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1. ESTIMATE THE TYPE AND MAGNITUDE OF EXPOSURES TO CONTAMINANTS
2. IDENTIFY CONTAMINANTS OF CONCERN
3. IDENTIFY SITES FOR REMEDIAL ACTION
4. RECOMMEND SITES FOR THE NO ACTION REMEDIAL ALTERNATIVE
5. PROVIDE A BASIS FOR DETAILED CHARACTERIZATION OF THE RISK ASSOCIATED WITH ALL SITES.

THIS DOCUMENT CONSISTS OF THE FOLLOWING: AN EXCUTIVE SUMMARY. VOL.I - LAND USE AND EXPOSED POPULATION EVALUATIONS. VOL.II & III - TOXICITY ASSESSMENT (INCLUDES ARMY AND SHELL TOXICITY PROFILES). VOL. IV - PPLV METHODOLOGY. VOL. V - PPLV CALCULATIONS. VOL. VI - STUDY AREA EXPOSURE ANALYSIS (A INTRODUCTION, B WESTERN STUDY AREA, C SOUTHERN STUDY AREA, D NORTHERN CENTRAL STUDY AREA, E CENTRAL STUDY AREA, F EASTERN STUDY AREA, G SOUTH PLANTS STUDY AREA, AND H NORTH PLANTS STUDY AREA. VOL. VII - SUMMARY EXPOSURE ASSESSMENT. VOL. VIII -

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FOR ROCKY MOUNTAIN ARSENAL
STUDY AREA EVALUATIONS
VOLUME VI-B
WESTERN STUDY AREA
EXPOSURE ASSESSMENT
VERSION 4.1
SEPTEMBER 1990
CONTRACT NO. DAAA15-88-D-0024
RIFS2

EBASCO SERVICES INCORPORATED
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HUMAN HEALTH EXPOSURE ASSESSMENT FOR ROCKY MOUNTAIN ARSENAL STUDY AREA EVALUATIONS

VOLUME VI-B
WESTERN STUDY AREA
EXPOSURE ASSESSMENT
VERSION 4.1
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Prepared by:

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Rocky Mountain Arse
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Commerce City, Colora

Prepared for:

U.S. ARMY PROGRAM MANAGER'S OFFICE
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LIST OF ACRONYMS

CAR	Contamination Assessment Report
COC	contaminant of concern
COS	contaminant of significance
CRL	certified reporting limit
EI	Exposure Index
ICP	Inductively Coupled Plasma
ISCLT	Industrial Source Complex Long Term Plume Dispersion
MKE	Morrison-Knudsen Engineers
PPDDE	2,2-bis(Para-chlorophenyl)-1,1-dichloroethene
PPDDT	2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane
PPLV	preliminary pollutant limit value
RI	remedial investigation
RMA	Rocky Mountain Arsenal
RMACCPMT	Rocky Mountain Arsenal Contamination Control Program Management Team
SAR	Study Area Report
SPPPLV	single pathway preliminary pollutant limit value
VEI	vapor exposure index
WSA	Western Study Area

EXECUTIVE SUMMARY

The Western Study Area (WSA) Exposure Assessment presents detailed exposure analyses for the 31 potentially contaminated areas defined by the Western Study Area Report (SAR). The evaluations were based on the soil and sediment contaminant concentrations presented in the site-specific Contamination Assessment Reports (CARs) and the overall SARs and groundwater contaminants from DP Associates Groundwater Database. The maximum concentrations for each contaminant detected were extracted from these data and reported. Draft preliminary pollutant limit values (PPLVs) were computed for each of these site-specific contaminants as described in Volume IV of the Exposure Assessment Report for the direct (soil ingestion, suspended particulate inhalation, and dermal contact) and indirect (open and enclosed space vapor inhalation) exposure pathways. Cumulative PPLVs were computed for the five exposed populations (regulated visitors, casual visitors, recreational visitors, commercial workers, and industrial workers). The site-by-site evaluations consisted of comparisons of the maximum site contaminant concentrations to their corresponding cumulative Draft PPLVs in order to determine exceedances and, hence, established a first screen for determining sites which may be considered as candidates for remedial action during the Feasibility Study. These are ranked into two categories: Priority 1 which consists of sites where available soil contaminant concentration data indicate that the maximum detected concentrations exceed the draft human health based criteria, and Priority 2 which consists of sites where available soil contaminant concentration data indicate that the maximum detected concentrations do not exceed the draft human health based criteria. Site designations will be reconsidered throughout the Endangerment Assessment process as health based criteria are refined and additional data become available.

No samples from the interior of sewer lines present in the WSA were included in the analysis since these evaluations are based on soil contaminants only. Sewers are being considered for remedial action under the ongoing Feasibility Study.

A groundwater plume has been identified in the WSA. Therefore, in addition to the direct soil exposure evaluations, the significance of the inhalation of volatile groundwater contaminants which diffuse through site soils was estimated using the open space and

enclosed space vapor inhalation models as described in detail in Volume IV (Sections 4.5 and 4.6, respectively) and the exposure analysis procedures presented in Volume VI-A. The exposure evaluations were performed for the most sensitive exposed population (i.e., the industrial worker).

Of the 31 sites evaluated in the WSA, 14 were designated Priority 1 Sites. These include:

- Section 3 - Isolated Spill Area (WSA-1b)
- Railyard - Zinc Detection Area (WSA-1d)
- Railyard - Nemagon Spill Area (WSA-1e)
- Railyard - Aldrin and Dieldrin Detection (WSA-1f)
- Railyard - Mercury Detection (WSA-1g)
- West Landfill - Burning Pit (WSA-2)
- East Landfill - Toluene, Trichloropropene, and Cadmium Detection (WSA-3a)
- East Landfill - Main Surface Disposal Area (WSA-3c)
- Open Storage and Salvage Yard Support Areas (WSA-4b)
- North Landfill - Trench (WSA-5a)
- North Landfill - Trenches (WSA-5d)
- Motor Pool Area - Main Ditch (WSA-6a)
- Motor Pool - Drainage Ditch (WSA-6d)
- Sanitary Sewers - Internal Sediment (WSA-7a)

Of the 31 sites evaluated in the WSA, 17 were designated Priority 2 sites. These include:

- Section 3 - Pyrene/Fluoranthene Detection Area (WSA-1a)
- Section 3 - Wood Preservative Derivative Area (WSA-1c)
- East Landfill - Disposal Pit (WSA-3b)
- East Landfill - Methylisobutyl Ketone Detection (WSA-3d)
- Open Storage Yard - Methyl Cyclohexane Detection (WSA-4a)
- North Landfill - Burn Pit (WSA-5b)
- North Landfill - Trench (WSA-5c)
- Motor Pool - Fuel Tank Storage Area (WSA-6b)
- Motor Pool Area - Roundhouse and Old Septic Tank System (WSA-6c)
- Motor Pool Area - Culvert Outfall (WSA-6e)

- Sanitary Sewers - Overflow Area (WSA-7b)
- Section 33 - Copper Detection (WSA-8a)
- Section 33 - Zinc Detection (WSA-8b)
- Section 4 - 1,1,2,2-Tetrachloroethane Detection (WSA-8c)
- Section 3 - Phosphoric Acid, Tributyl Ester Detection (WSA-8d)
- Section 3 - Phosphoric Acid, Tributyl Ester Detection (WSA-8e)
- Section 9 - Methyl Naphthalene Detection (WSA-8f)

The contaminants of concern (COCs) in soils (i.e., those displaying cumulative EIs greater than 0.1) for the WSA, based on the most sensitive exposed population PPLV (i.e., the industrial worker), are:

- Aldrin
- Benzene
- Carbon tetrachloride
- Dibromochloropropane
- Dicyclopentadiene
- Dieldrin
- Hexachlorocyclopentadiene
- Isodrin
- Methylene chloride
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- Trichloroethylene
- Arsenic
- Cadmium
- Chromium
- Copper
- Lead

The contaminant of significance (COS) in groundwater (i.e., those displaying vapor exposure indices (VEIs) greater than 1) for the WSA is:

- 1,1-Dichloroethylene

1.0 INTRODUCTION

The analyses and evaluations performed under the Rocky Mountain Arsenal (RMA) Exposure Assessment are documented in eight report volumes. These include Volume I, Surface Use and Exposed Population Evaluations; Volumes II and III, Toxicity Assessment; Volumes IV and V, Preliminary Pollutant Limit Value (PPLV) Methodology; Volume VI, Study Area Exposure Assessments; Volume VII, Summary Exposure Assessment; and Volume VIII, Response to Comments on the Draft Exposure Assessment.

Volume VI of the Exposure Assessment is a detailed presentation of the study area exposure analyses, consisting of site-by-site comparisons of measured maximum contaminant concentrations to their Draft PPLVs derived for an industrial worker (the most sensitive receptor). Volume VI consists of eight subvolumes, VI-A through VI-H. Subvolume B (this document) constitutes the Study Area Exposure Assessment for the Western Study Area (WSA). The remaining subvolumes are: VI-A, Introduction; VI-C, Southern Study Area; VI-D, North Central Study Area; VI-E, Central Study Area; VI-F, Eastern Study Area; VI-G, South Plants Study Area; and VI-H, North Plants Study Area. A description of the contents, approach, specific procedures, and format in preparing the Study Area Exposure Assessment documents is presented in Volume VI-A.

The exposure assessment for the WSA was performed on a site-by-site basis. The site designations are consistent with those used in the remedial investigation (RI) Study Area Report (SAR) for the WSA (EBASCO, 1989a). The analytical data used for each site were based on the original Rocky Mountain Arsenal Contamination Control Program Management Team (RMACCPMT)/Phase I and II RI site Contamination Assessment Reports (CARs). Additional information on the history of these sites can be found in Section 3.2 of the SAR (EBASCO, 1989a). The SARs present a regional overview of the extent of contamination and migration characteristics throughout the Arsenal. An analogous regional overview of the exposure assessment for the WSA is presented in the Study Area Exposure Summary, Section 3.0 of this report volume. This regional summary is integrated with the other study area exposure summaries in Volume VII to provide an Arsenal-wide perspective of the significance of the measured contamination.

The sites included in the Western Exposure Assessment are as follows:

- WSA-1a Section 3 - Pyrene/Fluoranthene Detection Area
- WSA-1b Section 3 - Isolated Spill Area
- WSA-1c Section 3 - Wood Preservative Derivative Area
- WSA-1d Railyard - Zinc Detection Area
- WSA-1e Railyard - Nemagon Spill Area
- WSA-1f Railyard - Aldrin and Dieldrin Detection
- WSA-1g Railyard Area - Mercury Detection
- WSA-2 West Landfill - Burning Pit
- WSA-3a East Landfill - Toluene, Trichloropropene and Cadmium Detection
- WSA-3b East Landfill - Disposal Pit
- WSA-3c East Landfill - Main Surface Disposal Area
- WSA-3d East Landfill - Methylisobutyl Ketone Detection
- WSA-4a Open Storage Yard - Methyl Cyclohexane Detection
- WSA-4b Open Storage and Salvage Yard Support Areas
- WSA-5a North Landfill - Trench
- WSA-5b North Landfill - Burn Pit
- WSA-5c North Landfill - Trench
- WSA-5d North Landfill - Trenches
- WSA-6a Motor Pool Area - Main Ditch
- WSA-6b Motor Pool - Fuel Tank Storage Area
- WSA-6c Motor Pool Area - Roundhouse and Old Septic Tank System
- WSA-6d Motor Pool - Drainage Ditch
- WSA-6e Motor Pool Area - Culvert Outfall
- WSA-7a Sanitary Sewers - Internal Sediment
- WSA-7b Sanitary Sewers - Overflow Area
- WSA-8a Section 33 - Copper Detection
- WSA-8b Section 33 - Zinc Detection
- WSA-8c Section 4 - 1,1,2,2-Tetrachloroethane Detection
- WSA-8d Section 3 - Phosphoric Acid, Tributyl Ester Detection

- WSA-8e Section 3 - Phosphoric Acid, Tributyl Ester Detection
- WSA-8f Section 9 - Methyl Naphthalene Detection

The locations of each of the sites listed above in the WSA were depicted in the Western SAR (EBASCO, 1989a). The site-by-site exposure assessments for each of the 31 areas investigated are presented in Sections 2.1 through 2.31. A study area exposure summary for the WSA is presented in Section 3.0.

The Soil Contaminant Concentration Tables in Sections 2.1 through 2.31, list the maximum concentrations that were calculated for each site over two depth intervals, designated as Horizon 1 and Horizon 2. Horizon 1 included depths from 0 to 10 feet (ft), and Horizon 2 accounted for all depths, including 0 to 10 ft. If the maximum concentration for all depths is in Horizon 1, then the listed concentration in Horizon 2 will equal Horizon 1. For a further discussion, see Volume VI-A, Section 2.2.4. The Inductively Coupled Plasma (ICP) metals (i.e., cadmium, chromium, copper, lead, and zinc), arsenic, and mercury identified as site contaminants in the tables include only those which were detected above indicator levels. The following are the indicator levels used:

Contaminant	Indicator Level
Arsenic	CRL[1]-10 ug/g[2]
Cadmium	1-2 ug/g
Chromium	25-40 ug/g
Copper	20-35 ug/g
Lead	25-40 ug/g
Mercury	CRL-0.10 ug/g
Zinc	60-80 ug/g

As described in Volume VI-A of this report, nontarget contaminants were subjected to two screening processes to determine whether or not they should be evaluated in detail in the site-by-site exposure assessments. The first screening was conducted as part of the RMA

1/ certified reporting limit
2/ micrograms per gram

Chemical Index (EBASCO, 1988c/RIC 88357R01), and was based on the toxicity, concentration, and frequency of occurrence of the nontarget compounds. Contaminants passing through this first screening were then subjected to a second screening that was conducted on a study area-by-study area basis within Appendix A of each Study Area Exposure Assessment (Volumes VI-B through VI-H). This second screening process considered frequency of occurrence, similarity of the nontarget concentration to that of target contaminants, and co-occurrence of nontarget compounds with target compounds in the soil and sediment samples. The reader is encouraged to consult the RMA Chemical Index and the Study Area Exposure Assessment Appendices for details of the screening processes, as it was judged too repetitive to include this information in each site where nontargets were detected.

Draft PPLVs for each of the site contaminants were computed for the five exposed populations of concern regulated visitors, casual visitors, recreational visitors, commercial workers, and industrial workers for the direct (i.e., soil ingestion, dermal contact, and suspended particulate inhalation) and indirect (i.e., open and enclosed space vapor inhalation) exposure pathways, according to the methodology detailed in Volume IV of the Exposure Assessment. Draft PPLVs for each site are presented in the Exposure Evaluation Tables. Figure WSA-1-0 explains various aspects of the data presented in the Exposure Evaluation Tables. For a further discussion of these tables, see Section 3.0 in Volume VI-A.

The cumulative Draft PPLVs in these tables for Inductively Coupled Plasma (ICP) metals (i.e., cadmium, chromium, copper, lead, and zinc), arsenic, and mercury do not include the single pathway preliminary pollutant limit values (SPPPLVs) computed for vapor inhalation exposure pathways since the potential for inhalation of vaporized ICP metals, arsenic, and mercury is assumed to be negligible (see Volume VI-A). SPPPLVs for the inhalation pathways are not included in the cumulative Draft PPLVs for chloroacetic acid, 1,2-dichloroethylene, dimethylmethyl phosphonate, Dithiane, fluoroacetic acid, isopropylmethyl phosphate, isopropylmethyl phosphonic acid, n-nitrosodimethylamine, 1,4-Oxathiane, Sarin, and thiodiglycol. These chemicals are highly soluble (log Kow less than one) and,

Figure WSA-1-8
Sample Exposure Summary 1

1	2	3	4	5	6	7	8	9	10
Contaminant	Direct PPLV	Indirect PPLV 1/ OSVI 3/	ESVI 4/	Cumulative PPLV	Direct EI 5/	Indirect EI	Cumulative EI	VEI 2/ OPN 6/	ENC 7/
ORGANICS (Only contaminants found in either the soil or the groundwater are listed.)									
Aldrin	1.16E-01	1.17E+04	4.20E+01	1.16E-01	6.87E+02*	1.91E+00*	6.89E+02*	2.23E-06	1.68E-03
Carbon Tetrachloride	1.52E+01	0.00E+00	0.00E+00	1.52E+01	0.00E+00	0.00E+00	0.00E+00	6.07E-04	4.58E-01
Chlordane	1.52E+00	1.26E+06	5.17E+00	1.17E+00	5.27E+02*	1.53E+02*	6.81E+02*	0.00E+00	0.00E+00
Chloroform	3.11E+02	0.00E+00	0.00E+00	3.11E+02	0.00E+00	0.00E+00	0.00E+00	1.36E-05	1.02E-02
PPDDE	5.72E+00	7.07E+05	1.95E+01	4.42E+00	1.43E-02	4.21E-03	1.85E-02	1.34E-07	1.02E-04
PPDDT	5.72E+00	1.49E+06	1.95E+01	4.42E+00	1.75E+00*	5.14E-01*	2.26E+00*	0.00E+00	0.00E+00
Dieldrin	1.22E-01	5.35E+03	1.92E+01	1.22E-01	2.45E+04*	1.57E+02*	2.47E+04*	0.00E+00	0.00E+00
Diisopropylmethyl Phosphonate	6.77E+04	0.00E+00	0.00E+00	6.77E+04	0.00E+00	0.00E+00	0.00E+00	3.13E-10	2.37E-07
Endrin	2.54E+02	4.33E+06	1.00E+06	2.50E+02	7.88E-02	1.29E-03 a	8.01E-02	0.00E+00	0.00E+00
Hexachlorocyclopentadiene	3.84E+02	5.96E+01	8.34E-01	8.20E-01	7.81E+00*	3.65E+03*	3.66E+03*	0.00E+00	0.00E+00
Isodrin	5.92E+01	8.47E+05	3.04E+03	5.81E+01	8.45E+00*	1.65E-01*	8.61E+00*	0.00E+00	0.00E+00
Supona	1.27E+02	0.00E+00	0.00E+00	1.27E+02	00.E+00	0.00E+00	0.00E+00	1.39E-12	1.05E-09
METALS									
Arsenic	1.61E+00	0.00E+00	0.00E+00	1.61E+00	1.30E+01*	0.00E+00	1.30E+01*	0.00E+00	0.00E+00
Copper	5.71E+02	0.00E+00	0.00E+00	5.71E+04	6.83E-04	0.00E+00	6.83E-04	0.00E+00	0.00E+00
Mercury	4.61E+02	0.00E+00	0.00E+00	4.61E+02	2.38E-03	0.00E+00	2.38E-03	0.00E+00	0.00E+00
Zinc	1.39E+05	0.00E+00	0.00E+00	1.39E+05	7.17E-04	0.00E+00	7.17E-04	0.00E+00	0.00E+00

a This contaminant saturates the soil gas and produces a vapor flux that is below one-tenth of the critical flux. The SPPPLV 8/ for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

A direct PPLV will be computed even if contaminant does not occur in the soil but only in the groundwater.

Indirect PPLVs are not computed for the nonvolatile contaminants (metals).

Contaminants with a Direct EI > 0.1 are denoted with an asterisk.

Contaminants with an Indirect EI > 0.1 are denoted with an asterisk.
A contaminant which saturates the soil gas will not show a VEI.

A contaminant which saturates the soil gas but does not have an Indirect EI exceedance will be denoted with the footnote marker "a." The indirect PPLVs (OSVI, ESVI) are set to 1.00E+06 (pure compound).

Contaminants which occur in the groundwater, but also occur in the soil may not have a computed VEI if the contamination saturates the soil gas.

VEIs are not computed for metals or organics if the contaminant does not occur in the groundwater.

An enclosed space VEI may not be computed if the reported depth to groundwater is less than 10 ft. In such cases, the enclosed space VEI will have "NA" for not applicable. No enclosed space VEI will be computed for lake sites. For lake sites, the enclosed space VEI will have "LS" for lake site.

1/ PPLV - preliminary pollutant limit value
2/ VEI - vapor exposure index
3/ OSVI - open space vapor inhalation PPLLV
4/ ESVI - enclosed space vapor inhalation PPLV
5/ EI - exposure index
6/ OPN - open
7/ ENC - enclosed
8/ SPPPLV - single pathway preliminary pollutant limit value

therefore, are assumed to have low potential for vaporization. Draft PPLVs were not computed for nontarget chemicals measured at this site since these contaminants were rejected in the nontarget screening (Appendix A).

The chemical-specific and site-specific parameters used to calculate the open and enclosed space vapor inhalation PPLVs are included in the RMA Source Data File, provided as part of the PPLV Computer Model for RMA (Volume V). Contaminant-specific parameters for the open space pathways are the depth to the top of the contamination zone (d), and the depth to the bottom of the contamination zone (h), diffusivity and soil concentration. These variables are calculated as described in Volume IV. The site-specific parameter, X/F_o, represents the wind dispersion factor at the receptor location receiving the maximum concentration. This parameter was generated by the Industrial Source Complex Long Term (ISCLT) model as described in Volume IV. The distance from the center of the site to the critical receptor location, D_{max}, used with the computation of X/F_o, was calculated as described in Volume IV.

Site-by-site comparisons of the maximum site contaminant concentrations to their corresponding cumulative Draft PPLVs were done in order to determine sites which may be considered for remedial action during the Feasibility Study. These are ranked into two categories: Priority 1 which consists of sites where available soil contaminant concentration data indicate that the maximum detected concentrations exceed the draft human health based criteria, and Priority 2 which consists of sites where available soil contaminant concentration data indicate that the maximum detected concentrations do not exceed the draft human health based criteria. Site designations will be reconsidered throughout the Endangerment Assessment process as health based criteria are refined and additional data become available.

2.0 SITE-BY SITE EXPOSURE ASSESSMENT

2.1 SITE WSA-1a: SECTION 3 - PYRENE/FLOURANTHENE DETECTION AREA (formerly Section 3 - Nonsource Area; EBASCO, 1988n/RIC 88076R01)

2.1.1 Site-Specific Considerations

Figure WSA-1a-1 and Table WSA-1a-1 depict the target contaminants for Site WSA-1a. Boring 2 was included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contaminant assessment revealed that Aldrin, 2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane (PPDDT), and old mustard containers may have been stored in Section 3 (EBASCO, 1988n/RIC 88076R01), but it is unlikely that Site WSA-1a was the storage area, as it is located along a rail line. None of these chemicals were detected in the soil during the Phase I and Phase II investigations. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-1a (EBASCO, 1988n/RIC 88076R01).

2.1.2 Spatial Distribution of Measured Contaminant Concentrations

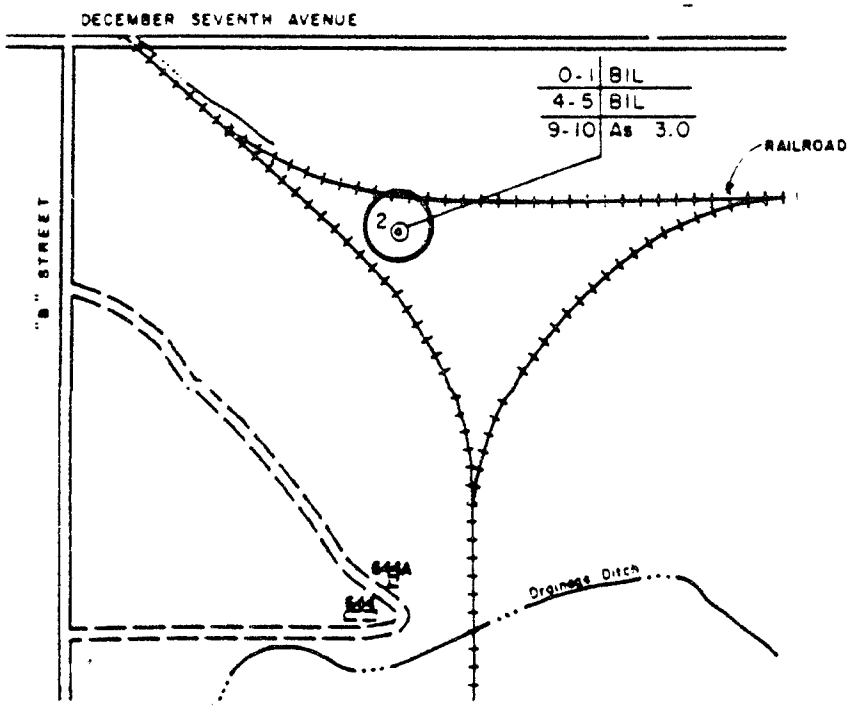
The locations and concentrations of the target contaminants that were detected in Site WSA-1a are depicted in Figure WSA-1a-1. The following contaminants were not included in the figure, since they were not considered target contaminants during the Phase I and Phase II investigations: Flouranthene or pyrene, occurring in Boring 2 (0-1 ft). Although not shown in the figure, flouranthene or pyrene was included in the Western SAR and in this exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-1a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and certified reporting limits (CRLs) for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown.
Table WSA-1a-1 shows that no target contaminants were found above the indicator level. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling

period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.1.3 Site Exposure Summary

Only nontarget soil contaminants are shown in Table WSA-1a-1. Since nontarget contaminants (excluding 1,1,2,2-tetrachloroethane) were not assessed using the PPLV methodology, no COCs were identified for this site. Site WSA-1a is therefore designated as a Priority 2 site.



Legend

2 ⊙ Phase I Boring

Site Boundary

Sample Interval (ft.) — 9-10 | As 3.0 — Analyte — Level (ug/g)

BIL - Below Indicator Level

As Arsenic

N

0 400
FEET

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-1a-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-1a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-1a

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Fluoranthene or Pyrene[1/]	0.3	0-1	2	0.3	0-1	2

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

2.2 SITE WSA-1b: SECTION 3 - ISOLATED SPILL AREA (formerly Section 3 - Nonsource Area; EBASCO, 1988n/RIC 88076R01)

2.2.1 Site-Specific Considerations

Figure WSA-1b-1 and Table WSA-1b-1 depict the target contaminants for Site WSA-1b. Borings 27 through 30 were included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contaminant assessment revealed that Aldrin, PPDDT, and old mustard containers may have been stored in Section 3 (EBASCO, 1988n/RIC 88076R01), but it is unlikely that Site WSA-1b was the storage area, as it is located along a rail line. None of these chemicals were detected in the soils during the Phase I and Phase II investigations. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-1b (EBASCO, 1988n/RIC 88076R01).

2.2.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-1b were depicted in Figure WSA-1b-1. Table WSA-1b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

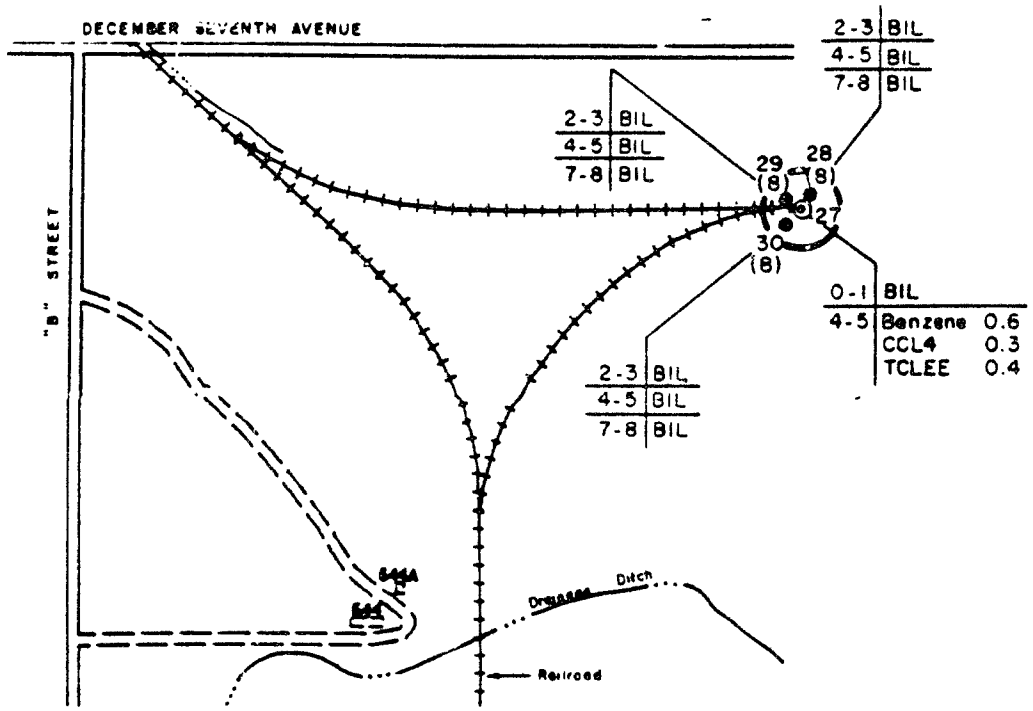
2.2.3 Site Exposure Summary

Tables WSA-1b-2 through WSA-1b-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Benzene	--	--	--	Indirect	Indirect
Carbon tetrachloride	--	--	--	Indirect	Indirect
Tetrachlorethylene	--	--	--	--	Indirect

Note: Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the indirect pathways are the primary contributors to the exceedance of the cumulative PPLVs for an industrial worker. Site WSA-1b is therefore designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Legend

27 ◎ Phase I Boring

28 (8) ● Phase II Boring with Total Depth Drilled (ft.)

○ Site Boundary

Sample Interval (ft.) — 4-5 | CCL4 0.3 — Analyte — Level (ug/g)

BIL Below indicator levels

CCL4 Carbon tetrachloride

TCLEE Tetrachloroethylene

N

0 400

FEET

Prepared for:

Program Manager's Office for

Rocky Mountain Arsenal Cleanup

Aberdeen Proving Ground, Maryland

FIGURE WSA-Ib-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-1b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-1b

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Benzene	0.6	4-5	27	0.6	4-5	27
Carbon tetrachloride	0.3	4-5	27	0.3	4-5	27
Tetrachloroethylene	0.4	4-5	27	0.4	4-5	27

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-1b-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	8.6E+02	1.8E+03	5.8E+02	7.0E-04	3.4E-04	1.0E-03	0.0E+00
CARBON TETRACHLORIDE	2.0E+02	4.1E+02	1.3E+02	1.5E-03	7.4E-04	2.3E-03	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	1.6E+04	5.0E+02	7.8E-04	2.5E-05	8.1E-04	0.0E+00

WSA-1b-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	8.6E+02	1.8E+03	5.8E+02	7.0E-04	3.4E-06	1.0E-03	0.0E+00
CARBON TETRACHLORIDE	2.0E+02	4.1E+02	1.3E+02	1.5E-03	7.4E-04	2.3E-03	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	1.6E+04	5.0E+02	7.8E-04	2.5E-05	8.1E-04	0.0E+00

WSA-1b-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	1.2E+02	2.8E+02	8.4E+01	5.0E-03	2.2E-03	7.2E-03	0.0E+00
CARBON TETRACHLORIDE	2.7E+01	6.3E+01	1.9E+01	1.1E-02	4.8E-03	1.6E-02	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	2.4E+03	6.9E+01	5.6E-03	1.6E-04	5.8E-03	0.0E+00

WSA-1b-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
BENZENE	1.1E+03	1.9E-01	1.9E-01	5.5E-04	3.2E+00*	3.2E+00*	0.0E+00
CARBON TETRACHLORIDE	2.5E+02	9.6E-02	9.6E-02	1.2E-03	3.1E+00*	3.1E+00*	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	8.4E+00	8.3E+00	6.2E-04	4.8E-02	4.8E-02	0.0E+00

*: EI is equal to or exceeds 1.0E-01

WSA-1b-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
BENZENE	6.7E+01	2.4E+02	1.1E-01	1.1E-01	8.9E-03	5.3E+00*	5.3E+00*	0.0E+00	0.0E+0
CARBON TETRACHLORIDE	1.5E+01	5.4E+01	2.6E-02	2.6E-02	2.0E-02	1.2E+01*	1.2E+01*	0.0E+00	0.0E+0
TETRACHLOROETHYLENE	4.1E+01	2.1E+03	1.0E+00	9.8E-01	9.7E-03	4.0E-01*	4.1E-01*	0.0E+00	0.0E+0

*: EI is equal to or exceeds 1.0E-01

2.3 SITE WSA-1c: SECTION 3 - WOOD PRESERVATIVE DERIVATIVE AREA (formerly Section 3 - Nonsource Area; EBASCO, 1988n/RIC 88076R01)

2.3.1 Site-Specific Considerations

Figure WSA-1c-1 and Table WSA-1c-1 depict the target contaminants for Site WSA-1c. Borings 3 and 13 were included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contaminant assessment revealed that Aldrin, PPDDT, and old mustard containers may have been stored in Section 3 (EBASCO, 1988n/RIC 88076R01); however, none of these chemicals were detected in the soil during the Phase I and Phase II investigations, and there is no evidence that these chemicals were stored in the rail yard. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-1c (EBASCO 1988n/RIC 88076R01).

2.3.2 Spatial Distribution of Measured Contaminant Concentrations

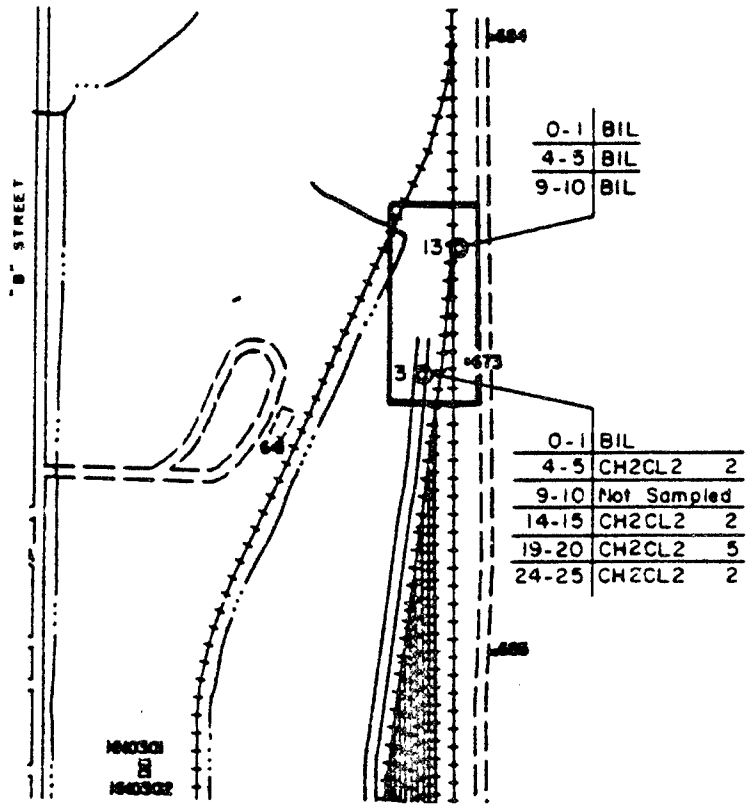
The locations and concentrations of the target contaminants that were detected in Site WSA-1c are depicted in Figure WSA-1c-1. The following contaminants were not included in the figure since they were not considered target contaminants during the Phase I and Phase II investigations: Flouranthene and pyrene, occurring in Boring 13 (0-1 ft). Although not shown in this figure, these nontarget compounds were included in the western SAR and in the exposure assessment because they passed through the screening process performed in the RMA Chemical Index (EBASCO,1988c/RIC 88357R01).

Table WSA-1c-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Table WSA-1c-1 shows that no target contaminants were found above the indicator level. Methylene chloride, shown on table WSA-1c-1, is excluded from consideration in the exposure analysis for this site because it was considered a laboratory contaminant in the samples analyzed. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from

the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.3.3 Site Exposure Summary

Only nontarget soil contaminants are shown in Table WSA-1c-1. Since nontarget contaminants (excluding 1,1,2,2-tetrachloroethane) were not assessed using the PPLV methodology, no COCs were identified for this site. Site WSA-1c is designated as a Priority 2 site.



Legend

3 ⊙ Phase I Boring

□ Site Boundary

Sample Interval (ft.) — 4-5 | CH2CL2 — Analyte — 2 — Level (ug/g)

BIL - Below Indicator Level

CH2CL2 - Methylene chloride

N

0 400
FEET

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-Ic-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels
Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE WSA-1c-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-1c

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Methylene chloride[1/]	2	4-5	3	5	19-20	3
Flouranthene[2/]	0.9	0-1	13	0.9	0-1	13
Pyrene[2/]	0.7	0-1	13	0.7	0-1	13

1/ Suspected laboratory contaminant.
2/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA	Western Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

2.4 SITE WSA-1d: RAILYARD - ZINC DETECTION AREA (formerly Site 3-4: Nemagon Spill Area; EBASCO, 1988a/RIC 88076R04; and EBASCO, 1988b/RIC 88076R04A)

2.4.1 Site-Specific Considerations

Figure WSA-1d-1 and Tables WSA-1d-1 and WSA-1d-2 depict the target contaminants for Site WSA-1d. Boring 7 was included in this exposure assessment, consistent with the Western SAR. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-1d (EBASCO, 1988a/RIC 88076R04).

