **pre-treatment** may be used. Pre-treatment of extracted water might consist of either physical (such as filtering) or chemical pre-treatment, depending on the quality of the extracted groundwater and the final treatment system used. Based on current knowledge of groundwater conditions, pre-treatment does not appear to be necessary.

The final groundwater treatment system may consist of one or more of the following:

- **Air stripping** transfers volatile organic contaminants from the water to the air in a closed system, creating a contaminant-rich air stream that is treated before it is released to the atmosphere. Treatment of air is accomplished either through **thermal oxidation** or **carbon adsorption.** Thermal oxidation is done by either burning contaminants or passing contaminants over a catalyst similar to a catalytic converter in a car's exhaust system. Carbon adsorption transfers contaminants from water (or air) to carbon. As more contaminants are transferred to the carbon, the pores in the carbon become full, it loses its effectiveness and must be replaced. The **spent carbon,** or carbon that has lost its ability to adsorb contaminants, is then transported off-site and recycled.

- **Granular activated carbon** uses activated carbon to remove volatile organic contaminants from groundwater.

- **UV-oxidation** uses ultraviolet light to destroy volatile organic contaminants in groundwater. A UV-oxidation system destroys contaminants by pumping contaminated groundwater to a treatment unit, injecting chemicals such as hydrogen peroxide or ozone into the contaminated groundwater, and then exposing the water to ultraviolet light in a closed system. The chemicals help the light break down contaminants more effectively. This process produces no residuals.

- If required as a condition of **effluent** discharge permits, the treatment system will include a process to remove nickel from groundwater. The planned groundwater Interim Remedial Measure is expected to provide additional information which will aid in assessment of the need to remove nickel prior to discharge.

The type of treatment best suited to this task depends on a number of factors including the type and concentration of groundwater contaminants and the flow rate of water through the system. These systems may be used independently or they may be combined to produce the best treatment at the least cost.

Treated groundwater would be discharged to the existing City of Sacramento sewer system through underground piping. The treated groundwater will flow through the sewer to a waste water treatment plant owned and operated by Sacramento County. Finally, treated groundwater will be discharged into the Sacramento River.

Cost Effectiveness

Alternative 4 is more costly than Alternative 1, but will remedy groundwater contamination and allow beneficial uses of groundwater after remedial action is complete. The total present worth cost of this alternative for Operable Unit GW-1 ranges from about $980,000 to $3.1 million, depending on the number and location of wells and which treatment system is selected. The least expensive treatment system is an air stripper that treats water at a low flow (approximately 20 gallons per minute). This system would also include treatment of air before release to the atmosphere. The most expensive system is UV-oxidation treatment at high flow rate (approximately 200 gallons per minute).

Capital costs are estimated to range from about $320,000 to $1.7 million and include costs for equipment, labor, materials, and equipment installation. Operation and maintenance costs are estimated to range from about $1.2 to $2.4 million over a three- to thirty-year period and include groundwater monitoring, sampling and analysis of treated groundwater, pump operation, treatment system operation, and annual reporting.

Implementation Time

The time needed to implement this remedial alternative for Operable Unit GW-1 is expected to be about 12 months, provided no unforeseen delays or difficulties are encountered. This includes three months to design the system, three months for DTSC review, three months to obtain construction permits, six months to obtain well permit restrictions, and three months for construction (i.e., installing groundwater extraction wells, trenching, installing piping and wiring, and installing the treatment system). It is assumed that obtaining well permit restrictions would be completed concurrently with DTSC review and approval. It is not currently known how long groundwater extraction and treatment would continue, but it is expected to take three to thirty years.

Groundwater Use

The overall long-term effects of this remedial alternative on groundwater use will be beneficial. After remedial action is complete, this resource will be available for future beneficial uses. During treatment, there may be local lowering of the groundwater table, but this is not expected to impact existing nearby groundwater users.

Environmental Impact

Short-term environmental impacts would occur during construction of the system and may include increased traffic congestion, noise and dust from construction equipment used to drill wells, dig trenches, and install the treatment system. Standard construction industry dust control measures will be used, as necessary, during trenching and construction of the treatment system foundation. Noise and traffic impacts will be temporary and limited to daylight hours when most people are away from home. Following remediation, contaminants previously available to environmental receptors would be removed.

Justification for Rejection or Selection

This remedial alternative would result in some short-term environmental impacts during construction and system operation. However, these impacts would be minor and would be out-weighed by long-term advantages of removing contaminated groundwater. Extraction and treatment of contaminated groundwater would reduce the toxicity, mobility, and volume of contaminants in Operable Unit GW-1, thereby providing adequate protection of human health and the environment and allowing future beneficial uses of groundwater. This alternative uses proven technologies to extract and treat groundwater, and though this alternative is more expensive than the No Action Alternative, the extra costs are justified by the long-term benefits. Therefore, this alternative was selected as the recommended remedial alternative for Operable Unit GW-1.

6.3.4.3 Recommended Remedial Alternative

The recommended remedial alternative for Operable Unit GW-1 is Alternative 4. This alternative consists of extraction of contaminated groundwater, treatment of contaminated groundwater, and discharge of treated water to the sewer. Also included in this alternative are groundwater monitoring to assess plume migration and the effectiveness of groundwater remedial action, and restrictions on the number and type of permits for the drilling of groundwater supply wells during groundwater clean-up to control access to contaminated groundwater.

Justification for Selection

Alternative 4 was selected as the recommended remedial alternative for the following reasons:

- It will provide the greatest protection of human health and the environment.
- It will reduce the toxicity, mobility, and volume of contaminants.
- It uses proven technologies that are well tested and easy to implement.
- It is reasonably cost-effective.
- Short-term impacts during construction and system operation will be minor and would be outweighed by the long-term advantages of meeting Remedial Action Objectives for groundwater.

Following approval of this Draft Remedial Action Plan, a Remedial Action Design Work Plan will be prepared. It will provide detailed design specifications for the recommended remedial alternative for this Operable Unit. After the Remedial Action Design Work Plan is prepared, it will be submitted to the DTSC for review and approval. Design and construction activities associated with the recommended remedial alternative for Operable Unit GW-1 are discussed in Section 6.5.2.

6.3.5 Groundwater Operable Unit GW-2

Groundwater Operable Unit GW-2 is the smaller on-site groundwater contaminant plume (Plume B on Figure 8). This smaller plume covers an area of about 5 acres and contains volatile organic compounds and nickel above the groundwater clean-up levels. Three final candidate alternatives for Operable Unit GW-2 were analyzed in the Feasibility Study Supplement:

- Alternative 1 — No Action;
- Alternative 2 — Limited Action; and
- Alternative 4 — Extract, Treat, and Discharge.

This section summarizes the detailed analysis of these three alternatives for Operable Unit GW-2. Tables 13 and 14 also contain a summary comparison of the final candidate alternatives for groundwater Operable Unit GW-2.

6.3.5.1 Alternative 1: No Action

Objectives and Scope

Consideration of the No Action Alternative is required by the National Oil and Hazardous Substances Pollution Contingency Plan. The amount of risk reduction provided by each of the other final candidate alternatives is compared to the No Action Alternative to assess how effective they are. The No Action Alternative involves neither clean-up of contaminated groundwater, nor groundwater monitoring.

Cost Effectiveness

The No Action Alternative is the least expensive of the alternatives being considered for Operable Unit GW-2, but does not remedy existing groundwater contamination. There are no costs associated with this alternative.

Implementation Time

Since this No Action alternative does not include any activities, it does not require any time to implement.

Groundwater Use

Because the No Action alternative leaves the contaminated groundwater in place, groundwater use in and around the area of the contaminated groundwater would need to be limited. Over time, the contamination would move and spread in the direction of groundwater flow and might ultimately impact nearby existing groundwater users.

Environmental Impact

Since there are no clean-up activities associated with this alternative, there are no short-term impacts to the environment due to construction. However, since this alternative does not remove and/or treat contaminants, this alternative provides the least protection of the environment of all the final candidate alternatives for Operable Unit GW-2.

Justification for Rejection of Selection

This alternative was rejected from consideration as the recommended remedial alternative because it would not meet Remedial Action Objectives and would not provide adequate protection of human health and the environment. It would not reduce the toxicity, mobility, or volume of the contaminants in groundwater, and could prevent future beneficial uses of this resource.

6.3.5.2 Alternative 2: Limited Action

Objectives and Scope

The objective of the Limited Action Alternative is to provide human health protection beyond the No Action Alternative by monitoring groundwater, and by limiting the potential exposure to contaminated groundwater by implementing restrictions on drilling permits for groundwater supply wells in Operable Unit GW-2.

The Limited Action Alternative involves no clean-up of contaminated groundwater. However, it does include groundwater monitoring for 30 years. Groundwater monitoring for this operable unit would be integrated with other soil and groundwater operable unit groundwater monitoring programs. It also includes preparation of a report of groundwater monitoring results which would be submitted to the DTSC yearly.

Cost Effectiveness

The Limited Action Alternative is the least expensive of the alternatives being considered for Operable Unit GW-2 and provides adequate protection of human health. This alternative is estimated to have a total present worth cost of about $180,000. This includes only operation and maintenance costs. Operation and maintenance costs include groundwater sampling, analytical tests, and preparation of an annual groundwater monitoring report for 30 years. The total present worth cost does not include the costs for drilling permit restrictions because the costs for these restrictions are unknown.

Implementation Time

The time expected to put this alternative into effect is about nine months. This includes three months to prepare a groundwater monitoring work plan, three months for review and approval of the work plan by DTSC, and six months to obtain well permit restrictions. It is assumed that obtaining permit restrictions would be concurrent with DTSC review and approval. There are no construction activities associated with the Limited Action Alternative.

Groundwater Use

This alternative leaves the contaminated groundwater in place and limits groundwater use in the area of GW-2. Because there is currently no known use of groundwater in GW-2, this alternative will not adversely affect present beneficial use of this resource. Over time, the concentration of contaminants in GW-2 will decrease due to natural breakdown of the contaminants and dilution. The rate at which the concentrations will decrease is unknown, but levels could drop below groundwater clean-up levels in a relatively short period of time so that future beneficial use of the groundwater would not be adversely affected. The groundwater monitoring program included in this alternative would monitor both the movement and concentrations of the contaminants in the plume to evaluate the reduction of the concentration of contaminants in the plume through natural degradation.

Environmental Impact

Since there are no clean-up activities associated with this alternative, there are no short-term impacts to the environment due to construction. However, because this alternative does not remove or treat contaminants, it provides less protection of the environment than Alternative 4, and is only marginally better than Alternative 2 in this respect.

Justification for Rejection of Selection

This alternative would not provide an immediate remedy for existing environmental impacts. However, it would allow for the reduction of the volume and toxicity of contaminants through natural degradation over an extended period. Human health would be protected by monitoring contaminant degradation and potential migration and by limiting access to the groundwater through permit restrictions. Because Alternative 2 does not remedy existing impacts and will prevent future beneficial uses of groundwater for many years, it was rejected from further consideration as the recommended remedial alternative for Operable Unit GW-2.

6.3.5.3 Alternative 4: Extract, Treat, and Discharge

Objective and Scope

The objective of this alternative is to treat contaminated groundwater until contaminant concentrations are below groundwater clean-up levels. Alternative 4 consists of extraction, treatment of contaminated groundwater, and discharge of treated water to the sewer, monitoring groundwater to evaluate the progress of clean-up, and limiting the potential exposure to groundwater during remedial action through restrictions on permits for drilling of groundwater wells in Operable Unit GW-2.

Groundwater monitoring for this operable unit would be integrated with other soil and groundwater operable unit groundwater monitoring programs. It also includes preparation of an annual groundwater monitoring report which would be submitted to DTSC.

To remove contaminated groundwater, extraction wells would be placed on-site. The exact number and location of the wells is not currently known, but will be determined before completion of the Remedial Action Design Work Plan. It is estimated that the total flow to the treatment system would be 20 gallons per minute, and that pumping and treatment would last for about 3 years.

Extracted groundwater would be pumped to a treatment system that is assumed to be located near the east central portion of the site. Piping and wiring would need to be installed in a trench to connect the wells with the treatment system. Soil would be wetted during construction of the trench and treatment system foundation, as necessary, to minimize the amount of dust generated during construction. A conceptual plan for Groundwater Alternative 4 is shown on Figure 17.

In order to improve the efficiency, extend the operating life, and enhance the cost effectiveness of the treatment system, some form of pretreatment may be used. The type of pretreatment that may be required and associated costs cannot be specified until more data is collected on the quality of extracted water. Based on current knowledge of groundwater conditions, pretreatment is not expected to be necessary.

The final groundwater treatment system may consist of one or more of the following:

- Air stripping transfers the volatile organic contaminants from the water to the air in a closed system, creating a contaminant-rich air stream that is treated before it is released to the atmosphere. Treatment of the air is accomplished either through thermal oxidation or carbon adsorption. Thermal oxidation is done by either burning the contaminants or passing contaminants over a catalyst similar to a catalytic converter in a car's exhaust system. Carbon adsorption transfers contaminants from water (or air) to carbon. As more contaminants are transferred to the carbon, the pores in the carbon become full, it loses its effectiveness and must be replaced. The spent carbon, or carbon that has lost its ability to adsorb contaminants, is then transported off-site and recycled.

- Granular activated carbon uses activated carbon to remove volatile organic contaminants from groundwater.

- UV-oxidation uses ultraviolet light to destroy volatile organic contaminants in groundwater. A UV-oxidation system destroys contaminants by pumping contaminated groundwater to the surface of the site, injecting chemicals such as hydrogen peroxide or ozone into the contaminated groundwater, and then exposing the water to ultraviolet light in a closed system. The chemicals help the light break down contaminants more effectively. This process produces no residuals.

- If required as a condition of effluent discharge permits, the treatment system will include a process to remove nickel from groundwater. The planned groundwater Interim Remedial Measure is expected to provide additional information which will aid in assessment of the need to remove nickel prior to discharge.

The type of treatment best suited to this task depends on a number of factors including the type and concentration of groundwater contaminants and the flow rate of water through the system. These systems may be used independently or they may be combined to produce the best treatment at the least cost.

Treated groundwater would be discharged to the existing City of Sacramento sewer system and will flow through underground pipe to a waste water treatment plant owned by Sacramento County. The treated groundwater will ultimately be discharged into the Sacramento River.

Cost Effectiveness

Alternative 4 is the most expensive alternative considered for Operable Unit GW-2. However, it will remedy existing groundwater impacts relatively quickly and allow future beneficial uses of groundwater sooner than either Alternative 1 or 2. The total present worth cost of this alternative for Operable Unit GW-2 ranges from $170,000 to $280,000. The least expensive system is an air stripper that also includes treatment of the air before release to the atmosphere. The most expensive system is UV-oxidation treatment. Capital costs are estimated to be about $60,000 if the groundwater from GW-2 is treated using the same equipment designed for GW-1. They include costs for equipment, labor, materials, and installation. Operation and maintenance costs are estimated to range from about $110,000 to $230,000. They include costs for groundwater monitoring, sampling and analysis of treated groundwater, pump operation, treatment system operation, and annual reporting.

Implementation Time

The time needed to implement this alternative for Operable Unit GW-2 is expected to be about eleven months, provided no difficulties or unforeseen delays are encountered. This includes three months to design the system, three months for DTSC review, three months to obtain construction permits, six months to obtain well permit restrictions, and two months for construction (i.e., installing groundwater extraction wells, trenching, installing piping and wiring, and installing the treatment system). It is assumed that obtaining well permit restrictions would be completed concurrently with DTSC review and approval. Operation and maintenance of the treatment system are expected to continue for 3 years or longer.

Groundwater Use

The long-term effects of this alternative on future groundwater use will be beneficial because groundwater contaminants will be removed through treatment.

Environmental Impact

Short-term impacts would occur during construction of the system and may include increased traffic congestion, noise and dust from construction equipment used to drill the wells, dig trenches, and install the treatment system. Standard construction industry dust control measures, such as using water to wet down soil, will be used as necessary during construction of the trench and treatment system foundation. Noise and traffic impacts will be temporary and work will occur during business hours when most people are away from home.

Justification for Rejection or Selection

This alternative would result in some short-term environmental impacts during construction and system operation. Removal of contaminated groundwater would reduce the toxicity, mobility, and volume of contaminants in Operable Unit GW-2, thereby providing adequate protection of human health and the environment and providing for beneficial use of groundwater resources. Alternative 4 is also reasonably cost-effective. Therefore, this alternative was selected as the recommended remedial alternative for Operable Unit GW-2.

6.3.5.4 Recommended Remedial Alternative

The recommended remedial alternative for Operable Unit GW-2 is Alternative 4 (Extract, Treat, and Discharge). This alternative consists of extraction of contaminated groundwater, treatment of contaminated groundwater, and discharge of treated water to the sewer. Also included with this alternative are groundwater monitoring and restrictions on the number and type of permits for the drilling of groundwater wells during groundwater clean-up.

Justification for Selection

Alternative 4 was selected as the recommended remedial alternative for the following reasons:

- It will provide the greatest protection of human health and the environment.
- It will reduce the toxicity, mobility, and volume of contaminants.

- It uses proven technologies that are well tested and easy to implement.

- It is reasonably cost-effective.

- Short-term impacts during construction and system operation will be minor and would be outweighed by the long-term advantages of meeting Remedial Action Objectives for groundwater.

Following approval of this Draft Remedial Action Plan, a Remedial Action Design Work Plan will be prepared. It will provide detailed design specifications for the recommended remedial alternative for this Operable Unit. After the Remedial Action Design Work Plan is prepared, it will be submitted to the DTSC for review and approval. Design and construction activities associated with the recommended remedial alternative for Operable Unit GW-2 are discussed in Section 6.5.2.

6.4 REMEDIAL ACTION FOR SOIL OPERABLE UNIT S-5

Prior to completion of the additional investigation in the northeastern portion of Operable Unit S-5, a feasibility study analysis for this operable unit was planned based on the assumption that soil impacts present in that area would be considered to pose a threat to groundwater quality, human health, and/or the environment. However, data obtained from that additional subsurface investigation indicate that soil impacts do not pose a threat to human health. Groundwater impacts have not been fully characterized, but appear to be very limited. These minimal impacts to soil and groundwater may be further reduced by naturally occurring biodegradation. A formal feasibility study analysis was therefore not completed for this portion of the site.

In keeping with the recent findings, planned remedial action for Operable Unit S-5 will consist of the following:

- Diesel-impacted soil will be cleaned up to 1,000 mg/Kg;

- Providing and maintaining a cover over selected slag and/or metals-impacted soil, and removal of agreed-upon areas of slag;

- Further investigation of diesel hydrocarbon impacts in shallow groundwater; and

- If, after one year of groundwater monitoring, groundwater impacts are demonstrated, a focused feasibility study of remedial alternatives for groundwater will be performed. For the purpose of this Draft Remedial Action Plan, the preliminary clean-up level for diesel hydrocarbons in groundwater is 100 μg/L.

These proposed actions are discussed in greater detail in the following sections.

6.4.1 Remedial Action to Address Petroleum Hydrocarbons in Soil

As discussed in the Additional Subsurface Investigation Report (Dames & Moore, 1993b), petroleum hydrocarbons were reported (as diesel, kerosene, and lubricating oil) for soil samples collected from the northeastern portion of Operable Unit S-5 at concentrations ranging from 65 to 8,300 mg/Kg. The majority of reported detections were less than 2,000 mg/Kg. The area of impacted soil is estimated to have an aerial extent of approximately 10,000 square feet, and extends from approximately five feet below ground surface (bgs) into the saturated zone (up to 29 feet bgs). The areal extent of these impacts is shown on Figure 5.

Soil samples judged in the field to have the greatest concentrations of petroleum hydrocarbons were also analyzed for polycyclic aromatic hydrocarbons. Polycyclic aromatic hydrocarbons were not detected in any of the soil samples analyzed.

Based on the data, the diesel hydrocarbon clean-up level of 1,000 mg/Kg is also applicable in this operable unit. However, due to the nature of industrial activities ongoing in the active yard, the number of appropriate remedial technologies is limited. A pilot study to assess the feasibility of an in-situ treatment technology (such as bioremediation) will be performed. Prior to the pilot study, a Work Plan will be submitted to the DTSC for review and approval.

6.4.2 Remedial Action to Address Petroleum Hydrocarbons in Groundwater

During the additional subsurface investigation, diesel hydrocarbons were detected in three of six Hydropunch groundwater samples in the northeastern portion of Operable Unit S-5. Detections of diesel ranged from 0.29 to 2.9 mg/L in these three samples, and polycyclic aromatic hydrocarbons were not detected in any of the six groundwater samples (Dames & Moore, December 1993b).

Based on currently available data, groundwater impacts in the northeastern portion of Operable Unit S-5 appear to be limited to a small area (less than 7,000 square feet), and are contained within the UPRR property boundary (see Figure 8, Plume C). Furthermore, analytical data indicate that there are no carcinogenic or toxic constituents in groundwater in this area.

However, additional groundwater investigation and monitoring will be conducted in the northeastern portion of Operable Unit S-5. The investigation will consist of collecting of additional groundwater samples in the area of known impacts to verify the lateral extent of diesel hydrocarbons in shallow groundwater. Following the investigation, two piezometers and one groundwater monitoring well will be installed to evaluate the groundwater flow direction and gradient, and to enable long-term groundwater monitoring in this area. The monitoring well will be added to the quarterly groundwater monitoring program currently in effect.

Analysis parameters for groundwater samples will include diesel, gasoline, benzene, toluene, ethylbenzene, xylene, and polycyclic aromatic hydrocarbons. Although polycyclic aromatic hydrocarbons have not been reported for available groundwater samples, annual testing for these compounds will be included in the monitoring program because they are the primary constituents of concern with respect to diesel fuel contamination. If polycyclic aromatic hydrocarbons are consistently not detected, then the monitoring frequency for these constituents will be reduced. The purpose of monitoring groundwater in this area of Operable Unit S-5 is to evaluate groundwater quality against accepted health-risk criteria and Maximum Contaminant Levels.

After one year (four quarters) of groundwater monitoring, if impacts to groundwater are demonstrated, then a focused feasibility study of remedial alternatives to address these impacts will be performed. For the purposes of this Draft Remedial Action Plan, the preliminary clean-up level for diesel hydrocarbons is 100 μg/L and clean-up levels for other constituents will be as stated in Table 8.

6.4.3 Remedial Action to Address Slag and Metals Impacted Soil

As discussed in the report, Development of Remedial Action Levels (Dames & Moore, 1992b), the concentrations of metals detected in soil in Operable Unit S-5 do not exceed the calculated risk-based allowable exposure concentrations. This is conservative in that exposure point concentrations were calculated without considering the low bioavailability of the metals present in the slag. In addition, the following plan will be implemented to minimize airborne slag particulates:

- Track reballasting with rock will take place as part of an ongoing railyard operation and maintenance;
- Gravel cover will be maintained over exposed slag along non-rail (truck) traffic ways (the eastern portion of the active yard) to mitigate potential particulate emissions;
- The gravel cover will be periodically inspected and replenished as necessary;
- Exposed slag in the eastern portion of Operable Unit S-5 has been replaced with rock ballast as part of the slag removal Interim Remedial Measure in late 1993; and
- Air monitoring will be performed in the active railyard to evaluate the level of airborne particulates and concentrations of arsenic and lead in the particulates. Air monitoring will be performed on a quarterly basis during the dry season (April through October). If the results of air monitoring suggest that arsenic and lead concentrations in airborne particulates are elevated relative to background concentrations, then remedial action to

address the remaining slag in the active yard will be implemented before the end of sitewide soil remediation (1996).

6.5 REMEDIAL ACTION DESIGN AND CONSTRUCTION ACTIVITIES

This section describes activities which will take place after this Draft Remedial Action Plan is finalized, including pre-design, design, and construction activities. These activities are discussed in general terms, because many of the specific details are not yet known. After the Remedial Action Plan has been accepted as final, work will begin on a detailed Remedial Action Design Work Plan. The purpose of the Remedial Action Design Work Plan is to:

- Describe the remedial actions which have been selected to remedy soil and groundwater contamination at the site.
- Discuss soil and groundwater remedial pre-design activities that must be completed prior to initiation of remedial systems design and remedial actions.
- Provide a detailed description of how soil and groundwater treatment systems or activities will be designed.
- Provide a detailed schedule for site-wide remedial action including engineering design, construction, and operation and maintenance.

Typical elements of the Remedial Action Design, either included in the Work Plan or described in the Work Plan and provided as subsequent submittals, are listed below:

- Excavation Plan;
- Grading Plan;
- Transportation Plan;
- Sampling and Analysis Plan;
- Quality Assurance Project Plan; and
- Data Management Plan.

Recommended remedial alternatives for soil are discussed in Section 6.4.1, and groundwater recommended remedial alternatives are discussed in Section 6.4.2.

6.5.1 Recommended Remedial Alternatives for Soil

Soil Alternative 10 (Excavation and Off-Site Disposal of Soil Above Clean-Up Levels) was selected for soil Operable Units S-1, S-2, and S-3. The recommended remedial alternative includes excavating soil contaminated above the clean-up levels, loading excavated soil onto railcars or trucks and transporting it to an appropriately licensed and permitted landfill for disposal. It is anticipated that remedial action for soil in Operable Unit S-5 will consist of in-situ treatment. Initially, a pilot study will be performed. Design, construction, construction monitoring, and Health and Safety monitoring activities which will be performed are discussed in general terms below. Environmental impacts associated with construction activities are also discussed.

6.5.1.1 Design Activities

Areas of soil removal will be identified for each operable unit as part of the design activities associated with Alternative 10. Clean-up levels for each operable unit will depend on future land uses as identified in Section 6.1. Clean-up levels will be used together with soil contaminant distribution information collected during the Remedial Investigation to plan a series of excavation areas. It is anticipated that excavation areas will be similar in location and size to the areas shown on Figures 5, 6, 7, and 12. Engineering design for Alternative 10 will consist of planning soil excavation and transport activities and will include several design drawings, a construction specification, and other engineering documents. Products of engineering design may include the following:

- Excavation and Grading Plan drawings
- Identification of temporary on-site soil stockpile areas
- Equipment and material lists
- Contractor bid and performance specifications.

Because soil contamination at this site tends to be shallow and spread over relatively large areas, shoring of excavations to prevent cave-in is not expected to be needed. One exception to this is the Central Fill Area in Operable Unit S-2. The Central Fill Area contains debris and soil contamination to a depth of approximately 15 feet below the existing ground surface. Shoring or bracing may therefore be required in this area. In addition, the exact nature and location of all waste materials present in this area are not currently known. As mentioned previously, miscellaneous debris including drums have been encountered during remedial investigation of this area. Prior to beginning excavation activities in Operable Unit S-2, an attempt will be made to evaluate the area using **electromagnetic survey** or other **geophysical investigation** techniques to identify the location of potential metallic subsurface obstacles such as drums.

In addition to DTSC approval, soil remedial action activities at the site are expected to require other state and local agency permits. It is expected that the Sacramento Metropolitan Air Quality Management District will issue an air emissions permit. Also, grading and construction permits from the City of Sacramento Building Department will be needed. Other permits necessary for this project will be identified during preparation of the design documents.

6.5.1.2 Construction Activities

After the Remedial Action Design Work Plan and engineering design drawings and documents are completed and approved by the DTSC, construction activities will begin. Potential site remediation contractors will be asked to submit bids for site work. The bids will be evaluated, and a qualified contractor will be selected to perform the remedial activities. It is anticipated that site work and construction activities associated with Soil Alternative 10 will take place in the following order:

- The site will be **cleared and grubbed** (shrubs, trees, and debris will be removed and disposed off-site).

- An attempt will be made to locate subsurface hazards such as piping and drums (if present in the Central Fill Area) using electromagnetic surveying or other geophysical investigation techniques. Once located, these objects will be carefully excavated. If drums are found, each drum (except those which are empty and dry) will be placed in a protective overpack to prevent leakage. Following **waste characterization**, drums will be taken off-site for recycling or other disposal, as appropriate.

- Soil contaminated above the clean-up levels will be excavated and loaded onto railcars and/or trucks (depending on its destination) for transport off-site. Transport vehicles will be covered to prevent load loss during transit. The hazardous waste hauler(s) will be certified, and waste materials will be manifested and transported in accordance with applicable state and federal regulations.

- Temporary soil stockpiles will be covered as necessary to prevent wind-blown dust.

- Confirmatory soil samples will be collected from the walls and bottom of each excavation. These samples will be submitted to a laboratory for testing to assess residual contaminant concentrations after soil excavation. If statistical analysis of the test results indicates that the clean-up levels have been met, excavation will discontinue. Otherwise, additional excavation and sampling will continue until the desired clean-up levels have been reached. Sampling and analysis methods will be described in detail in the Sampling and Analysis Plan.

- Clean soil may be brought from an off-site location and placed in the excavations to restore grade and/or eliminate safety hazards, if needed. As the clean soil fill is placed in the excavations in thin layers, it will be compacted in accordance with specifications to reduce potential for settlement.

- The fence that currently surrounds the site will be maintained to prevent unauthorized access to the site during construction activities.

To limit the amount of dust generated by construction activities, water will be sprayed onto contaminated soil as needed until excavation and backfilling operations are finished.

6.5.1.3 Construction Monitoring

During construction activities, the quality of work will be inspected at appropriate intervals as specified in the Quality Assurance Project Plan and construction specifications. Several tests commonly used to measure compliance with construction specifications will be performed. These tests may include:

- Testing of imported fill for chemical constituents prior to placement.
- **Modified Proctor Test** (Moisture-Density Relationship) of clean soil fill used to backfill excavation pits.
- Testing **clean fill** after compaction to verify that the proper density has been achieved.

6.5.1.4 Health and Safety Monitoring

Site work activities may create a temporary increase in airborne dust and therefore a short-term health risk to the public and on-site workers. However, dust control measures will be used to minimize airborne dust and the potential threat to site workers and the public. Air monitoring will be conducted to measure potential dust emissions during remedial activities.

Air sampling will be conducted by a trained specialist during construction activities that could create airborne dust. Air sampling typically consists of collecting samples of airborne dust in the work area and at various other locations using low- or high-volume air samplers and/or monitoring fugitive dust levels using **real-time direct-reading instruments**. Samplers will be located upwind of the site to indicate normal background levels and downwind to capture emissions produced by the work activities. Samples will be tested regularly to assess levels of contaminated dust.

If levels of dust or contaminants of concern (lead, arsenic, and/or asbestos) exceed allowable levels established in the **Site Health and Safety Plan** or permit requirements, construction will be stopped and work methods modified so that dust and/or airborne contaminants are reduced to acceptable levels. If the wind speed rises above limits set in the Site Health and Safety Plan or existing permits, construction work will stop until the wind dies down to an acceptable speed. If necessary, site workers may be required to use **personal protective equipment** (such as air-purifying respirators and protective suits) to prevent breathing and/or swallowing contaminated dust and to prevent contamination of clothing and skin. Signs will be posted around the site to inform the public of potential health and safety risks.

Prior to initiation of site work, the DTSC will be informed in writing of additional monitoring required as a result of permit restrictions. These will also be incorporated into the Site Health and Safety Plan and/or the Remedial Action Design Work Plan. On-site personnel will be properly trained in accordance with the **Occupational Safety and Health Act**, will participate in a **medical surveillance**

program, and will be equipped with personal protective equipment as specified in the Site Health and Safety Plan. Workers will be checked frequently during site work to verify compliance with the Site Health and Safety Plan.

6.5.1.5 Environmental Impacts

Implementation of the recommended remedial alternative will likely create short-term environmental impacts caused by construction activities. These impacts are expected to include increased noise, truck traffic, and dust emissions on the site and in the vicinity. The impact of noise and traffic will be temporary, and site work will be limited to daylight hours during the week when most people are away from their homes. Dust emissions will be mitigated through the use of standard construction industry dust control measures.

The only long-term environmental impact associated with Alternative 10 is the need to restrict future land uses in Operable Units S-1 and S-2. Redevelopment plans for these areas must incorporate engineered controls to prevent exposure to the relatively low levels of contamination that will be left in place after clean-up. Future land use in Operable Unit S-3 will be unrestricted after remediation is complete.

6.5.2 Recommended Remedial Alternatives for Groundwater

Groundwater Remedial Alternative 4 (Extract, Treat, and Discharge) was selected as the recommended remedial alternative for groundwater Operable Units GW-1 and GW-2. Alternative 4 includes pumping contaminated groundwater to a treatment unit, treating the water to remove contaminants, and discharging the treated groundwater to the City sewer. Design, construction, monitoring, and Health and Safety monitoring are discussed in general terms below. Environmental impacts associated with construction activities are also discussed.

6.5.2.1 Design Activities

Design of the extraction system will include selecting the optimum location for extraction wells. Well locations should optimize groundwater extraction while minimizing adverse impacts to the surrounding community. Location of wells will also consider the best possible route for the trench that will carry piping and wiring between off-site wells and the on-site treatment system. Other important elements of system design will be safeguards to prevent untreated water from accidentally being discharged to the sewer and automatic controls to shut the system down if flow within the sewer exceeds its design capacity.

Design of the treatment system will include selecting a treatment unit of sufficient size to accommodate the flow of groundwater from the extraction wells. The engineering design of the system may include several design documents and drawings which will be incorporated into the Remedial Action Design Work Plan. These documents may include the following:

- Trench design drawings
- Treatment system pad and enclosure design drawings
- Treatment system design drawings
- Extraction well design drawings
- Piping design and layout drawings
- Existing infrastructure drawings
- Equipment and materials list
- Subcontractor bid and performance specifications.

Appropriate permits will be obtained for system construction and discharge of treated groundwater. These permits may include but not be limited to: building permits, well drilling permits, sewer discharge permits (allowed flow rates, discharge location, and contaminant concentrations), air permits (if an air stripper is used), and an agreement with the City of Sacramento to permit use of the City sewer system. Additionally, water supply well installation permit restrictions will be developed for DTSC review and approval. Water supply well permit restriction will prohibit new supply wells within the contaminant plumes until groundwater remediation is complete.

6.5.2.2 Construction Activities

After the Remedial Action Design Work Plan is prepared, it will be submitted to the DTSC for review and approval. Potential groundwater remediation system contractors will be asked to submit bids for construction and installation of the groundwater treatment system. The bids will be evaluated, and a qualified contractor will be selected to perform the work. Construction activities will begin only after DTSC approval is received. Construction of different parts of the system will probably be concurrent and include the following:

- Extraction well installation
- Trench excavation, piping and wiring installation, and trench backfilling
- Installation of a foundation pad and enclosure for the treatment system
- Installation of the treatment system
- Installation of piping to the discharge point.

Once the system is completed, it will be tested over a period of about two months to evaluate its performance. Flows from different wells may be adjusted, treated water will be sampled to make sure the system is working properly, and safeguards will be tested to ensure that they also are working properly. This initial operation period is commonly called "system start-up".

6.5.2.3 Construction Monitoring

During construction, quality of the work will be periodically inspected. Inspections will include review of extraction well construction, trenching, treatment system foundation and enclosure construction, and piping and wiring tests.

6.5.2.4 Health and Safety Monitoring

Site work activities may create a temporary increase in airborne dust. However, site work for groundwater remediation will be much less extensive than work required for soil remediation, and the potential for exposure to site workers and the public is not considered significant. As a safety precaution, dust control measures will be used to control visible dust emissions from the site, if necessary.

On-site personnel will be properly trained in accordance with the Occupational Safety and Health Act, will participate in a medical surveillance program, and will be equipped with personal protective equipment as specified in the Site Health and Safety Plan. Workers will be checked frequently during site work to verify compliance with the Site Health and Safety Plan.

6.5.2.5 Environmental Impacts

Implementation of this alternative will result in short-term impacts due to construction activities. Short-term impacts are expected to include increased traffic congestion, noise, and dust from construction equipment used to drill wells, dig trenches, and install the treatment system. Noise and traffic impacts will be temporary and limited to daylight hours when most people are away from their homes.

6.6 REGULATORY COMPLIANCE

DTSC guidelines for preparation of Remedial Action Plans (Department of Health Services, 1987), call for an evaluation of the consistency of the recommended remedial alternatives with the Health and Safety Code, and for the incorporation in the Remedial Action Plan of any applicable Resource Conservation and Recovery Act (RCRA) or California Code of Regulations (CCR) Title 22 technical and administrative requirements. Furthermore, compliance of the Remedial Action Plan and recommended remedial alternatives with the Comprehensive Emergency Response and Clean-up Liability Act (CERCLA) Section 101(24) requirements must be briefly discussed, as well as development of a health and safety plan for remediation workers and its consistency with California Occupational Safety and Health Administration (CAL-OSHA) regulations. The following sections address these issues.

6.6.1 Health and Safety Code Section 25356.1(c)

Subdivision (c) of Chapter 6.8, Section 25356.1 of the Health and Safety Code states that Remedial Action Plans for sites on the Hazardous Substance Account or Hazardous Substance Clean-up Fund list must be prepared and approved in a manner consistent with Title 40 of the Code of Federal Regulations (CFR), Section 300.61 et seq (National Oil and Hazardous Substances Pollution Contingency Plan) and amendments thereto. It also states that Remedial Action Plans must consider all of the following:

- The health and safety risks posed by conditions of the site
- The effect of contamination upon present, future, and probably beneficial uses of resources
- The effect of alternative remedial action measures on reasonable availability of groundwater resources for present, future, and probable beneficial uses
- Site-specific characteristics including off-site migration, surface and subsurface soil and hydrogeological conditions
- Cost-effectiveness of alternative remedial action measures
- Potential environmental impacts of alternative remedial action measures.

The Feasibility Study (Dames & Moore, 1991b), Addendum Feasibility Study (Dames & Moore, 1991d), Feasibility Study Supplement (Dames & Moore, 1992c), and this Draft Remedial Action Plan have considered all of the above-mentioned factors in detailed analyses of final candidate alternatives and selection of the recommended remedial alternative for each operable unit.

6.6.2 40 CFR 260-270 and CCR Title 22 Applicable Requirements

6.6.2.1 Soil Remediation

A hazardous waste facility is defined as a facility used for the treatment, transfer, storage, disposal, or recycling of hazardous waste (22 CCR 66260.10). Because the site does not meet this definition based on historical facility operations, and because the recommended remedial alternatives do not propose the creation of such a facility, federal and state requirements for a hazardous waste facility are not applicable. However, should hazardous wastes be generated during remediation activities, federal and state requirements for hazardous waste management as specified for generators and transporters will apply.

