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A Compendium of Field Reports Providing Supporting Information Regarding Closure of the 1100-EM-1, 1100-EM-2, and 1100-EM-3 Operable Units, Hanford, Washington

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Date Published
September 1995

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

United States
Department of Energy
P.O. Box 550
Richland, Washington

Approved for Public Release

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4.0 Field Investigation Report for the 1100-EM-2 and 1100-EM-3 Operable Units.

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SECTION 1

INTRODUCTION

A COMPENDIUM OF FIELD REPORTS PROVIDING SUPPORTING INFORMATION REGARDING CLOSURE OF THE 1100-EM-1, 1100-EM-2, AND 1100-EM-3 OPERABLE UNITS, HANFORD, WASHINGTON

1.0 INTRODUCTION

This compendium contains field activity reports and summaries of data associated with pre-remediation investigations and the remedial actions for the 1100-EM-1, 1100-EM-2, and 1100-EM-3 operable units. It is intended to provide backup detail to the information provided in DOE/RL-95-80.

SECTION 2

SUMMARY OF REMEDIAL ACTIVITIES FOR THE 1100-EM-1 OPERABLE UNIT, HANFORD, WASHINGTON

2.0 SUMMARY OF REMEDIAL ACTIVITIES FOR THE 1100-EM-1 OPERABLE UNIT, HANFORD, WASHINGTON

SUMMARY OF REMEDIAL ACTIVITIES FOR THE 1100-EM-1 OPERABLE UNIT, HANFORD, WASHINGTON

CONTRACT NO. DACW68-94-D-0001

DELIVERY ORDER NO. 015

September 21, 1995

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SUMMARY OF REMEDIAL ACTIVITIES FOR THE
1100-EM-1 OPERABLE UNIT
HANFORD, WASHINGTON

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LIST OF ABBREVIATIONS AND ACRONYMS

BEHP	Bis(2-ethylhexyl)phthalate
beta-HCH	Beta-Hexachlorocyclohexane
CDM Federal	CDM Federal Programs Corporation
CLP	Contract Laboratory Program
COPC	Contaminant of Potential Concern
DOE	U.S. Department of Energy
DQOs	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
HEIS	Hanford Environmental Information System
HTRW	Hazardous, Toxic, and Radiological Waste
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NPL	National Priorities List
mg/kg	milligrams per kilogram
OU	Operable Unit
PCB	Polychlorinated Biphenyl
QA/QC	Quality Assurance/Quality Control
QAPjP	Quality Assurance Project Plan
QAR	Quality Assurance Report
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SOW	Statement of Work
SVOCs	Semi-volatile Organic Compounds
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act
μg/kg	microgram(s) per kilogram
USACE	U.S. Army Corps of Engineers Walla Walla District

LIST OF ABBREVIATIONS AND ACRONYMS (continued)

UTL	Upper Tolerance Limit
VOCs	Volatile Organic Compounds

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1.0 INTRODUCTION

CDM Federal Programs Corporation (CDM Federal) has prepared this summary report describing the removal and stockpiling of contaminated soil at the Hanford 1100 Area, EM-1 Operable Unit (1100-EM-1), Hanford Reservation, Richland, Washington, for the U.S. Army Corps of Engineers Walla Walla District (USACE) under Contract No. DACW68-94-D-0001. Activities described in this summary report were conducted as part of the remedial action for the 1100-EM-1 portion of the 1100 Area National Priorities List (NPL) Site. This work was conducted in accordance with the USACE Statement of Work (SOW) dated September 26, 1994, and subsequent modifications dated January 20, and February 24, 1995. Work conducted by others as part of the 1100-EM-1 Remedial Action is briefly described in this report.