2.4.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-1d were depicted in Figure WSA-1d-1. Table WSA-1d-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-1d-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.4.3 Site Exposure Summary

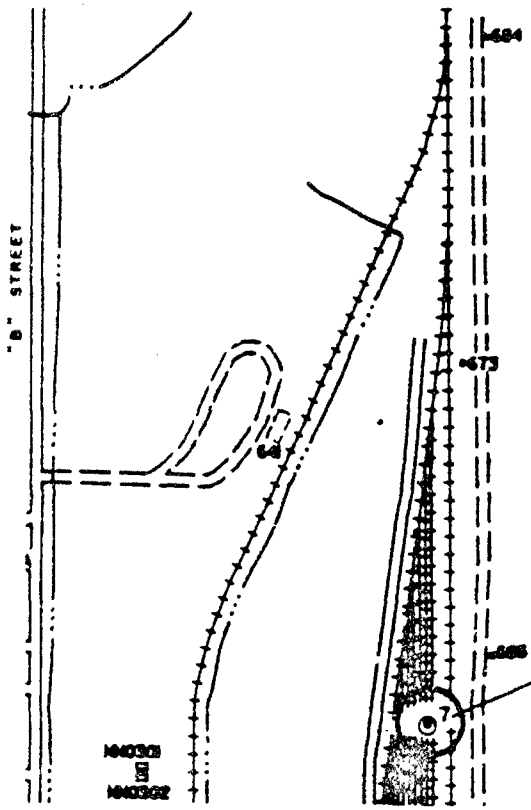
Tables WSA-1d-3 through WSA-1d-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-1d is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Methylene chloride	--	--	--	Indirect	Indirect

Note: Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the indirect pathways are the primary contributors to the exceedance of the cumulative PPLVs. Site WSA-1d is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



0-1	BIL	
4-5	BIL	
9-10	BIL	
14-15	BIL	
19-20	CH2CL2	1
29-30	Cd	1.3
39-40	CH2CL2	4
49-50	Zn	190
59-60	Cd	1
69-70	Cd	1.2
74-75	CH2CL2	1
	Cd	1.4

Legend

7 ⊙ Phase I Boring

○ Site Boundary

Sample interval (ft.) — 74-75 | Cd | 1.4 — Analyte — Level (ug/g)

BIL - Below Indicator Level

CH2CL2 Methylene chloride
Cd Cadmium
Zn Zinc

N

0 400
FEET

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-Id-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-1d-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-1d

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methylene chloride	--	--	--	4	39-40	7

(Railyard Area - Deep Zinc Detection)

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

TABLE WSA-1d-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-1d

AVERAGE SITE DEPTH TO GROUNDWATER: 69 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE	9.2	03523	05/11/88
CHLOROFORM	18	03523	12/7/87
HEXACHLOROCYCLOPENTADIENE	0.69	03523	05/11/88
CHLOROBENZENE	34	03523	05/11/88
DIBROMOCHLOROPROPANE	61	03523	12/7/87
DICYCLOPENTADIENE	3.2	03523	12/7/87
MALATHION	0.59	03523	10/27/88
TRICHLOROETHYLENE	2.1	03523	05/11/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-1d-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	5.9E-07
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.9E-08
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.7E-07
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	8.0E-06
DICYCLOPENTADIENE	5.4E+04	0.0E+00	5.4E+04	0.0E+00	0.0E+00	0.0E+00	6.2E-07
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	3.8E-07
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	1.7E-15
METHYLENE CHLORIDE	3.3E+03	4.0E+03	1.8E+03	0.0E+00	9.9E-04	9.9E-04	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-07

WSA-1d-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	5.9E-07
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.9E-08
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.7E-07
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	8.0E-06
DICYCLOPENTADIENE	5.4E+04	0.0E+00	5.4E+04	0.0E+00	0.0E+00	0.0E+00	6.2E-07
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	3.8E-07
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	1.7E-15
METHYLENE CHLORIDE	3.3E+03	4.0E+03	1.8E+03	0.0E+00	9.9E-04	9.9E-04	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-07

WSA-1d-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	8.8E-06
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	1.2E-07
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	2.5E-06
DIBROMOCHLOROPROPANE	2.5E+00	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-04
DICYCLOPENTADIENE	1.8E+04	0.0E+00	1.8E+04	0.0E+00	0.0E+00	0.0E+00	4.0E-06
HEXACHLOROCYCLOPENTADIENE	5.7E+03	0.0E+00	5.7E+03	0.0E+00	0.0E+00	0.0E+00	2.4E-06
MALATHION	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	1.1E-14
METHYLENE CHLORIDE	4.5E+02	1.4E+03	3.4E+02	0.0E+00	2.8E-03	2.8E-03	0.0E+00
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	1.8E-06

WSA-1d-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI EMC
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	6.5E-03
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	6.2E-04
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	1.9E-03
DIBROMOCHLOROPROPANE	2.3E+01	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	8.9E-02
DICYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.1E-02
HEXACHLOROCYCLOPENTADIENE	5.5E+03	0.0E+00	5.5E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-02
MALATHION	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	5.7E-11
METHYLENE CHLORIDE	4.1E+03	4.1E-01	4.1E-01	0.0E+00	9.8E+00*	9.8E+00*	0.0E+00
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-03

*: EI is equal to or exceeds 1.0E-01

WSA-1d-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW	VEI ENC
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	4.4E-06	2.0E-02
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	1.4E-07	6.2E-04
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	1.3E-06	5.6E-03
DIBROMOCHLOROPROPANE	1.4E+00	0.0E+00	0.0E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-05	2.7E-01
DICYCLOPENTADIENE	1.2E+03	0.0E+00	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	4.7E-06	2.1E-02
HEXACHLOROCYCLOPENTADIENE	3.8E+02	0.0E+00	0.0E+00	3.8E+02	0.0E+00	0.0E+00	0.0E+00	2.8E-06	1.3E-02
MALATHION	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.3E-14	5.7E-11
METHYLENE CHLORIDE	2.5E+02	5.4E+02	3.3E-01	3.3E-01	0.0E+00	1.2E+01*	1.2E+01*	0.0E+00	0.0E+00
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	8.9E-07	3.9E-03

*: EI is equal to or exceeds 1.0E-01

2.5 SITE WSA-1e: RAILYARD - NEMAGON SPILL AREA (formerly Site 3-4: Nemagon Spill Area; EBASCO, 19[illegible]/RIC 88076R04 and EBASCO, 1988b/RIC 88076R04A)

2.5.1 Site-Specific Considerations

Figure WSA-1e-1 and Tables WSA-1e-1 and WSA-1e-2 depict the target contaminants for Site WSA-1e. Borings 15, 17, 18, and 31 through 34 were included in this exposure assessment consistent with the Western SAR. The historical search conducted under the contamination assessment revealed that PPDDT may have been stored in Site WSA-1e (EBASCO, 1988a/RIC 88076R04), but it was not detected in the Phase I and Phase II investigations. According to the site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-1e (EBASCO, 1988a/RIC 88076R04).

2.5.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-1e are shown in Figure WSA-1e-1. Table WSA-1e-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-1e-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.5.3 Site Exposure Summary

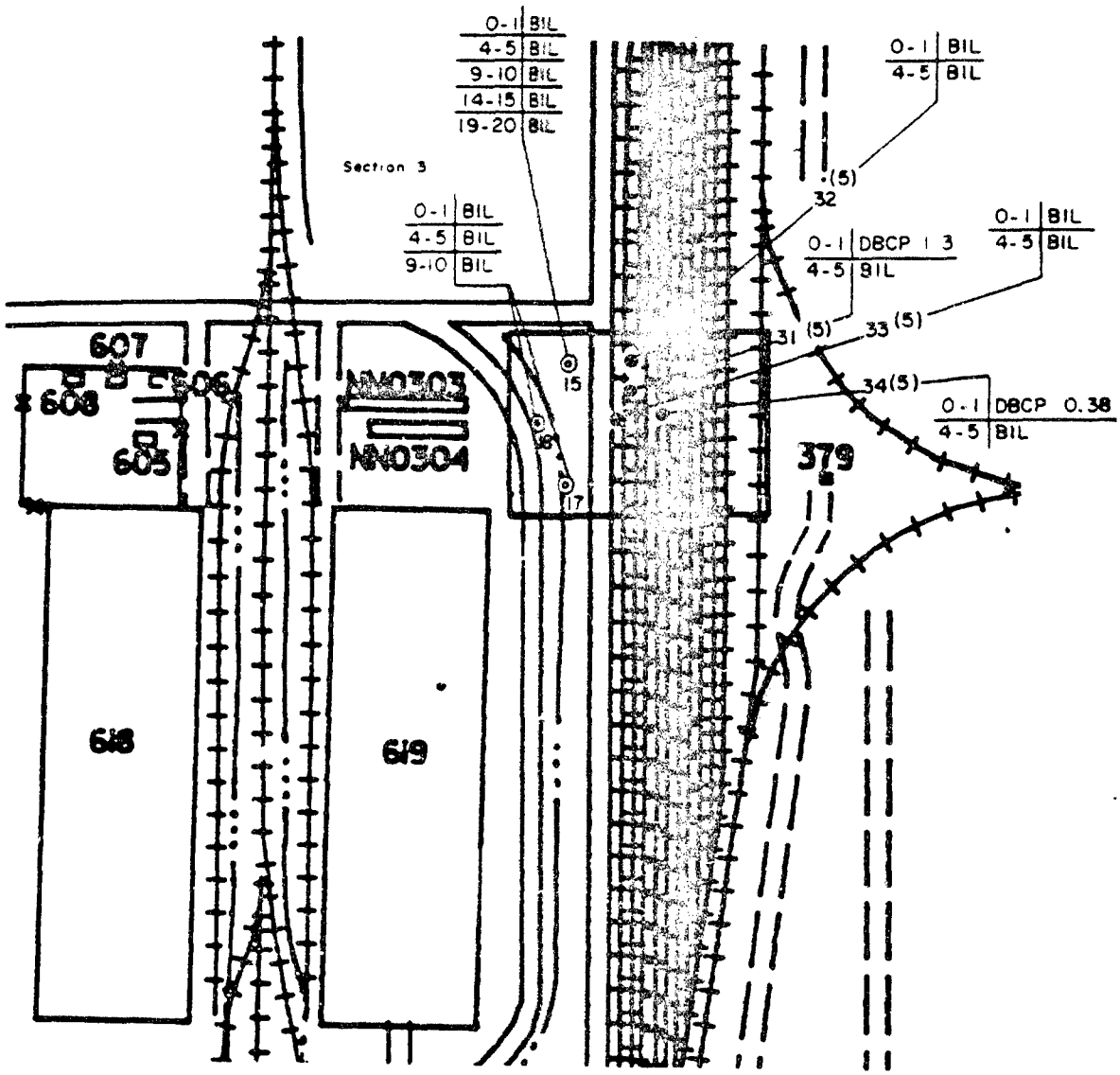
Tables WSA-1e-3 through WSA-1e-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-1e is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Dibromochloropropane	--	--	Direct	Indirect	Dir/Ind

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. Site WSA-1e is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Legend

14 ⊙ Phase I Boring

31 (5) ● Phase II Boring with Total Depth Drilled (ft)

□ Site Boundary

Sample Interval (ft) — 0-1 | DBCP 1.3 — Analyte; Level (ug/g)

BIL - Below Indicator Level

DBCP Dibromochloropropane

N

0 200 FEET

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-Ie-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-1e-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-1e

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Dibromochloropropane	1.3	0-1	31	1.3	0-1	31

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

TABLE WSA-1e-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-1e

AVERAGE SITE DEPTH TO GROUNDWATER: 69 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE	9.2	03523	05/11/88
CHLOROFORM	18	03523	12/7/87
HEXACHLOROCYCLOPENTADIENE	0.69	03523	05/11/88
CHLOROBENZENE	34	03523	05/11/88
DIBROMOCHLOROPROPANE	61	03523	12/7/87
DICYCLOPENTADIENE	3.2	03523	12/7/87
MALATHION	0.59	03523	10/27/88
TRICHLOROETHYLENE	2.1	03523	05/11/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-1e-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	5.3E-06
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.7E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.5E-06
DIBROMOCHLOROPROPANE	1.8E+01	2.0E+02	1.7E+01	7.2E-02	6.6E-03	7.9E-02	7.2E-05
DICYCLOPENTADIENE	5.4E+04	0.0E+00	5.4E+04	0.0E+00	0.0E+00	0.0E+00	5.6E-06
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	3.4E-06
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	1.5E-14
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.1E-06

WSA-1e-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	5.3E-06
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.7E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.5E-06
DIBROMOCHLOROPROPANE	1.8E+01	2.0E+02	1.7E+01	7.2E-02	6.6E-03	7.9E-02	7.2E-05
DICYCLOPENTADIENE	5.4E+04	0.0E+00	5.4E+04	0.0E+00	0.0E+00	0.0E+00	5.6E-06
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	3.4E-06
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	1.5E-14
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.1E-06

WSA-1e-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	8.0E-05
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	1.1E-06
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	2.3E-05
DIBROMOCHLOROPROPANE	2.5E+00	3.0E+01	2.3E+00	5.2E-01*	4.3E-02	5.6E-01*	1.1E-03
DICYCLOPENTADIENE	1.8E+04	0.0E+00	1.8E+04	0.0E+00	0.0E+00	0.0E+00	3.6E-05
HEXACHLOROCYCLOPENTADIENE	5.7E+03	0.0E+00	5.7E+03	0.0E+00	0.0E+00	0.0E+00	2.2E-05
MALATHION	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	9.9E-14
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-05

*: EI is equal to or exceeds 1.0E-01

WSA-1e-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	6.5E-03
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	6.2E-04
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	1.9E-03
DIBROMOCHLOROPROPANE	2.3E+01	4.8E+00	3.9E+00	5.7E-02	2.7E-01*	3.3E-01*	8.9E-02
DICYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.1E-02
HEXACHLOROCYCLOPENTADIENE	5.5E+03	0.0E+00	5.5E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-02
MALATHION	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	5.7E-11
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-03

*: EI is equal to or exceeds 1.0E-01

WSA-1e-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ON	VEI ENC
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	4.0E-05	2.0E-02
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	1.3E-06	6.2E-04
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	1.1E-05	5.6E-03
DIBROMOCHLOROPROPANE	1.4E+00	2.6E+01	4.8E+00	1.0E+00	9.3E-01*	3.2E-01*	1.3E+00*	5.4E-04	2.7E-01
DICYCLOPENTADIENE	1.2E+03	0.0E+00	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	4.2E-05	2.1E-02
HEXACHLOROCYCLOPENTADIENE	3.8E+02	0.0E+00	0.0E+00	3.8E+02	0.0E+00	0.0E+00	0.0E+00	2.5E-05	1.3E-02
MALATHION	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.1E-13	5.7E-11
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	8.0E-06	3.9E-03

*: EI is equal to or exceeds 1.0E-01

2.6 SITE WSA-1f: RAIL YARD - ALDRIN AND DIELDRIN DETECTION (formerly Site 3-4: Nemagon Spill Area and EBASCO, 1988a/RIC 88076R04 and EBASCO, 1988b/RIC 88076204A).

2.6.1 Site-Specific Considerations

Figure WSA-1f-1 and Tables WSA-1f-1 and WSA-1f-2 depict the target contaminants for Site WSA-1f. Borings 14, 16, and 35 through 37 were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-1f (EBASCO, 1988a/RIC 88076R04).

2.6.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-1f are depicted in Figure WSA-1f-1. Table WSA-1f-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-1f-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.6.3 Site Exposure Summary

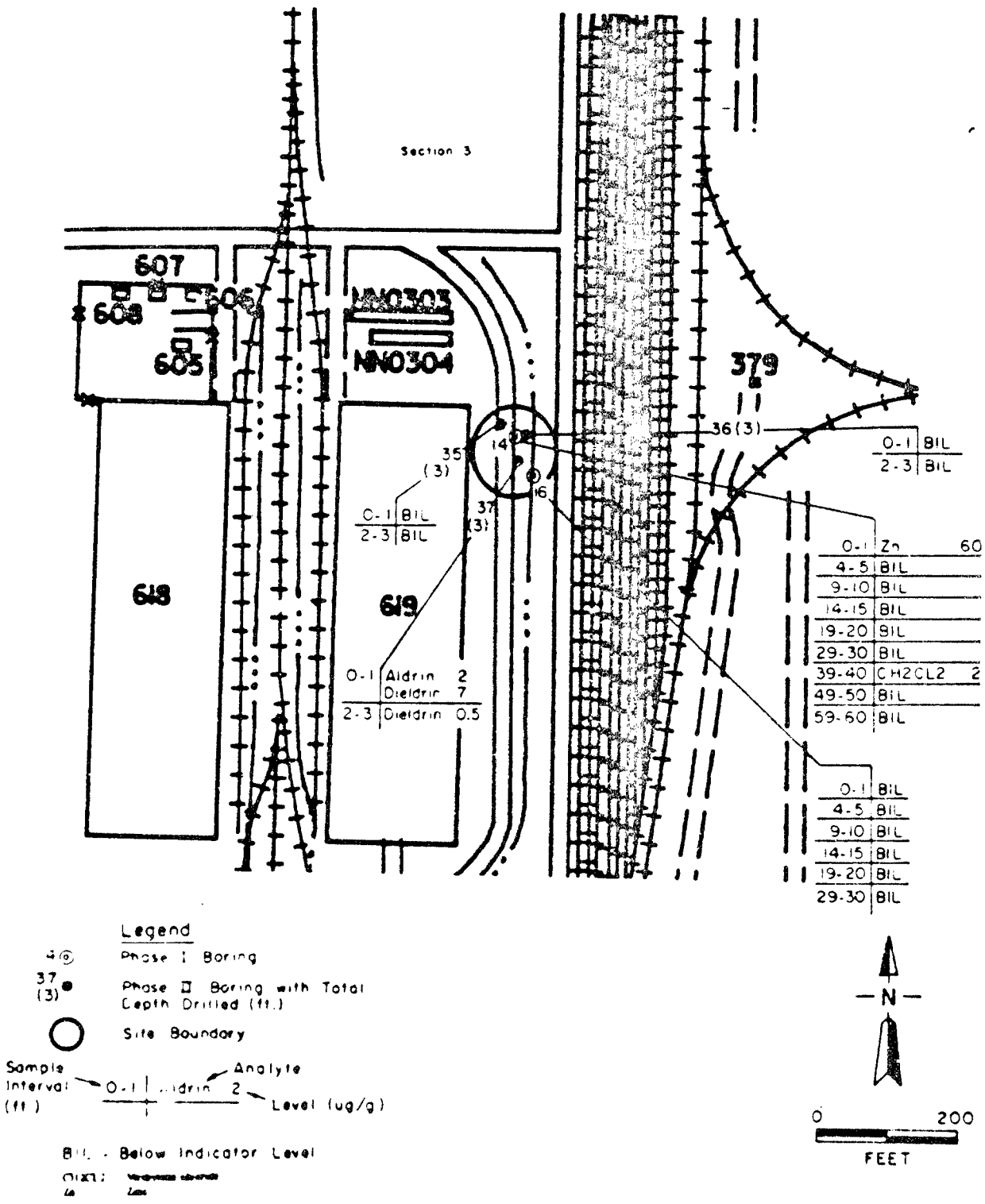
Tables WSA-1f-3 through WSA-1f-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-1f is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Aldrin	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Dieldrin	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Methylene chloride	--	--	--	Indirect	Indirect

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. Site WSA-1f is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-1f-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by Ebasco Services Incorporated

TABLE WSA-1f-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-1f

	Horizon 1			Horizon 2		
Contaminant	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Aldrin	2	0-1	37	2	0-1	37
Dieldrin	7	0-1	37	7	0-1	37
Methylene chloride	--	--	--	2	39-40	14

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

TABLE WSA-1f-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-1f

AVERAGE SITE DEPTH TO GROUNDWATER: 69 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE	9.2	03523	05/11/8
CHLOROFORM	18	03523	12/7/87
HEXACHLOROCYCLOPENTADIENE	0.69	03523	05/11/8
CHLOROBENZENE	34	03523	05/11/8
DIBROMOCHLOROPROPANE	61	03523	12/7/87
DICYCLOPENTADIENE	3.2	03523	12/7/87
MALATHION	0.59	03523	10/27/8
TRICHLOROETHYLENE	2.1	03523	05/11/8

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALY
FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-1f-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE - EI	VEI OPN
ALDRIN	1.5E+00	3.2E+06	1.5E+00	1.3E+00*	6.2E-07	1.3E+00*	0.0E+00
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	2.1E-07
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	6.8E-09
CHLOROFORM	4.0E+03	0 0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	6.2E-08
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	2.9E-06
DICYCLOPENTADIENE	5.4E+04	0.0E+00	5.4E+04	0.0E+00	0.0E+00	0.0E+00	2.3E-07
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	4.4E+00*	4.8E-06a	4.4E+00*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.4E-07
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	6.2E-16
METHYLENE CHLORIDE	3.3E+03	1.2E+05	3.2E+03	0.0E+00	1.7E-05	1.7E-05	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	4.3E-08

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-1f-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	3.2E+06	1.5E+00	1.3E+00*	6.2E-07	1.3E+00*	0.0E+00
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	2.1E-07
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	6.8E-09
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	6.2E-08
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	2.9E-06
DICYCLOPENTADIENE	5.4E+04	0.0E+00	5.4E+04	0.0E+00	0.0E+00	0.0E+00	2.3E-07
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	4.4E+00*	4.8E-06a	4.4E+00*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.4E-07
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	6.2E-16
METHYLENE CHLORIDE	3.3E+03	1.2E+05	3.2E+03	0.0E+00	1.7E-05	1.7E-05	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	4.3E-08

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-1f-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	2.1E-01	2.1E+05	2.1E-01	9.6E+00*	9.4E-06	9.6E+00*	0.0E+00
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	3.2E-06
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	4.4E-08
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	9.3E-07
DIBROMOCHLOROPROPANE	2.5E+00	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	4.4E-05
DICYCLOPENTADIENE	1.8E+04	0.0E+00	1.8E+04	0.0E+00	0.0E+00	0.0E+00	1.5E-06
DIELDRIN	2.2E-01	1.0E+06	2.2E-01	3.2E+01*	7.2E-05a	3.2E+01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.7E+03	0.0E+00	5.7E+03	0.0E+00	0.0E+00	0.0E+00	8.8E-07
MALATHION	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	4.0E-15
METHYLENE CHLORIDE	4.5E+02	1.8E+04	4.4E+02	0.0E+00	1.1E-04	1.1E-04	0.0E+00
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	6.5E-07

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

WSA-1f-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	4.0E-01	3.3E-01	1.1E+00*	5.1E+00*	6.1E+00*	0.0E+00
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	6.5E-03
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	6.2E-04
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	1.9E-03
DIBROMOCHLOROPROPANE	2.3E+01	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	8.9E-02
DICYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.1E-02
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	3.5E+00*	1.2E-01*	3.6E+00*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.5E+03	0.0E+00	5.5E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-02
MALATHION	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	5.7E-11
METHYLENE CHLORIDE	4.1E+03	1.5E+00	1.5E+00	0.0E+00	1.3E+00*	1.3E+00*	0.0E+00
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-03

*: EI is equal to or exceeds 1.0E-01

WSA-1f-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	4.3E+05	4.0E-01	9.0E-02	1.7E+01*	5.1E+00*	2.2E+01*	0.0E+00	0.0E+00
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	1.6E-06	2.0E-02
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	5.1E-08	6.2E-04
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	4.6E-07	5.6E-03
DIBROMOCHLOROPROPANE	1.4E+00	0.0E+00	0.0E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	2.2E-05	2.7E-01
DICYCLOPENTADIENE	1.2E+03	0.0E+00	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	1.7E-06	2.1E-02
DIELDRIN	1.2E-01	2.0E+05	1.9E+01	1.2E-01	5.7E+01*	3.6E-01*	5.8E+01*	0.0E+00	0.0E+00
HEXACHLOROCYCLOPENTADIENE	3.8E+02	0.0E+00	0.0E+00	3.8E+02	0.0E+00	0.0E+00	0.0E+00	1.0E-06	1.3E-02
MALATHION	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	4.6E-15	5.7E-11
METHYLENE CHLORIDE	2.5E+02	1.6E+04	1.5E+00	1.5E+00	0.0E+00	1.3E+00*	1.3E+00*	0.0E+00	0.0E+00
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	3.2E-07	3.9E-03

*: EI is equal to or exceeds 1.0E-01

2.7 SITE WSA-1g: RAILYARD AREA - MERCURY DETECTION (formerly Site 3-4: Nemagon Spill Area; EBASCO, 1988a/RIC 88076R04 and EBASCO, 1988b/RIC 88076R04A).

2.7.1 Site-Specific Considerations

Figure WSA-1g-1 and Tables WSA-1g-1 and WSA-1g-2 depict the target contaminants for Site WSA-1g. Boring 8 was included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-1g (EBASCO, 1988a/RIC 88076R04).

2.7.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-1g are depicted in Figure WSA-1g-1. Table WSA-1g-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-1g-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.7.3 Site Exposure Summary

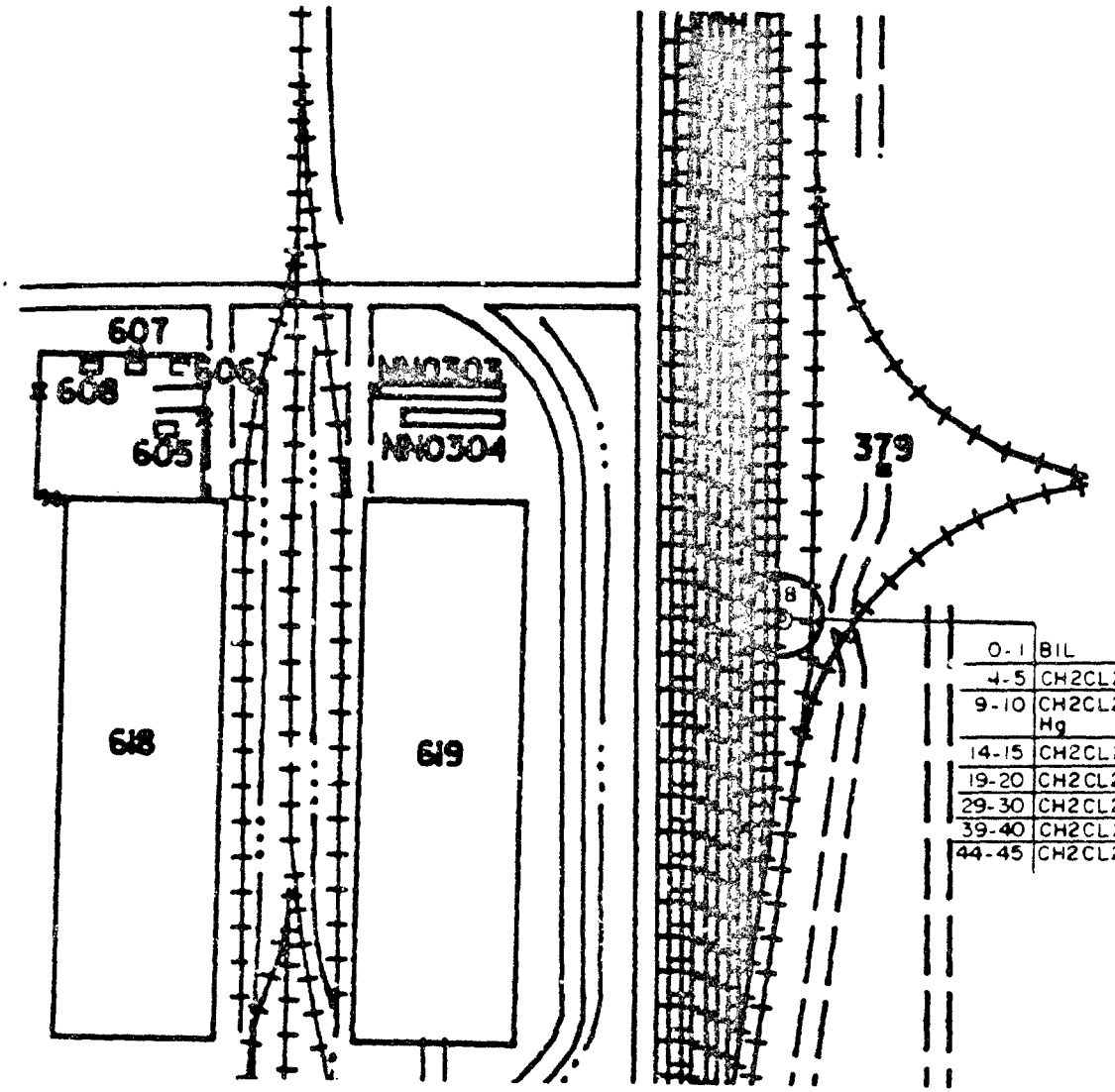
Tables WSA-1g-3 through WSA-1g-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-1g is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Methylene chloride	--	--	--	Indirect	Indirect

Note: Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the indirect pathways are the primary contributors to the exceedance of the cumulative PPLVs. Site WSA-1g is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



0-1	BIL	
4-5	CH2CL2	5
9-10	CH2CL2	3
	Hg	0.20
14-15	CH2CL2	1
19-20	CH2CL2	2
29-30	CH2CL2	1
39-40	CH2CL2	2
44-45	CH2CL2	3

Legend

8 Phase I Boring

Site Boundary

Sample Interval (ft) — 9-10 | Hg — Analyte — 0.20 — Level (ug/g)

BIL - Below Indicator Level

CH2CL2: Methylene chloride

Hg: Mercury

N

0 200

FEET

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-Ig-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-1g-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-1g

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methylene chloride	5	4-5	8	5	4-5	8
Mercury	0.20	9-10	8	--	--	--

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-1g-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	4.5E-07
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.4E-08
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-07
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	6.2E-06
DICYCLOPENTADIENE	5.4E+04	0.0E+00	5.4E+04	0.0E+00	0.0E+00	0.0E+00	4.8E-07
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.9E-07
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	1.3E-15
METHYLENE CHLORIDE	3.3E+03	9.9E+03	2.5E+03	1.5E-03	5.0E-04	2.0E-03	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	9.2E-08
MERCURY	3.3E+03	0.0E+00	3.3E+03	6.0E-05	0.0E+00	6.0E-05	0.0E+00

WSA-1g-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	4.5E-07
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.4E-08
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-07
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	6.2E-06
DICYCLOPENTADIENE	5.4E+04	0.0E+00	5.4E+04	0.0E+00	0.0E+00	0.0E+00	4.8E-07
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.9E-07
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	1.3E-15
METHYLENE CHLORIDE	3.3E+03	9.9E+03	2.5E+03	1.5E-03	5.0E-04	2.0E-03	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	9.2E-08
MERCURY	3.3E+03	0.0E+00	3.3E+03	6.0E-05	0.0E+00	6.0E-05	0.0E+00

WSA-1g-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	6.9E-06
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	9.4E-08
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	2.0E-06
DIBROMOCHLOROPROPANE	2.5E+00	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	9.4E-05
DICYCLOPENTADIENE	1.8E+04	0.0E+00	1.8E+04	0.0E+00	0.0E+00	0.0E+00	3.1E-06
HEXACHLOROCYCLOPENTADIENE	5.7E+03	0.0E+00	5.7E+03	0.0E+00	0.0E+00	0.0E+00	1.9E-06
MALATHION	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	8.5E-15
METHYLENE CHLORIDE	4.5E+02	1.5E+03	3.5E+02	1.1E-02	3.3E-03	1.4E-02	0.0E+00
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	1.4E-06
MERCURY	2.0E+03	0.0E+00	2.0E+03	1.0E-04	0.0E+00	1.0E-04	0.0E+00

WSA-1g-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	6.5E-03
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	6.2E-04
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	1.9E-03
DIBROMOCHLOROPROPANE	2.3E+01	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	8.9E-02
DICYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.1E-02
HEXACHLOROCYCLOPENTADIENE	5.5E+03	0.0E+00	5.5E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-03
MALATHION	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	5.7E-11
METHYLENE CHLORIDE	4.1E+03	3.6E-01	3.6E-01	1.2E-03	1.4E+01*	1.4E+01*	0.0E+00
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-03
MERCURY	1.4E+03	0.0E+00	1.4E+03	1.4E-04	0.0E+00	1.4E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

WSA-1g-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI EM
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	3.4E-06	2.0E-
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	1.1E-07	6.2E-
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	9.8E-07	5.6E-
DIBROMOCHLOROPROPANE	1.4E+00	0.0E+00	0.0E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	4.7E-05	2.7E-
DICYCLOPENTADIENE	1.2E+03	0.0E+00	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	3.6E-06	2.1E-
HEXACHLOROCYCLOPENTADIENE	3.8E+02	0.0E+00	0.0E+00	3.8E+02	0.0E+00	0.0E+00	0.0E+00	2.2E-06	1.3E-
MALATHION	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	9.9E-15	5.7E-
METHYLENE CHLORIDE	2.5E+02	1.3E+03	3.0E-01	3.0E-01	2.0E-02	1.7E+01*	1.7E+01*	0.0E+00	0.0E+
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	6.9E-07	3.9E-
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	4.3E-04	0.0E+00	4.3E-04	0.0E+00	0.0E+

*: EI is equal to or exceeds 1.0E-01

2.8 SITE WSA-2: WEST LANDFILL - BURNING PIT (formerly Site 4-2: Burning Pit; EBASCO, 1988d/RIC 88046R02 and EBASCO, 1988e/RIC 88046R02A)

2.8.1 Site-Specific Considerations

Figure WSA-2-1 and Tables WSA-2-1 and WSA-2-2 depict the target contaminants for Site WSA-2. Borings 1 through 21 and 18B through 21B were included in the exposure assessment, consistent with the Western SAR. The historical search conducted under the contamination assessment revealed that contaminated material from the mustard plant may have been disposed of at this site (EBASCO, 1988d/RIC 88046R02), but mustard degradation products were not detected in soil during the Phase I or Phase II investigations. According to the site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-2 (EBASCO, 1988d/RIC 88046R02).

