FEB, 1993

REVISED SOIL VOLUMES AND REMEDIAL ALTERNATIVE DETAILED COST ESTIMATES FEASIBILITY STUDY SUPPLEMENT UNION PACIFIC RAILROAD YARD SACRAMENTO, CALIFORNIA

DAMES & MOORE

February 1993
Project No. 00173-072-044

SAC57.009

DAMES & MOORE
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February 12, 1993

Mr. Val L. Siebal, Ombudsman
Region 1, Department of Toxic Substances Control
California Environmental Protection Agency
10151 Croydon Way, Suite 3
Sacramento, CA 95827

Attention: Mr. James L. Tjosvold, P.E., Chief
Sacramento Responsible Party Unit
Site Mitigation Program

Re: Transmittal of Revised Soil Volume and
Remedial Alternative Detailed Cost Estimates
Feasibility Study Supplement
Union Pacific Railroad Yard
Sacramento, California
D&M Project No. 00173-072-044

Dear Mr. Tjosvold:

Union Pacific Railroad Company (UPRR) has requested that Dames & Moore transmit the above-referenced document. This document presents revised affected soil volume estimates, figures depicting the extent of soils above remedial action objectives (RAOs), and revised soil remedial alternative detailed cost estimates for the UPRR Sacramento site. The revised volume estimates, figures, and remedial alternative detailed cost estimates reflect the RAOs for lead and arsenic which were recommended by the California Environmental Protection Agency — Department of Toxic Substances Control (DTSC) in the meeting of November 25, 1992. These data and figures will be incorporated into the Revised Draft Remedial Action Plan for the site.

SAC57.009

If you have any questions or require further clarification, please contact Tim Parker at (916) 387-7527.

Sincerely,

DAMES & MOORE

Timothy K. Parker
Project Manager

John D. Fawcett, P.E.
Senior Engineer

Enclosure

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REVISED SOIL VOLUMES AND REMEDIAL ALTERNATIVE DETAILED COST ESTIMATES FEASIBILITY STUDY SUPPLEMENT UNION PACIFIC RAILROAD YARD SACRAMENTO, CALIFORNIA

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

FEASIBILITY STUDY SUPPLEMENT
REVISED SOIL VOLUMES AND
REMEDIAL ALTERNATIVE DETAILED COST ESTIMATES
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Table of Contents
(Continued)

REVISED SOIL VOLUMES AND REMEDIAL ALTERNATIVE DETAILED COST ESTIMATES FEASIBILITY STUDY SUPPLEMENT UNION PACIFIC RAILROAD YARD SACRAMENTO, CALIFORNIA

1.0 INTRODUCTION

Dames & Moore is pleased to present this Revised Soil Volume and Remedial Alternative Detailed Cost Estimate for the Union Pacific Railroad (UPRR) Yard (the site) located in Sacramento, California. The purpose of this document is to present revisions to the Feasibility Study (FS) Supplement which were undertaken because of new remedial action objectives (RAOs) for arsenic and lead in soil in the inactive portion of the site. This document includes the following elements:

- Revised affected soil volumes (soils above RAOs);
- Revised figures depicting the extent of soils above RAOs;
- Revised soil remedial alternative detailed cost estimates; and
- Other pertinent revised tables.

The revisions affect neither the future land use assumptions and analyses presented in the FS Supplement, nor the selection of preferred remedial alternatives for Soil Operable Units S-1, S-2, and S-3. The primary effect of the new RAOs is an increase in the volume of soil subject to remedial action and consequent changes in the cost of the recommended remedial alternatives.

1.1 BACKGROUND

UPRR submitted an FS Supplement to the California Environmental Protection Agency — Department of Toxic Substances Control (DTSC) in October 1992. The FS Supplement incorporated comments on the FS portion of the Addendum Remedial Investigation/Feasibility Study Report (Dames & Moore, November 1991) provided by the DTSC and the City of Sacramento. Presented in the FS Supplement were new RAOs for contaminants of concern in soil, one new RAO for groundwater, estimates of affected volumes for each operable unit, detailed cost estimates for each of the alternatives under consideration, a re-evaluation of the remedial alternatives, and selection of recommended remedial alternatives which would allow for beneficial future land uses at the site.

The RAOs for arsenic and lead in soils in the inactive portion of the site presented in the FS Supplement were health risk-based values selected to be protective of human health under a general future land use scenario developed for the site based on input from the DTSC, the City, and the Union Pacific

Land Use Committee. Future land use assumptions employed in the FS Supplement analyses were as follows:

- The active switching yard will continue in its present use indefinitely;
- Future land use in the areas which contain Soil Operable Units S-1 and S-2 will be restricted to commercial or mixed uses; and
- Future land use in the area of Soil Operable Unit S-3 will be unrestricted.

The risk-based RAOs for lead and arsenic were selected to correspond with these land use types as shown in the table below.

TABLE 1
Arsenic and Lead RAOs Presented in the FS Supplement

Constituent	Remedial Action Objective	
	Restricted Future Land Use (Operable Units S-1 and S-2)	**Unrestricted Future Land Use** (Operable Unit S-3)
Arsenic	135 mg/kg	8 mg/kg
Lead	950 mg/kg	335 mg/kg

These RAOs were used as the basis for calculating affected soil volumes and preparing cost estimates for the previously defined final candidate remedial alternatives. The detailed analysis of final candidate remedial alternatives was then re-evaluated and new preferred alternatives for Soil Operable Units S-1, S-2, and S-3 were selected. The recommended remedial alternatives included excavation and off-site disposal of soils contaminated above the operable unit-specific RAOs.

1.2 DTSC COMMENTS ON THE FEASIBILITY STUDY SUPPLEMENT

As of the date of this report, the DTSC has not provided complete comments on the FS Supplement; however, DTSC provided verbal comments on the RAOs for arsenic and lead in soil in a meeting on November 25, 1992. The comments on the RAOs were formally stated in a letter dated January 22, 1993, a copy of which is presented in Appendix D. For areas where future land use is to be restricted, the DTSC recommended that the RAO for arsenic be reduced to 55 mg/kg. Additionally, the DTSC recommended that the RAO for lead in areas planned for unrestricted future land use be reduced to 220 mg/kg. While the RAOs presented in the FS Supplement are considered acceptable

medium-specific or operable unit-specific goals for protecting human health and the environment, UPRR has agreed to use the more conservative values recommended by the DTSC.

The new, more conservative RAOs for arsenic and lead have increased the volume of soil impacted above the RAOs, and therefore have also increased the cost of some of the final candidate remedial alternatives for soils. The following section describes those changes and presents revised tables, figures, and cost estimates as appropriate to make the FS Supplement consistent with the new RAOs.

2.0 REVISIONS TO THE FEASIBILITY STUDY SUPPLEMENT

UPRR has agreed to modify the RAOs for lead and arsenic in the inactive portion of the site as requested by the DTSC. This section summarizes the effects of the changed RAOs on data and figures which were presented in the FS Supplement and discusses pertinent revised tables (Appendix A), figures (Appendix B), and cost estimates (Appendix C). These revised versions are intended to replace the corresponding versions presented in the FS Supplement. Table and figure numbers have not been changed, except to add "R" to designate *revised* (for example, Table 4 in the FS Supplement is now Table 4R). The analyses and conclusions presented in the FS Supplement are not affected by the new lead and arsenic RAOs.

2.1 REVISED SOIL REMEDIAL ACTION OBJECTIVES

Section 3.0 of the FS Supplement presented a discussion of RAOs for the site, including the development of future land use assumptions, the rationale for calculating and selecting risk-based RAOs, and other relevant elements (such as ARARs). At the request of the DTSC, UPRR has agreed to adopt DTSC's more conservative RAOs for arsenic and lead in the inactive portion of the site. These RAOs are summarized in the table below. The new arsenic and lead RAOs have been incorporated into Table 4R (previously Table 4 in the FS Supplement), which is presented in Appendix A.

TABLE 2
Arsenic and Lead RAOs Adopted in December 1992

Constituent	Remedial Action Objective	
	Restricted Future Land Use (Operable Units S-1 and S-2)	**Unrestricted Future Land Use** (Operable Unit S-3)
Arsenic	55 mg/kg	8 mg/kg
Lead	950 mg/kg	220 mg/kg

New RAO adopted subsequent to submittal of the FS Supplement.

The RAOs for other contaminants of concern present in soil at the site (including RAOS for total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and asbestos) have not been changed. Table 5R presents a summary of all RAOs for soil (Appendix A).

2.2 REVISED SOIL OPERABLE UNIT AFFECTED VOLUMES

Soil operable unit definitions for the site and the corresponding affected volumes were described in Section 4.0 of the FS Supplement. The following is a brief description of affected volumes and areas. The descriptions have been revised to reflect the new RAOs for lead and arsenic in the inactive portion of the site (Soil Operable Units S-1, S-2, and S-3). FS Supplement figures depicting the extent of arsenic and lead above RAOs at different depth intervals have been revised to reflect the new RAOs. The revised arsenic and lead figures (Figures 14R through 21R), as well as revised figures depicting the areal extent of all contamination by operable unit are presented in Appendix B. Volumes of affected soils have been revised to reflect the new RAOs and these revisions have been incorporated into Table 7R (Appendix A).

2.2.1 Soil Operable Unit S-1

Soil Operable Unit S-1 is contained within an approximately 36-acre area in the southern part of the inactive portion of the site. This operable unit contains soil and/or slag with concentrations of arsenic, lead, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAHs), and asbestos which exceed the restricted future land use RAOs. The total volume of affected soil in S-1 is estimated to be approximately 14,000 cubic yards (see Table 7R). Soil contaminated above the RAOs in Operable Unit S-1 is distributed over areas which total approximately 6.7 acres. These areas are shown in Figure 10R (Appendix B).

2.2.2 Soil Operable Unit S-2

Soil Operable Unit S-2 covers approximately 7 acres in the central inactive portion of the site and contains soil and/or slag contaminated above the RAOs with arsenic, lead, TPH, and PAHs, in addition to unknown quantities of buried debris. Drums have also been found buried in this portion of the site. Figure 11R (Appendix B) depicts areas totalling approximately 2.7 acres where soil contamination in S-2 exceeds the RAOs. The revised total affected volume of this operable unit is estimated to be 21,500 cubic yards (Table 7R - Appendix A).

2.2.3 Soil Operable Unit S-3

Operable Unit S-3 is contained within a 17-acre area in the northern part of the inactive portion of the site. S-3 contains soil and/or slag with concentrations of arsenic, lead, TPH, and PAHs which exceed the unrestricted land use RAOs. These contaminants are distributed over a total area of approximately 5.5 acres as presented in Figure 12R (Appendix B). The revised total volume of soil above RAOs is estimated to be 19,500 cubic yards for this operable unit (Table 7R - Appendix A).