1.1 OBJECTIVES

The objectives of the tasks completed by CDM Federal were to excavate and stockpile, for offsite treatment and/or disposal, soils contaminated with hazardous materials at 1100-EM-1 sites that have been shown to present potential long-term risks to human health. These objectives were accomplished through the excavation of suspected contaminated soils and segregation of confirmed contaminated materials. Sampling and analyses were performed to determine the amount of excavation necessary and to verify the concentration of contaminants in remaining soils with respect to the remediation criteria. The objectives of remedial activities completed by others included the closure of the Horn Rapids Landfill as an asbestos landfill and the installation of five groundwater-monitoring wells to facilitate evaluation of groundwater remedial action objectives.

1.2 SCOPE

The scope of the tasks completed by CDM Federal included the removal and stockpiling of soils from areas of three 1100-EM-1 sites where previous investigations (DOE 1993) have demonstrated the presence of contaminants exceeding remediation criteria. These three sites are the Discolored Soil Site, the Ephemeral Pool Site, and Horn Rapids Landfill. Contaminated soils were to be stockpiled on and covered with plastic sheeting pending transportation and disposal by others. Determination of the concentration of contaminants of concern (COC) in soils excavated from the three sites was made using onsite laboratory capabilities and confirmed by offsite laboratory analyses.

1.3 REPORT ORGANIZATION

This summary report is organized into seven sections. Introduction and site background are presented in Section 1.0. Previous investigation results are summarized in Section 2.0. Methods

used for remediation of the 1100-EM-1 sites are discussed in Section 3.0. A summary of the results of remediation of the three sites is provided in Section 4.0. Section 5.0 details Quality Assurance/Quality Control (QA/QC) protocols implemented by CDM Federal, and provides an assessment of data usability. A brief statement of conclusions is included as Section 6.0 of the report. Section 7.0 is a listing of references cited.

Appended to this summary report is a presentation of the analytical data generated by the onsite laboratory during the site remediation activities (Appendix A). Offsite laboratory analytical data are presented in table form within the main portion of the report, except for waste characterization sample results. Data for the waste characterization samples are provided in summary form in Appendix B. Full analytical data sets as reported by the offsite laboratory will be entered on the Hanford Environmental Information System (HEIS). All sample tables presenting the results of offsite analyses include HEIS numbers for each sample to allow cross-reference. Attainment criteria determination was made using the data set presented in Appendix C. A copy of the USACE North Pacific Division Quality Assurance Report (QAR) is provided in Appendix D. Appendix E of this report includes two memoranda describing radiological surveys of tires formerly located at the Horn Rapids Landfill. Well logs are provided in Appendix F for five groundwater-monitoring wells installed at the Horn Rapids Landfill.

2.0 BACKGROUND

A detailed background of the Hanford 1100 Area is presented in the Remedial Investigation/Feasibility Study (RI/FS) Report (DOE 1993), and in the Remediation Design and Remedial Action Plan for the 1100 Area (USACE 1994a). This section provides a brief summary of site history and setting.