2.8.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-2 are shown in Figure WSA-2-1. The following contaminants were not included in the figure since they were not considered target contaminants during the Phase I and Phase II investigations: 2-Butoxyethanol, occurring in Boring 2 (39-40 ft), and pyrene and 1,1,2,2-tetrachloroethane, occurring in 18 (9.5-10.5 ft). Although not shown on the figure, these nontarget compounds were included in the Western SAR and in this exposure assessment because they passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-2-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume IV-A). Table WSA-2-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.8.3 Site Exposure Summary

Tables WSA-2-3 through WSA-2-7 present Draft PPLV, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-2 is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation for the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

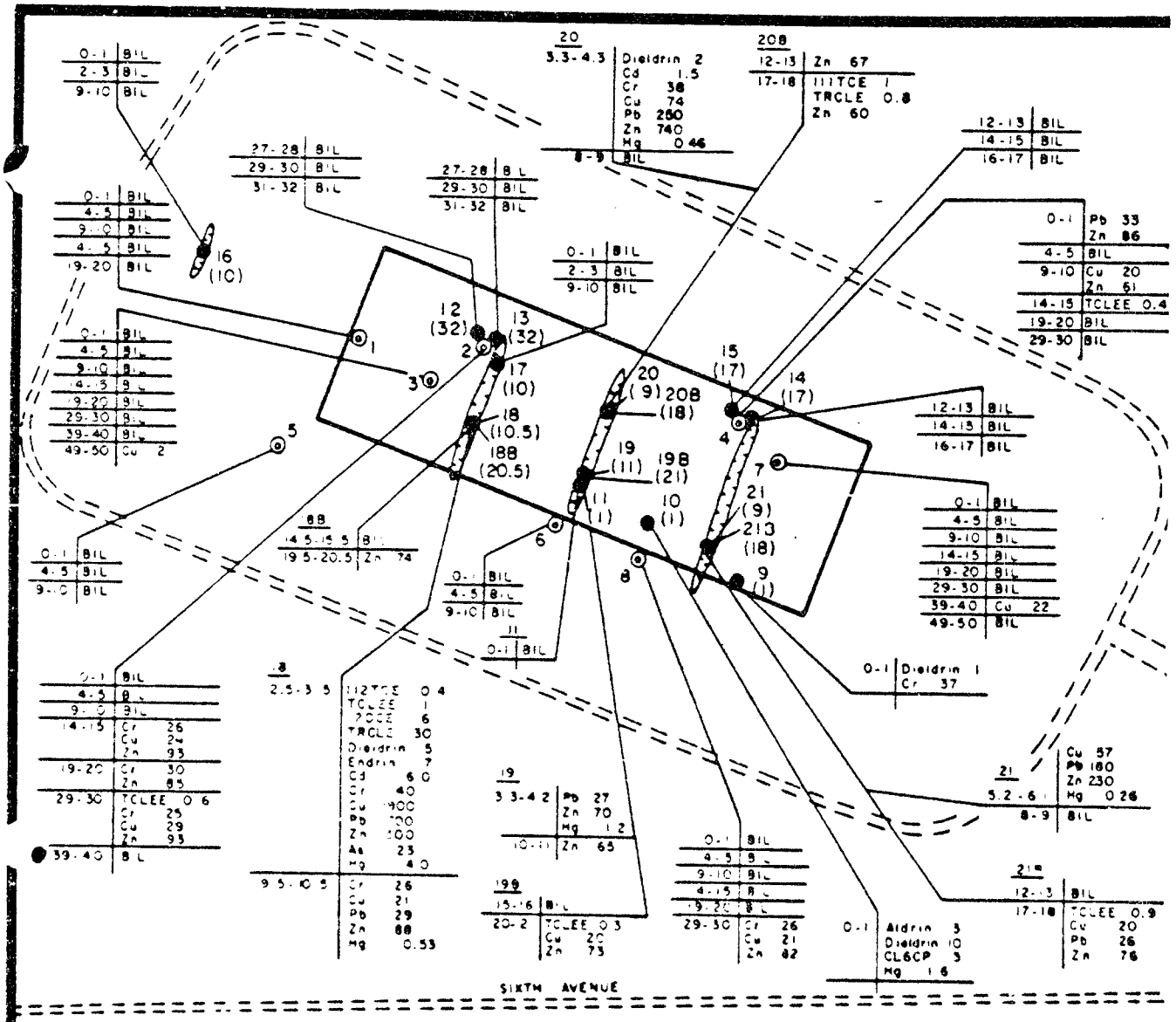
Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Aldrin	Direct	Direct	Direct	Direct	Direct
Dieldrin	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Arsenic	Direct	Direct	Direct	Direct	Direct
Chromium	Direct	Direct	Direct	Direct	Direct
1,1,2,2-Tetrachloroethane	--	--	Direct	Indirect	Dir/Ind
Trichloethylene	--	--	Indirect	--	Dir/Ind
Cadmium	--	--	Direct	--	Direct
Hexachlorocyclo-pentadiene	--	--	--	Indirect	Indirect
Tetrachloroethylene	--	--	--	Indirect	Indirect
Lead	--	--	--	Direct	Direct

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. Site WSA-2 is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

The following groundwater contaminant results in an unacceptable exposure due to vapor inhalation as indicated by a VEI value greater than 1:

- 1,1-Dichloroethylene (enclosed)



Legend

Phase I borings

Phase II boring and total depth drilled (ft)

Site Boundary

Trench

Sampling interval (ft) — Analyte — Level (ug/g)

BIL · Below indicator level
CL6CP · Hexachlorocyclopentadiene
111TCE · 1,1,1-Trichloroethane
112TCE · 1,1,2-Trichloroethane
TCLEE · Tetrachloroethylene
12DCLE · 1,2-Dichloroethene
TRCLE · Trichloroethylene
As · Arsenic
Cd · Cadmium
Cr · Chromium
Cu · Copper
Pb · Lead
Hg · Mercury
Zn · Zinc

N

0 200 400
FEET

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-2-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE WSA-2-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-2

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Aldrin	3	0-1	10	3	0-1	10
2-Butoxyethanol[1/]	--	--	--	0.40	39-40	2
1,2-Dichloroethylene	6	2.5-3.5	18	6	2.5-3.5	18
Dieldrin	10	0-1	10	10	0-1	10
Endrin	7	2.5-3.5	18	7	2.5-3.5	18
Hexachlorocyclopentadiene	5	0-1	10	5	0-1	10
Pyrene[1/]	10	9.5-10.5	18	10	9.5-10.5	18
1,1,2,2-Tetrachloroethane[1/]	2.0	9.5-10.5	18	2	9.5-10.5	18
Tetrachloroethylene	1	2.5-3.5	18	1	2.5-3.5	18
1,1,1-Trichloroethane	--	--	--	1	17-18	20B
1,1,2-Trichloroethane	0.4	2.5-3.5	18	0.4	2.5-3.5	18
Trichloroethylene	30	2.5-3.5	18	30	2.5-3.5	18
Arsenic	23	2.5-3.5	18	--	--	--
Cadmium	6.0	2.5-3.5	18	--	--	--
Chromium	140	2.5-3.5	18	--	--	--
Copper	1900	2.5-3.5	18	--	--	--
Lead	700	2.5-3.5	18	--	--	--
Mercury	4.0	2.5-3.5	18	--	--	--
Zinc	1300	2.5-3.5	18	--	--	--

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

REA11/TBL0077.REA VI-B 8/30/90 10:44 pm rml 8

TABLE WSA-2-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-2

AVERAGE SITE DEPTH TO GROUNDWATER: 65 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
1,1,1-TRICHLOROETHANE	36	04040	06/2/88
1,1-DICHLOROETHYLENE	15	04040	06/2/88
CHLOROFORM	0.75	04040	06/2/88
TRICHLOROETHYLENE	76	04040	06/2/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-2-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	4.0E+04	1.5E+00	2.0E+00*	7.4E-05	2.0E+00*	0.0E+00
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.2E-07
1,1-DICHLOROETHYLENE	4.3E+01	0.0E+00	4.3E+01	0.0E+00	0.0E+00	0.0E+00	6.4E-03
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	3.6E-05	0.0E+00	3.6E-05	0.0E+00
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	6.4E+00*	5.4E-04a	6.4E+00*	0.0E+00
ENDRIN	2.5E+03	1.0E+06	2.5E+03	2.8E-03	4.7E-07a	2.8E-03	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	1.6E+04	8.0E+03	3.0E-04	3.2E-04	6.2E-04	0.0E+00
1,1,2,2-TETRACHLOROETHANE	1.3E+02	4.8E+02	1.0E+02	1.6E-02	4.2E-03	2.0E-02	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	1.8E+03	4.0E+02	2.0E-03	5.7E-04	2.5E-03	0.0E+00
1,1,1-TRICHLOROETHANE	7.5E+05	6.7E+05	3.5E+05	0.0E+00	1.5E-06	1.5E-06	4.2E-08
1,1,2-TRICHLOROETHANE	4.3E+02	5.5E+02	2.4E+02	9.3E-04	7.3E-04	1.7E-03	0.0E+00
TRICHLOROETHYLENE	2.3E+03	1.9E+03	1.0E+03	1.3E-02	1.6E-02	2.9E-02	1.3E-04
ARSENIC	2.2E+01	0.0E+00	2.2E+01	1.1E+00*	0.0E+00	1.1E+00*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	1.3E-02	0.0E+00	1.3E-02	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	2.0E+00*	0.0E+00	2.0E+00*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	4.5E-03	0.0E+00	4.5E-03	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	4.5E-02	0.0E+00	4.5E-02	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.2E-03	0.0E+00	1.2E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	6.6E-04	0.0E+00	6.6E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-2-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	4.0E+04	1.5E+00	2.0E+00*	7.4E-05	2.0E+00*	0.0E+00
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.2E-07
1,1-DICHLOROETHYLENE	4.3E+01	0.0E+00	4.3E+01	0.0E+00	0.0E+00	0.0E+00	6.4E-03
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	3.6E-05	0.0E+00	3.6E-05	0.0E+00
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	6.4E+00*	5.4E-04a	6.4E+00*	0.0E+00
ENDRIN	2.5E+03	1.0E+06	2.5E+03	2.8E-03	4.7E-07a	2.8E-03	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	1.6E+04	8.0E+03	3.0E-04	3.2E-04	6.2E-04	0.0E+00
1,1,2,2-TETRACHLOROETHANE	1.3E+02	4.8E+02	1.0E+02	1.6E-02	4.2E-03	2.0E-02	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	1.8E+03	4.0E+02	2.0E-03	5.7E-04	2.5E-03	0.0E+00
1,1,1-TRICHLOROETHANE	7.5E+05	6.7E+05	3.5E+05	0.0E+00	1.5E-06	1.5E-06	4.2E-08
1,1,2-TRICHLOROETHANE	4.3E+02	5.5E+02	2.4E+02	9.3E-04	7.3E-04	1.7E-03	0.0E+00
TRICHLOROETHYLENE	2.3E+03	1.9E+03	1.0E+03	1.3E-02	1.6E-02	2.9E-02	1.3E-04
ARSENIC	2.2E+01	0.0E+00	2.2E+01	1.1E+00*	0.0E+00	1.1E+00*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	1.3E-02	0.0E+00	1.3E-02	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	2.0E+00*	0.0E+00	2.0E+00*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	4.5E-03	0.0E+00	4.5E-03	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	4.5E-02	0.0E+00	4.5E-02	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.2E-03	0.0E+00	1.2E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	6.6E-04	0.0E+00	6.6E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-2-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	2.1E-01	2.7E+03	2.1E-01	1.4E+01*	1.1E-03	1.4E+01*	0.0E+00
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	3.3E-06
1,1-DICHLOROETHYLENE	5.9E+00	0.0E+00	5.9E+00	0.0E+00	0.0E+00	0.0E+00	9.6E-02
1,2-DICHLOROETHYLENE	7.0E+04	0.0E+00	7.0E+04	8.5E-05	0.0E+00	8.5E-05	0.0E+00
DIELDRIN	2.2E-01	1.0E+06	2.2E-01	4.6E+01*	8.2E-03a	4.6E+01*	0.0E+00
ENDRIN	1.1E+03	1.0E+06	1.1E+03	6.6E-03	3.0E-06a	6.6E-03	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.7E+03	2.4E+03	1.7E+03	8.8E-04	2.1E-03	2.9E-03	0.0E+00
1,1,2,2-TETRACHLOROETHANE	1.8E+01	3.2E+01	1.1E+01	1.1E-01*	6.3E-02	1.8E-01*	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	2.7E+02	5.6E+01	1.4E-02	3.7E-03	1.8E-02	0.0E+00
1,1,1-TRICHLOROETHANE	3.2E+05	2.4E+05	1.4E+05	0.0E+00	4.1E-06	4.1E-06	2.7E-07
1,1,2-TRICHLOROETHANE	6.0E+01	8.5E+01	3.5E+01	6.7E-03	4.7E-03	1.1E-02	0.0E+00
TRICHLOROETHYLENE	3.2E+02	3.0E+02	1.5E+02	9.4E-02	1.0E-01*	2.0E-01*	2.0E-03
ARSENIC	3.9E+00	0.0E+00	3.9E+00	5.8E+00*	0.0E+00	5.8E+00*	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	1.0E-01*	0.0E+00	1.0E-01*	0.0E+00
CHROMIUM	8.8E+00	0.0E+00	8.8E+00	1.6E+01*	0.0E+00	1.6E+01*	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	7.6E-03	0.0E+00	7.6E-03	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	7.6E-02	0.0E+00	7.6E-02	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	2.0E-03	0.0E+00	2.0E-03	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.2E-03	0.0E+00	1.2E-03	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-2-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	1.3E+02	1.9E+00	1.6E+00*	2.4E-02	1.6E+00*	0.0E+00
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	8.4E-05
1,1-DICHLOROETHYLENE	5.4E+01	0.0E+00	5.4E+01	0.0E+00	0.0E+00	0.0E+00	2.5E+00
1,2-DICHLOROETHYLENE	9.2E+04	0.0E+00	9.2E+04	6.5E-05	0.0E+00	6.5E-05	0.0E+00
DIELDRIN	2.8E+00	5.8E+01	1.9E+00	5.0E+00*	1.7E-01*	5.2E+00*	0.0E+00
[illegible]	[illegible]	[illegible]	2.4E+02	5.1E-03	2.4E-02a	2.9E-02	0.0E+00
[illegible]	[illegible]	[illegible]	1.6E+01	9.2E-04	3.1E-01*	3.1E-01*	0.0E+00
[illegible]	[illegible]	8.7E-01	8.7E-01	1.2E-02	2.3E+00*	2.3E+00*	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	1.5E-03	4.5E-01*	4.5E-01*	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	0.0E+00	1.1E-03	1.1E-03	4.9E-05
[illegible]	[illegible]	[illegible]	9.4E-01	7.3E-04	3.5E-03	4.2E-03	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	1.0E-02	7.6E-02	8.6E-02	5.0E-02
[illegible]	[illegible]	[illegible]	[illegible]	1.2E+00*	0.0E+00	1.2E+00*	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.0E+00	1.7E-02	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	2.5E+00*	0.0E+00	2.5E+00*	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.0E+00	1.1E-02	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]*	0.0E+00	1.1E-01*	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	2.9E-03	0.0E+00	2.9E-03	0.0E+00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.0E+00	1.7E-03	0.0E+00

a [illegible] which is below one-tenth of [illegible] to be equal to pure compound. [illegible] (See [illegible] VI-6)

* EI is equal to or [illegible]

WSA-2-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	5.4E+03	4.2E+01	1.2E-01	2.6E+01*	7.2E-02	2.6E+01*	0.0E+00	0.0E+00
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-06	2.5E-04
1,1-DICHLOROETHYLENE	3.2E+00	0.0E+00	0.0E+00	3.2E+00	0.0E+00	0.0E+00	0.0E+00	4.8E-02	7.5E+00
1,2-DICHLOROETHYLENE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	3.5E-04	0.0E+00	3.5E-04	0.0E+00	0.0E+00
DIELDRIN	1.2E-01	2.5E+03	1.9E+01	1.2E-01	8.2E+01*	5.3E-01*	8.2E+01*	0.0E+00	0.0E+00
ENDRIN	2.5E+02	1.0E+06	1.0E+06	2.0E+02	2.8E-02	8.1E-03a	3.6E-02	0.0E+00	0.0E+00
HEXACHLOROCYCLOPENTADIENE	3.8E+02	2.1E+03	1.6E+01	1.5E+01	1.3E-02	3.1E-01*	3.2E-01*	0.0E+00	0.0E+00
1,1,2,2-TETRACHLOROETHANE	9.9E+00	6.4E+01	2.9E-01	2.8E-01	2.0E-01*	6.9E+00*	7.1E+00*	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	2.3E+02	2.2E+00	2.1E+00	2.4E-02	4.5E-01*	4.8E-01*	0.0E+00	0.0E+00
1,1,1-TRICHLOROETHANE	7.8E+04	8.9E+04	7.0E+02	6.8E+02	0.0E+00	1.4E-03	1.4E-03	3.2E-07	4.9E-05
1,1,2-TRICHLOROETHANE	3.4E+01	7.4E+01	1.1E+02	1.9E+01	1.2E-02	8.9E-03	2.1E-02	0.0E+00	0.0E+00
TRICHLOROETHYLENE	1.8E+02	2.6E+02	4.0E+02	8.2E+01	1.7E-01*	1.9E-01*	3.6E-01*	9.7E-04	1.5E-01
ARSENIC	1.6E+00	0.0E+00	0.0E+00	1.6E+00	1.4E+01*	0.0E+00	1.4E+01*	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	7.9E-01*	0.0E+00	7.9E-01*	0.0E+00	0.0E+00
CHROMIUM	1.1E+00	0.0E+00	0.0E+00	1.1E+00	1.2E+02*	0.0E+00	1.2E+02*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	3.3E-02	0.0E+00	3.3E-02	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	3.2E-01*	0.0E+00	3.2E-01*	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	8.7E-03	0.0E+00	8.7E-03	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	9.3E-03	0.0E+00	9.3E-03	0.0E+00	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

2.9 SITE WSA-3a: EAST LANDFILL - TOLUENE, TRICHLOROPROPENE, AND CADMIUM DETECTION (formerly Site 4-3: Burning Pit; EBASCO, 1988f/RIC 88126R01 and EBASCO, 1988g/RIC 88126R01A)

2.9.1 Site-Specific Considerations

Figure WSA-3a-1 and Table WSA-3a-1 depict the target contaminants for Site WSA-3a. Borings 1, 18 through 20, 18B, and 19B were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-3a (EBASCO, 1988f/RIC 88126R01).

2.9.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-3a are depicted in Figure WSA-3a-1. Toluene, occurring in Boring 1 (0-1 ft and 14-15 ft) was not included in this figure because it was detected in the nontarget analysis, but is still considered a target contaminant for this exposure assessment (see Appendix A). Trichloropropene, occurring in Boring 1 (19-20 ft) was not included in the figure since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown in this figure, this nontarget compound was included in the Western SAR and in the exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO,1988c/RIC 88357R01).

Table WSA-3a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

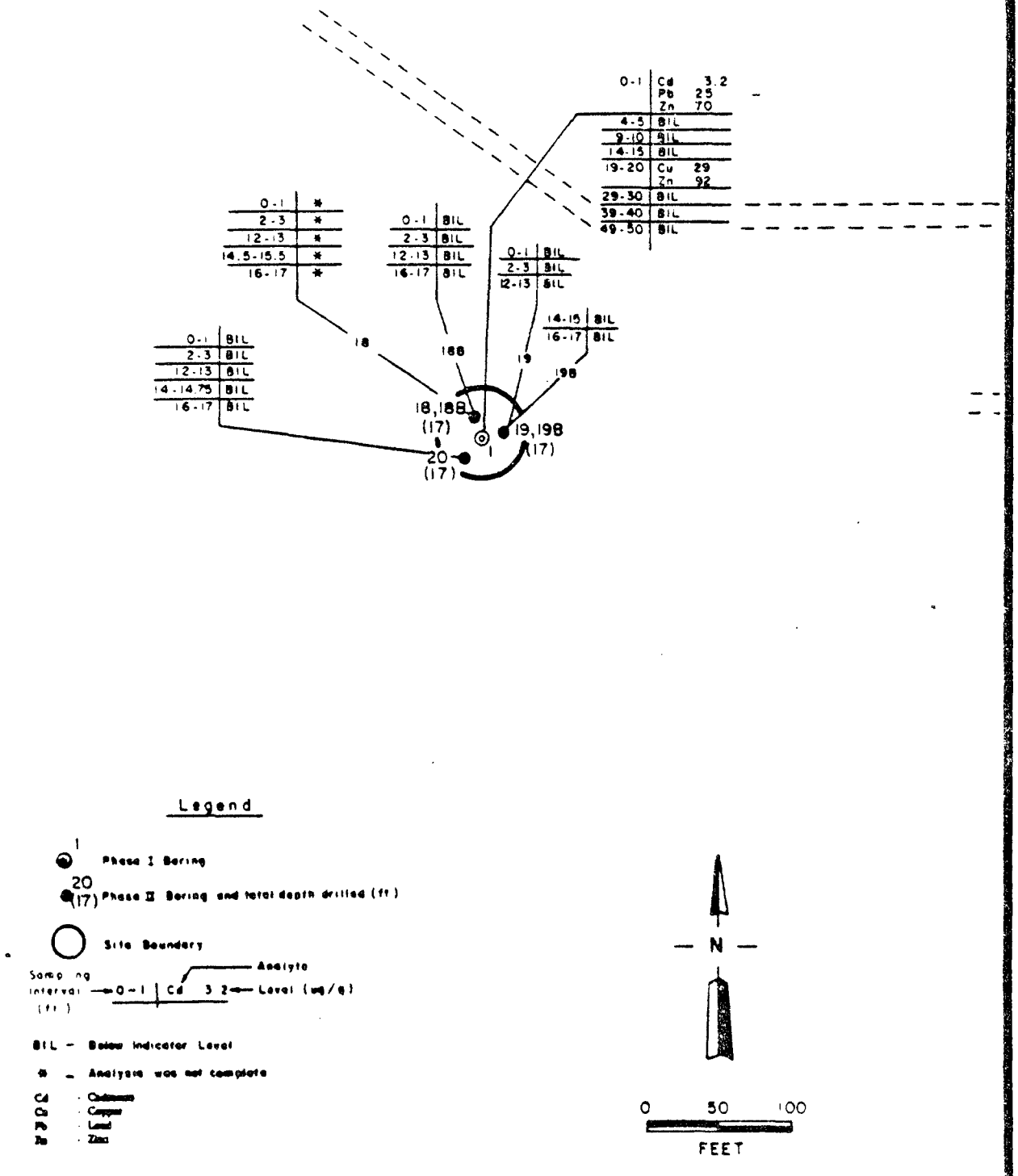
2.9.3 Site Exposure Summary

Tables WSA-3a-2 through WSA-3a-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Cadmium	--	--	--	--	Direct

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.

The results of the soil exposure summary indicate that exposure to contamination from the direct pathways are the primary contributors to the exceedance of the cumulative PPLVs. Site WSA-3a is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-3a-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-3a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-3a

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Toluene	0.30	0-1	1	0.30	0-1	1
Trichloropropene[1/]	--	--	--		14-15	1
Cadmium	--	--	--	0.4[illegible]	19-20	1
	3.2	0-1	1	--	--	--

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-3a-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI DPM
TOLUENE	2.5E+06	2.9E+08	2.5E+06	1.2E-07	1.0E-09	1.2E-07	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	7.1E-03	0.0E+00	7.1E-03	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3a-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW
TOLUENE	2.5E+06	2.9E+08	2.5E+06	1.2E-07	1.0E-09	1.2E-07	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	7.1E-03	0.0E+00	7.1E-03	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3a-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
TOLUENE	1.1E+06	1.0E+08	1.0E+06	2.8E-07	2.9E-09	2.9E-07	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	5.5E-02	0.0E+00	5.5E-02	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3a-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
TOLUENE	1.4E+06	1.7E+03	1.7E+03	2.2E-07	1.8E-04	1.8E-04	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	8.9E-03	0.0E+00	8.9E-03	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3a-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
TOLUENE	2.6E+05	3.9E+07	5.1E+03	5.0E+03	1.2E-06	5.8E-05	6.0E-05	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	4.2E-01*	0.0E+00	4.2E-01*	0.0E+00	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.10 SITE WSA-3b: EAST LANDFILL - DISPOSAL PIT (formerly Site 4-3: Burning Pit; EBASCO, 1988f/RIC 88126R01 and EBASCO, 1988g/RIC 88126R01A)

2.10.1 Site-Specific Considerations

Figure WSA-3b-1 and Table WSA-3b-1 depict the target contaminants for Site WSA-3b. Boring 30 was included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-3b (EBASCO, 1988f/RIC 88126R01).

2.10.2 Spatial Distribution of Measured Contaminant Concentrations

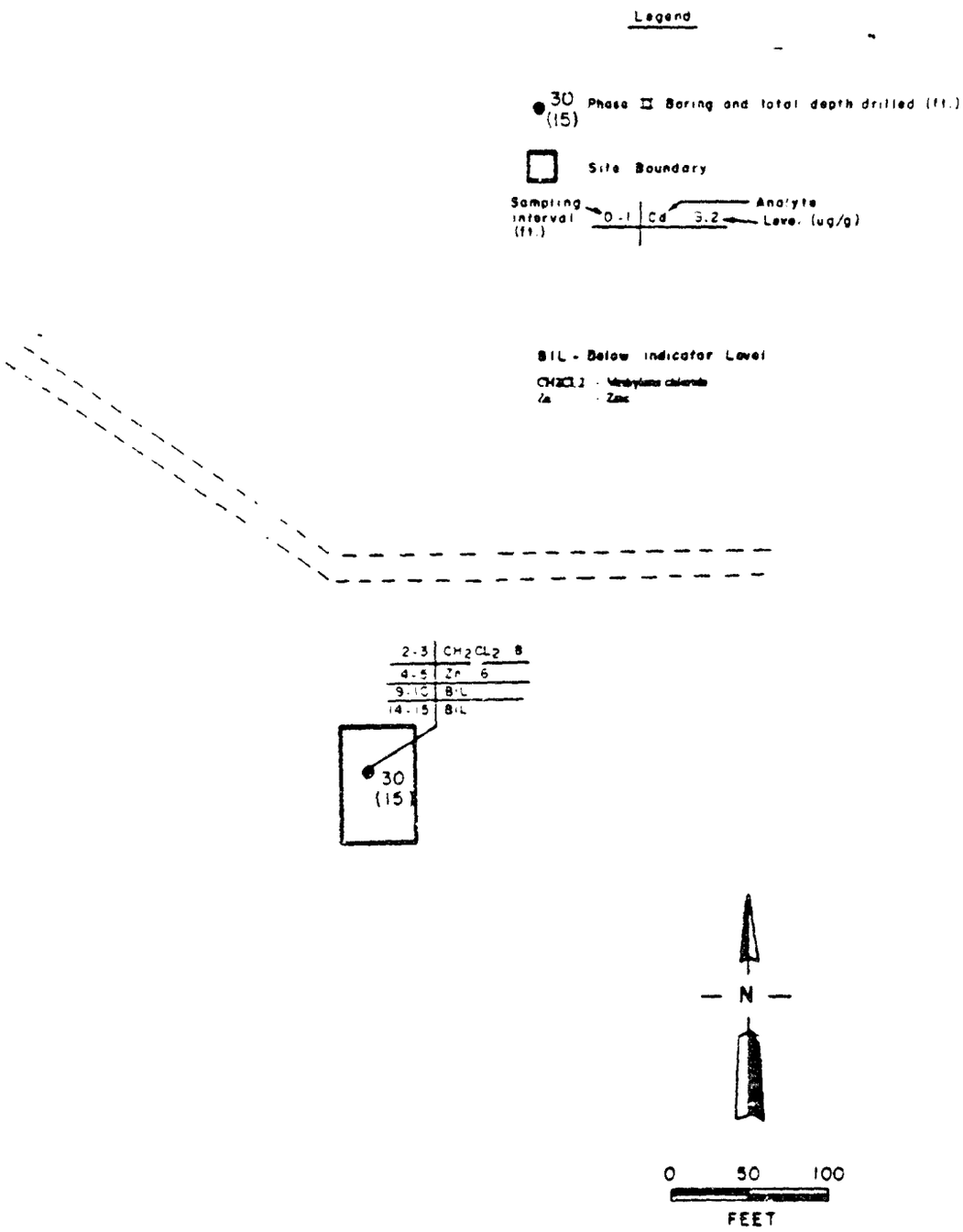
The locations and concentrations of the target contaminants that were detected in Site WSA-3b are depicted in Figure WSA-3b-1. Table WSA-3b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.10.3 Site Exposure Summary

Tables WSA-3b-2 through WSA-3b-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-3b is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-3b-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-3b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-3b

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methylene chloride	8	2-3	30	8	2-3	30

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-3b-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
METHYLENE CHLORIDE	3.3E+03	1.0E+06	3.3E+03	2.4E-03	7.7E-06	2.5E-03	0.0E+00

WSA-3b-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
METHYLENE CHLORIDE	3.3E+03	1.0E+06	3.3E+03	2.4E-03	7.7E-06	2.5E-03	0.0E+00

WSA-3b-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
METHYLENE CHLORIDE	4.5E+02	1.6E+05	4.5E+02	1.8E-02	5.0E-05	1.8E-02	0.0E+00

WSA-3b-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
METHYLENE CHLORIDE	4.1E+03	4.8E+02	4.3E+02	1.9E-03	1.7E-02	1.9E-02	0.0E+00

WSA-3b-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
METHYLENE CHLORIDE	2.5E+02	1.4E+05	4.8E+02	1.6E+02	3.2E-02	1.7E-02	4.9E-02	0.0E+00	0.0E+00

2.11 SITE WSA-3c: EAST LANDFILL - MAIN SURFACE DISPOSAL AREA (formerly Site 4-3: Buring Pit; EBASCO, 1988f/RIC 88126R01 and EBASCO, 1988g/RIC 88126R01A)

2.11.1 Site-Specific Considerations

Figure WSA-3c-1 and Table WSA-3c-1 depict the target contaminants for Site WSA-3c. Borings 2 through 4, 6, 7, 10 through 17, 21, 21B, 22, 23, 27, 27B, 28, 29, and 31, were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-3c (EBASCO, 1988f/RIC 88126R01).

2.11.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-3c are depicted in Figure WSA-3c-1. Table WSA-3c-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

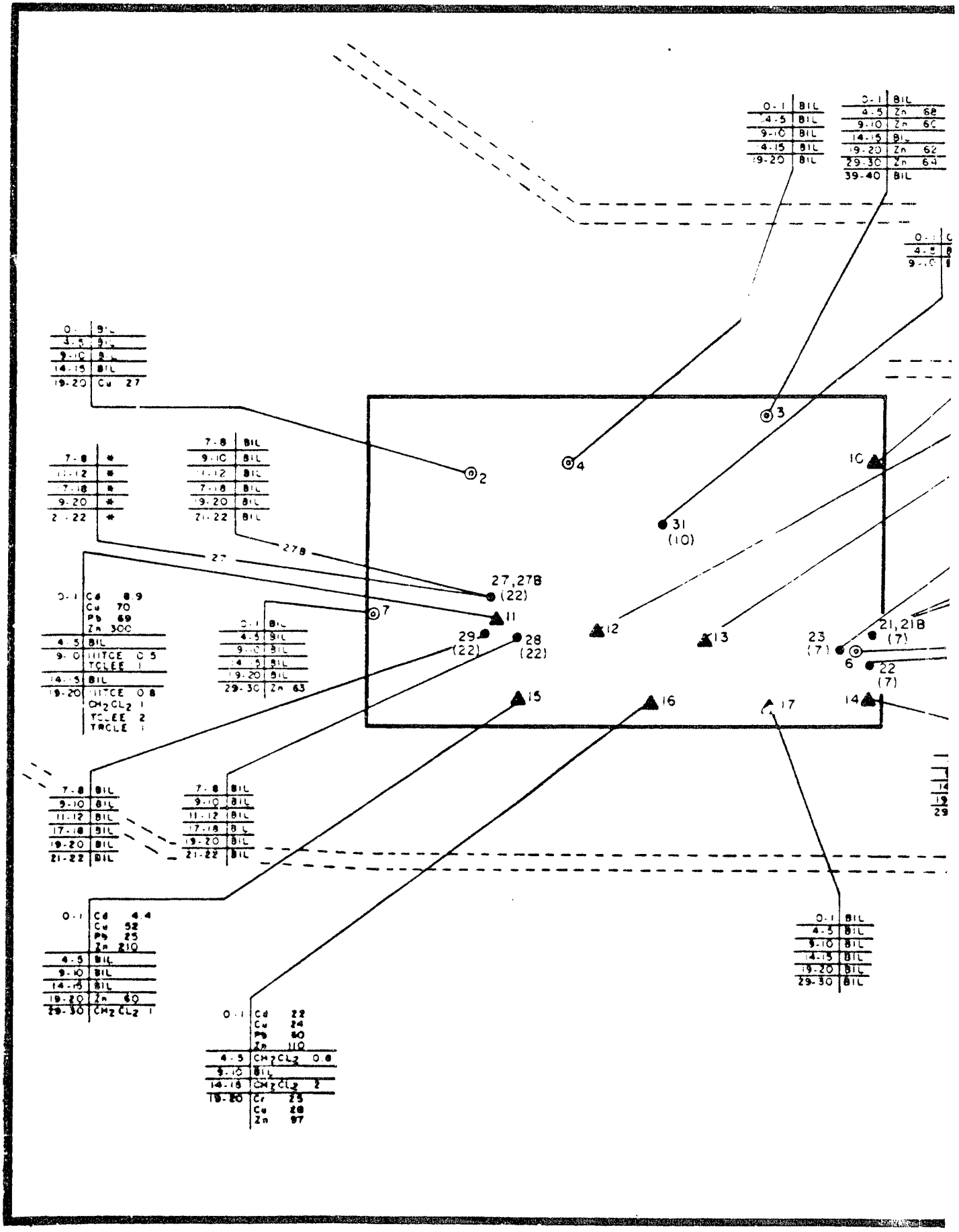
2.11.3 Site Exposure Summary

Tables WSA-3c-2 through WSA-3c-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Cadmium	Direct	Direct	Direct	Direct	Direct
Methylene chloride	--	--	--	Indirect	Indirect
Tetrachloroethylene	--	--	--	Indirect	Indirect
Trichloroethylene	--	--	--	Indirect	Indirect

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. Site WSA-3c is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).