2.3 REVISED COST ESTIMATES FOR FINAL CANDIDATE ALTERNATIVES

Three final candidate remedial alternatives were re-evaluated in Section 6.0 of the FS Supplement:

- Alternative 1 - No Action The No Action Alternative was evaluated for Soil Operable Units S-1, S-2, and S-3. This alternative includes access and deed restrictions and long-term groundwater monitoring, but no remediation of contaminated soil.

- Alternative 4 - Containment with Institutional Controls This alternative was evaluated for Soil Operable Units S-1 and S-3. It would include design, construction and long-term maintenance of a cap or series of caps to cover soil contaminated above the unrestricted land use RAOs, as well as long-term groundwater monitoring. Deed restrictions were also included to minimize potential exposure to contaminated soil.

- Alternative 10 - Excavation and Off-site Disposal of Soil Above RAOs This alternative was evaluated for Soil Operable Units S-1, S-2, and S-3. It provides for removal and off-site disposal of soil contaminated above the operable unit-specific RAOs. Following implementation, land use would be restricted in operable units S-1 and S-2 as described in the general future land use assumptions developed for the FS Supplement. Future land use in S-3 would be unrestricted.

As part of the detailed analysis of these alternatives, cost estimates were prepared for each final candidate alternative. The recent adoption of more conservative RAOs for arsenic and lead resulted in additional soil subject to remedial action; therefore, the cost estimates for Alternative 10 have been revised to reflect the increased volumes of soil to be excavated and disposed. The Alternative 10 cost estimates have also been revised to reflect lower disposal costs which resulted from the repeal of the State tax on out-of-state hazardous waste disposal which became effective January 1, 1993. Cost estimates for Alternative 4 were not revised because the new arsenic and lead RAOs do not substantially change the area of asphalt cap required under this alternative. The revised cost estimates for Alternative 10 are presented in Appendix C. Revised Table 11R summarizes the results of the feasibility study detailed analysis and reflects the new net present worth cost of Alternative 10 for each of the three operable units. The new arsenic and lead RAOs resulted in slight volume increases for Soil Operable Units S-2 and S-3; however, reduction of the restricted land use RAO for arsenic to 55 mg/kg increased the disposal volume for Soil Operable Unit S-1 by over 50%. The additional excavation required to implement Alternative 10 for Operable Unit S-1 is reflected in the increased construction time, as shown in revised Table 12R. Revised Table 13R provides modified costs for Alternative 10 (Appendix B).

3.0 SUMMARY AND CONCLUSION

This document presents specific, limited modifications to the FS Supplement for the Union Pacific Railroad Yard in Sacramento, California. The modifications were undertaken in order to adopt more conservative DTSC-recommended RAOs for arsenic and lead in soils in the inactive portion of the site. The more conservative RAOs resulted in greater affected volumes for Soil Operable Units S-1, S-2, and S-3. Consequently, the detailed cost estimates for one alternative (Alternative 10) were reviewed and revised to reflect the increased volume of excavated/disposed soil. The increase in the affected volumes does not affect the detailed analysis of the final candidate alternatives, except to change the cost of Alternative 10; therefore, no other modifications to the feasibility study analyses were required. The affected volumes and cost estimates presented in this document will be incorporated, as appropriate, into all subsequent Remedial Action Plan documents prepared for this site.

Appendix A

APPENDIX A

REVISED TABLES

TABLE 4R
SELECTION OF REMEDIAL ACTION OBJECTIVES
FOR LEAD AND ARSENIC
FEASIBILITY STUDY SUPPLEMENT
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Critical Exposure Time Period (by Operable Unit)	Chemical	Allowable Exposure Point Concentration (mg/kg)	Factors Influencing RAO Selection	RAO (mg/kg)
During Site Redevelopment				
Soil in S-1 and S-2	Arsenic	135	Exposure point concentration is based on potential off-site residential exposure during construction. The risk assessment demonstrates that 135 mg/kg would be protective of human health; however, the DTSC has recommended a cleanup level of 55 mg/kg for arsenic.	55
	Lead	8,760	Exposure point concentration is based on on-site worker contact. The risk assessment demonstrates that 8,760 mg/kg would be protective of human health; however, 950 mg/kg was selected to be less than the California Code of Regulations (CCR) Total Threshold Limit Concentration (TTLC) of 1,000 mg/kg for lead.	950
After Site Redevelopment				
Soil in S-3	Arsenic	0.66	Exposure point concentration is based on carcinogenic effects for on-site residents. However, this level falls well below background levels, which suggests that this concentration cannot be attained. The site-specific background level, which is 8 mg/kg, was therefore selected as the RAO.	8
	Lead	335	The exposure point concentration based on IU/BK modeling of sensitive receptor (child) is 335 mg/kg. An additional factor of safety is provided by the chemical species of lead present in the slag. DTSC has recommended, however, the more conservative value of 220 mg/kg.	220

NOTES: 1. Additional details of the risk assessment analyses are presented in *Development of Remedial Action Levels for Union Pacific Railroad Yard* (Dames & Moore, 1992d).

TABLE 5R
REMEDIAL ACTION OBJECTIVES FOR SOIL
FEASIBILITY STUDY SUPPLEMENT
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Exposure Scenario and Pathway	Chemical	Concentration in Surface Soil (mg/kg)		Detection Limit (mg/kg)	Background Average Sample Concentration (mg/kg)[1]	Regional Background Concentration Range (mg/kg)[2]	Residual Risk-Based Concentration (mg/kg)	ARAR/TBC[3]		Selected Remedial Action Objective (mg/kg)	Comments
		Maximum	Average					Value (mg/kg)	Source		
Future land use - hypothetical on-site child resident											
Direct contact with soil	Arsenic	600	39	0.6	8	6-16	See Table 4R			See Table 4R	Varies depending on land use.
	Lead	5,190	405	1.4	22	10-150	See Table 4R			See Table 4R	Varies depending on land use
	Carcinogenic PAHs	18	1.77	Varies	-	-	0.042[4]	-	-	0.042	
	Non-carcinogenic PAHs	67.9	7	Varies	-	-	-	100	AAL[6]	100	
Migration from soil to groundwater.	TPH (diesel)	269,000	16,587	-	-	-	NA	NA	NA	1,000	
Inhalation	Asbestos	3% by volume	<1% by volume	1% by volume	-	-	-	1% by weight	TTLC[7]	1% by weight	RAO selected based on ARAR

1 Average of park soil sample analyses.
2 Shacklette and Boergnan, 1984.
3 Applicable and Relevant or Appropriate Requirements/To Be Considered.
4 Concentration in soil equivalent to a 10^{-6} increased lifetime cancer risk.
5 Total Threshold Limit Concentration.
6 Applied Action Level.
7 CCR Title 22 Total Threshold Limit Concentration.
- Not available
NA - Not Applicable.

TABLE 7R
ESTIMATED VOLUME OF AFFECTED SOILS
FEASIBILITY STUDY SUPPLEMENT
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 > 1,000 mg/kg**		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 ≥1000 mg/kg**		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 > 1,000 mg/kg**		< 500	< 500	—	—	500
					S-3 Subtotal	19,500
Soil Operable Unit S-5						
Volume Above RAOs (cubic yards)						
TPH ≥1000 mg/kg**	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
					S-5 Subtotal	Unknown
TOTAL ALL SOIL OPERABLE UNITS:						**55,000**

Legend:
bgs - below ground surface
NA — Not Applicable
As — Arsenic
Pb — Lead
TPH — Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons
— None detected.
** PAH contamination is associated with areas where TPH contamination is also present. Separate volumes for PAHs above the RAOs were therefore not estimated.

TABLE 11R
COMPARISON OF SOIL ALTERNATIVES
FEASIBILITY STUDY SUPPLEMENT
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Operable Unit	Alternative	Short-term Effectiveness	Long-term Effectiveness	Reduction of T,M,V	Implement-ability	Net Present Worth Cost*	Compliance with ARARs	Overall Protection of Public Health and Environment	State Acceptance	Community Acceptance
S-1	1	Fair	Poor	Poor	Fair	$803,000	Poor	Poor	Poor	Poor
	4	Fair	Good	Fair	Fair	$4,514,000	Good	Good	Poor	Poor
	10	Fair	Good	Fair	Good	$3,682,000	Good	Good	Good	Good
S-2	1	Fair	Poor	Poor	Fair	$731,000	Poor	Poor	Poor	Poor
	10	Fair	Good	Fair	Good	$6,817,000	Good	Good	Good	Good
S-3	1	Fair	Poor	Poor	Fair	$753,000	Poor	Poor	Poor	Poor
	4	Fair	Good	Fair	Fair	$1,480,000	Good	Good	Poor	Poor
	10	Fair	Good	Fair	Good	$1,938,000	Good	Good	Good	Good

* Net present worth cost of the alternative in 1992 dollars 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 and Off-site Disposal of Soil Above RAOs

Recommended remedial alternative

TABLE 12R
IMPLEMENTATION TIMES FOR SOIL ALTERNATIVES
FEASIBILITY STUDY SUPPLEMENT
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Alternative	Operable Unit	Design (Weeks) *	Permitting (Weeks) *	Construction (Weeks)	Operation and Maintenance (Years)*	Total (Years)
1 No Action	S-1	4	8	8	30	30.3
	S-2	4	8	3	30	30.2
	S-3	4	8	4	30	30.2
4 Containment/ Institutional Controls	S-1	12	12	27	30	30.7
	S-3	12	12	12	30	30.5
10 Excavation/Off-Site Disposal of Soil Above RAOs	S-1	8	12	12	0	0.5
	S-2	8	12	16	0	0.7
	S-3	8	12	12	0	0.6

* Design time for No Action alternative includes time for preparation of groundwater monitoring work plan. Permitting times include time for DTSC review and approval of work plan plus development, review and approval of deed restrictions. Operation and maintenance times include fence repair and/or replacement. Permitting period is concurrent with design period.

