SEPT, 1990

WORK PLAN
ASBESTOS REMOVAL INTERIM REMEDIAL MEASURE (IRM)
UNION PACIFIC RAILROAD YARD
SACRAMENTO, CALIFORNIA

DAMES & MOORE

September 1990
Job No. 00173-062-044

DAMES & MOORE A PROFESSIONAL LIMITED PARTNERSHIP
9300 TECH CENTER DRIVE, SUITE 100, SACRAMENTO, CALIFORNIA 95826 (916) 364-8698

September 25, 1990

Mr. Val W. Siebel, Regional Administrator
Region I
Toxic Substances Control Division
Department of Health Services
10151 Croyden Way
Sacramento, CA 95827-2106

Attention: Mr. Jose Salcedo
Project Manager

Re: Work Plan
Asbestos Removal Interim Remedial Measures (IRM)
Union Pacific Railroad Yard
Sacramento, California
Job No. 00173-062-044

Dear Mr. Salcedo:

Union Pacific has requested Dames & Moore to transmit the enclosed Work Plan. The Work Plan provides the results of the recent asbestos sampling activities and proposes Interim Remedial Measures to mitigate the asbestos on-site.

If you have any questions regarding this Work Plan, please contact Tim Parker of this office.

Sincerely,

DAMES & MOORE

Allen Kearns
Associate

Timothy Parker
Project Geologist

AK/TP/sd
Enclosure

UPS1.072

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Library Reference Desk
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TABLE OF CONTENTS

WORK PLAN
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SACRAMENTO, CALIFORNIA

1.0 INTRODUCTION

This Work Plan presents the results of the focused soil sampling activities conducted in the immediate vicinity of the former Asbestos Storage Building and Union Pacific Railroad's planned interim remedial measure (IRM) removal activities to mitigate the asbestos containing soils on-site.

During Phase One and Phase Two of the Remedial Investigation a total of 187 soil samples were collected and analyzed for asbestos to evaluate the lateral distribution over the site. In the vicinity of the asbestos storage building, 9 asbestos samples were collected during Phase One and 11 samples were collected during Phase Two. Samples were collected at depths of 0-0.5 and 1.0-1.5 feet. Out of these 20 samples, 6 samples contained greater than one percent asbestos.

In June 1988 and February 1990 Dames & Moore submitted Phase One and Phase Two Remedial Investigation Reports for the Union Pacific Railroad Company (UPRR) Sacramento Shops Yard to the California Department of Health Services (Dames & Moore 1988 and 1990). The reports included the findings from the asbestos sampling program conducted throughout the site including the vicinity of the former asbestos storage building. The findings presented in the reports indicate remaining asbestos contamination is limited to near surface soils in the immediate vicinity of the former asbestos storage building. Air monitoring results for asbestos indicated air quality typical for an urban area.

Asbestos contaminated soils and wood debris were removed from the site on two previous occasions as interim remedial measures (IRMs). Approximately 1,600 cubic yards of wood debris and soil suspected of containing asbestos was removed and disposed of in the Anderson Landfill during these activities.

In order to delineate the area and depths of remaining soils containing asbestos, in August 1990, additional focused sampling was conducted in the immediate vicinity of the former Asbestos Storage Building. The sampling methodology and analytical results are discussed in the following section.

2.0 SOIL SAMPLING AND ANALYSES

2.1 SOIL SAMPLING ACTIVITIES

The results of previous investigations indicate that soils within 1-foot of the ground surface in the immediate vicinity of the former Asbestos Storage Building contain relatively minor amounts of asbestos. To define the area of soils containing asbestos, the area within a 120 foot by 160 foot area around the former asbestos storage building was divided into a six by eight grid containing 20 by 20 foot plots (Figure 1). The grid numbering system utilized was the same grid numbering system utilized during the remedial investigations. Each plot was numbered by north and east coordinates. Two soil samples were taken in the center of each 20 foot plot at depths of 0-0.5 and 0.5-1.0 feet below ground surface. Samples were identified by their north and east location coordinates and depth interval.

The sampling procedures for the two depths were as follows:

- 0.0 to 0.5 feet. A power auger was used to dig to a depth of 0.5 feet. The loose soil in the hole was hand mixed and samples were placed in the sampling container; and

- 0.5 to 1.0 feet. All soil from the upper sample was removed from the hole and a hand auger was used to reach the one-foot depth. Loose soil was taken from the bottom of the hole and placed in a sampling container.

This procedure was followed for each of the 48 sample locations except for the following:

- Sample location 310E, 540N. Only a 0-0.5 foot sample was taken due to obstructive debris;

- Sample location 330E, 540N. Only a 0-0.5 foot sample was taken due to obstructive debris; and

- Sample location 450E, 480N was moved north five feet to 445E, 480N due to obstruction by railroad tracks.

2.2 ANALYTICAL RESULTS

The asbestos analytical results of soil samples are provided in Table 1, and analytical laboratory reports are included in Appendix A. All soil samples were analyzed by McClara Laboratory, Sacramento, California. Polarized light microscopy (PLM) was the method of analysis.

The distribution of asbestos containing soil is shown in Figure 1. A total of 94 soil samples were collected and analyzed. The analytical results were as follows:

- 7 samples contained asbestos at greater than or equal to 1%, and ranged from 1% to 5% asbestos;
- 42 samples contained less than 1% asbestos, with a range of to 0.1% to 0.8%; and
- Asbestos was not detected in 45 of the soil samples.

3.0 INTERIM REMEDIAL MEASURE (IRM)

3.1 REMOVAL ACTIVITIES

As an interim remedial measure (IRM), soil containing one per cent or greater asbestos will be excavated and removed from the site. The area to be excavated is shown in Figure 1 and amounts to approximately 60 cubic yards of material. The soil within this zone will be excavated and transported by truck to an approved asbestos disposal site.

Asbestos removal activities will be undertaken by excavation with a skiploader by Hess and Hess Construction, Inc. Hess & Hess is a Cal-OSHA certified asbestos-related work contractor. The loader will initially work from uncontaminated outside areas toward the known affected areas. The loader will make as few passes as possible to remove soil to the desired depth. After each pass, the skiploader will move to the loading area and place the excavated soil into dump trucks which will be lined and sealed with two layers of 6 mil. polyethylene. The dump trucks will be located as near as possible to the excavation area to limit the amount of travel of the skiploader. The skiploader will travel between the asbestos containing area and the loading area on 10 mil. plastic sheeting in order to capture any asbestos or asbestos containing material which may fall from the loader. Any soil spilled from the loader will be placed immediately into the loader for disposal into the polyethylene-lined dump trucks.

On the basis of previous analytical test results, soils containing one per cent or greater asbestos had clearly visible marble sized clumps of asbestos. Upon attaining the predetermined depth of excavation, the floor and sidewalls of the excavation will be carefully examined by a Dames & Moore field technician for the presence of asbestos. If asbestos or suspect asbestos material is observed, additional excavation will be completed. This process will be continued until there is no remaining visible evidence of asbestos in the immediate vicinity of the former Asbestos Storage Building.

Upon completion of excavation activities, a total of five random confirmatory samples will be collected from the excavation floor. These five samples will be analyzed by polarized light microscopy for the presence of asbestos. Upon confirmation of adequate removal, the excavation will be backfilled with appropriate clean fill and compacted.

3.2 HEALTH AND SAFETY MEASURES AND MONITORING

All on-site activities will be conducted in conformance with the Health and Safety Plan (Appendix B). All excavation and removal activities will be performed in a manner to minimize airborne contamination. As an initial dust control measure, surface soils will be moistened with water from a fine mist sprayer to eliminate dust emissions. In addition, a fine mist sprayer will be applied to the front of the bucket loader to wet newly exposed soil during excavation. All personnel will wear a half-face respirator equipped with HEPA cartridges at all times in the vicinity of the area of excavation, during excavation operations, and during subsequent confirmatory soil sampling. Upon completion of soil removal the entire area will be temporarily covered with plastic sheeting secured by weights to safeguard against any ancillary airborne contamination.

Potential asbestos exposure will be monitored using two methods. Personal air monitoring of all workers in proximity to excavation activities will be performed throughout the operation using a low flow MSA pump (or equivalent) with 25 mm sample cassettes. In addition, area monitoring will be conducted using four high flow MSA pumps (or equivalent), two upwind and two downwind, to assess the levels of asbestos in dust emissions in the vicinity of the work area. Air monitoring samples will be analyzed by a DHS certified hazardous waste testing laboratory using phase contrast microscopy (PCM).

Tables

TABLE 1
ANALYTICAL RESULTS
(% ASBESTOS)

COORDINATE	DEPTH (ft bgs)	RESULTS	COORDINATE	DEPTH (ft bgs)	RESULTS
310E, 480N	0.0 - 0.5	ND	370E, 540N	0.0 - 0.5	0.1%
310E, 480N	0.5 - 1.0	ND	370E, 540N	0.5 - 1.0	0.1%
310E, 500N	0.0 - 0.5	ND	370E, 560N	0.0 - 0.5	0.1%
310E, 500N	0.5 - 1.0	ND	370E, 560N	0.5 - 1.0	0.2%
310E, 520N	0.0 - 0.5	ND	370E, 580N	0.0 - 0.5	0.1%
310E, 520N	0.5 - 1.0	ND	370E, 580N	0.5 - 1.0	0.1%
310E, 540N	0.0 - 0.5	ND	390E, 480N	0.0 - 0.5	0.1%
310E, 560N	0.0 - 0.5	ND	390E, 480N	0.5 - 1.0	0.6%
310E, 560N	0.5 - 1.0	ND	390E, 500N	0.0 - 0.5	0.1%
310E, 580N	0.0 - 0.5	ND	390E, 500N	0.5 - 1.0	0.6%
310E, 580N	0.5 - 1.0	ND	390E, 520N	0.0 - 0.5	0.1%
330E, 480N	0.0 - 0.5	ND	390E, 520N	0.5 - 1.0	1.0%
330E, 480N	0.5 - 1.0	ND	390E, 540N	0.0 - 0.5	0.2%
330E, 500N	0.0 - 0.5	ND	390E, 540N	0.5 - 1.0	0.8%
330E, 500N	0.5 - 1.0	ND	390E, 560N	0.0 - 0.5	0.2%
330E, 520N	0.0 - 0.5	ND	390E, 560N	0.5 - 1.0	0.1%
330E, 520N	0.5 - 1.0	ND	390E, 580N	0.0 - 0.5	0.1%
330E, 540N	0.0 - 0.5	ND	390E, 580N	0.5 - 1.0	0.6%
330E, 560N	0.0 - 0.5	ND	410E, 480N	0.0 - 0.5	0.8%
330E, 560N	0.5 - 1.0	ND	410E, 480N	0.5 - 1.0	0.1%
330E, 580N	0.0 - 0.5	0.1%	410E, 500N	0.0 - 0.5	0.1%
330E, 580N	0.5 - 1.0	ND	410E, 500N	0.5 - 1.0	0.2%
350E, 480N	0.0 - 0.5	ND	410E, 520N	0.0 - 0.5	0.1%
350E, 480N	0.5 - 1.0	ND	410E, 520N	0.5 - 1.0	0.1%
350E, 500N	0.0 - 0.5	ND	410E, 540N	0.0 - 0.5	5.0%
350E, 500N	0.5 - 1.0	0.1%	410E, 540N	0.5 - 1.0	ND
350E, 520N	0.0 - 0.5	ND	410E, 560N	0.0 - 0.5	2.0%
350E, 520N	0.5 - 1.0	ND	410E, 560N	0.5 - 1.0	0.2%
350E, 540N	0.0 - 0.5	ND	410E, 580N	0.0 - 0.5	0.1%
350E, 540N	0.5 - 1.0	ND	410E, 580N	0.5 - 1.0	2.0%
350E, 560N	0.0 - 0.5	ND	430E, 480N	0.0 - 0.5	1.0%
350E, 560N	0.5 - 1.0	ND	430E, 480N	0.5 - 1.0	0.1%
350E, 580N	0.0 - 0.5	ND	430E, 500N	0.0 - 0.5	0.1%
350E, 580N	0.5 - 1.0	ND	430E, 500N	0.5 - 1.0	ND
370E, 480N	0.0 - 0.5	0.3%	430E, 520N	0.0 - 0.5	0.1%
370E, 480N	0.5 - 1.0	0.1%	430E, 520N	0.5 - 1.0	0.1%
370E, 500N	0.0 - 0.5	ND	430E, 540N	0.0 - 0.5	0.1%
370E, 500N	0.5 - 1.0	ND	430E, 540N	0.5 - 1.0	0.2%
370E, 520N	0.0 - 0.5	ND	430E, 560N	0.0 - 0.5	0.4%
370E, 520N	0.5 - 1.0	0.2%	430E, 560N	0.5 - 1.0	0.1%