0-1 BIL
4-5 BIL
9-10 BIL
14-15 BIL
19-20 BIL
0-1 BIL
4-5 Zn 68
9-10 Zn 60
14-15 BIL
19-20 Zn 62
29-30 Zn 64
39-40 BIL
0-1 BIL
3-5 BIL
9-10 BIL
14-15 BIL
19-20 Cu 27
7-8 *
11-12 *
17-18 *
19-20 *
21-22 *
7-8 BIL
9-10 BIL
11-12 BIL
17-18 BIL
19-20 BIL
21-22 BIL
27
27B
0-1 Cd 8.9
Cu 70
Pb 69
Zn 300
4-5 BIL
9-10 TTCE 0.5
TCLEE 1
14-15 BIL
19-20 TTCE 0.8
CH2CL2 1
TCLEE 2
TRCLE 1
0-1 BIL
4-5 BIL
9-10 BIL
14-15 BIL
19-20 BIL
29-30 Zn 63
7-8 BIL
9-10 BIL
11-12 BIL
17-18 BIL
19-20 BIL
21-22 BIL
7-8 BIL
9-10 BIL
11-12 BIL
17-18 BIL
19-20 BIL
21-22 BIL
0-1 Cd 4.4
Cu 52
Pb 25
Zn 210
4-5 BIL
9-10 BIL
14-15 BIL
19-20 Zn 60
29-30 CH2CL2 1
0-1 Cd 22
Cu 24
Pb 40
Zn 110
4-5 CH2CL2 0.8
9-10 BIL
14-15 CH2CL2 2
19-20 Cr 25
Cu 28
Zn 97
0-1 BIL
4-5 BIL
9-10 BIL
14-15 BIL
19-20 BIL
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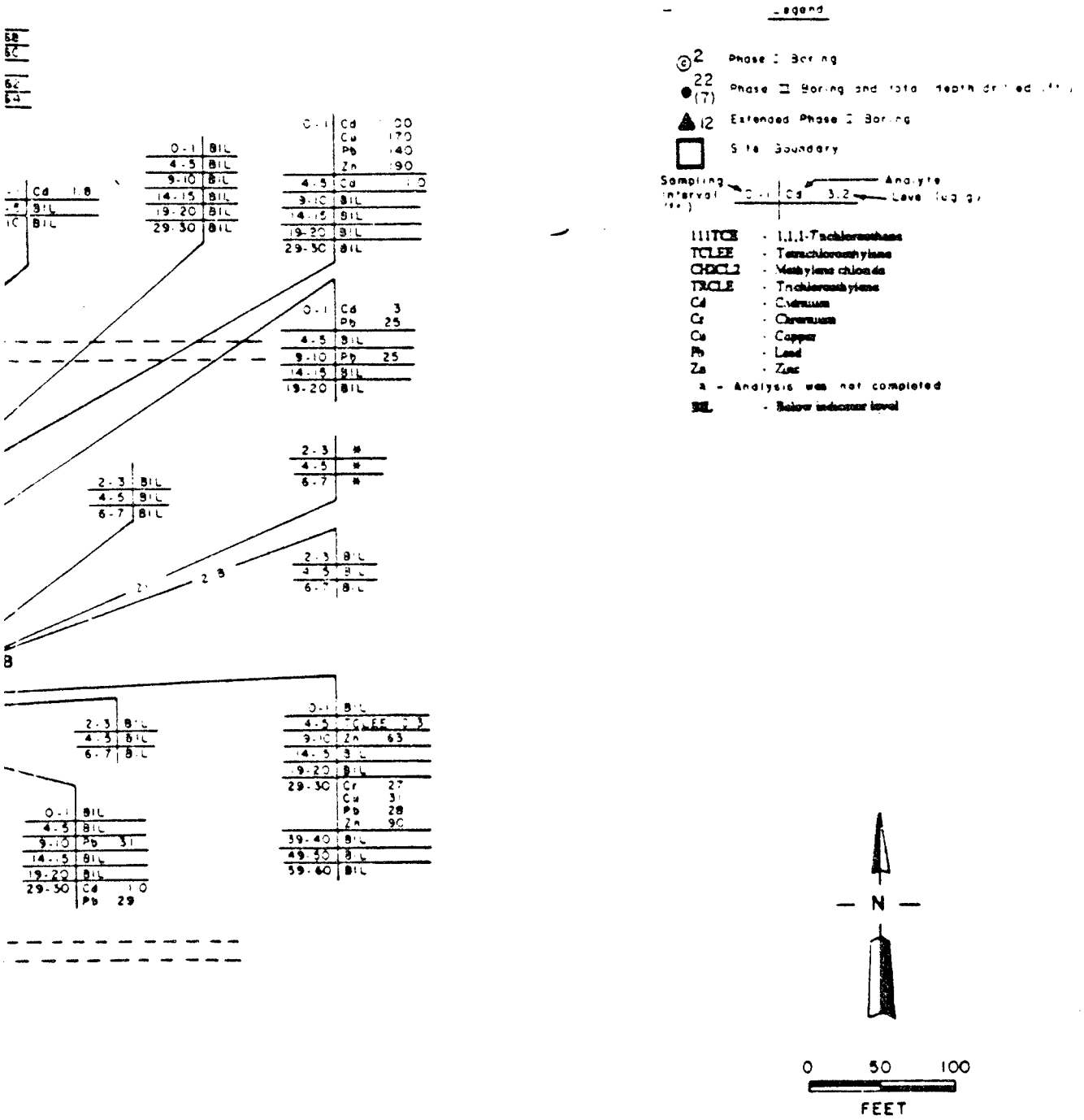


Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-3c-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-3c-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-3c

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methylene chloride	0.8	4-5	16	2	14-15	16
Tetrachloroethylene	1	9-10	11	2	19-20	11
1,1,1-Trichloroethane	0.5	9-10	11	0.8	19-20	11
Trichloroethylene	--	--	--	1	19-20	11
Cadmium	1100	0-1	12	--	--	--
Copper	170	0-1	12	--	--	--
Lead	140	0-1	12	--	--	--
Zinc	300	0-1	11	--	--	--

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-3c-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
METHYLENE CHLORIDE	3.3E+03	6.9E+02	5.7E+02	2.4E-04	2.9E-03	3.1E-03	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	5.8E+03	4.7E+02	2.0E-03	3.4E-04	2.3E-03	0.0E+00
1,1,1-TRICHLOROETHANE	7.5E+05	2.8E+06	5.9E+05	6.7E-07	2.9E-07	9.6E-07	0.0E+00
TRICHLOROETHYLENE	2.3E+03	8.5E+03	1.8E+03	0.0E+00	1.2E-04	1.2E-04	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	2.4E+00*	0.0E+00	2.4E+00*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	4.1E-04	0.0E+00	4.1E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	9.1E-03	0.0E+00	9.1E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.5E-04	0.0E+00	1.5E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3c-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
METHYLENE CHLORIDE	3.3E+03	6.9E+02	5.7E+02	2.4E-04	2.9E-03	3.1E-03	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	5.8E+03	4.7E+02	2.0E-03	3.4E-04	2.3E-03	0.0E+00
1,1,1-TRICHLOROETHANE	7.5E+05	2.8E+06	5.9E+05	6.7E-07	2.9E-07	9.6E-07	0.0E+00
TRICHLOROETHYLENE	2.3E+03	8.5E+03	1.8E+03	0.0E+00	1.2E-04	1.2E-04	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	2.4E+00*	0.0E+00	2.4E+00*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	4.1E-04	0.0E+00	4.1E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	9.1E-03	0.0E+00	9.1E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.5E-04	0.0E+00	1.5E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3c-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
METHYLENE CHLORIDE	4.5E+02	2.1E+02	1.5E+02	1.8E-03	9.4E-03	1.1E-02	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	9.0E+02	6.6E+01	1.4E-02	2.2E-03	1.6E-02	0.0E+00
1,1,1-TRICHLOROETHANE	3.2E+05	1.0E+06	2.4E+05	1.6E-06	7.9E-07	2.4E-06	0.0E+00
TRICHLOROETHYLENE	3.2E+02	2.4E+02	1.4E+02	0.0E+00	4.2E-03	4.2E-03	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	1.9E+01*	0.0E+00	1.9E+01*	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	6.8E-04	0.0E+00	6.8E-04	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	1.5E-02	0.0E+00	1.5E-02	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	2.9E-04	0.0E+00	2.9E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3c-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
METHYLENE CHLORIDE	4.1E+03	3.6E-01	3.6E-01	1.9E-04	5.6E+00*	5.6E+00*	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	8.4E+00	8.3E+00	1.5E-03	2.4E-01*	2.4E-01*	0.0E+00
1,1,1-TRICHLOROETHANE	4.2E+05	8.1E+02	8.1E+02	1.2E-06	9.8E-04	9.8E-04	0.0E+00
TRICHLOROETHYLENE	2.9E+03	4.0E+00	4.0E+00	0.0E+00	2.5E-01*	2.5E-01*	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	3.1E+00*	0.0E+00	3.1E+00*	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	9.7E-04	0.0E+00	9.7E-04	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	2.1E-02	0.0E+00	2.1E-02	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	3.8E-04	0.0E+00	3.8E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

WSA-3c-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM	VEI ENC
METHYLENE CHLORIDE	2.5E+02	9.2E+01	2.6E-01	2.6E-01	3.2E-03	7.6E+00*	7.6E+00*	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	7.8E+02	1.1E+00	1.1E+00	2.4E-02	1.8E+00*	1.8E+00*	0.0E+00	0.0E+00
1,1,1-TRICHLOROETHANE	7.8E+04	3.7E+05	4.8E+02	4.8E+02	6.4E-06	1.7E-03	1.7E-03	0.0E+00	0.0E+00
TRICHLOROETHYLENE	1.8E+02	1.1E+03	1.3E+00	1.3E+00	0.0E+00	7.6E-01*	7.6E-01*	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	1.4E+02*	0.0E+00	1.4E+02*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	3.0E-03	0.0E+00	3.0E-03	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	6.4E-02	0.0E+00	6.4E-02	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	2.2E-03	0.0E+00	2.2E-03	0.0E+00	0.0E+00

*: EI is equal to or exceeds 1.0E-01

2.12 SITE WSA-3d: EAST LANDFILL - METHYLISOBUTYL KETONE DETECTION (formerly Site 4-3: Burning Pit; EBASCO, 1988f/RIC 88126R01 and EBASCO, 1988g/RIC 88126R01A)

2.12.1 Site-Specific Considerations

Figure WSA-3d-1 and Table WSA-3d-1 depict the target contaminants for Site WSA-3d. Borings 9 and 24 through 26 were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-3d (EBASCO, 1988f/RIC 88126R01).

2.12.2 Spatial Distribution of Measured Contaminant Concentrations

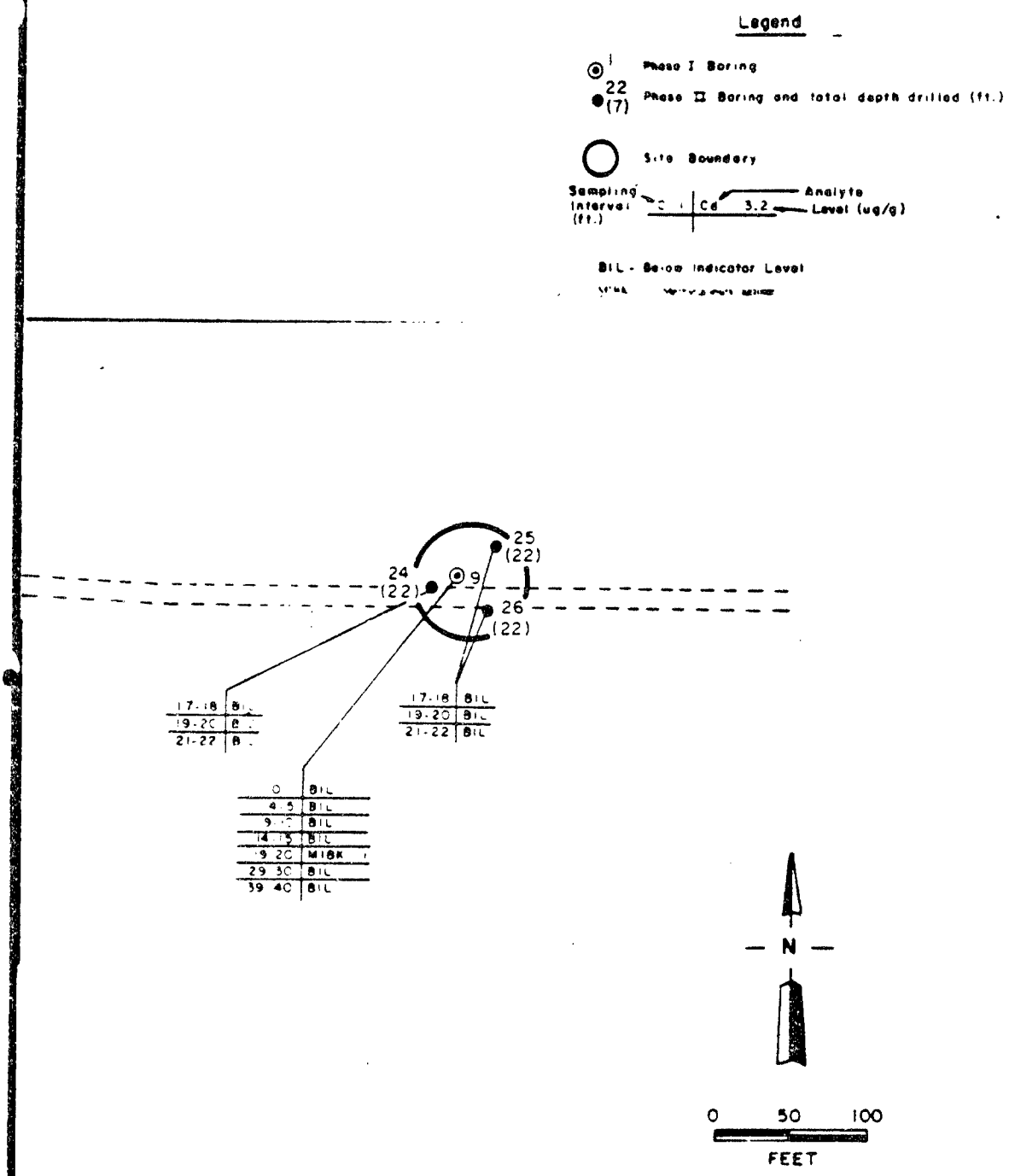
The locations and concentrations of the target contaminants that were detected in Site WSA-3d are depicted in Figure WSA-3d-1. Table WSA-3d-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.12.3 Site Exposure Summary

Tables WSA-3d-2 through WSA-3d-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-3d is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-3d-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-3d-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-3d

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methylisobutyl ketone	--	--	--	1	19-20	9

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-3d-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
METHYLISOBUTYL KETONE	4.1E+05	1.9E+07	4.0E+05	0.0E+00	5.3E-08	5.3E-08	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3d-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
METHYLISOBUTYL KETONE	4.1E+05	1.9E+07	4.0E+05	0.0E+00	5.3E-08	5.3E-08	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3d-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
METHYLISOBUTYL KETONE	1.7E+05	1.5E+07	1.7E+05	0.0E+00	6.5E-08	6.5E-08	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-3d-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
METHYLISOBUTYL KETONE	2.2E+05	8.5E+01	8.5E+01	0.0E+00	1.2E-02	1.2E-02	0.0E+00

WSA-3d-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
METHYL ISOBUTYL KETONE	4.0E+04	2.5E+06	8.5E+01	8.5E+01	0.0E+00	1.2E-02	1.2E-02	0.0E+00	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.13 SITE WSA-4a: OPEN STORAGE YARD - METHYL CYCLOHEXANE DETECTION (formerly Site 4-4: Open Storage and Salvage Yard Support Areas; EBASCO, 1988h/RIC 88126R03 and EBASCO, 1988i/RIC 88126R03A)

2.13.1 Site-Specific Considerations

Figure WSA-4a-1 and Tables WSA-4a-1 and WSA-4a-2 depict the target contaminants for Site WSA-4a. Boring 3 was included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-4a (EBASCO, 1988h/RIC 88126R03).

2.13.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-4a are depicted in Figure WSA-4a-1. Methyl cyclohexane, occurring in Boring 3 (14-15 ft) was not included in the figure since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown on this figure, methyl cyclohexane was included in the Western SAR and in this exposure assessment because it passed through the screening performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-4a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Table WSA-4a-1 shows that no target contaminants were found above the indicator level. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-4a-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

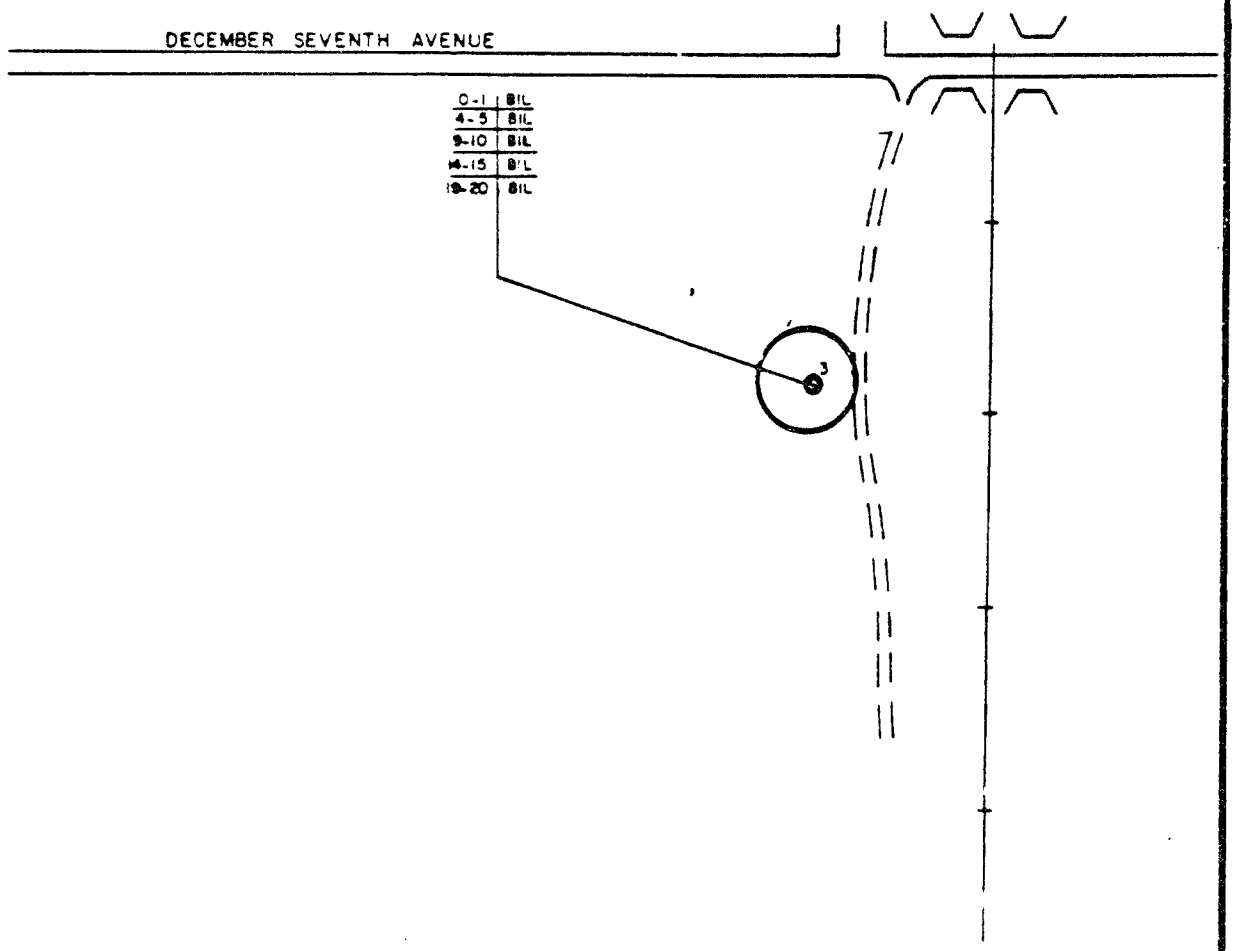
2.13.3 Site Exposure Summary

Tables WSA-4a-3 through WSA-4a-7 present Draft PPLVs and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-4a is greater than 10 ft the

enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity.

Only nontarget soil contaminants are shown in Table WSA-4a-1. Since nontarget contaminants (excluding 1,1,2,2-tetrachloroethane) were not assessed using the PPLV methodology, no COCs were identified for this site. Site WSA-4a is designated as a Priority 2 site.

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Legend

Sample Interval (ft) → 0-1 | Cu — Analyte; 30 — Level (ug/g)

Site Boundary

14 Phase I boring

BIL - Below Indicator Level

- N -

0 200

FEET

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground; Maryland

FIGURE WSA-4a-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-4a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-4a

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methyl cyclohexane[1/]	--	--	--	0.20	14-15	3

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

TABLE WSA-4a-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-4a

AVERAGE SITE DEPTH TO GROUNDWATER: 75 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE	12	04014	12/2/87
DIBROMOCHLOROPROPANE	6.7	04014	05/12/88
DIISOPROPYLMETHYL PHOSPHONATE	0.88	04014	10/24/88
MALATHION	0.68	04014	10/24/88
SUPONA	0.96	04014	10/24/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE
FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-4a-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	9.5E-08
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	1.1E-07
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	1.7E-13
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	2.5E-16
SUPONA	1.2E+03	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	2.8E-16

WSA-4a-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	9.5E-08
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	1.1E-07
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	1.7E-13
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	2.5E-16
SUPONA	1.2E+03	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	2.8E-16

WSA-4a-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	1.4E-06
DIBROMOCHLOROPROPANE	2.5E+00	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-06
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	0.0E+00	2.8E+05	0.0E+00	0.0E+00	0.0E+00	1.1E-12
MALATHION	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	1.6E-15
SUPONA	5.3E+02	0.0E+00	5.3E+02	0.0E+00	0.0E+00	0.0E+00	1.8E-15

WSA-4a-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	7.4E-03
DIBROMOCHLOROPROPANE	2.3E+01	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	8.8E-03
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	0.0E+00	3.7E+05	0.0E+00	0.0E+00	0.0E+00	3.9E-08
MALATHION	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	5.9E-11
SUPONA	6.9E+02	0.0E+00	6.9E+02	0.0E+00	0.0E+00	0.0E+00	6.6E-11

WSA-4a-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	7.1E-07	2.2E-02
DIBROMOCHLOROPROPANE	1.4E+00	0.0E+00	0.0E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	8.5E-07	2.6E-02
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	0.0E+00	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	1.2E-12	3.9E-08
MALATHION	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.9E-15	5.9E-11
SUPONA	1.3E+02	0.0E+00	0.0E+00	1.3E+02	0.0E+00	0.0E+00	0.0E+00	2.1E-15	6.6E-11

2.14 SITE WSA-4b: OPEN STORAGE AND SALVAGE YARD SUPPORT AREAS (formerly Site 4-4: Open Storage and Salvage Yard Support Areas;-EBASCO, 1988h/RIC 88126R03 and EBASCO, 1988i/RIC 88126R03A)

2.14.1 Site-Specific Considerations

Figure WSA-4b-1 and Tables WSA-4b-1 and WSA-4b-2 depict the target contaminants for Site WSA-4b. Borings 5 through 7, 9, 10, 12 through 14, and 15 through 28 were included in this exposure assessment consistent with the Western SAR. According to the site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-4b (EBASCO, 1988h/RIC 88126R03).

2.14.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-4b are shown in Figure WSA-4b-1. Toluene, occurring in Borings 5 (0-1 ft and 19-20 ft) and 9 (59-60 ft), was not included in this figure because it was detected in the nontarget analysis (EBASCO, 1988h/RIC 88126R03), but is still considered a target contaminant for this exposure assessment (see Appendix A). Tetrahydrofuran, occurring in Boring 6 (9-10 ft) was not included in the figure since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown on this figure, tetrahydrofuran was included in the Western SAR and in this exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-4b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury for Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-4b-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.14.3 Site Exposure Summary

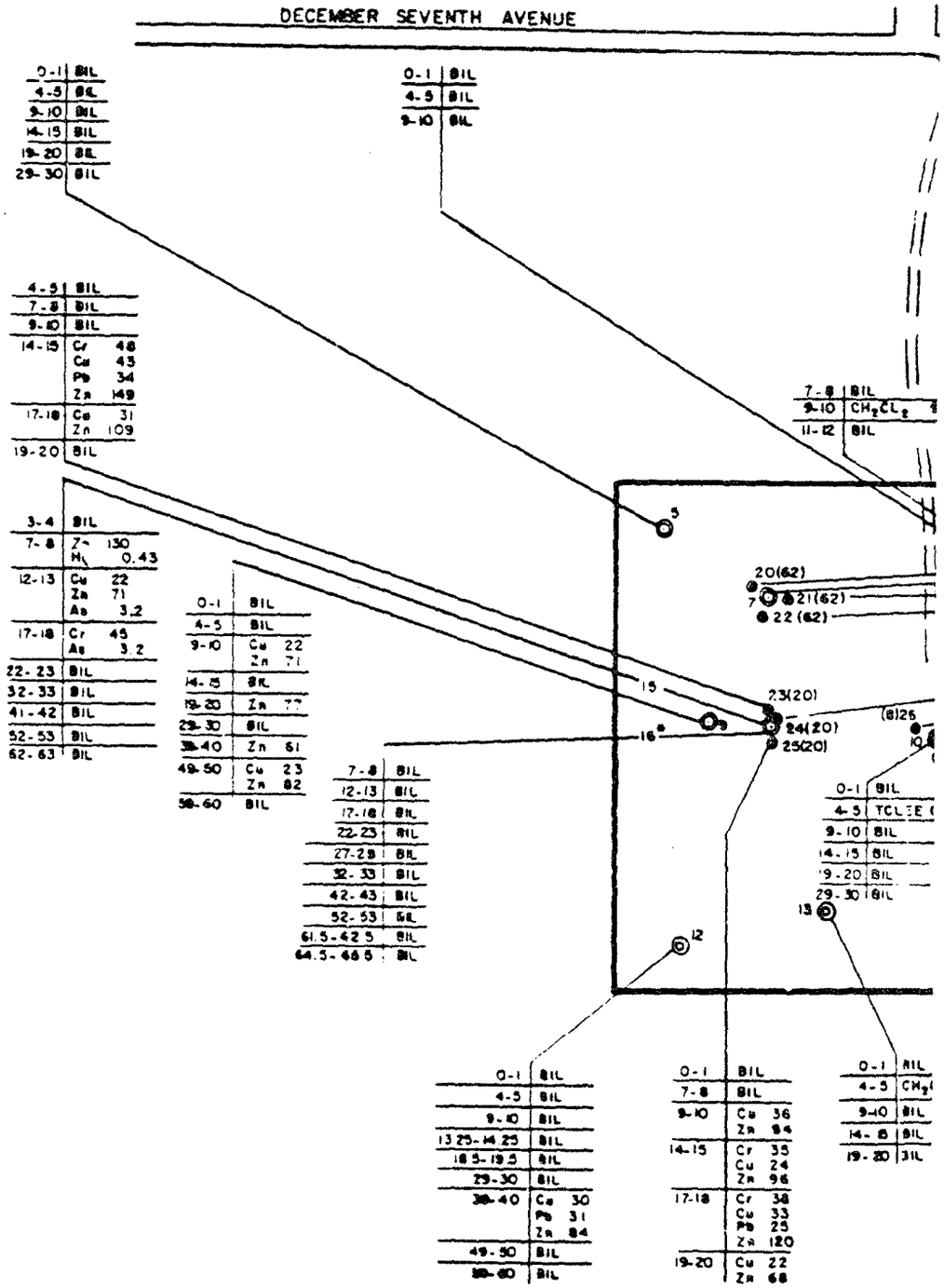
Tables WSA-4b-3 through WSA-4b-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-4b is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

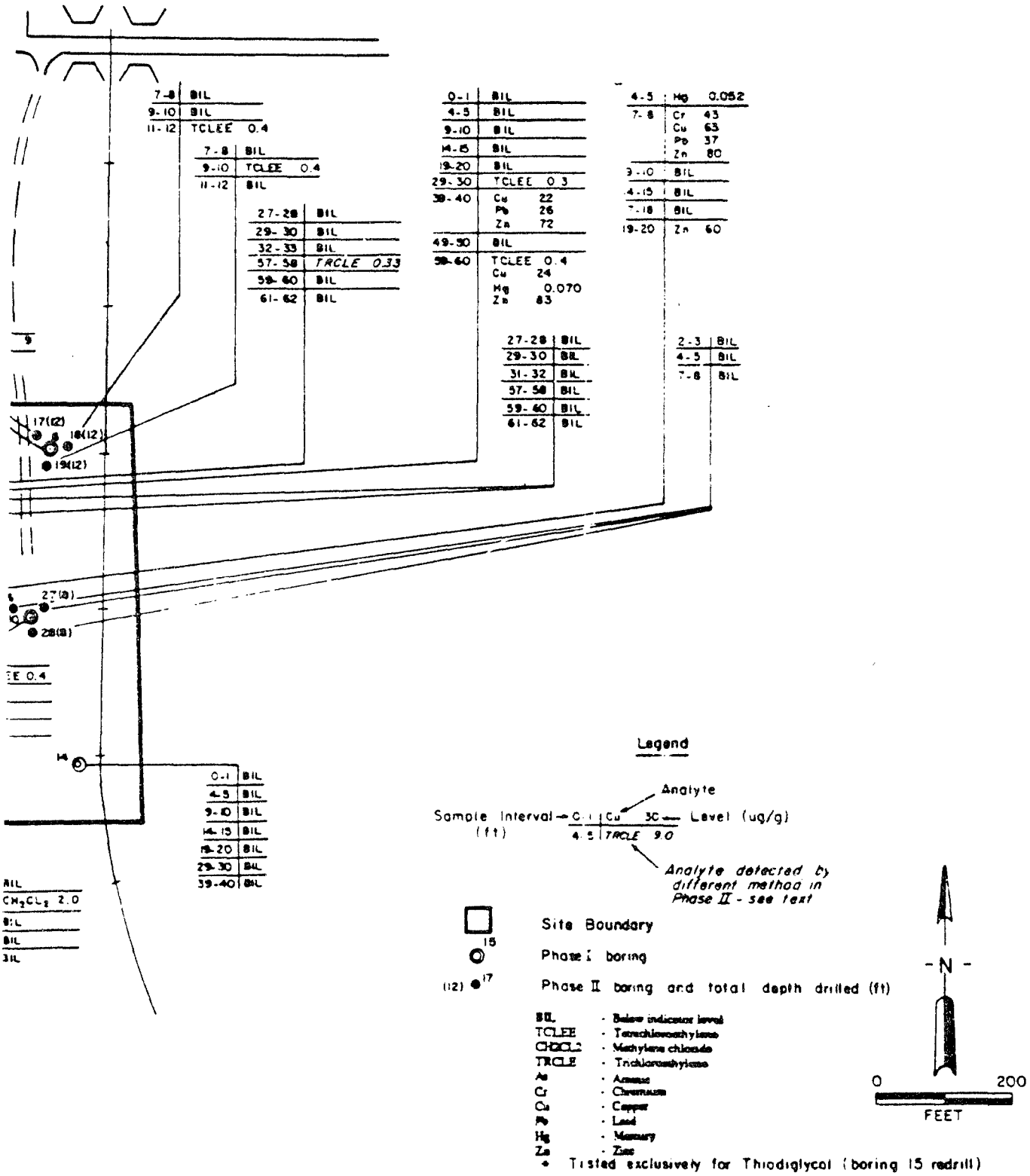
Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Chromium	Direct	Direct	Direct	Direct	Direct
Methylene chloride	--	--	--	Indirect	Indirect
Tetrachloroethylene	--	--	--	--	Indirect
Trichloroethylene	--	--	--	--	Indirect

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLV. Site WSA-4b is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.


DECEMBER SEVENTH AVENUE
0-1 BIL
4-5 BIL
9-10 BIL
14-15 BIL
19-20 BIL
29-30 BIL
0-1 BIL
4-5 BIL
9-10 BIL
4-5 BIL
7-8 BIL
9-10 BIL
14-15 Cr 48
Cu 43
Pb 34
Zn 149
17-18 Cu 31
Zn 109
19-20 BIL
7-8 BIL
9-10 CH2CL2
11-12 BIL
3-4 BIL
7-8 Zn 130
Hg 0.43
12-13 Cu 22
Zn 71
As 3.2
17-18 Cr 45
As 3.2
22-23 BIL
32-33 BIL
41-42 BIL
52-53 BIL
62-63 BIL
0-1 BIL
4-5 BIL
9-10 Cu 22
Zn 71
14-15 BIL
19-20 Zn 77
29-30 BIL
39-40 Zn 61
49-50 Cu 23
Zn 82
59-60 BIL
7-8 BIL
12-13 BIL
17-18 BIL
22-23 BIL
27-28 BIL
32-33 BIL
42-43 BIL
52-53 BIL
61.5-62.5 BIL
64.5-66.5 BIL
5
20(62)
7
21(62)
22(62)
15
23(20)
9
24(20)
16
25(20)
(8)26
10
0-1 BIL
4-5 TCLEE
9-10 BIL
14-15 BIL
19-20 BIL
29-30 BIL
13
12
0-1 BIL
4-5 BIL
9-10 BIL
13.25-14.25 BIL
18.5-19.5 BIL
29-30 BIL
39-40 Cu 30
Pb 31
Zn 84
49-50 BIL
59-60 BIL
0-1 BIL
7-8 BIL
9-10 Cu 36
Zn 84
14-15 Cr 35
Cu 24
Zn 96
17-18 Cr 38
Cu 33
Pb 25
Zn 120
19-20 Cu 22
Zn 68
0-1 BIL
4-5 CH2
9-10 BIL
14-15 BIL
19-20 BIL



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground; Maryland

FIGURE WSA-4b-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-4b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-4b

	Horizon 1			Horizon 2		
Contaminant	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methylene chloride	9	9-10	17	9	9-10	17
Tetrachloroethylene	0.4	4-5	10	0.4	4-5	10
	--	9-10	19		9-10	19
	--	--	--		11-12	18
	--	--	--		59-60	7
Tetrahydrofuran[1/]	200	9-10	6	200	9-10	6
Toluene	0.8	0-1	5	1.0	59-60	9
Trichloroethylene	--	--	--	0.33	57-58	20
Chromium	43	7-8	24	--	--	--
Copper	63	7-8	24	--	--	--
Mercury	0.43	7-8	15	--	--	--
Zinc	180	7-8	24	--	--	--

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA	Western Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE WSA-4b-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-4b

AVERAGE SITE DEPTH TO GROUNDWATER: 72 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
M-XYLENE	1.7	04029	10/20/88
ALDRIN	0.53	04027	12/4/87
BENZENE	12	04014	12/2/87
CHLOROFORM	1.2	04029	06/2/88
DIBROMOCHLOROPROPANE	10	04026	05/9/88
DIISOPROPYLMETHYL PHOSPHONATE	0.88	04014	10/24/88
MALATHION	0.68	04014	10/24/88
SUPONA	0.96	04014	10/24/88
TRICHLOROETHYLENE	5.4	04037	11/14/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-4b-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	0.0E+00	1.5E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-08
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	7.5E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.1E-08
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	1.3E-06
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	1.3E-12
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	2.0E-15
METHYLENE CHLORIDE	3.3E+03	2.1E+05	3.2E+03	2.7E-03	4.3E-05	2.8E-03	0.0E+00
SUPONA	1.2E+03	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	2.2E-15
TETRACHLOROETHYLENE	5.1E+02	2.5E+04	5.0E+02	7.8E-04	1.6E-05	8.0E-04	0.0E+00
TOLUENE	2.5E+06	1.4E+08	2.4E+06	3.2E-07	7.0E-09	3.3E-07	0.0E+00
TRICHLOROETHYLENE	2.3E+03	2.5E+04	2.1E+03	0.0E+00	1.3E-05	1.3E-05	3.1E-07
M-XYLENE	1.4E+07	0.0E+00	1.4E+07	0.0E+00	0.0E+00	0.0E+00	1.0E-10
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	6.2E-01*	0.0E+00	6.2E-01*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	1.5E-04	0.0E+00	1.5E-04	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.3E-04	0.0E+00	1.3E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	9.1E-05	0.0E+00	9.1E-05	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-4b-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	0.0E+00	1.5E+00	0.0E+00	0.0E+00	0.0E+00	2.7E-08
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	7.5E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.1E-08
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	1.3E-06
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	1.3E-12
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	2.0E-15
METHYLENE CHLORIDE	3.3E+03	2.1E+05	3.2E+03	2.7E-03	4.3E-05	2.8E-03	0.0E+00
SUPONA	1.2E+03	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	2.2E-15
TETRACHLOROETHYLENE	5.1E+02	2.5E+04	5.0E+02	7.8E-04	1.6E-05	8.0E-06	0.0E+00
TOLUENE	2.5E+06	1.4E+08	2.4E+06	3.2E-07	7.0E-09	3.3E-07	0.0E+00
TRICHLOROETHYLENE	2.3E+03	2.5E+04	2.1E+03	0.0E+00	1.3E-05	1.3E-05	3.1E-07
M-XYLENE	1.4E+07	0.0E+00	1.4E+07	0.0E+00	0.0E+00	0.0E+00	1.0E-10
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	6.2E-01*	0.0E+00	6.2E-01*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	1.5E-04	0.0E+00	1.5E-04	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.3E-04	0.0E+00	1.3E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	9.1E-05	0.0E+00	9.1E-05	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-4b-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	2.1E-01	0.0E+00	2.1E-01	0.0E+00	0.0E+00	0.0E+00	4.2E-07
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	1.1E-05
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-07
DIBROMOCHLOROPROPANE	2.5E+00	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-05
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	0.0E+00	2.8E+05	0.0E+00	0.0E+00	0.0E+00	8.5E-12
MALATHION	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	1.3E-14
METHYLENE CHLORIDE	4.5E+02	3.2E+04	4.5E+02	2.0E-02	2.8E-04	2.0E-02	0.0E+00
SUPONA	5.3E+02	0.0E+00	5.3E+02	0.0E+00	0.0E+00	0.0E+00	1.4E-14
TETRACHLOROETHYLENE	7.1E+01	3.9E+03	7.0E+01	5.6E-03	1.0E-04	5.7E-03	0.0E+00
TOLUENE	1.1E+06	2.2E+07	1.0E+06	7.5E-07	4.5E-08	8.0E-07	0.0E+00
TRICHLOROETHYLENE	3.2E+02	3.9E+03	2.9E+02	0.0E+00	8.5E-05	8.5E-05	4.6E-06
M-XYLENE	5.8E+06	0.0E+00	5.8E+06	0.0E+00	0.0E+00	0.0E+00	6.7E-10
CHROMIUM	8.8E+00	0.0E+00	8.8E+00	4.9E+00*	0.0E+00	4.9E+00*	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	2.5E-04	0.0E+00	2.5E-04	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	2.2E-04	0.0E+00	2.2E-04	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.7E-04	0.0E+00	1.7E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-4b-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	0.0E+00	1.9E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-04
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	7.8E-03
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-04
DIBROMOCHLOROPROPANE	2.3E+01	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	1.4E-02
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	0.0E+00	3.7E+05	0.0E+00	0.0E+00	0.0E+00	4.1E-08
MALATHION	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	6.2E-11
METHYLENE CHLORIDE	4.1E+03	7.9E+00	7.9E+00	2.2E-03	1.1E+00*	1.1E+00*	0.0E+00
SUPONA	6.9E+02	0.0E+00	6.9E+02	0.0E+00	0.0E+00	0.0E+00	6.9E-11
TETRACHLOROETHYLENE	6.5E+02	8.4E+00	8.3E+00	6.2E-04	4.8E-02	4.8E-02	0.0E+00
TOLUENE	1.4E+06	5.5E+03	5.4E+03	5.8E-07	1.8E-04	1.8E-04	0.0E+00
TRICHLOROETHYLENE	2.9E+03	6.0E+00	6.0E+00	0.0E+00	5.5E-02	5.5E-02	3.1E-03
M-XYLENE	7.0E+06	0.0E+00	7.0E+06	0.0E+00	0.0E+00	0.0E+00	3.2E-06
CHROMIUM	5.5E+01	0.0E+00	5.5E+01	7.8E-01*	0.0E+00	7.8E-01*	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	3.6E-04	0.0E+00	3.6E-04	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	3.1E-04	0.0E+00	3.1E-04	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	2.3E-04	0.0E+00	2.3E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-4b-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIREC · OSVI (mg/kg)	ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW	ENC
ALDRIN	1.2E-01	0.0E+00	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	2.1E-07	8.7E-0
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	5.7E-06	2.3E-0
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	8.6E-08	3.5E-0
DIBROMOCHLOROPROPANE	1.4E+00	0.0E+00	0.0E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-05	4.2E-0
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	0.0E+00	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	9.8E-12	4.1E-0
MALATHION	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.5E-14	6.2E-1
METHYLENE CHLORIDE	2.5E+02	2.8E+04	7.9E+00	7.7E+00	3.6E-02	1.1E+00*	1.2E+00*	0.0E+00	0.0E+0
SUPONA	1.3E+02	0.0E+00	0.0E+00	1.3E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-14	6.9E-1
TETRACHLOROETHYLENE	4.1E+01	3.3E+03	1.1E+00	1.0E+00	9.7E-03	3.8E-01*	3.9E-01*	0.0E+00	0.0E+0
TOLUENE	2.6E+05	1.9E+07	5.5E+03	5.4E+03	3.1E-06	1.8E-04	1.9E-04	0.0E+00	0.0E+0
TRICHLOROETHYLENE	1.8E+02	3.4E+03	9.7E-01	9.6E-01	0.0E+00	3.4E-01*	3.4E-01*	2.3E-06	9.4E-0
M-XYLENE	8.8E+05	0.0E+00	0.0E+00	8.8E+05	0.0E+00	0.0E+00	0.0E+00	7.8E-10	3.2E-0
CHROMIUM	1.1E+00	0.0E+00	0.0E+00	1.1E+00	3.8E+01*	0.0E+00	3.8E+01*	0.0E+00	0.0E+0
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	1.1E-03	0.0E+00	1.1E-03	0.0E+00	0.0E+0
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	9.3E-04	0.0E+00	9.3E-04	0.0E+00	0.0E+0
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	1.3E-03	0.0E+00	1.3E-03	0.0E+00	0.0E+0

*· EI is equal to or exceeds 1.0E-01

ı: the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.15 SITE WSA-5a: NORTH LANDFILL - TRENCH (formerly Site 4-5: Burning Pits; EBASCO, 1988j/RIC 88076R02 and EBASCO, 1988k/RIC 88076R02A)

2.15.1 Site-Specific Considerations

Figure WSA-5a-1 and Table WSA-5a-1 depict the target contaminants for Site WSA-5a. Boring 32 was included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contaminant assessment revealed that the burning pits may have received material from the old mustard plant (EBASCO, 1988j/RIC 88076R02); however, mustard and its degradable products were not detected in the soil during the Phase I and Phase II investigations. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-5a (EBASCO, 1988j/RIC 88076R02).