TABLE 13R
SUMMARY OF ESTIMATED COSTS
SOIL ALTERNATIVES
FEASIBILITY STUDY SUPPLEMENT
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

Alternative	Operable Unit	Capital Costs*	Operation and Maintenance Costs**	Total Costs	Total Present Worth Cost*** (1992 $)
1 No Action	S-1	$105,000	$1,170,000	$1,275,000	$803,000
	S-2	$30,000	$1,170,000	$1,200,000	$731,000
	S-3	$53,000	$1,170,000	$1,223,000	$753,000
4 Containment/ Institutional Controls	S-1	$3,317,000	$2,483,000	$5,800,000	$4,514,000
	S-3	$659,000	$1,469,000	$2,128,000	$1,480,000
10 Excavation/Off-Site Disposal of Soil Above RAOs	S-1	$3,866,000	$0	$3,866,000	$3,682,000
	S-2	$7,158,000	$0	$7,158,000	$6,817,000
	S-3	$2,035,000	$0	$2,035,000	$1,938,000

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

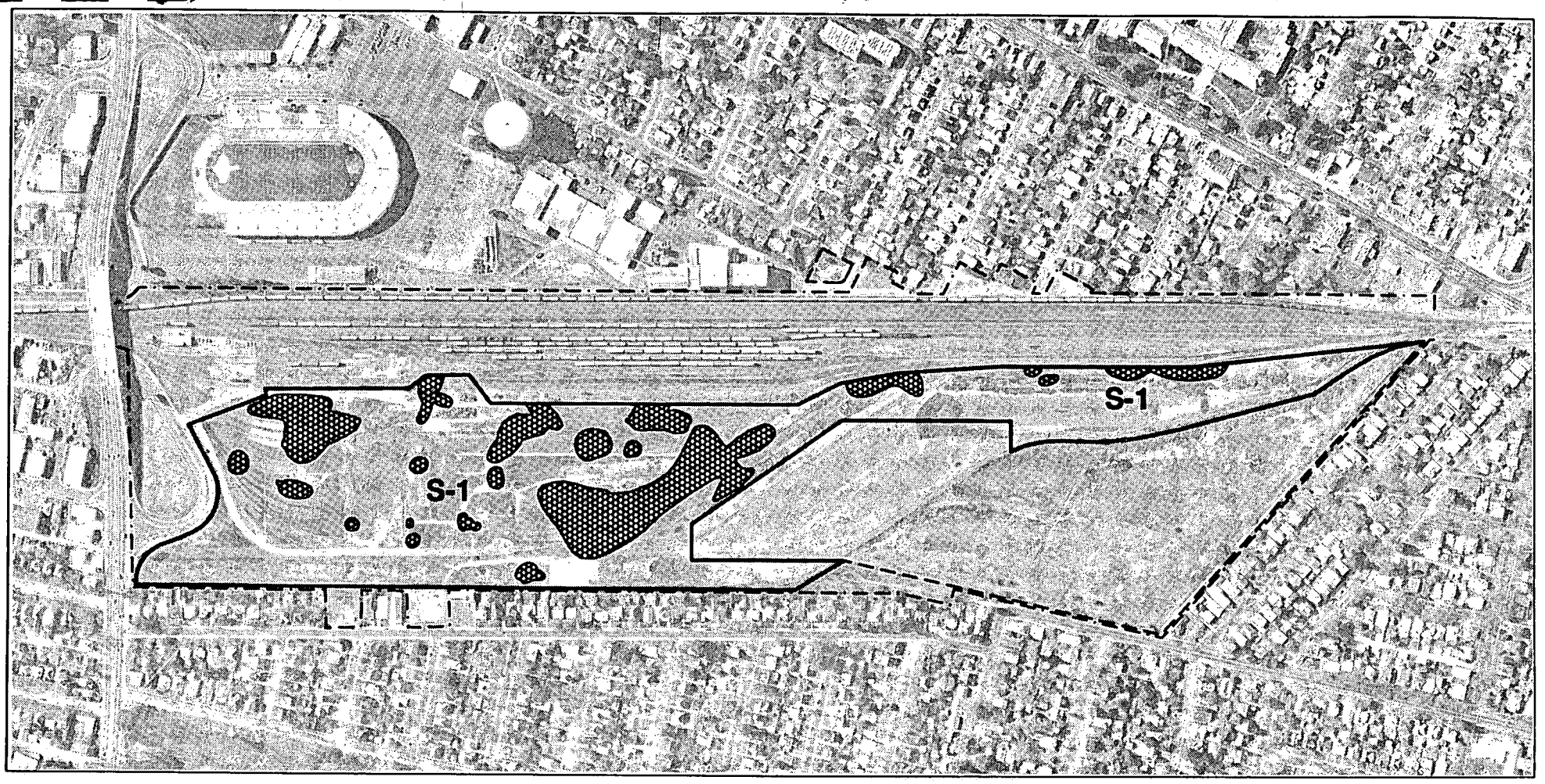
** O&M costs are not constant over the project life (see Appendix C for yearly cost allocations).

*** Net present worth cost at 5% annual interest rate. Total present worth costs are presented in 1992 dollars.

Appendix B

APPENDIX B

REVISED FIGURES



EXPLANATION

Approximate Lateral Extent of Soils Above Restricted Land Use RAOs:
Lead >950 mg/kg
Arsenic >55 mg/kg
Asbestos >1%
TPH >1,000 mg/kg

UPRR Property Boundary

Fence Line

Operable Unit Geographic Boundary

N

0 500
Scale in Feet

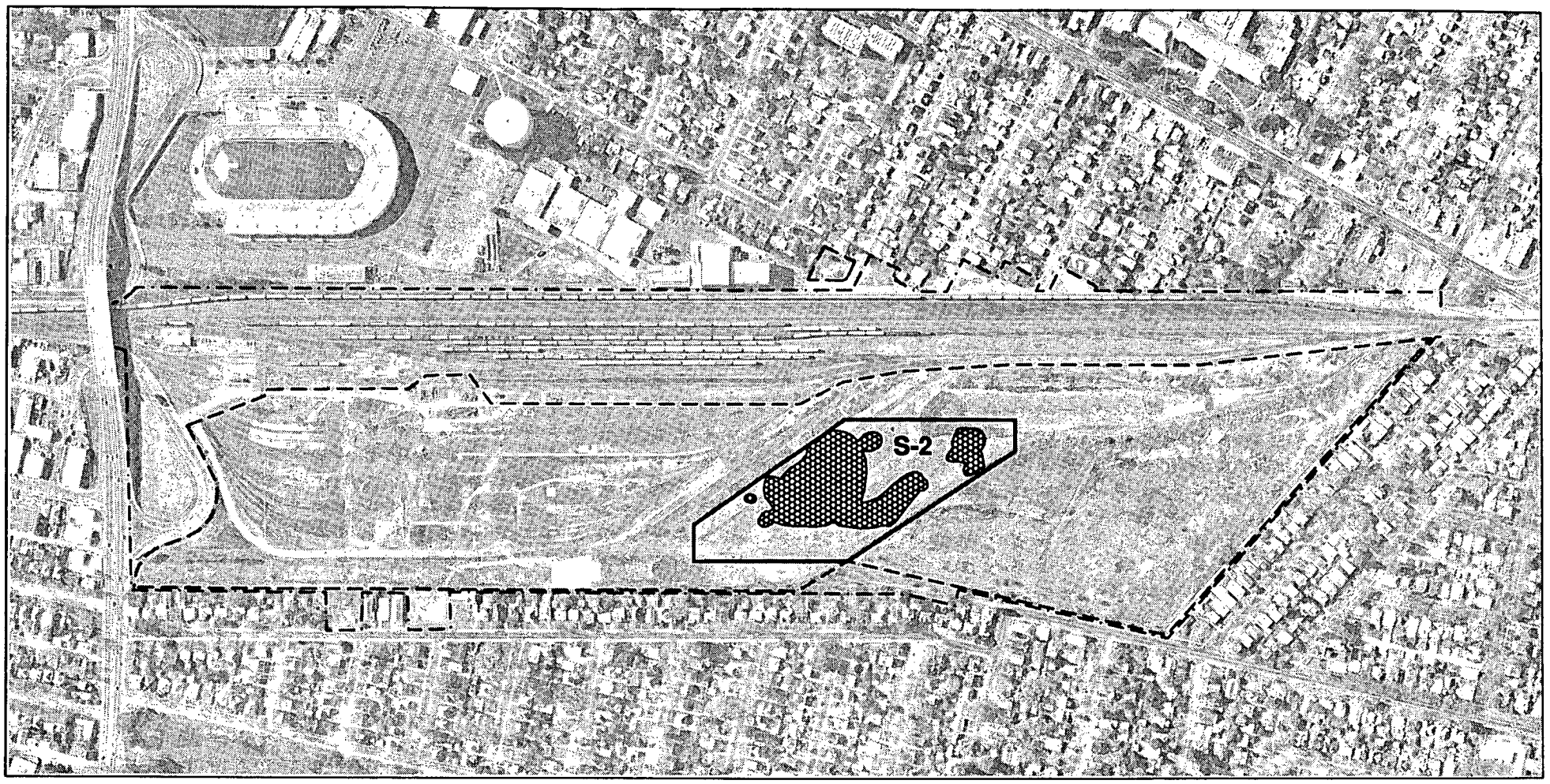
DAMES & MOORE

00173-072-044 SJR 12/22/92 OU_1

SOIL OPERABLE UNIT S-1

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

FIGURE 10R



EXPLANATION

Approximate Lateral Extent of Soils Above Restricted Land Use RAOs:
Lead >950 mg/kg
Arsenic >55 mg/kg
TPH >1,000 mg/kg

UPRR Property Boundary

Fence Line

Operable Unit Geographic Boundary

N

0 500
Scale in Feet

SOIL OPERABLE UNIT S-2

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

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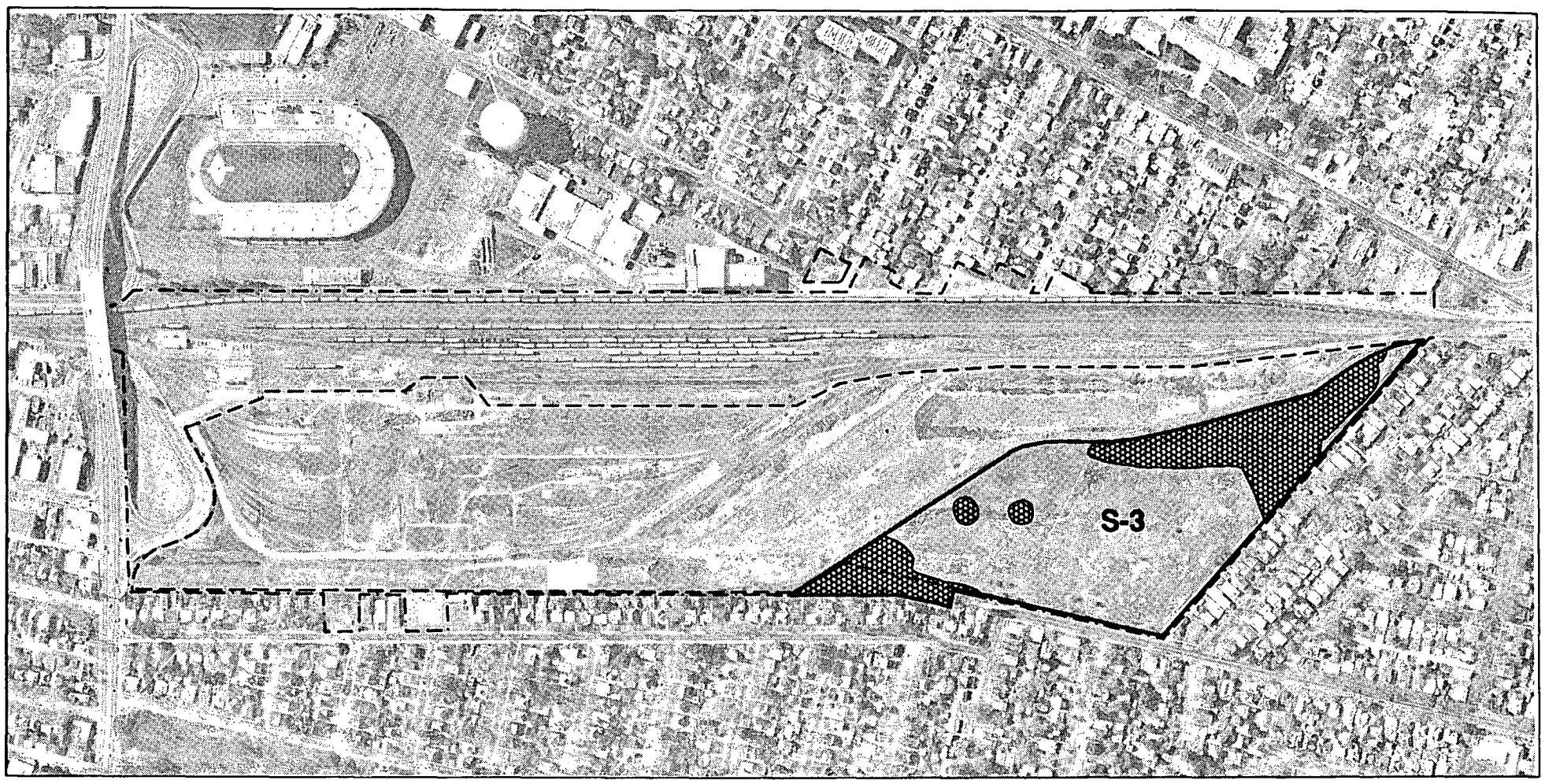
00173-072-044 SJR 12/22/92 OU_2