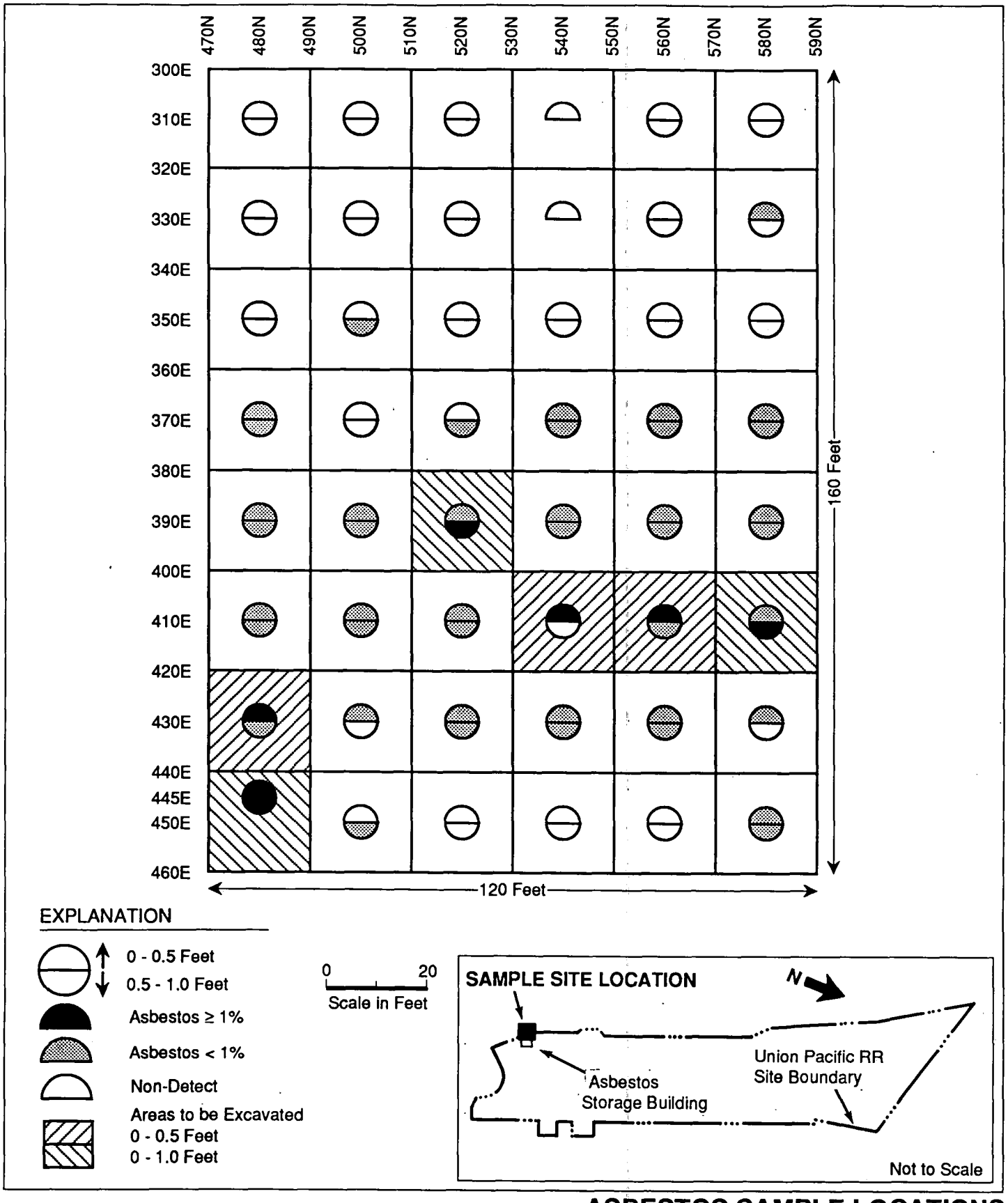
TABLE 1 (Continued)

ANALYTICAL RESULTS
(% ASBESTOS)

COORDINATE	DEPTH (ft bgs)	RESULTS	COORDINATE	DEPTH (ft bgs)	RESULTS
430E, 580N	0.0 - 0.5	0.2%	450E, 520N	0.5 - 1.0	ND
430E, 580N	0.5 - 1.0	ND	450E, 540N	0.0 - 0.5	ND
445E, 480N	0.0 - 0.5	1.0%	450E, 540N	0.5 - 1.0	ND
445E, 480N	0.5 - 1.0	1.0%	450E, 560N	0.0 - 0.5	ND
450E, 500N	0.0 - 0.5	ND	450E, 560N	0.5 - 1.0	ND
450E, 500N	0.5 - 1.0	0.1%	450E, 580N	0.0 - 0.5	0.1%
450E, 520N	0.0 - 0.5	ND	450E, 580N	0.5 - 1.0	0.1%

ND = Non Detectable

FIGURES



ASBESTOS SAMPLE LOCATIONS AND AREAS TO BE EXCAVATED

Asbestos Removal IRM
Union Pacific Railroad
Sacramento, California
SEPTEMBER 1990

DAMES & MOORE

00173-062-044 / Rev. 4

FIGURE 1

Appendix A

APPENDIX A

ANALTYICAL LABORATORY REPORTS

MCCLARA LABORATORY
3560 Business Drive, Suite 116
Sacramento, CA 95820
ph (916) 451-7244

CERTIFIED HAZARDOUS WASTE TESTING LABORATORY, Calif. Depart. of Health Services

Analytical Report to:

24-Sep-90

Dames & Moore
9300 Tech Center Drive, Suite 100
Sacramento, CA 95826
ATTN: Tim Parker

re: 44 bulk samples to be analyzed for asbestos content. Project: U.P. Sac, #00173-062-044. Samples received at McClara Lab on 01-Sep-90.

The following determination was based on observation by polarized light microscopy of refractive indices, birefringence, extinction angle, sign of elongation, color and pleochroism, and morphology. Dispersion staining was also used in the final determination. Detection limit for identification is 0.1%.

ANALYSIS:

McClara Lab # B-5595 #370E 500N 0.0 - 0.5	No Asbestos Detected 2% Cellulose 98% Quartz & other non-fibrous minerals
McClara Lab # B-5596 #370E 500N 0.5 - 1.0	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5597 #370E 520N 0.0 - 0.5	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5598 #370E 520N 0.5 - 1.0	Sample not homogenous: Soil: 0.2% Chrysotile Asbestos (clumps*) 2% Cellulose 97% Quartz & other non-fibrous minerals *Clumps: pea sized 100% Chrysotile Asbestos
McClara Lab # B-5599 #370E 540N 0.0 - 0.5	Sample not homogenous: Soil: 0.1% Chrysotile Asbestos (clumps*) 3% Cellulose 97% Quartz & other non-fibrous minerals *Clumps: pea sized 100% Chrysotile Asbestos

ANALYSIS continued:

McClara Lab # B-5600
#370E 540N 0.5 - 1.0

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
99.9% Quartz & other non-fibrous minerals
*Clumps:
100% Chrysotile Asbestos

McClara Lab # B-5601
#370E 560N 0.0 - 0.5

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
99.9% Quartz & other non-fibrous minerals
*Clumps:
100% Chrysotile Asbestos

McClara Lab # B-5602
#370E 560N 0.5 - 1.0

Sample not homogenous:
0.2% Asbestos (clumps*)
99.8% Quartz & other non-fibrous minerals
*Clumps:
100% Amosite Asbestos
*Clumps:
100% Chrysotile Asbestos

McClara Lab # B-5603
#370E 580N 0.0 - 0.5

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
2% Cellulose
97.9% Quartz & other non-fibrous minerals
*Clumps:
100% Chrysotile Asbestos

McClara Lab # B-5604
#370E 580N 0.5 - 1.0

0.1% Chrysotile Asbestos
5.0% Cellulose
95.9% Quartz & other non-fibrous minerals

ANALYSIS continued:

McClara Lab # B-5605 #350E 500N 0.0 - 0.5	No Asbestos Detected 3% Cellulose 97% Quartz & other non-fibrous minerals
McClara Lab # B-5606 #350E 500N 0.5 - 1.0	Soil not homogenous: 0.1% Chrysotile Asbestos 3.0% Cellulose 97.9% Quartz & other non-fibrous minerals Clumps: 100% Chrysotile Asbestos
McClara Lab # B-5607 #350E 520N 0.0 - 0.5	No Asbestos Detected 3% Cellulose 97% Quartz & other non-fibrous minerals
McClara Lab # B-5608 #350E 520N 0.5 - 1.0	No Asbestos Detected 2% Cellulose 98% Quartz & other non-fibrous minerals
McClara Lab # B-5609 #350E 540N 0.0 - 0.5	No Asbestos Detected 2% Cellulose 98% Quartz & other non-fibrous minerals
McClara Lab # B-5610 #350E 540N 0.5 - 1.0	No Asbestos Detected 2% Cellulose 98% Quartz & other non-fibrous minerals
McClara Lab # B-5611 #350E 560N 0.0 - 0.5	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5612 #350E 560N 0.5 - 1.0	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals

---

ANALYSIS continued:

McClara Lab # B-5613
#350E 580N 0.0 - 0.5

No Asbestos Detected
1% Cellulose
99% Quartz & other non-fibrous minerals

McClara Lab # B-5614
#350E 580N 0.5 - 1.0

No Asbestos Detected
3% Cellulose
97% Quartz & other non-fibrous minerals

McClara Lab # B-5615
#390E 480N 0.0 - 0.5

Soil not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
2.0% Cellulose
98.9% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

McClara Lab # B-5616
#390E 480N 0.5 - 1.0

Sample not homogenous:
Soil:
0.6% Amosite Asbestos (clumps*)
2.0% Cellulose
98.4% Quartz & other non-fibrous minerals
*Clumps: marble sized
100% Amosite Asbestos

McClara Lab # B-5617
#390E 500N 0.0 - 0.5

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
2.0% Cellulose
98.9% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

McClara Lab # B-5618
#390E 500N 0.5 - 1.0

Sample not homogenous:
Soil:
0.6% Amosite Asbestos (clumps*)
2.0% Cellulose
98.4% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

ANALYSIS continued:

McClara Lab # B-5619
#390E 520N 0.0 - 0.5

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
2.0% Cellulose
98.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5620
#390E 520N 0.5 - 1.0

Sample not homogenous:
Soil:
1% Chrysotile Asbestos (fabric*)
3% Cellulose
96% Quartz & other non-fibrous minerals
*fabric: 1 inch x .5 inch
100% Chrysotile Asbestos

McClara Lab # B-5621
#390E 540N 0.0 - 0.5

Sample not homogenous:
Soil:
0.2% Chrysotile Asbestos (clumps*)
3.0% Cellulose
97.8% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5622
#390E 540N 0.5 - 1.0

Sample not homogenous:
Soil:
0.8% Amosite Asbestos (clumps*)
2.0% Cellulose
97.2% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Amosite Asbestos

McClara Lab # B-5623
#390E 560N 0.0 - 0.5

Sample not homogenous:
Soil:
0.2% Chrysotile Asbestos (clumps*)
2.0% Cellulose
97.8% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

ANALYSIS continued:

McClara Lab # B-5624
#390E 560N 0.5 - 1.0

0.1% Chrysotile Asbestos
99.9% Quartz & other non-fibrous minerals

McClara Lab # B-5625
#390E 580N 0.0 - 0.5

Sample not homogenous:
Soil:
0.1% Amosite Asbestos (clumps*)
99.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Amosite Asbestos

McClara Lab # B-5626
#390E 580N 0.5 - 1.0

Sample not homogenous:
Soil:
0.6% Chrysotile Asbestos (clumps*)
99.4% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

McClara Lab # B-5627
#410E 480N 0.0 - 0.5

Sample not homogenous:
Soil:
0.8% Chrysotile Asbestos (clumps*)
4.0% Cellulose
96.2% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

McClara Lab # B-5628
#410E 480N 0.5 - 1.0

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
3.0% Cellulose
97.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

ANALYSIS continued:

McClara Lab # B-5629
#410E 500N 0.0 - 0.5

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
4.0% Cellulose
96.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5630
#410E 500N 0.5 - 1.0

Sample not homogenous:
Soil:
0.2% Chrysotile Asbestos (clumps*)
3.0% Cellulose
97.8% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5631
#410E 520N 0.0 - 0.5

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
1.0% Cellulose
99.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5632
#410E 520N 0.5 - 1.0

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
3.0% Cellulose
97.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5633
#410E 540N 0.0 - 0.5

Sample not homogenous:
Soil:
5% Chrysotile Asbestos (clumps*)
3% Cellulose
92% Quartz & other non-fibrous minerals
*Clumps: golf ball sized
100% Chrysotile Asbestos

ANALYSIS continued:

McClara Lab # B-5634
#410E 540N 0.5 - 1.0

No Asbestos Detected
2% Cellulose
97% Quartz & other non-fibrous minerals

McClara Lab # B-5635
#410E 560N 0.0 - 0.5

Sample not homogenous
Soil:
2% Chrysotile Asbestos (clumps*)
98% Quartz & other non-fibrous minerals
*Clumps: marble sized
100% Chrysotile Asbestos

McClara Lab # B-5636
#410E 560N 0.5 - 1.0

Sample not homogenous:
Soil:
0.2% Chrysotile Asbestos (clumps*)
3.0% Cellulose
97.8% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5637
#410E 580N 0.0 - 0.5

Sample not homogenous:
Soil:
0.1% Chrysotile Asbestos (clumps*)
4.0% Cellulose
96.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5638
#410E 580N 0.5 - 1.0

Sample not homogenous:
Soil:
2% Chrysotile Asbestos (clumps*0
3% Cellulose
95% Quartz & other non-fibrous minerals
*Clumps: marble sized
100% Chrysotile Asbestos

Analyzed by:

Michael J. McClara

MCCLARA LABORATORY
3560 Business Drive, Suite 116
Sacramento, CA 95820
ph (916) 451-7244

CERTIFIED HAZARDOUS WASTE TESTING LABORATORY, Calif. Depart. of Health Services

Analytical Report to:

24-Sep-90

Dames & Moore
9300 Tech Center Drive, Suite 100
Sacramento, CA 95826
ATTN: Tim Parker

re: 50 bulk samples to be analyzed for asbestos content. Project: U.P. Sac, #00173-062-044. Samples received at McClara Lab on 04-Sep-90.

The following determination was based on observation by polarized light microscopy of refractive indices, birefringence, extinction angle, sign of elongation, color and pleochroism, and morphology. Dispersion staining was also used in the final determination. Detection limit for identification is 0.1%.

ANALYSIS:

McClara Lab # B-5643 #430E 480N 0.0 - 0.5	1% Chrysotile Asbestos 2% Cellulose 97% Quartz & other non-fibrous minerals
McClara Lab # B-5644 #430E 480N 0.5 - 1.0	0.1% Chrysotile Asbestos 2.0% Cellulose 97.9% Quartz & other non-fibrous minerals
McClara Lab # B-5645 #430E 500N 0.0 - 0.5	0.1% Chrysotile Asbestos 99.9% Quartz & other non-fibrous minerals
McClara Lab # B-5646 #430E 500N 0.5 - 1.0	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5647 #430E 520N 0.0 - 0.5	0.1% Chrysotile Asbestos 1.0% Cellulose 99.9% Quartz & other non-fibrous minerals

ANALYSIS continued:

McClara Lab # B-5648
#430E 520N 0.5 - 1.0

0.1% Chrysotile Asbestos
2.0% Cellulose
98.9% Quartz & other non-fibrous minerals

McClara Lab # B-5649
#430E 540N 0.0 - 0.5

0.1% Chrysotile Asbestos
1.0% Cellulose
99.9% Quartz & other non-fibrous minerals

McClara Lab # B-5650
#430E 540N 0.5 - 1.0

Sample not homogenous
Soil:
0.2% Chrysotile Asbestos (clumps*)
2.0% Cellulose
98.8% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

McClara Lab # B-5651
#430E 560N 0.0 - 0.5

Sample not homogenous
Soil:
0.2% Chrysotile Asbestos (clumps*1)
0.2% Amosite Asbestos (clumps*2)
4.0% Cellulose
*1 Clumps: pea sized
100% Chrysotile Asbestos
*2 Clumps: pea sized
100% Amosite Asbestos

McClara Lab # B-5652
#430E 560N 0.5 - 1.0

Sample not homogenous
Soil:
0.1% Chrysotile Asbestos (clumps*)
3.0% Cellulose
97.9% Quartz & other non-fibrous minerals
*Clumps: commma sized (,)
100% Chrysotile Asbestos

ANALYSIS continued:

McClara Lab # B-5653
#430E 580N 0.0 - 0.5

Sample not homogenous
Soil:
0.2% Chrysotile Asbestos (clumps*)
2.0% Cellulose
98.8% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5654
#430E 580N 0.5 - 1.0

Sample not homogenous
Soil:
No Asbestos Detected
1% Cellulose (clumps*)
99% Quartz & other non-fibrous minerals
*Clumps: rice sized
No Asbestos Detected
100% Cellulose

McClara Lab # B-5655
#445E 480N 0.0 - 0.5

1% Chrysotile Asbestos
2% Cellulose
97% Quartz & other non-fibrous minerals

McClara Lab # B-5656
#445E 480N 0.5 - 1.0

1% Chrysotile Asbestos
2% Cellulose
97% Quartz & other non-fibrous minerals

McClara Lab # B-5657
#450E 500N 0.0 - 0.5

Sample not homogenous
Soil:
No Asbestos Detected
1% Cellulose (clumps*)
99% Quartz & other non-fibrous minerals
*Clumps: rice sized
No Asbestos Detected
100% Cellulose

McClara Lab # B-5658
#450E 500N 0.5 - 1.0

Sample not homogenous
Soil:
0.1% Chrysotile Asbestos (clumps*)
4.0% Cellulose
96.9% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

ANALYSIS continued:

McClara Lab # B-5659
#450E 520N 0.0 - 0.5

Sample not homogenous
Soil:
No Asbestos Detected
3% Cellulose (clumps*)
97% Quartz & other non-fibrous minerals
*Clumps: rice sized
100% Cellulose

McClara Lab # B-5660
#450E 520N 0.5 - 1.0

No Asbestos Detected
3% Cellulose
97% Quartz & other non-fibrous minerals

McClara Lab # B-5661
#450E 540N 0.0 - 0.5

No Asbestos Detected
2% Cellulose
98% Quartz & other non-fibrous minerals

McClara Lab # B-5662
#450E 540N 0.5 - 1.0

No Asbestos Detected
3% Cellulose
97% Quartz & other non-fibrous minerals

McClara Lab # B-5663
#450E 560N 0.0 - 0.5

Sample not homogenous
Soil:
No Asbestos Detected
1% Cellulose (clumps*)
99% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
No Asbestos Detected
100% Cellulose

McClara Lab # B-5664
#450E 560N 0.5 - 1.0

No Asbestos Detected
4% Cellulose
96% Quartz & other non-fibrous minerals

McClara Lab # B-5665
#450E 580N 0.0 - 0.5

Sample not homogenous
Soil:
0.1% Chrysotile Asbestos (clumps*)
4.0% Cellulose
96.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

ANALYSIS continued:

McClara Lab # B-5666
#450E 580N 0.5 - 1.0

Sample not homogenous
Soil:
0.1% Chrysotile Asbestos (clumps*)
3.0% Cellulose
97.9% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

McClara Lab # B-5667
#370E 480N 0.0 - 0.5

Sample not homogenous
Soil:
0.3% Chrysotile Asbestos (clumps*)
1.0% Cellulose
99.7% Quartz & other non-fibrous minerals
*Clumps: pea sized
100% Chrysotile Asbestos