2.15.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-5a are depicted in Figure WSA-5a-1. Table WSA-5a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

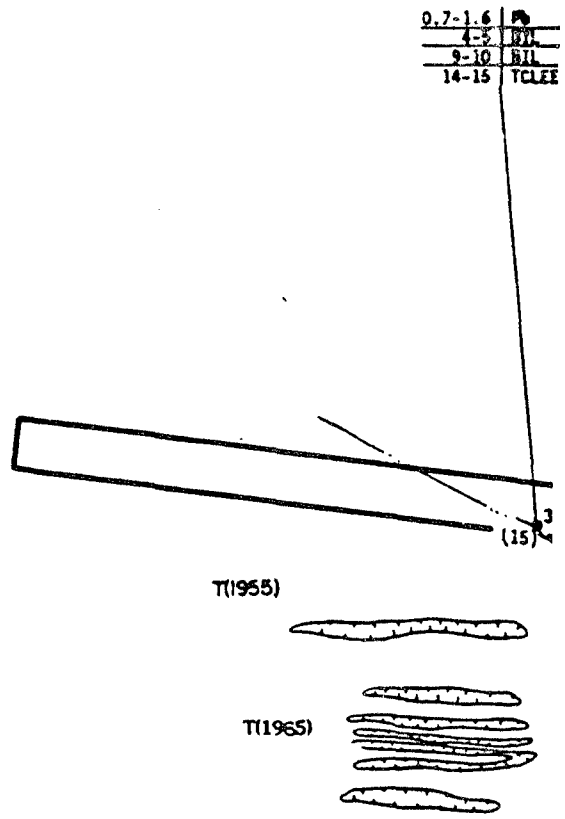
2.15.3 Site Exposure Summary

Tables WSA-5a-2 through WSA-5a-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Tetrachloroethylene	--	--	--	--	Indirect

Note: Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the indirect pathways are the primary contributors to the exceedance of the cumulative PPLVs. Site WSA-5a is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Legend

(12) 19 — Phase II Boring and Total Depth Drilled (ft.)

Site Boundary

T(1965) — Trench Location and Date of Aerial Photo Interpreted

Drainage Ditch and Culvert

TCLEE - Tetrachloroethylene
Pb - Lead
BDL - Below detection level

Sampling Interval (feet) → 0-1 | Zn 68 ← Level (µg/g)

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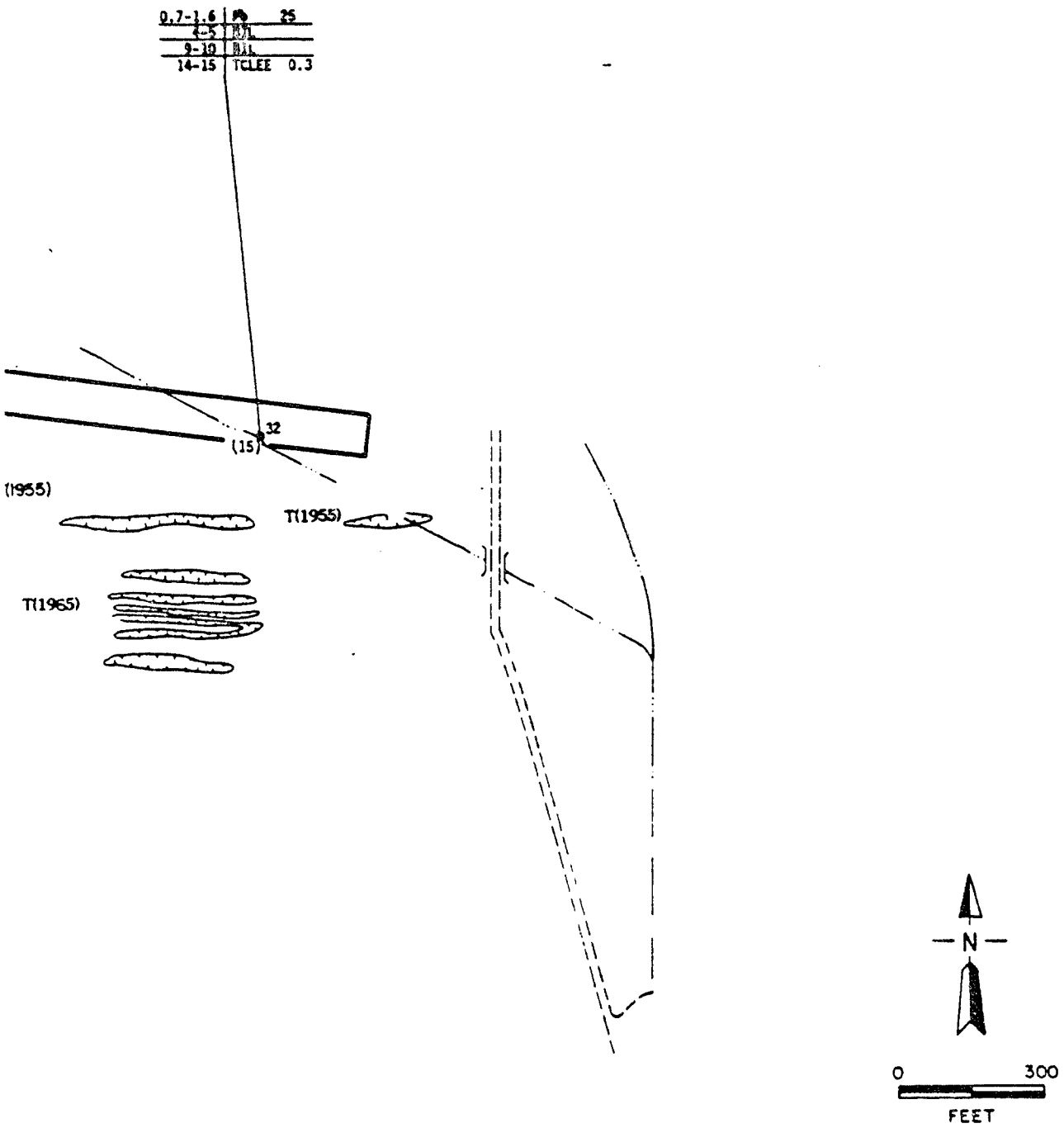


Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-5a-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

el (µg/g)

TABLE WSA-5a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-5a

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Tetrachloroethylene	--	--	--	0.3	14-15	32

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-5a-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW
TETRACHLOROETHYLENE	5.1E+02	2.0E+03	4.1E+02	0.0E+00	1.5E-04	1.5E-04	0.0E+00

WSA-5a-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
TETRACHLOROETHYLENE	5.1E+02	2.0E+03	4.1E+02	0.0E+00	1.5E-04	1.5E-04	0.0E+00

WSA-5a-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
TETRACHLOROETHYLENE	7.1E+01	3.1E+02	5.8E+01	0.0E+00	9.7E-04	9.7E-04	0.0E+00

WSA-5a-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
TETRACHLOROETHYLENE	6.5E+02	8.5E+00	8.6E+00	0.0E+00	3.4E-02	3.4E-02	0.0E+00

WSA-5a-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
TETRACHLOROETHYLENE	4.1E+01	7.7E+02	1.2E+00	1.1E+00	0.0E+00	2.6E-01*	2.6E-01*	0.0E+00	0.0E+00

*: EI is equal to or exceeds 1.0E-01

2.16 SITE WSA-5b: NORTH LANDFILL - BURN PIT (formerly Site 4-5: Burning Pits; EBASCO, 1988j/RIC 88076R02 and EBASCO, 1988k/RIC 88076R02A)

2.16.1 Site-Specific Considerations

Figure WSA-5b-1 and Tables WSA-5b-1 and WSA-5b-2 depict the target contaminants for Site WSA-5b. Borings 29 and 29B were included in this exposure assessment, consistent with the Western SAR. The history search conducted under the contaminant assessment revealed that the burning pits may have received material from the old mustard plant (EBASCO, 1988j/RIC 88076R02); however, mustard and its degradation products were not detected in soil during the Phase I and Phase II investigations. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-5b (EBASCO, 1988j/RIC 88076RO2).

2.16.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-5b are depicted in Figure WSA-5b-1. Table WSA-5b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-5b-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

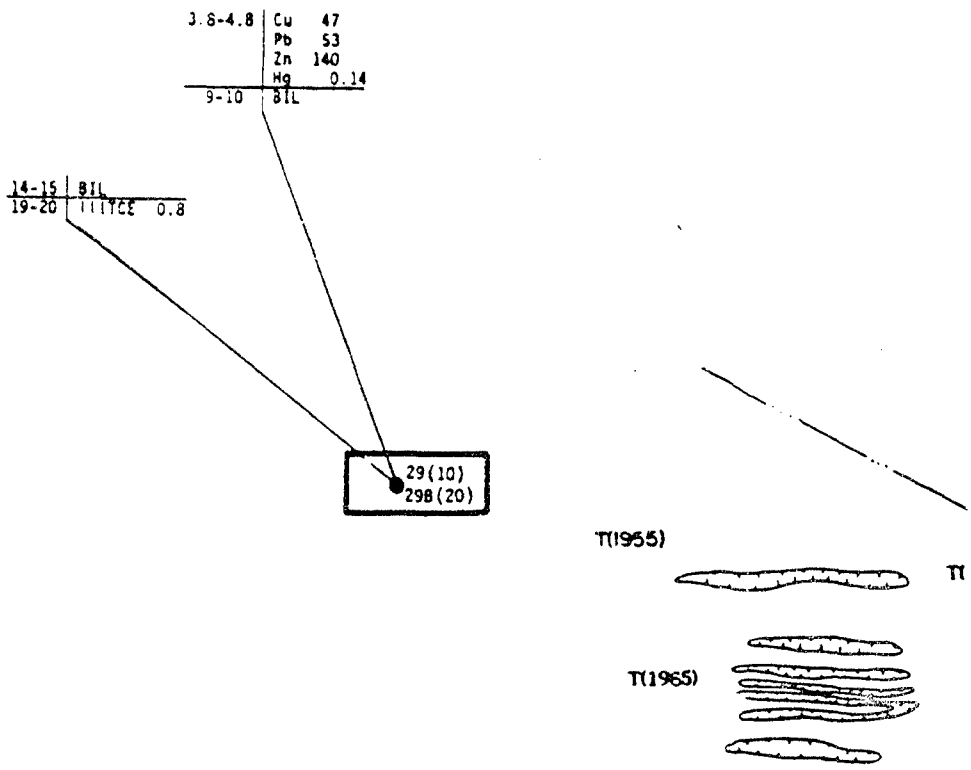
2.16.3 Site Exposure Summary

Tables WSA-5b-3 through WSA-5b-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-5b is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-5b is designated as Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Legend

(12)● 19 — Phase II Boring and Total Depth Drilled (ft.)

Site Boundary

T(1960) — Trench Location and Date of Aerial Photo Interpreted

Drainage Ditch and Culvert

BIL - Below indicator level
111TCE - 1,1,1-Trichloroethane
Cu - Copper
Pb - Lead
Hg - Mercury
Zn - Zinc

Sampling Interval (feet) → 0-1 | Zn 68 ← Level (µg/g)
Analyte

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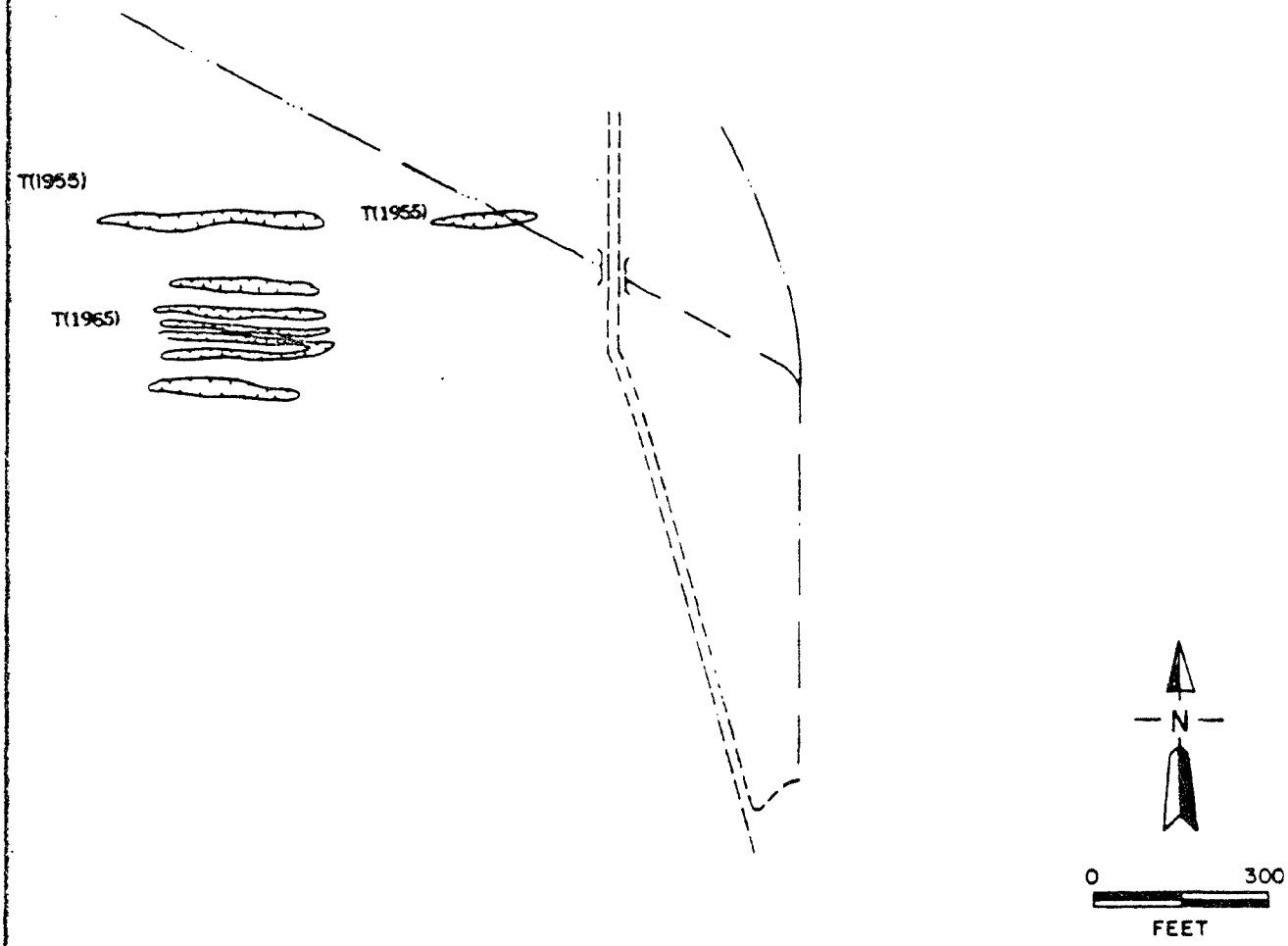


Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-5b-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

evel (µg/g)

TABLE WSA-5b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-5b

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
1,1,1-Trichloroethane	--	--	--	0.8	19-20	29B
Copper	47	3.8-4.8	29	--	--	--
Lead	53	3.8-4.8	29	--	--	--
Mercury	0.14	3.8-4.8	29	--	--	--
Zinc	140	3.8-4.8	29	--	--	--

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

TABLE WSA-5b-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-5b

AVERAGE SITE DEPTH TO GROUNDWATER: 71 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE	5.6	04010	05/12/88
CHLOROBENZENE	37	04010	05/12/88
TRICHLOROETHYLENE	3.3	04010	05/12/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTI
FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-5b-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-07
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	9.3E-09
1,1,1-TRICHLOROETHANE	7.5E+05	3.2E+07	7.3E+05	0.0E+00	2.5E-08	2.5E-08	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	8.4E-08
COPPER	4.2E+05	0.0E+00	4.2E+05	1.1E-04	0.0E+00	1.1E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	3.4E-03	0.0E+00	3.4E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	4.2E-05	0.0E+00	4.2E-05	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	7.1E-05	0.0E+00	7.1E-05	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-5b-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-07
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	9.3E-09
1,1,1-TRICHLOROETHANE	7.5E+05	3.2E+07	7.3E+05	0.0E+00	2.5E-08	2.5E-08	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	8.4E-08
COPPER	4.2E+05	0.0E+00	4.2E+05	1.1E-04	0.0E+00	1.1E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	3.4E-03	0.0E+00	3.4E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	4.2E-05	0.0E+00	4.2E-05	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	7.1E-05	0.0E+00	7.1E-05	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-5b-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	2.5E-06
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	6.0E-08
1,1,1-TRICHLOROETHANE	3.2E+05	1.1E+07	3.1E+05	0.0E+00	7.0E-08	7.0E-08	0.0E+00
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	1.3E-06
COPPER	2.5E+05	0.0E+00	2.5E+05	1.9E-04	0.0E+00	1.9E-04	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	5.7E-03	0.0E+00	5.7E-03	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	7.1E-05	0.0E+00	7.1E-05	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.3E-04	0.0E+00	1.3E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-5b-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI EMC
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	3.8E-03
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	6.4E-04
1,1,1-TRICHLOROETHANE	4.2E+05	9.0E+02	8.9E+02	0.0E+00	8.9E-04	8.9E-04	0.0E+00
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	1.9E-03
COPPER	1.8E+05	0.0E+00	1.8E+05	2.7E-04	0.0E+00	2.7E-04	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	8.1E-03	0.0E+00	8.1E-03	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	1.0E-04	0.0E+00	1.0E-04	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	1.8E-04	0.0E+00	1.8E-04	0.0E+00

WSA-5b-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW	VEI ENC
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	1.2E-06	1.1E-02
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	6.9E-08	6.4E-04
1,1,1-TRICHLOROETHANE	7.8E+04	4.2E+06	5.5E+02	5.4E+02	0.0E+00	1.5E-03	1.5E-03	0.0E+00	0.0E+00
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	6.3E-07	5.8E-03
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	8.2E-04	0.0E+00	8.2E-04	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	2.4E-02	0.0E+00	2.4E-02	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	3.0E-04	0.0E+00	3.0E-04	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	1.0E-03	0.0E+00	1.0E-03	0.0E+00	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.17 SITE WSA-5c: NORTH LANDFILL - TRENCH (formerly Site 4-5: Burning Pits, EBASCO, 1988j/RIC 88076RO2 and EBASCO, 1988k/RIC 88076RO2A)

2.17.1 Site-Specific Considerations

Figure WSA-5c-1 and Tables WSA-5c-1 and WSA-5c-2 depict the target contaminants for Site WSA-5c. Borings 2, 27, and 28 were included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contaminant assessment revealed that the burning pits may have received material from the old mustard plant (EBASCO, 1988j/RIC 88076R02); however, mustard and its degradation products were not detected in soil during the Phase I and Phase II investigations. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-5c (EBASCO, 1988j/RIC 88076R02).

2.17.2 Spatial Distribution of Measured Contaminant Concentrations

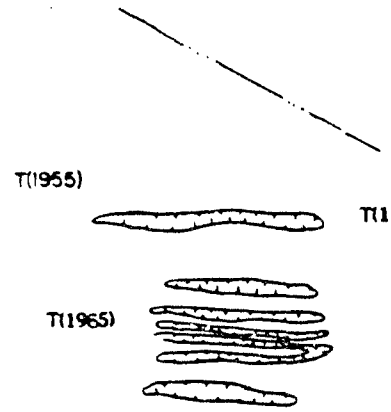
The locations and concentrations of the target contaminants that were detected in Site WSA-5c are depicted in Figure WSA-5c-1. Table WSA-5c-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Methylene chloride, shown in Table WSA-5c-1 is excluded from consideration in the exposure analysis for this site, because it was considered a laboratory contaminant in the sample analyzed. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-5c-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.17.3 Site Exposure Summary

Tables WSA-5c-3 through WSA-5c-7 present Draft PPLVs and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-5c is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity.

Only laboratory contaminants are shown in Table WSA-5c-1. Since laboratory contaminants were not assessed using the PPLV methodology, no COCs were identified for this site. Site WSA-5c is designated as a Priority 2 site.

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Legend

1 — Phase I Boring

19 — Phase II Boring and Total Depth Drilled (ft.)

Site Boundary

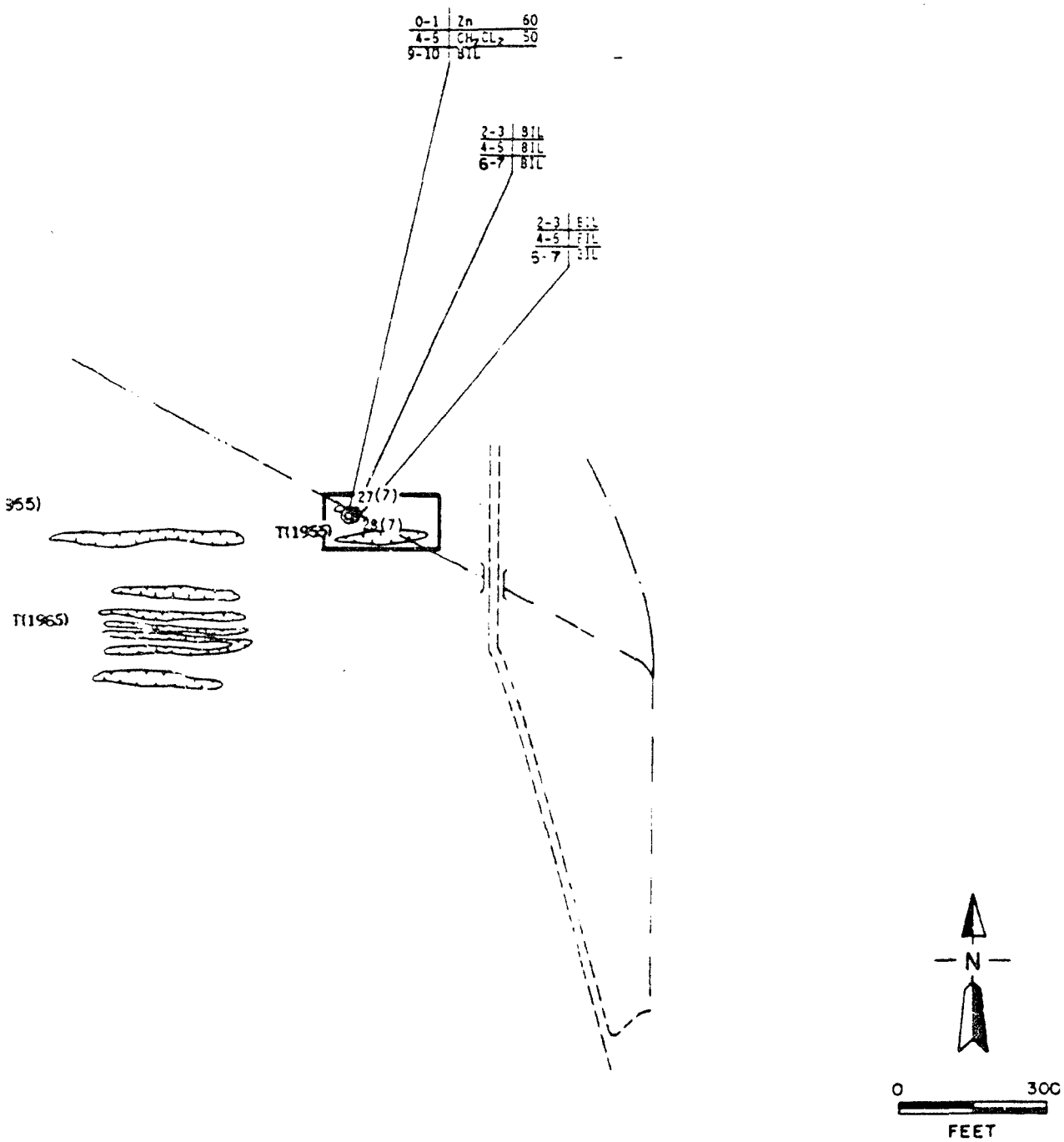
T(1965) — Trench Location and Date of Aerial Photo Interpreted

Drainage Ditch and Culvert

CH_2Cl_2 - Methylene chloride
Zn - Zinc
BL - Below unknown level

Sampling Interval (feet) → 0-1 | Zn 68 ← Level (µg/g)
Analyte

F ·pared fo
Program M
Rocky Mou
Aberdeen F



(µg/g)

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-5c-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE WSA-5c-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-5c

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methylene chloride[1/]	50	4-5	2	50	4-5	2

1/ Suspected laboratory contaminant.

WSA	Western Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE WSA-5c-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-5c

AVERAGE SITE DEPTH TO GROUNDWATER: 74 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
CHLOROFORM	0.83	04037	06/2/8
TRICHLOROETHYLENE	5.4	04037	11/14/

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANAL
FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-5c-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	4.1E-09
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.5E-07

WSA-5c-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	4.1E-09
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.5E-07

WSA-5c-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	6.1E-08
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	2.3E-06

WSA-5c-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	8.5E-05
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	3.2E-03

WSA-5c-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	3.1E-08	2.5E-04
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	1.2E-06	9.7E-03

2.18 SITE WSA-5d: NORTH LANDFILL - TRENCHES (formerly Site 4-5: Burning Pits; EBASCO,1988j/RIC 88076R0. and EBASCO, 1988k/RIC 88076R02A)

2.18.1 Site-Specific Considerations

Figure WSA-5d-1 and Table WSA-5d-1 depict the target contaminants for Site WSA-5d. Borings 1, 4 through 6, 9 through 11, 14 through 26, 30, 30A, 30B, and 31 were included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contamination assessment revealed that the burning pits may have received material from the old mustard plant (EBASCO, 1988j/RIC 88076R02); however, mustard and its degradation products were not detected in soil during the Phase I and Phase II investigations. According to the site history, no other chemicals from the RMA target contaminant lists were suspected to be present in Site WSA-5d (EBASCO, 1988j/RIC 88076R02).

2.18.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-5d are shown in Figure WSA-5d-1. The following contaminants were not included in the figure since they were not considered target contaminants during the Phase I and Phase II investigations: Methyl cyclohexane, occurring in Borings 10 (14-15 ft) and 31 (7-8 ft); and fluoranthene or pyrene, occurring on Boring 30 (5.5-5.8 ft). Although not shown on this figure, these nontarget compounds were included in the Western SAR and in this exposure assessment because they passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-5d-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Methylene chloride, shown in table WSA-5d-1 is excluded from consideration in the exposure analysis for this site, because it was considered a laboratory contaminant in the samples analyzed. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from

the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

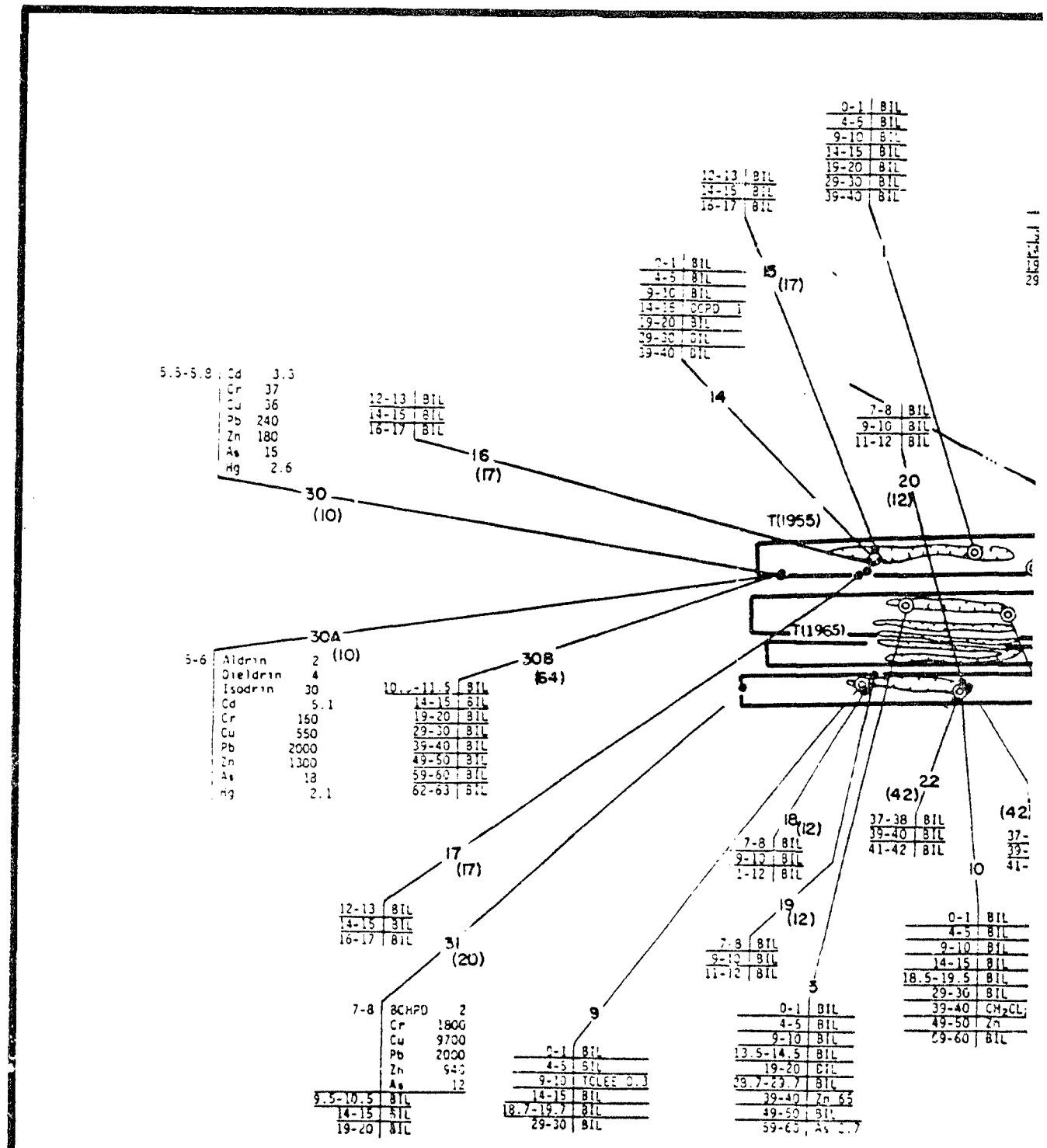
2.18.3 Site Exposure Summary

Tables WSA-5d-2 through WSA-5d-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Aldrin	Direct	Direct	Direct	Direct	Direct
Dieldrin	Direct	Direct	Direct	Direct	Dir/Ind
Arsenic	Direct	Direct	Direct	Direct	Direct
Chromium	Direct	Direct	Direct	Direct	Direct
Lead	Direct	Direct	Direct	Direct	Direct
Isodrin	--	--	Direct	Cumulative	Direct
Dicyclopentadiene	--	--	--	Indirect	Indirect
Cadmium	--	--	--	--	Direct
Copper	--	--	--	--	Direct

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. It should be noted for Isodrin, the cumulative EI exceeds 0.1 for the commercial worker, but the direct and indirect EIs do not exceed 0.1. Site WSA-5d is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



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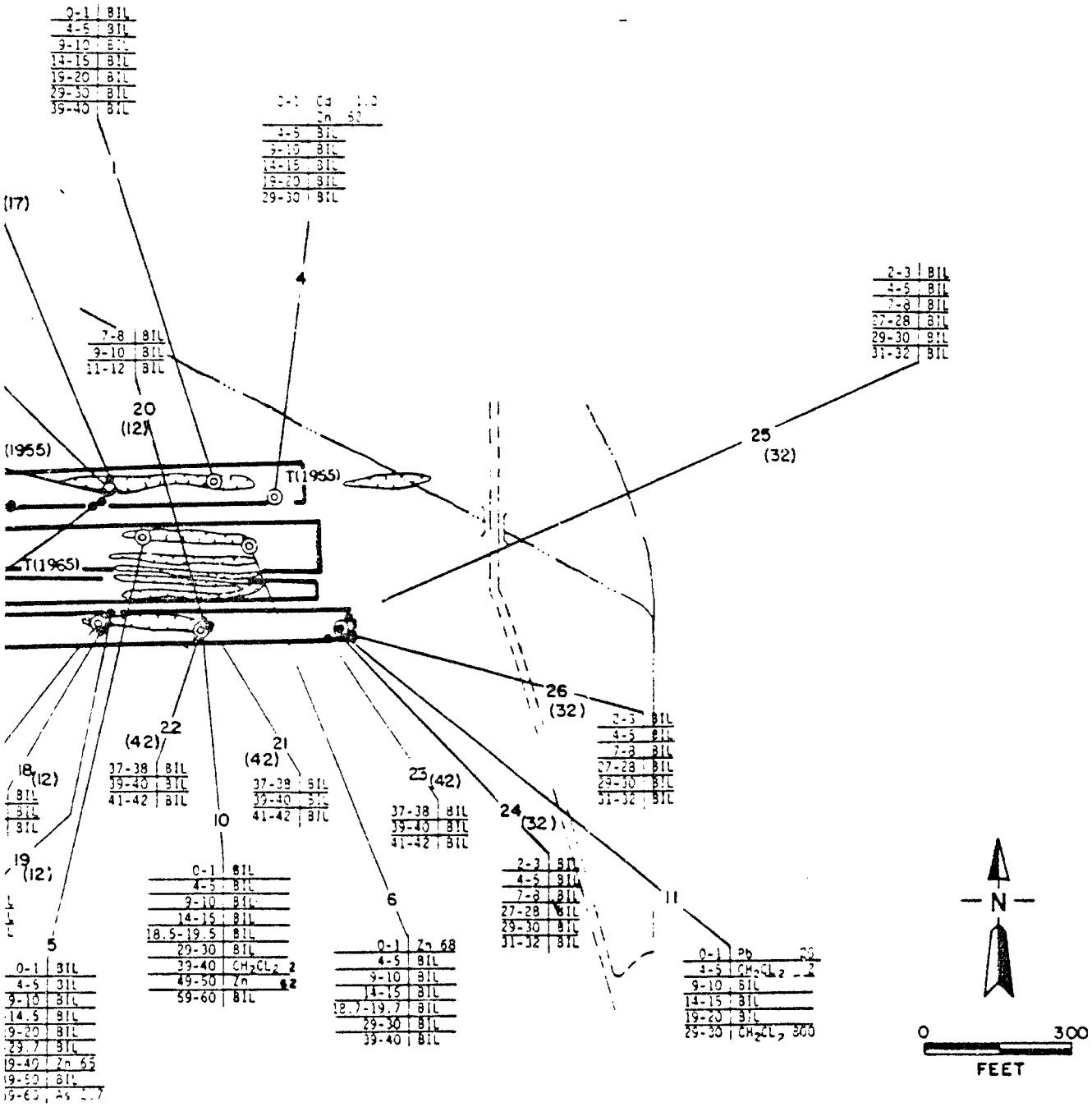


Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-5d-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

el (ug/g)

TABLE WSA-5d-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-5d

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Aldrin	2	5-6	30A	2	5-6	30A
Bicycloheptadiene	2	7-8	31	2	7-8	31
Dicyclopentadiene	--	--	--	1	14-15	14
Dieldrin	4	5-6	30A	4	5-6	30A
Fluoranthene or Pyrene[1/]	4.0	5.5-5.8	30	4	5.1-6.1	30
Isodrin	30	5-6	30A	30	5-6	30A
Methyl cyclohexane[1/]	60	7-8	31	60	7-8	31
Methylene chloride[2/]	2	4-5	11	800	29-30	11
Tetrachloroethylene	0.3	9-10	9	0.3	9-10	9
Arsenic	18	5-6	30A	--	--	--
Cadmium	5.1	5-6	30A	--	--	--
Chromium	1800	7-8	31	--	--	--
Copper	9700	7-8	31	--	--	--
Lead	2000	5-6	30A	--	--	--
		7-8	31	--	--	--
Mercury	2.6	5.5-5.8	30	--	--	--
Zinc	1300	5-6	30A	--	--	--

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.
2/ Suspected laboratory contaminant.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

REA11/TBL0077.REA VI-B 8/30/90 10:44 pm rml 18

WSA-5d-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	1.3E+05	1.5E+00	1.3E+00*	1.5E-05	1.3E+00*	0.0E+00
BICYCLOHEPTADIENE	3.2E+05	1.3E+06	2.5E+05	6.3E-06	1.6E-06	7.9E-06	0.0E+00
DICYCLOPENTADIENE	5.4E+06	3.3E+03	3.1E+03	0.0E+00	3.0E-04	3.0E-04	0.0E+00
DIELDRIN	1.6E+00	5.9E+04	1.6E+00	2.5E+00*	6.8E-05	2.5E+00*	0.0E+00
ISODRIN	5.8E+02	1.0E+06	5.8E+02	5.2E-02	3.2E-06a	5.2E-02	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	5.2E+04	5.1E+02	5.9E-04	5.8E-06	5.9E-04	0.0E+00
ARSENIC	2.2E+01	0.0E+00	2.2E+01	8.3E-01*	0.0E+00	8.3E-01*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	1.1E-02	0.0E+00	1.1E-02	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	2.6E+01*	0.0E+00	2.6E+01*	0.0E+00
COPPER	6.2E+05	0.0E+00	6.2E+05	2.3E-02	0.0E+00	2.3E-02	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	1.3E-01*	0.0E+00	1.3E-01*	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	7.9E-04	0.0E+00	7.9E-04	0.0E+00
ZINC	2.2E+06	0.0E+00	2.2E+06	6.6E-04	0.0E+00	6.6E-04	0.0E+00

a [illegible] and produces a vapor flux which is below one-tenth of [illegible] is considered to be equal to pure compound. [illegible] mg/kg (See volume VI-A).