2.1 LOCATION AND DESCRIPTION OF THE EM-1 OPERABLE UNIT

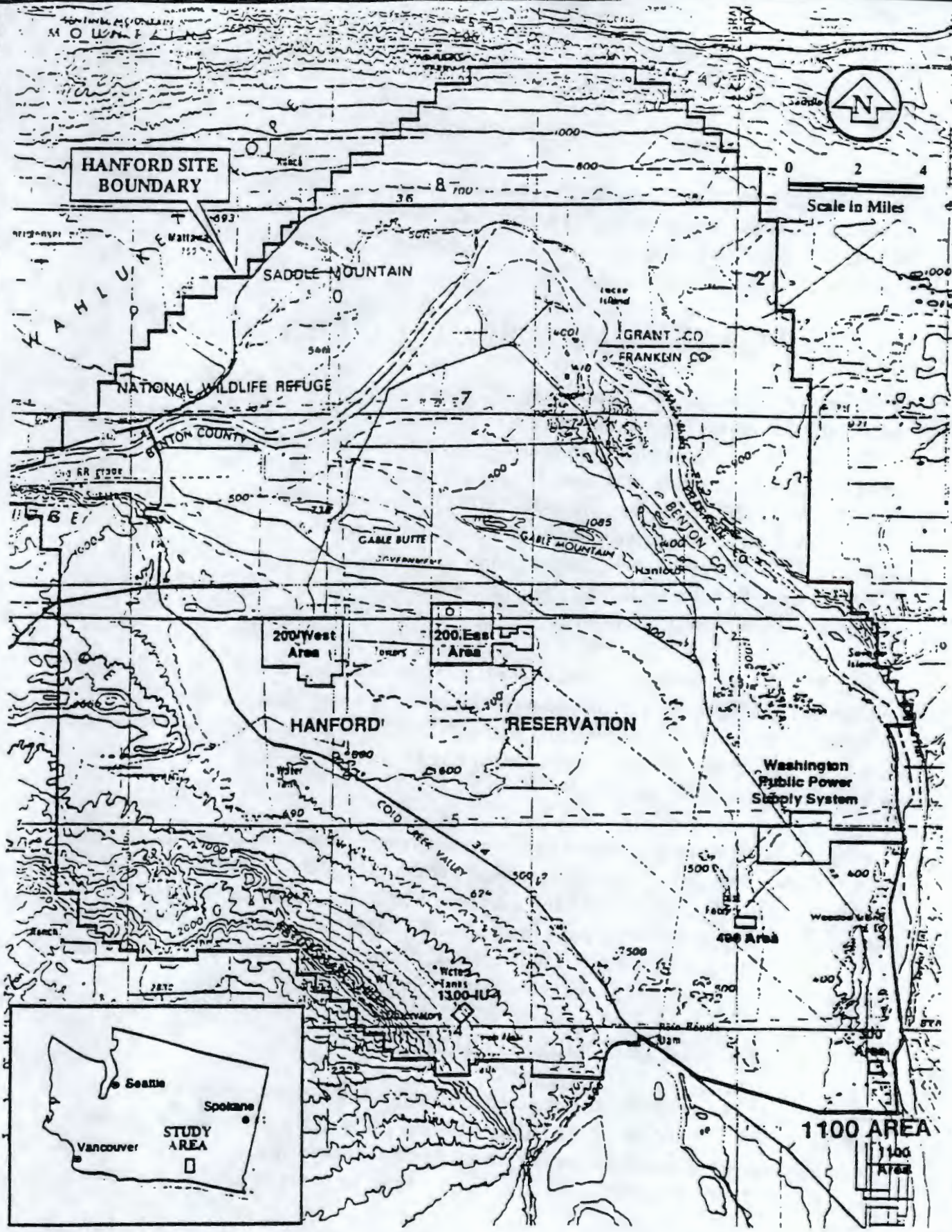
The Hanford 1100 Area was placed on the NPL in July 1989. The location of the Hanford Site and the 1100 Area are depicted on Figure 2-1. To facilitate the assessment and remediation of 1100 Area, potential hazardous waste sites were divided into four OUs based on geographic area and common waste sources. The four OUs are identified as 1100-EM-1 (EM-1), 1100-EM-2 (EM-2), 1100-EM-3 (EM-3), and 1100-IU-1 (IU-1). Due to the close proximity of the 1100-EM-1 to the North Richland well field which constitutes the water supply for the town of Richland, EM-1 was assigned the highest priority of the Hanford 1100 Area OUs. The 1100-EM-1 underwent a full-scale RI/FS to determine the nature and extent of contamination and to identify preferred remedial alternatives.

The 1100-EM-1 encompasses an area on the southeast side of the Hanford Site, north of the town of Richland. EM-1 contains the central warehousing, vehicle maintenance, and transportation distribution center for the entire Hanford Site. Additionally, the Horn Rapids Landfill is located in the northern portion of EM-1. Operations at EM-1 have included the use of solvents, fuels, oils, and polychlorinated biphenyls (PCB).