FIGURE 11R



EXPLANATION

Approximate Lateral Extent of Soils Above Unrestricted Land Use RAOs:
Lead >220 mg/kg
Arsenic >8 mg/kg
TPH >1,000 mg/kg

UPRR Property Boundary

Fence Line

Operable Unit Geographic Boundary

N

0 500
Scale in Feet

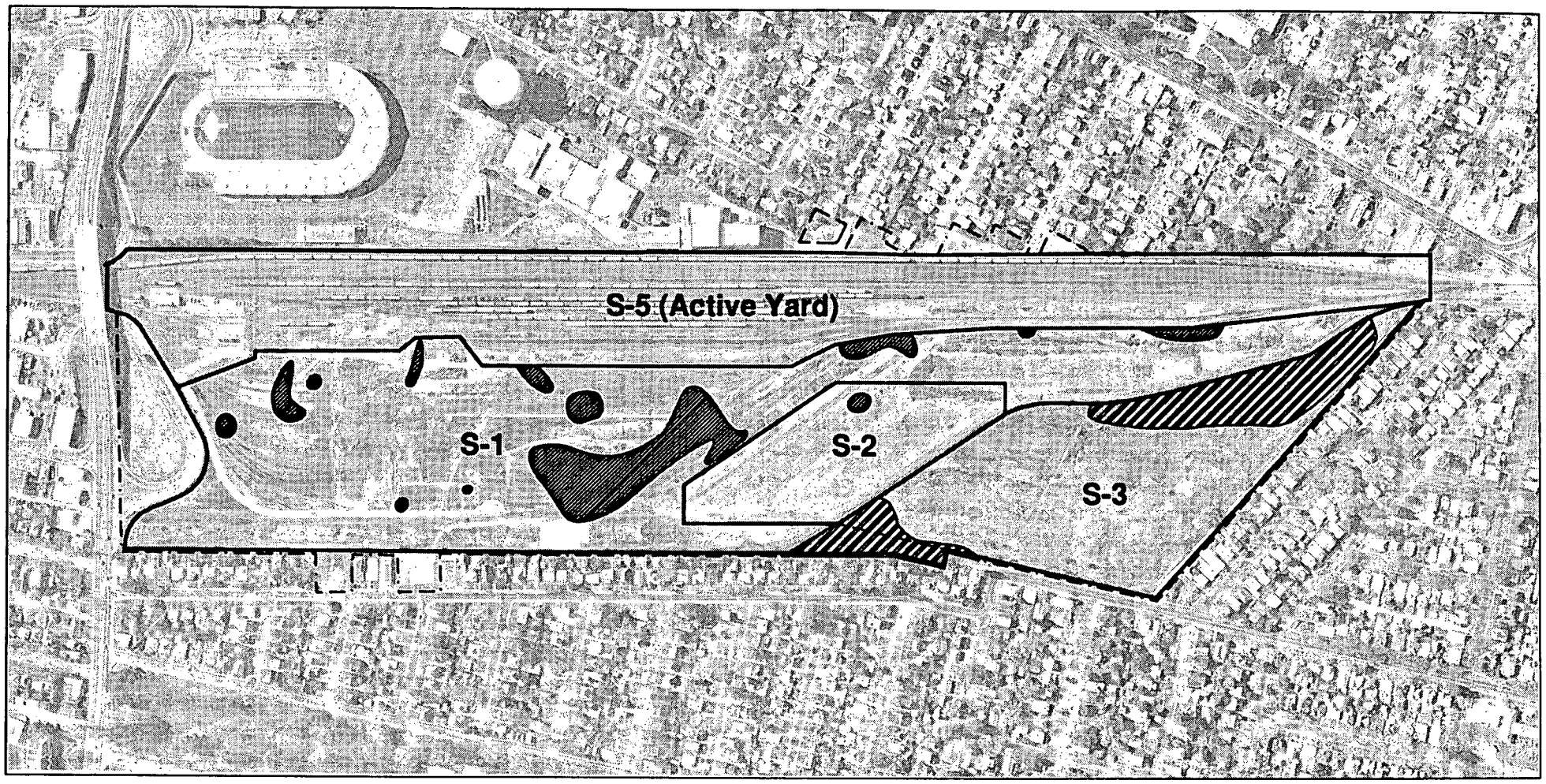
SOIL OPERABLE UNIT S-3

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

DAMES & MOORE

00173-072-044 SJR 12/22/92 OU_3

FIGURE 12R



EXPLANATION

- Approximate Area Where Arsenic Exceeds the Unrestricted Land Use RAOs (8mg/Kg)
- Approximate Area Where Arsenic Exceeds the Restricted Land Use RAOs (55mg/Kg)
- **S-1** Soil Operable Unit Designation
- UPRR Property Boundary
- Fence Line
- Operable Unit Geographic Boundary

N

0 500

Scale in Feet

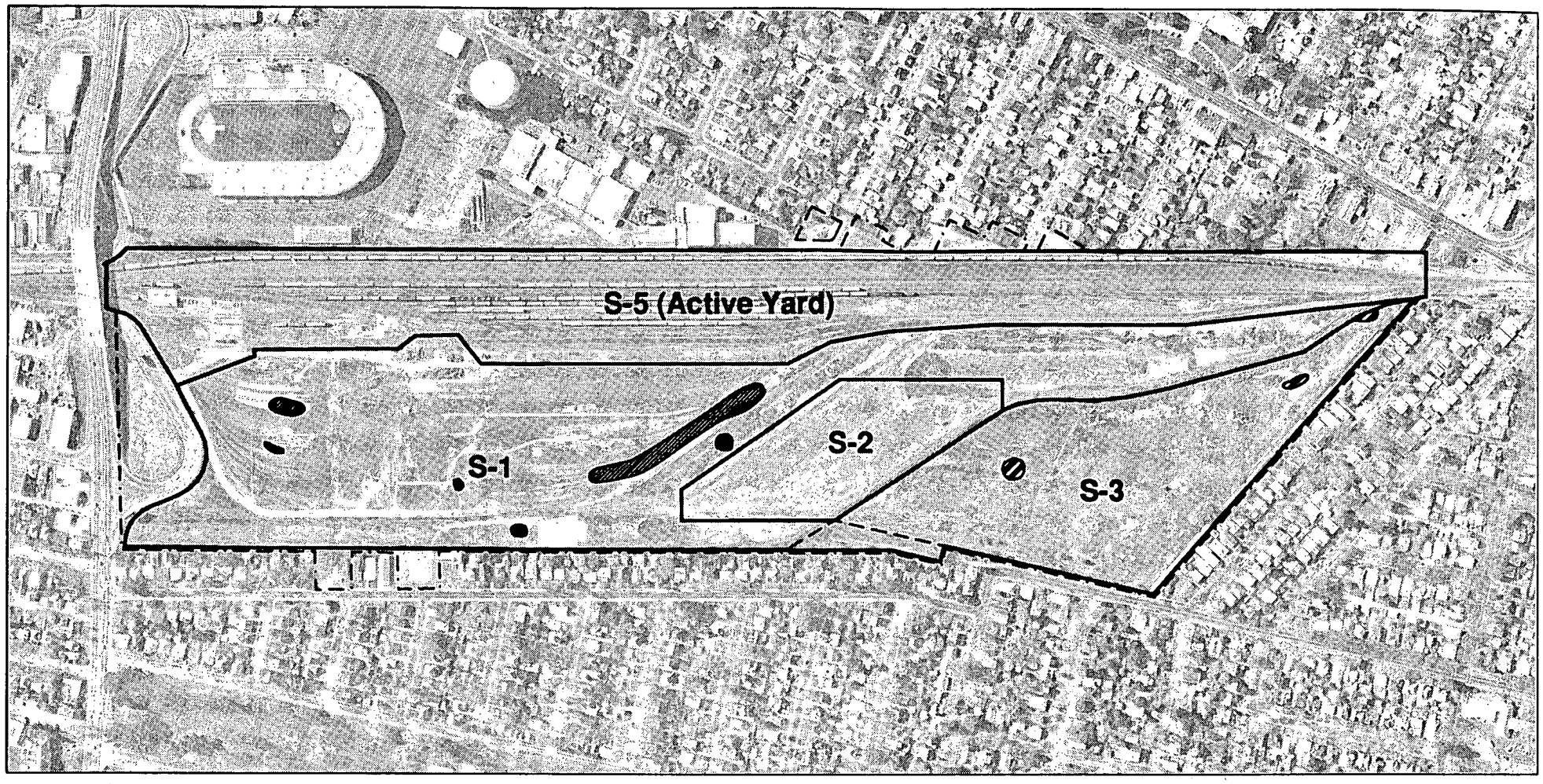
DISTRIBUTION OF ARSENIC ABOVE RAOs FOR 0.0 TO 0.5 FEET