* [illegible]

* [illegible] the calculations imply that the contaminant [illegible] the exposure pathway considered, even in its pure form.

WSA-5d-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	1.3E+05	1.5E+00	1.3E+00*	1.5E-05	1.3E+00*	0.0E+00
BICYCLOHEPTADIENE	3.2E+05	1.3E+06	2.5E+05	6.3E-06	1.6E-06	7.9E-06	0.0E+00
DICYCLOPENTADIENE	5.4E+04	3.3E+03	3.1E+03	0.0E+00	3.0E-04	3.0E-04	0.0E+00
DIELDRIN	1.6E+00	5.9E+04	1.6E+00	2.5E+00*	6.8E-05	2.5E+00*	0.0E+00
ISODRIN	5.8E+02	1.0E+06	5.8E+02	5.2E-02	3.2E-06a	5.2E-02	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	5.2E+04	5.1E+02	5.9E-04	5.8E-05	5.9E-04	0.0E+00
ARSENIC	2.2E+01	0.0E+00	2.2E+01	8.3E-01*	0.0E+00	8.3E-01*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	1.1E-02	0.0E+00	1.1E-02	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	2.6E+01*	0.0E+00	2.6E+01*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	2.3E-02	0.0E+00	2.3E-02	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	1.3E-01*	0.0E+00	1.3E-01*	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	7.9E-04	0.0E+00	7.9E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	6.6E-04	0.0E+00	6.6E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-5d-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	2.1E-01	8.6E+03	2.1E-01	9.6E+00*	2.3E-04	9.6E+00*	0.0E+00
BICYCLOHEPTADIENE	1.4E+05	4.6E+05	1.0E+05	1.5E-05	4.4E-06	1.9E-05	0.0E+00
DICYCLOPENTADIENE	1.8E+04	1.2E+03	1.1E+03	0.0E+00	8.4E-04	8.4E-04	0.0E+00
DIELDRIN	2.2E-01	3.9E+03	2.2E-01	1.8E+01*	1.0E-03	1.8E+01*	0.0E+00
ISODRIN	2.5E+02	1.0E+06	2.5E+02	1.2E-01*	2.1E-05a	1.2E-01*	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	8.0E+03	7.0E+01	4.2E-03	3.7E-05	4.3E-03	0.0E+00
ARSENIC	3.9E+00	0.0E+00	3.9E+00	4.6E+00*	0.0E+00	4.6E+00*	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	8.8E-02	0.0E+00	8.8E-02	0.0E+00
CHROMIUM	8.8E+00	0.0E+00	8.8E+00	2.0E+02*	0.0E+00	2.0E+02*	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	3.9E-02	0.0E+00	3.9E-02	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	2.2E-01*	0.0E+00	2.2E-01*	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	1.3E-03	0.0E+00	1.3E-03	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.2E-03	0.0E+00	1.2E-03	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-5d-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	1.3E+02	1.9E+00	1.1E+00*	1.6E-02	1.1E+00*	0.0E+00
BICYCLOHEPTADIENE	1.8E+05	5.3E+02	5.3E+02	1.1E-05	3.7E-03	3.8E-03	0.0E+00
DICYCLOPENTADIENE	1.7E+04	3.6E-01	3.6E-01	0.0E+00	2.8E+00*	2.8E+00*	0.0E+00
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	2.0E+00*	7.0E-02	2.1E+00*	0.0E+00
ISODRIN	3.2E+02	1.0E+06	2.9E+02	9.4E-02	9.9E-03a	1.0E-01*	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	2.0E+03	4.9E+02	4.6E-04	1.5E-04	6.1E-04	0.0E+00
ARSENIC	2.0E+01	0.0E+00	2.0E+01	9.0E-01*	0.0E+00	9.0E-01*	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	1.4E-02	0.0E+00	1.4E-02	0.0E+00
CHROMIUM	5.5E+01	0.0E+00	5.5E+01	3.3E+01*	0.0E+00	3.3E+01*	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	5.5E-02	0.0E+00	5.5E-02	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	3.1E-01*	0.0E+00	3.1E-01*	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	1.9E-03	0.0E+00	1.9E-03	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	1.7E-03	0.0E+00	1.7E-03	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

WSA-5d-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	1.7E+04	4.2E+01	1.2E-01	1.7E+01*	4.8E-02	1.7E+01*	0.0E+00	0.0E+00
BICYCLOHEPTADIENE	3.3E+04	1.7E+05	1.6E+03	1.5E+03	6.1E-05	1.3E-03	1.3E-03	0.0E+00	0.0E+00
DICYCLOPENTADIENE	1.2E+03	4.4E+02	1.1E+00	1.1E+00	0.0E+00	9.3E-01*	9.3E-01*	0.0E+00	0.0E+00
DIELDRIN	1.2E-01	7.9E+03	1.9E+01	1.2E-01	3.3E+01*	2.1E-01*	3.3E+01*	0.0E+00	0.0E+00
ISODRIN	5.9E+01	1.0E+06	1.0E+06	5.8E+01	5.1E-01*	9.9E-03a	5.2E-01*	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	6.9E+03	2.0E+03	4.0E+01	7.3E-03	1.9E-04	7.5E-03	0.0E+00	0.0E+00
ARSENIC	1.6E+00	0.0E+00	0.0E+00	1.6E+00	1.1E+01*	0.0E+00	1.1E+01*	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	6.7E-01*	0.0E+00	6.7E-01*	0.0E+00	0.0E+00
CHROMIUM	1.1E+00	0.0E+00	0.0E+00	1.1E+00	1.6E+03*	0.0E+00	1.6E+03*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	1.7E-01*	0.0E+00	1.7E-01*	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	9.1E-01*	0.0E+00	9.1E-01*	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	5.6E-03	0.0E+00	5.6E-03	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	9.3E-03	0.0E+00	9.3E-03	0.0E+00	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

* EI is equal to or exceeds 1.0E-01

2.19 SITE WSA-6a: MOTOR POOL AREA - MAIN DITCH (formerly Site 4-6: Motor Pool Area; EBASCO, 19881/RIC 88196R12)

2.19.1 Site-Specific Considerations

Figure WSA-6a-1 and Tables WSA-6a-1 and WSA-6a-2 depict the target contaminants for Site WSA-6a. Borings 3 through 10, 17, 18, 23 through 25, 38, 39, and grab sample G26 were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-6a (EBASCO, 19881/RIC 8819R12).

2.19.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-6a are depicted in Figure WSA-6a-1. The following contaminants were not included in the figure since they were not considered target contaminants during the Phase I and Phase II investigations: Fluoranthene or pyrene, occurring in Boring 25 (0-1 ft), 7 (0-1 ft), 9 (0-1 ft), 10 (0-1 ft), 23 (0-1 ft), 38 (0-1 ft), and 39 (0-1 ft). Although not shown in this figure, this nontarget compound was included in the Western SAR and in the exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-6a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-6a-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.19.3 Site Exposure Summary

Tables WSA-6a-3 through WSA-6a-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-6a is greater than 10 ft the

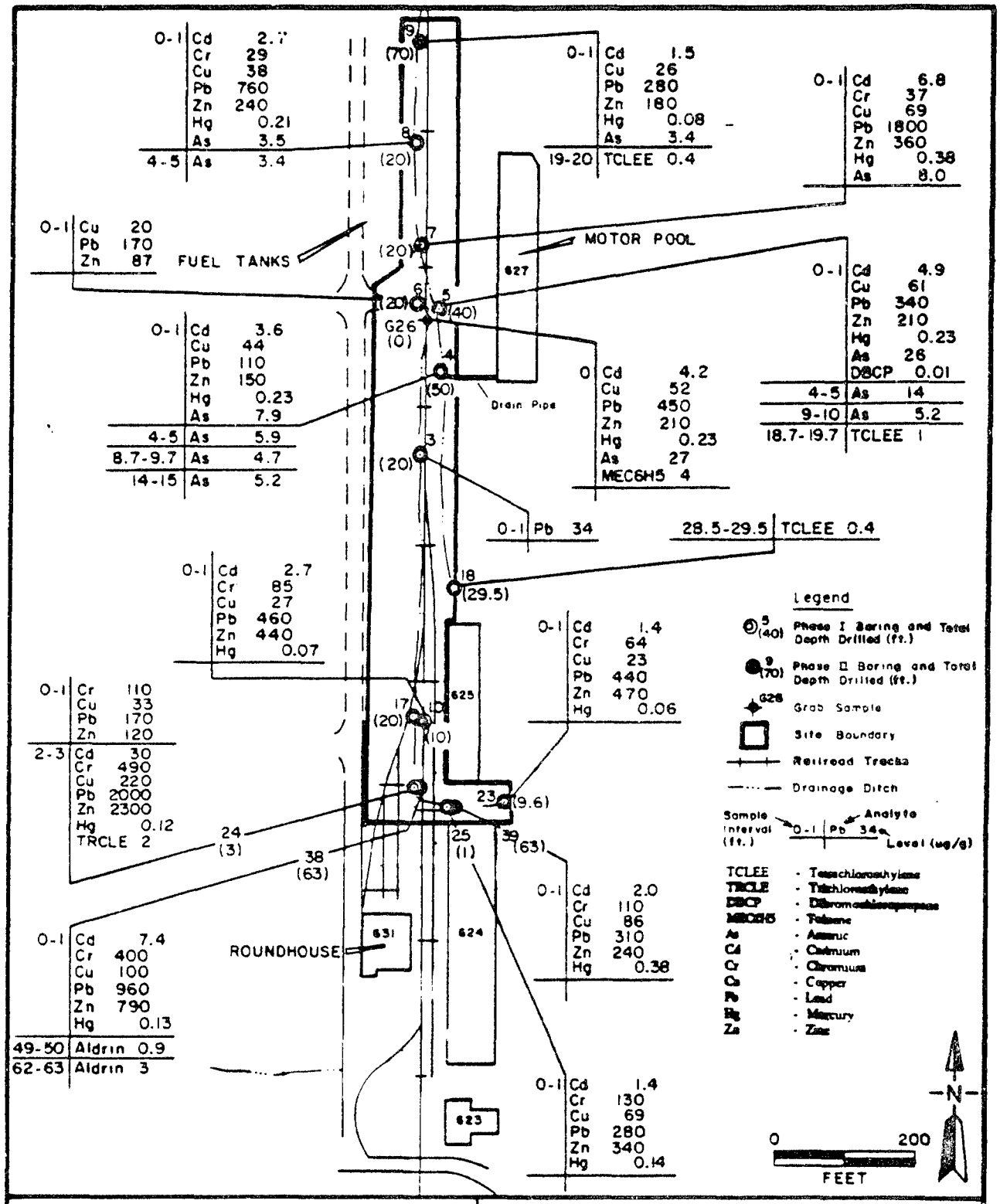
enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Arsenic	Direct	Direct	Direct	Direct	Direct
Chromium	Direct	Direct	Direct	Direct	Direct
Lead	Direct	Direct	Direct	Direct	Direct
Cadmium	--	--	Direct	--	Direct
Tetrachloroethylene	--	--	--	Indirect	Indirect
Trichloroethylene	--	--	--	Indirect	Indirect

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. Site WSA-6a is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Prepared for:

Program Managers Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-6a-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-6a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-6a

	Horizon 1			Horizon 2		
Contaminant	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Aldrin	--	--	--	3	62-63	38
Dibromochloropropane	0.01	0-1	5	0.01	0-1	5
Fluoranthene or Pyrene[1/]	30	0-1	25	30	0-1	25
Tetrachloroethylene	--	--	--	1	18.7-19.7	5
Toluene	4	0	G26	4	0	G26
Trichloroethylene	2	2-3	24	2	2-3	24
Arsenic	27	0	G26	--	--	--
Cadmium	30	2-3	24	--	--	--
Chromium	490	2-3	24	--	--	--
Copper	220	2-3	24	--	--	--
Lead	2000	2-3	24	--	--	--
Mercury	0.38	0-1	7	--	--	--
		0-1	39	--	--	--
Zinc	2300	2-3	24	--	--	--

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA	Western Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE WSA-6a-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-6a

AVERAGE SITE DEPTH TO GROUNDWATER: 68 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
1,1,2-TRICHLOROETHANE	3.4	04048	06/8/88
1,2-DICHLOROETHYLENE	1.2	04048	06/8/88
CHLOROFORM	5.8	04051	10/26/88
CHLOROBENZENE	1.1	04036	06/6/88
DIISOPROPYLMETHYL PHOSPHONATE	0.82	04036	11/14/88
TRICHLOROETHYLENE	120	04048	06/8/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-6a-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	2.3E+08	1.5E+00	0.0E+00	1.3E-08	1.3E-08	0.0E+00
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.2E-09
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.1E-07
DIBROMOCHLOROPROPANE	1.8E+01	9.0E+02	1.8E+01	5.5E-04	1.1E-05	5.7E-04	0.0E+00
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	2.4E-12
TETRACHLOROETHYLENE	5.1E+02	2.1E+04	5.0E+02	0.0E+00	4.9E-05	4.9E-05	0.0E+00
TOLUENE	2.5E+06	3.1E+08	2.5E+06	1.6E-06	1.3E-08	1.6E-06	0.0E+00
1,1,2-TRICHLOROETHANE	4.3E+02	0.0E+00	4.3E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-07
TRICHLOROETHYLENE	2.3E+03	1.6E+04	2.0E+03	8.7E-04	1.3E-04	1.0E-03	1.3E-05
ARSENIC	2.2E+01	0.0E+00	2.2E+01	1.2E+00*	0.0E+00	1.2E+00*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	6.7E-02	0.0E+00	6.7E-02	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	7.1E+00*	0.0E+00	7.1E+00*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	5.3E-04	0.0E+00	5.3E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	1.3E-01*	0.0E+00	1.3E-01*	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.1E-04	0.0E+00	1.1E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.2E-03	0.0E+00	1.2E-03	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6a-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	2.3E+08	1.5E+00	0.0E+00	1.3E-08	1.3E-08	0.0E+00
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.2E-09
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.1E-07
DIBROMOCHLOROPROPANE	1.8E+01	9.0E+02	1.8E+01	5.5E-04	1.1E-05	5.7E-04	0.0E+00
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	2.4E-12
TETRACHLOROETHYLENE	5.1E+02	2.1E+04	5.0E+02	0.0E+00	4.9E-05	4.9E-05	0.0E+00
TOLUENE	2.5E+06	3.1E+08	2.5E+06	1.6E-06	1.3E-08	1.6E-06	0.0E+00
1,1,2-TRICHLOROETHANE	4.3E+02	0.0E+00	4.3E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-07
TRICHLOROETHYLENE	2.3E+03	1.6E+04	2.0E+03	8.7E-04	1.3E-04	1.0E-03	1.3E-05
ARSENIC	2.2E+01	0.0E+00	2.2E+01	1.2E+00*	0.0E+00	1.2E+00*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	6.7E-02	0.0E+00	6.7E-02	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	7.1E+00*	0.0E+00	7.1E+00*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	5.3E-04	0.0E+00	5.3E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	1.3E-01*	0.0E+00	1.3E-01*	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.1E-04	0.0E+00	1.1E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.2E-03	0.0E+00	1.2E-03	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6a-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	2.1E-01	1.6E+07	2.1E-01	0.0E+00	1.9E-07	1.9E-07	0.0E+00
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	7.6E-09
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-06
DIBROMOCHLOROPROPANE	2.5E+00	1.4E+02	2.5E+00	4.0E-03	7.2E-05	4.1E-03	0.0E+00
1,2-DICHLOROETHYLENE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	0.0E+00	2.8E+05	0.0E+00	0.0E+00	0.0E+00	1.5E-11
TETRACHLOROETHYLENE	7.1E+01	3.2E+03	6.9E+01	0.0E+00	3.1E-04	3.1E-04	0.0E+00
TOLUENE	1.1E+06	1.1E+08	1.1E+06	3.8E-06	3.6E-08	3.8E-06	0.0E+00
1,1,2-TRICHLOROETHANE	6.0E+01	0.0E+00	6.0E+01	0.0E+00	0.0E+00	0.0E+00	2.5E-06
TRICHLOROETHYLENE	3.2E+02	4.6E+02	1.9E+02	6.3E-03	4.4E-03	1.1E-02	2.0E-04
ARSENIC	3.9E+00	0.0E+00	3.9E+00	6.8E+00*	0.0E+00	6.8E+00*	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	5.2E-01*	0.0E+00	5.2E-01*	0.0E+00
CHROMIUM	8.8E+00	0.0E+00	8.8E+00	5.6E+01*	0.0E+00	5.6E+01*	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	8.9E-04	0.0E+00	8.9E-04	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	2.2E-01*	0.0E+00	2.2E-01*	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	1.9E-04	0.0E+00	1.9E-04	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	2.2E-03	0.0E+00	2.2E-03	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6a-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	4.3E+04	1.9E+00	0.0E+00	7.1E-05	7.1E-05	0.0E+00
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	2.0E-05
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	6.2E-04
DIBROMOCHLOROPROPANE	2.3E+01	4.8E+00	3.9E+00	4.4E-04	2.1E-03	2.5E-03	0.0E+00
1,2-DICHLOROETHYLENE	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	0.0E+00	3.7E+05	0.0E+00	0.0E+00	0.0E+00	4.1E-08
TETRACHLOROETHYLENE	6.5E+02	9.1E+00	9.0E+00	0.0E+00	1.1E-01*	1.1E-01*	0.0E+00
TOLUENE	1.4E+06	5.5E+05	3.9E+05	2.9E-06	7.3E-06	1.0E-05	0.0E+00
1,1,2-TRICHLOROETHANE	5.5E+02	0.0E+00	5.5E+02	0.0E+00	0.0E+00	0.0E+00	9.5E-04
TRICHLOROETHYLENE	2.9E+03	3.4E+00	3.4E+00	6.9E-04	5.9E-01*	5.9E-01*	7.6E-02
ARSENIC	2.0E+01	0.0E+00	2.0E+01	1.4E+00*	0.0E+00	1.4E+00*	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	8.4E-02	0.0E+00	8.4E-02	0.0E+00
CHROMIUM	5.5E+01	0.0E+00	5.5E+01	8.9E+00*	0.0E+00	8.9E+00*	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	1.3E-03	0.0E+00	1.3E-03	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	3.1E-01*	0.0E+00	3.1E-01*	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	2.7E-04	0.0E+00	2.7E-04	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	2.9E-03	0.0E+00	2.9E-03	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6a-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT SVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW	VEI ENC
ALDRIN	1.2E-01	3.1E+07	1.4E+04	1.2E-01	0.0E+00	2.1E-04	2.1E-04	0.0E+00	0.0E+00
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	8.8E-09	2.0E-0
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	8.2E-07	1.9E-0
DIBROMOCHLOROPROPANE	1.4E+00	1.2E+02	4.8E+00	1.1E+00	7.1E-03	2.2E-03	9.3E-03	0.0E+00	0.0E+00
1,2-DICHLOROETHYLENE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	0.0E+00	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	1.8E-11	4.1E-08
TETRACHLOROETHYLENE	4.1E+01	2.7E+03	1.4E+00	1.4E+00	0.0E+00	6.9E-01*	6.9E-01*	0.0E+00	0.0E+00
TOLUENE	2.6E+05	4.1E+07	1.6E+06	2.2E+05	1.5E-05	2.5E-06	1.8E-05	0.0E+00	0.0E+00
1,1,2-TRICHLOROETHANE	3.4E+01	0.0E+00	0.0E+00	3.4E+01	0.0E+00	0.0E+00	0.0E+00	1.3E-06	2.8E-03
TRICHLOROETHYLENE	1.8E+02	2.1E+03	1.1E+00	1.1E+00	1.1E-02	1.8E+00*	1.8E+00*	1.0E-04	2.3E-01
ARSENIC	1.6E+00	0.0E+00	0.0E+00	1.6E+00	1.7E+01*	0.0E+00	1.7E+01*	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	3.9E+00*	0.0E+00	3.9E+00*	0.0E+00	0.0E+00
CHROMIUM	1.1E+00	0.0E+00	0.0E+00	1.1E+00	4.3E+02*	0.0E+00	4.3E+02*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	3.9E-03	0.0E+00	3.9E-03	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	9.1E-01*	0.0E+00	9.1E-01*	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	8.2E-04	0.0E+00	8.2E-04	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	1.6E-02	0.0E+00	1.6E-02	0.0E+00	0.0E+00

* EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.20 SITE WSA-6b: MOTOR POOL - FUEL TANK STORAGE AREA (formerly Site 4-6: Motor Pool Area; EBASCO, 19881/RIC 88196R12)

2.20.1 Site-Specific Considerations

Figure WSA-6b-1 and Tables WSA-6b-1 and WSA-6b-2 depict the target contaminants for Site WSA-6b. Borings 11 through 15 were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-6b (EBASCO, 19881/RIC 88196R12).

2.20.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-6b are depicted in Figure WSA-6b-1. Methyl cyclohexane, occurring in Boring 12 (4-5 ft) was not included in the figure since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown in this figure, this nontarget compound was included in the Western SAR and in this exposure assessment because it passed through the screening performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-6b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-6b-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.20.3 Site Exposure Summary

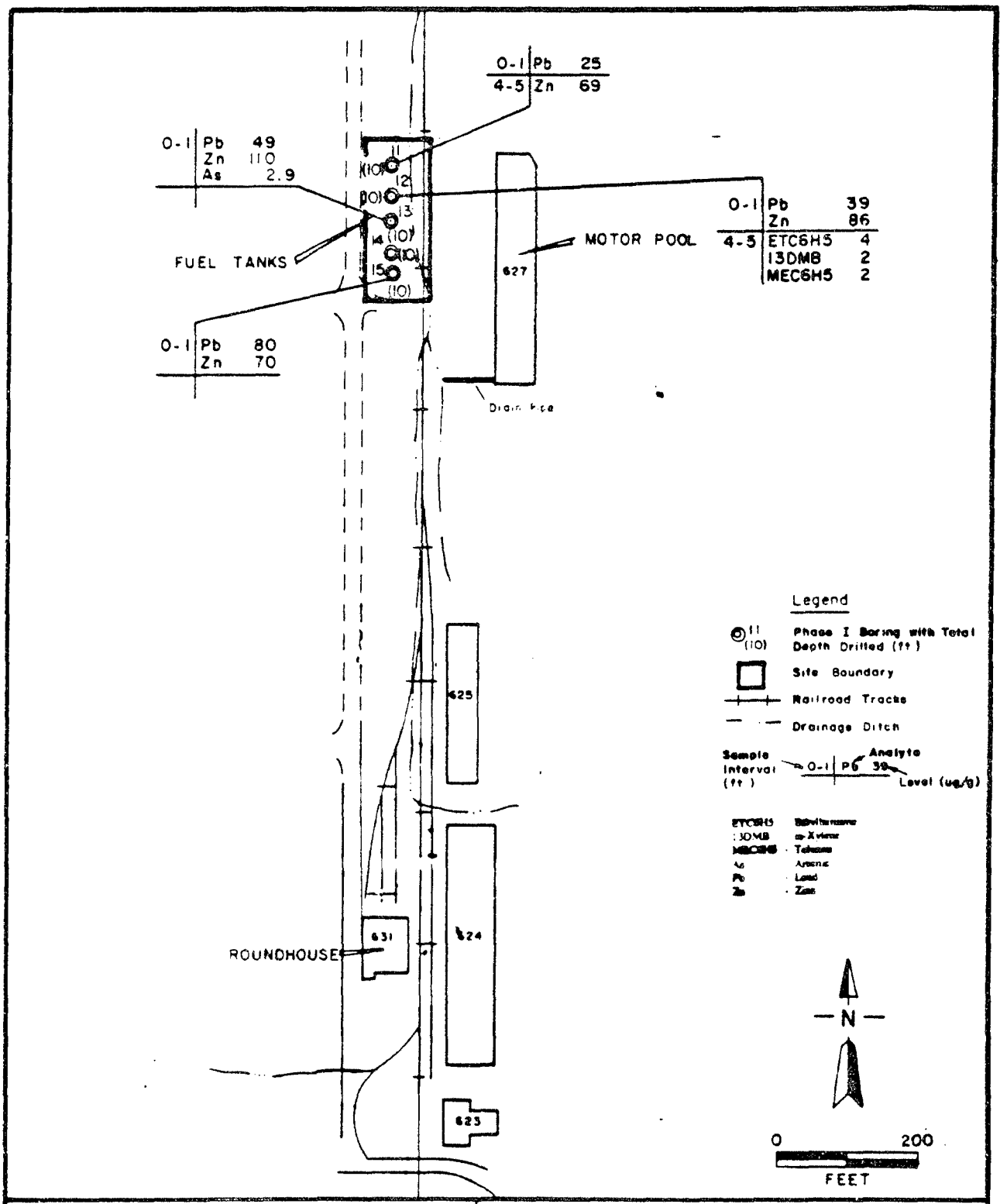
Tables WSA-6b-3 through WSA-6b-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-6b is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative

quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-6b is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-6b-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-6b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-6b

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Ethylbenzene	4	4-5	12	4	4-5	12
Methyl cyclohexane[1/]	10	4-5	12	10	4-5	12
Toluene	2	4-5	12	2	4-5	12
m-Xylene	2	4-5	12	2	4-5	12
Lead	80	0-1	15	--	--	--
Zinc	110	0-1	13	--	--	--

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA	Western Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE WSA-6b-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-6b

AVERAGE SITE DEPTH TO GROUNDWATER: 66 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
1,2-DICHLOROETHYLENE	0.97	04030	12/3/87
ALDRIN	0.095	04030	12/3/87
BENZENE	3.8	04030	05/11/88
CHLOROFORM	1.2	04030	12/3/87
HEXACHLOROCYCLOPENTADIENE	0.080	04030	10/21/88
VAPONA	1.5	04030	10/21/88
TRICHLOROETHYLENE	140	04030	10/21/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-6b-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	0.0E+00	1.5E+00	0.0E+00	0.0E+00	0.0E+00	5.3E-08
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	2.6E-06
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-07
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	8.3E+05	3.7E+06	6.8E+05	4.8E-06	1.1E-06	5.9E-06	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	4.7E-07
TOLUENE	2.5E+06	2.1E+07	2.2E+06	8.0E-07	9.4E-08	9.0E-07	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	8.6E-05
VAPONA	8.6E+01	0.0E+00	8.6E+01	0.0E+00	0.0E+00	0.0E+00	3.9E-10
M-XYLENE	1.4E+07	3.2E+06	2.6E+06	1.4E-07	6.2E-07	7.6E-07	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	5.2E-03	0.0E+00	5.2E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	5.5E-05	0.0E+00	5.5E-05	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6b-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	1.5E+00	0.0E+00	1.5E+00	0.0E+00	0.0E+00	0.0E+00	5.3E-08
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	2.6E-06
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-07
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	8.3E+05	3.7E+06	6.8E+05	4.8E-06	1.1E-06	5.9E-06	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	4.7E-07
TOLUENE	2.5E+06	2.1E+07	2.2E+06	8.0E-07	9.4E-08	9.0E-07	0.0E+00
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	8.6E-05
VAPONA	8.6E+01	0.0E+00	8.6E+01	0.0E+00	0.0E+00	0.0E+00	3.9E-10
M-XYLENE	1.4E+07	3.2E+06	2.6E+06	1.4E-07	6.2E-07	7.6E-07	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	5.2E-03	0.0E+00	5.2E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	5.5E-05	0.0E+00	5.5E-05	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6b-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
ALDRIN	2.1E-01	0.0E+00	2.1E-01	0.0E+00	0.0E+00	0.0E+00	8.0E-07
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	3.9E-05
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	1.8E-06
1,2-DICHLOROETHYLENE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	3.5E+05	1.4E+06	2.8E+05	1.1E-05	3.0E-06	1.4E-05	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.7E+03	0.0E+00	5.7E+03	0.0E+00	0.0E+00	0.0E+00	3.0E-06
TOLUENE	1.1E+05	7.7E+06	9.3E+05	1.9E-06	2.6E-07	2.1E-06	0.0E+00
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	1.3E-03
VAPONA	1.2E+01	0.0E+00	1.2E+01	0.0E+00	0.0E+00	0.0E+00	5.8E-09
M-XYLENE	5.8E+06	1.2E+06	9.7E+05	3.4E-07	1.7E-06	2.1E-06	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	8.7E-03	0.0E+00	8.7E-03	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.0E-04	0.0E+00	1.0E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6b-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	0.0E+00	1.9E+00	0.0E+00	0.0E+00	0.0E+00	5.8E-05
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	2.8E-03
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-04
1,2-DICHLOROETHYLENE	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	4.6E+05	1.1E+04	1.0E+04	8.7E-06	3.8E-04	3.8E-04	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.5E+03	0.0E+00	5.5E+03	0.0E+00	0.0E+00	0.0E+00	1.5E-03
TOLUENE	1.4E+06	6.1E+04	5.8E+04	1.4E-06	3.3E-05	3.4E-05	0.0E+00
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	9.4E-02
VAPONA	1.1E+02	0.0E+00	1.1E+02	0.0E+00	0.0E+00	0.0E+00	4.2E-07
M-XYLENE	7.0E+06	9.2E+03	9.1E+03	2.9E-07	2.2E-04	2.2E-04	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	1.2E-02	0.0E+00	1.2E-02	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	1.4E-04	0.0E+00	1.4E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6b-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	0.0E+00	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	4.0E-07	1.7E-04
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	1.9E-05	8.4E-03
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	8.8E-07	3.9E-04
1,2-DICHLOROETHYLENE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	8.5E+04	5.0E+05	3.2E+04	2.2E+04	4.7E-05	1.3E-04	1.8E-04	0.0E+00	0.0E+00
HEXACHLOROCYCLOPENTADIENE	3.8E+02	0.0E+00	0.0E+00	3.8E+02	0.0E+00	0.0E+00	0.0E+00	3.5E-06	1.5E-03
TOLUENE	2.6E+05	2.8E+06	1.8E+05	1.0E+05	7.7E-06	1.2E-05	1.9E-05	0.0E+00	0.0E+00
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	6.4E-04	2.8E-01
VAPONA	6.7E+00	0.0E+00	0.0E+00	6.7E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-09	1.3E-06
M-XYLENE	8.8E+05	4.3E+05	2.7E+04	2.5E+04	2.3E-06	7.7E-05	8.0E-05	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	3.6E-02	0.0E+00	3.6E-02	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	7.9E-04	0.0E+00	7.9E-04	0.0E+00	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.21 SITE WSA-6c: MOTOR POOL AREA - ROUNDHOUSE AND OLD SEPTIC TANK SYSTEM (formerly Site 4-6: Motor Pool Area; EBASCO,-1988l/RIC 88196R12)

2.21.1 Site-Specific Considerations

Figure WSA-6c-1 and Tables WSA-6c-1 and WSA-6c-2 depict the target contaminants for Site WSA-6c. Borings 26 and 29 were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-6c (EBASCO, 1988l/RIC 88196R12).

2.21.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-6c are depicted in Figure WSA-6c-1. Table WSA-6c-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). No organic contaminants were detected at this location. Table WSA-6c-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

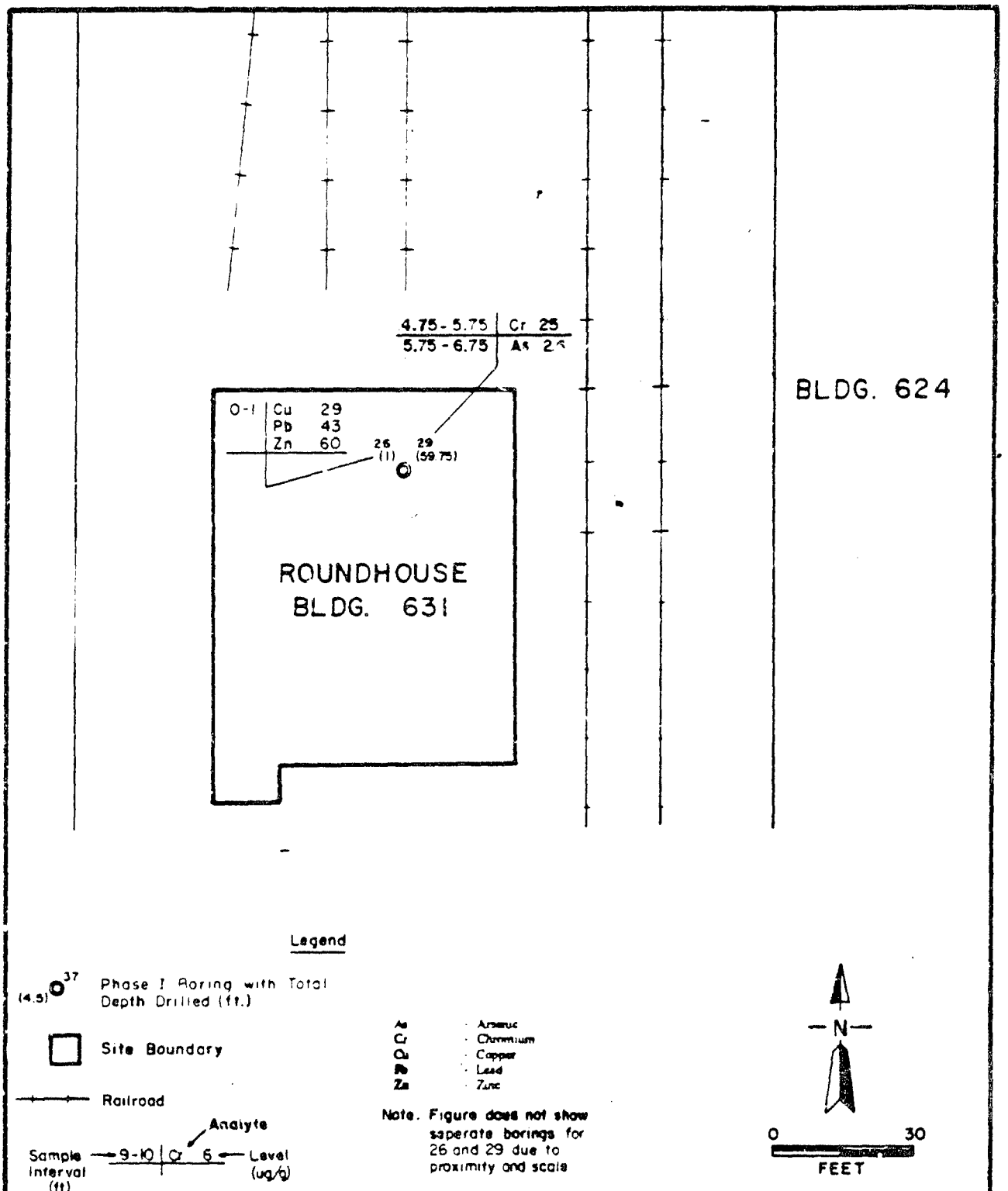
2.21.3 Site Exposure Summary

Tables WSA-6c-3 through WSA-6c-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-6c is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-6c is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Prepared for

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-6c-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-6c-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-6c

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Lead	43	0-1	26	--	--	--

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

TABLE WSA-6c-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-6c

AVERAGE SITE DEPTH TO GROUNDWATER: 73 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE	4.6	04035	06/6/88
CHLOROFORM	1.4	04035	11/1/88
TRICHLOROETHYLENE	11	04035	06/6/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE
FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-6c-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	6.4E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.8E-08
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.4E-06
LEAD	1.5E+04	0.0E+00	1.5E+04	2.8E-03	0.0E+00	2.8E-03	0.0E+00

WSA-6c-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	6.4E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.8E-08
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.4E-06
LEAD	1.5E+04	0.0E+00	1.5E+04	2.8E-03	0.0E+00	2.8E-03	0.0E+00

WSA-6c-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	9.7E-06
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	4.3E-07
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	2.1E-05
LEAD	9.2E+03	0.0E+00	9.2E+03	4.7E-03	0.0E+00	4.7E-03	0.0E+00

WSA-6c-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	3.1E-03
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	1.4E-04
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	6.5E-03
LEAD	6.5E+03	0.0E+00	6.5E+03	6.6E-03	0.0E+00	6.6E-03	0.0E+00

WSA-6c-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	4.8E-06	9.2E-03
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	2.1E-07	4.1E-04
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	1.0E-05	2.0E-02
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	2.0E-02	0.0E+00	2.0E-02	0.0E+00	0.0E+00

2.22 SITE WSA-6d: MOTOR POOL - DRAINAGE DITCH (formerly Site 4-6: Motor Pool Area; EBASCO, 1988l/RIC 88196R12)

2.22.1 Site-Specific Considerations

Figure WSA-6d-1 and Tables WSA-6d-1 and WSA-6d-2 depict the target contaminants for Site WSA-6d. Borings 1, 2, 19, 20, 22, and 31 through 37 were included in the exposure assessment, consistent with Western SAR. Although evaluated as a single site in this exposure assessment, the Western SAR discusses this site as a part of former Section 4. According to the site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-6d (EBASCO, 1988l/RIC 88196R12).