During the RI/FS, three areas within EM-1 were determined to contain contaminants at levels that may pose potential long-term risks to human health. These areas of concern include an area of discolored soil (Discolored Soil Site), a depression adjacent to a parking lot which served to collect runoff (Ephemeral Pool), and a former landfill (Horn Rapids Landfill). The location of each of these three areas are depicted in Figure 2-2. Section 2.2 presents descriptions of the three sites and the results of previous investigations for each.

2.2 SUMMARY OF PREVIOUS INVESTIGATIONS

Data from previous investigations were used to identify areas of contaminated soils requiring excavation. The 1100-EM-1 OU RI/FS Report (DOE 1993) served as the source for the information presented in this section and provides a more detailed description of the methods and results of the investigations. The investigation results for the three sites are presented separately.



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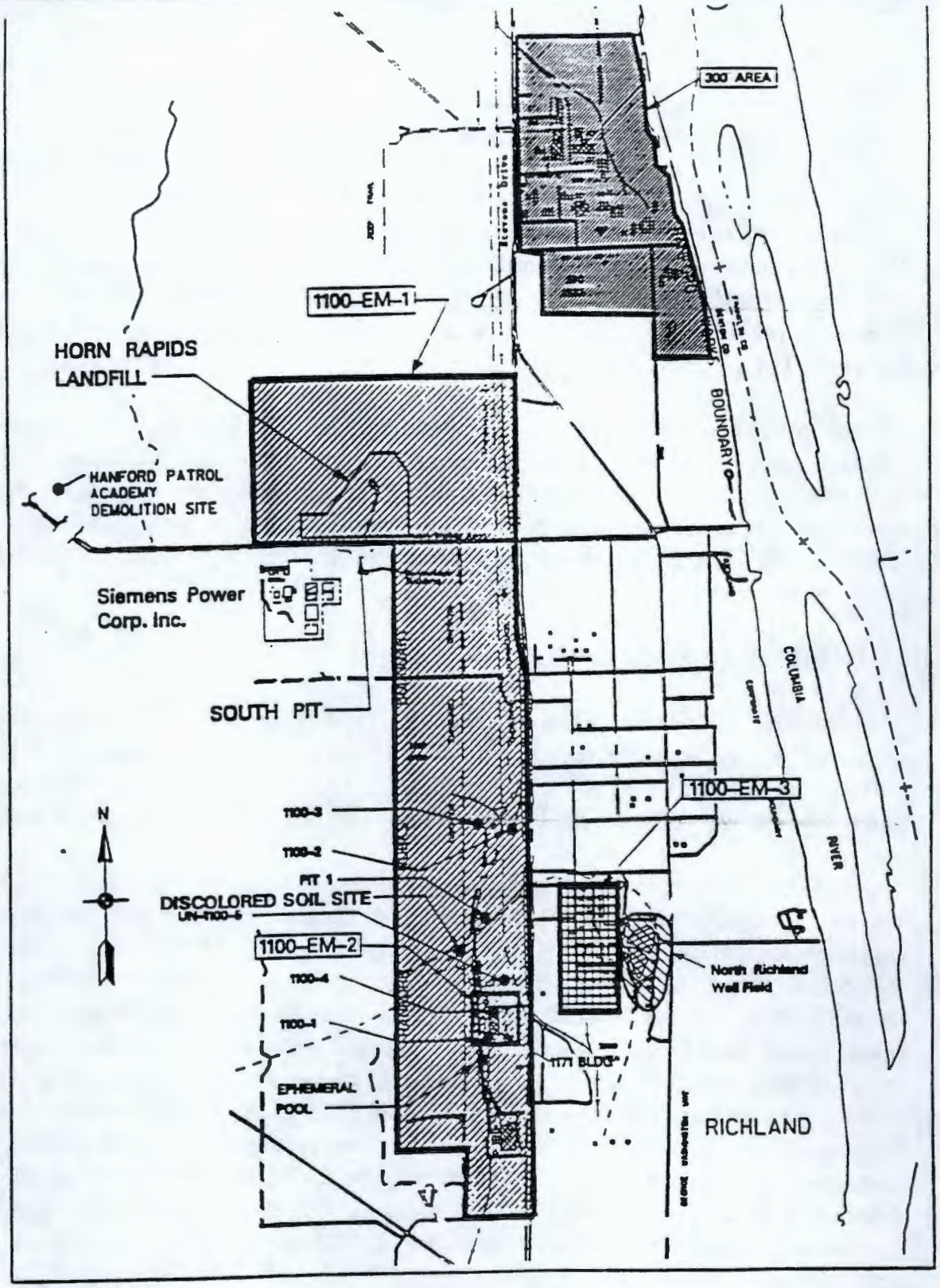
LOCATION OF THE HANFORD SITE AND THE 1100 AREA (MODIFIED FROM USACE 1994a)