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

DAMES & MOORE

00173-072-044 SJR 1/27/93 AS0_05

FIGURE 14R



EXPLANATION

- Approximate Area Where Arsenic Exceeds the Unrestricted Land Use RAOs (8mg/Kg)
- Approximate Area Where Arsenic Exceeds the Restricted Land Use RAOs (55mg/Kg)
- S-1 Soil Operable Unit Designation
- UPRR Property Boundary
- Fence Line
- Operable Unit Geographic Boundary

N

0 500

Scale in Feet

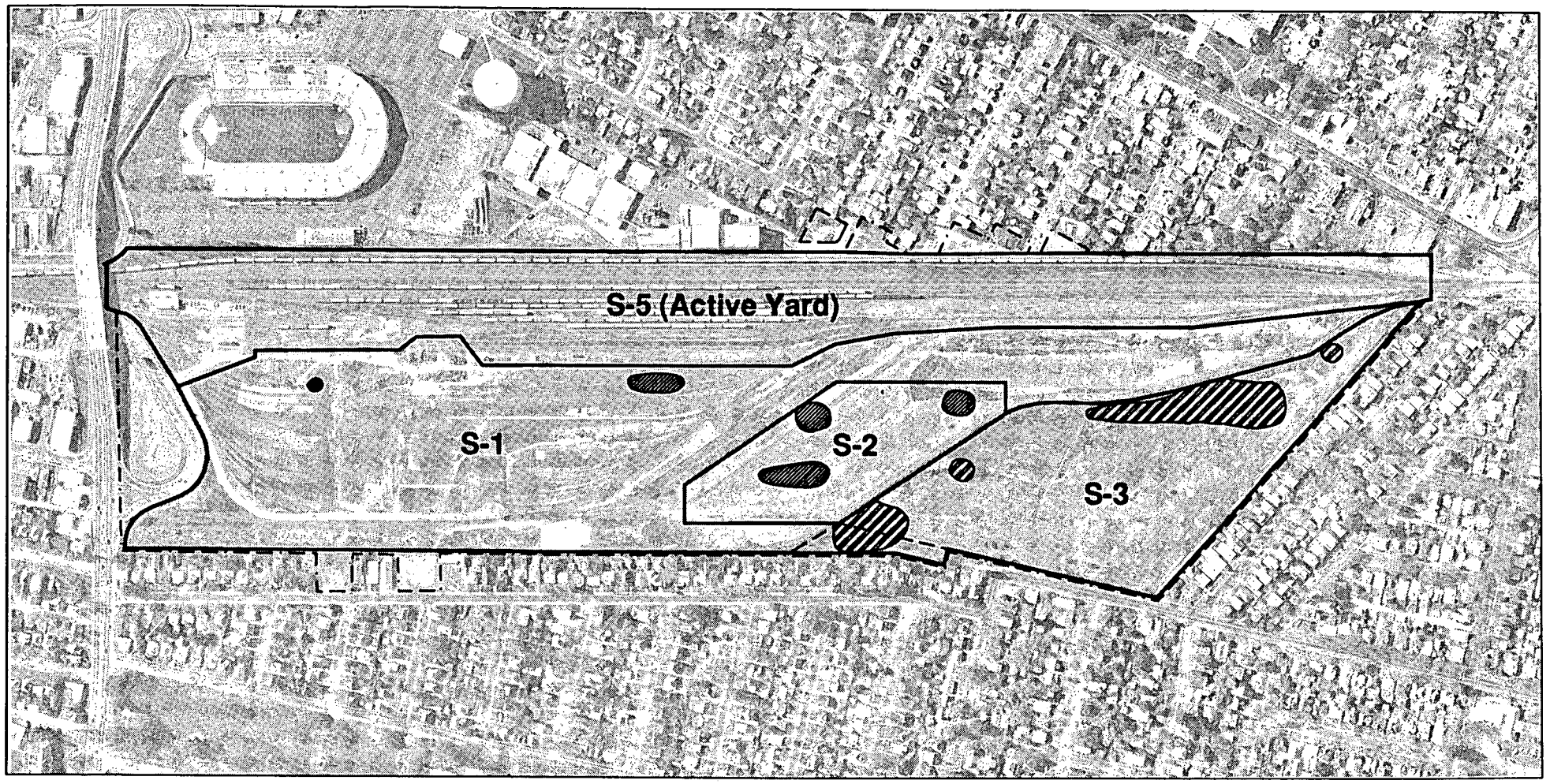
DISTRIBUTION OF ARSENIC ABOVE RAOs FOR 0.5 TO 1.5 FEET

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

DAMES & MOORE

00173-072-044 SJR 1/27/93 AS5_15

FIGURE 15R



EXPLANATION

- Approximate Area Where Arsenic Exceeds the Unrestricted Land Use RAOs (8mg/Kg)
- Approximate Area Where Arsenic Exceeds the Restricted Land Use RAOs (55mg/Kg)
- S-1 Soil Operable Unit Designation
- UPRR Property Boundary
- Fence Line
- Operable Unit Geographic Boundary

N

0 500

Scale in Feet

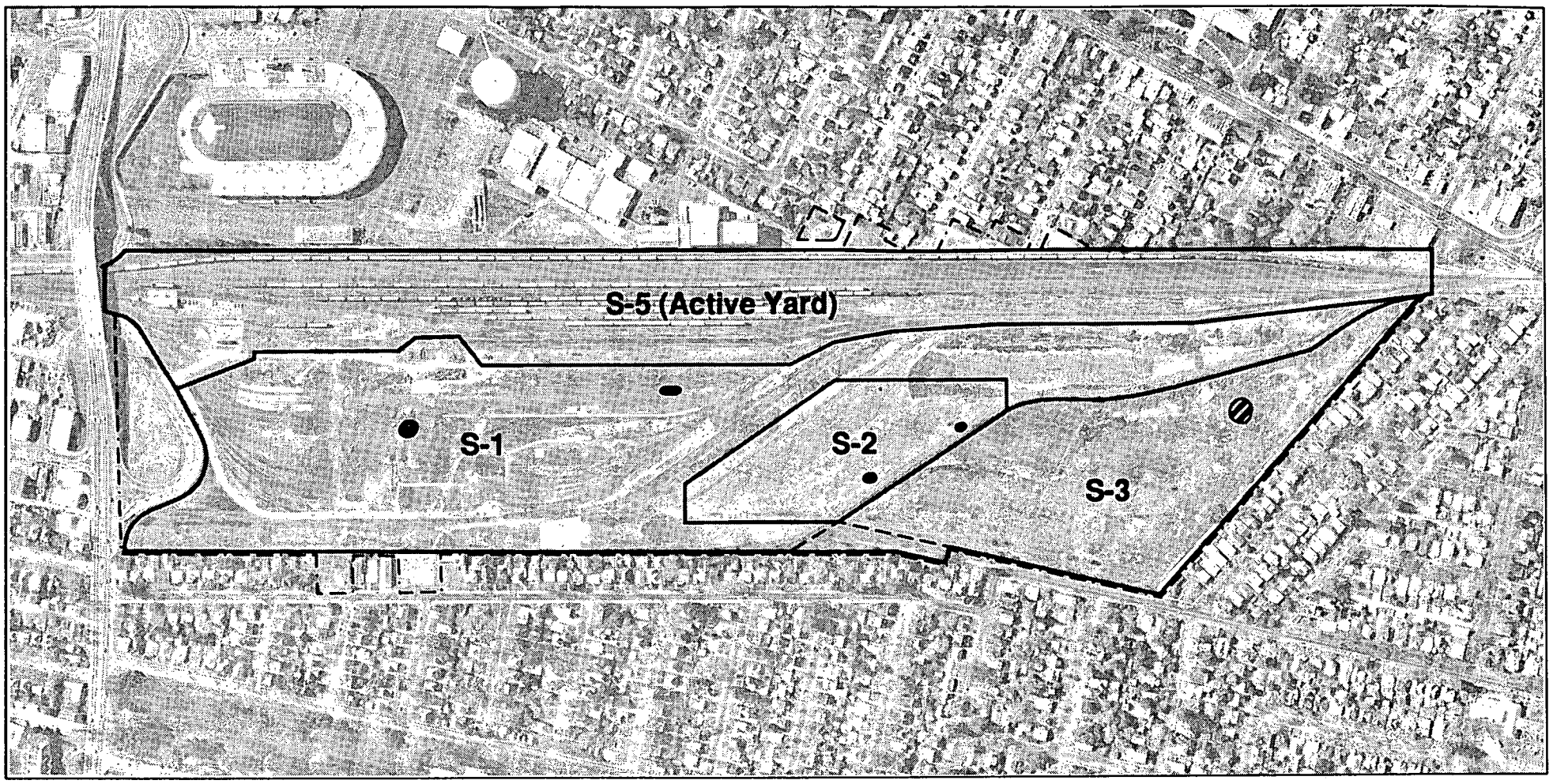
DISTRIBUTION OF ARSENIC ABOVE RAOs FOR 1.5 TO 5.0 FEET

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

DAMES & MOORE

00173-072-044 SJR 1/27/93 AS15_5

FIGURE 16R



EXPLANATION

- Approximate Area Where Arsenic Exceeds the Unrestricted Land Use RAOs (8mg/Kg)
- Approximate Area Where Arsenic Exceeds the Restricted Land Use RAOs (55mg/Kg)
- **S-1** Soil Operable Unit Designation
- UPRR Property Boundary
- Fence Line
- Operable Unit Geographic Boundary