2.22.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-6d are shown in Figure WSA-6d-1. Table WSA-6d-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Methylene chloride, shown in table WSA-6a-1 is excluded from consideration in the exposure analysis for this site, because it was considered a laboratory contaminant in the samples analyzed. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table WSA-6d-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.22.3 Site Exposure Summary

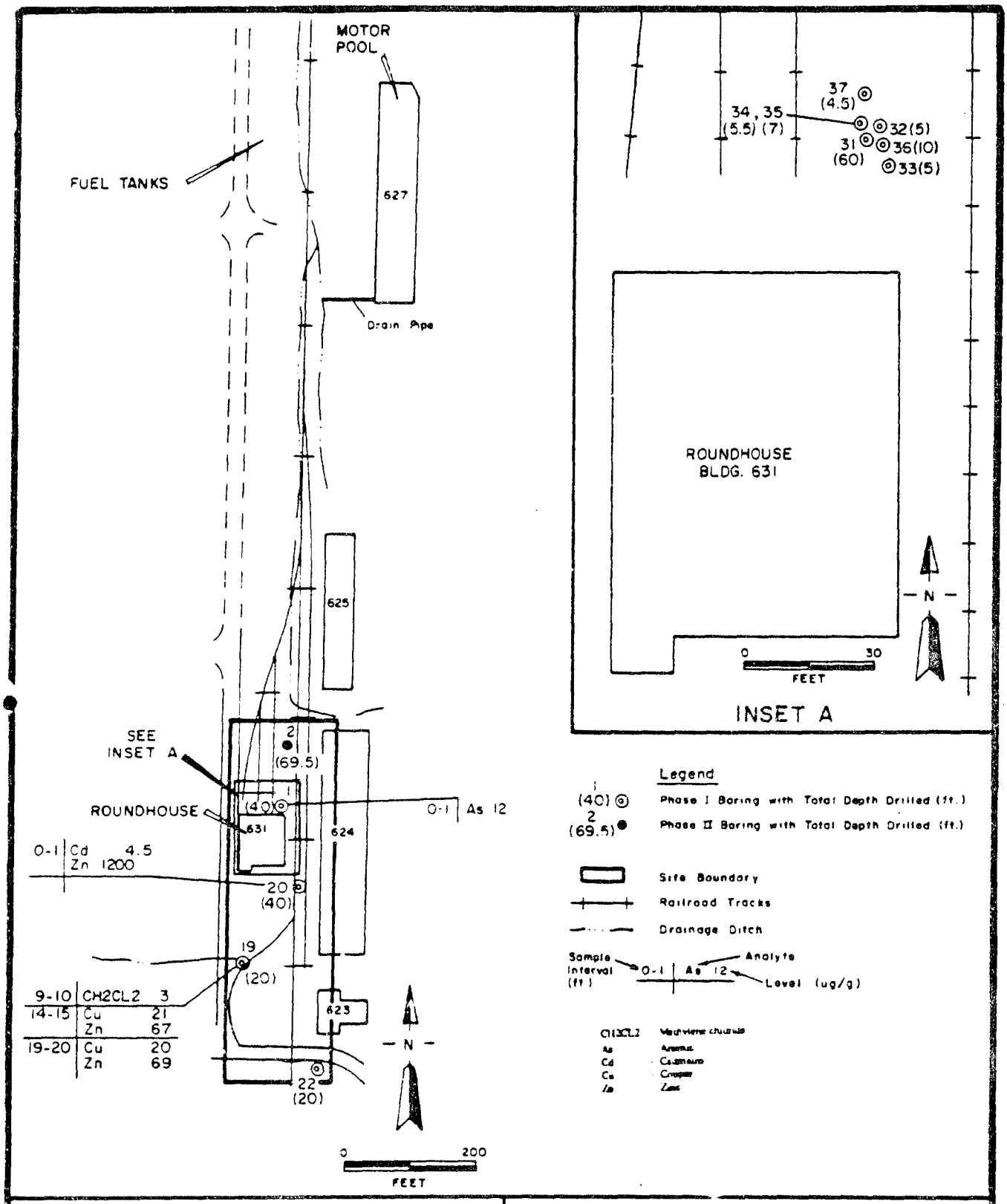
Tables WSA-6d-3 through WSA-6d-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-6d is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Arsenic	Direct	Direct	Direct	Direct	Direct
Cadmium	--	--	--	--	Direct

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.

The results of the soil exposure summary indicate that exposure to contamination from the direct pathways are the primary contributors to the exceedance of the cumulative PPLVs. Site WSA-6d is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



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Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-6d-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE WSA-6d-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-6d

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Methylene chloride[1/]	3.0	9-10	19	3.0	9-10	19
Arsenic	12	0-1	1	--	--	--
Cadmium	4.5	0-1	20	--	--	--
Zinc	1200	0-1	20	--	--	--

1/ Suspected laboratory contaminant.

WSA	Western Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE WSA-6d-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-6d

AVERAGE SITE DEPTH TO GROUNDWATER: 69 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
1,1,2-TRICHLOROETHANE	3.4	04048	06/8/88
1,2-DICHLOROETHYLENE	1.2	04048	06/8/88
BENZENE	4.6	04035	06/6/88
CHLOROFORM	1.4	04035	11/1/88
TRICHLOROETHYLENE	120	04048	06/8/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-6d-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	5.8E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.6E-08
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1,1,2-TRICHLOROETHANE	4.3E+02	0.0E+00	4.3E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-07
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-05
ARSENIC	2.2E+01	0.0E+00	2.2E+01	5.6E-01*	0.0E+00	5.6E-01*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	1.0E-02	0.0E+00	1.0E-02	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	6.0E-04	0.0E+00	6.0E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6d-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	5.8E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.6E-08
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1,1,2-TRICHLOROETHANE	4.3E+02	0.0E+00	4.3E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-07
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-05
ARSENIC	2.2E+01	0.0E+00	2.2E+01	5.6E-01*	0.0E+00	5.6E-01*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	1.0E-02	0.0E+00	1.0E-02	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	6.0E-04	0.0E+00	6.0E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6d-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	8.7E-06
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	3.8E-07
1,2-DICHLOROETHYLENE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1,1,2-TRICHLOROETHANE	6.0E+01	0.0E+00	6.0E+01	0.0E+00	0.0E+00	0.0E+00	2.5E-06
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	2.0E-04
ARSENIC	3.9E+00	0.0E+00	3.9E+00	3.0E+00*	0.0E+00	3.0E+00*	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	7.8E-02	0.0E+00	7.8E-02	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.1E-03	0.0E+00	1.1E-03	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-6d-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI EMC
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	3.3E-03
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	1.4E-04
1,2-DICHLOROETHYLENE	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1,1,2-TRICHLOROETHANE	5.5E+02	0.0E+00	5.5E+02	0.0E+00	0.0E+00	0.0E+00	9.3E-04
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	7.5E-02
ARSENIC	2.0E+01	0.0E+00	2.0E+01	6.0E-01*	0.0E+00	6.0E-01*	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	1.3E-02	0.0E+00	1.3E-02	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	1.5E-03	0.0E+00	1.5E-03	0.0E+00

*: EI is equal to or exceeds 1.0E-01

WSA-6d-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT [illegible]SVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	4.3E-06	9.8E-03
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	1.9E-07	4.3E-04
1,2-DICHLOROETHYLENE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1,1,2-TRICHLOROETHANE	3.4E+01	0.0E+00	0.0E+00	3.4E+01	0.0E+00	0.0E+00	0.0E+00	1.2E-06	2.8E-03
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	9.9E-05	2.2E-01
ARSENIC	1.6E+00	0.0E+00	0.0E+00	1.6E+00	7.4E+00*	0.0E+00	7.4E+00*	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	5.9E-01*	0.0E+00	5.9E-01*	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	8.6E-03	0.0E+00	8.6E-03	0.0E+00	0.0E+00

*: EI is equal to or exceeds 1.0E-01

2.23 SITE WSA-6e: MOTOR POOL AREA - CULVERT OUTFALL (formerly Site 4-6: Motor Pool Area; EBASCO, 1988l/RIC 88196R12)

2.23.1 Site-Specific Considerations

Figure WSA-6e-1 and Table WSA-6e-1 depict the target contaminants for Site WSA-6e. Boring 21 was included in this exposure assessment, consistent with the Western SAR. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-6e (EBASCO, 1988l/RIC 88196R12).

2.23.2 Spatial Distribution of Measured Contaminant Concentrations

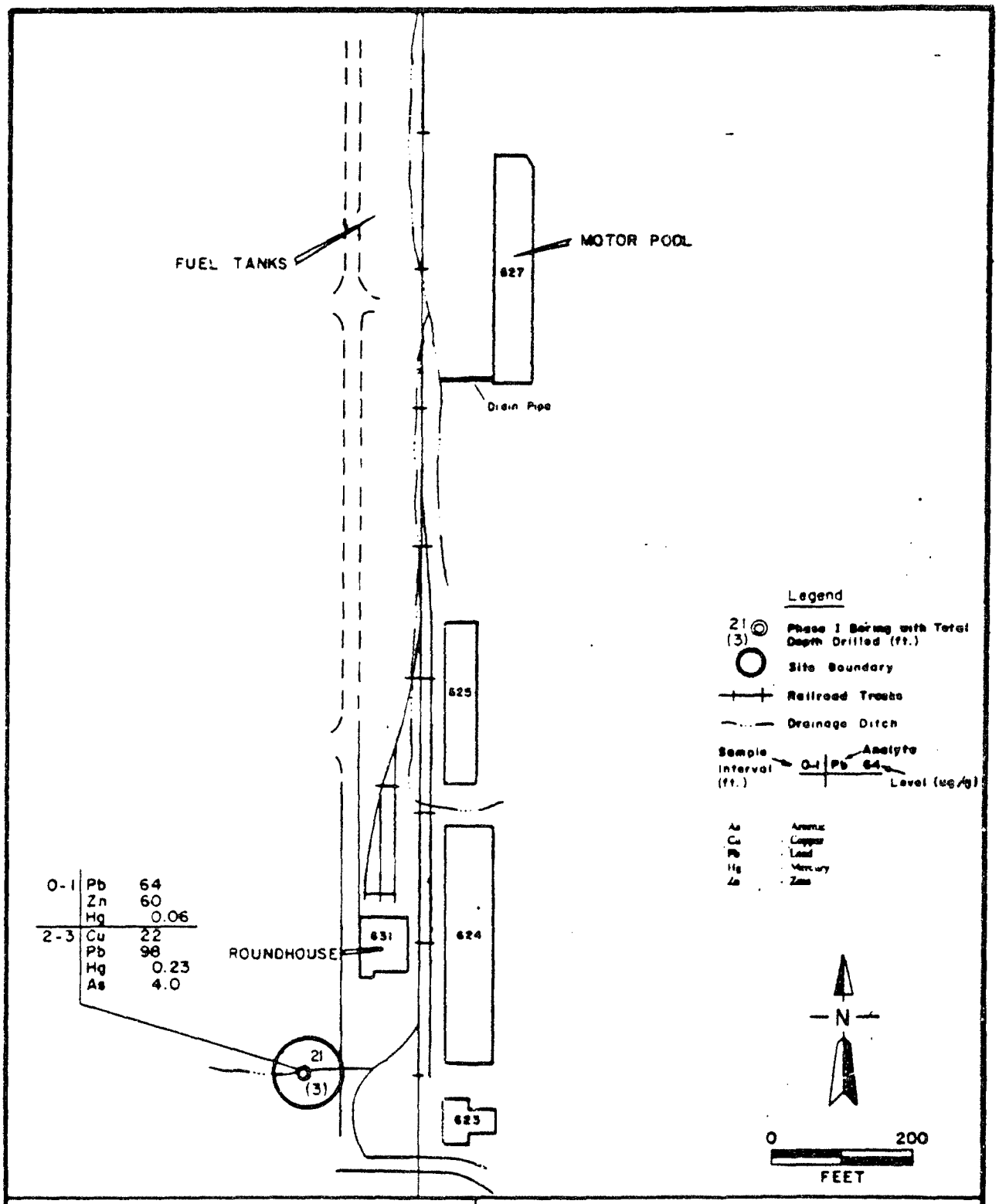
The locations and concentrations of the target contaminants that were detected in Site WSA-6e are depicted in Figure WSA-6e-1. Table WSA-6e-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). No organic contaminants were detected at this location. Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.23.3 Site Exposure Summary

Tables WSA-6e-2 through WSA-6e-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-6e is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



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Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-6e-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-6e-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-6e

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Lead	98	2-3	21	--	--	--
Mercury	0.23	2-3	21	--	--	--

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-6e-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW
LEAD	1.5E+04	0.0E+00	1.5E+04	6.3E-03	0.0E+00	6.3E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	7.0E-05	0.0E+00	7.0E-05	0.0E+00

WSA-6e-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
LEAD	1.5E+04	0.0E+00	1.5E+04	6.3E-03	0.0E+00	6.3E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	7.0E-05	0.0E+00	7.0E-05	0.0E+00

WSA-6e-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
LEAD	9.2E+03	0.0E+00	9.2E+03	1.1E-02	0.0E+00	1.1E-02	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	1.2E-04	0.0E+00	1.2E-04	0.0E+00

USA-6e-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
LEAD	6.5E+03	0.0E+00	6.5E+03	1.5E-02	0.0E+00	1.5E-02	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	1.7E-04	0.0E+00	1.7E-04	0.0E+00

WSA-6e-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI EMC
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	4.5E-02	0.0E+00	4.5E-02	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	5.0E-04	0.0E+00	5.0E-04	0.0E+00	0.0E+00

2.24 SITE WSA-7a: SANITARY SEWERS - INTERNAL SEDIMENT (formerly Site 34-2: Sanitary Sewer - Railyard and Administration Areas; EBASCO, 1988m/RIC 88256R03)

2.24.1 Site-Specific Considerations

Figure WSA-7a-1 and Table WSA-7a-1 depict the target contaminants for Site WSA-7a. Borings R12, R17, R29, and R30 were included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contamination assessment revealed that the previous investigations detected dibromochloropropane and Isodrin in water samples (EBASCO, 1988m/RIC 88256R03); however, these chemicals were not detected in soil during the Phase I investigation. According to the site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-7a (EBASCO, 1988m/RIC 88256R03).

2.24.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected on Site WSA-7a are depicted in Figure WSA-7a-1. Table WSA-7a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). No groundwater data table was included for Site WSA-7a since this site is a sewer line (see Volume VI-A).

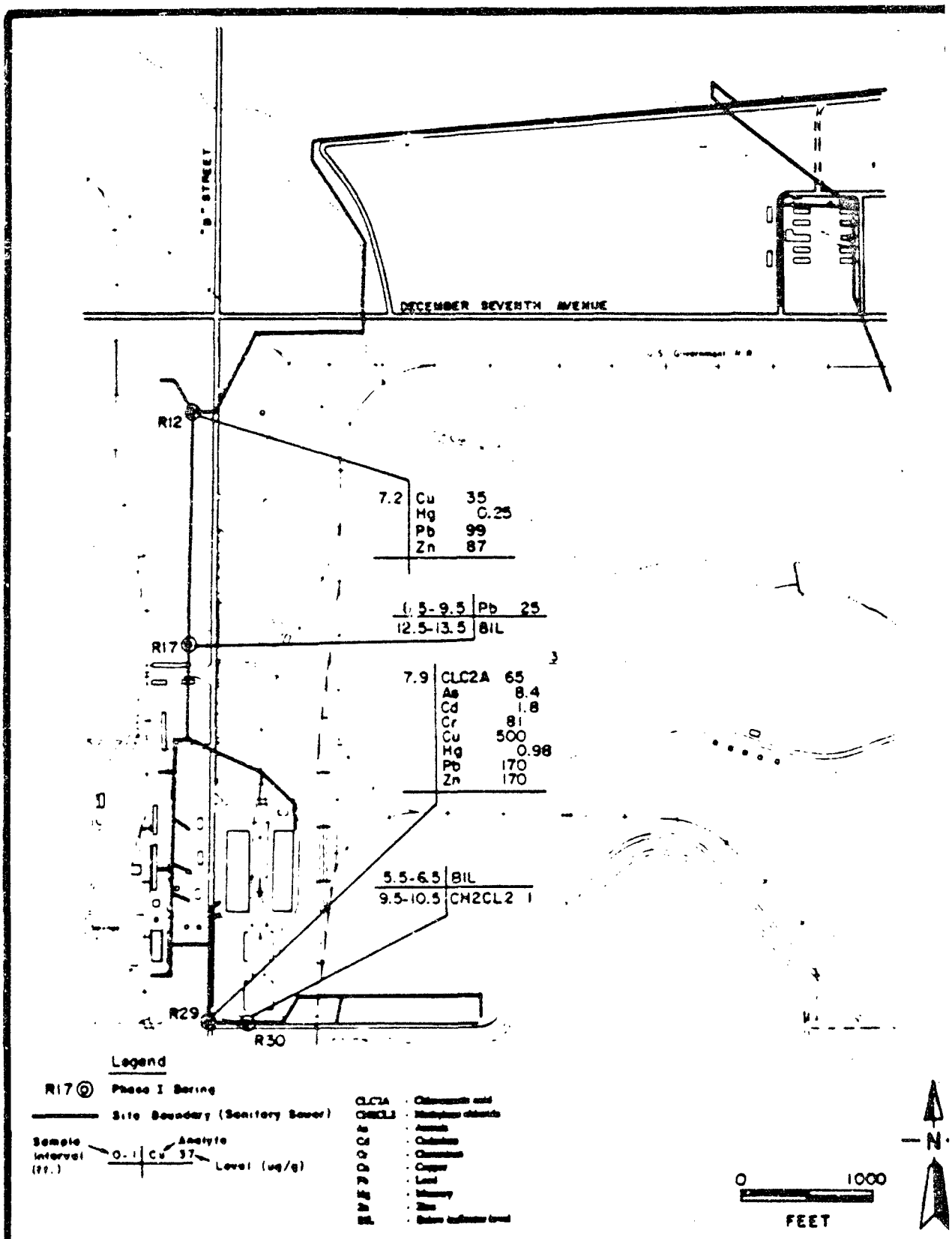
2.24.3 Site Exposure Summary

Tables WSA-7a-2 through WSA-7a-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Chromium	Direct	Direct	Direct	Direct	Direct
Methylene chloride	--	--	--	Indirect	Indirect

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. Site WSA-7a is designated as a Priority 1 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-7a-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE WSA-7a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-7a

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Chloroacetic acid	65	7.9	R29	65	7.9	R29
Methylene chloride	1	9.5-10.5	R30	1	9.5-10.5	R30
Chromium	81	7.9	R29	--	--	--
Copper	500	7.9	R29	--	--	--
Lead	170	7.9	R29	--	--	--
Mercury	0.98	7.9	R29	--	--	--
Zinc	170	7.9	R29	--	--	--

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-7a-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
CHLOROACETIC ACID	1.7E+04	0.0E+00	1.7E+04	3.9E-03	0.0E+00	3.9E-03	0.0E+00
METHYLENE CHLORIDE	3.3E+03	2.0E+04	2.8E+03	3.1E-04	5.1E-05	3.6E-04	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	1.2E+00*	0.0E+00	1.2E+00*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	1.2E-03	0.0E+00	1.2E-03	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	1.1E-02	0.0E+00	1.1E-02	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	3.0E-04	0.0E+00	3.0E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	8.6E-05	0.0E+00	8.6E-05	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-7a-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
CHLOROACETIC ACID	1.7E+04	0.0E+00	1.7E+04	3.9E-03	0.0E+00	3.9E-03	0.0E+00
METHYLENE CHLORIDE	3.3E+03	2.0E+04	2.8E+03	3.1E-04	5.1E-05	3.6E-04	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	1.2E+00*	0.0E+00	1.2E+00*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	1.2E-03	0.0E+00	1.2E-03	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	1.1E-02	0.0E+00	1.1E-02	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	3.0E-04	0.0E+00	3.0E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	8.6E-05	0.0E+00	8.6E-05	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-7a-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
CHLOROACETIC ACID	7.0E+03	0.0E+00	7.0E+03	9.2E-03	0.0E+00	9.2E-03	0.0E+00
METHYLENE CHLORIDE	4.5E+02	3.0E+03	3.9E+02	2.2E-03	3.3E-04	2.5E-03	0.0E+00
CHROMIUM	8.8E+00	0.0E+00	8.8E+00	9.2E+00*	0.0E+00	9.2E+00*	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	2.0E-03	0.0E+00	2.0E-03	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	1.8E-02	0.0E+00	1.8E-02	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	5.0E-04	0.0E+00	5.0E-04	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.6E-04	0.0E+00	1.6E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-7a-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
CHLOROACETIC ACID	9.2E+03	0.0E+00	9.2E+03	7.1E-03	0.0E+00	7.1E-03	0.0E+00
METHYLENE CHLORIDE	4.1E+03	4.0E+00	4.0E+00	2.4E-04	2.5E-01*	2.5E-01*	0.0E+00
CHROMIUM	5.5E+01	0.0E+00	5.5E+01	1.5E+00*	0.0E+00	1.5E+00*	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	2.8E-03	0.0E+00	2.8E-03	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	2.6E-02	0.0E+00	2.6E-02	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	7.0E-04	0.0E+00	7.0E-04	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	2.2E-04	0.0E+00	2.2E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

WSA-7a-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
CHLOROACETIC ACID	1.7E+03	0.0E+00	0.0E+00	1.7E+03	3.8E-02	0.0E+00	3.8E-02	0.0E+00	0.0E+00
METHYLENE CHLORIDE	2.5E+02	2.6E+03	4.0E+00	3.9E+00	4.0E-03	2.5E-01*	2.6E-01*	0.0E+00	0.0E+00
CHROMIUM	1.1E+00	0.0E+00	0.0E+00	1.1E+00	7.1E+01*	0.0E+00	7.1E+01*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	8.8E-03	0.0E+00	8.8E-03	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	7.8E-02	0.0E+00	7.8E-02	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	2.1E-03	0.0E+00	2.1E-03	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	1.2E-03	0.0E+00	1.2E-03	0.0E+00	0.0E+00

*: EI is equal to or exceeds 1.0E-01

2.25 SITE WSA-7b: SANITARY SEWERS - OVERFLOW AREA (formerly Site 34-2: Sanitary Sewer - Railyard and Administration Areas; EBASCO, 1988m/RIC 88256R03)

2.25.1 Site-Specific Considerations

Figure WSA-7b-1 and Tables WSA-7b-1 and WSA-7b-2 depict the target contaminants for Site WSA-7b. Boring LS0001/B393 was included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contaminant assessment revealed that the previous investigations detected dibromochloropropane and Isodrin in water samples (EBASCO, 1988m/RIC 88256R03); however, these chemicals were not detected in soil during the Phase I and Phase II investigations. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-7b (EBASCO, 1988m/RIC 88256R03).

2.25.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-7b are depicted in Figure WSA-7b-1. Table WSA-7b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). No organic contaminants were detected at this location. Table WSA-7b-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

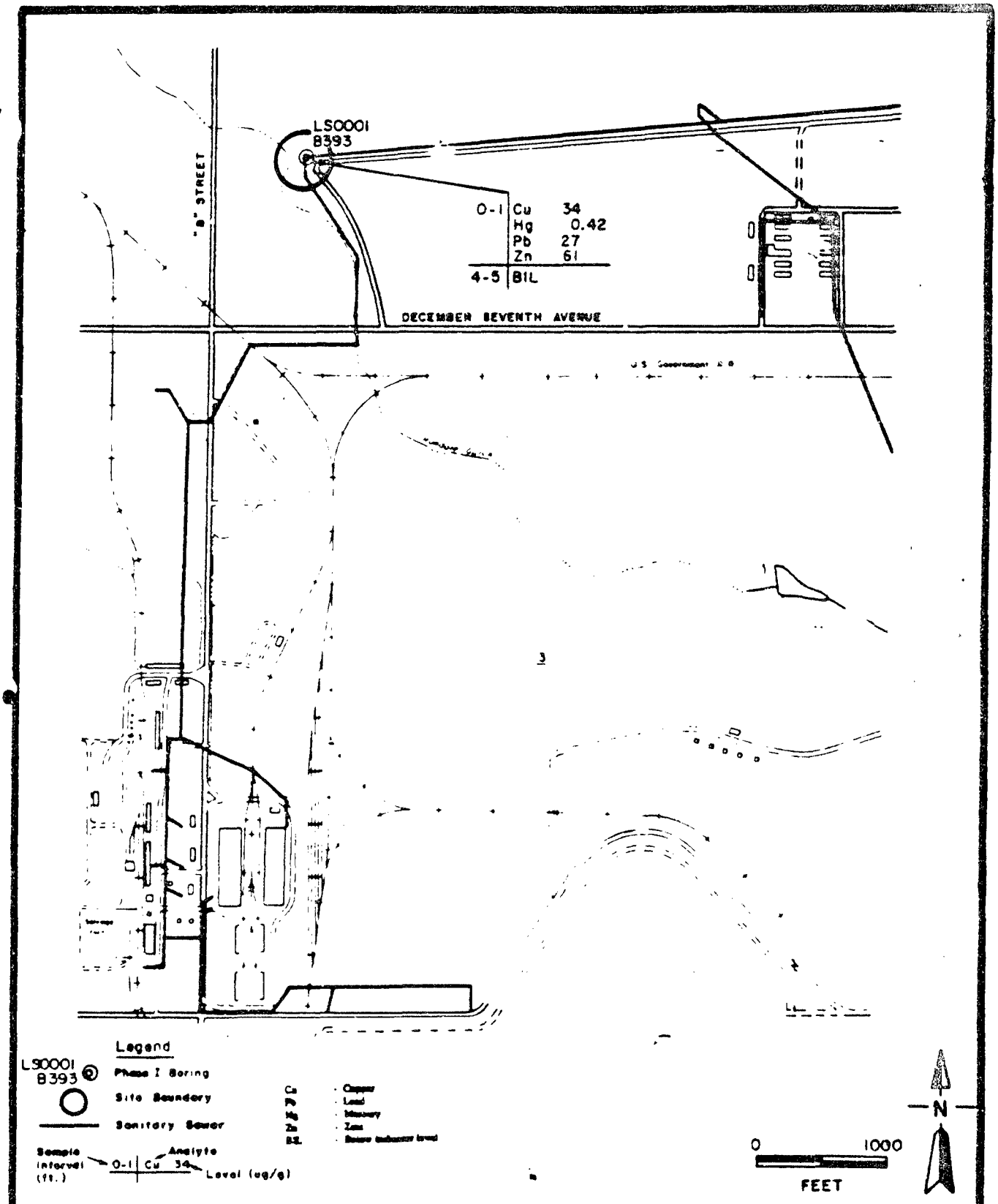
2.25.3 Site Exposure Summary

Tables WSA-7b-3 through WSA-7b-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site WSA-7b is greater than 10 ft the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-7b is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-7b-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-7b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-7b

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Mercury	0.42	0-1	LS0001/B393	--	--	--

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

TABLE WSA-7b-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE WSA-7b

AVERAGE SITE DEPTH TO GROUNDWATER: 46 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
BENZOTHIAZOLE	7.1	34515	01/7/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

WSA-7b-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW
BENZOTHIAZOLE	3.9E+04	0.0E+00	3.9E+04	0.0E+00	0.0E+00	0.0E+00	1.1E-09
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.3E-04	0.0E+00	1.3E-04	0.0E+00

WSA-7b-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZOTHIAZOLE	3.9E+04	0.0E+00	3.9E+04	0.0E+00	0.0E+00	0.0E+00	1.1E-09
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.3E-04	0.0E+00	1.3E-04	0.0E+00

WSA-7b-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZOTHIAZOLE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	7.2E-09
MERCURY	2.0E+03	0.0E+00	2.0E+03	2.1E-04	0.0E+00	2.1E-04	0.0E+00

USA-7b-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
BENZOTHIAZOLE	2.2E+04	0.0E+00	2.2E+04	0.0E+00	0.0E+00	0.0E+00	8.4E-06
MERCURY	1.4E+03	0.0E+00	1.4E+03	3.0E-04	0.0E+00	3.0E-04	0.0E+00

WSA-7b-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
BENZOTHIAZOLE	4.0E+03	0.0E+00	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	8.4E-09	8.4E-0
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	9.1E-04	0.0E+00	9.1E-04	0.0E+00	0.0E+0

2.26 SITE WSA-8a: SECTION 33 - COPPER DETECTION (formerly Section 33 - Nonsource Area; EBASCO, 1988r/RIC 88126R02)

2.26.1 Site-Specific Considerations

Figure WSA-8a-1 and Table WSA-8a-1 depict the target contaminants for Site WSA-8a. Borings 2 and 27 through 29 were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-8a (EBASCO, 1988r/RIC 88126R02).

2.26.2 Spatial Distribution of Measured Contaminant Concentrations

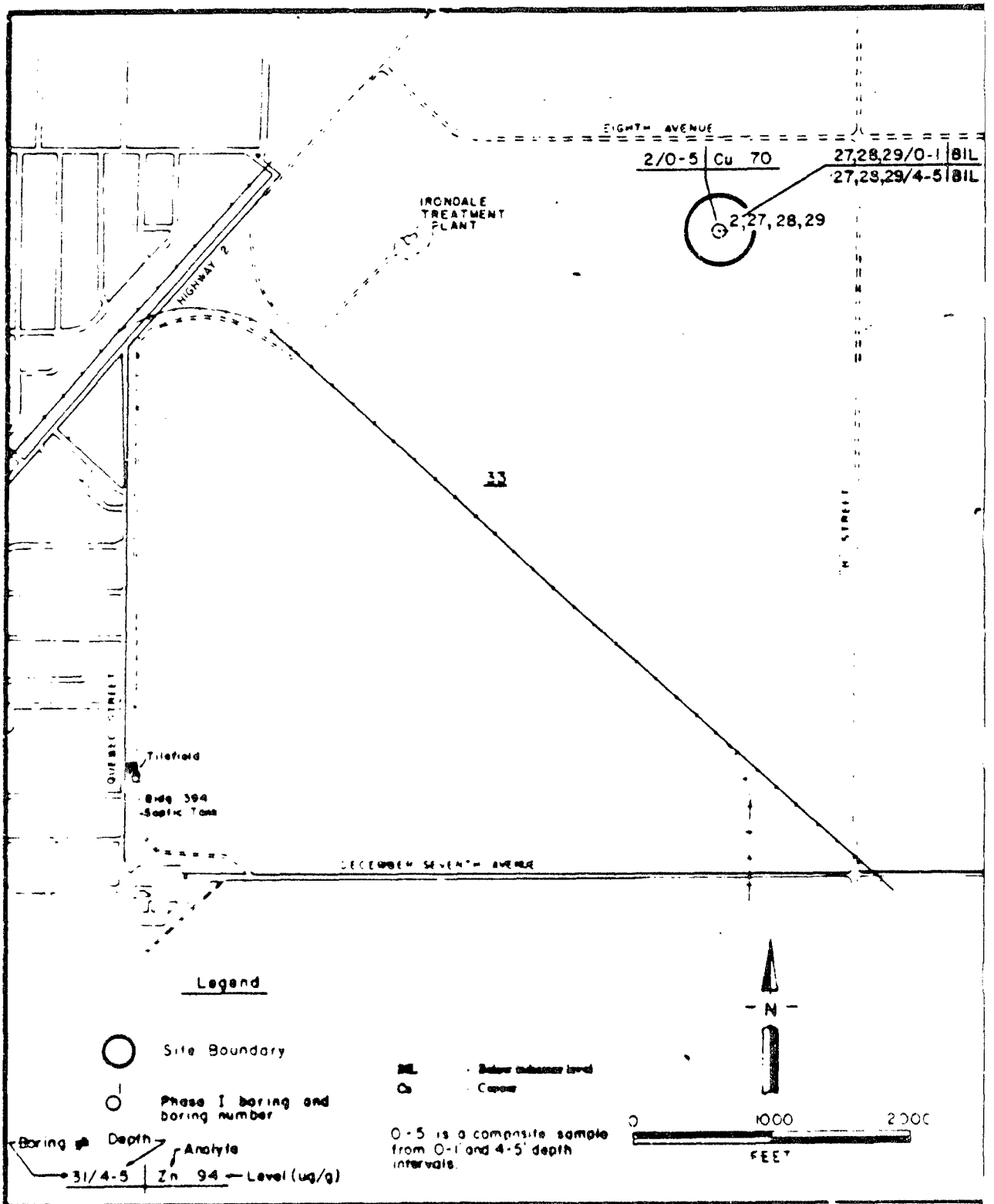
The locations and concentrations of the target contaminants that were detected in Site WSA-8a are depicted in Figure WSA-8a-1. Table WSA-8a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). No organic contaminants were detected at this location. Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.26.3 Site Exposure Summary

Tables WSA-8a-2 through WSA-8a-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-8a is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Prepared for

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-8a-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-8a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-8a

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Copper	70	Comp[1/] 0-1, 4-5	2	--	--	--

1/ Comp Composite sample from 0-1 ft and 4-5 ft depth intervals.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

WSA-8a-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW
COPPER	4.2E+05	0.0E+00	4.2E+05	1.7E-04	0.0E+00	1.7E-04	0.0E+00

WSA-8a-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
COPPER	4.2E+05	0.0E+00	4.2E+05	1.7E-04	0.0E+00	1.7E-04	0.0E+00

WSA-8a-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
COPPER	2.5E+05	0.0E+00	2.5E+05	2.8E-04	0.0E+00	2.8E-04	0.0E+00

WSA-8a-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
COPPER	1.8E+05	0.0E+00	1.8E+05	4.0E-04	0.0E+00	4.0E-04	0.0E+00

WSA-8a-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	1.2E-03	0.0E+00	1.2E-03	0.0E+00	0.0E+00

2.27 SITE WSA-8b: SECTION 33 - ZINC DETECTION (formerly Section 33 - Nonsource Area; EBASCO, 1988r/RIC 88126R02)

2.27.1 Site-Specific Considerations

Figure WSA-8b-1 and Table WSA-8b-1 depict the target contaminants for Site WSA-8b. Borings 6 and 30 through 32 were included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-8b (EBASCO, 1988r/RIC 88126R02).