Figure No. 2-1



1100 AREA — Outline and Designation of Operable Units

1100-3 — Subunit Location and Designation

0 500 1000 METERS

0 1000 2000 3000 FEET

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LOCATION OF THE
1100 AREA OPERABLE UNITS AND SITES
(MODIFIED FROM DOE 1993)

Figure No. 2-2

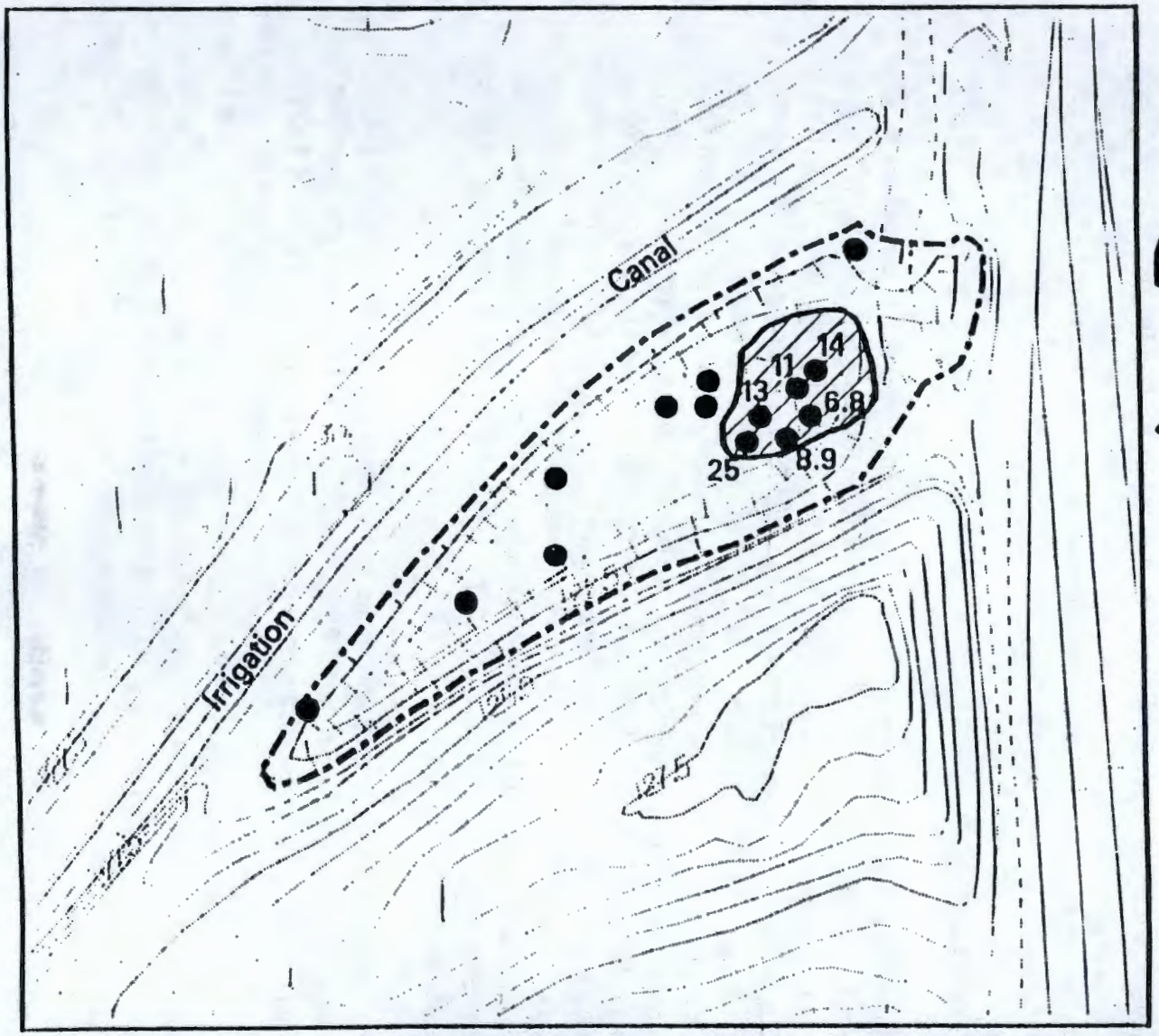
As reported in the RI/FS Report (DOE 1993), analytical results from soil samples collected at each of the three sites during previous investigations were compared to Upper Tolerance Limits (UTLs) for each analyte detected. The UTLs are essentially project-specific background levels calculated under an earlier study and reported in the Phase I 1100-EM-1 OU Report (DOE 1990). Further explanation and the method UTL calculations are provided in Appendix K of the 1100-EM-1 OU RI/FS Report (DOE 1993) and in the Phase I Report (DOE 1990). Any analyte found to be present at a site at a concentration exceeding the UTL was considered to be a contaminant of potential concern (COPC).