N

0 500

Scale in Feet

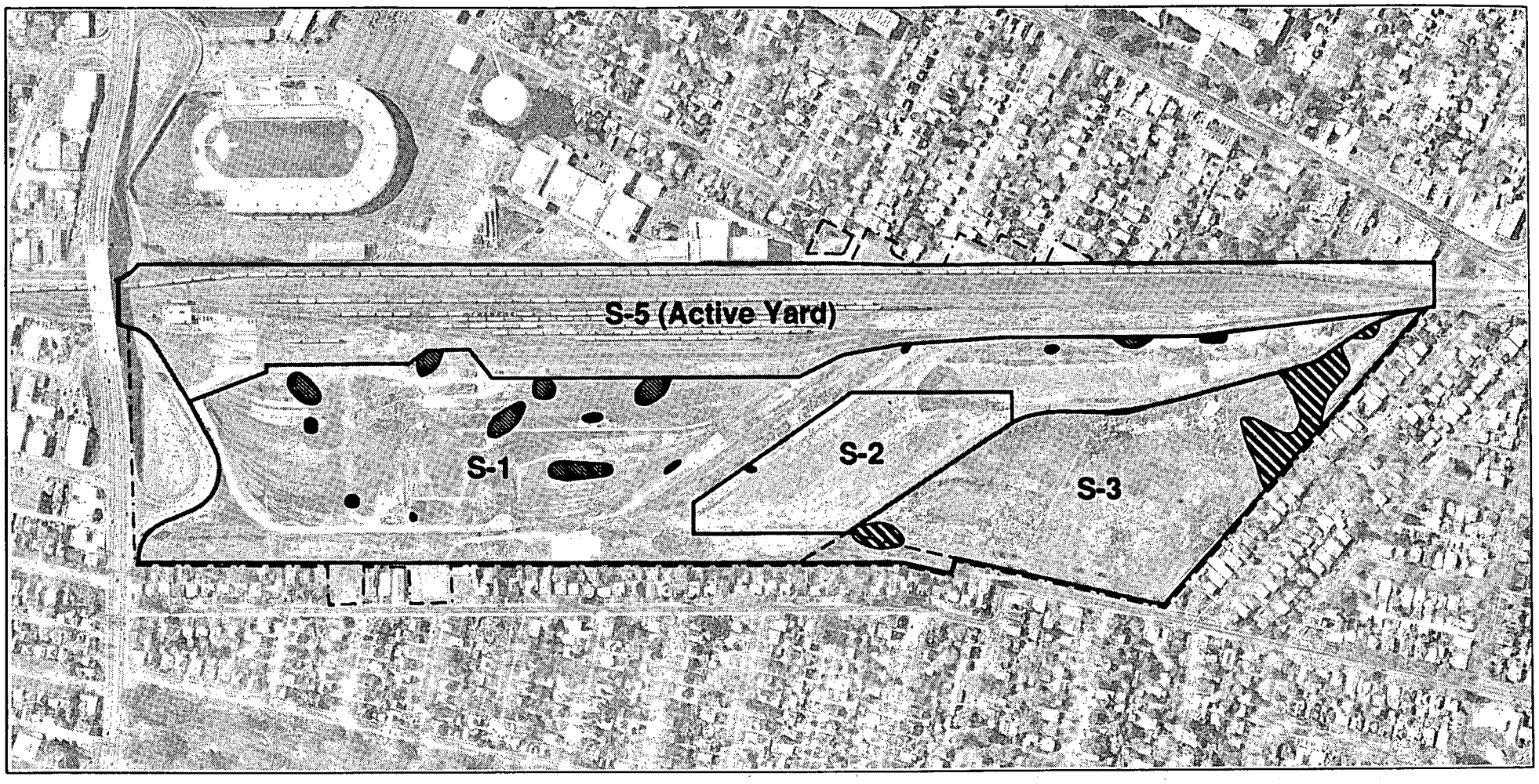
DISTRIBUTION OF ARSENIC ABOVE RAOs FOR 5 TO 10 FEET

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

FIGURE 17R

DAMES & MOORE

00173-072-044 SJR 1/27/93 AS5_10



EXPLANATION

- Approximate Area Where Lead Exceeds the Unrestricted Land Use RAOs (220mg/Kg)
- Approximate Area Where Lead Exceeds the Restricted Land Use RAOs (950mg/Kg)
- S-1 Soil Operable Unit Designation
- UPRR Property Boundary
- Fence Line
- Operable Unit Geographic Boundary

N

0 500

Scale in Feet

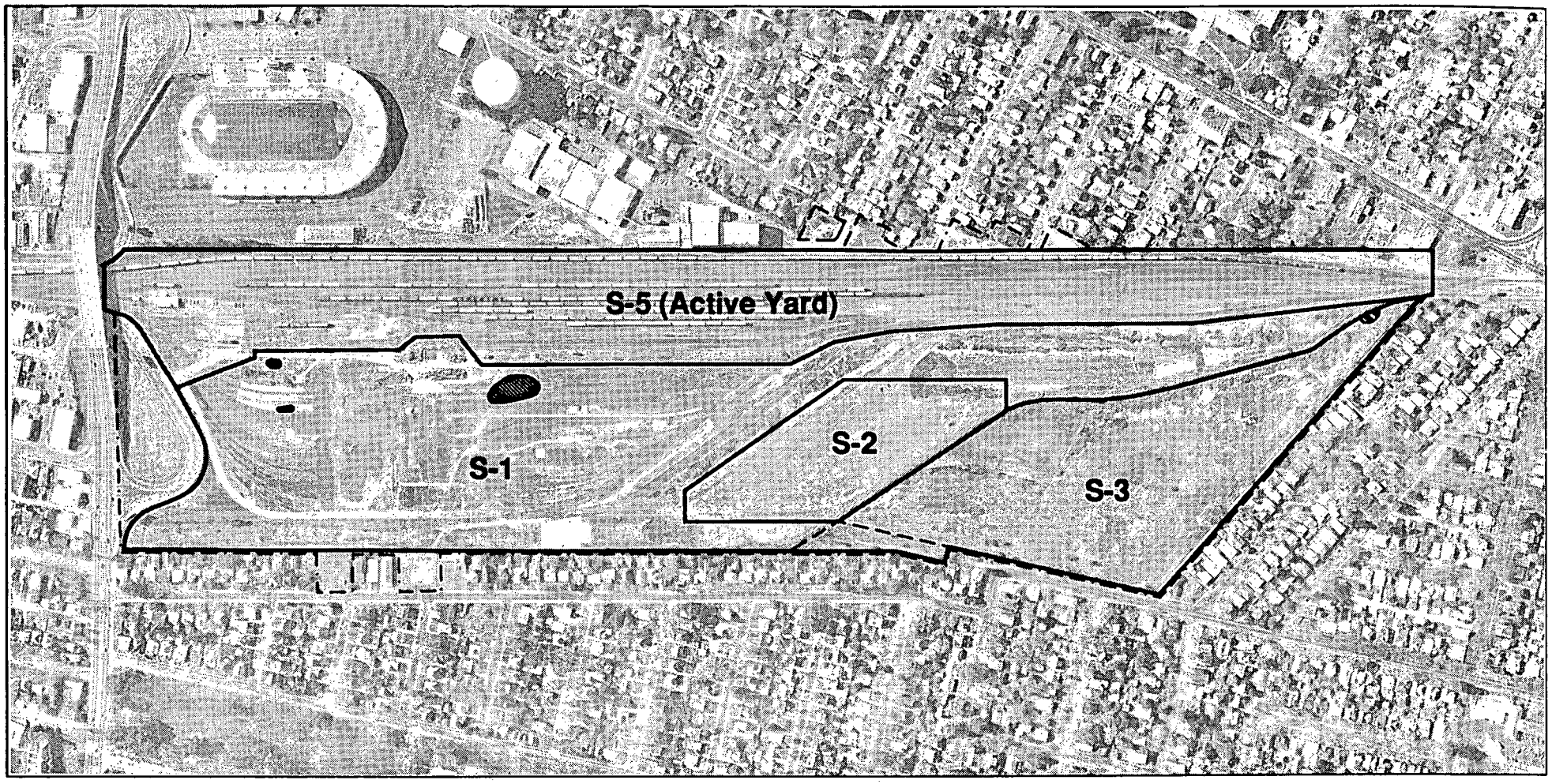
DISTRIBUTION OF LEAD ABOVE RAOs FOR 0 TO 0.5 FEET

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

FIGURE 18R

DAMES & MOORE

00173-072-044 SJR 12/22/92 PB0_05



EXPLANATION

- Approximate Area Where Lead Exceeds the Unrestricted Land Use RAOs (220mg/Kg)
- Approximate Area Where Lead Exceeds the Restricted Land Use RAOs (950mg/Kg)
- S-1 Soil Operable Unit Designation
- UPRR Property Boundary
- Fence Line
- Operable Unit Geographic Boundary

N

0 500

Scale in Feet

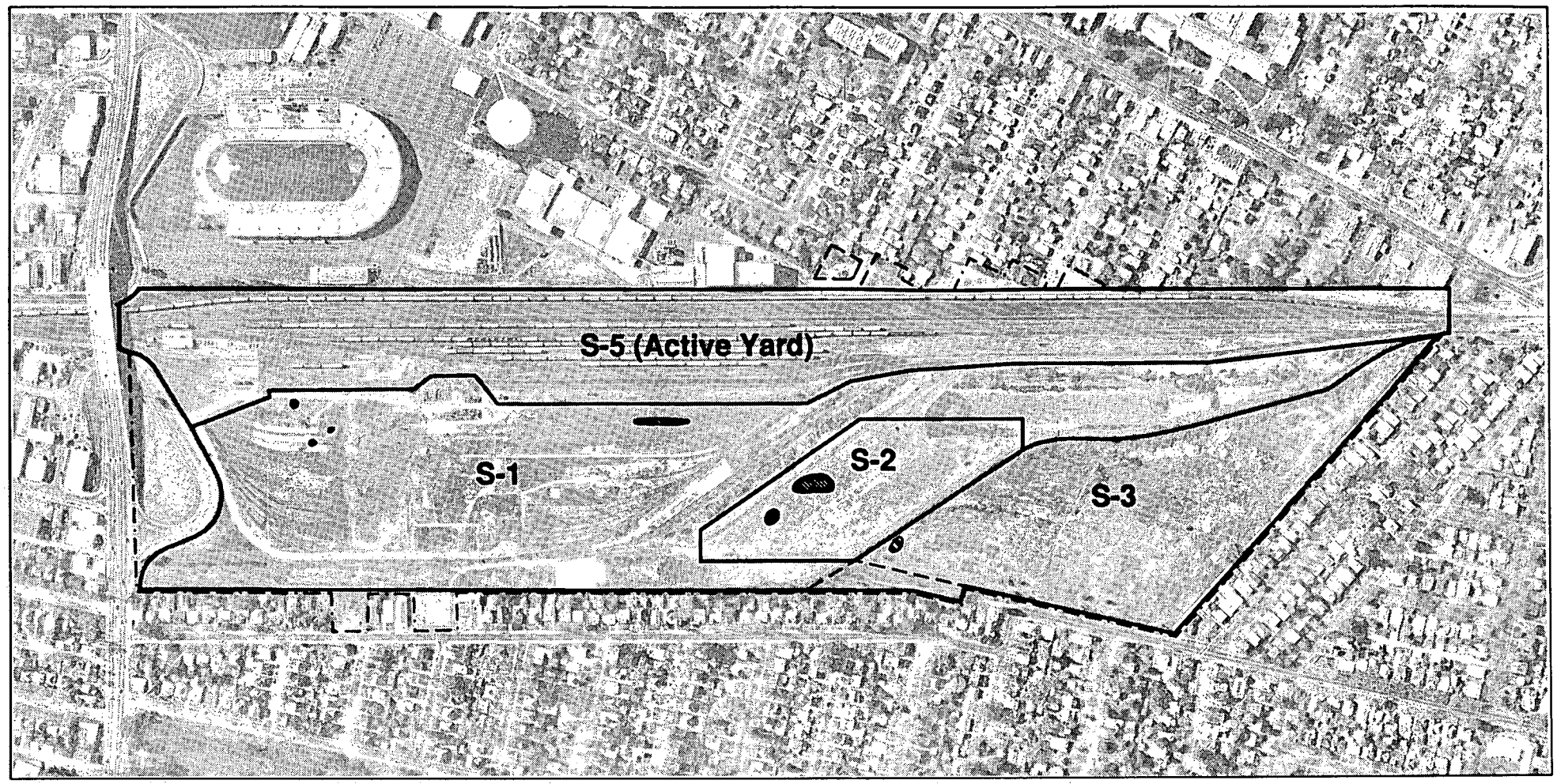
DISTRIBUTION OF LEAD ABOVE RAOs FOR 0.5 TO 1.5 FEET