The Remedial Action Design Work Plan will describe methods to be used to determine whether soils are classified as hazardous waste. Soil classification will comply with all appropriate regulatory requirements contained in 40 CFR Part 261 and CCR Title 22, Section 66261.

The Remedial Action Design Work Plan will also describe actions to be taken to package, manifest, and transport soils determined to be hazardous waste. These actions will comply with all appropriate regulatory requirements contained in 40 CFR Part 262 and Section 66262 of CCR Title 22.

40 CFR, Part 268 and CCR Title 22 Section 66268 impose land disposal restrictions on hazardous waste. Prior to landfilling hazardous wastes, the regulations specify that wastes must be treated to meet prescribed standards. To determine the applicability of these regulations (including potential treatment standards) to contaminated soil in Operable Units S-1, S-2, and S-3, additional analytical studies will be performed. The results of this work will be submitted to the DTSC as part of the Remedial Action Design Work Plan. If the contaminated soil is subject to the land disposal restrictions, the Remedial Action Design Work Plan will contain a strategy for compliance with these regulations.

6.6.2.2 Groundwater Remediation

Technical and administrative requirements of 40 CFR and Title 22 of CCR which are applicable to recommended remedial alternative for Operable Unit GW-1 include:

- 40 CFR 262.30-34/22 CCR 66262.30-34 (Pre-transport Requirements)
- 40 CFR 268.43/22 CCR 66268.43 (Treatment standards expressed as waste concentration)
- 40 CFR 141.61/22 CCR 64444.5 and 64473 (Maximum contaminant levels for organic contaminants)
- 40 CFR 141.50 (Maximum contaminant level goals for organic contaminants)
- 40 CFR 264.601/22 CCR 264.601 (Environmental Performance Standards)
- 22 CCR 66270.60 and 67450 (Permits by Rule for Transportable Treatment Unit (TTU))
- 22 CCR 66747 67450.11 (List of Approved Treatment Process, Influent Waste Streams).

The recommended remedial alternatives for GW-1 and GW-2 have been developed and selected to be in compliance with all of the regulations listed above. The manner in which the installation, operation, and maintenance of these alternatives will comply with these regulations will be described in the Remedial Action Design Work Plan.

6.6.3 CERCLA Section 101 (24)

Section 101 (24) of CERCLA states that the terms "remedy" or "remedial action" are those actions which are consistent with a permanent remedy taken and which prevent or minimize the release of hazardous substances so that they do not migrate or cause substantial danger to present or future health or welfare or the environment. The use of these terms in this Draft Remedial Action Plan is consistent with this definition.

6.6.4 Health and Safety Plan

29 CFR Section 1910.120(b)(4) requires that a site-specific Health and Safety Plan be developed and implemented during construction and maintenance of any remediation at sites containing hazardous substances. The Health and Safety Plan must assign responsibilities, establish personnel protection standards and mandatory safety procedures, and provide for contingencies that may arise while operations are being conducted at the site. To comply with these requirements, a Site Health and Safety Plan will be developed as part of the Remedial Design Work Plan and submitted to the DTSC for review. The main components of the Site Health and Safety Plan will include:

- Names of key personnel and alternates responsible for site safety and health, and appointment of a Site Safety Officer.
- Safety and health risk monitoring during excavation, backfilling, and other construction activities.
- Employee training assignments.
- Medical surveillance requirements.
- Frequency and types of air monitoring, personnel monitoring, and contaminant sampling techniques.
- Site control measures.
- Decontamination measures.

- A contingency plan meeting the requirements of paragraph (1) (1) and (1) (2) of Section 29 CFR 1910.120 for safe and effective responses to emergencies including necessary personal protective equipment.

6.6.5 California Environmental Quality Act (CEQA)

The proposed remedial strategy is not expected to cause significant adverse environmental impacts. The DTSC will prepare a Negative Declaration pursuant to the California Environmental Quality Act and distribute it to state and local government agencies for review and comment. A Negative Declaration is a written statement briefly describing the reasons a proposed project will not have a significant impact on the environment and does not require preparation of an environmental impact report.

7.0 IMPLEMENTATION SCHEDULE

7.1 SOIL REMEDIATION

The preliminary implementation schedule for recommended remedial alternatives for Soil Operable Units S-1 through S-5 is presented on Figure 18. The total time (from issuance of the Final Remedial Action Plan to end of construction activities) needed to implement the recommended remedial alternatives for Operable Units S-1, S-2, S-3, and S-5 is estimated to be approximately 22 months. Operable Unit S-4 is not included in the implementation schedule because remedial action for this Operable Unit was completed under an Interim Remedial Measure in 1991.

Remedial activities will start with preparation of a Remedial Action Design Work Plan. Work on the Remedial Action Design Work Plan is scheduled to begin immediately after approval of the Final Remedial Action Plan by DTSC. Preparation of the Remedial Action Design Work Plan is expected to take approximately six months. DTSC review and approval of the Remedial Action Design Work Plan is expected to take approximately two months. Completing design documents, obtaining necessary construction permits, procuring equipment, and mobilizing crews and equipment to the site should take approximately five months after receiving DTSC approval of the Remedial Action Design Work Plan.

Implementation times presented in this Revised Draft Remedial Action Plan were estimated based on the assumption that all on-site activities will take place 8 hours per day, 5 days per week. It was also assumed that an average of 1,000 tons of soil can be excavated and loaded onto transport vehicles (railcars and/or trucks) every day. This was based on the assumption that more than one excavation will be underway at a given time, and is subject to modification during remedial design for soil operable units.

In preparing the implementation schedule, it was assumed that no significant delays would result from soil sampling or analysis activities, and that the type and concentration of contaminants encountered will be the same as those discovered during the Remedial Investigation. It should be noted that any of the following events could delay completion of excavation activities:

- The occurrence of excessive dust or vapor emissions or wind speeds above an established threshold, requiring a work stoppage.
- Permitting delays.
- Modification of the staging area locations or the scheduling of trucks or railcars.
- Excavation of a larger volume of soil than is specified in the Feasibility Study Supplement (Dames & Moore, 1992c and 1993).

Because several details will not be known until completion of the Remedial Action Design Work Plan and pre-design activities, a revised schedule will be submitted to the DTSC as new information becomes available.

7.2 GROUNDWATER REMEDIATION

As discussed in Section 2.1.7, clean-up of Groundwater Operable Units GW-1 and GW-2 began in 1993 as Interim Remedial Measures. The Operable Unit GW-1 Interim Remedial Measure is currently operating. An air stripper groundwater treatment unit with an activated carbon vapor recovery system was installed in the southeast area of the site. Two existing on-site wells are being pumped, and contaminated water flows through underground pipes into the treatment unit. The treated groundwater is being discharged to the City sewer.

The GW-2 Interim Remedial Measure is planned for early 1994. A pump will be installed in one of the existing wells in the southern area of the site. Extracted groundwater will be routed through underground piping to the GW-1 treatment unit.

If the groundwater treatment system is effective in meeting the goals of the Interim Remedial Measures, final remedial action for groundwater may consist primarily of installing a separate off-site treatment system at the toe (end) of the GW-1 groundwater plume.

The preliminary implementation schedule for recommended remedial alternatives for Operable Units GW-1 and GW-2 is presented on Figure 18. Total time (from issuance of the Final Remedial Action Plan to the end of construction activities) required to implement groundwater remediation is estimated to be approximately 17 months.

Predesign activities are scheduled to begin during development of the Remedial Action Design Work Plan, and are expected to take approximately seven and one-half months. Remedial action design for Operable Unit GW-1 will begin upon completion of predesign activities and approval of the Remedial Action Design Work Plan, and is expected to take about five months. Final system construction is expected to take about five months. Remedial action for Operable Unit GW-2 will proceed as an interim remedial measure, subject to DTSC approval of the Design Work Plan.

Implementation times for remedial action construction were estimated based on an 8-hour work day, 5 days per week. Construction implementation times were estimated using the following assumptions:

- One groundwater monitoring well can be installed in two days.

- 250 feet of utility trench with necessary piping and wiring can be installed per day.
- Five days will be required for treatment system installation.

Some activities listed above may be performed concurrently.

It was assumed that no significant delays will be encountered during construction and that the type and concentration of contaminants encountered will be the same as those discovered during the Remedial Investigation. It should be noted that permitting delays or discovery of unforeseen subsurface obstacles during utility trench construction will delay the completion of construction activities. Because several details will not be known until completion of the Remedial Action Design Work Plan and design documents, a revised schedule will be submitted to DTSC as new information becomes available.

8.0 NON-BINDING PRELIMINARY ALLOCATION OF FINANCIAL RESPONSIBILITY

8.1 INTRODUCTION

Section 25356.1 of the California Health and Safety Code states that Remedial Action Plans shall include "a non-binding preliminary allocation of responsibility among all identifiable Potentially Responsible Parties at a particular site, including those parties which may have been released, or may otherwise be immune from liability pursuant to this chapter or any other." This section of the Draft Remedial Action Plan provides a proposed preliminary allocation of responsibility.

California Health and Safety Code Section 25323.5 defines responsible party to mean those persons described in Section 107(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). According to CERCLA, the following parties are potentially liable for the costs of remedial actions at hazardous waste sites:

1. The owner and operator of a facility

2. Any party who, at the time of disposal of any hazardous substance, owned or operated any facility at which such hazardous substances are disposed

3. Any party who by contract, agreement, or other manner arranged for disposal or treatment of hazardous substances owned or possessed by such party or by any other party or entity, at any facility owned by another party or entity and containing such hazardous substances

4. Any party who accepts or accepted any hazardous substances for transport or disposal; treatment facilities or sites selected by such party from which there is a release of a hazardous substance or a threatened release which causes response costs to be incurred.

After the DTSC issues the final Remedial Action Plan pursuant to Section 253566.1(d), any Potentially Responsible Parties with aggregate alleged liability in excess of 50 percent of the costs of the removal and remedial action may convene an arbitration proceeding pursuant to Section 25356.3 by agreeing to submit to binding arbitration. If an arbitration panel is convened, any other Potentially Responsible Parties may also elect to submit to binding arbitration.

Section 25256.3(c) of the Health of Safety Code states that the arbitration panel is to apportion liability based on the following factors:

1. The amount of hazardous substance for which each party may be responsible

2. The degree of toxicity of the hazardous substance

3. The degree of involvement of the Potentially Responsible Parties in the generation, transportation, treatment, or disposal of the hazardous substance

4. The degree of care exercised by the Potentially Responsible Parties, with respect to the hazardous substances, taking into account the characteristics of the substance

5. The degree of cooperation by the Potentially Responsible Parties with federal, state, and local officials to prevent harm to human health and the environment.

8.2 IDENTIFICATION OF POTENTIALLY RESPONSIBLE PARTIES

Historical information indicates that the Western Pacific Railroad operated a railroad maintenance yard at the site commencing in 1910. From 1910 through the mid-1950s, the site was used primarily for maintaining and rebuilding steam locomotives, boilers, refurbishing rail cars, and assembling trains. During the mid-1950s, diesel engine repair and maintenance began. In 1982 UPRR acquired WPRR. UPRR discontinued railroad maintenance operations at the site in 1983, and remaining railroad maintenance buildings and structures on the site were demolished by UPRR in 1985 and 1986.

8.3 NON-BINDING PRELIMINARY ALLOCATION

Given that during the approximately 70 to 80 year operating history of the Sacramento Yard, WPRR owned and operated the facility for a total of at least 72 years, it is likely that WPRR generated, transported, treated and/or disposed of as much as 99 percent of the hazardous substances which are present at the site. Since UPRR owned and operated the facility for only one year, it is probable that UPRR's contribution of hazardous substances is minimal. However, WPRR as a corporate entity ceased to exist when purchased by UPRR. Therefore, UPRR is responsible for all hazardous substances at the site.

This allocation of responsibility is non-binding and preliminary. Parties assigned responsibility have various options for challenging the allocation. Based on the foregoing information, UPRR is allocated 100 percent of the financial responsibility for the hazardous substances which are at the site.

9.0 OPERATION AND MAINTENANCE REQUIREMENTS

9.1 SOIL REMEDIATION

Recommended remedial alternatives for each of the soil Operable Units in the inactive portion of the site (Operable Units S-1, S-2, and S-3) consist of excavation and off-site disposal of soil contaminated above the DTSC-approved clean-up levels. After final remedial action is complete, long-term maintenance of the site will not be needed. Therefore, post-construction activities will be associated only with inspection and repair of the existing fence around the site, as necessary.

The recommended remedial alternative for Operable Unit S-4, which has already been implemented, involved off-site disposal of soils with contaminant concentrations exceeding the Remedial Action Objectives and does not require any maintenance or monitoring following remediation.

9.2 GROUNDWATER REMEDIATION

Recommended remedial alternatives for GW-1 and GW-2 include groundwater extraction, treatment and discharge. Groundwater monitoring would be conducted during the remedial action (3 to 30 years, depending upon several factors). Because the recommended remedial alternatives for Operable Units GW-1 and GW-2 are the same (Alternative 4), operation and maintenance requirements will be essentially the same. Operation and maintenance for the groundwater operable units are therefore discussed together. Specific operation and maintenance requirements for the system or systems used to remediate Operable Units GW-1 and GW-2 will depend on the treatment technology and pumping rates selected. General operation and maintenance needs are discussed below.

If necessary, a long-term groundwater monitoring and maintenance plan will be prepared for groundwater in Operable Unit S-5. The monitoring and maintenance plan will identify specific monitoring parameters and frequency. Monitoring and maintenance reports will be submitted to the DTSC annually. If applicable, an operation and maintenance plan will be prepared and implemented for in-situ remediation of diesel hydrocarbon impacts soil in Operable Unit S-5.

9.2.1 Post-Construction Activities

System Operation

Each well will have a submersible electric pump to extract groundwater. Controls will be used to monitor the operation of each pump and of the treatment system. Controls will include safeguards to prevent discharge of untreated water to the sewer. In addition, any loss in pressure as a result of a leak of underground piping will automatically cause the pump to shut off. If required to preserve storm drain capacity during storm events, the treatment system will be designed to shut down automatically during rain storms.

System Maintenance

Groundwater treatment systems would be operated 24 hours a day. After the initial start-up period for an air stripper, maintenance would be minimal and will include sampling of the treated effluent and periodic shutdown and cleaning of the air stripper. Maintenance of a UV-oxidation system (if selected) would include periodic cleaning and/or replacement of ultraviolet lights when they burn out. Maintenance of a granular activated carbon system would be greater than for either of the other two systems and would include replacement of used carbon on a regular basis. Carbon is typically contained in large vessels. Each carbon vessel would be replaced periodically, depending on how quickly the adsorptive capacity of the carbon is used up. Major factors influencing carbon life are groundwater contaminant concentrations and total flow of contaminated water into the treatment unit.

Inspection

A **Site Supervisor** will be designated within 30 days of DTSC approval of the Remedial Action Design Work Plan. A letter identifying the designated Site Supervisor and specifying the rationale for choosing him or her will be sent to the DTSC. This selection will be subject to DTSC review and approval.

The Site Supervisor's responsibilities will include immediately reporting to DTSC unusual operating conditions, such as high or low pressure, burnt-out UV light bulbs, etc. The Site Supervisor will also be responsible for making sure that the treatment system is checked every time samples of treated effluent are collected. He/she will be responsible for the preparation and submittal of an annual inspection report to the DTSC. This report will detail the results of inspections, unusual conditions discovered, and repairs undertaken (including their location and extent).

Replacement

Although it is assumed that extraction pumps may require periodic replacement, it is also assumed that whatever treatment system is used, its components will require minimal replacement. Replacement of one or more extraction pumps is expected to occur every 5 to 10 years.

Monitoring

Groundwater Alternative 4 provides for two kinds of monitoring during groundwater clean-up:

- Sampling and testing the quality of groundwater using existing monitoring wells.
- Sampling and testing the quality of groundwater before it enters the treatment system, and treated effluent before it is discharged into the sewer.

On-going groundwater quality monitoring will include collecting samples from approximately 30 monitoring wells located both on- and off-site. Representative groundwater samples will be submitted to an analytical laboratory and tested to assess levels of the contaminants of concern (nickel, volatile organic compounds, and volatile aromatic compounds. Groundwater monitoring is expected to continue for several years (or until groundwater clean-up is completed).

To monitor the performance of the treatment system, samples of treated effluent will be collected from the treatment unit and tested. Treated effluent will be submitted to an analytical laboratory and tested to measure levels of the contaminants of concern (nickel, volatile organic compounds, and volatile aromatic compounds). The frequency of effluent testing will depend on the type of treatment used. If air stripping or UV-oxidation is selected, treated effluent would be tested every week for the first three months, then every month for the next three months, and finally, every three months for the next several years, depending on the number of wells and total flow rate into the treatment unit.

If a granular activated carbon system is used, more frequent testing may be required because the efficiency of carbon decreases over time. Testing will occur frequently enough to assess when the carbon canisters need to be changed. Treated effluent testing may be done as often as every four days (for flows of 200 gallons per minute) or every 15 days (for flows of 20 gallons per minute) if granular activated carbon is used.

9.2.2 Cost of Post-Construction Activities

The cost of operation and maintenance of groundwater treatment depends on the type of system used, the number of extraction wells, and the total flow into the treatment unit. The yearly cost of system operation and maintenance and groundwater monitoring for both operable units is expected to range from approximately $77,000 to $96,000.

9.2.3 Performance Assurance

A groundwater monitoring report and a report describing system operation and maintenance, including the results of analysis of treated effluent, will be submitted on a yearly basis to the DTSC. These reports will demonstrate that UPRR has conducted all post-construction activities specified in this Draft Remedial Action Plan.

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GLOSSARY

11.0 GLOSSARY

11.1 INTRODUCTION

The purpose of the glossary is to provide definitions for words which may be unfamiliar to the reader. Some of the words used in this Draft Final Remedial Action Plan have specific meaning for certain technical specialists which may not be apparent to people unfamiliar with the specialty. In this glossary, words having special technical meaning are defined using the technical meaning. The technical specialty with which the word is associated is included in brackets ([ ]) at the beginning of the definition. Site-specific references are included where appropriate.

11.2 DEFINITIONS

Abandon(ment) [GEOLOGY, ENGINEERING] — Refers to the practice of closing or sealing a well, mine shaft, or other underground feature such as piping. Well abandonment is performed using industry-accepted and/or agency-required procedures and usually includes filling the well casing with cement grout.

Adsorbed [CHEMISTRY) — See **adsorption.**

Adsorption [CHEMISTRY] — The process through which molecules (or small particles) of one substance become attached to particles of another substance. Metals dissolved in groundwater can become **adsorbed** to clay particles. Adsorption can also be used to remove organic contaminants from air or water using activated carbon or other similar material.

Advection [HYDROGEOLOGY] — The process through which contaminants move in groundwater in the direction of groundwater flow.

Air Stripper [ENGINEERING] — Equipment designed to remove groundwater contaminants by enhancing the circulation of an air flow through water. **Volatile** compounds turn into vapor form, and are removed from groundwater in the form of contaminated air. If necessary, the contaminated air can be treated to remove or destroy the contaminants before release to the atmosphere.

Ambient — Pertaining to the natural (undisturbed) environment. In site-specific terms, ambient air quality refers to normal air quality in the site vicinity, excluding any impacts to air quality which may be due to conditions at the site. Ambient air quality may be poor in some areas due to environmental pollutants from a variety of sources.

Analysis — A method of determining a scientific fact. Depending on the goal, analysis may involve the use of mathematical calculations, laboratory testing, or the application of critical thinking skills and specialized knowledge.

Applicable or Relevant and Appropriate Requirements (ARARs) — Federal, state, or local regulatory standards, requirements, criteria, or limitations that are determined legally to be applicable or relevant and appropriate. Under the Comprehensive Environmental Recovery, Compensation, and Liability

Act, remedial action at Superfund sites must comply with the ARARs which have been identified for each site.

Assemblage [GEOLOGY] — A readily identifiable natural grouping of geologic features, such as sedimentary layers, which are correlatable from one area to another.

Backfill(ing) [ENGINEERING, GEOLOGY] — Material used to fill a man-made hole or trench (such as soil, gravel, concrete); the act of placing backfill.

Background Concentration [GEOLOGY] — The concentration of a chemical in areas surrounding the site which have presumably not been affected by site activities. Many toxic chemicals are found naturally in soil and water. The types and concentrations of chemicals normally found in soil and water varies regionally. In some areas, normal background concentrations of chemicals in soil or water can pose a health risk.

Ballast [ENGINEERING] — Coarse gravel or crushed rock laid down to form a structural base for railroad tracks.

Basin [GEOLOGY, HYDROLOGY] — Topographic (surface) feature or subsurface structure that is capable of collecting, storing, and discharging water. A lake is an example of a basin. A groundwater basin is a contiguous underground feature of soil, sediments, and/or fractured rock where groundwater collects. The Central Valley is one groundwater basin composed of thick sediment deposits.

Bioavailable [TOXICOLOGY] — The degree to which a chemical is capable of being effectively absorbed by human or animal organ systems, once taken into the body through ingestion, inhalation, or other pathways.

Biological Receptors [TOXICOLOGY] — Organisms (such as people, animals and plants) that can be affected by a substance or material if exposed by breathing, swallowing, and/or skin contact.

Bunker Fuel — A heavy residual petroleum oil used for fuel by ships, industry, and large-scale heating and power production installations.

By-Product — Something produced in the making of something else.

California Environmental Quality Act (CEQA) — A group of state regulations and procedures which agencies and developers must use to assess the environmental impacts of a proposed land development project or land use.

California Natural Diversity Data Base [BIOLOGY, NATURAL SCIENCE] — A computerized data base of rare, threatened or endangered species together with the location of potential and known habitat and last known sightings. The Natural Diversity Data Base is maintained by the California Department of Fish and Game.

Capital Costs [ECONOMICS, BUSINESS] — Costs for equipment, or improvement or additions to a property or facility.

Carbon Adsorption [ENGINEERING, CHEMISTRY] — A physical contaminant removal process using granular activated carbon which, because of its large surface area, has the ability to trap and remove organic contaminants from air or water.

Carcinogenic [TOXICOLOGY] — cancer-causing

Chemical Analysis [CHEMISTRY] — Testing to evaluate the presence and concentration of chemical substances. Chemical analysis usually refers to precise special tests performed in a laboratory, but some test kits are available which allow less precise results outside of a laboratory setting.

Claypan [GEOLOGY, ENGINEERING] — A layer of compact, very stiff to hard, non-cemented clay. Claypan usually impedes the flow of water.

Clean Fill — A construction term referring to clean material (usually soil and/or gravel) used to fill an excavation or depression, or raise ground surface elevation on a site.

Clean-up — Action taken to deal with a release or threatened release of hazardous substances that could affect human health and/or the environment.

Clear and Grub — A construction term referring to removal of unwanted trees, shrubs, weeds, and debris or trash from a property.

Climatology — The study of the regional variation of weather patterns over many years.

Coliform Bacteria [MICROBIOLOGY] — Type of bacteria often found in human and animal feces. May cause illness if ingested. Possible sources of coliform bacteria in groundwater include livestock feed lots, inadequate septic systems, and sewer leaks.

Compliance (Regulatory Compliance) — The act of obeying a regulation or law.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) — Provides for liability, compensation, clean-up, and emergency response for hazardous substances released into the environment and clean-up of inactive hazardous waste disposal sites.

Conservative Assumptions — Conservative assumptions are assumptions that tend to produce a worst-case estimate. The Health Risk Assessment methodology developed by the United States EPA uses conservative assumptions to estimate human health risks posed by environmental contaminants. The term may also be applied to cost estimates or other technical estimates (such as contaminant transport rates).

Contaminant Mobility [HYDROGEOLOGY, HYDROLOGY] — the ability of a contaminant to move through air, soil, surface water, or groundwater.

Contaminant — A substance which is present at a concentration greater than normal (background concentration) in air, soil, or water; a pollutant.

Criterion — A standard, rule, or test, forming the basis for a decision or judgment. The plural is **criteria**.

Degreaser — A solvent used to remove grease from machinery or equipment.

Demography — The statistical study of human populations.

Dermal Contact [TOXICOLOGY] — Touching or allowing the skin to come into contact with contaminated material (such as soil and/or groundwater). A type of exposure pathway.

Dilution - [CHEMISTRY] The process of reducing the concentration of a solution. Dilution of contaminated groundwater occurs naturally as a contaminant plume migrates into uncontaminated groundwater.

Dispersion [CHEMISTRY] — The process of breaking up or scattering. Dispersion of soil contaminants can occur due to small particles of contaminated material being carried by wind.

Dissolution Kinetics [CHEMISTRY] — The chemical and physical circumstances under which chemicals become dissolved. A study of dissolution kinetics would include identifying potential solvents and running a series of laboratory tests to assess how well the target chemicals dissolve in them. Temperature and pH can also have an effect on how soluble a chemical will be in a given solvent.

Downgradient [GEOLOGY, HYDROLOGY] — The direction in which the elevation of the water table declines relative to another location. Groundwater flows in the downgradient direction similar to the way surface water flows downhill.

Downwind — The direction in which air travels relative to another location. If a person stands downwind of an odor source, he or she will likely be able to detect the odor.

Effluent [ENGINEERING] — An outflow or discharge of wastewater. Treated effluent is wastewater that has been treated to achieve a water quality standard. Water quality standards for treated effluent vary, depending on the ultimate fate of the effluent.

Electromagnetic Survey [GEOLOGY, ENGINEERING] — A field investigation technique using an instrument which measures magnetic fields in order to locate or detect the presence of underground metallic objects, such as piping, tanks, or drums.

Electroplating [CHEMISTRY] — A process through which a dissolved metal is removed from a solution by electric current and deposited on the article to be plated.

Environmental Impacts — Effects on the environment. These impacts can be either negative (adverse) or positive (beneficial).

Estimated Lifetime Cancer Risk [TOXICOLOGY] — The sum of all calculated cancer risks a given receptor will experience in a lifetime. Used to estimate the likelihood that cancer will result from known exposures. Estimated Lifetime Cancer Risk is usually presented as a ratio, such as one in one million. This means that for every one million receptors experiencing the same exposure during their lifetime, it is estimated that one of them will contract cancer caused by that exposure.

Exposure Pathways [TOXICOLOGY] — The potential means of exposure to contaminants. These may include ingestion, inhalation, or direct contact with contaminants.

Exposure Scenarios [TOXICOLOGY] — The activities or circumstances which may cause receptors to be exposed to contaminants.

Extraction Well [GEOLOGY, ENGINEERING] — A groundwater well used to remove or extract groundwater from the subsurface. Often, the water is extracted by a pump placed in the well.

Feasibility Study — An engineering study used to identify and evaluate alternative ways of cleaning up contaminants or reducing significant health risks at a site. Alternatives are analyzed based on a variety of criteria, and ranked based on their ability to achieve the clean-up goals in a cost-effective manner. The selected alternative is the alternative that offers the most benefits, while incurring the fewest adverse impacts.

Final Candidate Alternatives — Under CERCLA Feasibility Study guidance, final candidate alternatives are the ones that survived screening and were selected for detailed analysis in the Feasibility Study.

Flood Plain Deposits [GEOLOGY] — Fine-grained sediments (clays, silts, and fine sands) deposited adjacent to a river channel when a river overflows its banks during a flood stage.

Flora [BIOLOGY] — Plants.

Food Chain [BIOLOGY] — A succession of organisms in a community that make up a feeding chain in which food energy is transferred from one organism to another as each consumes a lower member and in turn is preyed upon by a higher member.

Forbes [BIOLOGY] — Herbaceous plants other than grass. Usually found in fields or meadows.

Geophysical Investigation [GEOLOGY] — Subsurface exploration (either from the surface or in a borehole) that relies upon the relative physical properties of rock and soil to assess subsurface conditions. Ground-penetrating radar is one surface geophysical method that uses sound waves to locate variations in subsurface features.

Granular Activated Carbon [ENGINEERING] — A form of carbon used to remove contaminants from air or water. The contaminants **adsorb** to the carbon as the contaminated stream passes through it.

Groundwater Basin — see **Basin**

Groundwater Modeling [HYDROLOGY] — Mathematical methods of estimating flow characteristics of groundwater. Many groundwater models are computer based and allow the user to use site-specific geological information to predict groundwater movement and contaminant transport over several years.

Groundwater Monitoring [GEOLOGY] — Program designed to measure groundwater quality in monitoring wells and to track contaminant plumes as they move through groundwater. Samples of groundwater are taken from the wells and laboratory tests are used to determine the level of contaminants present.

Groundwater Gradient [HYDROGEOLOGY, HYDROLOGY] — The rate of change of water table elevation per unit distance. The gradient indicates both the direction of groundwater flow and the steepness of the water table surface.

Habitat [BIOLOGY] — The environment in which an organism or biological population usually lives or breeds.

Hardpan [GEOLOGY] — A layer of hard, cemented subsoil or clay. Hardpan often exhibits relatively low permeability to water.

Hazard Index [TOXICOLOGY] — A ratio comparing the estimated exposure to a non-cancer-causing contaminant with acceptable exposure guidelines and/or standards.

Hazard Quotient [TOXICOLOGY] — The sum of one or more **Hazard Indices** which produce the same effect (such as liver damage). If the Hazard Index for a given health effect is greater than 1, the effect of the exposure is considered to be significant.

Hazardous Substance — Any material or waste that may pose a substantial present or potential threat to human health and/or the environment.

Hazardous Substances Release Sites — Sites where hazardous materials have been released into the environment due to the activities of man.

Health Risk Assessment [TOXICOLOGY] — An evaluation of the risk posed by contaminants to the public. The results of this evaluation are used to assess the need for and/or type of clean-up which may be needed at a hazardous substance release site.

Hot Spots — Areas where contaminant concentrations are unusually high compared to the rest of the site.

Hydrogeology — The study of the interrelationship of geologic materials and processes with water.

In-Situ [GEOLOGY] - Refers to actions taken without removing the matter of interest (such as soil or groundwater) from its place.

In-Situ Groundwater Sampling [GEOLOGY] — A method of obtaining a groundwater sample without using a well. Typically consists of driving or pushing a sampling device into soil below the groundwater table. Groundwater flows into the sampling device, and can then be removed for laboratory testing. Often used to assess the extent of a groundwater contaminant plume, but less suitable for long-term groundwater monitoring because of high cost.

Infiltration [HYDROGEOLOGY] — The process through which liquids permeate soil by passing through the spaces between soil particles.

Ingest [TOXICOLOGY] — To take in by swallowing.

Insoluble [CHEMISTRY] — Not capable of becoming dissolved in. For example, oil is insoluble in water, but some oils contain other chemicals which are soluble in water.

Interim Remedial Measures — Clean-up actions taken to immediately reduce the potential for exposure to contaminants. Typically interim remedial measures are short-term remedies and/or small-scale clean-up measures.

Lagging Material — A type of pipe insulation.

Land Use Covenant — A document which provides information about residual contamination at a site. The document is an agreement which would be entered into by DTSC and UPRR. The agreement would have provisions to notice the deed to the property, to ensure monitoring and maintenance is conducted as required, and restrict land use as appropriate.

Leachability [GEOLOGY, CHEMISTRY] — The ability of a contaminant to dissolve in water (or other liquid), thereby enhancing the mobility of the contaminant in soil.

Leachate [GEOLOGY, CHEMISTRY] — Contaminated liquid resulting from contact of water (or other solvent) with soluble contaminants.

Lye [CHEMISTRY] — A caustic solution of potassium hydroxide or sodium hydroxide used in industry.

Maximum Contaminant Level(s), or MCL - Maximum allowable concentration of a chemical in drinking water. MCLs are established by either the United States Environmental Protection Agency or the California Environmental Protection Agency. Primary MCLs are intended to be protective of human health, whereas secondary MCLs are developed in consideration of other criteria such as taste or odor.

Mean Sea Level — The elevation of the ocean's surface, halfway between high and low tide. The elevation of mean sea level is often used as a reference point for surveys of elevation.

Medical Surveillance — A program whereby hazardous waste workers are periodically examined by a doctor to see if their health is being (or is likely to be) affected by their work environment. A medical surveillance program may also include periodic blood and urine tests, x-rays, and lung-function tests, depending on the hazardous substances to which the worker is exposed.

Medium — An entity in which objects exist and events take place. The plural form of the word is **media**. Relevant examples of media are air, water, soil, and groundwater.

Meteorological Station — A temporary or permanent installation where instruments are used to measure climate data such as temperature, wind speed and direction, relative humidity, and rainfall.

Micrograms per deciliter [CHEMISTRY] — A unit of measure for concentration in a liquid. If a child has a lead concentration of 10 micrograms per deciliter in his or her blood, it means that for every deciliter (1/10th of a liter) of blood, 10 micrograms (10 one-millionths of a gram) of lead were detected.

Mobility [GEOLOGY, HYDROGEOLOGY] — The ability of contaminants to move. Mobility depends on the contaminant, the **medium** in which it is found, and many other factors.

Modified Proctor Test — A standard test used to measure the maximum density that can be achieved during compaction of soil. This test is used to assess whether soil is suitable for use as engineered fill and the best soil moisture content to use during fill placement.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) — Federal regulations governing procedures for preparing for, and responding to, releases of hazardous substances into the environment.

Non-Binding Preliminary Allocation of Financial Responsibility — An agreement (non-binding) naming the party who will pay for remedial action at a hazardous substance release site.

Occupational Safety and Health Act — Federal regulations contained in 29 CFR (Code of Federal Regulations) for general industry (Part 1910) and construction activities (Part 1926) that includes general health and safety standards for workers' protection.

Operable Unit — For a Feasibility Study, an operable unit is a type, volume, or area of contaminated medium which, because of its unique chemical and/or physical characteristics, can be addressed most efficiently and economically as a unit.

Operation and Maintenance — Activities conducted after implementation of a recommended remedial alternative to ensure that it is functioning properly.

Overpack Container — Typically, a polyethylene container which is large enough to contain a 55-gallon drum. It is designed to withstand chemical degradation and is used to package drums which may potentially leak or are leaking so that they can be shipped safely with minimal risk of a release due to handling and transport.

Parts per million — A unit of measurement for concentrations. One part by weight of chemical contained in one million parts of material, for example soil.

Perched Groundwater Table [GEOLOGY] — A localized phenomenon where groundwater is held above the main groundwater table, usually by a low-permeability geologic formation (such as clay or hardpan).

Permeability [ENGINEERING, GEOLOGY] — Ability of material to permit passage of liquid through itself. In general, gravels and sands are very permeable; whereas silts and clays often exhibit low permeability.

Personal Protective Equipment — Special clothing and equipment used to minimize worker contact with contaminated materials. Selection of personal protective equipment depends on the type of contaminants, their form, and other site-specific factors, and may include air-purifying respirators, plastic coveralls, boots, and/or gloves.

Petroleum Hydrocarbons [CHEMISTRY] — Organic compounds commonly found in petroleum products that contain carbon and hydrogen only.

Plume [HYDROGEOLOGY, ENGINEERING] — A contaminated portion of air or groundwater.

Polycyclic Aromatic Hydrocarbons [CHEMISTRY] — Hydrocarbon compounds consisting of two or more fused benzene rings containing only hydrogen and carbon atoms. A common minor component of diesel fuel and asphalt.

Potentially Responsible Party — Any individual or company (including owners, operators, transporters, or generators of hazardous substances) potentially responsible for, or contributing to, contamination at a hazardous substances release site.

Pre-treatment System — A treatment system designed to remove gross contamination or compounds that might interfere with treatment. Pre-treatment is sometimes used to increase the efficiency of the following treatment steps.

Priority Pollutant — One of several chemicals judged by the U.S. EPA to be of concern to human health or the environment.

Range [ENGINEERING] — Any series of townships of the U.S. Public Land Survey System aligned north and south and numbered consecutively east or west from a standard regional baseline.

Real-Time Direct-Reading Instruments — Monitoring instruments capable of providing specific data essentially instantaneously. Contrast to other instruments that collect a sample which must be then sent to a laboratory for analysis, or instruments that indicate whether a constituent is present, but not the concentration.

Recommended Remedial Alternative — An alternative for clean-up of contamination that has been recommended based on several criteria considered during a feasibility study evaluation.

Remedial Investigation — A study including collection and analysis of soil, groundwater and air samples to assess the nature and extent of contamination at a site.

Remedial Action Objectives — Medium- and contaminant-specific clean-up goals for protecting human health and the environment.

Remedial Alternative — One or more remedial technologies assembled into one alternative clean-up plan. Each alternative should include technologies which, combined, will address all contaminants in the medium of interest (soil or groundwater, for this site).

Remedial Technologies — Methods used to clean up environmental contamination. Some examples of remedial technologies are chemical or physical treatment, and containment.

Remedial Action Plan — Document that provides information regarding contaminants present at a hazardous substances release site and the proposed clean-up strategies.

Remedial Action Design Work Plan — Provides detailed design information and engineering specifications about the recommended remedial alternatives for clean-up of a hazardous substances release site.

Remediation — Correction or clean-up of environmental contamination.

Resource Conservation and Recovery Act (RCRA) — Federal regulations governing procedures for treating, transporting, storing, and disposing of hazardous substances.

Rinsate — Liquid (usually water) left after washing or decontaminating an object.

Riparian [BIOLOGY] — Living or located on a riverbank.

Risk Characterization [TOXICOLOGY] — Mathematical estimates of health risks associated with exposure to environmental contaminants. Risk Characterization is part of a Baseline Health Risk Assessment.

Section [ENGINEERING] — The unit of survey of the U.S. Public Land Survey System, representing a piece of land that is 1 mile by 1 mile. There are 36 Sections per Township.

Sediment [GEOLOGY, ENGINEERING] — Solid material, mineral or organic, that is in suspension, is being transported, or has been moved from its origin by air, water, or ice, and has come to rest on the earth's surface.

Site Health and Safety Plan — A plan defining the procedures and equipment required to protect the health and safety of remediation workers during clean-up activities.

Site Supervisor — The person designated in the Site Health and Safety Plan who is responsible for making sure that all site visitors and workers follow the Health and Safety Plan rules, or a person designated responsible for operation and maintenance of remediation systems.

Slag [MINING, ENGINEERING] — The vitreous (glassy metallic) mass left as a residue of metallic ore smelting.

Soil Vapor Study [GEOLOGY, ENGINEERING] — An investigative method used to assess the concentration of organic contaminants (in vapor form) within soil pores. Soil gas surveys typically use soil gas probes which are inserted below ground. Soil gas flows into the probe, and is collected and analyzed for contaminants of concern. Soil vapors may come from volatile liquid contaminants in soil.