McClara Lab # B-5668
#370E 480N 0.5 - 1.0

Sample not homogenous
Soil:
0.1% Chrysotile Asbestos (clumps*)
1.0% Cellulose
99.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5669
#350E 480N 0.0 - 0.5

Sample not homogenous
Soil:
No Asbestos Detected
1% Cellulose (clumps*)
99% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
No Asbestos Detected
100% Cellulose

McClara Lab # B-5670
#350E 480N 0.5 - 1.0

No Asbestos Detected
1% Cellulose
99% Quartz & other non-fibrous minerals

ANALYSIS continued:

McClara Lab # B-5671 #330E 480N 0.0 - 0.5	Sample not homogenous Soil: No Asbestos Detected 3% Cellulose (clumps*) 97% Quartz & other non-fibrous minerals *Clumps: comma sized (,) No Asbestos Detected 100% Cellulose
McClara Lab # B-5672 #330E 480N 0.5 - 1.0	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5673 #330E 500N 0.0 - 0.5	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5674 #330E 500N 0.5 - 1.0	No Asbestos Detected 2% Cellulose 98% Quartz & other non-fibrous minerals
McClara Lab # B-5675 #330E 520N 0.0 - 0.5	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5676 #330E 520N 0.5 - 1.0	No Asbestos Detected 2% Cellulose 97% Quartz & other non-fibrous minerals
McClara Lab # B-5677 #330E 540N 0.0 - 0.5	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5678 #330E 560N 0.0 - 0.5	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals
McClara Lab # B-5679 #330E 560N 0.5 - 1.0	No Asbestos Detected 1% Cellulose 99% Quartz & other non-fibrous minerals

ANALYSIS continued:

McClara Lab # B-5680
#330E 580N 0.0 - 0.5

Sample not homogenous
Soil:
0.1% Chrysotile Asbestos (clumps*)
1.0% Cellulose
99.9% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Chrysotile Asbestos

McClara Lab # B-5681
#330E 580N 0.5 - 1.0

No Asbestos Detected
2% Cellulose
98% Quartz & other non-fibrous minerals

McClara Lab # B-5682
#310E 480N 0.0 - 0.5

Sample not homogenous
Soil:
No Asbestos Detected
3% Cellulose (clumps*)
97% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
No Asbestos Detected
100% Cellulose

McClara Lab # B-5683
#310E 480N 0.5 - 1.0

Sample not homogenous
Soil:
No Asbestos Detected
3% Cellulose (clumps*)
97% Quartz & other non-fibrous minerals
*Clumps: comma sized
No Asbestos Detected
100% Cellulose

McClara Lab # B-5684
#310E 500N 0.0 - 0.5

Sample not homogenous
Soil:
No Asbestos Detected
3% Cellulose (clumps*)
97% Quartz & other non-fibrous minerals
*Clumps: comma sized
100% Cellulose

McClara Lab # B-5685
#310E 500N 0.5 - 1.0

No Asbestos Detected
2% Cellulose
97% Quartz & other non-fibrous minerals

ANALYSIS continued:

McClara Lab # B-5686
#310E 520N 0.0 - 0.5

No Asbestos Detected
2% Cellulose
98% Quartz & other non-fibrous minerals

McClara Lab # B-5687
#310E 520N 0.5 - 1.0

No Asbestos Detected
2% Cellulose
98% Quartz & other non-fibrous minerals

McClara Lab # B-5688
#310E 540N 0.0 - 0.5

Sample not homogenous
Soil:
No Asbestos Detected
3% Cellulose
97% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
100% Cellulose

McClara Lab # B-5689
#310E 560N 0.0 - 0.5

Sample not homogenous
Soil:
No Asbestos Detected
3% Cellulose (clumps*)
97% Quartz & other non-fibrous minerals
*Clumps: comma sized (,)
No Asbestos Detected
100% Cellulose

McClara Lab # B-5690
#310E 560N 0.5 - 1.0

No Asbestos Detected
1% Cellulose
99% Quartz & other non-fibrous minerals

McClara Lab # B-5691
#310E 580N 0.0 - 0.5

No Asbestos Detected
1% Cellulose
99% Quartz & other non-fibrous minerals

McClara Lab # B-5692
#310E 580N 0.5 - 1.0

No Asbestos Detected
1% Cellulose
99% Quartz & other non-fibrous minerals

Analyzed by: Michael J. McClara

Appendix B

APPENDIX B

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN
REMOVAL OF ASBESTOS-CONTAINING SOIL
UNION PACIFIC RAILROAD
SACRAMENTO SHOPSYARD
SACRAMENTO, CALIFORNIA

UPSACSHP.HP8

Job No.: 00173-054-044
Prepared by: Dan Erwin
Date: May 1990

HEALTH AND SAFETY PLAN
REMOVAL OF ASBESTOS-CONTAINING SOIL
UNION PACIFIC RAILROAD
SACRAMENTO SHOPSYARD
SACRAMENTO, CALIFORNIA

APPROVALS

Project Manager	Jim Smith	9/26/90 Date
Site Safety Officer	Dan Erwin	Date
Division Health and Safety Manager	John G. Danby, CIH	5/11/90 Date

HEALTH AND SAFETY PLAN
REMOVAL OF ASBESTOS-CONTAINING SOIL
UNION PACIFIC RAILROAD
SACRAMENTO SHOPSYARD
SACRAMENTO, CALIFORNIA

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

ATTACHMENTS

HEALTH AND SAFETY PLAN
REMOVAL OF ASBESTOS-CONTAINING SOIL
UNION PACIFIC RAILROAD
SACRAMENTO SHOPSYARD
SACRAMENTO, CALIFORNIA

1.0 SUMMARY

The site is the former location of buildings and equipment associated with Union Pacific Railroad's Sacramento Shops Yard; it is located approximately two miles south of the downtown Sacramento area.

Results of Phase I and Phase II investigations have indicated the presence of elevated levels of the metals arsenic, copper, and lead in soils, petroleum hydrocarbons in soil, and one to eight percent asbestos in area A-5 soils, the Asbestos Storage Area.

In this project, soil approximately one to three feet in depth will be excavated from area A-5 and transported to a landfill as hazardous waste. The excavation will be performed by a subcontractor. Dames & Moore will perform oversight of the operation and perform area air monitoring.

Skin contact with potentially contaminated soil will be minimized by wearing personal protective clothing (as described in Section 8.0). Inhalation of potentially contaminated dusts and petroleum hydrocarbon vapors will be minimized by the use of respiratory protection during excavation and subsequent confirmatory soil sampling. Ingestion of contaminated materials will be minimized by good personal hygiene during decontamination (i.e., thoroughly washing face and hands with soap and water before eating or drinking).

Additional exposure monitoring and personal protective equipment criteria are found in Sections 7.0 and 8.0, respectively.

2.0 PURPOSE

The purpose of this plan, which was developed specifically for operations at the Union Pacific Railroad, Sacramento Shops Yard, Sacramento, California (the site), is to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while operations are being conducted at the site. This plan complies with, but does not replace, Federal Health and Safety Regulations as set forth in 29 CFR 1910 and 1926, California Health and Safety Regulations as set forth in Title 8, California Code of Regulations, and guidance established by the California Department of Health Services. This plan is to be used by Dames & Moore personnel as a supplement to such rules, regulations, and guidance.

3.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite Dames & Moore employees engaged in hazardous material management activities including but not limited to initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization.

Changing and/or unanticipated site conditions may require modification of this site safety plan in order to maintain a safe and healthful work environment. Any proposed changes to this plan should be reviewed with the Dames & Moore Division Health and Safety Manager, or his designee, prior to their implementation. If this is not feasible, the site/project manager may modify the plan and record all changes in the field log book; under no circumstances will plan modifications to this plan conflict with Federal, state, or local health and safety regulations.

Dames & Moore is providing a copy of this Health and Safety Plan to each site contractor in order to fulfill its obligation under 29 CFR 1910.120(b) (15) to inform contractors of site hazards. Each contractor shall provide a Health & Safety plan for its employees covering any exposure to hazardous materials and shall complete all work in accordance with that plan. The contractor shall hold Dames & Moore harmless from, and indemnify it against, all liability in the case of any injury. Dames & Moore reserves the right to review and approve the contractor's plan at any time.

Dames & Moore reserves the right to suspend the contractor's site work and ask the contractor's personnel to evacuate the hazard area in the event of grossly inadequate health and safety precautions on the part of the contractor or the belief that the contractor's personnel are or may be exposed to an immediate health hazard.

The contractor shall provide its own safety equipment in accordance with its health & safety plan requirements. The contractor will comply with all regulations, including OSHA 29 CFR 1910.134 (Respiratory Protection), 29 CFR 1926.58 (Construction Safety Orders) 29 CFR 1910.120 (Hazardous Waste Operations), and CCR Title 8, Section 5208 (Asbestos).

4.0 FACILITY BACKGROUND/WORK PLAN

4.1 SITE LOCATION

The UPRR Sacramento site area is located approximately two miles south of the downtown Sacramento area. The site encompasses approximately 60 acres. In the immediate project area, the Sacramento City College complex is situated approximately one-half mile directly west and includes Hughes Stadium which is located approximately 600 yards west of the site. Lying next to the college on the west is William Land Park encompassing approximately 100 acres. On the east side of the site approximately one-quarter of a mile away is Curtis Park which is substantially smaller in size. The remaining areas which surround the site are residential. The tracks and sidings in the western portion of the site remain operational.

4.2 SITE HISTORY

The facility was operated as a railroad maintenance and switching yard. As a part of the operation, solvents, cleaners and degreasers were used to clean and strip the rail cars before refurbishing. Waste chemicals from this operation were discharged to sumps adjacent to the former maintenance building. In June 1988, Dames & Moore completed Phase 1 of a Remedial Investigation (RI) at the site. The RI identified heavy metals, asbestos and petroleum hydrocarbon contamination in the soil site at the site, and low-level chlorinated hydrocarbon contamination in groundwater underlying the site.

The asbestos is located in shallow soil in the southwest corner of the site. This area has been designated A-5, the Asbestos Storage Area. An asbestos storage building was formerly located in this area. Soil concentrations ranging from trace (less than 1 percent) to eight percent chrysotile asbestos were indicated in soil samples collected from a depth of 0 to 6 inches during the Phase I investigation. No asbestos was indicated in soil samples collected at a depth of 1.5 feet. A recently completed Phase II investigation included sampling additional soil in Area A-5. Trace asbestos was indicated at depths up to 1.5 feet.

Elevated concentrations of arsenic, copper, and lead were in indicated in near-surface soil, particularly in the vicinity of the Main Shop Area.

Petroleum hydrocarbons are present in soil at isolated locations near areas previously used for storage or use of fuels.

4.3 PURPOSE AND SCOPE OF WORK

The purpose of the abatement is to remove asbestos-containing soil from the Asbestos Storage Area A-5.