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

DAMES & MOORE

00173-072-044 SJR 12/22/92 PB5_15

FIGURE 19R



EXPLANATION

- Approximate Area Where Lead Exceeds the Unrestricted Land Use RAOs (220mg/Kg)
- Approximate Area Where Lead Exceeds the Restricted Land Use RAOs (950mg/Kg)
- **S-1** Soil Operable Unit Designation
- UPRR Property Boundary
- Fence Line
- Operable Unit Geographic Boundary

N

0 500

Scale in Feet

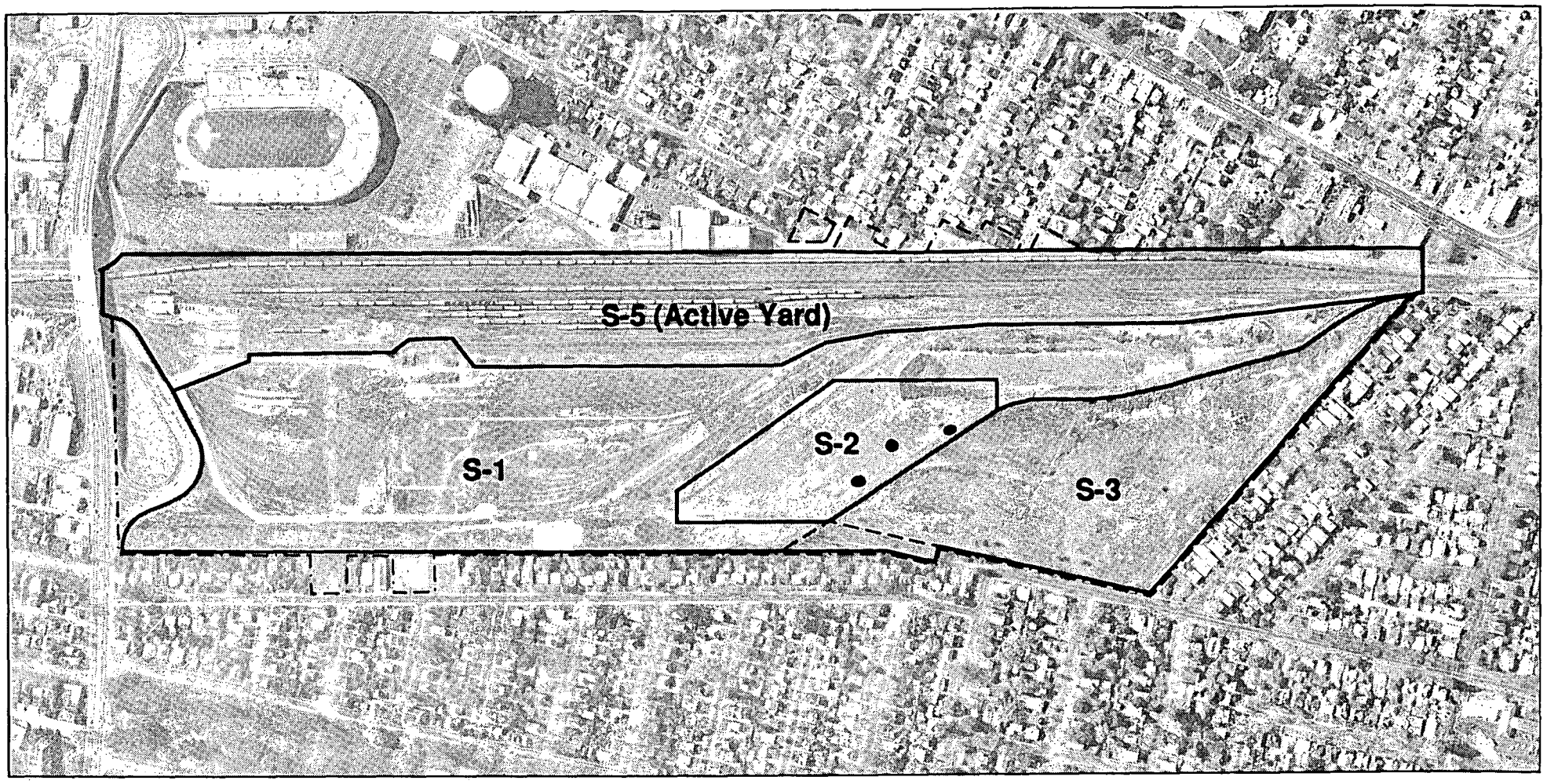
DISTRIBUTION OF LEAD ABOVE RAOs FOR 1.5 TO 5.0 FEET

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

FIGURE 20R

DAMES & MOORE

00173-072-044 SJR 12/22/92 PB15_5



EXPLANATION

- Approximate Area Where Lead Exceeds the Unrestricted Land Use RAOs (220mg/Kg)
- Approximate Area Where Lead Exceeds the Restricted Land Use RAOs (950mg/Kg)
- **S-1** Soil Operable Unit Designation
- UPRR Property Boundary
- Fence Line
- Operable Unit Geographic Boundary

N

0 500

Scale in Feet

DISTRIBUTION OF LEAD ABOVE RAOs FOR 5 TO 10 FEET

Union Pacific Railroad Yard
Sacramento, California
JANUARY 1993

FIGURE 21R

DAMES & MOORE

00173-072-044 SJR 12/22/92 PB5_10

Appendix C

APPENDIX C

REVISED ALTERNATIVE 10 DETAILED COST ESTIMATES

ALT10S1R.WK1

Table C–11R

Soil Alternative 10 (S–1) Detailed Cost Estimate
Feasibility Study Supplement
Union Pacific Railroad Yard
Sacramento, California

CAPITAL COSTS

Direct Capital Costs

Item	Units	Quantity	Cost per Unit	Source	Total
SITE DEVELOPMENT					
Mobilization	ea	1	$20,000.00	B	$20,000
Clear & Grub	ac	36	$2,500.00	*B	$90,000
Debris Disposal	tn	3000	$19.00	B	$57,000
Hazardous Soil Disposal					
Excavate & Load	cy	17000	$11.00	*I	$187,000
Air Monitoring	day	17	$1,950.00	E	$33,150
Dust Control	day	17	$450.00	I	$7,650
Verification Testing					
Asbestos	sample	20	$28.00	C	$560
Lead & Arsenic	sample	190	$94.00	C	$17,860
TPH & PAHs	sample	50	$388.00	C	$19,400
Haul & Dispose	tn	23000	$120.00	B	$2,760,000
Backfill Pits	cy	17000	$15.00	I	$255,000
Fill Density Testing	day	7	$560.00	E	$3,920
Subtotal Site Work					$3,451,540
CAPITAL EQUIPMENT					$0
Subtotal Capital Equipment					$0
DIRECT CAPITAL COST SUBTOTAL					$3,451,540

Indirect Capital Costs

Item	Cost (as % of Direct Capital Costs)	Source	Total
Engineering/Construction Mgmt.	10%	F	$345,154
Permitting	2%	F	$69,031
INDIRECT CAPITAL COST SUBTOTAL			$414,185
TOTAL CAPITAL COSTS			$3,865,725

OPERATION AND MAINTENANCE COSTS

Item	Units	Quantity	Average Cost per Year	Source	Total
SAMPLING/MONITORING					
None Required					$0
Total Sampling/Monitoring Costs					$0
SYSTEM OPERATION AND MAINTENANCE					
None Required					$0
Total System O&M Costs					$0
TOTAL O&M COSTS					$0

TOTAL PRESENT WORTH COST $3,681,643

* 25% contingency added due to the anticipated presence of surfacer and subsurface hazards.

NOTES

1) Soil assumed to be characterized as non–RCRA waste for disposal cost estimate. Cost includes shipment by rail to USPCI's Class I landfill in Utah.
2) Excavation unit cost based on in–place density of 1.38 tn/cy (Dames & Moore, RI, 1991).
3) Excavation pits to be filled with clean inported borrow and compacted to 90% relative compaction.
4) Fill density testing cost includes labor, equipment, and reporting. Number of days based on 2500 cy/day compacted fill placement.
5) Net Present Worth Cost calculated using annual interest rate of 5%.

KEY

ac=acre ea=each tn=ton cy=cubic yard

SOURCES

B) USPCI Remedial Services (1991)
C) D&M Laboratories (1991).
D) Chemical Waste Management (1991).
E) Dames & Moore internal estimate based on previous project experience.
F) Remedial Action Costing Procedures Manual, EPA 1987 (EPA600/8–87/049).
I) OHM Corporation (1991).

Table C-12R

TOTAL PRESENT WORTH COST

Alternative 10 (S-1)

Feasibility Study Supplement

Union Pacific Railroad Yard

Sacramento, California

YEAR	CAPITAL COSTS	MONITORING COSTS	O&M COSTS	TOTAL COSTS
1	$3,865,725			$3,865,725
2				$0
3				$0
4				$0
5				$0
6				$0
7				$0
8				$0
9				$0
10				$0
11				$0
12				$0
13				$0
14				$0
15				$0
16				$0
17				$0
18				$0
19				$0
20				$0
21				$0
22				$0
23				$0
24				$0
25				$0
26				$0
27				$0
28				$0
29				$0
30				$0
SUM (1991 $)	$3,865,725	$0	$0	$3,865,725

TOTAL PRESENT WORTH COST: **$3,681,643**

ALT10S-2.WK1

Table C-13R

Soil Alternative 10 (S-2) Detailed Cost Estimate
Feasibility Study Supplement
Union Pacific Railroad Yard
Sacramento, California

CAPITAL COSTS

Direct Capital Costs

Item	Units	Quantity	Cost per Unit	Source	Total
SITE DEVELOPMENT					
Mobilization	ea	1	$20,000.00	B	$20,000
Clear & Grub	ac	7	$2,500.00	*B	$17,500
Hazardous Soil Disposal					
Excavate & Load	cy	33000	$11.00	*I	$363,000
Air Monitoring	day	22	$1,950.00	E	$42,900
Dust Control	day	22	$365.00	I	$8,030
Verification Testing					
TPH & PAHs	sample	80	$388.00	C	$31,040
Lead & Arsenic	sample	70	$94.00	C	$6,580
Haul & Dispose	tn	45000	$120.00	B	$5,400,000
Backfill Pits	cy	33000	$15.00	I	$495,000
Fill Density Testing	day	13	$560.00	E	$7,280
Subtotal Site Work					$6,391,330
CAPITAL EQUIPMENT					$0
Subtotal Capital Equipment					$0
DIRECT CAPITAL COST SUBTOTAL					$6,391,330

Indirect Capital Costs

Item	Cost (as % of Direct Capital Costs)	Source	Total
Engineering/Construction Mgmt.	10%	F	$639,133
Permitting	2%	F	$127,827
INDIRECT CAPITAL COST SUBTOTAL			$766,960
TOTAL CAPITAL COSTS			$7,158,290

OPERATION AND MAINTENANCE COSTS

Item	Units	Quantity	Average Cost per Year	Source	Total
SAMPLING/MONITORING					
None Required					$0
Total Sampling/Monitoring Costs					$0
SYSTEM OPERATION AND MAINTENANCE					
None Required					$0
Total System O&M Costs					$0
TOTAL O&M COSTS					$0

TOTAL PRESENT WORTH COST $6,817,419

* 25% contingency added due to the anticipated presence of surface and subsurface hazards.