Potential risks to human health and the environment posed by the COPCs identified at each site were assessed in the RI/FS. Contaminants present at concentrations believed to present an unacceptable potential health risk are those which were targeted for cleanup. Health-based cleanup goals were established for these contaminants, typically at higher concentrations than the UTLs. No contaminants were found to present an unacceptable potential risk to environmental receptors.

2.2.1 DISCOLORED SOIL SITE

The Discolored Soil Site lies approximately 609 m (2000 ft) northwest of Building 1171 and encompasses an east-west trending depression. Previous investigations identified visibly stained soil covering an area of about 1.8 m (6 ft) by 3.0 m (10 ft) at the eastern end of the depression. The stained soil was determined to be the result of a spill of bis(2-ethylhexyl)phthalate (BEHP).

Three COPCs were determined to be present in surface soils of the Discolored Soil Site at concentrations exceeding UTLs. These contaminants and their maximum detected concentrations include the following: bis(2-ethylhexyl)phthalate (BEHP) (25,000 mg/kg); chlordane (1.86 mg/kg); and heptachlor (0.065 mg/kg). The risk assessment conducted as part of the RI/FS (DOE 1993) demonstrated that BEHP was the only contaminant detected at a concentration which presented an unacceptable potential health risk. Contamination was thought to be limited to the top 25.4 cm (10 in) of soil and in the eastern end of a triangular depression which defines the site. Figure 2-3 modified from the RI/FS Report (DOE 1993) shows the estimated distribution of BEHP in surface soils at concentrations exceeding the UTL of 690 micrograms per kilogram (μg/kg). The cleanup criteria for BEHP established in the 1100 Area Record of Decision (ROD) (EPA 1993) was 71 mg/kg. The volume of contaminated soil to be removed was estimated to be 99 to 336 cubic meters (130 to 440 cubic yards) assuming an excavation depth of 0.46 m (1.5 ft) (USACE 1994a).



LEGEND :

- ● Soil Sampling Location and BEHP concentration x 10^6 (micro-g/kg).
- Surface Soil with BEHP concentration above Screening Criterion. (690 micro-g/kg)
- UN-1100-6 Operable Sub-unit Boundary. (Estimated)

N

0 20 40 METERS

0 80 120 FEET

Contour Interval is 0.5 meter.