An asbestos abatement subcontractor will perform the actual removal. One contractor estimates the loose volume of soil to be excavated at approximately 130 cubic yards. This contractor would use a Case 580 enclosed backhoe to load the soil into 55-gallon, plastic lined fiber drums using a portable funnel hopper. Moisture control would be used during the excavation and drum loading tasks to reduce levels of airborne fibers. A second contractor proposes to remove an estimated 6,250 square feet of asbestos contaminated soil using a Guzzler vacuum truck. The material would be double bagged, placed into fiber drums, and disposed of as asbestos containing material. An isolation area would be constructed for the bag out area.

5.0 RESPONSIBILITIES

Dames & Moore will have site safety and health oversight and coordination responsibilities; however, each Contractor and Subcontractor will be held accountable for the safe and healthful performance of work by each of their employees, subcontractor, or support personnel who may enter the site.

The Contractor and all Subcontractors involved in handling contaminated soils are required to ensure that all employees, visitors, subcontractors, and their suppliers/vendors, while on the work site and in the conduct of Dames & Moore contracts comply with the minimum standards set forth by OSHA and by the contractor's or subcontractor's site health and safety plan. Any specific operation, machine, or process not covered in these orders will be governed by other applicable local, state and Federal regulations, The Contractor and Subcontractors are required to know and comply with the safety regulations which apply to their operations.

The provisions of this health and safety plan along with the applicable regulations issued by governmental entities will be strictly adhered to by Dames & Moore.

5.1 PROJECT MANAGER (Dames & Moore)

The Project Manager (PM) shall direct onsite investigations and operational efforts. The PM may delegate all or part of these duties to the Site Manager. At the site the PM, assisted by the Site Safety Officer (SSO), has primary responsibility for:

1. Assuring that appropriate personal protective equipment is available and properly utilized by all onsite personnel;

2. Assuring that personnel are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and are familiar with planned procedures for dealing with emergencies;

3. Assuring all field personnel have a minimum of 40 hours training and have been fit tested for the appropriate respirators;

4. Assuring that personnel are aware of the potential hazards associated with site operations;

5. Monitoring the safety performance of all personnel to ensure that the required work practices are employed;

6. Correcting any work practices or conditions that may result in injury or exposure to hazardous substances;

7. Preparing any accident/incident reports;

8. Assuring the completion of Plan Acceptance forms by Dames & Moore personnel (See Attachments); and

9. Halting site operations, if necessary, to correct unsafe work practices.

5.2 SITE SAFETY OFFICER (Dames & Moore)

The Site Safety Officer's (SSO) duties may be carried out by the PM or other site manager. The SSO shall:

1. Implement project Health and Safety Plans, and report any deviations from the anticipated conditions described in the plan to the PM, and, if necessary, the DHSM.

2. Ensure that all monitoring equipment is calibrated on a daily basis and that the results are properly recorded and filed. (See Attachments for Daily Calibration Check Sheet).

3. Ensure monitoring equipment is operating correctly and provide for maintenance if it is not.

4. Assume any other duties as directed by the PM or DHSM.

5. Be responsible for identifying all site personnel with special medical problems (e.g., allergies, perforated eardrum, etc.).

6. Be responsible for conducting daily safety meetings and completing the Tailgate Safety Meeting Report (see Attachments).

7. Be responsible for reviewing daily use of personal protective equipment.

8. Be responsible to see that decontamination procedures listed in Section 10.0 are followed.

9. Be responsible for monitoring and recording results of exposure evaluations.

5.3 WESTERN DIVISION HEALTH AND SAFETY MANAGER (Dames & Moore)

The Western Division Health and Safety Manger (DHSM) shall:

1. Periodically audit the operation to ensure compliance with this plan.

2. Provide health and safety support as requested by the SSO and PM.

5.4 PROJECT PERSONNEL (Dames & Moore)

Project personnel involved in onsite investigations and operations are responsible for:

1. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees; and

2. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the SSO or PM.

3. Implementing the procedures set forth in the Health and Safety Plan, and reporting any deviations from the procedures described in the Plan to the SSO or PM for action.

4. Notifying the PM and SSO of any special medical problems (i.e., allergies) and insuring that all onsite personnel are aware of any such problems.

5.5 SUBCONTRACTOR'S SAFETY REPRESENTATIVE

Each Subcontractor is required to designate a Safety Representative (SSR). The SSR is responsible for the safe and healthful performance of work by his work force and subcontractors. During the Subcontractor's activities onsite, the SSR will perform continuing work area inspections, and conduct safety meetings and safety orientations for all new employees. The SSR will attend periodic safety meetings with the SSO. The SSR will also investigate accidents and overexposures involving subcontractor personnel.

5.6 DAMES & MOORE PROJECT PERSONNEL

Dames & Moore personnel responsible for work on this site and for conducting work on this site include:

Project Manager	Jim Smith	(916) 364-8698
Site Safety Officer	Dan Erwin	(916) 364-8698
Division Health and Safety Manager	John G. Danby, CIH	(916) 364-8698

6.0 JOB HAZARD ANALYSIS

Soil contaminants include less than one percent to eight percent chrysotile asbestos, elevated levels of arsenic, copper, and lead, and diesel-type petroleum hydrocarbons.

Physical hazards include those from excavation equipment operation, heat stress, and underground and overhead utilities, if present.

6.1 EXCAVATION WORK PRACTICES

As it is not anticipated that the depth of excavation will exceed two feet, it will not be necessary to apply for an excavation permit and shore or slope the excavation.

6.2 HEAT STRESS RECOGNITION AND CONTROL

Wearing Personal Protective Equipment (PPE) can place a hazardous waste worker at considerable risk of developing heat stress. This can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, work load, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at hazardous waste sites, regular monitoring and other preventive precautions are vital.

Heat stress monitoring should commence when personnel are wearing PPE, including Tyvek-type coveralls, and the ambient temperature exceeds 70°F; if impermeable garments are not worn, monitoring should commence at 85°F. Heat stress monitoring and control guidance can be found in the Attachments.

6.3 CHEMICAL HAZARDS

From an occupational health standpoint, given that any potential exposure to site personnel will be only for a very short period of time (intermittent for

several days), the low levels of contaminants detected by previous site investigations are not a major concern. However, the site is not fully characterized, so the potential for exposure to elevated levels of these contaminants may exist. Overviews of the hazards associated with exposure to the chemicals found onsite to date are presented below in terms of:

PEL - Permissible Exposure Limit (Cal-OSHA Regulation)
(* denotes Fed-OSHA PEL; given if lower than Cal-OSHA PEL)
If applicable:
EL - Excursion Limit (Cal-OSHA Regulation)
C - Ceiling (Cal-OSHA Regulation)
TLV - Threshold Limit Value (ACGIH, Guidance)
TLV-STEL - Short Term Exposure Limit (ACGIH, Guidance)

Arsenic and Inorganic Arsenic Compounds

PEL = 0.01 mg/m^3 TLV = 0.2 mg/m^3

Trivalent arsenic compounds are corrosive to the skin. Brief contact has no effect, but prolonged contact with the skin or moist mucous membranes (such as lips or inner eye lids) may result in severe irritation.

Acute (short-term) inhalation may result in coughing, chest pain, and extreme general weakness. If some of the inhaled arsenic is swallowed, inflammation of the GI tract, loss of appetite, and violent vomiting may follow.

Industrial workers who are chronically exposed (long-term) may exhibit a hoarse voice, perforated nasal septum, conjunctivitis, and skin lesions. In prolonged over-exposures peripheral numbness and skin or lung cancer may occur. Target organs include the skin, lungs, liver, kidneys, and lymphatic system.

NIOSH recommends that inorganic arsenicals be treated as a "potential human carcinogen."

Copper

PEL = 0.1 mg/m^3 (fume) TLV = 0.2 mg/m^3 (fume)
1.0 mg/m^3 (dust) 1.0 mg/m^3 (dust)

Chronic human intoxication rarely occurs from copper exposure. Ingestion exposure of large doses of copper is limited by its emetic effect. Inhalation of copper fume from welding processes has produced upper respiratory tract irritation and metal fume fever in exposed workers. Copper is also an essential element in human nutrition; normal intake is approximately 2 mg/day. Adverse effects have been demonstrated only at high exposure levels, and low levels of exposure are unlikely to be of concern.

Lead

PEL = 0.05 mg/m^3 TLV = 0.15 mg/m^3

Acute lead poisoning usually manifests as gastroenteritis. Lead accumulates in the body; chronic lead poisoning is manifested by anemia, constipation, and abdominal pain. Accumulation in the peripheral nerves leads to wrist and ankle drop.

Lead enters the body primarily by inhalation. In the respiratory tract, most lead compounds are absorbed rapidly and stored in nerve tissue so that poisoning can develop from long-term exposure to low doses. Poisoning can also develop slowly from ingestion via lead contaminated food, drink or tobacco products. Prevention of lead poisoning is almost entirely a matter of good personal hygiene and housekeeping.

Diesel Fuel (Fuel Oil)

Diesel fuel is mildly toxic by ingestion. When inhaled, many of the constituents function as central nervous system depressants, with

characteristic symptoms (headaches, nausea, dizziness, incoordination, and vomiting). Diesel fuel has been shown to be a strong skin irritant.

Few chronic inhalation or ingestion studies of the toxic effects of diesel vapors/fuels are available. Skin painting studies of experimental animals suggest the potential for weak tumor-producing activity.

Because diesel fuel is a complex mixture of varying proportions of hydrocarbons, a mean odor threshold has not been determined.

Asbestos

PEL = 0.2 f/cc EL = 1.0 f/cc in 30 minutes

Asbestos is the generic name applied to a group of six fibrous silicate minerals which occur naturally in the earth's crust. Individual asbestos fibers are long, thin, and smaller than can be seen by the naked eye. Exposure to asbestos is primarily by inhalation and to lesser degree ingestion. Workers occupationally exposed to asbestos (such as in asbestos mines and shipyards) may exhibit one of three medical conditions:

- Asbestosis, a disease which is characterized by progressive scarring of the lungs caused by the accumulation of asbestos fibers, interferes with oxygen uptake through the lungs and can lead to respiratory and heart failure. Often asbestosis is a progressive disease even in the absence of continued exposure;

- Lung cancer, which can occur many years after exposure has ceased, is responsible for over half of the excess deaths resulting from occupational exposure. When combined with cigarette smoking, can multiply the risk of developing lung cancer is multiplied as much as 90 times over the risk to a non-smoker with no history of exposure to asbestos;

- Mesothelioma, a malignant cancer of the membranes which line the lung and intestinal cavity, is extremely rare in persons with no history of asbestos exposure, but may account for 10 - 18 percent of excess deaths in workers occupationally exposed to asbestos. Generally a latency period of at least 25 to 30 years is required in order to observe mesotheliomas. This form of cancer is incurable. Mesothelioma has also been associated with short-term, incidental exposure.