Solvent [CHEMISTRY] — A liquid capable of dissolving other substances. Common household organic solvents include paint thinner, spot remover, paint remover, and nail polish remover. Many organic solvents are potentially toxic. Water is also a solvent for some compounds.

Spent Carbon [ENGINEERING] — Activated carbon which is no longer effective in adsorbing contaminants. Typically, this occurs when contaminants fill pore space within a carbon bed and there is no room for additional contaminants to be adsorbed to carbon surfaces. Spent carbon may be recycled or disposed.

Stoddard Solvent — A type of petroleum product with a standard chemical formulation. Often used as a solvent and in dry cleaning.

Surface Impoundment — A man-made pond designed to contain liquids. Unlined surface impoundments are a potential source of groundwater contamination if used to store liquids containing hazardous substances.

Thermal Oxidation [ENGINEERING] — A process that removes or destroys organic contaminants using heat treatment.

Total Present Worth Cost — The net present worth of a series of cash disbursements over a given time, with a given interest rate. Expressed as an equivalent sum of money in present day dollars. Conceptually, the total present worth cost is the amount of money that must be deposited in a savings account today, if the money and the interest it earns are to be used to pay a series of debts whose amounts and future due dates are known.

Total Dissolved Solids [CHEMISTRY] — The concentration of minerals and other substances dissolved in water. A common indicator of water quality.

Township [ENGINEERING] — The unit of survey of the U.S. Public Land Survey System, representing a piece of land that is approximately 6 miles by 6 miles with a specific north/south and east/west boundary.

Toxicity — The degree to which a chemical compound can cause illness in humans or animals.

Track Ballast — see **Ballast.**

Trespasser — An individual who gains unauthorized entry to a property.

Upwind — The direction from which air travels. If a person stands upwind of an odor source, he or she will probably not detect the odor.

UV-oxidation [ENGINEERING] — A process using the properties of ultraviolet light to chemically alter or destroy organic contaminants in groundwater.

Volatile Aromatic Compounds [CHEMISTRY] — A type of volatile organic compound containing one or more benzene rings in its molecular structure.

Volatile Organic Compounds [CHEMISTRY] — Any of a group of organic compounds that can volatilize (vaporize) at normal temperatures and pressures.

Volatilization [CHEMISTRY] — The process of turning into a vapor. Water volatilizes when it evaporates.

Waste Characterization — Laboratory tests or other analyses used to assess the chemical composition of waste materials.

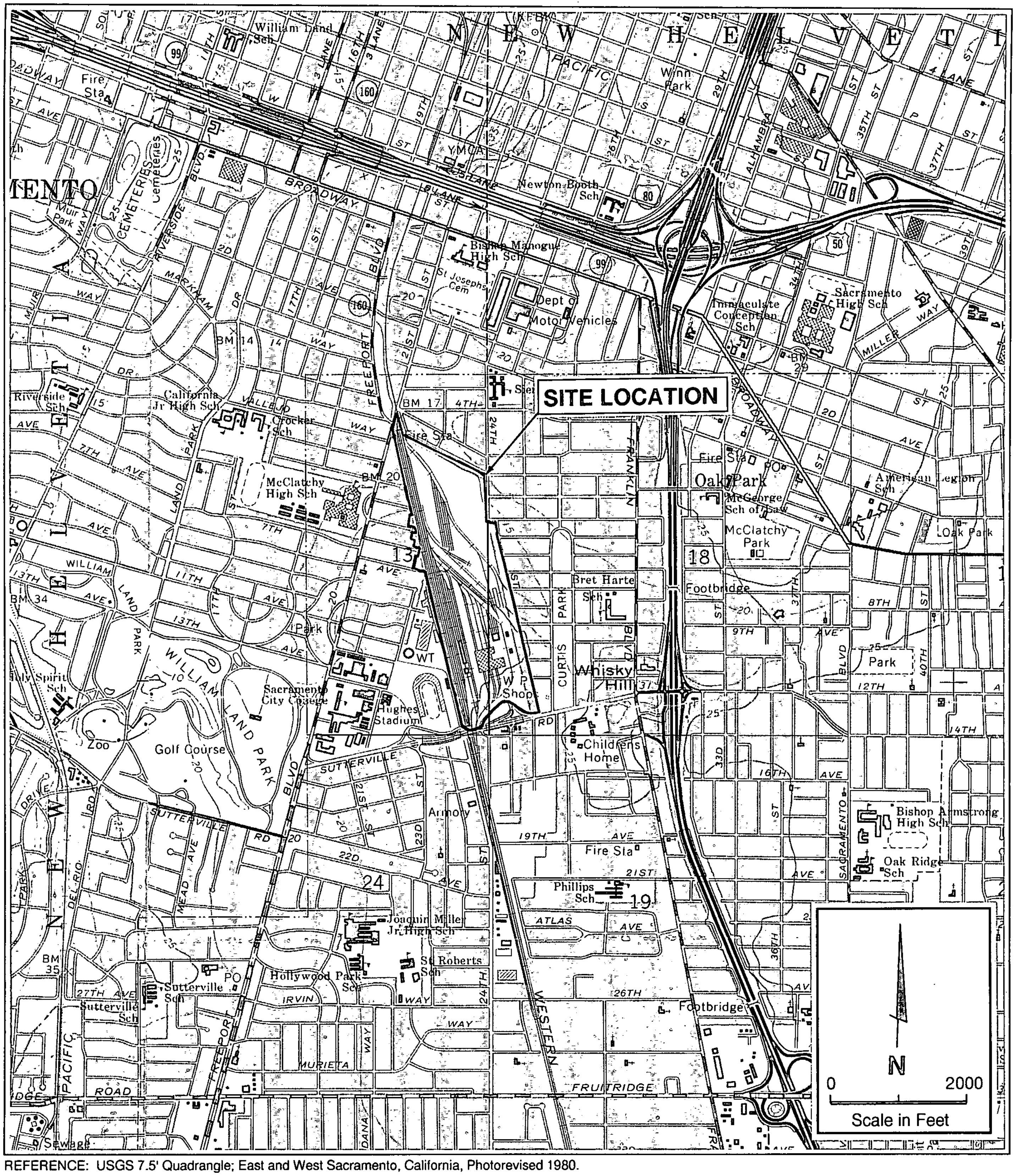
Water Table [GEOLOGY] — The surface of a groundwater body. Water tables are often reported in terms of depth below the ground surface or elevation with respect to Mean Sea Level.

Water-Bearing Zone [GEOLOGY] — Subsurface zone made up of gravel, sand, silt or porous rock that contains or yields groundwater.

Weedy Species [BIOLOGY] — Highly competitive plants that tend to choke out other species, and are among the first to colonize cleared land.

Well Casing [GEOLOGY, ENGINEERING] — Slotted pipe casing (usually plastic or stainless steel) installed in a soil boring to make a groundwater well. Groundwater flows through the slots into the casing, where it can then be sampled or pumped to the surface.

FIGURES



REFERENCE: USGS 7.5' Quadrangle; East and West Sacramento, California, Photorevised 1980.

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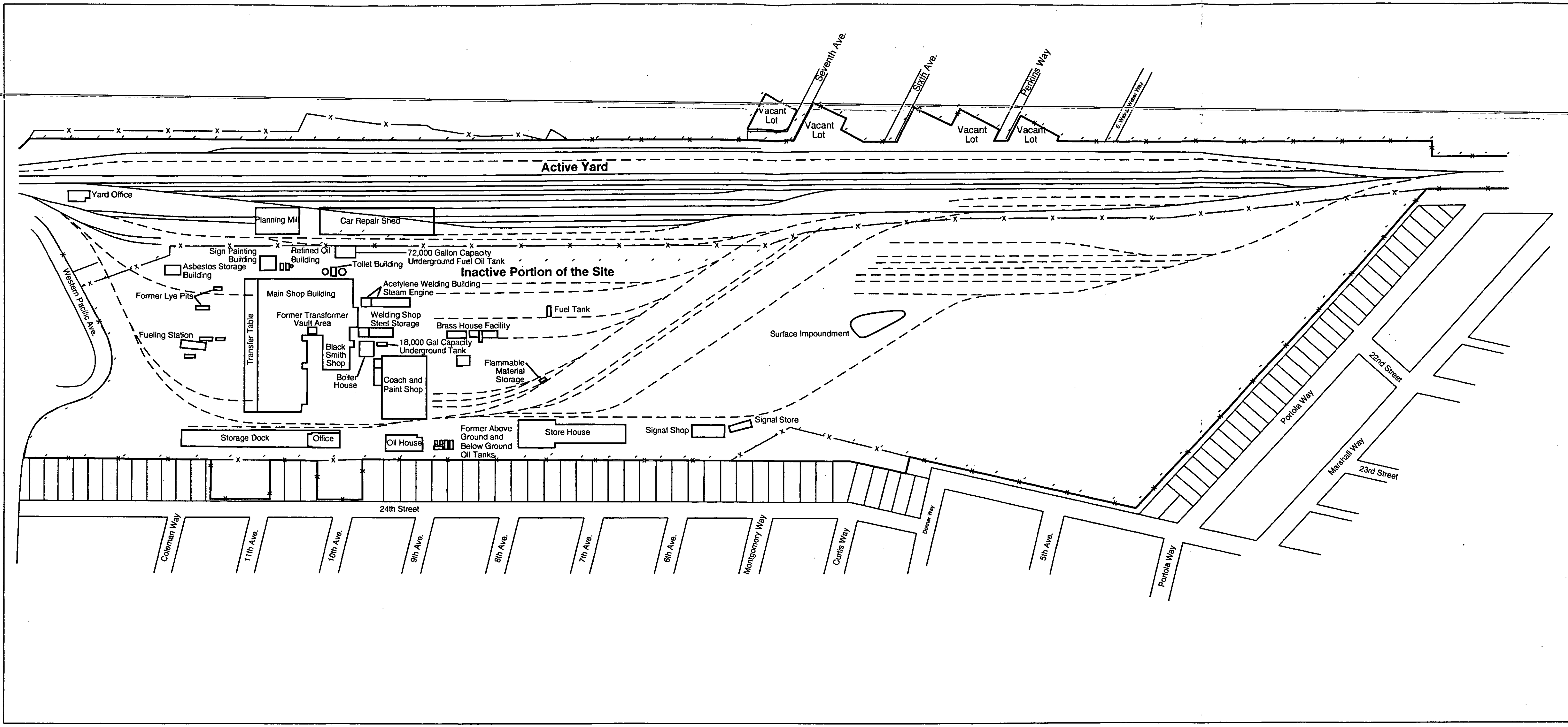
SITE VICINITY MAP

Union Pacific Railroad Yard
Sacramento, California

00173-076-044

FIGURE 1



EXPLANATION

—x— Fence Line

—— UPRR Property Boundary

- - - - Former Railroad Tracks

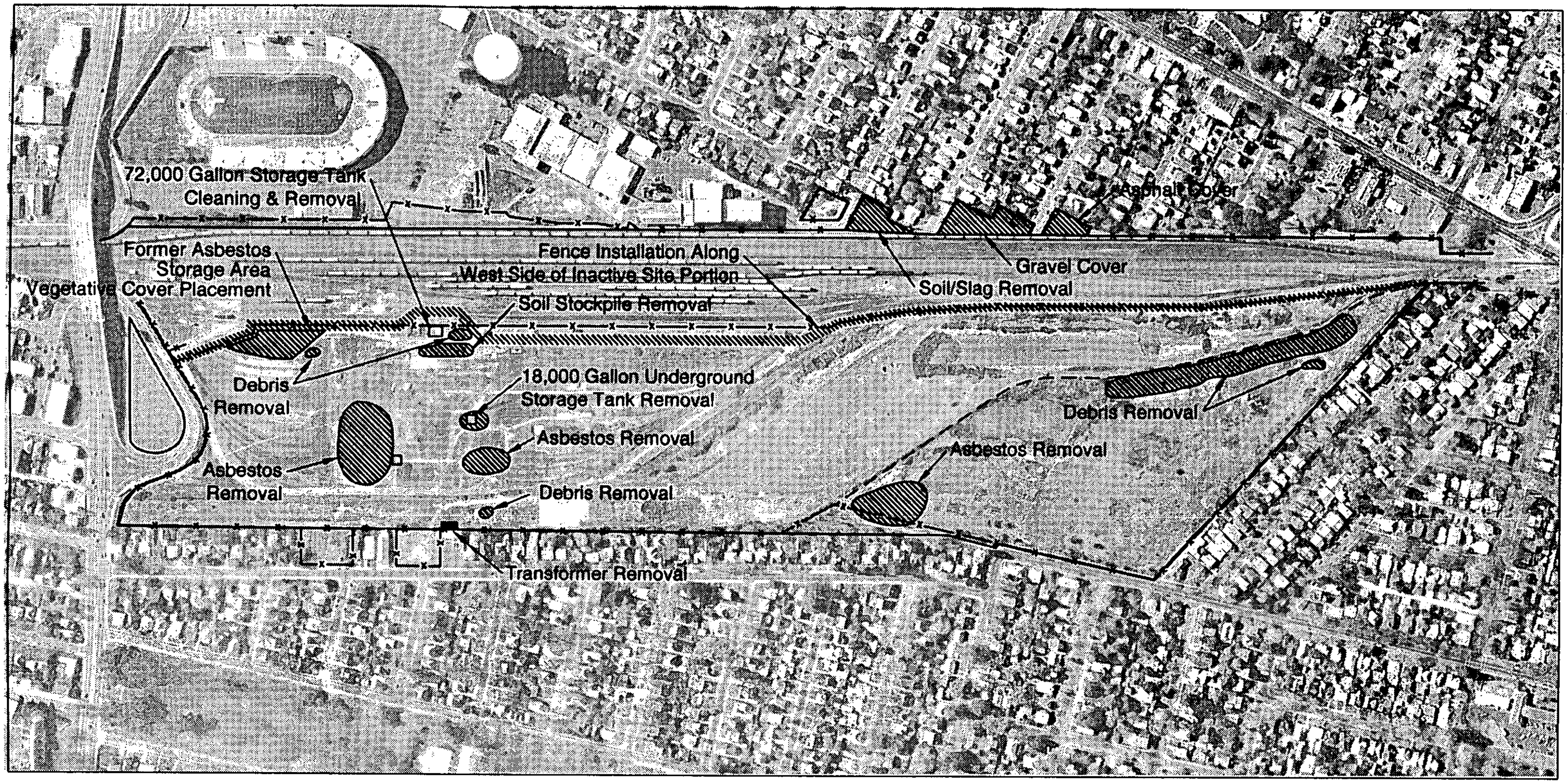
—— Existing Railroad Tracks

DAMES & MOORE

HISTORICAL FACILITIES (PRE-1985)
Union Pacific Railroad Yard
Sacramento, California

00173-072-044 SJR 1/3/93 HISTORY

FIGURE 2



EXPLANATION

—x——x——x Fence Line

———— UPRR Property Boundary

– – – – – Man-made Berm at Edge of Fill

Area of Interim Remedial Measure

N

0 500
Scale in Feet

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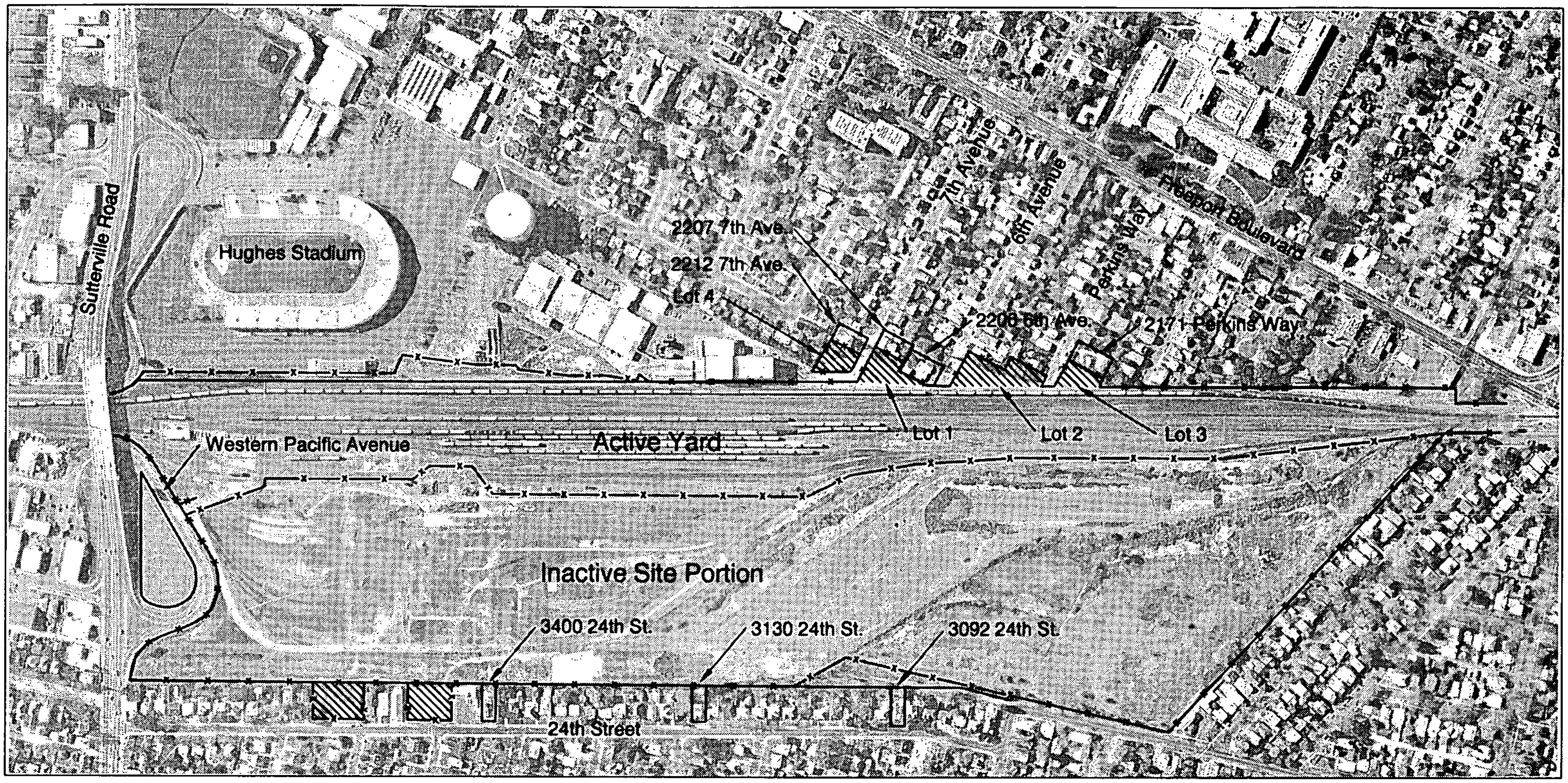
00173-072-044 SJR 2/1/93 R-MEAS

LOCATION OF INTERIM REMEDIAL MEASURES
Union Pacific Railroad Yard
Sacramento, California

FIGURE 3



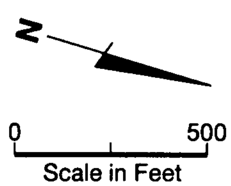
EXPLANATION

x—x—x— Fence Line

UPRR Property Boundary

Off-Site Lots Owned by UPRR

Privately Owned Off-Site Lots



LOCATION OF OFF-SITE SOIL SAMPLING

Union Pacific Railroad Yard
Sacramento, California

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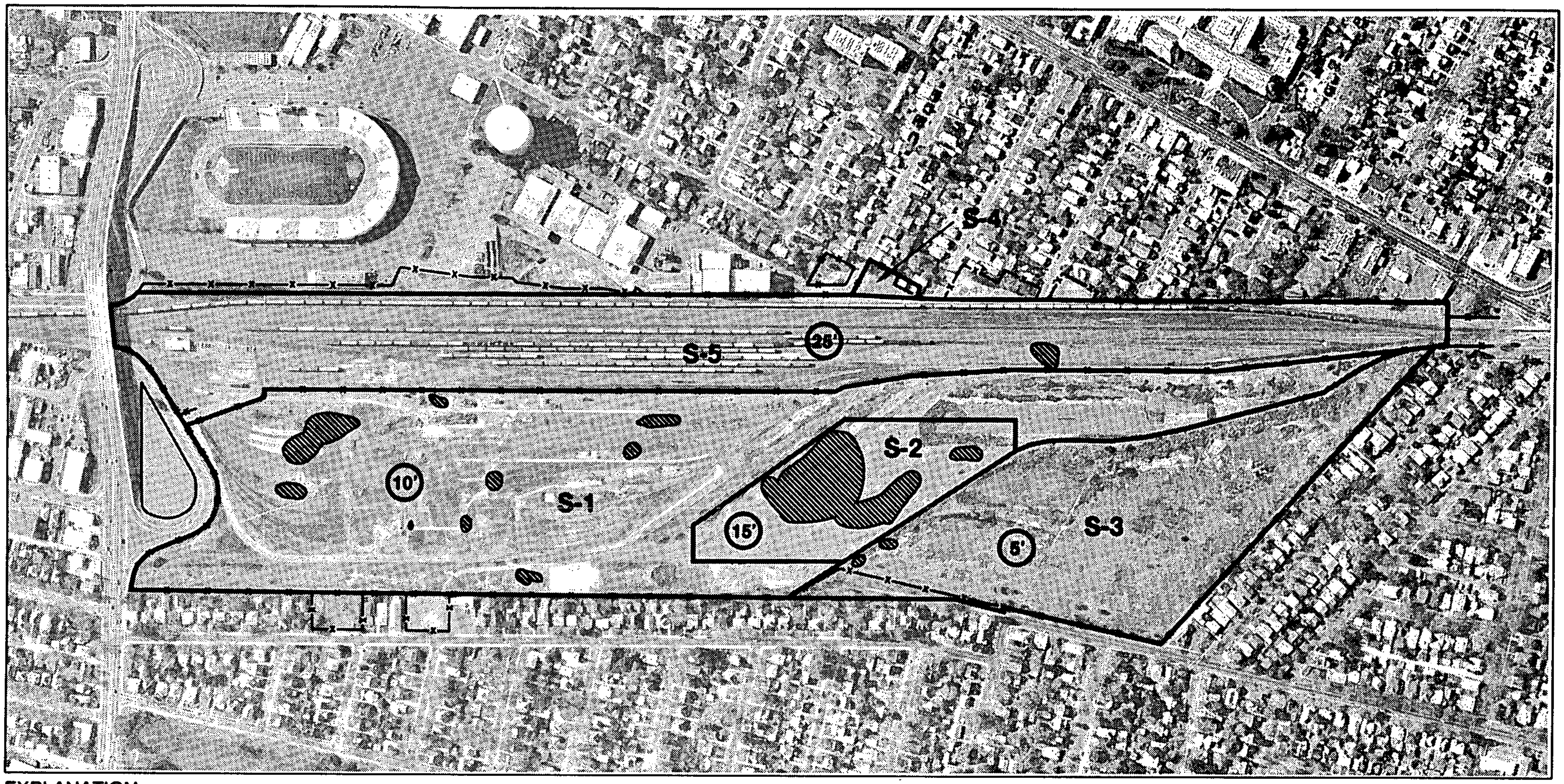
00173-072-044 SJR 2/1/93 OFF-SOIL

FIGURE 4



EXPLANATION

Area of Petroleum Hydrocarbons in Soil

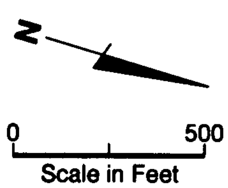
5' Approximate Maximum Depth of Contamination (feet)

—x——x——x Fence Line

UPRR Property Boundary

Operable Unit Boundary

S-1 Soil Operable Unit Designation



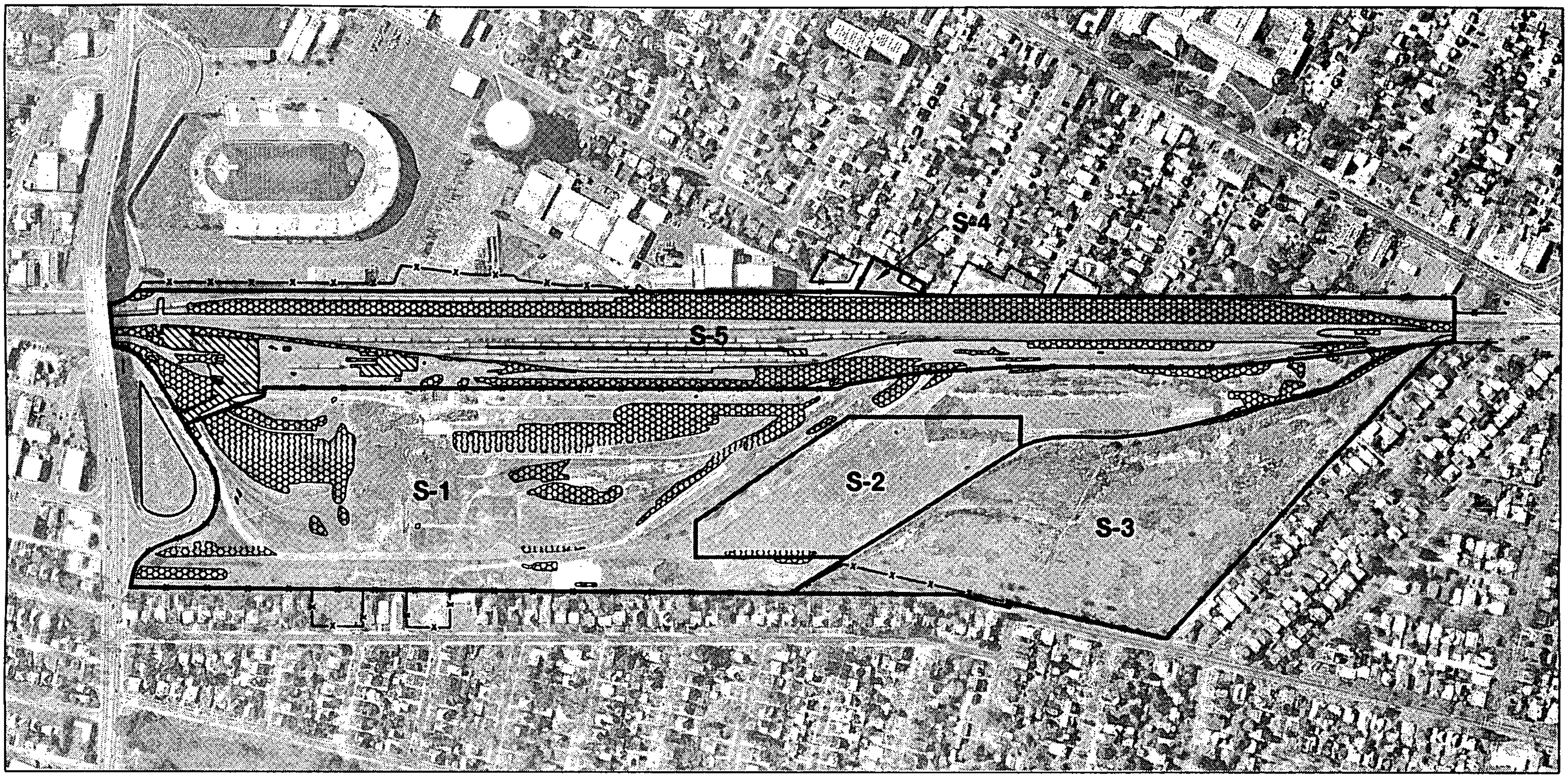
EXTENT OF HYDROCARBONS IN SOIL

Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-072-044 SJR 2/1/93 HYDRO

FIGURE 5



EXPLANATION

Existing Pavement

Surface Soil with Slag Content of Approximately 10% or Greater

Fence Line

UPRR Property Boundary

Soil Operable Unit Boundary

S-1 Operable Unit Designation

N

0 500

Scale in Feet

SLAG DISTRIBUTION BEFORE INTERIM REMEDIAL MEASURE

Union Pacific Railroad Yard
Sacramento, California

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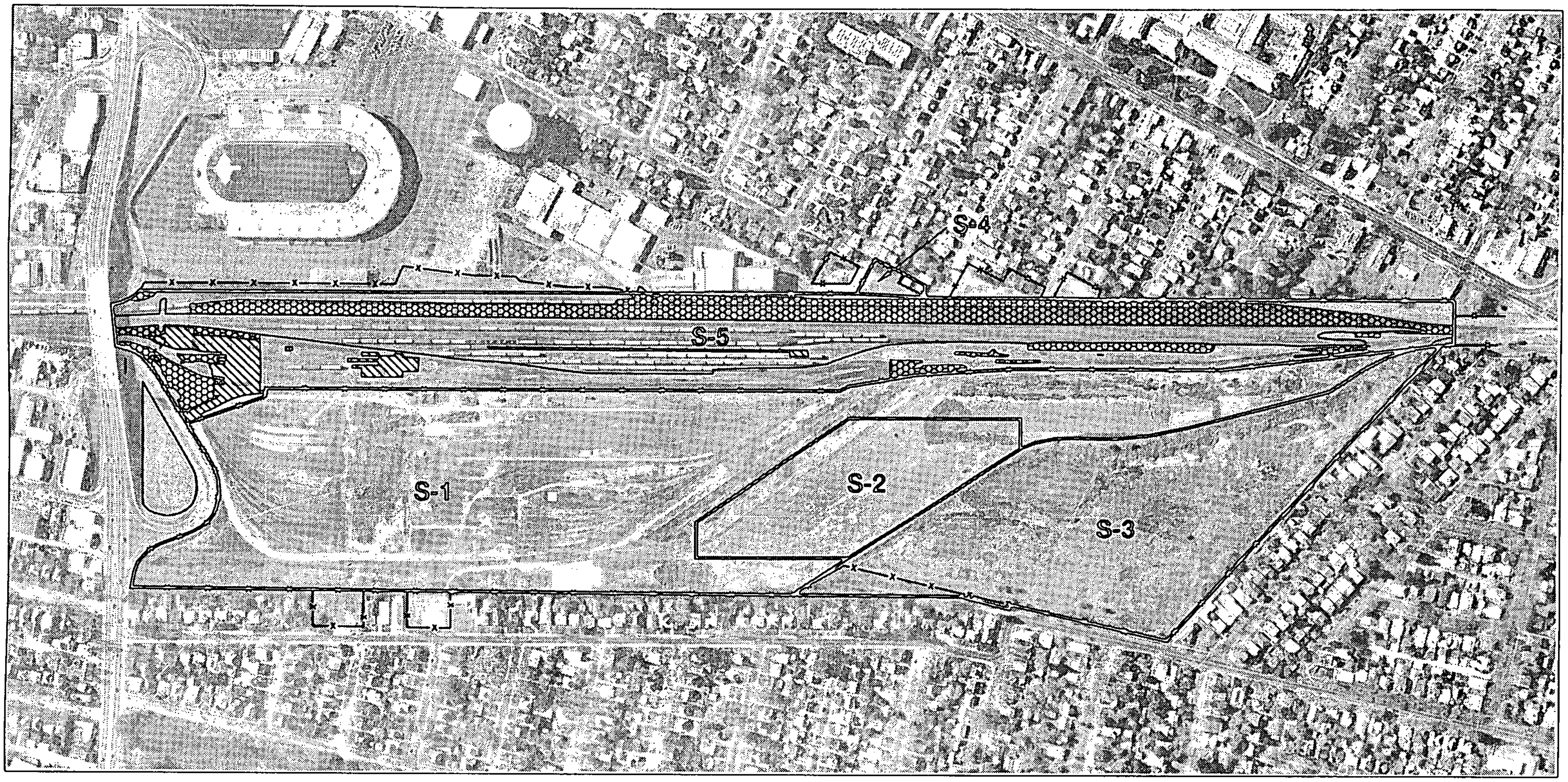
00173-072-044 SJR 12/21/93 BEFORE

FIGURE 6A



EXPLANATION

Existing Pavement

Surface Soil with Slag Content of Approximately 10% or Greater

Fence Line

UPRR Property Boundary

Soil Operable Unit Boundary

S-1 Operable Unit Designation

N

0 500
Scale in Feet

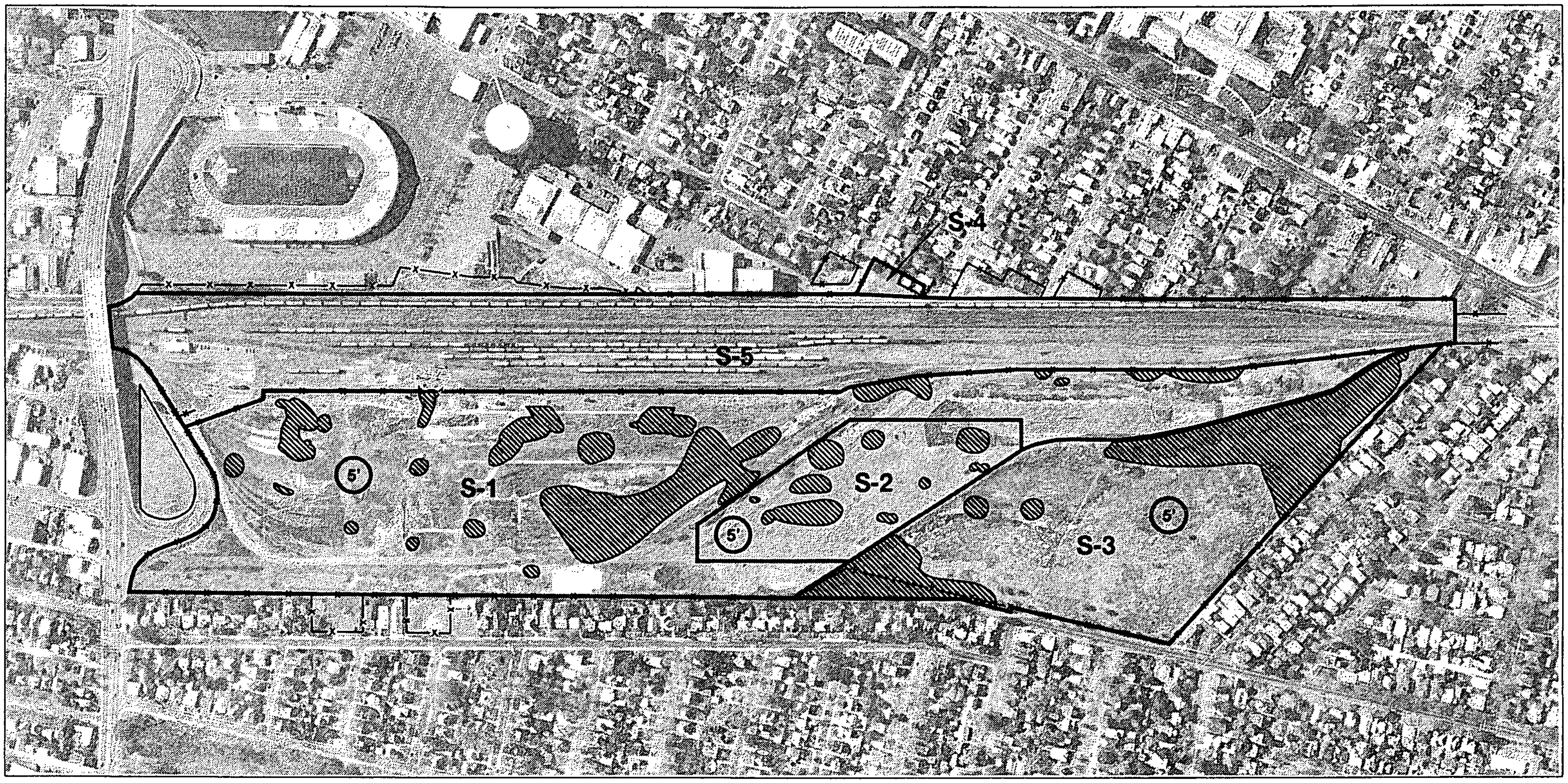
DAMES & MOORE

00173-072-044 SJR 2/1/93 after

SLAG DISTRIBUTION AFTER INTERIM REMEDIAL MEASURE

Union Pacific Railroad Yard
Sacramento, California

FIGURE 6B



EXPLANATION

Area Where Concentration of Arsenic and/or Lead in Soil is Greater than Clean-up Levels (See Table 8 for Clean-up Levels)

(10') Apporximate Maximum Depth of Contamination Exceeding Clean-up Levels (feet)

—x—x—x Fence Line

UPRR Property Boundary

Operable Unit Boundary

S-1 Soil Operable Unit Designation

N

0 500
Scale in Feet

NOTE: Cross hatched areas shown above represent distribution of arsenic and lead on the site prior to slag removal. A post slag removal evaluation of arsenic and lead levels on site will be preformed in early 1994 to determine the extend of additional clean-up needed, if any.