NOTES

1) Soil assumed to be characterized as a non-RCRA waste for disposal cost estimate. Cost includes shipment by rail to USPCI's Class I Landfill.
2) Excavation pits to be filled with clean inported borrow and compacted to 90% relative compaction.
3) Excavation unit cost based on in-place density of 1.38 tn/cy (Dames & Moore, RI, 1991).
4) Fill density testing cost includes labor, equipment, and reporting. Number of days based on 2500 cy/day compacted fill placement.
5) Net Present Worth Cost calculated using annual interest rate of 5%.

KEY

ac=acre ea=each tn=ton cy=cubic yard ls=lump sum

SOURCES

B) USPCI Remedial Services (1991)
C) D&M Laboratories (1991).
D) Chemical Waste Management (1991).
E) Dames & Moore internal estimate based on previous project experience.
F) Remedial Action Costing Procedures Manual, EPA 1987 (EPA/600/8-87/049).
I) OHM Corporation (1991).

Table C-14R
TOTAL PRESENT WORTH COST
Alternative 10 (S-2)
Feasibility Study Supplement
Union Pacific Railroad Yard
Sacramento, California

YEAR	CAPITAL COSTS	MONITORING COSTS	O&M COSTS	TOTAL COSTS
1	$7,158,290			$7,158,290
2				$0
3				$0
4				$0
5				$0
6				$0
7				$0
8				$0
9				$0
10				$0
11				$0
12				$0
13				$0
14				$0
15				$0
16				$0
17				$0
18				$0
19				$0
20				$0
21				$0
22				$0
23				$0
24				$0
25				$0
26				$0
27				$0
28				$0
29				$0
30				$0
SUM (1991 $)	$7,158,290	$0	$0	$7,158,290

TOTAL PRESENT WORTH COST: $6,817,419

ALT10S-3.WK1

Table C-15R
Soil Alternative 10 (S-3) Detailed Cost Estimate
Feasibility Study Supplement
Union Pacific Railroad Yard
Sacramento, California

CAPITAL COSTS

Direct Capital Costs

Item	Units	Quantity	Cost per Unit	Source	Total
SITE DEVELOPMENT					
Mobilization	ea	1	$20,000.00	B	$20,000
Clear & Grub	ac	7	$2,500.00	*B	$17,500
Hazardous Soil Disposal					$0
Excavate & Load	cy	28000	$11.00	*I	$308,000
Air Monitoring	day	12	$1,950.00	E	$23,400
Dust Control	day	12	$450.00	I	$5,400
Analytical Testing					$0
Lead & Arsenic	sample	250	$94.00	C	$23,500
TPH & PAHs	sample	60	$388.00	C	$23,280
Haul & Dispose					
Class III landfill	tn	37000	$25.00	E	$925,000
Class I landfill	tn	2000	$120.00	B	$240,000
Backfill Pits	cy	15000	$15.00	I	$225,000
Fill Density Testing	day	10	$560.00	E	$5,600
Subtotal Site Work					$1,816,680
CAPITAL EQUIPMENT					$0
Subtotal Capital Equipment					$0
DIRECT CAPITAL COST SUBTOTAL					$1,816,680

Indirect Capital Costs

Item	Cost (as % of Direct Capital Costs)	Source	Total
Engineering/Construction Mgmt.	10%	F	$181,668
Permitting	2%	F	$36,334
INDIRECT CAPITAL COST SUBTOTAL			$218,002
TOTAL CAPITAL COSTS			$2,034,682

OPERATION AND MAINTENANCE COSTS

Item	Units	Quantity	Average Cost per Year	Source	Total
SAMPLING/MONITORING					
None Required					$0
Total Sampling/Monitoring Costs					$0
SYSTEM OPERATION AND MAINTENANCE					
None Required					$0
Total System O&M Costs					$0
TOTAL O&M COSTS					$0

TOTAL PRESENT WORTH COST $1,937,792

* 25% contingency added due to the anticipated presence of surface and subsurface hazards.

NOTES
1) Soil containing TPH and As and/or Pb assumed to be characterized as non-RCRA waste for disposal cost estimate. Cost includes shipment by rail to USPCI's Class I landfill in Utah. Soil containing low levels of lead and/or arsenic assumed suitable for diposal in a Class III landfill in Yolo County. Cost includes transportation and landfill tipping fees.
2) Excavation unit cost based on in-place density of 1.38 tn/cy (Dames & Moore, RI, 1991).
3) Excavation pits to be filled with clean inported borrow and compacted to 90% relative compaction.
4) Fill density testing cost includes labor, equipment, and reporting. Number of days based on 2500 cy/day compacted fill placement.
5) Net Present Worth Cost calculated using annual interest rate of 5%.

SOURCES
B) USPCI Remedial Services (1991)
C) D&M Laboratories (1991).
D) Chemical Waste Management (1991).
E) Dames & Moore internal estimate based on previous project experience.
F) Remedial Action Costing Procedures Manual, EPA 1987 (EPA/600/8-87/049).
I) OHM Corporation (1991).

KEY
ac=acre ea=each tn=ton cy=cubic yard

Table C-16R
TOTAL PRESENT WORTH COST
Alternative 10 (S-3)
Feasibility Study Supplement
Union Pacific Railroad Yard
Sacramento, California

YEAR	CAPITAL COSTS	MONITORING COSTS	O&M COSTS	TOTAL COSTS
1	$2,034,682			$2,034,682
2				$0
3				$0
4				$0
5				$0
6				$0
7				$0
8				$0
9				$0
10				$0
11				$0
12				$0
13				$0
14				$0
15				$0
16				$0
17				$0
18				$0
19				$0
20				$0
21				$0
22				$0
23				$0
24				$0
25				$0
26				$0
27				$0
28				$0
29				$0
30				$0
SUM (1991 $)	$2,034,682	$0	$0	$2,034,682

TOTAL PRESENT WORTH COST: $1,937,792

Appendex D

APPENDIX D

DTSC COMMENTS ON ARSENIC AND LEAD REMEDIAL ACTION OBJECTIVES

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, Governor

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
10151 CROYDON WAY, SUITE 3
SACRAMENTO, CA 95827-2106
(916) 255-3545

January 22, 1993

Mr. Rick L. Eades, Director
Environmental Site Remediation
Union Pacific Railroad
1416 Dodge Street, Room 930
Omaha, Nebraska 68179-0930

COMMENTS TO REMEDIAL ACTION LEVEL AND REVISED RISK ASSESSMENT
UNION PACIFIC RAILYARD, SACRAMENTO COUNTY

Dear Mr. Eades:

The Department of Toxic Substances Control (Department) has reviewed the documents titled:

"Supplement to the Revised Baseline Health Risk Assessment" and "Development of Remedial Action Levels"

Union Pacific (UP) submitted these documents in response to Department and City of Sacramento comments.

The Department's comments to the proposed Remedial Action Objectives (RAO's) were transmitted verbally to UP's consultant, Dames and Moore, on November 25, 1992, in a meeting here at our office. At that meeting, the Department presented Dames and Moore with rationale for why we believe the RAO's should be modified.

Restricted Development

UP's proposed RAO's for the restricted area are based on comparing exposures of construction workers to California and Federal Occupational Safety and Health Administration (OSHA) action levels. The Department believes that contaminant exposure OSHA standards should not be applied to construction workers who typically do not have chemical exposures.

The Department conducted its own risk assessments based on exposure to lead and arsenic to construction workers, residential children and adults, and office workers for the restricted use scenario. Our analysis indicates that the most highly exposed group over a short interval would be construction workers.

The Department's calculated action level for lead is 1040 parts per million (ppm), assuming 1000 ug/m^3 of respirable dust and 120 mg/day soil ingestion. With these assumptions, construction workers would have less than a one percent chance of

having a blood lead level of 10 ug/dl or greater. UP's calculated action level is 8,700 ppm based on OSHA standards. However, this point is moot because the proposed RAO for lead is 950 ppm. The Department believes this RAO is sufficiently protective for all exposed groups in this scenario.

The Department's calculated action level for arsenic is 55 ppm, assuming 1000 ug/m^3 of respirable dust and 480 mg/day soil ingestion. This level would result in a hazard quotient of 0.99 with an incremental lifetime upper bound cancer risk of about $2*10^{-5}$ to construction workers. UP's proposed RAO of 135 ppm for arsenic is not acceptable. The Department believes that the RAO should be set at 55 ppm for arsenic.

Unrestricted Development

UP's proposed RAO for lead, 335 ppm, in the unrestricted area was calculated using the U.S. Environmental Protection Agency Integrated Uptake/Biokinetic (IU/BK) model. We prefer the Department's model because it considers additional pathways and exposure groups. Our model output shows that a soil concentration of 220 ppm lead and the following assumptions: a) site grown produce, b) lead in drinking water at 5 parts per billion, c) lead in air at 0.04 ug/m^3, and d) lead in airborne dust at 70 ug/m^3 would result in a blood lead concentration of 10 ug/dl or less for 99 out of 100 children under the age of six. Therefore, the Department believes the RAO for lead under this exposure scenario should be 220 ppm.

UP's proposed RAO for arsenic under this scenario is background (8 ppm). This proposed level is acceptable to the Department.

In Summary, the table below indicates the values that would be acceptable to the Department.

	Unrestricted Development	Restricted Development
Lead	220 ppm	950 ppm
Arsenic	8 ppm	55 ppm

If you have any questions please contact Jose Salcedo at (916) 255-3741 or myself at (916) 255-3730.

Sincerely,

James Tjosvold

James L. Tjosvold, Chief
Sacramento Responsible Party Unit
Site Mitigation Branch

cc: Mr. Tim Parker
Dames and Moore
8801 Folsom Boulevard, Suite 200
Sacramento, California 95826

Ms. Antonia Vorster
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