Inhalation exposure is measured by sampling the air and counting the number of asbestos fibers (f) counted per cubic centimeter of air (cc), and is expressed as f/cc. Because asbestos does not have any warning properties to indicate exposure, special work practices including use of protective clothing, respirators, and air monitoring are required to prevent over exposure to airborne levels in excess of the PEL.

The following potential exposures may exist at the site:

- Skin contact with contaminated soil;
- Inhalation of petroleum hydrocarbon vapors;
- Inhalation of dusts contaminated with asbestos or metals; and
- Ingestion of contaminated soil dusts, especially if poor personal hygiene is practiced.

Skin contact with potentially contaminated soil will be minimized by wearing personal protective clothing (as described in Section 8.0). Inhalation of diesel-type petroleum hydrocarbon vapors during soil excavation and subsequent sampling will be minimized by air monitoring, and the use of respiratory protection if diesel odors are noted. Inhalation of dusts contaminated with metals and asbestos represents the most significant route of exposure during excavation of the contaminated soil. In addition to controlling visible dust emissions by continuous wetting with water, respirators equipped with HEPA cartridges (or organic vapor-HEPA if petroleum hydrocarbon odors are noted) will be worn at all times during operations in Area A-5, including confirmatory soil

sampling following excavation. Ingestion of contaminated materials will be minimized by good personal hygiene during decontamination (i.e., thoroughly washing face and hands with soap and water before eating or drinking).

6.4 NOISE HAZARDS

The primary noise hazard at this site is from the excavation equipment. Previous surveys indicate that such equipment may produce continuous noise at or above the PEL. All personnel within 10 feet of an operating unit shall wear hearing protective devices (either muffs or plugs) at the direction of the SSO.

6.5 UNDERGROUND UTILITIES

As excavation is not anticipated to be below 2 feet, locating underground utilities will not be necessary prior to excavation.

6.6 WORK AREA PROTECTION

As excavation operations will take place inside a fenced-in area, work area protection procedures will not be required for this project.

6.7 HAZARD COMMUNICATION

TSP, a hazardous material, will be used during this project for the decontamination of equipment. In accordance with the Dames & Moore Hazard Communication Program, a MSDS for TSP is included in the attachments. The SSO will make a copy of this MSDS available to any subcontractors on this project.

7.0 EXPOSURE MONITORING PLAN

Heat stress, noise, asbestos, and chemical exposures may be encountered at this site. Heat stress monitoring and prevention is addressed in Section 6. Noise levels will not be monitored; personnel will wear hearing protection as described in Section 6.4.

7.1 CHEMICAL EXPOSURE MONITORING

Asbestos exposure will be monitored using two methods. Personal air monitoring of the worker in closest proximity to excavation activities will be performed throughout the operation using a low flow SKC pump and 25 mm sample cassette. In addition, area monitoring will be conducted using 5 additional low-flow SKC pumps (2 upwind and 3 downwind) to assess the levels of asbestos in dust emissions in the vicinity of the work area.

All personnel will wear a half-face respirator equipped with HEPA cartridges at all times in the vicinity of Area A-5, during excavation operations, and during subsequent confirmatory soil sampling. An organic vapor monitor will not be required to monitor for petroleum hydrocarbon vapors associated with diesel fuel, as this parameter has been sufficiently characterized in area A-5 during the Phase I and Phase II investigations. If a petroleum hydrocarbon is noted, combination organic vapor-HEPA cartridges (such as MSA's GMA-H) will be used.

It may be necessary to periodically replace the HEPA cartridges as they become clogged with dust and breathing resistance becomes excessive.

7.2 DATA LOGGING

All exposure monitoring data, including background readings will be logged in the field log book. The results of daily instrument calibration can either be logged on the form provided in the Attachments or in the field log book. All monitoring instruments will be calibrated, in accordance with the manufacturer's instructions or the guidance found in the Attachments, prior to the start of each

shift. Calibration should also be performed when inconsistent or erratic readings are obtained. If an instrument cannot be calibrated to specification, or becomes otherwise inoperable, all site work will cease until the instrument is appropriately repaired or replaced.

7.3 DUST CONTROL

A water mist will be applied to minimize visible dust emissions during excavation and transfer to containers for shipment. Personnel will wear respirators (half-face) with HEPA cartridges (or combination organic vapor-HEPA cartridges if a petroleum odor is noted) at all times in the vicinity of Area A-5 during excavation operations, and during subsequent confirmatory soil sampling.

8.0 PERSONAL PROTECTIVE EQUIPMENT

Minimum Protective Equipment for Site Personnel:

- Hardhat
- Safety glasses
- Steel-toed boots

Work/Exclusion Zone Requirements

- Hardhat
- Eye protection (face shield or safety glasses)
- Chemical-resistant steel-toed boots
- Ear protection in vicinity of drilling
- Work gloves
- Coveralls
- Tyvek coveralls
- Nitrile gloves (drillers can wear under work gloves)
- Surgical latex or vinyl gloves (inner)
- Half-face respirator with HEPA cartridges

If petroleum hydrocarbon odors noted:

- Half-face respirator with combination organic vapor-HEPA cartridges

9.0 SITE CONTROL

9.1 GENERAL

Barricades and barricade tape should be used to delineate an exclusion zone around Area A-5. A short piece of barricade tape can be affixed to a pole to serve as a wind-direction tell-tale. A five foot opening in the barricades at the support zone (upwind of the operation area) will serve as the personnel and equipment entry and exit point. The personnel decontamination station will be established at this point. All entry to and exit from the drilling work area will be made at this opening in order to control potential sources of contamination (i.e., leave contaminated soil and debris in the exclusion area).

At the end of the shift, all boring/sampling holes must be covered or otherwise secured. All decontamination fluids are to be drummed, and the drums shall be properly marked and labeled in accordance with applicable DOT regulations (at 49 CFR 172).

The PM or SSO will determine an upwind evacuation area prior to each shift, and all personnel will be notified of its location. A compressed gas horn will be used to signal an evacuation in the event of an emergency. Three blasts of the horn will be the signal to immediately stop work and proceed to the evacuation area.

The SSO will ensure that all site visitors sign the visitors' log and that all Dames & Moore personnel who enter the work zone do so only after presenting evidence of both their participation in a medical surveillance program and completion of health and safety training programs that fulfill the requirements of this plan.

The SSO will provide site hazard and emergency action information to all site visitors before they enter the site; this can be done by providing a copy of this SSP to the visitor.

9.2 WORK ZONES

o Exclusion zone - a circle around Area A-5 will be defined before excavation starts. The encircled area will constitute the "Exclusion Zone". This zone is where potentially hazardous contaminants and physical hazards to the workers will be contained. Full personal protection will be required in this area. Plastic sheeting (visqueen) and/or tarps will be used to control waste spilled to the ground during excavation operations. The size of the Exclusion Zone may be altered to accommodate site conditions and to ensure contaminant containment.

o Contamination Reduction Zone (CRZ) - a corridor leading from the Exclusion Zone will be defined, and will lead from the operations area to a break area. All decontamination activities will occur in this area. A waste container will be placed at the end of the corridor so contaminated disposal equipment can be placed inside and covered. Surface/soil contamination in this area should be controlled using plastic sheeting. No Dames & Moore personnel will be permitted into the Contamination Reduction Zone or Exclusion Zone unless they are in full compliance with this Plan.

o Support Zone - a Support Zone, the outermost part of the site, must be defined for each field activity. Support equipment is located in this uncontaminated or clean area. Normal work clothes are appropriate within this zone. The location of this zone depends on factors such as accessibility, wind direction (upwind of excavation), and resources (i.e., roads, shelter, utilities).

10.0 DECONTAMINATION PROCEDURES

The following steps will be followed whenever personnel leave the exclusion zone/work area:

1. Remove all equipment, sample containers, and notes to the CRZ. Obtain decontamination solutions and decon the shovels, auger flights, etc. by brushing them under a water rinse. A high-pressure steam cleaner may also be used for decon. All waste and spent decon solutions will be properly contained.

2. Scrub boots and gloves with a stiff bristle brush and water. Washtubs and chairs will be provided.

3. Remove outer gloves (and boot covers, if used).

4. Remove Tyvek coverall; discard in provided container.

5. Remove hardhat and eye protection.

6. Remove respirator.

7. Remove inner gloves.

8. Wash hands and face.

The decontamination area will be covered with plastic sheeting which will be replaced when torn or heavily soiled, and at the end of each shift. A schematic of a "Minimum Layout of Personnel Decontamination Station" is provided in the Attachments for reference.

Each worker will be responsible for cleaning, sanitizing and storing their own respirator in accordance with manufacturer's guidance (i.e., washing in warm water and detergent or sanitizing solution, air drying, and storing in a plastic storage bag). Cartridges will be changed as soon as breakthrough occurs

(detection of organic vapor odor while wearing the respirator) and at the end of each shift. Respirators will be kept in storage bags or boxes when not in use.

11.0 SAFE WORK PRACTICES

11.1 GENERAL

1. Eating, drinking, chewing gum, or tobacco and smoking are prohibited in the contaminated or potentially contaminated area of where the possibility for the transfer of contamination exists.

2. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surfaces (i.e., ground, etc.)

3. All field crew members should make use of their senses (all senses) to alert them to potentially dangerous situations in which they should not become involved (i.e., presence of strong, irritating or nauseating odors).

4. Prevent, to the extent possible, spillages. In the event that a spillage occurs, contain liquid if possible.

5. Prevent splashing of the contaminated materials.

6. Field crew members shall be familiar with the physical characteristics of investigations, including:

   - Wind direction in relation to ground-zero area;
   - Accessibility to associates, equipment, vehicles;
   - Communications;
   - Hot zone (areas of known or suspected contamination);

- Site access; and

- Nearest water sources.

7. The number of personnel and equipment in the contaminated area should be minimized but only to the extent consistent with workforce requirements of safe site operations.

8. All wastes generated during Dames & Moore and/or subcontractor activities at the site will be disposed of as directed by the PM.

9. All personal protective equipment will be used as specified and required.

10. The buddy system will be used at all times when performing sampling for hazardous material when the first action level criteria has been exceeded.

11.2 EXCAVATION AND SAMPLING PRACTICES

For all excavation and sampling activities, the following standard safety procedures shall be employed:

1. All sampling equipment should be cleaned before proceeding to the site.

2. At the sampling site, sampling equipment should be cleaned after each use.

3. Work in "cleaner" areas should be conducted first where practical.

4. The minimum number of personnel necessary to achieve the objectives shall be within 25 feet of the excavation or sampling activity.

5. If emergency and backup subcontracted personnel are at the site, they should remain 25 feet from the excavation or sampling activity, where practical.