2.27.2 Spatial Distribution of Measured Contaminant Concentrations

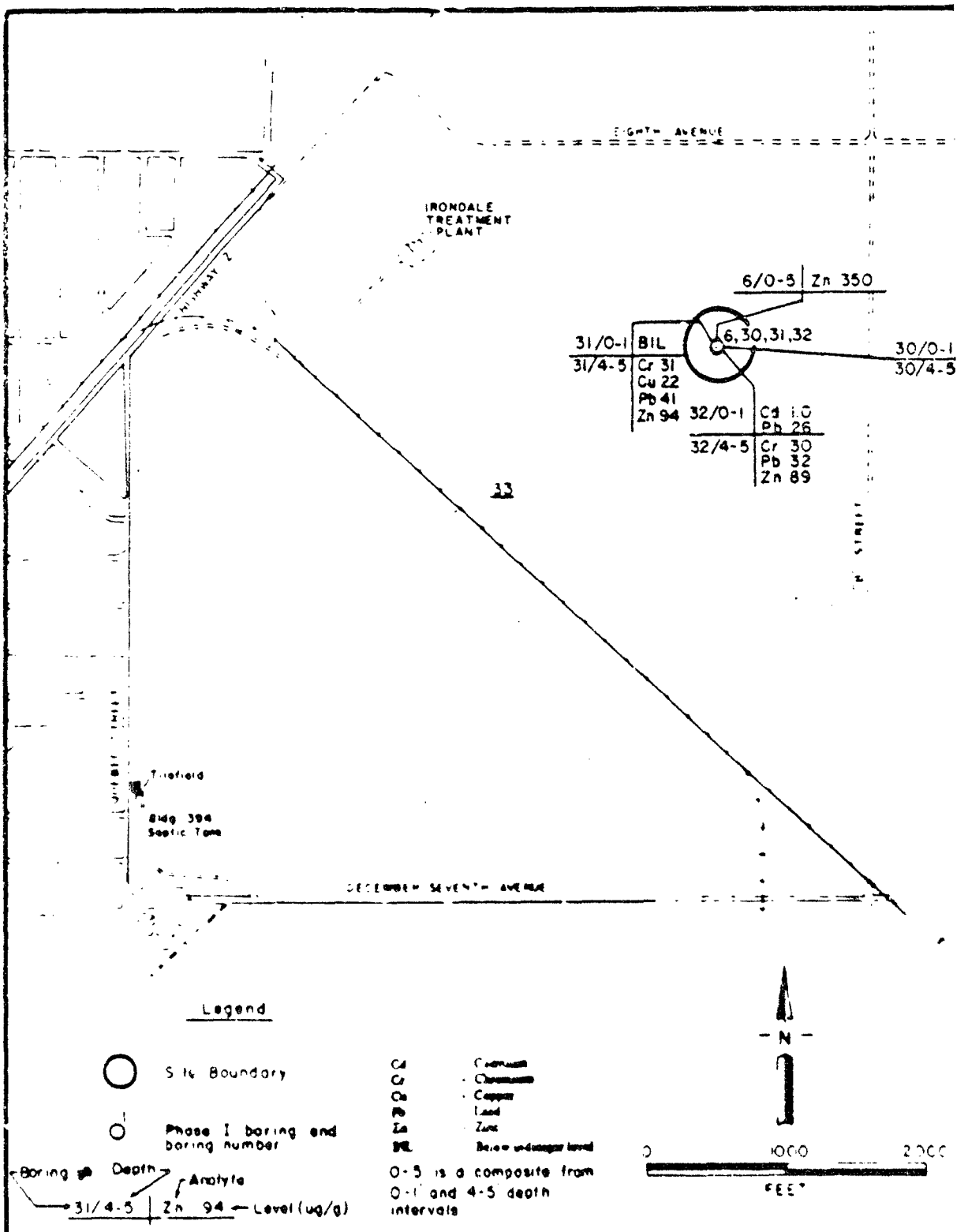
The locations and concentrations of the target contaminants that were detected in Site WSA-8b are depicted in Figure WSA-8b-1. Table WSA-8b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). No organic contaminants were detected at this location. Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.27.3 Site Exposure Summary

Tables WSA-8b-2 through WSA-8b-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site WSA-8b is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Prepared for

Program Managers Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-8b-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by Ebasco Services Incorporated

TABLE WSA-8b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-8b

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Lead	41	4-5	31	--	--	--
Zinc	350	Comp[1/] 0-1, 4-5	6	--	--	--

1/ Comp Composite sample from 0-1 ft and 4-5 ft depth intervals.

WSA Western Study Area
Max Maximum
ug/g microgram per gram
ft foot/feet

WSA-8b-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VCI OPN
LEAD	1.5E+04	0.0E+00	1.5E+04	2.7E-03	0.0E+00	2.7E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.8E-04	0.0E+00	1.8E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-8b-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPM
LEAD	1.5E+04	0.0E+00	1.5E+04	2.7E-03	0.0E+00	2.7E-03	0.0E+00
ZINC	2 0E+06	0.0E+00	2.0E+06	1.8E-04	0.0E+00	1.8E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

WSA-8b-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
LEAD	6.5E+03	0.0E+00	6.5E+03	6.3E-03	0.0E+00	6.3E-03	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	4.5E-04	0.0E+00	4.5E-04	0.0E+00

WSA-8b-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	1.9E-02	0.0E+00	1.9E-02	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	2.5E-03	0.0E+00	2.5E-03	0.0E+00	0.0E+00

2.28 SITE WSA-8c: SECTION 4 - 1,1,2,2-TETRACHLOROETHANE DETECTION (formerly Section 4 - Nonsource Area; EBASCO, 1988o/RIC 88196R01 and EBASCO, 1988p/RIC 88196R01A)

2.28.1 Site-Specific Considerations

Figure WSA-8c-1 and Table WSA-8c-1 depict the target contaminants for Site WSA-8c. Borings 22 and 44 through 46 were included in this exposure assessment consistent with the Western SAR. According to the site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-8c (EBASCO, 1988o/RIC 88196R01).

2.28.2 Spatial Distribution of Measured Contaminant Concentrations

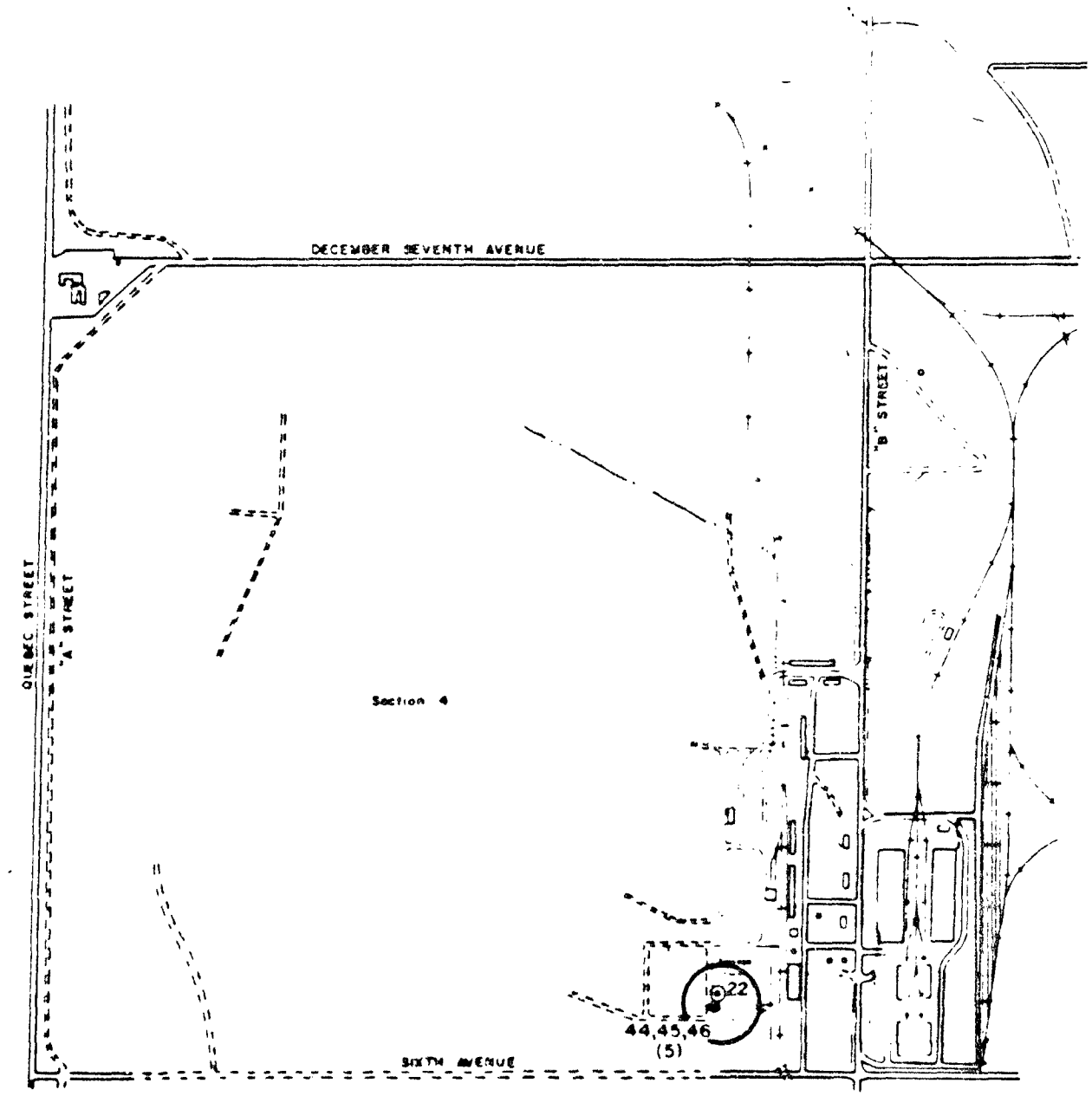
The locations and concentrations of the target contaminants that were detected in Site WSA-8c are shown in Figure WSA-8c-1. 1,1,2,2-Tetrachloroethane, occurring in Boring 46 (0-1 ft) was not included in the figure since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown in the figure, this nontarget compound was included in the Western SAR and in this exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-8c-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Table WSA-8c-1 shows that no target contaminants were found above the indicator level. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.28.3 Site Exposure Summary

The results of the soil exposure summary indicate that there are no COCs. Site WSA-8c is designated as a Priority 2 site, based on the most sensitive exposed population PPLV (i.e., the industrial worker).

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-8c-1

Phase I or Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-8c-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-8c

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
1,1,2,2-Tetrachloroethane[1/]	0.50	0-1	46	0.50	0-1	46

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

WSA	Western Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

WSA-8c-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPW
1,1,2,2-TETRACHLOROETHANE	1.3E+02	4.1E+04	1.3E+02	3.9E-03	1.2E-05	4.0E-03	0.0E+00

WSA-8c-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INC + CT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
1,1,2,2-TETRACHLOROETHANE	1.3E+02	4.1E+04	1.3E+02	3.9E-03	1.2E-05	4.0E-03	0.0E+00

WSA-8c-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
1,1,2,2-TETRACHLOROETHANE	1.8E+01	6.4E+03	1.8E+01	2.8E-02	7.8E-05	2.8E-02	0.0E+00

WSA-8c-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
1,1,2,2-TETRACHLOROETHANE	1.6E+02	3.4E+01	2.8E+01	3.1E-03	1.5E-02	1.8E-02	0.0E+00

WSA-8c-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
1,1,2,2-TETRACHLOROETHANE	9.9E+00	5.5E+03	3.4E+01	7.6E+00	5.1E-02	1.5E-02	6.6E-02	0.0E+00	0.0E+00

2.29 SITE WSA-8d: SECTION 3 - PHOSPHORIC ACID, TRIBUTYL ESTER DETECTION (formerly Section 3 - Nonsource Area; EBASCO, 1988n/RIC 88076R01)

2.29.1 Site-Specific Considerations

Figure WSA-8d-1 and Table WSA-8d-1 depict the target contaminants for Site WSA-8d. Boring 22 was included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contaminant assessment revealed that Aldrin, PPDDT, and old mustard containers may have been stored in Section 3 (EBASCO, 1988n/RIC 88076R01); however, none of these chemicals were detected in soil during the Phase I and Phase II investigations. According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site WSA-8d (EBASCO, 1988n/RIC 88076R01).

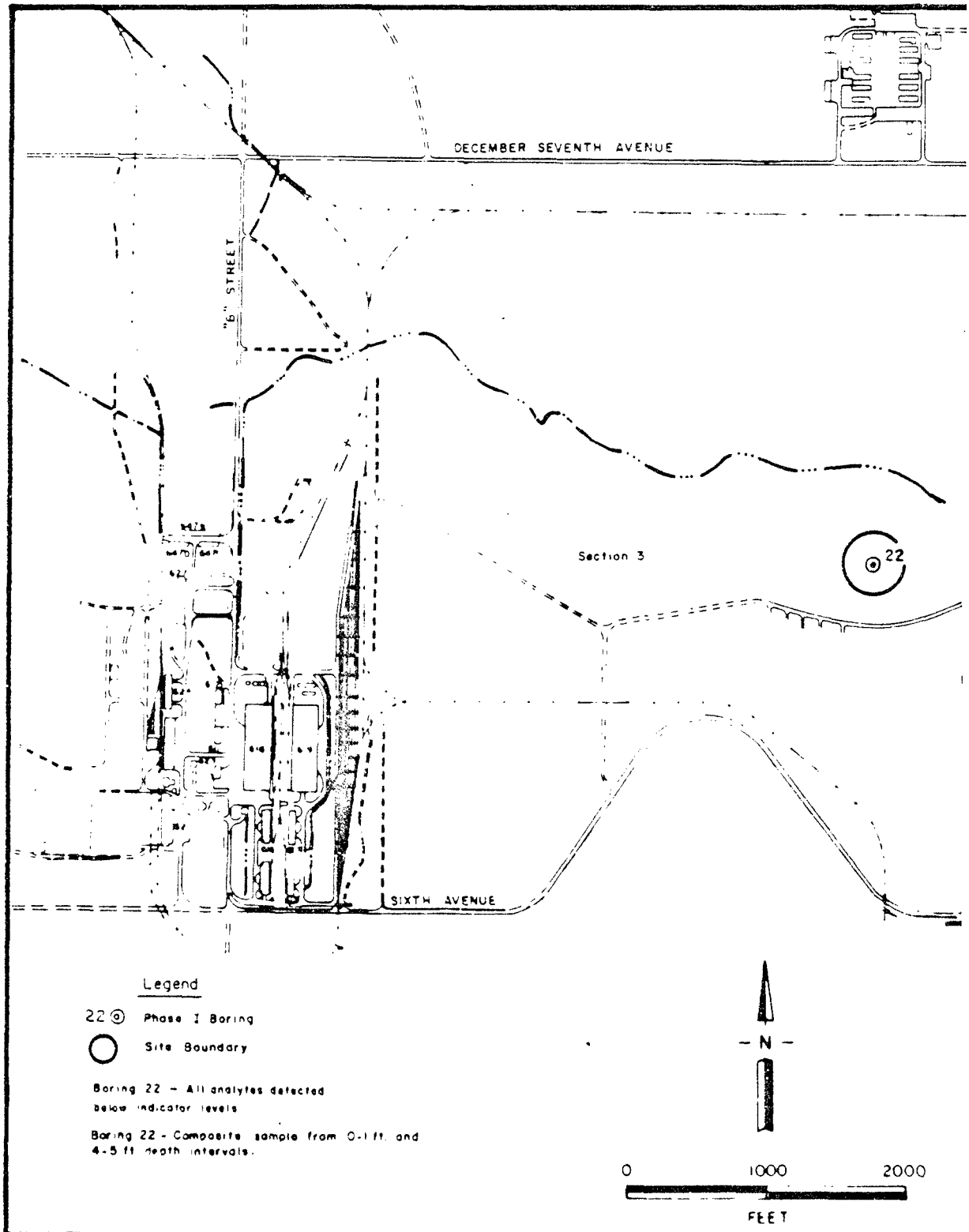
2.29.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-8d are depicted on Figure WSA-8d-1. Phosphoric acid, tributyl ester, occurring in Boring 22 (0-5 ft) was not included in the figure since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown in this figure, this nontarget compound was included in the Western SAR and in this exposure assessment because it passed through the screening performed in the RMA Chemical index (EBASCO, 1988c/RIC 88357R01).

Table WSA-8d-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Table WSA-8d-1 shows that no target contaminants were found above the indicator level. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.29.3 Site Exposure Summary

Only nontarget soil contaminants are shown in Table WSA-8d-1. Since nontarget contaminants (excluding 1,1,2,2-tetrachloroethane) were not assessed using the PPLV methodology, no COCs were identified for this site. Site WSA-8d is designated as a Priority 2 site.



Prepared for

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-8d-1
Phase I and Phase II Analytes Detecte
Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-8d-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-8d

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Phosphoric acid, tributyl ester[1/]	2.0	Comp[2/] 0-1, 4-5	22	2.0	Comp 0-1, 4-5	22

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.
2/ Comp Composite sample from 0-1 ft and 4-5 ft depth intervals.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

2.30 SITE WSA-8e: SECTION 3 - PHOSPHORIC ACID, TRIBUTYL ESTER DETECTION (formerly Section 3 - Nonsource Area; EBASCO, 1988n/RIC 88076R01)

2.30.1 Site-Specific Considerations

Figure WSA-8e-1 and Table WSA-8e-1 depict the target contaminants for Site WSA-8e. Boring 30 was included in this exposure assessment, consistent with the Western SAR. The historical search conducted under the contamination assessment revealed that Aldrin, PPDDT, and old mustard containers may have been stored in Site WSA-8e (EBASCO, 1988n/RIC 88076R01), but none of these chemicals were detected during the soil investigation. According to the site history, no other chemicals from the RMA target contaminant lists were suspected to be present in Site WSA-8e (EBASCO, 1988n/RIC 88076R01).

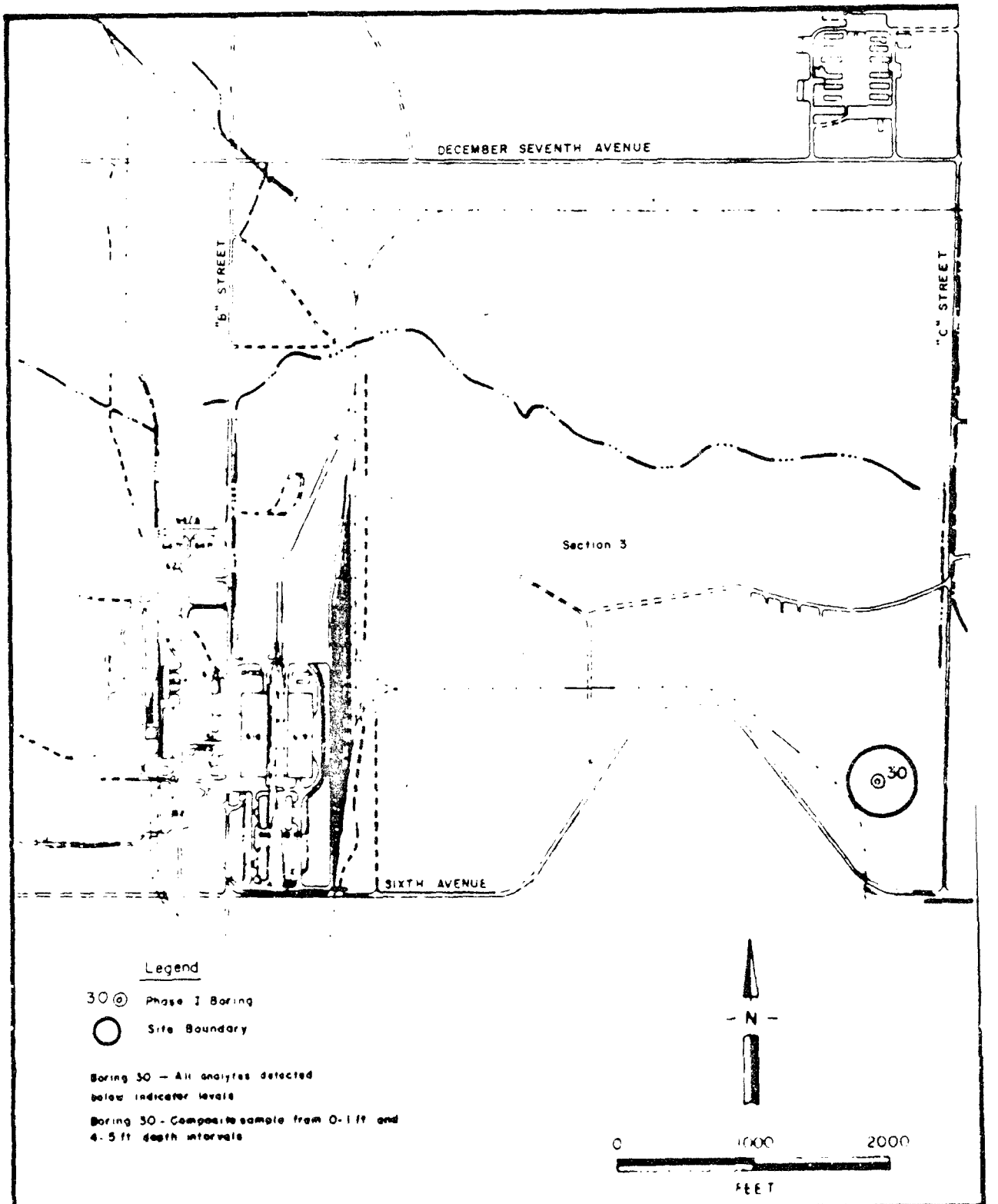
2.30.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-8e are shown in Figure WSA-8e-1. Phosphoric acid, tributyl ester, occurring in Boring 30 (0-5 ft) was not included in the figure since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown in the figure, this nontarget compound was included in the Western SAR and in this exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-8e-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Table WSA-8e-1 shows that no target contaminants were found above the indicator level. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.30.3 Site Exposure Summary

Only nontarget soil contaminants are shown in Table WSA-8e-1. Since nontarget contaminants (excluding 1,1,2,2-tetrachloroethane) were not assessed using the PPLV methodology, no COCs were identified for this site. Site WSA-8e is designated as a Priority 2 site.



Prepared for

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-8e-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-8e-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-8e

Contaminant	Horizon 1			Horizon 2		
	Max. (ug/g)	Depth (ft)	Boring Number	Max. (ug/g)	Depth (ft)	Boring Number
Phosphoric acid, tributyl ester[1/]	0.60	Comp[2/] 0-1, 4-5	30	0.60	Comp 0-1, 4-5	30

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.
2/ Comp Composite sample from 0-1 ft and 4-5 ft depth intervals.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

2.31 SITE WSA-8f: SECTION 9 - METHYL NAPHTHALENE DETECTION (formerly Section 9 - Nonsource Area; EBASCO, 1987/RIC 87336R10 and EBASCO, 1988q/RIC 87336R10A)

2.31.1 Site-Specific Considerations

Figure WSA-8f-1 and Table WSA-8f-1 depict the target contaminants for Site WSA-8f. Boring 25 was included in this exposure assessment, consistent with the Western SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site WSA-8f (EBASCO, 1987/RIC 87336R10).

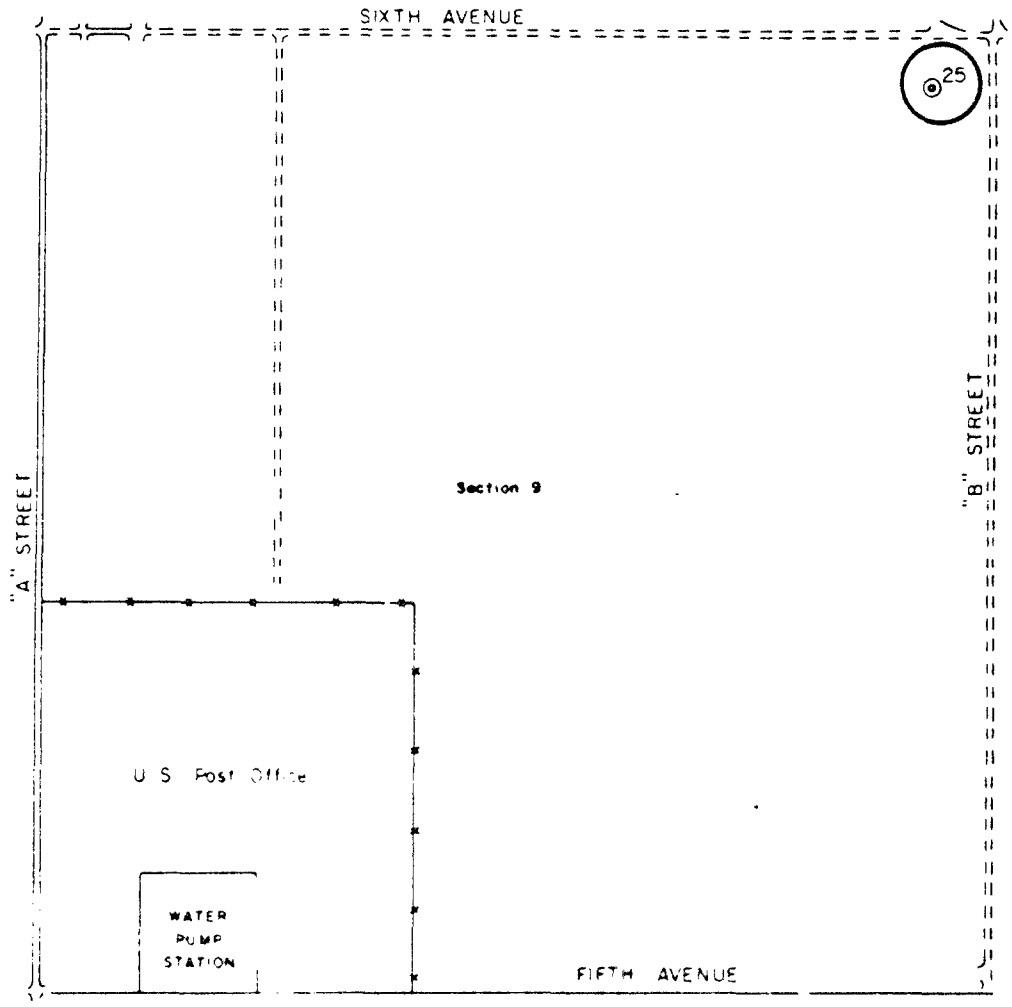
2.31.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site WSA-8f are depicted in Figure WSA-8f-1. Methyl naphthalene, occurring in Boring 25 (0-5 ft) was not included in the figure since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown in the figure, this nontarget compound was included in the Western SAR and in this exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

Table WSA-8f-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. Table WSA-8f-1 shows that no target contaminants were found above indicator level. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.31.3 Site Exposure Summary

Only nontarget soil contaminants are shown in Table WSA-8f-1. Since nontarget contaminants (excluding 1,1,2,2-tetrachloroethane) were not assessed using the PPLV methodology, no COCs were identified for this site. Site WSA-8f is designated as a Priority 2 site.



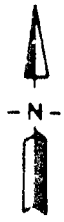
Legend

25 ⊙ Phase I Boring

○ Site Boundary

Boring 25 – All analytes detected below indicator levels

Boring 25 – Composite sample from 0-1 ft and 4-5 ft depth intervals



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE WSA-8f-1
Phase I and Phase II Analytes
Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE WSA-8f-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE WSA-8f

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Methyl naphthalene[1/]	0.40	Comp[2/] 0-1, 4-5	25	0.40	Comp 0-1, 4-5	25

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.
2/ Comp Composite sample from 0-1 ft and 4-5 ft depth intervals.

WSA Western Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

3.0 STUDY AREA EXPOSURE SUMMARY

The exposure assessment results for the WSA at RMA are summarized in Table 3-1. Of the 31 sites evaluated, 14 sites were designated as Priority 1 sites based on the most sensitive exposed population PPLV (i.e., the industrial worker). These include:

- Section 3 - Isolated Spill Area (WSA-1b)
- Railyard - Zinc Detection Area (WSA-1d)
- Railyard - Nemagon Spill Area (WSA-1e)
- Railyard - Aldrin and Dieldrin Detection (WSA-1f)
- Railyard - Mercury Detection (WSA-1g)
- West Landfill - Buring Pit (WSA-2)
- East Landfill - Toluene, Trichloropropene, and Cadmium Detection (WSA-3a)
- East Landfill - Main Surface Disposal Area (WSA-3c)
- Open Storage and Salvage Yard Support Areas (WSA-4b)
- North Landfill - Trench (WSA-5a)
- North Landfill - Trenches (WSA-5d)
- Motor Pool Area - Main Ditch (WSA-6a)
- Motor Pool - Drainage Ditch (WSA-6d)
- Sanitary Sewers - Internal Sediment (WSA-7a)

Seventeen sites were designated as Priority 2 sites based on the most sensitive exposed population PPLV (i.e., the industrial worker). These include:

- Section 3 - Pyrene/Fluoranthene Detection Area (WSA-1a)
- Section 3 - Wood Preservative Derivative Area (WSA-1c)
- East Landfill - Disposal Pit (WSA-3b)
- East Landfill - Methylisobutyl Ketone Detection (WSA-3d)
- Open Storage Yard - Methyl Cyclohexane Detection (WSA-4a)
- North Landfill - Burn Pit (WSA-5b)
- North Landfill - Trench (WSA-5c)
- Motor Pool - Fuel Tank Storage Area (WSA-6b)
- Motor Pool Area - Roundhouse and Old Septic Tank System (WSA-6c)
- Motor Pool Area - Culvert Outfall (WSA-6e)

- Sanitary Sewers - Overflow Area (WSA-7b)
- Section 33 - Copper Detection (WSA-8a)
- Section 33 - Zinc Detection (WSA-8b)
- Section 4 - 1,1,2,2-Tetrachloroethane Detection (WSA-8c)
- Section 3 - Phosphoric Acid, Tributyl Ester Detection (WSA-8d)
- Section 3 - Phosphoric Acid, Tributyl Ester Detection (WSA-8e)
- Section 9 - Methyl Naphthalene Detection (WSA-8f)

The COCs in soils (i.e., those displaying an EI greater than 0.1) for the WSA, based on the most sensitive exposed population PPLV (i.e., the industrial worker), are:

- Aldrin
- Benzene
- Carbon tetrachloride
- Dibromochloropropane
- Dicyclopentadiene
- Dieldrin
- Hexachlorocyclopentadiene
- Isodrin
- Methylene chloride
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- Trichloroethylene
- Arsenic
- Cadmium
- Chromium
- Copper
- Lead

The COS in groundwater (i.e., that with a VEI greater than 1) for WSA is:

- 1,1-Dichloroethylene

TABLE 3-1
NUMBER OF EXCEEDANCES FOR CONTAMINANTS OF CONCERN
IN THE WESTERN STUDY AREA

Contaminant of Concern	Number of Exceedances
Aldrin	3
Benzene	1
Carbon tetrachloride	1
Dibromochloropropane	1
Dicyclopentadiene	1
Dieldrin	3
Hexachlorocyclopentadiene	1
Isodrin	1
Methylene chloride	6
1,1,2,2-Tetrachloroethane	1
Tetrachloroethylene	6
Trichloroethylene	4
Arsenic	4
Cadmium	6
Chromium	5
Copper	1
Lead	3

4.0 REFERENCES

RIC 87336R10

EBASCO (EBASCO Services Incorporated). 1987. Final Phase I Contamination Assessment Report. Section 9 - Nonsource Area. Version 3.2. December 1987. Task No. 15 - Army Sites - South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88076R04

EBASCO. 1988a. Final Phase I Contamination Assessment Report. Site 3-4: Nemagon Spill Area. Version 3.2. March 1988. Task No. 7 - Lower Lakes. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88076R04A

EBASCO. 1988b. Phase II Data Addendum. Site 3-4: Nemagon Spill Area. Version 3.1. October 1988. Task No. 20 - Lower Lakes. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88357R01

EBASCO. 1988c. Rocky Mountain Arsenal Chemical Index Volumes I-II. May 1988. Contract No. DAAK11-84-D0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88046R02

EBASCO. 1988d. Final Phase I Contamination Assessment Report. Site 4-2: Burning Pit. Version 3.2. January 1988. Task No. 15 - Army Sites - South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88046R02A

EBASCO. 1988e. Phase II Data Addendum. Site 4-2: Burning Pit. Version 1.1. September 1988. Task No. 22 - Army Sites South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88125R01

EBASCO. 1988f. Final Phase I Contamination Assessment Report. Site 4-3: Burning Pit. Version 3.2. April 1988. Task No. 15 - Army Sites - South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88126R01A
EBASCO. 1988g. Phase II Data Addendum. Site 4-3: Burning Pit. Version 1.1. September 1988. Task No. 22 - Army Sites South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88126R03
EBASCO. 1988h. Final Phase I Contamination Assessment Report. Site 4-4: Open Storage and Salvage Yard Support Areas. Version 3.2. April 1988. Task No. 15 - Army Sites -South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88126R03A
EBASCO. 1988i. Final Phase II Data Addendum. Site 4-4: Open Storage and Salvage Yard Support Areas. Version 3.1. October 1988. Task No. 22 - Army Sites South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88076R02
EBASCO. 1988j. Final Phase I Contamination Assessment Report. Site 4-5: Burning Pits. Version 3.2. February 1988. Task No. 15 - Army Sites - South. Contract No. DAAK11-844-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88076R02A
EBASCO. 1988k. Final Phase II Data Addendum. Site 4-5: Burning Pits. Version 3.1. October 1988. Task No. 22 - Army Sites South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88196R12
EBASCO. 19881. Final Phase I Contamination Assessment Report. Site 4-6: Motor Pool Area. Version 3.1. July 1988. Task No. 38 - TCE Investigation. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88256RO3
EBASCO. 1988m. Final Phase I Contamination Assessment Report. Site 34-2: Sanitary Sewer - Railyard and Administration Areas. Version 3.2. August 1988. Task No. 10. contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88076R01
EBASCO. 1988n. Final Phase I Contamination Assessment Report. Section 3 - Nonsource Area. Version 3.2. February 1988. Task No. 15 - Army Sites - South. Contract No. DAAK11-84-D-0017. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88196R01
EBASCO. 1988o. Final Phase I Contamination Assessment Report. Section 4 - Nonsource Area. Version 3.2. June 1988. Task No. 15 - Army Sites - South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88196R01A
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RIC 87336R10A
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RIC 88126R02
EBASCO. 1988r. Final Phase I Contamination Assessment Report. Section 33 - Nonsource Area. Version 3.1. April 1988. Task No. 15 - Army Sites - South. Contract No. DAAK11-84-D-0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

EBASCO. 1989a. Final Remedial Investigation Report. Volume XII. Western Study Area. Version 3.3. May 1989. Contract No. DAAAK15-88-D-0024. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

APPENDIX A
NONTARGET SCREENING

NONTARGET SCREENING

A number of nontarget contaminants were originally identified through a screen (i.e., toxicity, concentration, frequency of occurrence) of the nontarget fraction of the Phases I and II RI data as part of the RMA Chemical Index (EBASCO, 1988c/RIC88357R01). These contaminants were carried through to the exposure assessment where an additional screening was performed to determine whether PPLVs should be developed for each of the site-specific nontarget contaminants. Development of PPLVs for these contaminants was based on four screening criteria, namely, frequency of occurrence, similarity of the nontarget concentration to that of target contaminants, suspicion that the detection was a laboratory contaminant, and co-occurrence of nontargets with targets in Arsenal soils (see Volume VI-A, Section 2.2.3.1).

The results of the nontarget evaluations for each site of Western Study Area, their screening parameters, and the decision to further consider or reject them, are presented in Table A-1.

TABLE A-1
WESTERN STUDY AREA NONTARGET SCREENING

Site	Nontarget Contaminant	Frequency of Occurrence	Relative Concentration	Suspected Lab Contam.	Co-occurs with Drivers	Nontarget Decision
WSA-1a	Fluoranthene or Pyrene	Low	Low	No	No	Reject
WSA-1c	Fluoranthene	Low	Low	No	No	Reject
	Pyrene	Low	Low	No	No	Reject
WSA-2	2-Butoxyethanol	Low	Low	Yes	Yes	Reject
	Pyrene	Low	Low	No	Yes	Reject
	1,1,2,2-Tetrachloroethane	Low	Low	No	Yes	Reject[1/]
WSA-3a	Trichloropropene	Low	Low	No	No	Reject
WSA-4a	Methyl cyclohexane	Low	Low	No	Yes	Reject
WSA-4b	Tetrahydrofuran	Low	High	No	No	Reject
WSA-5d	Fluoranthane or Pyrene	Low	Low	No	Yes	Reject
WSA-5d	Methyl cyclohexane	Low	Low	No	Yes	Reject
WSA-6a	Fluoranthane or Pyrene	Low	Low	No	Yes	Reject
WSA-6b	Methyl cyclohexane	Low	Moderate	No	No	Reject
WSA-8c	1,1,2,2-Tetrachloroethane	Low	Low	No	No	Reject[1/]
WSA-8d	Phosphoric acid, Tributyl ester	Low	Low	No	No	Reject
WSA-8e	Phosphoric acid, Tributyl ester	Low	Low	No	No	Reject
WSA-8f	Methyl naphthalene	Low	Low	No	No	Reject

1/ Although rejected, PPLVs are computed for this chemical since it was detected in the Western Study Area.