UN-1100-6, Discolored Soil Site – BEHP Distribution in Surface Soils at Concentrations above a UTL of 690 micro-g/kg.

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DISTRIBUTION OF BEHP IN SURFACE SOILS
OF THE DISCOLORED SOIL SITE AT CONCENTRATIONS
EXCEEDING THE UTL OF 690 Mg/Kg
(MODIFIED FROM DOE 1993)

11/94

Figure No 2-3

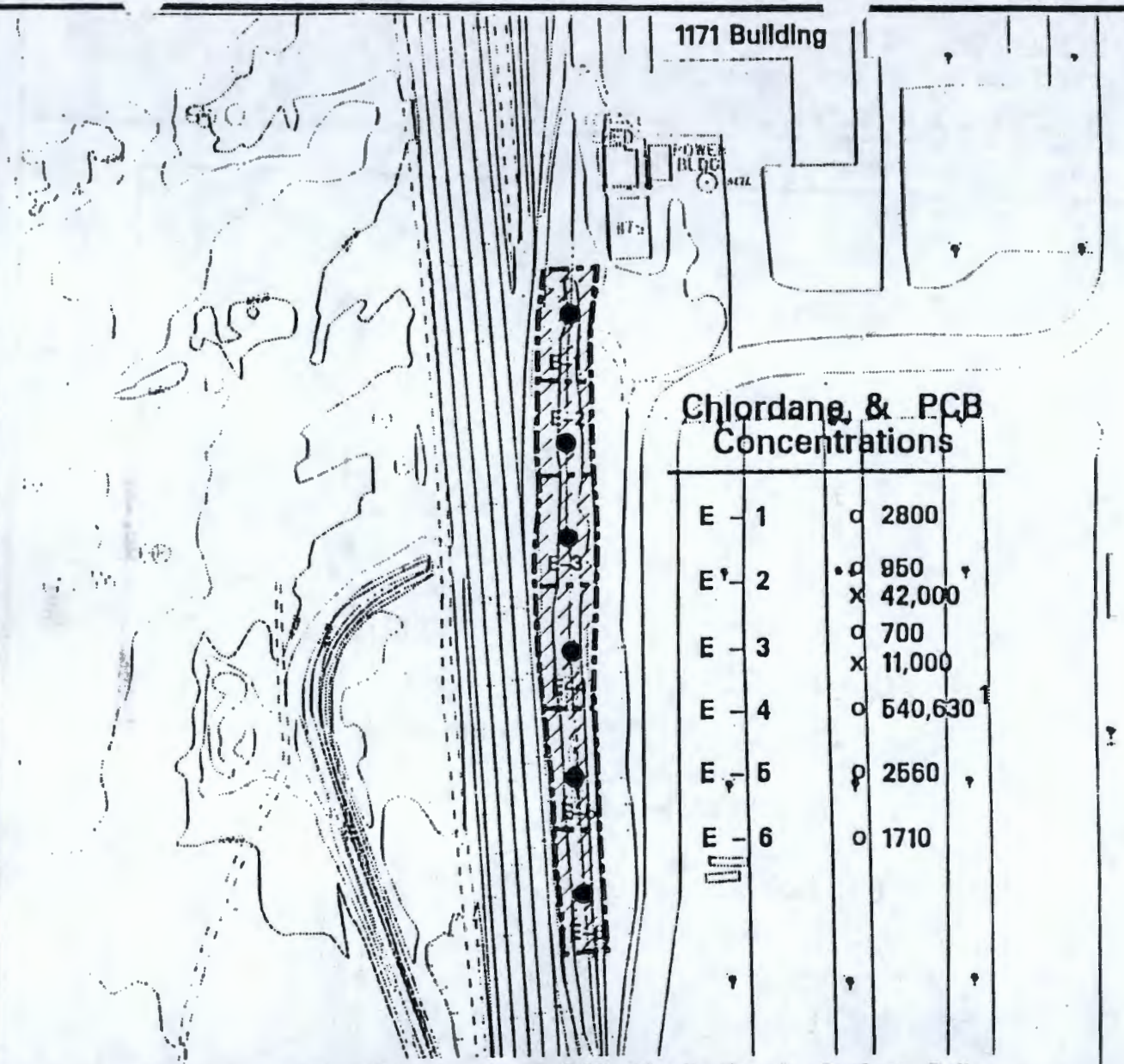
2.2.2 EPHEMERAL POOL

The Ephemeral Pool is a 6.1 m (20 ft) by 213 m (700 ft) manmade depression on the western side of the Building 1171 parking lot where runoff water collects and evaporates.
The COPCs identified in surface soils at the Ephemeral Pool Site and their maximum detected concentrations consist of chlordane (2.8 mg/kg), heptachlor (0.029 mg/kg), and PCB Aroclor 1248 (42 mg/kg). Of these contaminants, only Aroclor 1248 was determined to present an unacceptable potential human health risk. Figure 2-4 modified from the RI/FS Report, shows the estimated distribution of Aroclor 1248 and chlordane in surface soils of the Ephemeral Pool Site. The UTL for Aroclor 1248 is 170 µg/kg. The cleanup level for PCB at the Ephemeral Pool Site was established at 1 mg/kg (EPA 1993). Soil containing Aroclor 1248 at concentrations greater than this level was assumed to be confined to the northern portion of the elongate depression which defines the site. Based on an estimated depth of contamination of 0.46 m (1.5 ft), the volume of contaminated soils to be removed from this site was estimated to be between 126 to 260 cubic meters (165 to 340 cubic yards) (USACE 1994a).

2.2.3 HORN RAPIDS LANDFILL