6. All unauthorized personnel will remain outside exclusion zones at all times.

11.3 HEALTH AND SAFETY EQUIPMENT LIST

Hardhats
Safety glasses
Ear plugs or muffs
Tyvek coveralls
Chemical resistant steel-toed boots
Work gloves
Nitrile gloves
Surgical vinyl inner gloves
Plastic sheeting (visqueen)
55 gal 17-H drums (for contaminated solids) and 17-E drums (for liquids)
Drum liners
Barricade tape and barricades
Wash tubs and scrub brushes
Decon solution (i.e., TSP)
Folding chairs
5 or 10 gal portable eyewash
Respirator sanitizing equipment
First Aid kit
Drinking water
Type ABC fire extinguishers
Half-face respirators (NIOSH/MSHA approved)
HEPA and organic vapor-HEPA cartridges
Garden sprayer
Compressed gas horn

12.0 EMERGENCY RESPONSE PLAN

In the event of a fire or medical emergency, the following numbers can be called for assistance:

Fire:	911
Ambulance:	911
Hospital:	UCD Medical Center
Emergency Room:	(916) 453-3797
Police:	911

12.2 COMMUNICATION

The SSO will locate the nearest telephone prior to the start of work, mark it on the site map, and inform all site personnel of its location. A list of emergency numbers will be prominently posted at this telephone.

12.3 SAFETY EYEWASH

A 10-gallon, 15-minute safety eyewash will be available at the site for the sole purpose of flushing foreign particles or contaminants out of eyes. The SSO will demonstrate the proper operation of the unit prior to the start of work. If the 10-gallon unit is cumbersome, two 5-gallon units may be used.

12.4 INCIDENT REPORT

In the event of an injury or illness, work is to be stopped until the SSO and the DHSM (John Danby-Sacramento) have determined the cause of the incident and have taken the appropriate action. Any injury or illness, regardless of severity, is to be reported on the accident report form (see Attachments).

12.5 OPERATION SHUTDOWN

Under certain extreme hazardous situations the onsite geologist, SSO or SSR may request drilling or sampling procedures be temporarily suspended while the underlying hazard is corrected or controlled. During operation shutdown, all personnel will be required to stand upwind to prevent exposure to fugitive emissions. The SSO will have ultimate authority for operations shutdown and restart.

13.0 TRAINING AND MEDICAL SURVEILLANCE

All Dames & Moore site personnel will have met the requirements of 29 CFR 1910.120 (e), including 40 hour training or its recognized equivalent. All Dames & Moore site personnel are participating in medical surveillance programs that meet the requirements of 29 CFR 1910.120. The PM will maintain current copies of training certificates and statements of medical program participation for all site personnel.

In addition, all Dames & Moore site personnel will sign a copy of the

14.0 RECORDKEEPING

The PM and SSO are responsible for site recordkeeping. Prior to the start of work, they will review this plan; if there are no changes to be made, they will sign the approval form and forward a copy to the DHSM.

All D&M personnel will review the HSP and sign the plan acceptance form in Attachment A; copies of these forms will be forwarded to the DHSM.

The SSO will conduct a Tailgate Safety Meeting in accordance with Section 14 prior to each shift and have all attendees sign the form in Attachment E; copies will be forwarded to the DHSM.

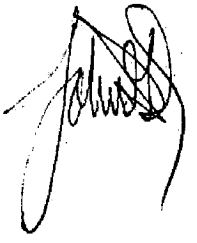
Any accident or exposure incident will be investigated and the form in Attachment C will be completed and forwarded to the office administrative manager and the DHSM.

All personal monitoring results will be reported to the individuals monitored, and a copy of the report will be placed in their health and safety file.

ATTACHMENT A

SAFETY PLAN COMPLIANCE AGREEMENT

ATTACHMENT A

Position	Name	Signature
Project Manager Dames & Moore	Jim Smith	
Site Safety Officer Dames & Moore	Dan Erwin	
Division Health and Safety Manager Dames & Moore	John G. Danby, CIH	

SAFETY PLAN COMPLIANCE AGREEMENT

FOR

UNION PACIFIC RAILROAD SHOP YARDS

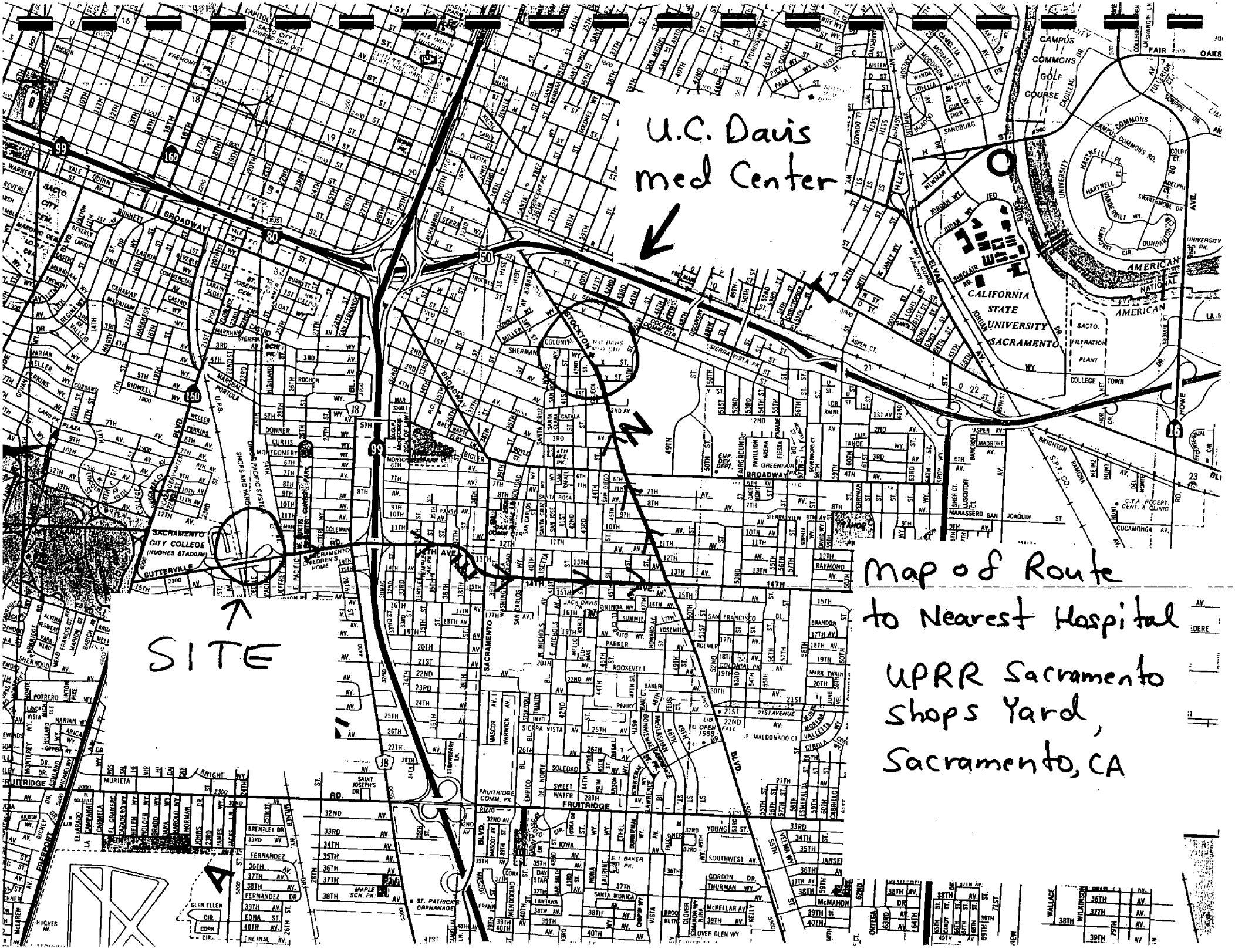
SACRAMENTO, CALIFORNIA

I, _____, have received a copy of the Health and Safety Plan for the Project. I have reviewed the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the health and safety requirements specified in the plan.

SIGNED: _____ _____

(Signature) (Date)

Firm: Dames & Moore


U.C. Davis
med Center
SITE
Map of Route
to Nearest Hospital
UPRR Sacramento
Shops Yard,
Sacramento, CA