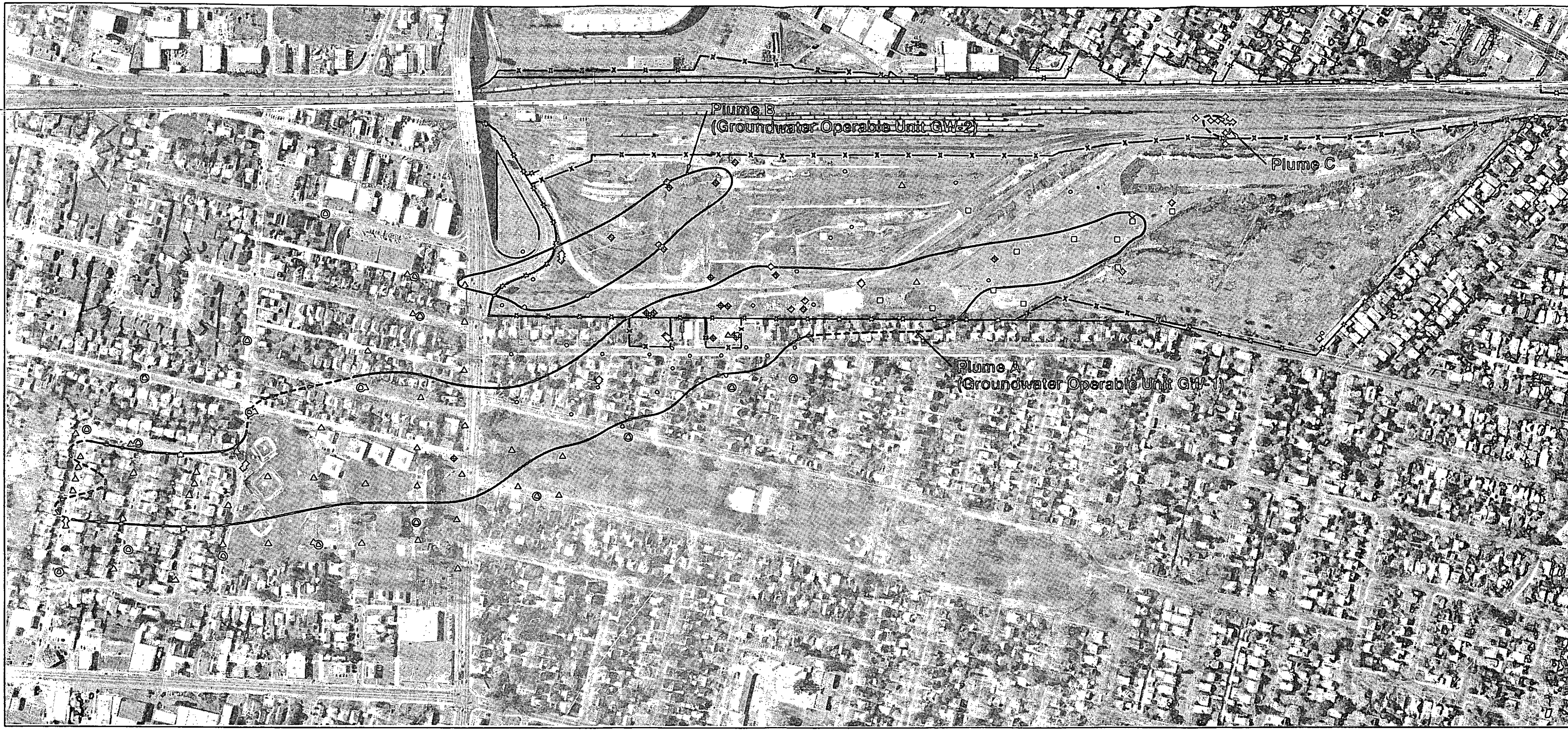
EXTENT OF ARSENIC AND LEAD IN SOIL ABOVE CLEAN-UP LEVELS PRIOR TO SLAG REMOVAL

Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-072-044 SJR 2/1/93 AS-LD

FIGURE 7



EXPLANATION

Hydropunch Groundwater Sample Locations:

- ○ April - May, 1990 Locations
- △ September - October, 1990 Locations
- □ February, 1991 Locations
- ◎ May - June, 1992 Locations
- ◇ October, 1993 Locations
- Monitoring Well Locations
- Extent of Groundwater Impacts (dashed where inferred)
- x—x— Fence Line
- UPRR Property Boundary

N

0 400
Scale in Feet

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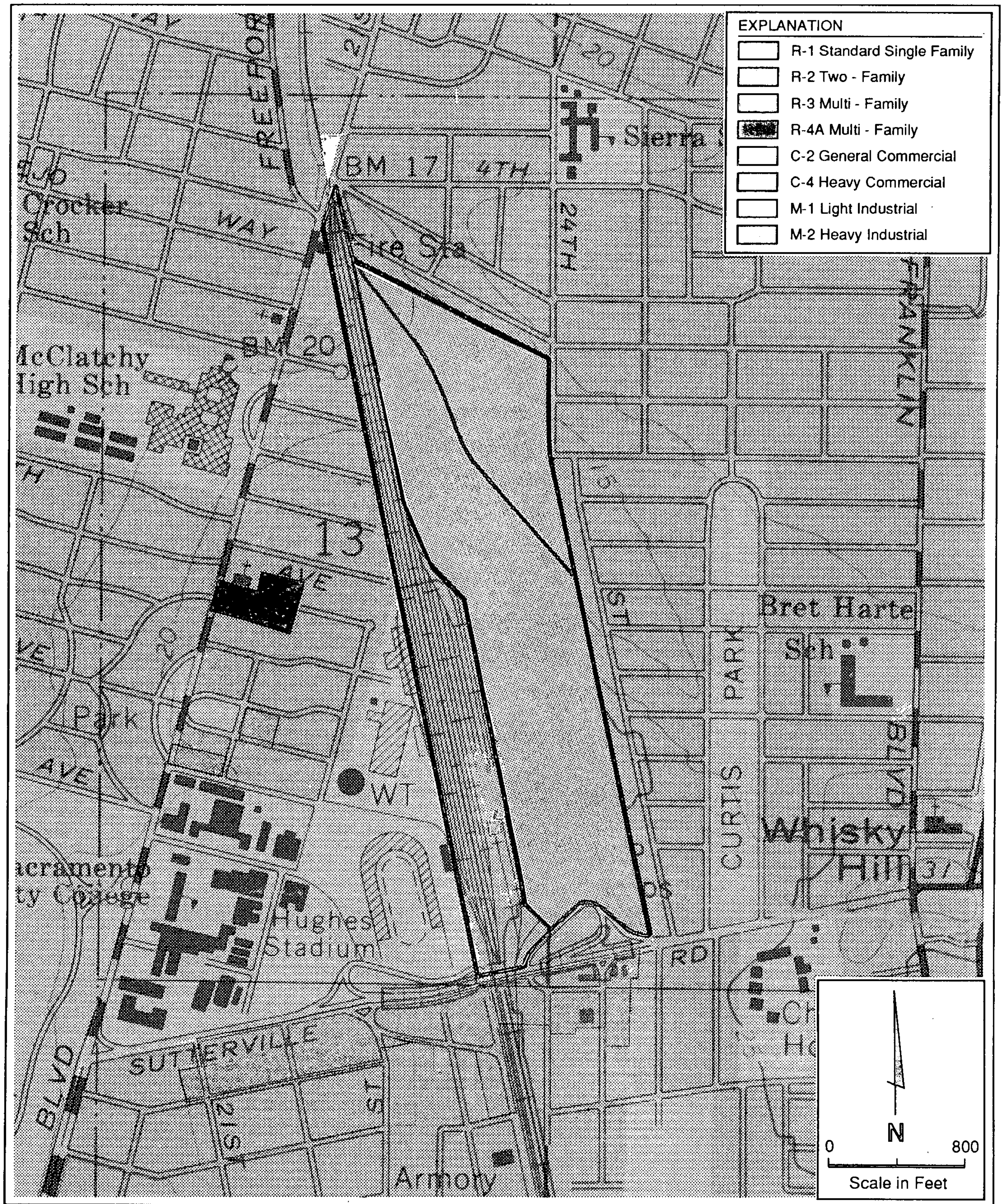
00173-072-044 SJR 12/21/93 GW-1-2

GROUNDWATER CONTAMINANT PLUMES
(OPERABLE UNITS GW-1 AND GW-2)
Union Pacific Railroad Yard
Sacramento, California

FIGURE 8



REFERENCE: Sacramento City Planning Department, 1991

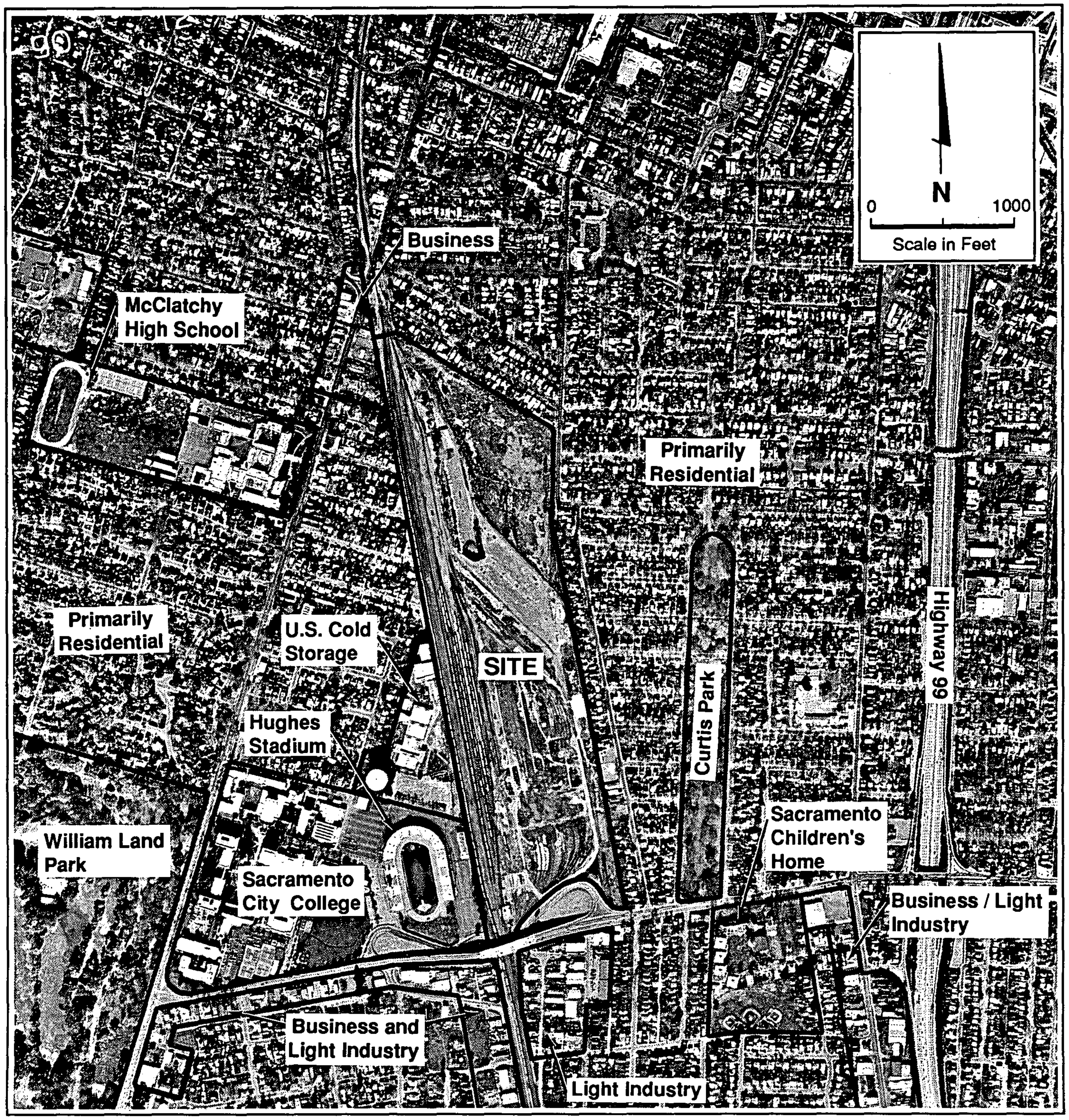
ZONING DESIGNATIONS NEAR THE SITE

Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-072-044

FIGURE 9



CURRENT LAND USE NEAR THE SITE
Union Pacific Railroad Yard
Sacramento, California

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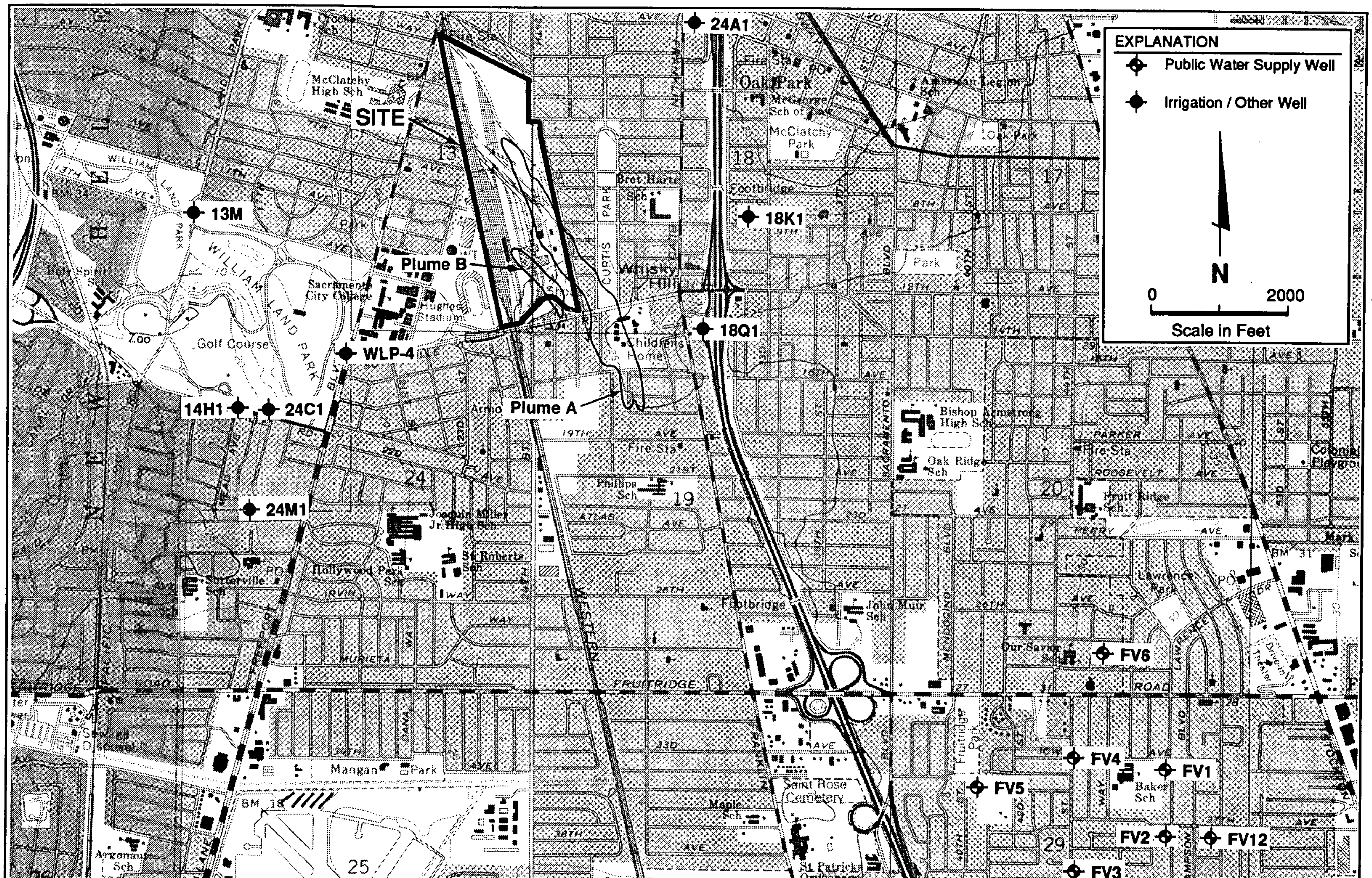
00173-072-044

FIGURE 10



REFERENCE: USGS 7.5 Minute Quadrangles,
Sacramento East, and West, CA., 1980.
Meyer, 1990
Stockton, 1990

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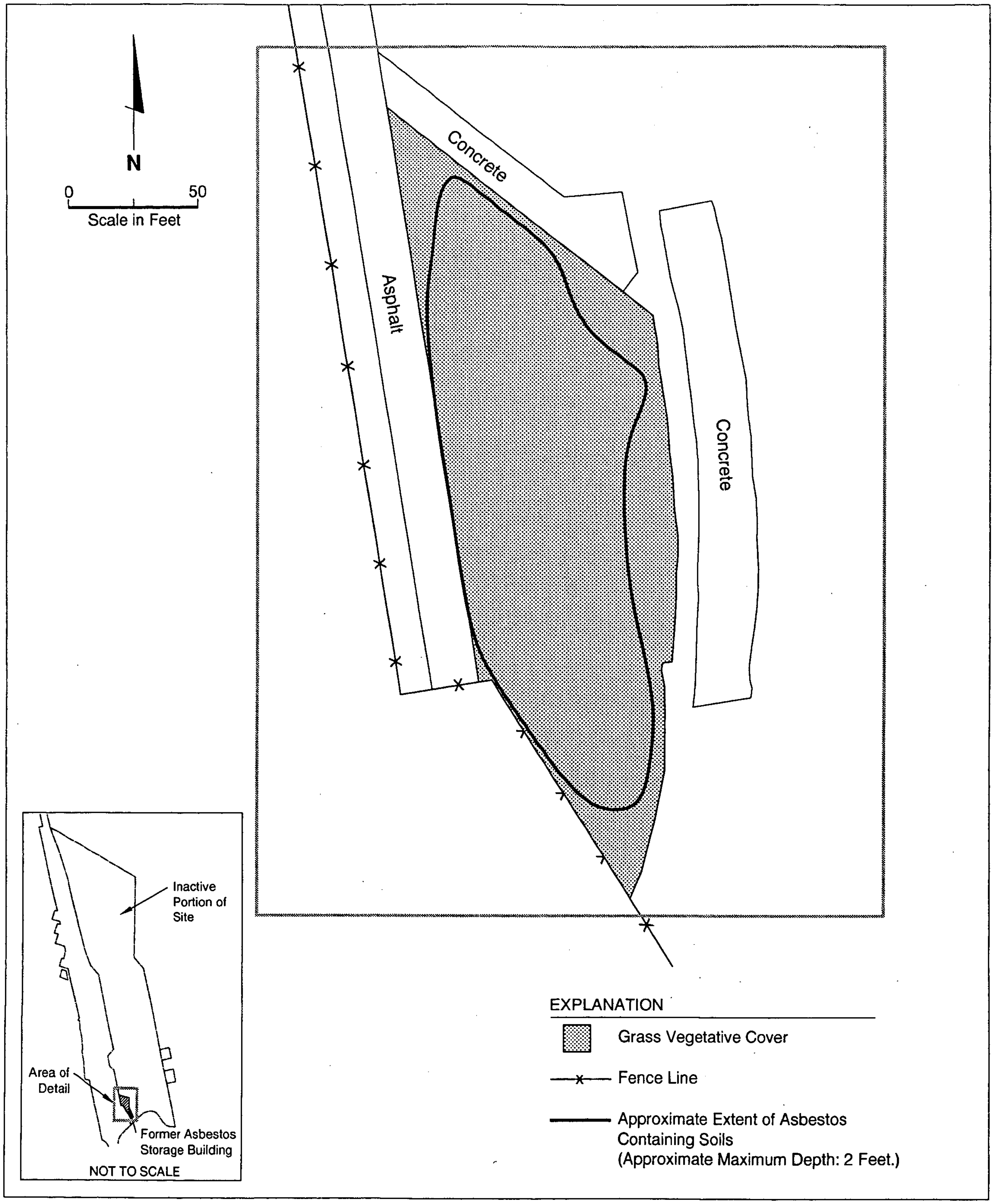
00173-072-044

NEARBY GROUNDWATER SUPPLY WELLS

Union Pacific Railroad Yard
Sacramento, California

FIGURE 11

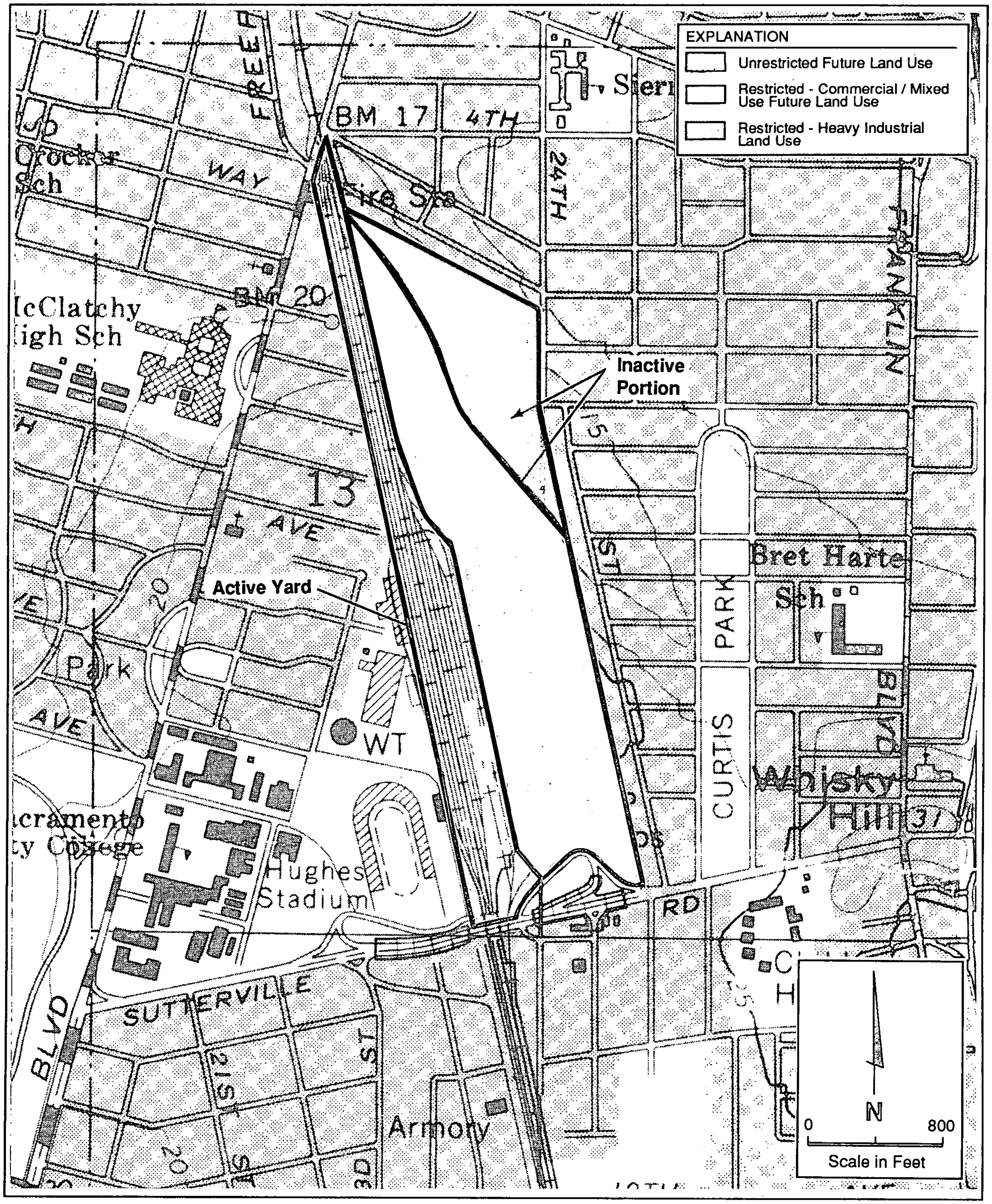


EXTENT OF ASBESTOS IN SOIL ABOVE CLEAN-UP LEVELS
Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-027-044 SJR 2/3/93 ASBEST

FIGURE 12



REFERENCE: USGS 7.5 Minute Quadrangles, Sacramento East, and West, CA., 1980.

ASSUMED FUTURE LAND USES AT THE SITE

Union Pacific Railroad Yard
Sacramento, California

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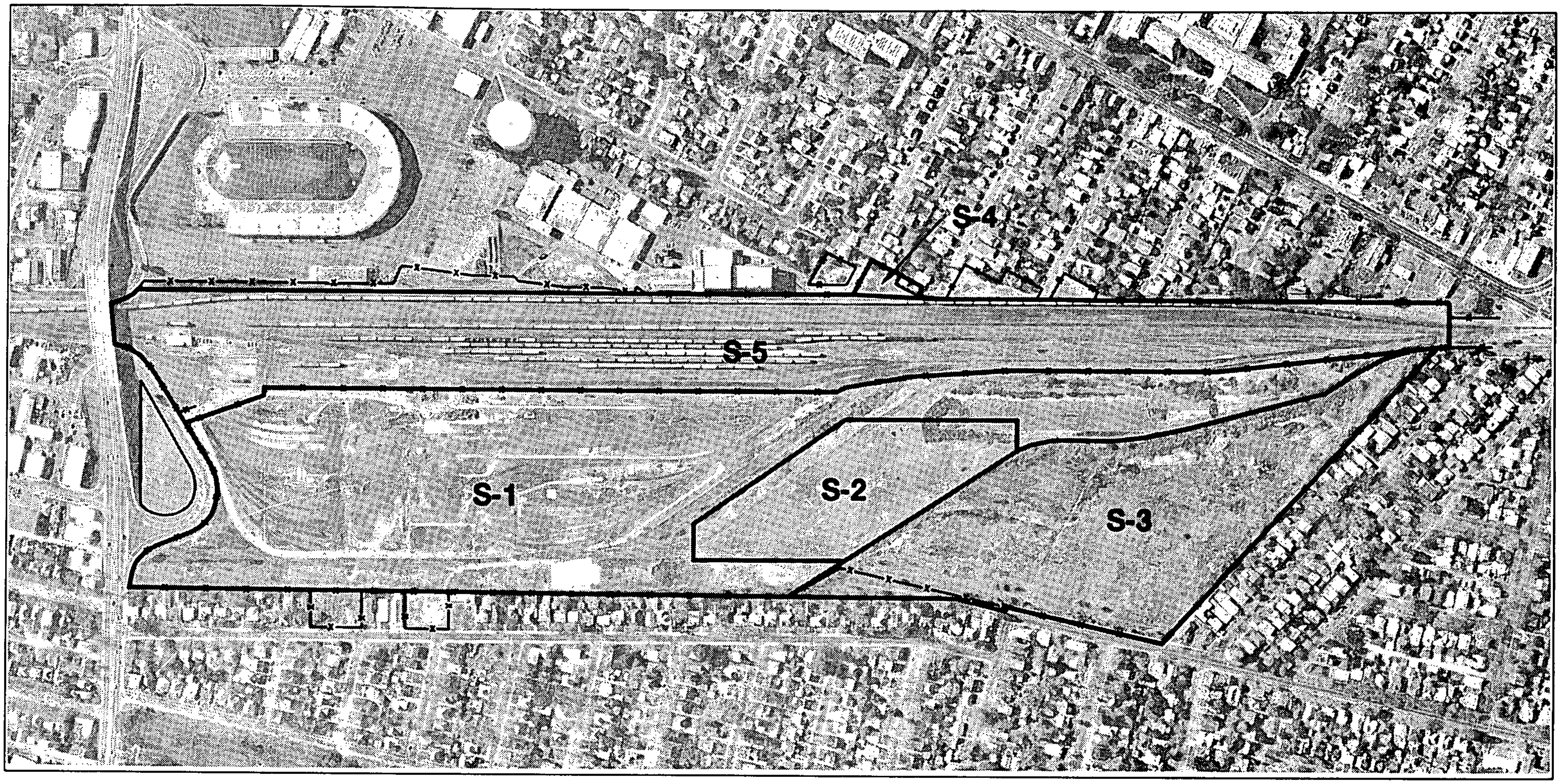
00173-072-044

FIGURE 13



EXPLANATION

—— Operable Unit Geographic Boundary

x—x—x— Fence Line

—— UPRR Property Boundary

S-3 Soil Operable Unit Designation

N

0 500
Scale in Feet

LOCATION OF SOIL OPERABLE UNITS

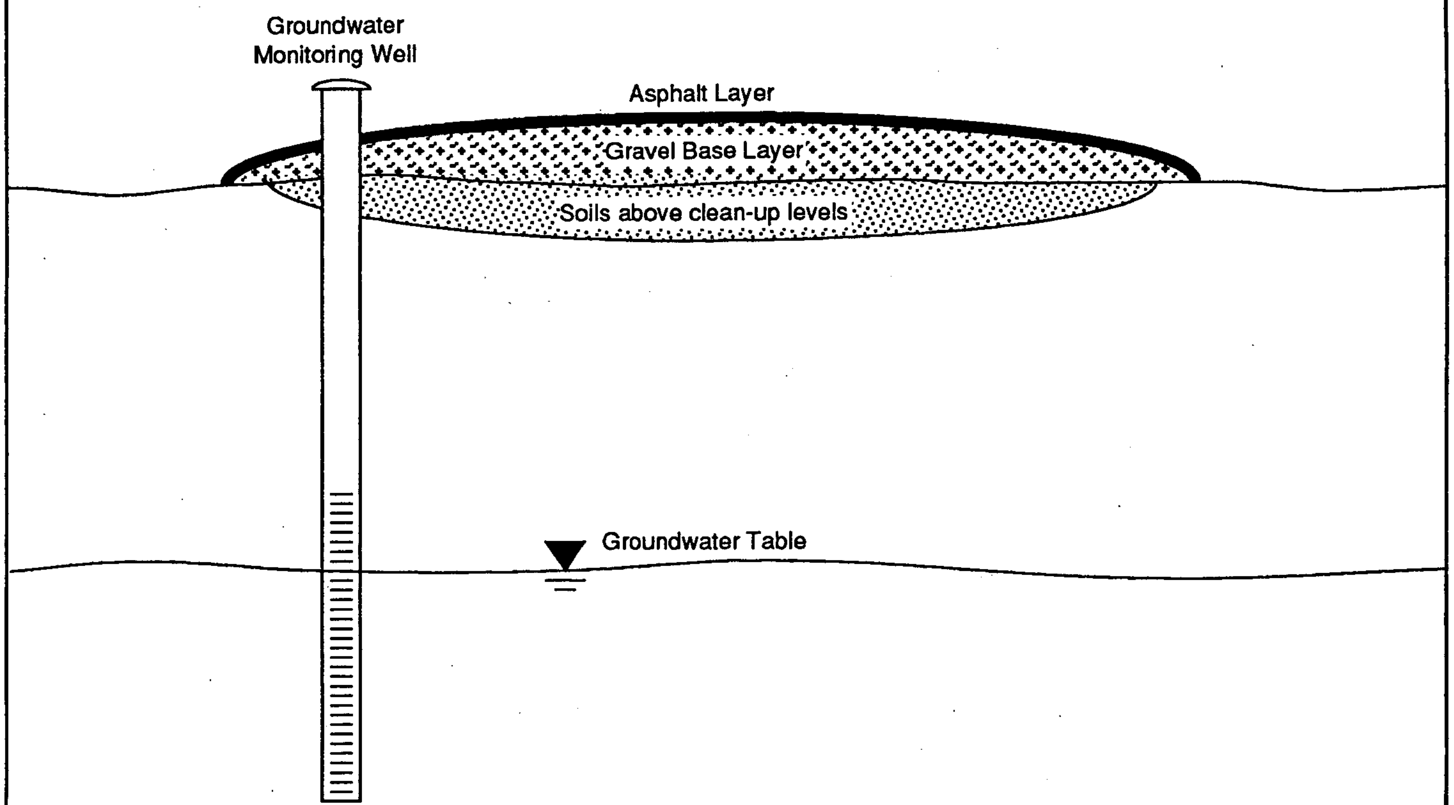
Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-072-044 SJR 2/1/93 S-OPER

FIGURE 14

1. **Construct engineered asphalt cap to contain soils contaminated above clean-up levels.**



2. **• Construct and maintain a fence around the site to restrict access.**
   • Record land use covenant/deed notice to restrict future land use at the site.
   • Perform long term groundwater quality monitoring.
   • Perform long-term maintenance of cap to ensure containment.

NOTE: Conceptual plan

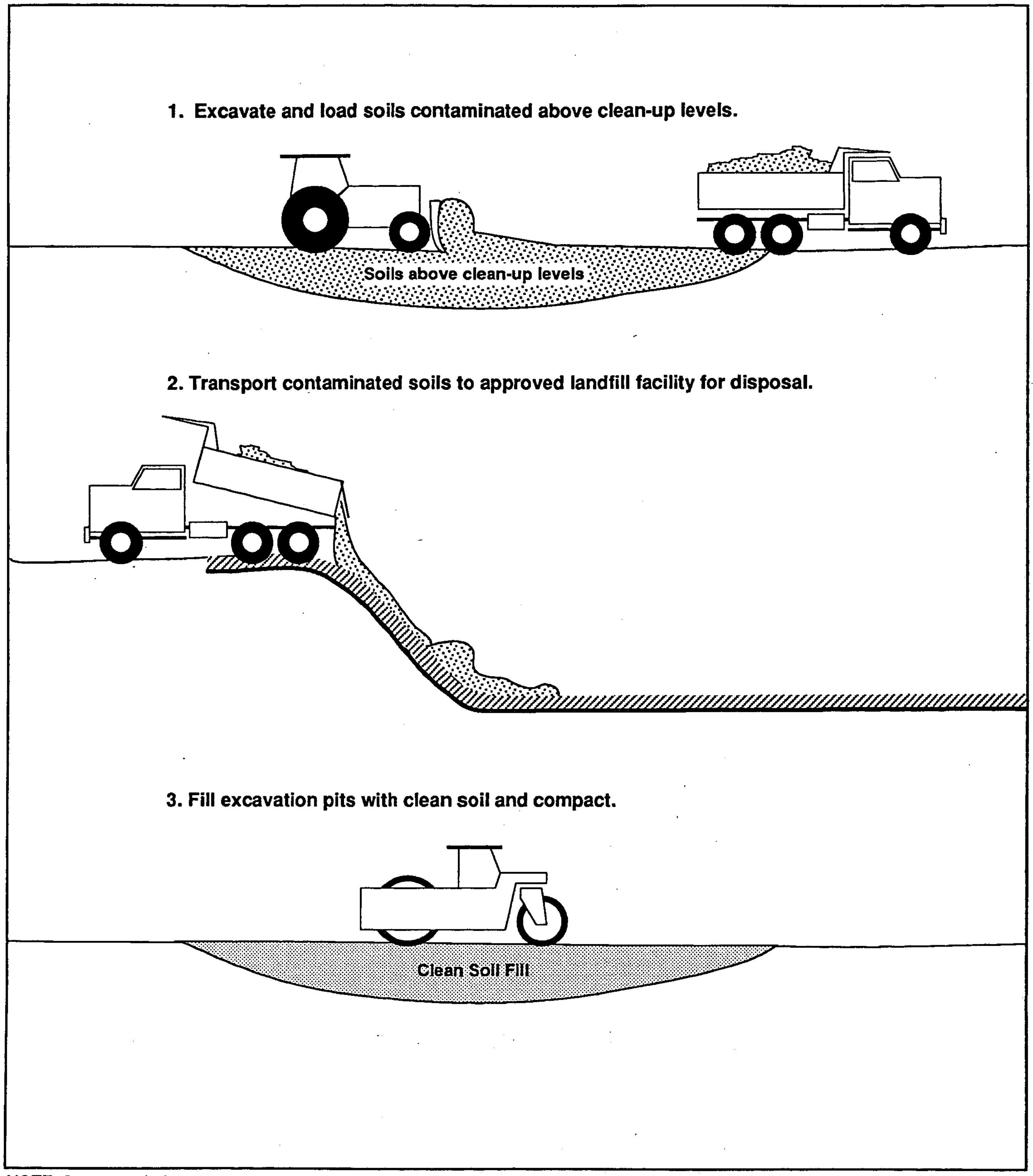
SOIL ALTERNATIVE 4: CONTAINMENT WITH INSTITUTIONAL CONTROLS

Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-072-044 sa.4

FIGURE 15



NOTE: Conceptual plan

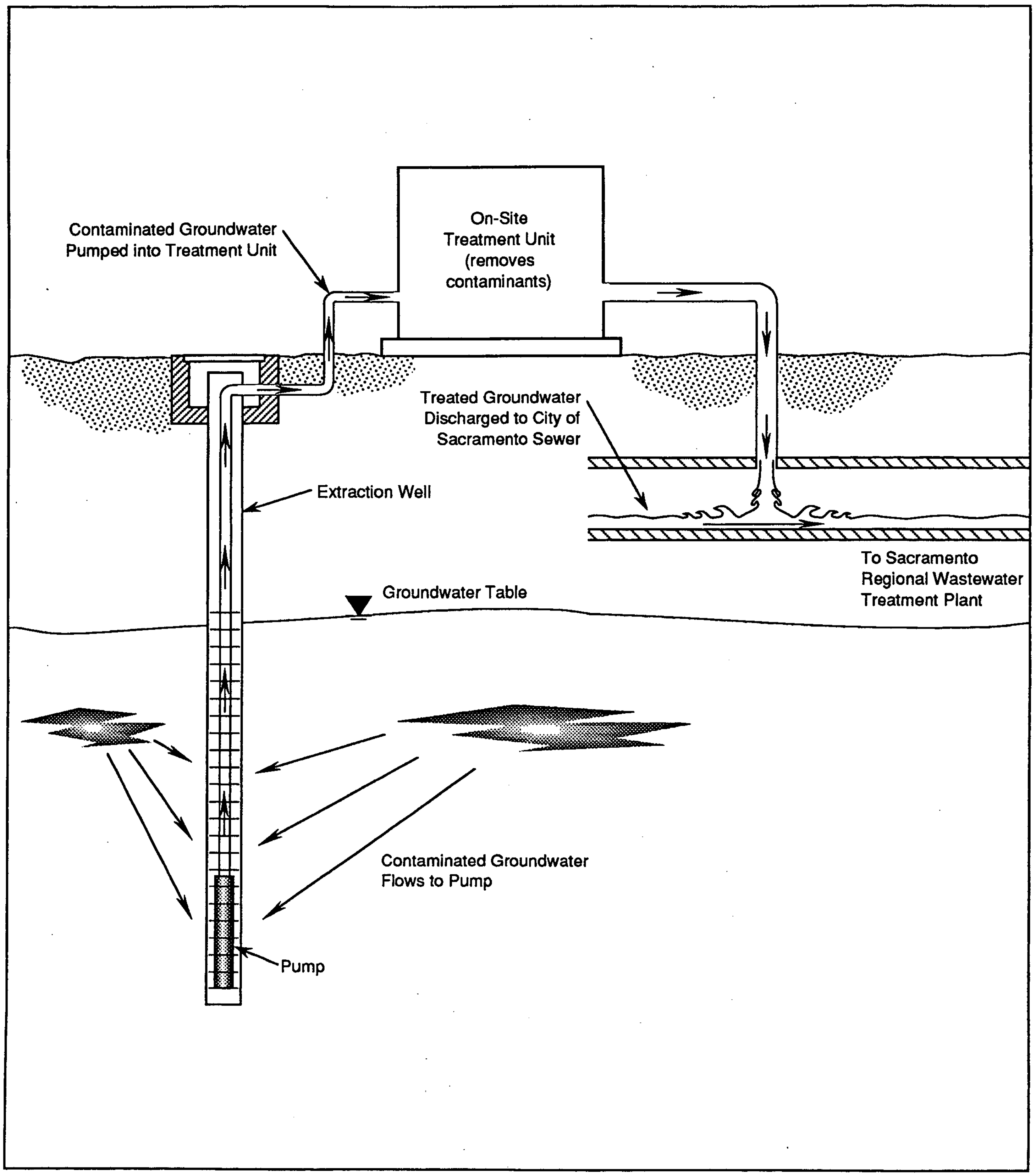
SOIL ALTERNATIVE 10:
EXCAVATION AND OFF-SITE DISPOSAL OF SOIL ABOVE CLEAN-UP LEVELS

Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-072-044 sa.10

FIGURE 16



NOTE: Conceptual plan - Not drawn to scale

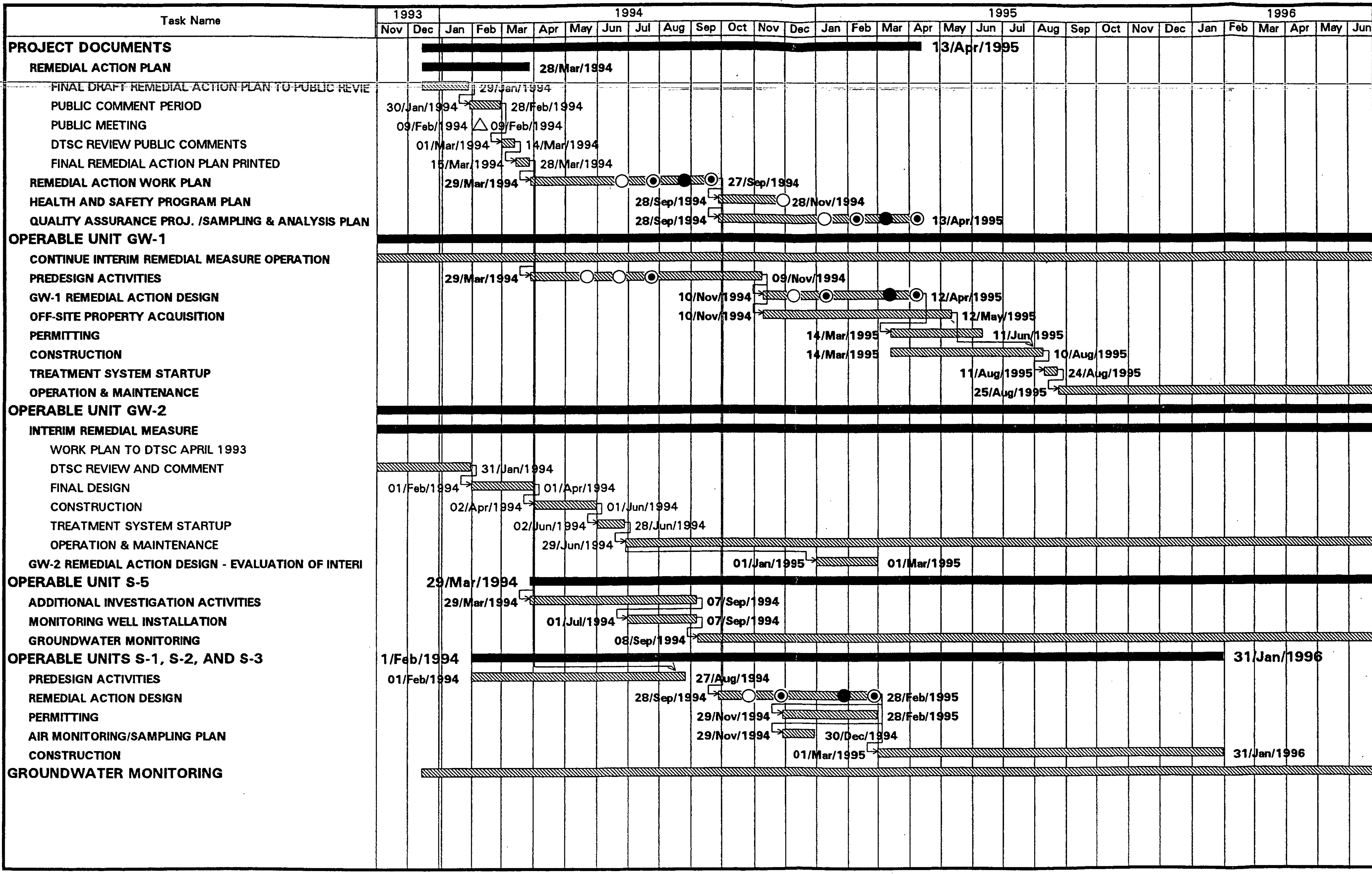
GROUNDWATER ALTERNATIVE 4: EXTRACT, TREAT AND DISCHARGE

Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-072-044 gw.4

FIGURE 17



EXPLANATION

- ○ Draft Submittal to DTSC
- ◉ Receive DTSC Comments
- ● Final Submittal to DTSC

REMEDIAL ACTION SCHEDULE

Union Pacific Railroad Yard
Sacramento, California

FIGURE 18

Appendix A

Appendix A

City of Sacramento Resolution Number 92-255

and Union Pacific Land Use Committee Report

RESOLUTION NO. 92-255

ADOPTED BY THE SACRAMENTO CITY COUNCIL

ON DATE OF APR 14 1992

RESOLUTION ENDORSING THE PLANNING PRINCIPLES DEVELOPED BY THE UNION PACIFIC LAND USE COMMITTEE FOR THE REUSE OF THE UNION PACIFIC RAILROAD YARD (M91-035)

WHEREAS, the Union Pacific Land Use Committee has prepared a list of recommended planning principles for the redevelopment of the Union Pacific Railroad yard;

BE IT RESOLVED BY THE COUNCIL OF THE CITY OF SACRAMENTO:

(1) The principles developed by the Union Pacific Land Use Committee are endorsed as guiding principles for development of the railroad yard site; and

(2) The Planning Director is directed to prepare a work program for redevelopment of the railroad yard site and return to City Council for review and approval; and

(3) The Planning Director is authorized to incorporate the endorsed principles within the forthcoming work program.