ATTACHMENT C

ACCIDENT REPORT FORM

DAMES & MOORE

Accident/Exposure Report

EMPLOYEE NAME_____ DATE OF BIRTH _____

HOME ADDRESS_____ PHONE NO._____

SEX: MALE____ FEMALE____ JOB TITLE_____ SOCIAL SECURITY NO._____

OFFICE NO._____ OFFICE LOCATION_____ DATE OF HIRE _____

HOURS USUALLY WORKED: HOURS PER DAY_____ HOURS PER WEEK_____ TOTAL HOURS WEEKLY_____

WHERE DID ACCIDENT OR EXPOSURE OCCUR? (INCLUDE ADDRESS)_____

_____

COUNTY_____ ON EMPLOYER'S PREMISES? YES_____ NO_____

WHAT WAS EMPLOYEE DOING WHEN INJURED? (BE SPECIFIC)_____

_____

HOW DID THE ACCIDENT OR EXPOSURE OCCUR? (DESCRIBE FULLY)_____

_____

_____

_____

WHAT STEPS COULD BE TAKEN TO PREVENT SUCH AN OCCURRENCE?_____

_____

_____

OBJECT OR SUBSTANCE THAT DIRECTLY INJURED EMPLOYEE_____

_____

DESCRIBE THE INJURY OR ILLNESS_____ PART OF BODY AFFECTED_____

NAME AND ADDRESS OF PHYSICIAN_____

IF HOSPITALIZED, NAME AND ADDRESS OF HOSPITAL_____

DATE OF INJURY/ILLNESS_____ TIME OF DAY_____ LOSS OF ONE OR MORE DAY OF WORK? YES/NO_____

IF YES-DATE LAST WORKED_____

HAS EMPLOYEE RETURNED TO WORK?_____ IF YES-DATE RETURNED_____ DID EMPLOYEE DIE?_____ IF YES-DATE_____

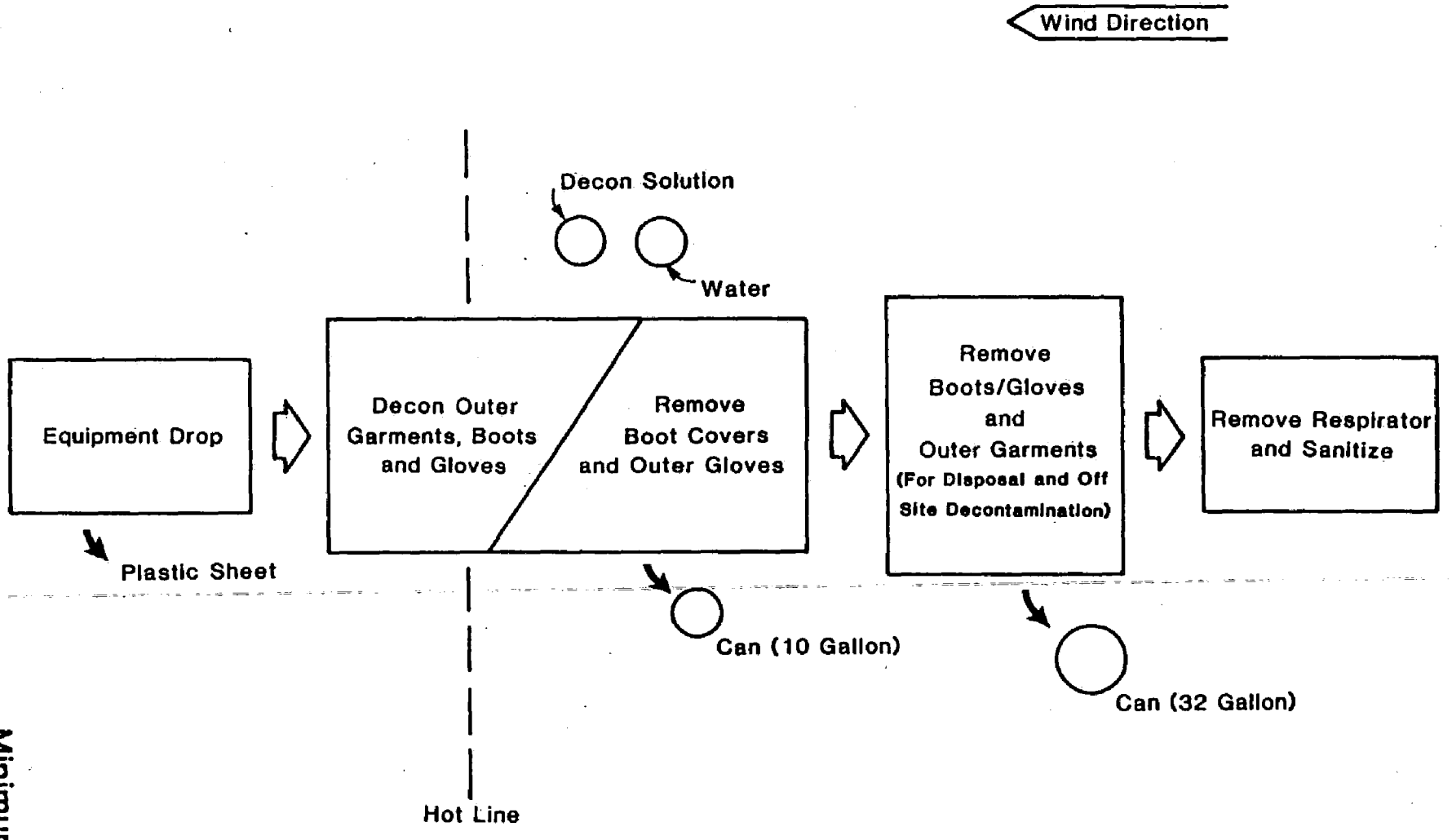
COMPLETED BY (PRINT)_____ SIGNATURE_____

TITLE_____ DATE_____

An accident/exposure report must be completed by the supervisor or site safety officer immediately upon learning of the incident. The completed report must be immediately transmitted to the office administrative manager.

ATTACHMENT D

PERSONNEL DECONTAMINATION STATION LAYOUT



Minimum Layout of Personnel Decontamination Station

Dames & Moore

ATTACHMENT E

TAILGATE SAFETY MEETING REPORT

TAILGATE SAFETY MEETING REPORT

Job Name_____ Number _____

Date_____ Start Time_____ Completed _____

Site Location_____

Type of Work (General)_____

****

SAFETY ISSUES

Tasks (this shift)_____

_____

Protective Clothing/Equipment_____

_____

Chemical Hazards_____

_____

Physical Hazards_____

_____

Control Methods_____

_____

_____

Special Equipment/Techniques_____

_____

Nearest Phone_____

Hospital Name/Address_____

Special Topics (incidents, actions taken, etc.)_____

_____

_____

****

ATTENDEES

Print Name	Sign Name
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting conducted by: _____

FORM1.021

1 COPY TO PROJECT FILE - 1 COPY TO RHSM (SAC)

ATTACHMENT F

HEAT STRESS GUIDANCE

SIGNS AND SYMPTOMS OF HEAT STRESS

Heat rash (prickly heat) may result from continuous exposure to heat or humid air.

Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

- pale, cool, moist skin
- heavy sweating
- dizziness
- nausea
- fainting

Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are:

- red, hot, usually dry skin
- lack of or reduced perspiration
- nausea
- dizziness and confusion
- strong, rapid pulse
- coma

FIRST AID FOR HEAT STRESS SYMPTOMS

- Heat rash - to prevent heat rash, you should shower after work, dry thoroughly, change your underwear, and stay in a cool place after work. See your physician if you get heat rash.

- Heat cramps - drink one or two glasses of slightly salted water, gently massage the cramping muscle, and rest in a cool place.

- Heat exhaustion - call a doctor, rest in a cool place, open clothing, drink slightly salted fluids. If the victim collapses, call an ambulance or paramedics immediately.

- Heat stroke - this is a medical emergency! Call paramedics or an ambulance immediately. Attempt to bring the victim's temperature down by increasing air movement, placing an ice bag on their head, or placing wetted sheets or towels on them.

HEAT STRESS MONITORING

For strenuous field activities that are part of ongoing site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to monitor the work cycle of each site worker. There are two phases to this monitoring: initial work/rest cycle determination, and physiological monitoring. The initial work/rest cycle is used to estimate how long the first work shifts of the day should be. Heart rate monitoring of each worker will establish the length of the successive work periods.

DETERMINATION OF THE INITIAL WORK/REST CYCLES

Measure the air temperature with standard thermometer. Estimate fraction of sunshine by judging what percent the sun is out: 100 percent sunshine - no cloud cover = 1.0; 50 percent sunshine = 50 percent cloud cover = 0.5; 0 percent sunshine = full cloud cover = 0.0.

Plug these variables into the following equation to determine the adjusted temperature:

T (adjusted) = T (actual) + (13 x fraction sunshine)

Use the chart below to determine the length of the first work shift. At the first break, initiate the heart rate monitoring as described in the next section.

Adjusted Temperature (°F)	Active Work Time (min/hr) Using Level B/C Protective Gear
75 or less	50
80	40
85	30
90	20
95	10
100	0

HEART RATE MONITORING

Heart rate should be measured by radial pulse for 30 seconds as early, as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beat/minute at the beginning of the next rest period, the following work period should be further shortened by 33 percent, while the length of the rest period stays the same.

HEAT STRESS PREVENTION

The best approach is preventative heat stress management. In general:

Have workers drink 16-ounces of water before beginning work, such as in the morning and after lunch. Provide disposable, 4-ounce cups, and water that is maintained at 50 to 60°F. Urge workers to drink one to two cups of water every 20 minutes, for a total of one to two gallons per day. Provide a cool, preferably air-conditioned area for rest breaks. Discourage the use of alcohol in non-working hours, and discourage the intake of coffee during working hours. Monitor for signs of heat stress.

Acclimate workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities.

ATTACHMENT G

MATERIAL SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 43

TRISODIUM PHOSPHATE DODECAHYDRATE

Date November 1978

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: TRISODIUM PHOSPHATE DODECAHYDRATE

DESCRIPTION: Crystallizes from water as $Na_3PO_4.12H_2O$ and can exist as several hydrate forms, depending on processing, and as the anhydrous salt.

OTHER DESIGNATIONS: TSP, Trisodium Orthophosphate, Sodium Phosphate, Tribasic, Teriary Sodium Phosphate, GE Material D4K1, ASTM D538, CAS# 007 601 549

MANUFACTURER: Available from several suppliers, including FMC Corporation, Monsanto Co., Stauffer Chemical Co., and Olin Corp.

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Trisodium Phosphate (as $Na_3PO_4.12H_2O$)	>97	No TLV established*
*Under OSHA inert dust limits it can be assumed that airborne particulate, not otherwise controlled, is limited to a maximum of 5 mg/kg of respirable dust; however, this level may not be adequate to prevent irritation with this material.		($Na_3PO_4.12H_2O$) Rat, Oral LD_{50} 7400 mg/kg

SECTION III. PHYSICAL DATA

Boiling point --------- -11 H_2O at 100 C (decomposes)

Melting point, deg C -- >73.3 (dec)

Solubility, g/100g H_2O:

at 0 C ---------- 1.5

at 15 C ---------- 28.3

at 70 C ---------- 157

Specific gravity (20/4 C) ------- 1.62

pH of 1% water solution at 25 C - ca 12

Molecular weight ---------- 380.1

Appearance & Odor: White or colorless crystalline solid (also as powder, flake, granules, etc.). No odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None	None	None		

Extinguishing Media: Use that which is appropriate to the surrounding fire; this material is non-combustible.

In a fire situation at high temperature phosphates can emit highly toxic phosphorus oxide fumes. Firefighters should use self-contained breathing apparatus.

SECTION V. REACTIVITY DATA

This material is a stable alkaline solid at room temperature. It does not undergo hazardous polymerization.

It is incompatible with acidic materials.

SECTION VI. HEALTH HAZARD INFORMATION

TLV None established (See Sect II)

This alkaline material will cause irritation to the respiratory tract if inhaled as a dust or as a solution mist. Prolonged or repeated skin contact will irritate the skin. Eye contact will irritate and can damage the eyes (alkaline attack). This material is low in toxicity by ingestion, but its alkaline nature will irritate, injure the digestive tract. (Trisodium phosphate is used as a food additive; but it must be reduced in alkalinity before being taken into the body.)

FIRST AID:

Eye contact: Promptly flush with plenty of water for 15 minutes. Get medical help.

Skin contact: Wash well with soap and water; rinse well with water. If irritation persists, get medical help.

Inhalation: Remove to fresh air. Get medical help if irritation persists.

Ingestion: Give 1-2 glasses of water or milk to drink to dilute; then give fruit juice or diluted vinegar to drink. Do not induce vomiting! Immediately contact a physician.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

For large spills, notify safety personnel. Clean-up personnel should use protection against contact or inhalation of dust or mist. Scoop up spill for recovery or disposal and place in a container with a lid. Flush residues to the sewer with plenty of water.

DISPOSAL: Scrap material can be used for neutralizing acidic wastes, or it can be buried in an approved manner in an approved landfill. Small amounts can be flushed to the sewer if regulations permit., Follow Federal, State and local regulations for disposal.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide general ventilation to the workplace; if dusting conditions occur, local exhaust ventilation will be needed and a NIOSH approved dust respirator may be required.

The use of rubber or plastic gloves and chemical safety glasses with side shields is recommended for handling this material. An apron may also be desirable to prevent contact with clothing, especially where solutions are involved.

Provide eyewash station near to the workplace where this material is used; a safety shower may also be needed where large amounts of solution are prepared or used.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store this material in tightly sealed containers in a clean, dry, ventilated area. Prevent physical damage to containers.

Avoid contact with the body and inhalation of dust.

Note that anhydrous trisodium phosphate and lower hydrates are more alkaline on a weight basis than $Na_3PO_4.12H_2O$.

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