ANNE RUDIN

MAYOR

ATTEST:

VALERIE BURROWES

CITY CLERK

FOR CITY CLERK USE ONLY

RESOLUTION NO.: 92-255

DATE ADOPTED: APR 14 1992

DEPARTMENT OF
PLANNING AND DEVELOPMENT

CITY OF SACRAMENTO
CALIFORNIA

1231 I STREET
SACRAMENTO, CA

ADMINISTRATION
ROOM 300
95814-2987
916-449-5571

ECONOMIC DEVELOPMENT
ROOM 300
95814-2987
916-449-1223

NUISANCE ABATEMENT
ROOM 301
95814-3982
916-449-5948

April 14, 1992

City Council
Sacramento, California

Honorable Members In Session:

SUBJECT: **REPORT OF THE UNION PACIFIC LAND USE COMMITTEE (M91-035)**

LOCATION: **Union Pacific Railroad Yard, 3675 Western Pacific Avenue**
COUNCIL DISTRICT 5

SUMMARY

As outlined in the attached report, the ad-hoc Union Pacific Land Use Committee has recommended planning principles to guide future redevelopment of the Union Pacific Railroad's former maintenance yard located adjacent to the Curtis Park and Land Park neighborhoods. The Committee, through an active community participation process, has identified land use goals and objectives which could be incorporated as the planning principles in a future land use plan prepared for the site.

The Committee's major objectives for the future use of the site are (1) compatibility with adjacent neighborhoods, (2) remediation of hazardous substances to allow preferred uses, (3) optimal utilization of the site to best serve the adjacent neighborhoods, and (4) pedestrian and transit oriented design.

COMMITTEE/COMMISSION ACTION

The Planning Commission heard the report as an informational item on April 2, 1992.

STAFF RECOMMENDATION

The staff recommends that the Council review the attached Union Pacific Land Use Committee report and refer it to staff for incorporation of the principles into a work program for redevelopment of the Union Pacific Railroad yard site.

BACKGROUND

On January 8, 1991, the City Council appointed twelve residents from the neighborhoods adjoining the railroad yard to the ad-hoc committee with the charge to formulate general recommendations for reuse of the site. The site, which is adjacent to the Curtis Park and Land Park neighborhoods, comprises a total of 94 acres which Western Pacific Railroad used as the maintenance facilities for its western operations. The report addresses the reuse of the eastern portion of the site which has been vacant since the railroad discontinued the maintenance activities. Union Pacific Railroad, which acquired Western Pacific in 1985, currently utilizes the western area of the yard for switching activities related to its main active line. Union Pacific intends to continue those active operations. (A map of the railroad yard indicating the active and inactive portions of the site is included in Attachment A to the report).

Since its appointment by City Council last year, the Committee held a series of public meetings with various agencies and planning experts to study the constraints involved in reuse of the yard. The Committee was comprised of area residents, business owners, representatives from neighborhood organizations, Sacramento City College and Union Pacific Railroad. (Attachment B to the report lists the Committee members appointed by Council.) Five Committee meetings were community workshops to which residents from the surrounding neighborhoods were invited to participate. The report represents overall planning principles, based on a consensus of the Committee and community participation over the past fifteen months, which could guide the development of the site.

Staff will develop a work program detailing the necessary analysis of existing conditions and constraints to development of the site, community participation, timeline and schedule of actions, and financing. The work program would involve interdepartmental cooperation for the identification of issues and analysis of land use goals and alternatives. The product of this work program will be a land use plan suitable for adoption by the City Council.

FINANCIAL CONSIDERATIONS

The report has no impact on the City's General Fund.

POLICY CONSIDERATIONS

The planning principles as developed by the Committee support the City's housing, transportation and air quality policies. The Committee has proposed that future development of the subject site include a mix of housing, commercial, community facilities and open space components, and that development be compatible in use, design and scale with the surrounding neighborhoods. Given the site's immediate proximity to existing residential neighborhoods and Sacramento City College, the Committee has recommended pedestrian and transit-oriented development for the former railroad yard site to mitigate potential impacts on the surrounding areas and to integrate the site with the surrounding community.

A detailed study of the site and land use alternatives would explore further policy considerations.

MBE/WBE

Not applicable.

Respectfully submitted,

Gary L. Stonehouse

GARY L. STONEHOUSE
Planning Director

RECOMMENDATION APPROVED BY:

WALTER J. SLIPE
City Manager

Dianne Guzman

DIANNE GUZMAN, AICP
Director of Planning & Development

Contact Persons:

Scot Mende, Senior Planner
Patricia Mendoza, Associate Planner
(916) 264-5381

FOR COUNCIL MEETING OF:
April 14, 1992

UNION PACIFIC LAND USE COMMITTEE REPORT ON

THE FUTURE USE OF THE UNION PACIFIC RAILYARD

SUMMARY

The Sacramento City Council assigned the Union Pacific Land Use Committee (UPLUC) the specific task of creating goals and policies to guide redevelopment of the Union Pacific Railroad Yard (UPRR) site whose longterm railroad maintenance function had terminated. Through a series of meetings with land use experts, government and service providers, and members of the surrounding communities, the Committee has determined that future use of the UPRR site should be compatible with the existing uses within the adjacent neighborhoods and serve as a "bridge" between Curtis Park and Land Park. Compatible uses, identified by the Committee, include low, medium and high density housing, open space and recreational facilities, community and neighborhood commercial businesses, additional educational facilities, and light rail. The Committee has encouraged higher residential and commercial densities around the two proposed light rail stations.

A description of the recommended land uses follows along with a discussion of the various issues the Committee has considered in the formulation of those uses and goals. The recommendations relate to the eastern 63 acres of the UPRR site, the inactive portion targeted for future development.

BACKGROUND

In the early 1900s, Western Pacific Railroad (WPRR) began to use the 94 acre site as its western locomotive maintenance yard. For the next eighty years, as the Curtis Park and Land Park communities grew alongside it, the site housed WPRR's switch yard and locomotive repair shops. The repair and maintenance use of the site continued until 1983. By 1985, Union Pacific had acquired WPRR and demolished the repair shops. Discussions which Union Pacific began with the City in 1986 on the reuse of the inactive eastern portion of the site were postponed when high levels of hazardous waste contamination were identified on the site. The railroad is currently addressing the issue of remediation of soil and groundwater contamination per State requirements, and has recently resumed negotiations with the City regarding the title of ownership issue and joint development of the site.

The site is located adjacent to the residential neighborhoods of Curtis Park and Land Park, as well as to Sacramento City College and a heavy commercial area to the south. The UPRR rail lines are on its west border, single family housing adjacent to Portola Way is to the north, primarily single family housing along 24th Street is to the east, and Western Pacific Avenue and Sutterville Road are to the south. (Refer to the site map in Attachment A). The site is comprised of a active 31-acre western portion used by the Railroad for switching activities, and an inactive eastern portion which was the former maintenance yard. The Committee has addressed the reuse of the 63-acre vacant eastern portion of the UPRR site. Union Pacific has indicated that it plans to continue operating its switching facilities on the western area of the site and running freight traffic on the active railroad lines.

COUNCIL APPOINTMENT OF UPLUC

Given the discontinuation of the land as a railroad maintenance yard and the need to begin to address its future redevelopment, on January 8, 1991, the Sacramento City Council appointed twelve residents from the neighborhoods adjoining the railyard site to the ad-hoc UPLUC. The Committee's task was to develop a general consensus among neighborhood residents and recommend land uses for the UPRR site. The Committee members represent each of the neighborhoods abutting the site, in addition to some of the various nonresidential tenants from the community. The UPLUC is comprised of area residents, local commercial business, and representatives from Sacramento City College and the UPRR. (See Attachment B for a list of Committee members).

PUBLIC PROCESS

Through a series of initial public meetings with various government agencies and land use planning experts, the Committee has studied the issues and constraints involved in reuse of the site. In addition, the Committee held several meetings to elicit input from the residents of the surrounding neighborhoods. (Appendix C contains meeting dates and agendas). After drafting the land use goals and recommendations, the UPLUC held additional workshops for community review. Two workshops were held in March prior to finalizing the report. The proposed land use recommendations are based on analysis of the various development issues, community views and a general consensus of the views of the Committee members.

FACTORS FOR CONSIDERATION

The Committee members have identified several land use factors relevant to the site which should be taken into consideration when planning for the future use of the former railroad yard. Those factors are:

- Land uses and architectural characteristics of the adjacent neighborhoods;

- General proximity of the site to Sacramento's downtown district;
- Immediate proximity to existing freight traffic and active switch yard;
- Proximity to Sacramento City College;
- Capacity of the supporting infrastructure (utilities, sewer, streets) and the availability of services;
- Site constraints to development (environmental, physical, financial);
- Circulation patterns (roadways, bikeways, pedestrian pathways);
- Capacity of schools;
- Potential for the extension of light rail through the site.

GOALS AND OBJECTIVES

With those factors in mind, the Committee has developed a set of goals and objectives for the UPRR site and general recommendations for its future use.

- Compatibility with the surrounding residential, educational and commercial uses in terms of (1) use, (2) design, (3) pedestrian orientation and (4) scale.
- Remediation of constraints to development, including remediation of toxic contamination to a level which allows recommended land uses.
- Optimal utilization of site to best serve the surrounding neighborhoods as well as the city.

GENERAL LAND USE RECOMMENDATIONS

The recommendations which follow are intended to serve as a starting point for the City and UPRR to follow in planning for the redevelopment of the site. The recommendations, while general in description and lacking detailed analysis, provide an important starting point for planning the reuse of the area. As previously stated, the Committee members have incorporated comments which they received from the neighborhood residents at three workshops in 1991 into these recommendations. The Committee presented the recommendations to the public at two additional community workshops held in early March of 1992.

1. Residential Use

The UPLUC strongly recommends development of housing on the site because of the existing adjacent residential neighborhoods. The Committee prefers to see development of residential densities that are compatible to the adjacent land uses. The surrounding neighborhoods contain primarily detached single family homes on small lots with narrow street widths. Higher density development (such as senior, family and student housing) would be appropriate adjacent to the proposed light rail transit stations in order to maximize utilization of the land, minimize traffic impacts, and serve the needs of the future residents.

- Housing should be the major use of the site. This use should be compatible to the residential neighborhoods adjacent to the site.
- Higher density housing for seniors, families or students should be located closer to the proposed light rail stations in order to maximize potential public transportation ridership.
- Mixed use (residential units and neighborhood-serving commercial uses) should be encouraged.
- Units affordable to low and moderate income households, as will be required under the inclusionary zoning ordinance currently being developed by the City, should be dispersed throughout the site to avoid clustering.
- Urban design guidelines should be developed to ensure compatibility with the adjacent Curtis Park and Land Park neighborhoods while encouraging visual diversity of the new development.
- Single family housing units should have design and development standards which allow the opportunity for the development of granny flats (secondary units).

2. Open Space and Recreational Use

While the site is within close proximity to both Curtis Park and Land Park, the Committee believes that some amount of open space should be included on the UPRR site in order to strengthen the pedestrian orientation of the adjacent neighborhoods. The Committee believes that the livability of any neighborhood is enhanced by open space and recreational opportunities for its residents.

- All oaks and other significant trees should be preserved.

- Part of the site should be reserved for open space and recreational park use. The park or open space use could be linear or on several scattered sites, or a combination thereof.

- Urban spaces such as a town square or village green, in addition to open space, should be incorporated where possible in the site design.

- Open space could be located over any necessary underground retention or drainage system or adjacent to the proposed light rail line to accommodate bicycle and pedestrian pathways.

- Bikeways and pedestrian pathways should be encouraged. They would serve to link the new development with the existing neighborhoods.

- Structures used for recreational activities (such as a swimming pool) that serve the existing and future neighborhoods should be considered for inclusion on the site.

3. Commercial Use

- Development of community and neighborhood-serving commercial uses (such as laundries, retail stores, banks, bakeries, restaurants, and other neighborhood-oriented services) are encouraged.

- Mixed commercial and residential uses are encouraged throughout the site.

- Professional offices should be allowed in the south end of the site, closer to Sutterville Road and the heavy commercial area south of Sutterville Road.

- All commercial development should be designed for pedestrian use. Auto-oriented commercial malls or shopping centers should not be considered.

- Commercial and mixed uses should be considered for development near the proposed light rail stations. Any nonresidential development on the site, especially at the north end, should be designed for compatibility with the existing residential neighborhoods.

4. **Schools**

- A detailed statistical analysis of the capacity of the existing schools needs to be conducted in order to assess the impacts of additional households on the local schools.

- Additional residential growth in the area may require construction of new or expansion of existing elementary and secondary school facilities. A potential school site should be reserved within the UPRR area.

- Land could be reserved for expansion of Sacramento City College at the southern end of the UPRR site. Space may be needed for classroom facilities.

5. **Light Rail**

Regional Transit is currently studying two alternative route for the southern extension of the light rail line, one of which follows the UPRR rail alignment. The Committee strongly encourages the extension of light rail along the Union Pacific route and recommends compatible commercial and residential densities at the potential light rail transit stations on the UPRR site. [The Committee recognizes that the light rail route is a political decision which Regional Transit has not yet made].

- Light rail extension following the UPRR rail alignment would better serve existing residential neighborhoods, Sacramento City College, Hughes Stadium and McClatchy High School students, as well as future residents and users of the UPRR site.

- Light rail transit would be compatible with existing uses within the area and with recommended residential and mixed use development on the UPRR site.

- Extension of light rail along the UPRR alignment would alleviate traffic impacts from redevelopment of the UPRR site, and promote alternative means of travel for area residents and student visitors.

- Proposed light rail transit stations should be designed to limit the amount of parking area. Park and ride lots should not be considered.

- The Committee supports an increase of public transportation service to the area, such as bus service, in the event that the UPRR alignment is not chosen for the southern extension of light rail.

6. Remediation of Toxic Substances

The Committee strongly urges the City to support remediation of soil and groundwater contamination to a level that would allow development of the recommended compatible uses.

- The clean-up level should be based on potential land uses that are sensitive to and compatible with the adjacent neighborhoods.

7. Circulation

The Committee would like to see the existing pedestrian-orientation of the existing neighborhoods strengthened by the future development. Circulation patterns should incorporate the new development into the existing residential neighborhoods.

- Development should encourage pedestrian and bike usage of the subject site.
- Future streets and traffic patterns should not divide the neighborhoods.
- Future traffic should be evenly distributed onto and within the UPRR site.
- Avoid converting existing residential streets, such as 24th Street, Donner Way, Portola Way and Fifth Avenue, into heavily travelled thoroughfares.
- Construction of pedestrian and bikeway overpasses should serve to link the Curtis Park and Land Park neighborhoods.
- Extension of light rail and expansion of other public transportation services (such as bus service) in the area would alleviate potential circulation impacts.
- A detailed study and analysis of existing area traffic patterns and future circulation impacts from potential UPRR site redevelopment should be undertaken prior to designation of land uses on the UPRR site.
- A portion of the site could be considered to accommodate Sacramento City College parking needs. (The College has identified light rail transit as its longterm solution to the student parking problem).
- Parking areas that might be required for any future use on the site, or parking that might be considered for use by the College, should be tree shaded and landscaped.

8. **Other Recommended Uses**

- The site could accommodate an underground storm water retention system which the City Department of Public Works has indicated is needed to accommodate the existing capacity of the neighborhood and anticipated capacity. Open space or bikeways could exist over a linear underground system.

- Opportunities should exist for expansion or relocation to the UPRR site of the Sierra II Community Center, especially if the Center is unable to continue to operate at its present location (the former Sierra School site).

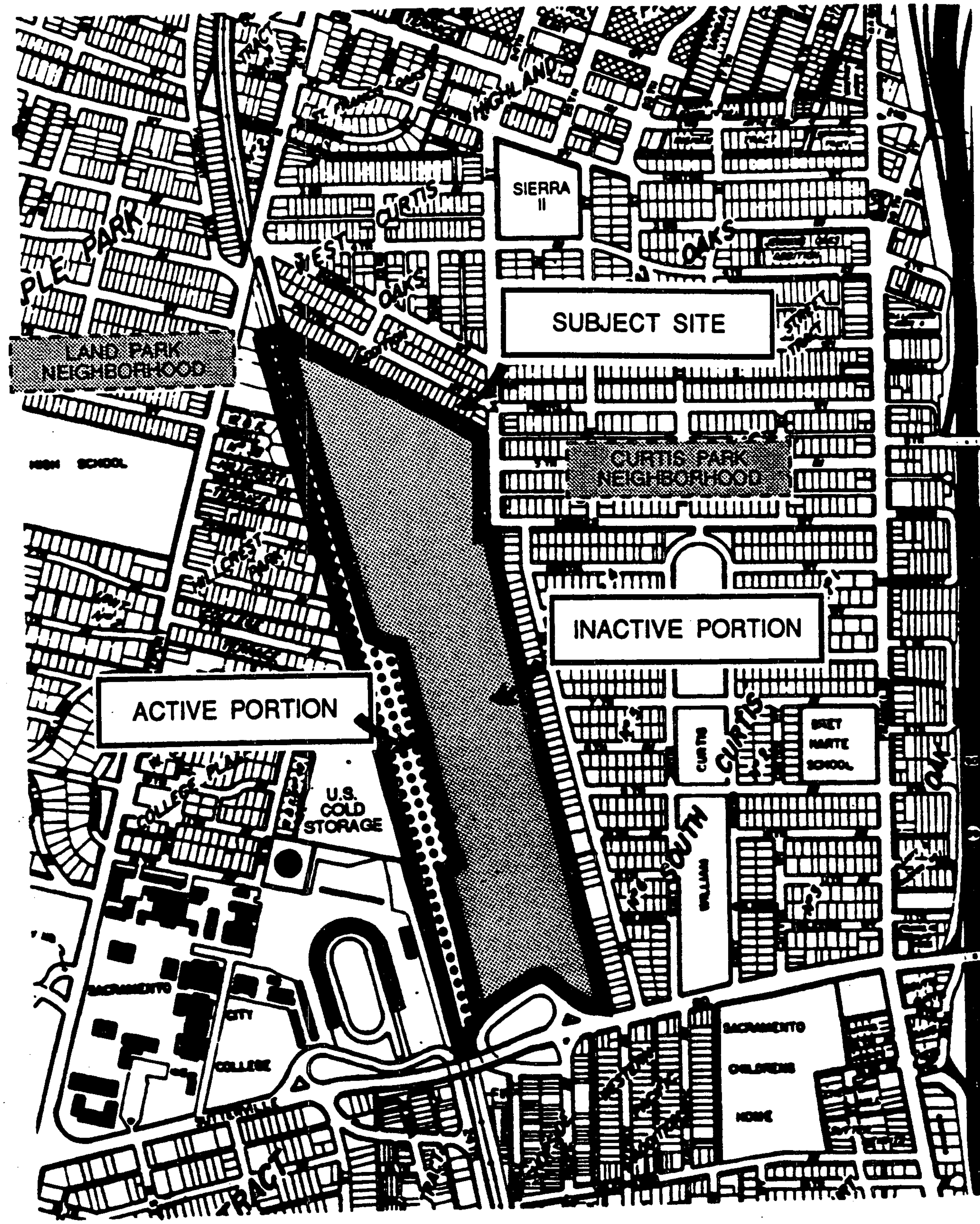
- Investigate the option of relocating the active switching facilities to another site during the City's quiet title negotiations with the railroad.

CONCLUSION

The Committee strongly recommends the continued participation of the neighborhood residents and the Union Pacific Land Use Committee in the planning process for the railyard site because development, regardless of intensity, will impact the existing neighborhoods. At the public meetings which the Committee held in the Curtis and Land Park neighborhoods, several area residents expressed their appreciation of the City Council's efforts to include the community in the planning process. Those residents also recommended that the City continue to incorporate community participation in all future planning efforts for the site.

In order to assess the alternative uses of the site and potential impacts on the adjacent neighborhoods, the Committee recommends that the City undertake a detailed study addressing land uses, infrastructure, traffic and other environmental issues. The Committee also recommends continuation of community participation and outreach efforts in the development of design guidelines for uses once the land use alternative has been selected.

ATTACHMENT A
UPRR SITE AND SURROUNDING NEIGHBORHOODS



ATTACHMENT B

AD-HOC UNION PACIFIC LAND USE COMMITTEE MEMBERS

- Tina Thomas, Committee Co-Chair
  Curtis Park Resident
- Genevieve Shiroma, Committee Co-Chair
  Curtis Park Resident
- Pat Osfeld, West Side/Land Park Resident
- Frank Pickel, Curtis Park Resident
- Bob Harris, Sacramento City College
- Rick Eades, Union Pacific Railroad
- Janet Robinson, Curtis Park Resident
- Rudy Martinez, Curtis Park Resident
  Local Business Operator - South of Sutterville Road
- Marc Brown, Curtis Park Resident
- Deborah Senna, Curtis Park Resident
- Charon Jenner, Curtis Park Resident
- Nick Docous, Curtis Park Resident
- UPLUC Alternates:
  - Randy Pestor, Curtis Park Resident
  - Marty Steiner, Curtis Park Resident
  - Richard Heltzel, Land Park Resident

ATTACHMENT C

UPLUC MEETINGS (Date, Time, Location, Agenda Items)

1. April 10, 1991 - 5:30 p.m. - Sierra II Community Room - Organizational Meeting; Invited Speakers: Councilman Joe Serna addressed the responsibilities of the UPLUC, and Mike Davis, Director of Department of Planning & Development, discussed land uses and the planning process.

2. April 24, 1991 - 5:30 p.m. - Sierra II Community Room - Invited Speakers: Tom Matoff, Director of Regional Transit, discussed regional transit issues, and Marty Van Duyn, Planning Director, Department of Planning & Development, covered land use alternatives and an overview of the planning process for the Southern Pacific Railyard.

3. May 8, 1991 - 5:30 p.m. - Sierra II Community Room - Invited Speaker: Dr. Jay Kenagy, Sacramento Unified School District, on the existing and potential impacts on the local schools; Mel Johnson, Director, Department of Public Works, on public utilities; and Marilyn Kuntemeyer, Private Consultant, and Kim Yee, City Traffic Engineer, Department of Public Works, on existing area traffic patterns.

4. May 15, 1991 - 5:30 p.m. - Sierra II Community Room - Invited Speaker: James Tjosvold, California Department of Toxic Substances Control, on the remediation of toxic contamination from the UPRR site.

5. June 26, 1991 - 5:30 p.m. - Sacramento City College - Invited Speaker: John Malloy, Executive Director of Sacramento Housing and Redevelopment Agency, addressed the ongoing study of the South Sacramento Redevelopment Survey Area.

6. July 10, 1991 - 5:30 p.m. - Sacramento City College - Invited Speakers: Gary Alm, Department of Public Works, addressed special assessment districts and Mello-Roos Community Facilities Districts; and Rebekah Buckles, Environmental and Financial Consultant, discussed use of Mello-Roos assessment funds to finance toxic clean-up.

7. July 24, 1991 - 5:30 p.m. - Sacramento City College - Open discussion on the community workshops and informational/invitational flyer.

8. September 25, 1991 - 7:00 p.m. - Sierra II Community Theater - Community meeting on the future land use of the UPRR site.

9. October 9, 1991 – 7:00 p.m. – McClatchy High School – Community meeting on the future land use of the UPRR site.

10. October 26, 1991 – 10:00 a.m. – Sacramento City College – Community meeting on the future land use of the UPRR site.

11. November 7, 1991 – 5:30 p.m. – Sacramento City College – Open discussion on the formulation of goals, policies and recommended land uses.

12. November 21, 1991 – 5:30 p.m. – Sacramento City College – Open discussion on the formulation of goals, policies and recommended land uses; and the work schedule for UPLUC.

13. December 1, 1991 – 5:30 p.m. – Sacramento City College – Continued discussion on the preliminary drafting of recommended land uses; and scheduling of additional meetings.

14. January 11, 1992 – 10:00 a.m. – 2337 Portola Way – Tour of the perimeter of the UPRR site by Timothy Parker, Project Manager, Dames & Moore.

15. January 29, 1992 – 5:30 p.m. – Sierra II Community Center – Open discussion of the preliminary draft of recommendations.

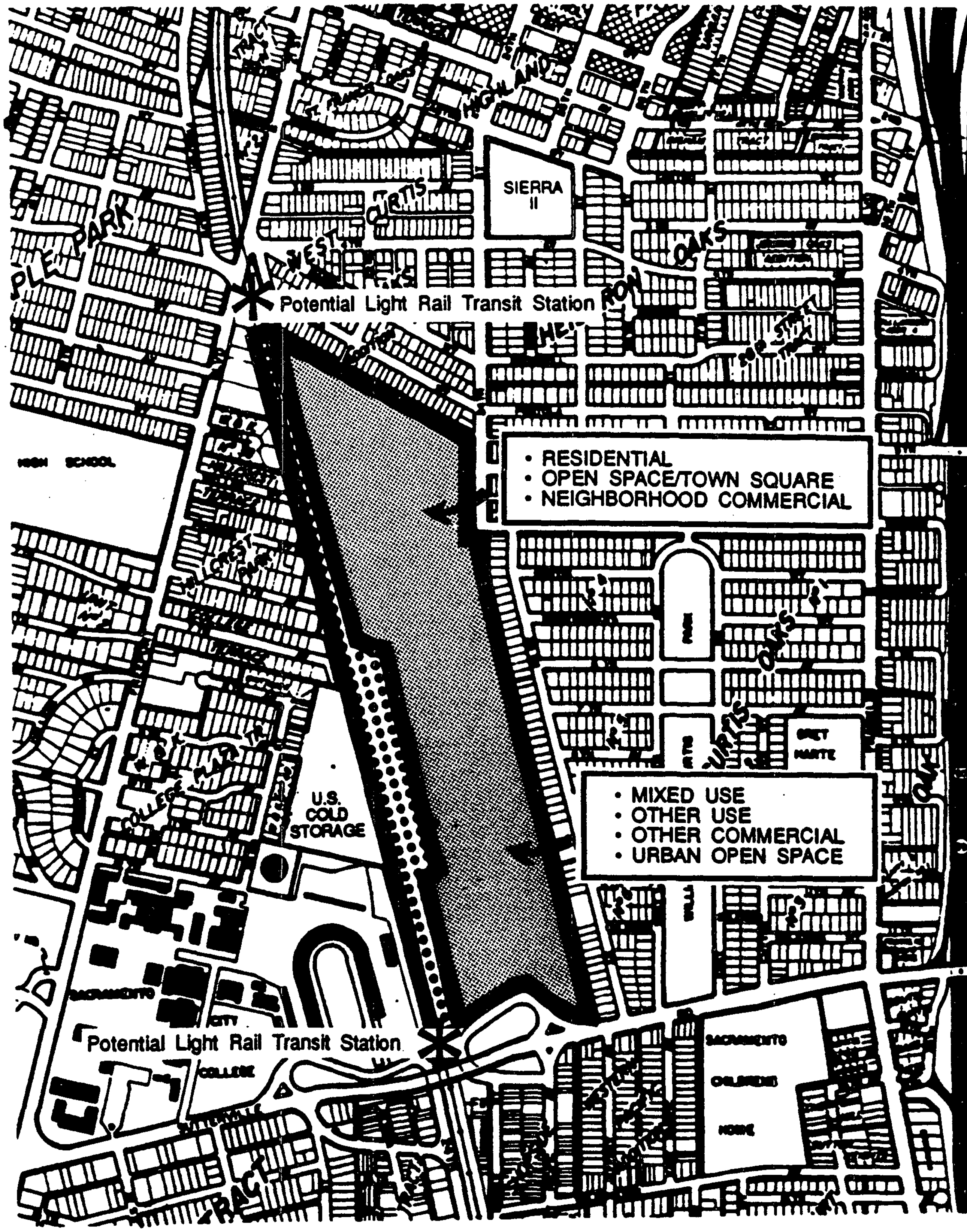
16. February 12, 1992 – 5:30 p.m. – Sierra II Community Center – Open discussion of the land use recommendations.

17. March 11, 1992 – 7:00 p.m. – McClatchy High School – Community meeting on draft recommendations.

18. March 14, 1992 – 10 a.m. – Sacramento City College – Community meeting on draft recommendations.

19. March 25, 1992 – 5:30 p.m. – Department of Planning and Development, 1231 I Street – Review of community meetings and finalization of report to City Council.

ATTACHMENT D
PREFERRED USE OF THE UPRR SITE



Appendix
B

B

Appendix

APPENDIX B

DTSC CORRESPONDENCE

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, Governor

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
REGION 1
10151 CROYDON WAY, SUITE 3
SACRAMENTO, CA 95827-2106
(916) 855-7700

April 6, 1992

Mr. Scot Mende
City of Sacramento
915 I Street
Sacramento, California 95814-2672

UNION PACIFIC, SACRAMENTO, LAND USE

Dear Mr. Mende:

On March 18, 1992, the Department of Toxic Substances Control (Department) met with the City of Sacramento and Union Pacific Railroad. At the conclusion of the meeting, you requested that we provide a matrix indicating which proposed uses can be sustained in the Restricted and Unrestricted areas, and a map depicting these zones.

First, I would like to reiterate some of the principles of our recommendation to remediate the site so that public health and the environment is protected for the land uses proposed. Some of our objectives in developing a remediation plan for this site are:

1. Allow as broad a range of land uses as possible in the Restricted area.

2. Allow people to utilize the land in the normal manner for that land use.

3. Minimize the need for future controls over exposure to contamination.

4. Make the remediation conservatively protective or fail safe, recognizing that unforeseen exposure scenarios will occur in the future.

5. Limit the necessity for future Department involvement.

We have recommended that two development types and associated remediations be established. One type is Unrestricted land use where any type of land use, including single family residences would be acceptable. The other type is Restricted land use where commercial land use or land use with similar potential exposures would be allowed. Regarding Restricted and Unrestricted land uses the following guidelines apply:

Unrestricted

1. Should be applied to areas where there has been minimal industrial use with possible associated contamination.

2. Sampling and historical information indicates that there is an area in the northeastern portion of the site that is acceptable for Unrestricted use, including residential.

3. It may be possible to expand the total area for Unrestricted use with additional sampling and, perhaps, remediation.

Restricted

1. A permanent deed restriction will be applied. It will preclude typical single family residential units and unless adequate protective provisions are established, schools, parks, and open space. It will preclude future removal of contaminated soil without proper sampling and disposal of the soil.

2. The land use developed will preclude direct exposure to the contaminated soil except in controlled circumstances. That is, the area will be covered by buildings, paving or controlled landscaping.

3. Cleanup will be to conservative levels, below those based on the typical exposure due to the land use, to allow for uncommon or unexpected exposures. That is, the cleanup levels will provide a margin of safety.

4. Other exposure scenarios will be evaluated with the risk assessment process to assure that health based levels are achieved by the cleanup. For example, the exposure of construction workers during development should be evaluated.

There are some special exposure scenarios which may occur which need to have mitigation measures established to eliminate or control exposure. Here are the exposure scenarios and possible mitigations identified to date:

1. Underground Utilities. The maintenance of underground utilities may present a significant exposure that could be dealt with in one of the following ways:

    a. Over excavate the utility trench and backfill with clean fill. The backfill could be crushed rock so that it would be visibly discernable from contaminated soil.

b. Place a concrete or other synthetic barrier around the trench.

c. Have maintenance work performed under a Health & Safety Plan according to state and federal laws governing workers at hazardous waste sites.

2. Landscaping. Landscaped areas associated with commercial or other Restricted use buildings could be dealt with in the following ways:

a. Provide three or four feet of clean fill so that people working or playing in the areas would not be exposed to contaminated soil.

b. Provide concrete structures to contain the landscaped areas.

3. Schools. Children are usually more sensitive receptors than adults and public concern may force a very conservative cleanup. However, the public school system could provide a more reliable institutional control than the private sector. Options exist depending on the amount of open space versus hard covered area (buildings, asphalt, etc.) and the degree to which the school is willing to exercise control.

a. If a large amount of open space is provided the remediation should conform with the Unrestricted type.

b. If the land utilization is dominated by buildings and hard covered areas and is, therefore, similar to commercial use, a Restricted use remediation may be acceptable.

The City could play an important role in assuring that mitigation measures that must be associated with the specific development are implemented. The City's permitting process provides the review of the specific development, for which the Department is typically not involved.

As you requested, we have enclosed a site map showing the areas that we have preliminarily defined as 1) Unrestricted, based on existing information, 2) Restricted and 3) Possible additional areas of Unrestricted use. Union Pacific has reviewed the map to identify the areas of possible expansion of Unrestricted use.

We have also reviewed the City's memo from Patricia Mendoza to you dated March 18, 1992, identifying potential land uses for the site to determine whether the land uses would be appropriate in the Restricted or Unrestricted area. Here is our evaluation:

- o Single family housing units: Unrestricted
- o Mixed use: Residential/Non-residential with non-residential on the ground story: Restricted
- o Non-residential uses: Restricted
- o Recreational facility: Restricted
- o Community Center: Restricted
- o Elementary School: Preferably Unrestricted (see discussion above)
- o Town Square: Restricted, if covered with concrete or asphalt
- o Natural open space: Unrestricted
- o Bike paths & pedestrian paths: Unrestricted, if part of open space
- o Underground combined sewer storage: Restricted

If you have any questions on these issues, please contact Jose Salcedo at (916) 855-7896 or me at (916) 855-7885.

Sincerely,

James Tjosvold

James L. Tjosvold, Chief
Sacramento Responsible Party Unit
Site Mitigation Branch

cc: Ms. Antonia Vorster
Regional Water Quality Control Board
3443 Routier Road
Sacramento, California 95827-3098

cc: Mr. Rick L. Eades
Director of Environmental Site Remediation
Union Pacific Railroad
1416 Dodge Street, Room 930
Omaha, Nebraska 68179

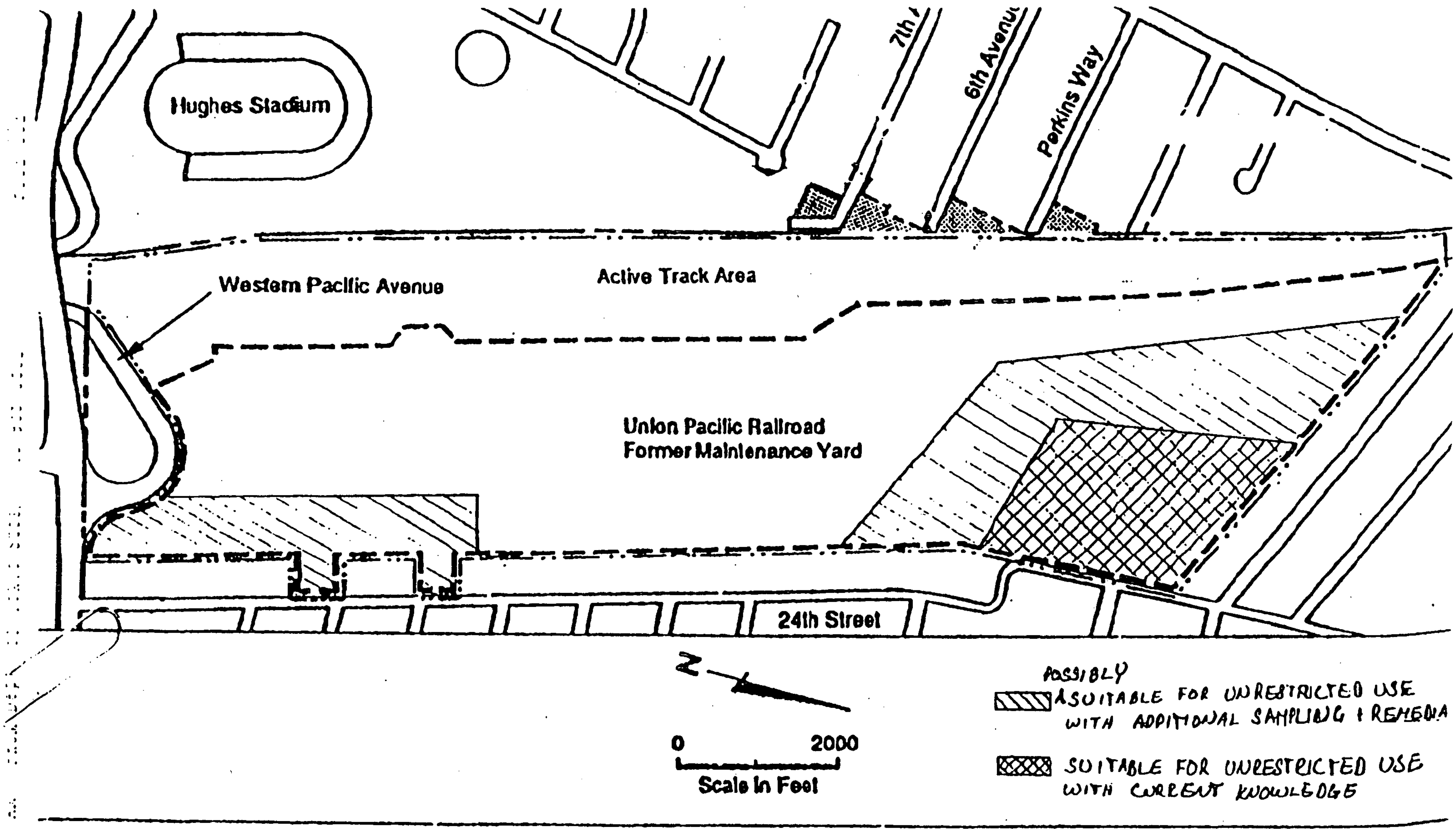
Ms. Genevieve Shiroma
Sierra Curtis Neighborhood Association
2791 24th Street
Sacramento, California 95818

Mr. Mel Knight
County of Sacramento
Hazardous Materials Division
8475 Jackson Road, Suite 230
Sacramento, California 95826

Mr. Joe Serna, Councilman
City of Sacramento
915 I Street
Sacramento, California 95814-2672

Mr. Tom Chinn, Councilman
City of Sacramento
915 I Street
Sacramento, California 95814-2672

Mr. Tim Parker
Dames & Moore
8801 Folsom Boulevard, Suite 200
Sacramento, California 95826


Hughes Stadium
7th A
6th Avenue
Perkins Way
Active Track Area
Western Pacific Avenue
Union Pacific Railroad
Former Maintenance Yard
24th Street
N
0
2000
Scale in Feet
POSSIBLY SUITABLE FOR UNRESTRICTED USE WITH ADDITIONAL SAMPLING & REMEDIA
SUITABLE FOR UNRESTRICTED USE WITH CURRENT KNOWLEDGE

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, *Governor*

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

REGION 1
10151 CROYDON WAY, SUITE 3
SACRAMENTO, CA 95827-2106
(916) 255-3730

June 22, 1993

Mr. Rick L. Eades, Director
Environmental Site Remediation
Union Pacific Railroad
1416 Dodge Street, Room-930
Omaha, Nebraska 68179-0930

COMMENTS ON FEASIBILITY STUDY SUPPLEMENT AND REVISED SOIL VOLUMES
UNION PACIFIC RAILYARD, SACRAMENTO COUNTY

Dear Mr. Eades:

The Department of Toxic Substances Control (Department) has completed its review of the <u>Feasibility Study Supplement (FS Supplement) and Revised Soil Volumes and Remedial Alternative Detailed Cost Estimates, FS Supplement</u> submitted on October 23, 1992, and February 17, 1993, respectively. These documents, generated in response to comments from the City of Sacramento, the community, and the Department, are adequate and acceptable with following required modifications.

<u>FS SUPPLEMENT</u>

1. Page 7, first paragraph - The text states that arsenic ranged from 3.1 to 545 mg/kg with an average of 7 mg/kg. The calculation for the average is incorrect, please revise.

2. Page 16, Section 3.2.1 - The list of chemicals of concern for ground water should also include lead, chromium, xylenes, toluene, and tetrachloroethylene (PCE). These chemical also exceed action levels.

3. Page 18, Section 3.2.3 - Remedial Action Objectives (RAO's) for volatile organic compounds in the central fill area should be identified. In addition, RAO's for total petroleum hydrocarbons - gasoline (TPH_g) and its derivatives; benzene, toluene, ethyl benzene and xylenes, based on the <u>Leaking Underground Fuel Tank (LUFT) Field Manual</u> should be identified for the former Oil House location.

cc: Ms. Wendy Cohen
Regional Water Quality Control Board
3443 Routier Road
Sacramento, California 95827-3098

Ms. Genevieve Shiroma
Sierra Curtis Neighborhood Association
2791 24th Street
Sacramento, California 95818

Mr. Mel Knight
County of Sacramento
Hazardous Materials Division
8475 Jackson Road, Suite 230
Sacramento, California 95826

Mr. Joe Serna, Mayor
City of Sacramento
915 I Street
Sacramento, California 95814-2672

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, *Governor*

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

REGION 1
10151 CROYDON WAY, SUITE 3
SACRAMENTO, CA 95827-2106
(916) 255-3741

June 22, 1993

Mr. Rick L. Eades, Director
Environmental Site Remediation
Union Pacific Railroad
1416 Dodge Street, Room 930
Omaha, Nebraska 68179-0930

COMMENTS TO REVISED DRAFT REMEDIAL ACTION PLAN, UNION PACIFIC RAILYARD, SACRAMENTO COUNTY

Dear Mr. Eades:

The Department of Toxic Substances Control (Department) has completed its review of the Revised Draft Remedial Action Plan (RAP) for the Union Pacific (UP) Sacramento site submitted on February 26, 1993. Our comments are as follows.

1. Page viii, last paragraph - The potential exposure pathways associated with future land use at the unremediated site should also include the inhalation of volatile organic compounds (VOC's) from the central fill area.

2. Page ix - Clean up levels and their rationale should be listed in the Executive Summary.

3. Page ix - The RAP must evaluate and propose remedial actions for the active switching yard (S-5). Amend the RAP accordingly.

4. Page x - It should be identified that a deed restriction will be used for areas with restricted land use. The deed restriction will preclude single family residential development and other uses with direct exposure to soil and limit excavation.

5. Page 1 - There will be a 30 day public comment period on the RAP within which a public meeting will be held. Please correct here and in the schedule.

6. Page 7, past chemical uses at the site - This list should also include the uses of solvents and degreasers to clean locomotive parts and herbicides for weed control.

7. Page 13, Section 2.2.2.1 - The description of soil contamination should be completed to include all contaminants present in the soil. The chemicals not

discussed in the text include polychlorinated biphenols (PCB's), VOC's, total petroleum hydrocarbons - gasoline [TPH(g)] and its derivatives; benzene, toluene, ethyl benzene, and xylene (BTEX).

8. Page 17, Section 2.2.8.3 - The text discusses the number of wells present within a one mile radius of the site. UP must re-evaluate and present this calculation using a one mile radius measured from the head of the plume.

9. Page 28, Section 3.4.1 - UP has not proven to the Department that only two water-bearing zones are impacted by contaminants. UP has installed only one monitoring well, MW-41, in the third water-bearing zone. The draft RAP should provide a discussion that the third water bearing zone needs to be characterized.

10. Page 30, last paragraph - The statement "soil vapors are not considered a problem because of the low levels detected" should be referenced to the Health Risk Assessment or substantiated better in the text.

11. Page 31, second paragraph - A lot of faith cannot be put on the first ambient air quality study since incorrect assumptions of predominant wind direction were used. However, the second air study conducted in November, 1992 indicated that the site was not impacting the ambient air down-wind from the site.

12. Page 52, Table 8 - This table should contain Remedial Action Objectives (RAO's) for all chemicals above levels of concern for all soil operable units. Constituents that must be included in this table are: TPH(g), benzene, toluene, xylenes, ethylbenzene, VOC's, and PCB's for soils. Lead, chromium, xylenes, toluene, vinyl chloride, 1,1,1-TCA, 1,1,2-TCA, carbon tetrachloride, and tetrachloroethylene must be included for ground water. Additionally, UP must also include the RAO's for soil operable unit S-5 (see comment 13).

13. Page 56, Section 6.2.1.5 - Future land use of the site will place workers and residents closer to the active switching yard than currently occurs. Also, UP's calculations for potential worker exposure to lead and arsenic underestimated risks because they used OSHA action levels rather than IRIS and California Environmental Protection Agency health

criteria per Department policy (see enclosed memo from James Carlisle). The Department believes that the air migration pathway for contaminants must be mitigated. Initially, UP proposed to cap the switching yard, however this has not been included in the proposed RAP. If a cap was proposed by UP, the alternative would have to include adequate provisions to assure that the cap would be maintained. The RAO's for S-5 should be identified in Table 8.

UP must characterize the petroleum hydrocarbon soil contamination in S-5 to provide estimates for impacted soil volumes, remediation alternative, and costs for this operable unit in the draft RAP.

14. The draft RAP should include a table outlining the comparison of costs for all final candidate alternatives.

15. Page 65, Paragraph 2 - Identify that a fence will be necessary around soil greater than the unrestricted RAO's until the development cover is constructed and maintained.

16. Page 104, Implementation schedule - The Department believes the implementation schedule is too long. UP should separate the Design for soils and ground water so that these can proceed on separate tracks. A separate event should be scheduled for the remaining ground water characterization work.

17. UP should complete the enclosed CEQA Initial Study Checklist.

Please resubmit a draft RAP that addresses the Department's and the community's comments within 30 days. We would like to meet as soon as possible to discuss the above comments. Please contact me (916) 255-3741 to arrange the meeting.

Sincerely,

José E. Salcedo

José E. Salcedo
Waste Management Engineer
Site Mitigation Branch

Enclosures
cc: See next page.

cc: Mr. Tim Parker
Dames and Moore
8801 Folsom Boulevard, Suite 200
Sacramento, California 95826

Ms. Wendy Cohen
Regional Water Quality Control Board
3443 Routier Road
Sacramento, California 95827-3098

Ms. Genevieve Shiroma
Sierra Curtis Neighborhood Association
2791 24th Street
Sacramento, California 95818

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8475 Jackson Road, Suite 230
Sacramento, California 95826

Mr. Joe Serna, Mayor
City of Sacramento
915 I Street
Sacramento, California 95814-2672

State of California Department of Toxic Substances Control

Memorandum

To: Jose Salcedo
Region 1, Site Mitigation
10151 Croyden Way, Site 3
California 95827-2106

Date: May 25, 1993

From: Office of the Science Advisor (OSA)
400 P Street, 4th Floor
P. O. Box 806
Sacramento, CA 95612-0806
(916) 255-2049 ATSS: 494-2049

Subject: Union Pacific PCA Code 11050 Site Code 100151-00

Document Reviewed: Development of Remedial Action Levels for the Union Pacific Railroad Yard, Sacramento, CA, by Dames and Moore, dated September, 1992.

General Comments

Union Pacific has proposed to remediate the active track area by covering the entire area with new ballast or paving, as appropriate, and leave up to 2860 ppm of arsenic and up to 17,500 ppm of lead in place. The new ballast is already in place, covering 70% of the area.

The following comments address the direct (ingestion, dermal contact, and inhalation) pathways only. We assume that regional staff are satisfied that groundwater is not threatened by the lead and arsenic which would remain in the active track area, and that the existing monitoring program would detect any lead or arsenic that might be leached from the site.

Although the availability of the arsenic and lead at the U.P. site appear to be low, this rests in part on the physical form of the these metals, which is mining slag used as ballast. Since the long-term fate of this material is unknown, we consider it to be essential that Region 1 staff ascertain that the cover is effective and provide for monitoring its continued integrity.

Specific Comments

Arsenic RAO

The OSHA action level for arsenic of 0.005 mg/m^3 has been used as the basis for calculating an allowable exposure point concentration of 2860 ppm. This is equivalent to 1.4 ug/kg/day, assuming a 70 kg person breathes 20 m^3 per work day. This value exceeds the IRIS RfD of 0.3 by a factor of 4.67. As a matter of policy DTSC requires the use of IRIS RfD value and California EPA cancer potency factors as the first choice among available criteria. OSHA standards are for work environments that are monitored and where personal protection and/or engineering controls may be implemented if action levels are exceeded.

In the absence of mitigating factors and using standard DTSC assumptions and U.S.EPA and California EPA criteria, we calculated a hazard index of 15.2 and a 25-year cancer risk of 0.0031 with a soil concentration of 2860 ppm. However, a report on the sources, speciation, and dissolution kinetics of arsenic and lead at the Union Pacific site, states that these metals are in the form of slag, in which the arsenic is tightly bound and therefore immobile and largely unavailable for exposure to humans or other biota (Walsh and Associates, 1992). It is our understanding that Union Pacific has covered the slag-based ballast with clean ballast which now covers approximately 70% of the active track area and has committed to pave the balance of the area. The low mobility of the arsenic in the slag and/or the effectiveness of the covering has been confirmed by air monitoring, which has shown no increase in airborne lead or arsenic between upwind and downwind air (Aerovironment, 1992).

Lead RAO

The proposed allowable concentration of 17,500 ppm for lead was also based on the OSHA action level, which is not the health criterion of choice according to DTSC policy. However, for the same reasons that arsenic will be immobile and unavailable, the lead will also not constitute a health risk.

Summary and Conclusions

DTSC policy is to use IRIS and California EPA health criteria, rather than OSHA action levels for development of remedial action objectives.

The relatively inert form in which the arsenic and lead are found at the Union Pacific site and the proposed and partially completed remedy would be expected to reduce exposure to an acceptable level provided that the cover material is effective in preventing significant exposure to lead and arsenic. We recommend that Region 1 staff obtain assurance that the continuing integrity of the cap will be monitored.

References

Aerovironment, 1992; Ambient Air Assessment at the Union Pacific Railroad Yard, Sacramento, CA.

Walsh and Associates, 1992; Sources, Speciation, and Dissolution Kinetics of Arsenic and Lead: Pacific Railroad Yard, Sacramento, CA.

J. C. Carlisle

James C. Carlisle, D.V.M., M.Sc.
Staff Toxicologist
Human and Ecological Risk Section

Reviewed by: Michael J. Wade, Ph.D., DABT MJW
Senior Toxicologist
Human and Ecological Risk Section

INITIAL STUDY SPECIAL CHECKLIST FOR

____
(fill in title of project)

This checklist has two purposes, to identify any reasonable possibility of "significant effect on the environment" as that term is used in Section 21068 of the Public Resources Code, and to identify "adverse effect, either individually or cumulatively, on wildlife" as that term is used in Sections 753.5 (c) and (d) of Title 14 of the California Code of Regulations.

"Significant effect on the environment" (significant effect) means a substantial, or potentially substantial, adverse change in the environment.

"Adverse effect, either individually or cumulatively, on wildlife" means an adverse change of any type or degree, either individually or cumulatively, on any wild animals, birds, plants, fish, amphibians, and related ecological communities, including the habitat upon which the wildlife depends for its continued viability.

	Substantial or potentially substantial adverse change		
	Yes	Maybe	No
1. **Earth** Will the proposed result in:			
a. Unstable earth conditions or in changes in geologic structures?	___	___	___
b. Disruptions, displacements, compaction or overcovering of the soil?	___	___	___
c. Change in topography or ground surface relief features?	___	___	___
d. The destruction, covering or modification of any unique geologic or physical features?	___	___	___
e. Any increase in wind or water erosion of soils, either on or off the site?	___	___	___
f. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake?	___	___	___

	Substantial or potentially substantial adverse change		
	Yes	Maybe	No
g. Exposure of people or property to geologic hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards?	___	___	___

	Any adverse change	
	Yes	No
h. Changes to any riparian land or wetlands under state or federal jurisdiction?	___	___
i. Changes to soil required to sustain habitat for fish and wildlife?	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

2. **Air** Will the proposed result in:

	Yes	Maybe	No
a. Substantial air emissions or deterioration of ambient air quality?	___	___	___
b. The creation of objectionable odors?	___	___	___
c. Alteration of air movement, moisture, or temperature, or any change in climate, either locally or regionally?	___	___	___

	Any adverse change	
	Yes	No
d. Degradation of any air resources which will individually or cumulatively result in a loss of biological diversity among the plants and animals residing in that air?	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

	Substantial or potentially substantial adverse change		
	Yes	Maybe	No
3. Water Will the proposed result in:			
a. Changes in currents, or the course of direction of water movements, in either marine or fresh waters?	___	___	___
b. Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff?	___	___	___
c. Alterations to the course or flow of flood waters?	___	___	___
d. Change in the amount of surface water in any water body?	___	___	___
e. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to, temperature, dissolved oxygen or turbidity?	___	___	___
f. Alteration of the direction or rate of flow of ground waters?	___	___	___
g. Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?	___	___	___
h. Substantial reduction in the amount or water otherwise available for public water supplies?	___	___	___
i. Exposure of people or property to water related hazards such as flooding or tidal waves?	___	___	___

	Any adverse change	
	Yes	No
j. Change to riparian land, rivers, streams, watercourses and and wetlands under state and federal jurisdiction?	___	___
k. Change to any water resources which will individually or cumulatively result in a loss of biological diversity among the plants and animals residing in that water?	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

	Substantial or potentially substantial adverse change		
	Yes	Maybe	No
4. Plant Life Will the proposed result in:			
a. Change in the diversity of species, or number of any species of plant (including trees, shrubs, grass, crops, and aquatic plants)?	___	___	___
b. Reduction of the numbers of any unique, rare or endangered species of plants?	___	___	___
c. Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?	___	___	___
d. Reduction in acreage of any agricultural crop?	___	___	___
e. Deterioration of existing plant habitat?	___	___	___

	Any adverse change	
	Yes	No
f. Any adverse effect to native and non-native plant life?	___	___
g. Effects to rare and unique plant life and ecological communities dependent on plant life?	___	___
h. Any adverse effect to listed threatened and endangered plants?	___	___
i. Effects on habitat in which listed threatened and endangered plants are believed to reside?	___	___

		Any adverse change	
		Yes	No
j.	Effects on species of plants listed as protected or identified for special management in the Fish and Game Code, the Public Resources Code, the Water Code, or regulations adopted thereunder?	___	___
k.	Effects on marine and terrestrial plant species subject to the jurisdiction of the Department of Fish and Game and the ecological communities in which they reside?	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

	Substantial or potentially substantial adverse change		
	Yes	Maybe	No
5. **Animal Life** Will the proposed result in:			
a. Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms or insects)?	___	___	___
b. Reduction of the numbers of any unique, rare or endangered species of animals?	___	___	___
c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?	___	___	___
d. Deterioration to existing fish or wildlife habitat?	___	___	___

		Any adverse change	
		Yes	No
e.	Effects on listed threatened or endangered animals?	___	___
f.	Effects on habitat in which listed threatened and endangered animals are believed to reside?	___	___

	Any adverse change Yes	No
g. Effects on species of animals listed as protected or identified for special management in the Fish and Game Code, the Public Resources Code, the Water Code, or regulations adopted thereunder?	___	___
h. Effects on marine and terrestrial animal species subject to the jurisdiction of the Department of Fish and Game and the ecological communities in which they reside?	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

	Substantial or potentially substantial adverse change Yes	Maybe	No
6. **Land Use** Will the proposal result in a substantial alteration of the present or planned land use of an area?	___	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

7. **Natural Resources** Will the proposal result in an increase in the rate of use of any natural resources?	___	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

	Substantial or potentially substantial adverse change		
	Yes	Maybe	No
8. Risk of Upset Will the proposal involve:			
a. A risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?	___	___	___
b. Possible interference with an emergency response plan or an emergency evacuation plan?	___	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

	Yes	Maybe	No
9. Transportation/Circulation Will the proposal result in:			
a. Generation of substantial additional vehicular movement?	___	___	___
b. Effects on existing parking facilities, or demand for new parking?	___	___	___
c. Substantial impact upon existing transportation systems?	___	___	___
d. Alterations to present patterns of circulation or movement of people and/or goods?	___	___	___
e. Alterations to waterborne, rail or air traffic?	___	___	___
f. Increase in traffic hazards to motor vehicles. bicyclists or pedestrians?	___	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

	Substantial or potentially substantial adverse change		
	Yes	Maybe	No
10. **Public Services** Will the proposal have an effect upon, or result in a need for new or altered governmental services in any or the following areas:			
a. Fire protection?	___	___	___
b. Police protection?	___	___	___
c. Schools?	___	___	___
d. Parks or their recreational facilities?	___	___	___
e. Maintenance of public facilities, including roads?	___	___	___
f. Other governmental services?	___	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

11. **Energy** Will the proposal result in:			
a. Use of substantial amounts of fuel or energy?	___	___	___
b. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?	___	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

12. **Utilities** Will the proposal result in a need for new systems, or substantial alterations to any utilities?	___	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

	Substantial or potentially substantial adverse change		
	Yes	Maybe	No
13. **Human Health** Will the proposal result in:			
a. Creation of any health hazard or potential health hazard (excluding mental health)?	___	___	___
b. Exposure of people to potential health hazards?	___	___	___

Explanation: (Explain or support answer. Be sure to site the data or evidence upon which you relied to come to your conclusion.)

DAMES & MOORE

8801 FOLSOM BOULEVARD, SUITE 200, SACRAMENTO, CALIFORNIA 95826
(916) 387-8800 FAX: (916) 387-0802

July 21, 1993

Mr. Val L. Siebal
Region 1, Department of Toxic Substances Control
California Environmental Protection Agency
10151 Croyden Way, Suite 3
Sacramento, CA 95827

Attention: Mr. James L. Tjosvold, P.E. Chief
Sacramento Responsible Party Unit
Site Mitigation Program

Re: Response to DTSC Comments on Revised Draft RAP and Feasibility Study Supplement for Union Pacific Sacramento Railyard Sacramento, California
D&M Project No. 00173-076-044

Dear Mr. Tjosvold:

Union Pacific Railroad Company (UPRR) has requested that Dames & Moore forward to you the above-referenced document. If you have any questions, please call me at (916) 387-7530.

Sincerely,

DAMES & MOORE

Jim Brake, R.G.
Project Manager

SAC73.27

DTSC Comments and UPRR Responses
Feasibility Study Supplement and Revised Draft Remedial Action Plan
Union Pacific Railroad Yard
Sacramento, California

Feasibility Study Supplement Comment	Response
1 Page 7, first paragraph The text states that arsenic ranged from 3.1 to 545 mg/kg with an average of 7 mg/kg. The calculation for the average is incorrect, please revise.	The sentence should read: "The arsenic concentrations reported in the subsurface soil samples ranged from 3.1 to 545 mg/kg, with an average of approximately 34 mg/kg. However, concentrations reported for 19 of 20 samples were 14 mg/kg or less. The average of reported concentration of arsenic for those 19 samples was approximately 7 mg/kg."
2 Page 16, Section 3.2.1 The list of chemicals of concern for ground water should also include lead, chromium, xylenes, toluene, and tetrachloroethylene (PCE). These chemical[s] also exceed action levels.	The listed constituents will be identified as chemicals of concern in the Final Draft Remedial Action Plan. However, the following should be noted: • Only six lead detections have been reported since 1991 with only one of these detections exceeding the MCL of 15 μg/L. • Chromium has been consistently detected in several wells at levels consistently below the MCL of 50 μg/L. Only seven detections of chromium at concentrations equal to or greater than 50 μg/L from five wells (none in 1992) have been reported. Chromium occurs naturally in groundwater in the Sacramento area at concentrations in the range of 1 to 20 μg/L (Johnson, 1985). • Only one well (MW-13) exhibited a xylene concentration in excess of the MCL (November 1991). Xylene concentrations in samples from MW-13 have been reported below the MCL since February 1992.

DTSC Comments and UPRR Responses
Feasibility Study Supplement and Revised Draft Remedial Action Plan
Union Pacific Railroad Yard
Sacramento, California

Feasibility Study Supplement Comment	Response
3 Page 18, Section 3.2.3 Remedial Action Objectives (RAO's) for volatile organic compounds in the central fill area should be identified. In addition, RAO's for total petroleum hydrocarbons — gasoline (TPH_g) and its derivatives; benzene, toluene, ethyl benzene and xylenes, based on the Leaking Underground Fuel Tank (LUFT) Field Manual should be identified for the former Oil House location.	Cancer risks and non-cancer health effects defined by the Hazard Index were less than 10^{-6} and 0.01 respectively for VOCs in soils for all receptors evaluated. Therefore, no remedial action objectives for VOCs in soil are required. Please see response to comment #10. RAOs for TPH(g), benzene, toluene, xylene, and ethylbenzene in soil in the Central Fill and Oil House areas (inactive site portion) will be identified in the Final Draft Remedial Action Plan.
4 Page 21, Section 3.2.4 and Table 6 The RAO's for ground water are Maximum Contaminant Levels (MCL) values. Chemicals not identified that exceed MCLs are: chemical — MCL (μg/L) lead — 15 PCE — 5 carbon tetrachloride — 0.5 xylenes — 1750	The chemicals listed by the DTSC will be identified in the RAP. Carbon tetrachloride has not been detected on-site. The furthest upgradient off-site detection was reported for samples collected from MW-29 within the first hydrostratigraphic zone. MW-29 is located adjacent to a former gas station as referenced in the RI/FS Report. Therefore, the source of carbon tetrachloride detected in the first and second hydrostratigraphic zones off-site may be the former gas station, but does not appear to be the site.
5 Page 24, Section 4.1.5 Characterization of Operable Unit (OU) S-5 should be complete in order to accurately compute soil volumes and cost. The calculated RAO's for this OU must be protective to ground water and nearby residents.	The lateral and vertical extent of TPH impacts in OU S-5 will be characterized in order to estimate impacted soil volumes and remediation costs. The Final Draft Remedial Action Plan will include a discussion of the preferred remedial alternative for this operable unit. RAOs for the TPH-diesel in Operable Unit S-5 soils will be identified in the Final Draft Remedial Action Plan.

DTSC Comments and UPRR Responses
Feasibility Study Supplement and Revised Draft Remedial Action Plan
Union Pacific Railroad Yard
Sacramento, California

Feasibility Study Supplement Comment	Response
6 (Revised Soil Volumes Document) Soil volumes should be calculated for OU S-5 and any soil with concentrations above the LUFT Field Manual values in the former Oil House Location.	Following completion of additional characterization of TPH-diesel impacted soil in the active yard (OU S-5), affected volumes will be calculated for OU S-5. Following establishment of RAOs for TPH-gasoline and associated constituents, affected volumes in the Oil House and Central Fill areas will be calculated. This information will be included in the Final Draft Remedial Action Plan.

Revised Draft Remedial Action Plan	Response
1 Page viii, last paragraph The potential exposure pathways associated with future land use at the unremediated site should also include the inhalation of volatile organic compounds (VOC's) from the central fill area.	These were evaluated and are discussed in the BHRA (October 1991) and the Supplement (October 1992). Please see response to comment #10.
2 Page ix Clean up levels and their rationale should be listed in the Executive Summary.	The Final Draft Remedial Action Plan will include a summary of cleanup levels for soil and groundwater in the Executive Summary.
3 Page ix The RAP must evaluate and propose remedial actions for the active switching yard (S-5). Amend the RAP accordingly.	Remedial alternatives for the active switching yard (OU S-5) will be evaluated, and a recommended alternative proposed following characterization of the extent of TPH impacts in OU S-5. The analysis of final candidate alternatives for OU S-5 will be presented in the Final Draft Remedial Action Plan.

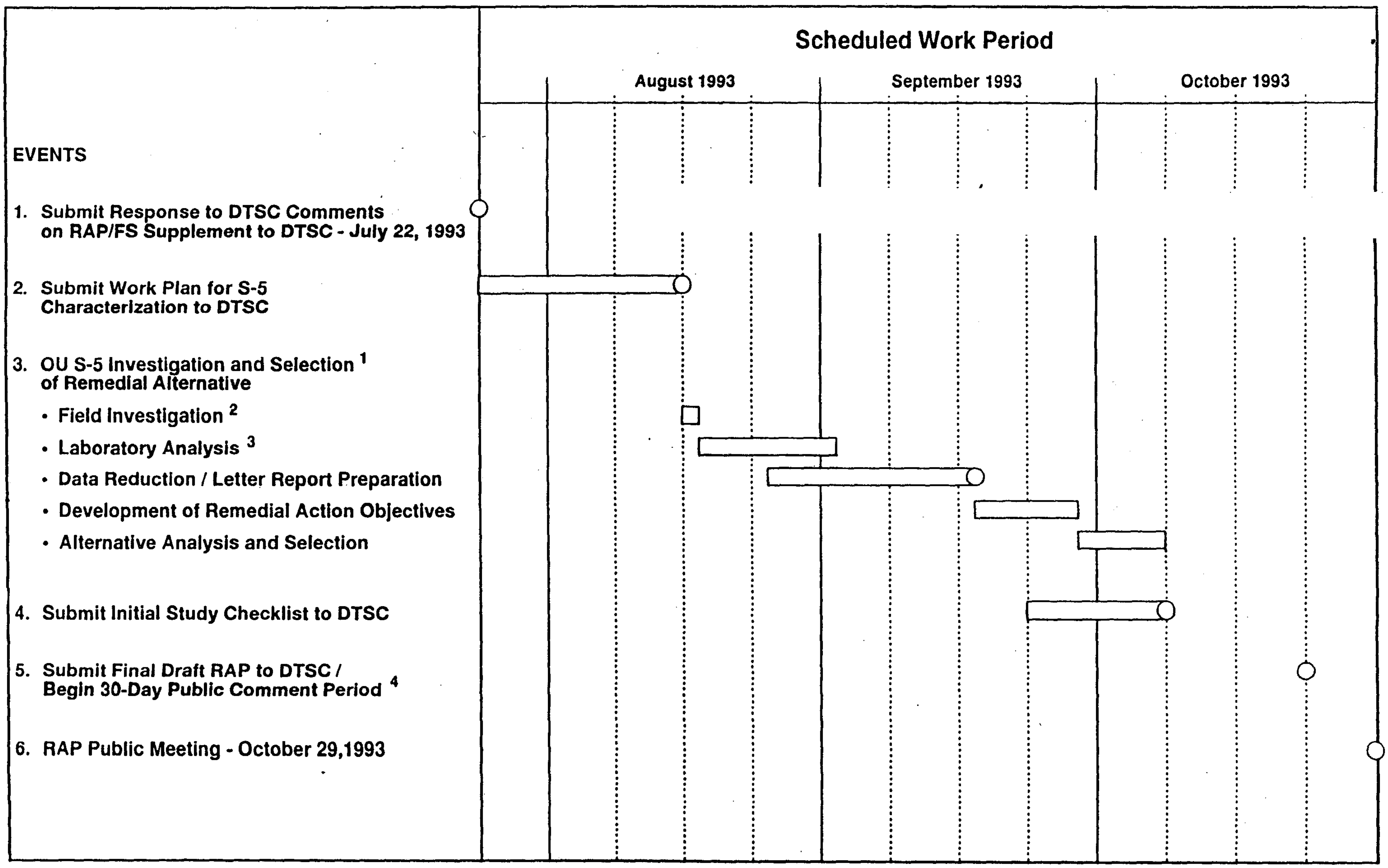
	Revised Draft Remedial Action Plan	Response
4	Page x It should be identified that a deed restriction will be used for areas with restricted land use. The deed restriction will preclude single family residential development and other uses with direct exposure to soil and limit excavation.	The need for deed restrictions in the restricted future land use areas will be added to the Executive Summary in the Final Draft Remedial Action Plan.
5	Page 1 There will be a 30 day public comment period on the RAP within which a public meeting will be held. Please correct here and in the schedule.	The text and schedule presented in the Final Draft Remedial Action Plan will indicate that the public meeting will be held during the 30-day public comment period.
6	Page 7, past chemical uses at the site This list should also include the uses of solvents and degreasers to clean locomotive parts and herbicides for weed control.	The Final Draft Remedial Action Plan will mention the use of solvents and degreasers for parts cleaning and use of herbicides on the list of past chemical uses at the site.
7	Page 13, Section 2.2.2.1 The description of soil contamination should be completed to include all contaminants present in the soil. The chemicals not discussed in the text include polychlorinated biphenyls (PCB's), VOC's, total petroleum hydrocarbons — gasoline [TPH(g)] and its derivatives; benzene, toluene, ethyl benzene, and xylene (BTEX).	Section 2.2.2.1 will include a description of the extent of the listed constituents in soils at the site.
8	Page 17, Section 2.3.8.3 The text discusses the number of wells present within a one mile radius of the site. UP must re-evaluate and present this calculation using a one mile radius measured from the head of the plume.	The text, Table 1, and Figure 11 will be revised to indicate the location of supply wells with respect to the groundwater contaminant plumes.

Revised Draft Remedial Action Plan	Response
9 Page 28, Section 3.4.1 UP has not proven to the Department that only two water-bearing zones are impacted by contaminants. UP has installed only one monitoring well, MW-41, in the third water-bearing zone. The draft RAP should provide a discussion that the third water bearing zone needs to be characterized.	The response of MW-41, in the third water-bearing zone, to pumping of the current groundwater IRM and potential future expansion will be evaluated to assess the potential for hydraulic connection between the third water-bearing zone and shallower zones. The results of this evaluation will define the need, if any, to further characterize this zone and will form the basis for appropriate investigation approaches.
10 Page 30, last paragraph The statement "soil vapors are not considered a problem because of the low levels detected" should be referenced to the Health Risk Assessment or substantiated better in the text.	Risks from potential exposure to soil vapors were evaluated in the BHRA (October 1991), p. 34, Section 3.2.2.1, and Table 31. They are also discussed in the Supplement to the Revised BHRA (September 1992), Tables 2-5, 2-6, 2-14, 2-15, and 2-20. In all cases, exposure to VOCs in soils resulted in risks of less than 10^{-6} and non-cancer Hazard Index of less than 0.01.
11 Page 31, second paragraph A lot of faith cannot be put on the first ambient air quality study since incorrect assumptions of predominant wind direction were used. However, the second air study conducted in November 1992 indicated that the site was not impacting the ambient air down-wind from the site.	No comment necessary. The DTSC seems to agree that the November 1992 air study adequately demonstrated that the site does not impact air down-wind from the site.
12 Page 52, Table 8 This table should contain Remedial Action Objectives (RAO's) for all chemicals above levels of concern for all soil operable units. Constituents that must be included in this table are: TPH(g), benzene, toluene, xylenes, ethylbenzene, VOC's, and PCB's for soils. Lead, chromium, xylenes, toluene, vinyl chloride, 1,1,1-TCA, 1,1,2-TCA, carbon tetrachloride, and tetrachloroethylene must be included for ground water.	RAOs for TPH(g), benzene, toluene, and ethylbenzene in soil will be developed and presented in the Final Draft Remedial Action Plan. RAOs for PCBs will also be presented. However, based on the results of the BHRA and the Supplement to the Revised BHRA, RAOs for VOCs in soils are not needed. This will be clarified in the Final Draft RAP. RAOs for the listed groundwater constituents will be included in the Final Draft Remedial Action Plan

	Revised Draft Remedial Action Plan	Response
	Additionally, UP must also include the RAO's for soil operable unit S-5 (see comment 13).	TPH-diesel RAOs for soil in OU S-5 will be presented in the Final Draft Remedial Action Plan.
13	Page 56, Section 6.2.1.5 Future land use of the site will place workers and residents closer to the active switching yard than currently occurs. Also, UP's calculations for potential worker exposure to lead and arsenic underestimated risks because they used OSHA action levels rather than IRIS and California Environmental Protection Agency health criteria per Department policy (see enclosed memo from James Carlisle).	Dr. Carlisle's memorandum states that due to the form in which lead and arsenic are present in the active switching yard (as slag), the concentrations detected in that area do not constitute an acceptable health risk.
	The Department believes that the air migration pathway for contaminants must be mitigated. Initially, UP proposed to cap the switching yard, however this has not been included in the proposed RAP. If a cap was proposed by UP, the alternative would have to include adequate provisions to assure that the cap would be maintained.	The interdiction of potentially complete pathways of exposure as designed for the site, and the nature of the arsenic and lead complexes in slag, together mitigate any potential risk from the active track area (S-5). This was documented in the report *Development of Remedial Action Levels* (Dames & Moore, September 1992). Moreover, UPRR plans to remove surface slag in the eastern portion of the active yard as part of the slag removal effort in the inactive site portion. Following slag removal activities, clean gravel ballast will be placed in those areas of the active railyard to restore grade and limit dust potential. It should also be noted that new ballast has also been placed in other portions of the active switching yard within the last several months. This will be stated in the Final Draft RAP.
	The RAO's for S-5 should be identified in Table 8.	As requested, RAOs for TPH-diesel in soil in OU S-5 will be identified in the Final Draft Remedial Action Plan.

	Revised Draft Remedial Action Plan	Response
	UP must characterize the petroleum hydrocarbon soil contamination in S-5 to provide estimates for impacted soil volumes, remediation alternative, and costs for this operable unit in the draft RAP.	The extent of TPH impacts to soil in OU S-5 will be investigated, and impacted soil volumes and remediation costs will be estimated. The Final Draft Remedial Action Plan will present this information, and a recommended remedial alternative for soils in OU S-5.
14	The draft RAP should include a table outlining the comparison of costs for all final candidate alternatives.	Table 11 of the Revised Draft Remedial Action Plan contains a comparison of the Final Candidate Alternatives, including the Net Present Worth Cost. Another table may be added, at DTSC's request, summarizing capital, O&M, and Net Present Worth Cost.
15	Page 65, Paragraph 2 Identify that a fence will be necessary around soil greater than the unrestricted RAO's until the development cover is constructed and maintained.	Following site-wide remedial action, UPRR will maintain a fence around the entire site. This will be noted in the Final Draft RAP.
16	Page 104, Implementation schedule The Department believes the implementation schedule is too long. UP should separate the Design for soils and ground water so that these can proceed on separate tracks. A separate event should be scheduled for the remaining ground water characterization work.	The Final Draft RAP will include schedules with groundwater and soil on separate tracks, as requested.

Revised Draft Remedial Action Plan	Response
17 UP should complete the enclosed CEQA Initial Study Checklist.	UPRR will submit the completed Initial Study Check List to DTSC for review and comment 5 weeks prior to submittal of the Final Draft Remedial Action Plan. Attachment 1 is a proposed schedule of events leading to submittal of the Final Draft Remedial Action Plan. The schedule includes time for the following tasks: • Preparation of a letter work plan describing additional investigation work to be performed in OU S-5; • Field investigation activities, laboratory testing, and data evaluation; • Identification of RAOs for TPH(d) in OU S-5 and calculation of affected volumes; • Analysis of alternatives for soils in S-5 and selection of the recommended remedial alternative; • Completion of the Initial Study Checklist; and • Preparation of a Final Draft Remedial Action Plan incorporating the additional information requested by DTSC, and addressing the comments of the DTSC as delineated above.



NOTES
1. Assumes immediate verbal approval of Work Plan by DTSC.
2. Assumes no unforeseen delays in field work due to site conditions or inclement weather.
3. Assumes laboratory turnaround of three weeks.
4. Assumes no delays for additional DTSC review / comment.

FINAL DRAFT
REMEDIAL ACTION PLAN SCHEDULE

Union Pacific Railroad Yard
Sacramento, California

DAMES & MOORE

00173-076-044.7/21/93

ATTACHMENT 1

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, *Governor*

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

REGION 1
10151 CROYDON WAY, SUITE 3
SACRAMENTO, CA 95827-2106
(916) 255-3545

September 23, 1993

Mr. Rick L. Eades
Director of Environmental
Site Remediation
Union Pacific Railroad
1416 Dodge Street, Room 930
Omaha, Nebraska 68179-0930

COMMENTS TO ACTIVE TRACK CHARACTERIZATION WORKPLAN AND SCHEDULE
UNION PACIFIC RAILYARD, SACRAMENTO COUNTY

Dear Mr. Eades:

The Department of Toxic Substances Control (Department) has reviewed the document titled "Draft Work Plan Additional Investigation Active (Western) Portion (August 18, 1993)" and the Response to Comments correspondence (July 21, 1993).

The proposal in the draft workplan is not approved in its present format. Union Pacific (UP) needs to revise the workplan to address the following deficiencies.

1. UP's proposal must have contingencies for stepping out radially if borings show soil contamination. UP needs to revise the workplan indicating how they intend to completely characterize the operable unit in and around soil boring location ATB-11 with one phase of field work.

2. The workplan needs to identify how the soil cutting from the borings will be disposed.

3. The criteria for determining whether to take a ground water sample from the bottom of the boreholes needs to be clearly defined.

4. A tremie pipe should be used for the grouting of all borings regardless of the potential for caving within the borehole.

5. The grout mixture proportions are 2 - 3 percent non-beneficiated pre-hydrated bentonite, to one sack of Portland cement, to 7.5 - 8.5 gallons of water.

The Response to Comments and Schedule overall were satisfactory, however, UP will need to amend and resubmit a revised Response to Comments addressing the following comments:

<u>Response to FS Comment 3</u>

Although the concentrations of volatile organic compounds (VOCs) are below the calculated health based levels, UP must provide Remedial Action Objectives (RAOs) protective to ground water. UP must also provide RAOs for total petroleum hydrocarbons (TPH_g), benzene, toluene, xylene, and ethylbenzene in soil in the Central Fill and Oil House areas prior to submitting the draft Remedial Action Plan (RAP) available for public review.

<u>Response to FS Comment 5</u>

The RAOs for TPH and any other contaminants of concern in OU S-5 should be established and submitted to the Department for review prior to submitting the draft RAP available for public review. Please see enclosed schedule for submittal due date.

<u>Response to draft RAP Comment 9</u>

The intent of our comment is to establish the fact that the third water-bearing zone has not been characterized. Further, UP will need to characterize this zone with monitoring wells in addition to pumping tests that may provide data on interconnections between water-bearing zones. The Department requests UP to state the above in the draft RAP. UP will need to submit subsequent workplans to characterize the ground water plumes.

<u>Response to draft RAP Comment 11</u>

The Department agrees that the November 1992 air quality study shows that the site is not adversely contributing to back-ground air quality. However, the draft RAP portrays a scenario where <u>two</u> air quality surveys demonstrate this fact. It can be agreed that the first air study was invalid. Please revise draft RAP to reflect above language.

<u>Response to draft RAP Comment 13</u>

UP's proposal for mitigating the air migration pathway in OU S-5 is unclear. The Department and UP need to reach an agreement on what remedial actions are needed in OU S-5.

Response to draft RAP comment 14

The Department is requesting UP to provide a table outlining the comparison of costs for all final candidate alternatives.

Response to draft RAP comment 16

The RAP implementation schedule must be submitted to the Department for review and approval prior to submitting the draft RAP available for public review. Please see enclosed schedule for submittal due date.

The schedule for submitting a revised workplan, for OU S-5, addressing the above deficiencies is October 4, 1993 ~~days~~. The scheduled due date for submitting the revised Response to Comments is October 29, 1993. If you have any questions regarding these issues, please contact me (916) 255-3741.

Sincerely,

José E. Salcedo
Waste Management Engineer
Site Mitigation Branch

Enclosure

cc: Mr. Jim Brake, R.G.
Dames and Moore
8801 Folsom Boulevard, Suite 200
Sacramento, California 95826

Ms. Wendy Cohen
Regional Water Quality Control Board
3443 Routier Road
Sacramento, California 95827-3098

Ms. Genevieve Shiroma
Sierra Curtis Neighborhood Association
2791 24th Street
Sacramento, California 95818

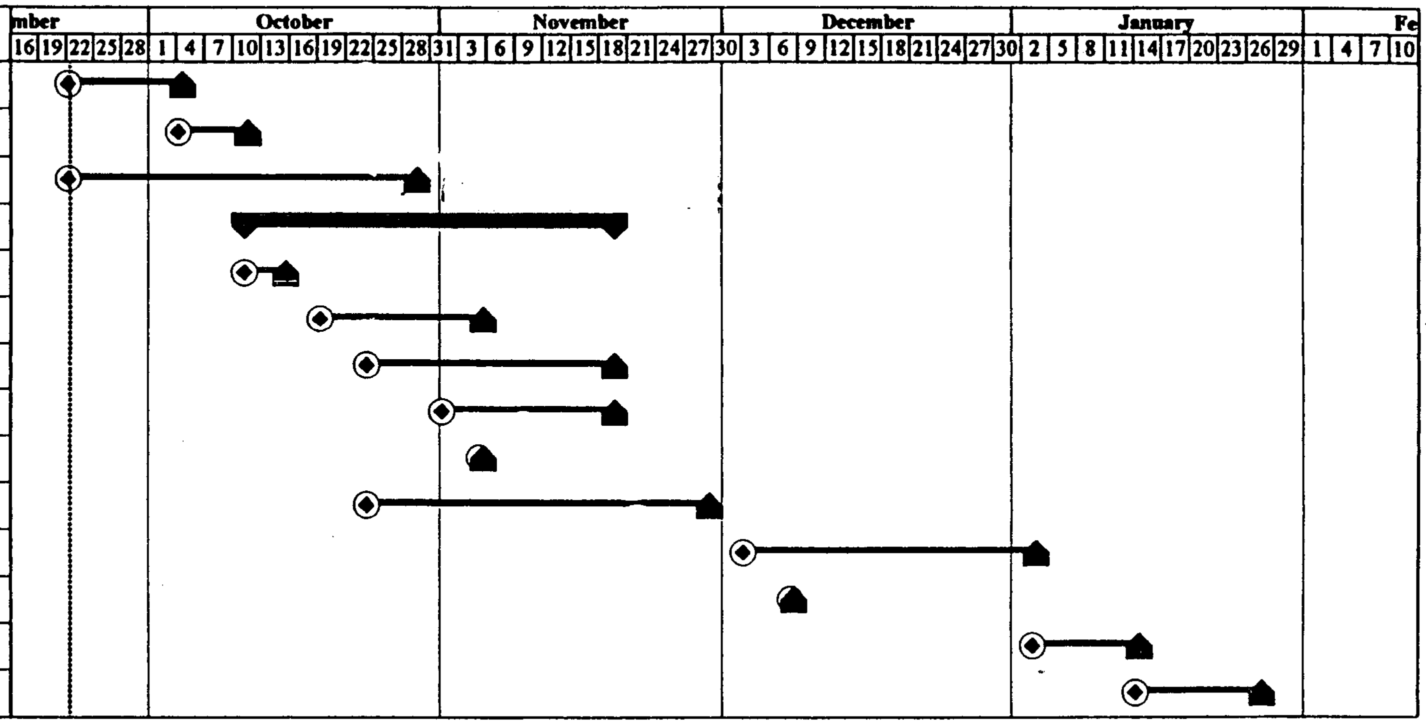
cc: Mr. Mel Knight
County of Sacramento
Hazardous Materials Division
8475 Jackson Road, Suite 230
Sacramento, California 95826

Mr. Joe Serna, Mayor
City of Sacramento
915 I Street
Sacramento, California 95814-2672

Ms. Patricia Mendoza
City of Sacramento
Department of Planning and Development
123 I Street, Suite 1900
Sacramento, California 95816

UNION PACIFIC SCHEDULE

ID	Name
1	UP submit revised workplan
2	DTSC approval of workplan
3	Submit revised Response to Comments
4	OU S-5 field work
5	Field Investigation
6	Laboratory Analyses
7	Data Reduction/Report Submittal to DTS
8	Develop and submit OU S-5 RAOs
9	Submit CEQA Initial Study checklist
10	Submit Final Draft RAP
11	Commence comment period
12	Public Meeting
13	DTSC Review public comments
14	Final RAP printed



October 29, 1993

Mr. Tony Landis, Chief
Site Mitigation Branch
Region 1, Department of Toxic Substances Control
California Environmental Protection Agency
10151 Croyden Way, Suite 3
Sacramento, CA 95827

Attention: Mr. James L. Tjosvold, P.E., Chief
Sacramento Responsible Party Unit
Site Mitigation Unit

Re: **Revised Response to DTSC Comments on**
Revised Draft RAP and FS Supplement
Union Pacific Sacramento Railyard
Sacramento, California
Dames & Moore Project No. 00173-076-044

Dear Mr. Tjosvold:

Union Pacific Railroad Company (UPRR) has requested that Dames & Moore forward to you the document referenced above. If you have any questions, please contact me at (916) 387-7530.

Sincerely,

DAMES & MOORE

Jim Brake, R.G.
Project Manager

SAC82.01

INTRODUCTION

The California Environmental Protection Agency Department of Toxic Substances Control (DTSC) commented on the Feasibility Study Supplement and Revised Draft Remedial Action Plan for the Union Pacific Sacramento Railyard in a letter dated June 22, 1993. Union Pacific Railroad Company's (UPRR) response to those comments was submitted to the DTSC on July 21, 1993.

The DTSC subsequently provided supplementary comments and clarified its position on certain issues in a letter dated September 23, 1993. A copy of the letter is presented in the Appendix. The letter identified eight outstanding issues, several of which the DTSC indicated must be fully resolved prior to completion of the Final Draft Remedial Action Plan. The DTSC also requested that UPRR provide a Revised Response to Comments by October 29, 1993.

On October 20, 1993 representatives of UPRR and Dames & Moore met with the DTSC. The purpose of the meeting was to discuss the DTSC's concerns and present a proposed approach to resolution of each issue identified by the DTSC. The following Revised Response to Comments is the first of the new submittals requested by the DTSC. UPRR's responses to the DTSC's letter of September 23 have been incorporated into the original Response to Comments format. Revised responses are printed in boldface. Some responses not specifically mentioned in the letter of September 23 have been changed slightly to maintain consistency with revisions agreed upon by UPRR and the DTSC.

UPRR has agreed to provide the requested additional submittals as quickly as practical in order to expedite completion of the Final Draft RAP. The Revised Response to Comments includes a schedule of activities culminating in distribution of the Final RAP. The schedule includes the additional submittals requested by the DTSC, including submittal dates.

DRAFT

DTSC Comments and UPRR Revised Responses
Feasibility Study Supplement and Revised Draft Remedial Action Plan
Union Pacific Railroad Yard
Sacramento, California

Feasibility Study Supplement Comment	Response
1 Page 7, first paragraph The text states that arsenic ranged from 3.1 to 545 mg/kg with an average of 7 mg/kg. The calculation for the average is incorrect, please revise.	The sentence should read: "The arsenic concentrations reported in the subsurface soil samples ranged from 3.1 to 545 mg/kg, with an average of approximately 34 mg/kg. However, concentrations reported for 19 of 20 samples were 14 mg/kg or less. The average of reported concentration of arsenic for those 19 samples was approximately 7 mg/kg."
2 Page 16, Section 3.2.1 The list of chemicals of concern for ground water should also include lead, chromium, xylenes, toluene, and tetrachloroethylene (PCE). These chemical[s] also exceed action levels.	The listed constituents will be identified as chemicals of concern in the Final Draft Remedial Action Plan. However, the following should be noted: • Only six lead detections have been reported since 1991 with only one of these detections exceeding the MCL of 15 μg/L. • Chromium has been consistently detected in several wells at levels consistently below the MCL of 50 μg/L. Only seven detections of chromium at concentrations equal to or greater than 50 μg/L from five wells (none in 1992) have been reported. Chromium occurs naturally in groundwater in the Sacramento area at concentrations in the range of 1 to 20 μg/L (Johnson, 1985). • Only one well (MW-13) exhibited a xylene concentration in excess of the MCL (November 1991). Xylene concentrations in samples from MW-13 have been reported below the MCL since February 1992.

Feasibility Study Supplement Comment	Response
3 Page 18, Section 3.2.3 Remedial Action Objectives (RAO's) for volatile organic compounds in the central fill area should be identified. In addition, RAO's for total petroleum hydrocarbons — gasoline (TPH_g) and its derivatives; benzene, toluene, ethyl benzene and xylenes, based on the Leaking Underground Fuel Tank (LUFT) Field Manual should be identified for the former Oil House location.	**Cancer risks and non-cancer health effects defined by the Hazard Index were less than 10^{-6} and 0.01 respectively for VOCs in soils for all receptors evaluated. RAOs will therefore be developed using the Designated Level Methodology (DLM) to be protective of groundwater, as requested by the DTSC during the meeting of October 20, 1993. A description of the leachability methodology used and proposed RAOs for VOCs in soil will be submitted to the DTSC in accordance with the attached schedule. Upon receipt of DTSC comments, the report will be revised as appropriate and a brief summary will be incorporated into the Final Draft RAP.** **RAOs for TPH(g), benzene, toluene, xylene, and ethylbenzene in soil in the Central Fill and Oil House areas (inactive site portion) will be developed using the LUFT Field Manual, as requested by the DTSC. A summary of RAO development and selection for these constituents will be submitted to the DTSC in accordance with the attached schedule. Upon receipt of DTSC comments, the final RAOs will be incorporated into the Final Draft RAP.**
4 Page 21, Section 3.2.4 and Table 6 The RAO's for ground water are Maximum Contaminant Levels (MCL) values. Chemicals not identified that exceed MCLs are: chemical — MCL (μg/L) lead — 15 PCE — 5 carbon tetrachloride — 0.5 xylenes — 1750	The chemicals listed by the DTSC will be identified in the RAP. Carbon tetrachloride has not been detected on-site. The furthest upgradient off-site detection was reported for samples collected from MW-29 within the first hydrostratigraphic zone. MW-29 is located adjacent to a former gas station as referenced in the RI/FS Report. Therefore, the source of carbon tetrachloride detected in the first and second hydrostratigraphic zones off-site may be the former gas station, but does not appear to be the site.

Feasibility Study Supplement Comment	Response
5 Page 24, Section 4.1.5 Characterization of Operable Unit (OU) S-5 should be complete in order to accurately compute soil volumes and cost. The calculated RAO's for this OU must be protective to ground water and nearby residents.	**The lateral and vertical extent of TPH impacts in OU S-5 will be assessed in order to estimate impacted soil volumes and remediation costs. Additional soil investigation in OU S-5 has recently been completed. When all data have been reviewed, RAOs for TPH-diesel will be developed and submitted to the DTSC for review and comment (see attached schedule). Additionally, estimates of impacted soil volumes will be used to conduct a feasibility study analysis of remedial alternatives for this OU. A summary of the feasibility study analysis, including the recommended remedial alternative, will be submitted to the DTSC for review and comment in accordance with the attached schedule. A summary of the RAOs and final FS analysis will be included in the Final Draft RAP, and the full FS analysis with cost estimates will be appended.**
6 (Revised Soil Volumes Document) Soil volumes should be calculated for OU S-5 and any soil with concentrations above the LUFT Field Manual values in the former Oil House Location.	Following completion of additional characterization of TPH-diesel impacted soil in the active yard (OU S-5), affected volumes will be calculated for OU S-5. Following establishment of RAOs for TPH-gasoline and associated constituents, affected volumes in the Oil House and Central Fill areas will be calculated. **This information will be included in the FS analysis appended to the Final Draft Remedial Action Plan, as well as in the RAP text.**

DTSC Comments and UPRR Revised Responses
Feasibility Study Supplement and Revised Draft Remedial Action Plan
Union Pacific Railroad Yard
Sacramento, California

Revised Draft Remedial Action Plan Comment	Response
1 Page viii, last paragraph The potential exposure pathways associated with future land use at the unremediated site should also include the inhalation of volatile organic compounds (VOC's) from the central fill area.	These were evaluated and are discussed in the BHRA (October 1991) and the Supplement (October 1992). Please see response to comment #10. **This will be clarified in the Final Draft RAP.**
2 Page ix Clean up levels and their rationale should be listed in the Executive Summary.	The Final Draft Remedial Action Plan will include a summary of cleanup levels for soil and groundwater in the Executive Summary.
3 Page ix The RAP must evaluate and propose remedial actions for the active switching yard (S-5). Amend the RAP accordingly.	Remedial alternatives for the active switching yard (OU S-5) will be evaluated, and a recommended alternative proposed following characterization of the extent of TPH impacts in OU S-5. The analysis of final candidate alternatives for OU S-5 will be presented in the Final Draft Remedial Action Plan.
4 Page x It should be identified that a deed restriction will be used for areas with restricted land use. The deed restriction will preclude single family residential development and other uses with direct exposure to soil and limit excavation.	The need for deed restrictions in the restricted future land use areas will be added to the Executive Summary in the Final Draft Remedial Action Plan.
5 Page 1 There will be a 30 day public comment period on the RAP within which a public meeting will be held. Please correct here and in the schedule.	The text and schedule presented in the Final Draft Remedial Action Plan will indicate that the public meeting will be held during the 30-day public comment period.
6 Page 7, past chemical uses at the site This list should also include the uses of solvents and degreasers to clean locomotive parts and herbicides for weed control.	The Final Draft Remedial Action Plan will mention the use of solvents and degreasers for parts cleaning and use of herbicides on the list of past chemical uses at the site.

	Revised Draft Remedial Action Plan Comment	Response
7	Page 13, Section 2.2.2.1 The description of soil contamination should be completed to include all contaminants present in the soil. The chemicals not discussed in the text include polychlorinated biphenyls (PCB's), VOC's, total petroleum hydrocarbons — gasoline [TPH(g)] and its derivatives; benzene, toluene, ethyl benzene, and xylene (BTEX).	Section 2.2.2.1 will include a description of the extent of the listed constituents in soils at the site.
8	Page 17, Section 2.3.8.3 The text discusses the number of wells present within a one mile radius of the site. UP must re-evaluate and present this calculation using a one mile radius measured from the head of the plume.	The text, Table 1, and Figure 11 will be revised to indicate the location of supply wells with respect to the groundwater contaminant plumes.
9	Page 28, Section 3.4.1 UP has not proven to the Department that only two water-bearing zones are impacted by contaminants. UP has installed only one monitoring well, MW-41, in the third water-bearing zone. The draft RAP should provide a discussion that the third water bearing zone needs to be characterized.	**As requested by the DTSC in the meeting of October 20, 1993, UPRR has agreed to develop a plan to investigate potential impacts to the third water-bearing zone. Upon receipt of DTSC comments, the plan will be finalized. The Final Draft RAP will include a discussion of the planned investigation.**
10	Page 30, last paragraph The statement "soil vapors are not considered a problem because of the low levels detected" should be referenced to the Health Risk Assessment or substantiated better in the text.	Risks from potential exposure to soil vapors were evaluated in the BHRA (October 1991), p. 34, Section 3.2.2.1, and Table 31. They are also discussed in the Supplement to the Revised BHRA (September 1992), Tables 2-5, 2-6, 2-14, 2-15, and 2-20. In all cases, exposure to VOCs in soils resulted in risks of less than 10^{-6} and non-cancer Hazard Index of less than 0.01.

	Revised Draft Remedial Action Plan Comment	Response
11	<u>Page 31, second paragraph</u> A lot of faith cannot be put on the first ambient air quality study since incorrect assumptions of predominant wind direction were used. However, the second air study conducted in November 1992 indicated that the site was not impacting the ambient air down-wind from the site.	**The Final Draft RAP will include a statement to the effect that the first air quality study was inconclusive, but that the DTSC concurs that the second air quality study in November 1992 adequately demonstrated that on-site conditions do not affect air quality downwind of the site.**
12	<u>Page 52, Table 8</u> This table should contain Remedial Action Objectives (RAO's) for all chemicals above levels of concern for all soil operable units. Constituents that must be included in this table are: TPH(g), benzene, toluene, xylenes, ethylbenzene, VOC's, and PCB's for soils.	**RAOs for TPH(g), benzene, toluene, and ethylbenzene in soil will be developed and presented in the Final Draft Remedial Action Plan. RAOs for PCBs will also be presented. RAOs for VOCs will be developed and submitted to the DTSC in accordance with the attached schedule (see response to FS Comment #3).**
	Lead, chromium, xylenes, toluene, vinyl chloride, 1,1,1-TCA, 1,1,2-TCA, carbon tetrachloride, and tetrachloroethylene must be included for ground water.	RAOs for the listed groundwater constituents will be included in the Final Draft Remedial Action Plan
	Additionally, UP must also include the RAO's for soil operable unit S-5 (see comment 13).	TPH-diesel RAOs for soil in OU S-5 will be presented in the Final Draft Remedial Action Plan.
13	<u>Page 56, Section 6.2.1.5</u> Future land use of the site will place workers and residents closer to the active switching yard than currently occurs. Also, UP's calculations for potential worker exposure to lead and arsenic underestimated risks because they used OSHA action levels rather than IRIS and California Environmental Protection Agency health criteria per Department policy (see enclosed memo from James Carlisle).	Dr. Carlisle's memorandum **concludes** that due to the form in which lead and arsenic are present in the active switching yard (as slag), the concentrations detected in that area do not constitute an unacceptable health risk.

	Revised Draft Remedial Action Plan Comment	Response
	The Department believes that the air migration pathway for contaminants must be mitigated. Initially, UP proposed to cap the switching yard, however this has not been included in the proposed RAP. If a cap was proposed by UP, the alternative would have to include adequate provisions to assure that the cap would be maintained.	**Limited paving in the Active Yard was considered (and assumed during development of allowable exposure point concentrations in the Active Yard). UPRR now plans to remove surface slag in that portion of the active yard as part of the slag removal effort in the inactive site portion. Following slag removal activities, clean gravel ballast will be placed in those areas of the active railyard to restore grade and limit dust potential. It should also be noted that new ballast has also been placed in other portions of the active switching yard within the last several months. The Final Draft RAP will include a discussion of the nature and extent of existing and planned measures to mitigate potential off-site migration of metals from slag. This will also be addressed in the FS analysis for OU S-5, including selection of long-term monitoring and/or maintenance measures, as appropriate. As requested by the DTSC, UPRR will submit a description of planned measures for DTSC review and approval prior to its incorporation into the Final Draft RAP.**
	The RAO's for S-5 should be identified in Table 8.	As requested, RAOs for TPH-diesel in soil in OU S-5 will be identified in the Final Draft Remedial Action Plan.
	UP must characterize the petroleum hydrocarbon soil contamination in S-5 to provide estimates for impacted soil volumes, remediation alternative, and costs for this operable unit in the draft RAP.	The extent of TPH impacts to soil in OU S-5 will be investigated, and impacted soil volumes and remediation costs will be estimated. The Final Draft Remedial Action Plan will present this information, and a recommended remedial alternative for soils in OU S-5.
14	The draft RAP should include a table outlining the comparison of costs for all final candidate alternatives.	Table 11 of the Revised Draft Remedial Action Plan contains a comparison of the Final Candidate Alternatives, including the Net Present Worth Cost. Another table will be added summarizing capital, O&M, and Net Present Worth Cost.

	Revised Draft Remedial Action Plan Comment	Response
15	Page 65, Paragraph 2 Identify that a fence will be necessary around soil greater than the unrestricted RAO's until the development cover is constructed and maintained.	Following site-wide remedial action, UPRR will maintain a fence around the entire site. This will be noted in the Final Draft RAP.
16	Page 104, Implementation schedule The Department believes the implementation schedule is too long. UP should separate the Design for soils and ground water so that these can proceed on separate tracks. A separate event should be scheduled for the remaining ground water characterization work.	**The RAP implementation schedule will be revised and submitted to the DTSC for review and comment in accordance with the attached schedule. Soil and groundwater related activities will be separated into separate scheduling tracks, and task durations will be reviewed to assess whether any can be expedited.**

Revised Draft Remedial Action Plan Comment	Response
17 UP should complete the enclosed CEQA Initial Study Checklist.	**UPRR will submit the completed Initial Study Check List to DTSC for review and comment prior to submittal of the Final Draft Remedial Action Plan in accordance with the attached schedule. The schedule includes time for the following tasks and DTSC submittals:** • **Preparation of a report describing results of the additional investigation work to be performed in OU S-5, including field investigation activities, laboratory testing, and data evaluation;** • **Identification of RAOs for TPH(d) in OU S-5 and calculation of affected volumes;** • **Analysis of alternatives for soils in S-5 and selection of the recommended remedial alternative;** • **Development of RAOs for VOCs, TPH-gasoline, and associated constituents;** • **Submittal of a revised RAP implementation schedule;** • **Completion of the Initial Study Checklist; and** • **Preparation of a Final Draft Remedial Action Plan incorporating the additional information requested by DTSC, and addressing the comments of the DTSC as delineated above.**

Appendix C

Appendix C

DTSC Policies and Procedures for Remedial Action Plans

TOXIC SUBSTANCES CONTROL DIVISION

OFFICIAL POLICY/PROCEDURE

TITLE: REMEDIAL ACTION PLAN DEVELOPMENT AND APPROVAL PROCESS

OPP#:87-2

Effective Date: OCT 05 1987

Expiration Date: ____________

Supersedes: ____________

Document Type:

/XX/ Policy

/XX/ Procedure

/__/ Regulation

/__/ Other

Status:

/XX/ New

/__/ Revision

Description: This document describes required contents of a Remedial Action Plan (RAP) and the DHS approval process, including statutory and Departmental mandates, draft and final approval forms, and suggested display advertisement.

APPROVED BY: Alex R. Cunningham

Alex R. Cunningham √
Chief Deputy Director

10/5/87
Date

cc: C. David Willis, Deputy Director
TSCD Technical Reference Center

OPP Form 005 (7/86)
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TOXIC SUBSTANCES CONTROL DIVISION
REMEDIAL ACTION PLAN DEVELOPMENT
AND APPROVAL PROCESS

OPP#87-2

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September 1987

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1. **PURPOSE**

The purpose of this document is to identify the required format and content of remedial action plans (RAPs) for hazardous substances release sites pursuant to Health and Safety Code (H&SC) Section 25356.1 and to establish the RAP approval process. It describes the overall process for the development and adoption of RAPs as well as organizational roles and responsibilities.

2. **BACKGROUND INFORMATION**

H&SC, Section 25356.1 (a) requires the Department of Health Services (DHS or Department), or Regional Water Quality Control Boards (RWQCB), if appropriate, to prepare or approve RAPs for all sites listed pursuant to Section 25356. Section 25356.1(b) provides for the preparation or approval of RAPs for sites that are not listed pursuant to Section 25356.

Section 25356.1 (d) and (e) further requires that RAPs be developed in draft, circulated for public/responsible party input, and adopted as a final document prior to undertaking final remedial action at listed hazardous substances release sites.

The purpose of a RAP is to compile and summarize site data gathered from the remedial investigation (RI) and the feasibility study (FS), in order to identify, and subsequently design, plan, and implement a final remedial action for a hazardous substance release site. The RAP approval process is the means by which the public is provided an opportunity to be involved in the hazardous substance release site remedial action decision-making process.

The remedial action plan itself is a summary of the remedial investigation and the feasibility study findings. RAPs are not intended to contain specific engineering design details of the proposed cleanup option; however, they must clearly and concisely describe the selected and rejected options to the extent that the interested public, other government agencies, and potentially responsible parties (PRPs) are given a meaningful opportunity to provide DHS with opinions and comments.

RAPs must also clearly set out specific remedial action objectives and timeframes for completion of actions. By adoption of a final RAP, DHS is in effect making a commitment to the public and PRPs that if the remedial action plan is fully implemented and completed, the site will be certified for removal from the state list of hazardous substance release sites which require remedial action or that it will be transferred to a list of sites which require long term operation and maintenance.

3. STATUTORY AUTHORITY-RAP CRITERIA/CONTENT AND PROCESS REQUIREMENTS

In addition to H&SC Section 25356.1, there are several other state and federal statutes and regulations which govern remedial action plans. H&S Code, Sections 25356.1(c) thru (h), 25356.3(c), 25358.7(a) thru (d), the California Environmental Quality Act (CEQA) found in Public Resources Code, 21000 et. seq., and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) found in 40 CFR Section 300.61 et. seq. prescribe the most substantive required criteria/content for RAP development and the required approval process. For reference, these sections, along with some annotation, are contained in Appendix 8. Additionally, the statutorily required RAP criteria/content is contained in Appendix 1 (Model RAP). The RAP process requirements are described in Chapter 5 and outlined in Appendix 2 (RAP Process Chart) for quick reference.

The following table lists major state and federal statutes and regulations as well as guidance/reference documents pertaining to RAPs. Staff must become familiar with the following laws, regulations, and documents to help ensure consistency between a proposed RAP and these requirements.

Table 1

Major Statutes/Regulations/Guidance Documents Pertaining to RAPs

	Statute	Regulation	Guidance/Ref. Document
State	o H&SC,Div.20,Chap.6.8 Sec.25356.1(c)-(h), 25356.3(c), 25358.7 (a)-(d) and 25356.3 (c) o Calif.Envir.Quality Act (CEQA) found in Public Resources Code Sec.21000 et. seq.,and title 14 CAC, Div.6, 15000 et. seq.	oTitle 8,14,22,23 of CA Admin. Code (CAC)	o Decision Tree o Bond Expenditure Plan
Fed.	o Comprehensive Environmental Response Compensation & Liability Act (CERCLA),commonly called Superfund, and modifications enacted 10/86 known as Superfund amendments and Reauthorization Act (SARA) o Resource Conservation and Recovery Act (RCRA) o Clean Air Act (CAA) o Clean Water Act (CWA) 33 U.S.C. 1321 o Toxic Substances Control Act	o Subpart F of the National oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR,Sec. 300.61 et. seq.) o 30 CFR o 49 CFR o RCRA regulations (40 CFR 260-270)	o EPA Superfund Guidance Manual which includes Record of Decision (ROD) Guidance & Interim Guidance on Superfund Selection of Remedy o EPA Guidance on Feasibility Studies under CERCLA o EPA RI/FS Guidance Document o Public Health Evaluation Manual o PCB Cleanup Guidance Manual

4. ROLES AND RESPONSIBILITIES

4.1 Headquarters(HQ):

- o Provides technical consultation, review, and comment on selected "team" site* RAPs.
- o Provides technical consultation on issues related to routine sites*, as requested by Regional Sections.
- o Schedules meetings/consultations with Regional Sections, if necessary, to resolve major issues.

*"Team" sites are large/complex/controversial sites which, because of their nature, have been selected for Headquarters technical staff involvement. Routine sites are uncomplicated to moderately complex sites which do not require consultation by HQ. The "team" sites will be identified annually as part of the zero base budget process.

4.1.1 Site Mitigation Unit Chief(SMU):

- o Reviews all draft RAP Executive Summaries and designates appropriate Regional Coordination and Evaluation staff at HQ (see below) to review and retain the Executive Summary in the site file.

4.1.2 Site Mitigation Regional Coordination and Evaluation Staff:

- o Reviews and retains all draft RAP Executive Summaries in the site files.
- o Provides technical consultation as requested on issues related to "team" site RAPs.

4.1.3 Technical Services Unit (TSU) Chief:

- o Reviews all draft RAP Executive Summaries.
- o Designates appropriate staff to review and comment on all "team" site draft RAPs.
- o Signs-off on the HQ Draft RAP Comments Record for "team" sites.

4.1.4 Designated Technical Services Unit Staff:

- o Provides technical consultation on issues related to "team" site RAPs including review of and comment on all "team" site draft RAPs.

- Provides technical consultation, as requested by the Regional Section, on issues related to routine site RAPs.

- Signs off on the Headquarters Draft RAP Comments Record (See Appendix 3) for "team" sites.

4.1.5 Designated Alternative Technology Section Staff:

- Provides technical consultation on issues related to all "team" site RAPs to identify, evaluate, and select appropriate and available treatment technologies for site remediation.

- Provides technical consultation, as requested by the Regional Section, on issues related to routine site RAPs.

4.1.6 Community Relations Coordinator:

- Performs any duties described under 4.2.1 of the chapter on an as needed basis as requested by the Regional Section.

4.2 Regional Sections:

- In general, have overall responsibility to ensure RAPs meet all state and federal statutory, regulatory, technical, and policy requirements.

- May approve and issue draft and final RAPs without HQ's approval. However, HQ must be provided an opportunity to review and comment on "team" site RAPs prior to draft RAP issuance.

4.2.1 Community Relations Coordinator:

- Receives and maintains copies of all RAP Executive Summaries.

- Drafts public notices.

- Assists in coordination of and moderates public meetings.

- At SMU Chief's request, assists Project Manager in preparing the "Analysis of Public Comments" received on draft RAP during public comment period.

4.2.2 Project Manager:

- Throughout RAP development and review process, ensures RAPs meet all state and federal statutory and regulatory requirements.
- Prepares memorandum regarding HQ and Regional RAP concerns and how they were handled.
- Disseminates or delegates dissemination of RAP as specified in this policy.
- Publishes or delegates publication of notice of public meeting.
- Makes presentation at public meeting.
- Prepares, together with Community Relations Coordinator (upon SMU Chief's request), "Analysis of Public Comments Record".
- Signs-off on all draft and final RAPs.
- Publishes final RAP approval notice.

4.2.3 Sr. Engineer/Specialist:

- Reviews/concurs on all draft and final RAPs.

4.2.4 SMU Chief:

- Reviews/concurs on all draft/final RAPs.

4.2.5 Regional Section Chief:

- Reviews/approves all draft/final RAPs.

5. REMEDIAL ACTION PLAN (RAP) PROCESS

The following is a step-by-step description of the DHS process for the development and finalization of RAPs consistent with H&SC Sections 25356.1 and 25358.7, draft

California Environmental Quality Act (CEQA) regulations, and the NCP.

The RAP development and approval process is essentially the same for all sites. However, there are minor processing differences between the routine site RAP and the "team" site RAP, as illustrated in the description below. (See also Appendix 2 for an overview of this process.)

5.1 Preparation of Draft RAP (H&SC 25356.1(a) & (b))

Draft RAPS will generally be prepared by the RP or a DHS contractor, although they may also be prepared by DHS/RWQCB staff. In those cases in which the RP requests DHS to develop the RAP, DHS will usually assign the project to the appropriate DHS contractor but may prepare the RAP in-house. (See Appendix 1 for Model RAP).

Note: For each NPL site, EPA and DHS will agree in advance concerning who will prepare the ROD/RAP.

5.2 Transmittal of Draft RAP Executive Summary to Headquarters (All Sites)

Upon acceptance of a draft RAP and prior to release for public comment, the Regional Section will forward a copy of the draft RAP Executive Summary to the Community Relations Section for review and retention.

5.3 Transmittal of Draft RAP Executive Summary to Headquarters (Routine Site)

For routine site RAPs, concurrent with step 5.2 above, the Regional Section will forward a copy of the RAP Executive Summary to the HQ's SMU Chief and the TSU Chief for information and comment only as requested by the Regional Section.

5.4 Transmittal of Complete Draft RAP to Headquarters ("Team" Site)

For "team" site RAPs, concurrent with step 5.2 above, the Regional Section will forward a complete copy of the RAP to HQ's TSU for technical review concurrent with the Project Manager's review. HQ's comments are submitted to the Regional Section during the Project Manager's review. The Regional Section will establish a submittal deadline and inform HQ of such date at the time the draft RAP is submitted. (See Appendix 3 for the HQ's Draft RAP Comments Record.)

5.5 Draft RAP Review (Regional Project Manager)

Draft RAPs will be reviewed by the site Project Manager for compliance with all state/federal statutory, regulatory, and policy requirements as described in this document. RAPs which meet all applicable legal and procedural requirements will then be reviewed for technical content. The RAP should provide adequate information to answer three basic categories of questions:

(a) Remedial Investigation (RI)

Has the (RI) been performed consistent with state law, DHS policy and relevant EPA guidance documents? Does the RI study provide reasonable assurance that the extent of contamination in all environmental media (air, surface water, ground water and soils, as appropriate) has been adequately defined?

(b) Feasibility Study (FS)

Has the FS been performed consistent with state law, DHS policy and EPA guidance? Does the FS adequately evaluate remedial alternatives using acceptable cost, environmental, and public health criteria? Is the evaluation consistent with applicable state and federal laws as stated in the statutory authority section of this document?

(c) Recommended Remedial Action

Is the remedial action option proposed reasonable and feasible given the conditions at the site as documented by the RI/FS?

Note: Any noted deficiencies in the above stated requirements or in technical content are to be corrected by the party who prepared the RAP, (e.g., PRP or DHS contractor).

5.6 Discussion of Concerns

HQ's comments regarding "team" sites are submitted to the Project Manager via the Regional SMU Chief. The Project Manager will prepare a memorandum of how any Regional and HQ concerns were addressed and/or resolved. It will be HQ's responsibility to schedule meetings/consultations, if necessary, to address major issues.

5.7 Draft RAP Approval

Draft RAPS which have been reviewed and recommended for approval by the Project Manager are sequentially routed together with related memorandum and other appropriate documentation to the Regional Senior Engineer/ Specialist, Regional SMU Chief and Regional Section Chief for review and/or approval.

A RAP Approval Record (See Appendix 4) is to be attached to draft RAPs to provide documentation of review and approval.

5.8 Draft RAP Dissemination (H&SC 25356.1(d) and 25358.7(a) (1))

Upon approval of the Regional Section Chief, draft RAPs are to be forwarded to:

(a) All identified potentially responsible parties for the site;

(b) EPA, the Office of the Secretary of Environmental Affairs as well as other appropriate federal, state, and/or local government agencies; and

(c) Local repository (e.g., library located in the site area).

Note: At the discretion of the Regional Section Chief, the PRP may be required to issue draft RAPs to those identified in (b) and (c), above.

5.9 Public Meeting Notice (H&SC 25356.1(d), 25358.7(a) 2, CEQA 67663 and CEQA 67664)

Concurrent with the release of draft RAPs pursuant to No. 5.8 above, the Regional Sections will publish a notice (display ad) of the availability of the RAP and public meeting on same in a local newspaper of general circulation. (See Appendix 5 for Model Public Notice).

Note: At the discretion of the Regional Section Chief, the PRP may be required to issue the public notice and/or be responsible for associated costs.

The notice shall include the following information:

(a) Notice that a copy of the draft RAP is available at the Regional Office and local information repository for review;

(b) Notice of the date, place, and time of the public meeting to discuss the draft RAP and receive comments; and

(c) The specific beginning and ending dates of the comment period.

Such a notice must be advertised, as a display ad, in a newspaper of general circulation within the area where the site is located at least 30 days prior to finalization of the RAP.

The Regional Section shall also:

(a) Post RAP notices at public locations near the site;

(b) Notify, by direct mailing: 1) persons owning and/or living on property contiguous to the site (as obtained from the County Assessor's office), 2) persons who, in writing, request notification, and 3) persons identified in the Community Relation plan; and

(c) Notify all affected public agencies that a proposed RAP is available for public review and comment and forward to them a copy of the entire proposed RAP. The Department is further required to consult with all such agencies pursuant to Section 67663 of the draft CEQA regulations.

5.10 <u>Conduct of Public Meeting</u> (H&SC 25356.1 (d) (3) , 25358.7(a) (3), and 25358.7(b) and (c))

Within the public comment period, but not sooner than 7 days following the newspaper publication of the public meeting notice, the Regional Section shall arrange and conduct a public meeting on the draft RAP.

DHS or RWQCB (whichever has lead responsibility for the site remediation) will coordinate the presentations at the meeting which summarize the following information regarding the site: 1) An assessment of the degree of contamination, 2) the characteristics of the hazardous substances, 3) remedial action alternatives considered and rejected (and why), 4) the selected alternative together with the rationale for selection, and 5) the timeline for carrying out the proposed remedial actions.

The lead agency will develop the agenda for the public meeting. In the event that the PRP is requested to make a presentation which is above and beyond the opportunity afforded the general public, the presentation shall first be approved by the Project Manager and the Community Relations Coordinator prior to the presentation.

Comments (written or oral) from other governmental agency representatives, PRPs, and the general public will be invited. The meeting is to be recorded (either by tape recording or a reporter) and transcribed. All comments received during the comment period, including those comments made at the hearing are to become part of the RAP decision-making record.

5.11 <u>Preparation of Analysis of Public Comments Record</u> (H&SC 25356.1 (e))

The Project Manager or designee will prepare a written analysis of all written and oral comments received during the public comment period, including those presented at the public meeting. The analysis is to identify any major issues of concern regarding the draft RAP, including suggested revisions. The analysis will make recommendations regarding any proposed changes to the RAP which the Regional Section believes are necessary together with the rationale for the recommendations. The headquarters or regional community relations coordinator may be consulted for assistance. (See Appendix 6 for the Analysis of Public Comments format).

5.12 <u>Review of Analysis of Public Comments Record</u> (H&SC 25356.1(e))

For "team" sites, the analysis of public comments will be presented to the Regional SMU Chief for review and approval. Concurrently, a copy of the analysis will be forwarded to the HQ's TSU Chief for review. The two Chiefs will confer as necessary.

For routine sites, Headquarters involvement will not be necessary.

5.13 Final RAP Preparation (H&SC 25356.1 (e))

Based on appropriate comments received, and upon approval by the Regional SMU Chief, the Project Manager or designee amends, or instructs the RAP preparer to amend, the RAP. The RAP preparer will be instructed by letter to make the specified changes and to issue the proposed final RAP to the Regional Section within a timeframe established by the Project Manager.

5.14 Final RAP Approval

The finalized RAP is sequentially reviewed and signed-off via a Final RAP Approval Record (See Appendix 4) by the following:

(a) Regional Project Manager,
(b) Regional Senior Engineer/Specialist,
(c) Regional Site Mitigation Unit Chief, and
(d) Regional Section Chief

5.15 Final RAP Dissemination (H&SC 25356.1(f), 25356.3 (a) and 25358.7(b))

Upon Regional Section Chief approval, a copy of the final RAP along with a copy of the Analysis of Public Comments Record is disseminated to all interested parties as follows:

(a) Potentially Responsible Parties (along with a transmittal letter.)

(b) EPA, the Office of the Secretary of Environmental Affairs and other appropriate governmental agencies, and

(c) Other identified interested parties.

The transmittal letter to the PRP will state that the PRP may seek judicial review of the final remedial action plan within 30 days from the date of this letter. It shall also state that the PRP may have the option to dispute allocation of financial responsibility specified in the RAP by requesting arbitration (15 day limit from date of letter). (See Appendix 7 for an example of a final RAP transmittal letter.)

Note: Under the law, neither the arbitration or litigation processes will stay implementation of a DHS remedial action if the RPs fail to implement a RAP.

5.16 <u>Notice of Adoption of Final Remedial Action Plan</u> (Draft CEQA Regs. Section 67666)

In order to inform the public of the RAP decision and to comply with draft CEQA regulations proposed by DHS, the Regional Section will take the following actions:

(a) File with the Secretary of the Resources Agency, a copy of the final RAP approval notice by forwarding it to:

Secretary of Resources Agency
1416 9th Street, Room 1311
Sacramento, CA 95814

Note: The Secretary of Resources Agency will display the approval notice for public viewing.

(b) Publish a notice (display ad) of the RAP approval in a newspaper of general circulation in the area affected by the RAP,

(c) notify those who, in writing, request notification, and

(d) retain a copy of the final RAP for TSCD regional records.

MODEL RAP

Site Name

REMEDIAL ACTION PLAN
(Submitted Pursuant to Health & Safety Code Section 25356.1)

Month/Year of Report

Submitted By:

Name and Address of
Entity or Agency
Submitting RAP

Prepared By:

Name of Person or

Organization Who Prepared RAP

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1. <u>Introduction</u>

   1.1 Discussion of the purpose of the Remedial Action Plan.

   1.2 Site identification - Introduction of site name, location, and nature of business conducted at the site.

   1.3 Scope of information presented in the RAP.

2. <u>Executive Summary</u>:

   2.1 Reference to consistency of RAP with appropriate state and federal requirements: 1) the Hazardous Substances Cleanup Bond Act of 1984, 2) the Hazardous Substance Account Act (Chapter 6.8 of the California Health and Safety Code), 3) the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 4) CERCLA as amended, i.e., the federal Superfund Amendments and Reauthorization Act of 1986 (SARA), 5) the Resource Conservation and Recovery Act (RCRA) 6) the National Contingency Plan (40 CFR Part 300 et. seq.), and other applicable laws as specified in Table 1 on page 3 and as identified by EPA.

   2.2 Concise summary of the history of the site and the type and extent of site contamination.

   2.3 Concise description of remedial action alternative selected and alternatives considered but rejected (including the no-action alternative).

   2.4 Concise summary of the preliminary allocation of financial responsibility.

3. <u>Detailed Site Description of Characteristics</u>: (40 CFR 300.68 (d) and (e) and (H&SC 25356.1(c)4)

   3.1 Site History

      3.1.1 Location.
      3.1.2 Nature of business.
      3.1.3 Length of operation.
      3.1.4 Types of chemicals handled, transferred, disposed, stored, etc., past and present, and description of their use.
      3.1.5 Any event which may have affected the release of chemicals, e.g. fire, flood, leaking underground tanks, spillage to the

ground, infiltration from surface impoundments, etc.

3.1.6 Chronology of site contamination, investigation, and remedial activities.
3.1.7 Previous studies (e.g. PA, RI, etc.).
3.1.8 Briefly discuss any history of Interim Remedial Measures implemented by PRPs or the Department.
3.1.9 Any other significant information.

3.2 Physical Description

3.2.1 Topography.
3.2.2 Areal extent of contamination.
3.2.3 Description of buildings, other structures and current uses on the property.
3.2.4 Description of outlying area including surrounding land use.
3.2.5 Demography.
3.2.6 Location and distance to nearby biological receptors.
3.2.7 Climatology.
3.2.8 Location of nearest water well and population served by well.
3.2.9 Map of property and off-site areas (assessor's parcel map).

4. Summary of Remedial Investigation (RI) Findings: (40 CFR 300.68 (d) and (e) and (H&SC 25356.1(c)(4))

Summary is to be based on all data generated during the RI including aerial photos, hazardous materials, historical use, soil reports, and any other RI reports and should address the following issues that apply:

4.1 Geological investigation of site and immediately adjacent area. Describe number of samples taken, where and how deep. This section may include a summary of regional geology based on literature search.

4.1.1 Type of soil/rocks.
4.1.2 Surface soil conditions.
4.1.3 Subsurface soil conditions.
4.1.4 Off-site soil sampling.
4.1.5 Contamination assessment (i.e. results of site sample collection and analysis, including type/nature of contamination, extent/ amounts/degree of toxicity, description of off-site migration of contaminants, and preexisting background levels of the substances of concern).

4.2 Hydrogeological investigation. Should include off-site (downgradient) investigation findings.

4.2.1 Ground water depth and direction of flow.
4.2.2 Surface water conditions and beneficial uses.
4.2.3 Subsurface water conditions and beneficial uses (all aquifers).
4.2.4 Contamination assessment (i.e. results of site sample collection and analysis, including type/nature of contamination, extent/ amounts/degree of toxicity, description of off-site migration of contaminants, and preexisting background contamination levels).

4.3 Air Investigation

4.3.1 Description of ambient air qualities.
4.3.2 Investigation of subsurface vapor.
4.3.3 Contamination assessment, (i.e., results of site sample collection and analysis, including type/nature of contamination, extent/amounts/degree of toxicity, and preexisting background levels of substances of concern).

4.4 Biological Investigation

Identify both on-site and off-site plant and animal populations that will be in direct or indirect contact with contaminants originating at the site.

4.4.1 Description of habitats
4.4.2 Food chain analysis
4.4.3 Contamination assessment including the following:
- o type, nature of contamination
- o concentrations in benthic sediments
- o areal extent of contamination
- o calculation of bioaccumulation indices for compounds
- o degradation of species diversity or decline in populations
- o plant uptake values
- o description of off-site migration of contaminants
- o observed and modelled results of biomagnification studies
- o comparison of contaminant levels in biota

to background levels or levels established in control groups during uptake or bioaccumulation studies.

5. Health and Safety Risks posed by the Conditions at the Site: (40 CFR 300.68(e) and (H&SC 25356.1(c)(1))

This section must be based on scientific data/reports which have a relationship to the site. Identify and list all supporting documents.

5.1 Assessment of current and potential risks including exposure and hazards to human health/safety and the environment. Risk is a function of both degree of hazard and probability of exposure.

6. Effects of Contamination upon Present, Future, and Probable Beneficial Uses of Resources (40 CFR 300.68(e)) and (H&SC 25356.1(c)(2))

6.1 Discuss the present uses of the land/water.

6.2 Discuss the consideration of future potential uses.

6.3 Discuss the probable beneficial uses of the land/water.

7. Summary of Remedial Action Feasibility Study: (40 CFR 300.68 f, g, h, and i), (H&SC 25356.1(c)(3)), (H&SC 25356.1(c)5), (H&SC 25356.1(c)6), (H&SC 25356.1(d)) and (Proposed CEQA regs. section 67661 and 67662)

7.1 Discussion of Alternative Remedial Actions (including the no action alternative).

7.1.1 Describe the purpose, objective, and scope of each remedial action alternative and treatment technology evaluated.

7.1.2 Describe the cost effectiveness of each alternative remedial action measure including the cost of each alternative (Total short term and long term costs.)

7.1.3 Provide an estimate of time necessary to carry out each alternative measure.

7.1.4 Describe the effect of each alternative measure on the availability of ground water for present and future beneficial uses.

7.1.5 Describe the potential for adverse change in the physical condition of the environment and the impact of each alternative remedial action.

7.1.6 Provide a justification statement for each of the rejected alternative remedial actions.

7.2 Recommended Final Remedial Action

7.2.1 Identify the remedial action alternative selected and provide a justification statement for its selection.

7.2.2 If, based on the evaluation presented in item 7.1.5 above, the remedial action selected will have a significant or potentially significant adverse effect on the environment (including human health and domestic and wild animals), include a description of the mitigation measures which would be taken in order to avoid or reduce the adverse environmental effects of the remedial action selected.

If the action selected will not have a significant or potentially significant adverse change on the environment, include a statement and supporting documentation which indicates that the proposed remedial action would not have adverse effects on the environment and therefore, alternatives or mitigation measures to avoid or reduce any significant effects on the environment have not been proposed.

7.2.3 Include an evaluation of the consistency of the selected option with the federal regulations and factors specified in subdivision (c) of Chapter 6.8, Section 25356.1 of the H&SC.

7.2.4 Incorporate the substantive technical and administrative requirements of the RCRA program (40 CFR 260-270) and California Administrative Code, Title 22, if any are applicable for the proposed remedy.

7.2.5 Of all or part of the recommended remedial action involves off-site transport, storage, destruction or disposal of hazardous wastes, CERCLA Section 101 (24) requirements must be met, (i.e., the proposed remedial action must be more cost effective than other alternatives, create new capacity to manage hazardous substances in addition to those at the facility, or be necessary to protect public health, welfare, or the environment from a present or potential risk. This determination must be briefly discussed).

7.2.6 Describe the health and safety plan for protection of workers, the environment and the community during remediation (must be consistent with CAL-OSHA regulations 29 CFR 1910).

8. Implementation Schedule:

8.1 Briefly discuss the proposed remedial action implementation schedule (i.e., activity and target date).

9. Non-Binding Preliminary Allocation of Financial Responsibility: (H&SC 25356.1(d) and 25356.3(c))

9.1 The RAP must contain brief statements: (1) finding the parties to be responsible parties; and, (2) allocating percentages of financial responsibility among them.

10. Ongoing Operation and Maintenance (O&M) Requirements: (40 CFR 300.68(h))

10.1 Identify and describe any ongoing and/or future site operation and maintenance and monitoring requirements.

10.2 Describe the estimated duration of O&M and monitoring activities.

10.3 Identify estimated cost of conducting O&M and monitoring and source of financing.

10.4 Identify measures taken which will assure continued operation and maintenance.

10.5 Identify measures taken to provide for remediation of any contamination discovered in the future.

REMEDIAL ACTION PLAN (RAP) PROCESS
(Coincides with text beginning at page 6)

A Uncomplicated to Moderately Complex Site ("Routine" Site)	B Large/Complex/ Controversial Site ("Team" Site)	draft RAP
X	X	1. Prepared by PRPs, DHS contractor or DHS/RWQCB staff and forwarded to appropriate Regional Section Project Manager. (See Appendix 1 for Model RAP)
X	X	2. Regional Section forwards copy of RAP Executive Summary to Community Relations Section upon acceptance of RAP.
X	X	3. Concurrent with step 2, Regional Section forwards copy of the draft RAP Executive Summary to HQ's Site Mitigation Unit (SMU) Chief and Technical Services Unit (TSU) Chief.
	X	4. Concurrent with step 2, Regional Section forwards complete copy of RAP to HQ's TSU for technical review concurrent with step 5. NOTE: HQ's comments are submitted to Regional Section during Project Manager's review period established by Regional Section. The due date must be indicated at time draft RAP is submitted to HQ. (See Appendix 3 for HQ Draft RAP Comments sheet.)
X	X	5. Project Manager reviews RAP for compliance with all state/federal statutory, regulatory, policy and technical content requirements.
	X	6. HQ's comments are submitted to Project Manager. Project Manager prepares memorandum addressing how any Regional (and/or HQ, as applicable) concerns were addressed and/or resolved. NOTE: For "team" sites, meetings/consultations will be scheduled (HQ's responsibility) to resolve major issues.

A Uncomplicated to Moderately Complex Site ("Routine" Site)	B Large/Complex/ Controversial Site ("Team" site)	draft RAP (cont.)
X	X	7. Draft RAP, together with memorandum, is reviewed and/or approved by: a) Regional Project Manager b) Regional Senior Engineer/Specialist c) Regional Site Mitigation Unit Chief, and d) Regional Section Chief NOTE: (See Appendix 4 for RAP Approval Record)
X	X	8. Regional Section forwards copy of draft RAP to a) All identified potential PRPs b) Appropriate federal, state, and/or local government agencies (e.g. RWQCB, EPA and any other affected public agencies) as described in section IV of Appendix 8. c) Local repository, e.g. library located in area of site.
X	X	9. Concurrent with release of draft RAP, Regional Section publishes newspaper display ad of public meeting on RAP and availability of draft RAP at Regional Section Office. (See Appendix 5 for Model Public Notice.)
X	X	10. Regional Section holds public meeting during public comment period which begins on date of notice and receives written/oral comments from public, PRPs, and government agencies.
X	X	11. Project Manager, prepares "Analysis of Public Comments" which includes Project Manager's recommendations and rationale regarding changes to RAP. (See Appendix 6 for "Analysis of Public Comments" format.) Community Relations Coordinator will provide assistance as needed.
	X	12. Project Manager forwards analysis to Regional SMU Chief for review. Concurrently, a copy is forwarded to HQ's TSU Chief. The two chiefs will confer as necessary.

A Uncomplicated to Moderately Complex Site ("Routine" Site)	B Large/Complex/ Controversial Site ("Team" site)	Final RAP
X	X	13. Upon Regional Site Mitigation Chiefs' approval, Project Manager or designee amends or directs (by letter) RAP preparer to amend RAP as appropriate per result of step 12. RAP preparer is instructed to return amended RAP to Regional Section within a time frame established by Project Manager.
X	X	14. Amended final RAP is sequentially routed for review and/or approval to: a) Regional Project Manager b) Regional Sr. Engineer/Specialist c) Regional Site Mitigation Chief, and d) Regional Section Chief NOTE: See Appendix 4 for RAP Approval Record.
X	X	15. Copy of approved final RAP along with a copy of the analysis of Public Comments Record is disseminated to: a) PRPs (along with transmittal letter) b) Appropriate governmental agencies. c) Other interested parties.
X	X	16. Regional SMU does the following: a) Concurrent with step 15, files with the Secretary of the Resources Agency, final RAP approval notice by forwarding a copy to same, b) Publishes notice (display ad) of approval in a newspaper of general circulation in the area affected by the RAP, c) Notifies those who, in writing, request notification, d) Retains a copy of the final RAP.

Headquarters' Draft RAP Comments Record
(For "Team" Sites Only)

COMPLETED BY REGIONAL SECTION

Site Name: ______________________

Regional Section: ______________________

Regional Project Manager: ______________ Phone ______________

Comments due to Project Manager: ______________________
(Date)

Forward this record with complete copy of draft RAP to HQ Technical Services Unit

COMPLETED BY HEADQUARTERS TECHNICAL SERVICES UNIT (attach additional pages as necessary)

Comments:

____

____

____

____

____

____

____

____

____

____

____

______________________ ______________________
TSU Staff (Date)

______________________ ______________________
TSU Chief (Date)

APPENDIX 4

Draft/Final Remedial Action Plan Approval Record

Site Name: ______________________________

Site Location: ______________________________

Regional Section: ______________________________

DRAFT

The undersigned have reviewed the attached draft Remedial Action Plan and determined that it meets state and federal statutory, regulatory, policy and technical requirements. Therefore, the draft remedial action plan shall be circulated for public comment and thereafter be revised as deemed appropriate.

Regional Project Manager	(Date)	Regional SMU Chief	(Date)
Reg. Sr. Engineer/Specialist	(Date)	Regional Section Chief	(Date)

FINAL

This is to certify that the attached Remedial Action Plan has been circulated for public comment and subsequently amended as deemed appropriate. The proposed remedial action has been determined to be reasonable and feasible.

The undersigned have further determined that the proposed remedial action: (select as appropriate)

1. Will not have an adverse impact on the environment; or
2. Will or may have an adverse impact [specify impact] but that specific measures [identify] will be taken to eliminate or reduce the adverse impact; or
3. It is not feasible to eliminate or reduce the adverse impact but the overall adverse impact of not proceeding with site cleanup outweighs the adverse impact of the proposed cleanup.

The undersigned hereby approve and adopt the attached remedial action plan as the Final Remedial Action Plan.

Regional Project Manager	(Date)	Regional SMU Chief	(Date)
Reg. Sr. Engineer/Specialist	(Date)	Regional Section Chief	(Date)

Model
Public Notice

The Department of Health Services (DHS) is requesting comments from the public on a draft Remedial Action Plan (RAP) for the hazardous waste site, ______________________ located at __________________.
(Site Name) (Site Address)
The draft RAP has been prepared to provide the Department and the public with an analysis of the conditions at the hazardous waste site and to propose the best remedial action from all the available options. This draft RAP has been prepared in accordance with the requirements of California Health and Safety Code Section 25356.1 and meets all other state and federal statutory requirements.

As required by Health and Safety Code Section 25356.1 a public meeting will be held for the public, local and state agencies, and potentially responsible parties as follows:

Date and Time: ____

Location: ____

The public comment period will end on _______.
(date)

A copy of the draft RAP is available at the following addresses for review by interested persons.

Toxic Substances Control Division

____
(Regional Section's Name

____
(Address)

____
(Time available for review)

Public Library

____
(Name)

____
(Address)

Comments may be mailed to:

____
(SMU Chief)

Toxic Substances Control Division
(at the above address)

____
(Name of Site)
Analysis of Public Comments
Received on Draft RAP

____
(Date prepared)

I. Introduction

On ______________________ , the California Department of
(Date of Public Meeting)
Health Services held a public meeting on the proposed remedial action plan for the ____________ (Name of Site), located in _____________ (city, county), California. The purpose of the meeting was to provide the public with information regarding the remedial action plan and to solicit public comments on the adequacy of the plan. In addition, comments on the remedial action plan were submitted to the Department during the public comment period which extended from ____________ (Date Opened) to _____________ (Date Closed). The verbal and written comments which were received during the public meeting and comment period have been compiled and categorized according to subject area. The purpose of this document is to present a written response by the Department to these comments.

A copy of the transcript of the public meeting and all the written comments received are available for review at: [TSCD Regional Office and Local Repository Name and Address]

____________________________ ____________________________

____________________________ ____________________________

____________________________ ____________________________

II. Comments and Responses

The verbal and written comments which were received have been compiled and categorized according to the following subject areas:

Example: (must be tailored for each site)

A. Soil Contamination and Treatment.
B. Ground Water Contamination and Treatment.
C. Remedial Action Schedules.
D. Cost of Cleanup.

Example (cont'd.)

A. Soil Contamination and Treatment

I. Issue(s) of concern: Briefly describe the questions or comments received for each identified issue, i.e. cost of cleanup.

2. Response: Provide response or responses to issue together with rationale.

EXAMPLE
FINAL RAP TRANSMITTAL LETTER
(to RPs)

CERTIFIED MAIL

Address Block

Dear :

This letter is to notify you that the Final Remedial Action Plan (RAP) has been adopted for ____________ (name of site). The Department has determined that the RAP satisfactorily addresses all applicable state and federal statutes and regulations.

Enclosed is a copy of the Final RAP. You have the option to seek judicial review of the RAP (within 30 days of the date of this letter). Based upon the percentage of financial responsibility assigned, you may also be eligible to dispute the preliminary allocation of financial responsibility, as specified in the RAP, by convening an arbitration proceeding (within 15 days of the date of this letter) and agreeing to binding arbitration by the arbitration panel. To exercise the arbitration option, it is necessary that the party or parties making the request be assigned a minimum of 51% of the responsibility for the site.

You should also be aware that neither filing for judicial review or requesting arbitration will stay implementation of the cleanup actions specified in the final RAP.

REGIONAL SECTION CHIEF

Enclosure

cc:

STATUTORY RAP CRITERIA/CONTENT AND PROCESS REQUIREMENTS

I. HEALTH AND SAFETY CODE SECTION 25356.1 (c) and (d)
State law (Section 25356.1 (c) and (d), H & S Code, Chapter 6.8) prescribes the required criteria/content for all RAPs developed or approved by the DHS or Regional Water Quality Control Boards.

Subdivisions (c) and (d) of Section 25356.1 read as follows:

"25356.1(c) All remedial action plans prepared or approved pursuant to this section shall be based upon Section 25350, Subpart F of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Section 300.61 et seq.), and upon all of the following factors, to the extent that these factors are consistent with these federal regulations and do not require a less stringent level of cleanup than these federal regulations:

(1) Health and safety risks posed by the conditions at the site. When considering these risks, the department or the regional water quality control board shall consider scientific data and reports which may have a relationship to the site.

(2) The effect of contamination or pollution levels upon present, future, and probable beneficial uses of contaminated, polluted, or threatened resources.

(3) The effect of alternative remedial action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses. The department or regional water quality control board shall consider the extent to which remedial action measures are available which use, as a principal element, treatment that significantly reduces the volume, toxicity, or mobility of the hazardous substances, as opposed to remedial actions which do not use this treatment. The department or regional water quality control board shall not select remedial action measures which use offsite transport and disposal of untreated hazardous substances or contaminated materials if practical and cost-effective treatment technologies are available.

(4) Site specific characteristics, including the potential for offsite migration of hazardous substances, the surface or subsurface soil, and the hydrogeologic conditions, as well as preexisting background contamination levels.

(5) Cost-effectiveness of alternative remedial action measures. In evaluating the cost effectiveness of proposed alternative remedial action measures, the DHS or Regional Water Quality Control Board shall consider, to the extent possible, the total short-term and long-term costs of these actions. Land disposal shall not be deemed the most cost-effective measure merely on the basis of lower short-term cost.

(6) The potential environmental impacts of alternative remedial action measures, including, but not limited to, land disposal of the untreated hazardous substances as opposed to treatment of the hazardous substances to remove or reduce its volume, toxicity, or mobility prior to disposal.

"25356.1(d) A remedial action plan prepared or approved pursuant to this section shall include a statement of reasons setting forth the basis for the removal and remedial actions selected. The statement shall include an evaluation of each proposed alternative submitted to, or prepared by, the department or the regional water quality control board for a particular site. The statement shall also include an evaluation of the consistency of the removal and remedial actions proposed by the plan with the federal regulations and factors specified in subdivision (c) and shall set forth the reasons for rejection of alternative removal and remedial actions. The statement shall also include a nonbinding preliminary allocation of responsibility among all identifiable potentially responsible parties at a particular site, including those parties which may have been released, or may otherwise be immune, from liability pursuant to this chapter or any other. "

II. ASSIGNMENT OF FINANCIAL RESPONSIBILITY

As stated above, part of Section 25356.1 (d) requires the Department or RWQCB to make a nonbinding preliminary allocation of financial responsibility among the potential responsible parties associated with the site in question. It does not specify criteria to be used. However, Section 25356.3 (c) does prescribe criteria for the Hazardous Substance Cleanup Arbitration Panel to consider in deciding the final binding allocations of financial responsibility.

A separate DHS policy on the allocations is being developed. Until it becomes available, the TSCD will consider the 25356.3(c) criteria as well as any other relevant factors when making its preliminary non-binding allocations. Factors identified by H&SC 25356.3(c) are listed below.

(1) The amount of hazardous substance for which each party may be responsible.

(2) The degree of toxicity of the hazardous substance.

(3) The degree of involvement of the potentially responsible parties in the generation, transportation, treatment, or disposal of the hazardous substance.

(4) The degree of care exercised by the potentially responsible parties with respect to the hazardous substances, taking into account the characteristics of the substance.

(5) The degree of cooperation by the potentially responsible parties with federal, state, and local officials to prevent harm to human health and the environment."

III. ADDITIONAL RAP CONTENT REQUIREMENTS PURSUANT TO PROPOSED DRAFT CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) REGULATIONS, SECTION 67662

As previously cited, RAPs must contain a description of the environmental effects of the proposed remedial action. Regulations further require that should the proposed remedial action have significant or potentially significant adverse effects on the environment, the proposed plan shall also include a clear description of what mitigation measures would be taken to avoid or reduce such environmental effects of the proposed remedial action.

Should the proposed remedial action not have a significant or potentially significant adverse effect on the environment, the proposed plan shall also include a statement to the effect that DHS does not believe, based on available information, that the proposed cleanup would adversely impact public health or the environment and that therefore, DHS has not proposed any alternatives or mitigation measures to avoid or reduce any significant adverse effects. DHS shall not approve a proposed remedial action plan if a more effective and feasible mitigation measure is available which would substantially lessen any significant adverse impact as compared to the proposed remedial action plan.

For the purpose of this section, "feasible" shall mean capable of being successfully accomplished within a reasonable period of time, considering economic, environmental, legal, social, and technological factors.

When DHS proposes to approve a proposed remedial action plan, DHS shall issue an approval or adoption record which shall include a statement summarizing the significant adverse environmental effects of the remedial action plan, as approved, and describing how these effects will be mitigated or why mitigation of such effects is not feasible.

Note: RAPs must also contain any other information or documentation as may be required by DHS, (e.g., in transporting hazardous waste, there are Transportation and Safety Law requirements).

IV. STATUTORY RAP PROCESS REQUIREMENTS PURSUANT TO H & S CODE, CHAPTER 6.8, SECTION 25356.1 AND DRAFT CEQA REGULATIONS, SECTION 67664

H&SC, section 25356.1(a) and (b) respectively, require the preparation of a RAP for all sites listed pursuant to section 25356 as well as all sites that are not already listed.

"25356.1. (a) The department, or, if appropriate, the regional water quality control board shall prepare or approve remedial action plans for all sites listed pursuant to Section 25356.

(b) A potentially responsible party may request the department or the regional water quality control board, when appropriate, to prepare or approve a remedial action plan for any site not listed pursuant to Section 25356 if the department or the State Water Resources Control Board determines that a removal or remedial action is required to respond to a release of a hazardous substance. The department or the state board shall respond to a request to prepare or approve a remedial action plan within 90 days of receipt. This subdivision does not affect the authority of any regional water quality control board to issue and enforce a cleanup and abatement order pursuant to Section 13304 of the Water Code or a cease and desist order pursuant to Section 13301 of the Water Code."

Part of Section 25356.1(d) through (h) details the statutory requirements for the public participation process involved in the development of a final RAP and reads as follows:

Note: The following sections and CEQA regulations (Section 67664) requirements overlap.

25356.1 (d) "...Before adopting a final remedial action plan, the Department or the Regional Water Quality Control Board shall prepare or approve a draft remedial action plan and shall do all of the following:

(1) Circulate the draft plan for public comment for at least 30 days.

(2) Notify affected local and state agencies of the removal and remedial actions proposed in the remedial action plan and publish a notice in a newspaper of general circulation in the area affected by the draft remedial action plan. The Department or Regional Water Quality Control Board shall also post notices in the location where the proposed removal or remedial action would be located and shall notify, by direct mailing, the owners of property contiguous to the site addressed by the plan, as shown in the latest equalized assessment roll.

(3) Hold one or more meetings with the lead and responsible agencies for the removal and remedial actions, the potentially responsible parties for the removal and remedial actions, and the interested public, to provide the public with the information which is necessary to address the issues which concern the public. The information to be provided shall include an assessment of the degree of contamination, the characteristics of the hazardous substances, an estimate of the time required to carry out the removal and remedial actions, and a description of the proposed removal and remedial actions.

(4) Comply with Section 25358.7.

(e) After complying with subdivision (d), the Department or Regional Water Quality Control Board shall review and consider any public comments, and shall revise the draft plan, if appropriate. The Department or Regional Water Quality Control Board shall then issue the final remedial action plan.

(f) A potentially responsible party named in the final remedial action plan issued by the Department or Regional Water Quality Control Board may seek judicial review of the final remedial action plan pursuant to Section 1085 of the Code of Civil Procedure within 30 days after the final plan is issued. The filing of a petition seeking judicial review of a final remedial action plan shall not stay any removal or remedial action specified in the final plan.

For purposes of judicial review, the court shall uphold the final remedial action plan if the plan is based upon substantial evidence available to the Department or Regional Water Quality Control Board, as the case may be. This subdivision does not prohibit the court from granting any appropriate relief within its jurisdiction, including, but not limited to, enjoining the expenditure of funds pursuant to paragraph (2) of subdivision (b) of Section 25385.6.

(g) This section does not require the Department or Regional Water Quality Control Board to prepare a remedial action plan if conditions present at a site present an imminent or substantial endangerment to the public health and safety or to the environment.

(h) Article 2 (commencing with Section 13320), Article 3 (commencing with Section 13330), Article 5 (commencing with Section 13350), and Article 6 (commencing with Section 13360) of Chapter 5 of Division 7 of the Water Code apply to any action or failure to act by a Regional Water Quality Control Board pursuant to this section."

V. ADDITIONAL STATUTORY RAP PROCESS REQUIREMENTS PURSUANT TO H & S CODE, SECTION 25358.7

"25358.7. (a) The Department shall provide any person affected by a removal or remedial action taken pursuant to this chapter with the opportunity to participate in the Department's decision making process regarding that action by taking all of the following actions:

(1) Provide that person with access to information which the Department is required to release pursuant to the California Public Records Act (Chapter 3.5 (commencing with Section 6250) of Division 7 of Title 1 of the Government Code), relating to the action, except for the following:

(A) Trade secrets, as defined in subdivision (a) of Section 25358.2.

(B) Business financial data and information, as specified in subdivision (c) of Section 25358.6

(C) Information which the Department is prohibited from releasing pursuant to any state or federal law.

(2) Provide the person notification, upon request, of any public meetings held by the Department concerning the action.

(3) Provide the person the opportunity to attend and to participate at those public meetings.

(b) The Department shall develop and make available to the public a schedule of activities for each site for which remedial action is expected to be taken by the Department pursuant to this chapter and shall make available to the public any plan provided to the Department by any responsible party, unless the Department is prohibited from releasing the information pursuant to any state or federal law.

(c) In making decisions regarding the methods to be used for removal or remedial actions taken pursuant to this chapter, the Department shall incorporate or respond to the advice of persons affected by the actions.

(d) This section does not apply to emergency actions taken pursuant to Section 25354."

VI. ADDITIONAL RAP PROCESS REQUIREMENTS PURSUANT TO PROPOSED DRAFT CEQA REGULATIONS, SECTION 67663

In addition to the aforementioned requirement pursuant to section 25356.1(d) to notify affected state and local agencies of the removal and remedial actions proposed, the Department is further required to consult with all public agencies which have legal jurisdiction with respect to the proposed remedial action. For purposes of this section, such public agencies shall be limited to:

(1) Those agencies with authority to grant a permit or other entitlement for use which is applicable to the proposed remedial action.

(2) Those agencies with authority to provide funding for the preparation or implementation of the proposed remedial action plan.

(3) Those agencies with authority over resources which may be affected by the proposed remedial action plan, or

(4) A city or county having primary jurisdiction over:

(A) The site of the proposed remedial action.

(B) The area in which the major environmental effects of the proposed remedial action will occur, or

(C) The area in which reside those citizens most directly concerned by the effects of the proposed remedial action, including the redisposal site.