The Horn Rapids Landfill covers approximately 20.25 hectares (50 acres) located northeast of the Siemens Power Corporation facility and north of Horn Rapids Road. The landfill was operated as an uncontrolled landfill from the late 1940s until the 1970s. Disposal of office and construction waste, asbestos wastes, sewage sludge, and fly ash is known to have occurred at the landfill. In addition to asbestos contamination, thirteen COPCs were identified in surface soils during investigation of the Horn Rapids Landfill. These contaminants and their maximum detected concentrations include the following: arsenic (6.6 mg/kg); barium (1320 mg/kg); chromium (1250 mg/kg); copper (1280 mg/kg); manganese (501 mg/kg); nickel (557 mg/kg); thallium (3.1 mg/kg); vanadium (101 mg/kg); zinc (3160 mg/kg); beta-hexachlorocyclohexane (beta-HCH) (0.094 mg/kg); DDT (1.98 mg/kg); heptachlor (0.02 mg/kg); and PCB (102 mg/kg). PCB were also detected in two subsurface soil samples. The risk assessment demonstrated that PCB represented the only contaminant detected at concentrations which present an unacceptable human health risk (DOE 1993).

Soils containing PCB were detected only in the south-central portion of the Horn Rapids Landfill. Figure 2-5 modified from the RI/FS Report (DOE 1993) illustrates the location of soil samples demonstrating PCB contamination at concentrations exceeding the UTL of 170 µg/kg. Other COPCs which were found to be approximately coincident with (i.e., detected in the same area as) the PCB contamination include the following: heptachlor, DDT, DDE, (beta-HCH), and vanadium. The 1100 Area ROD (EPA 1993) established a cleanup level of 5 mg/kg for PCB-contaminated soil at the Horn Rapids Landfill. Assuming a maximum depth of contamination of 1.52 m (5 ft), the volume of contaminated soils requiring removal (i.e., soil with concentrations



Chlordane & PCB Concentrations		
E – 1	o	2800
E – 2	o	950
	x	42,000
E – 3	o	700
	x	11,000
E – 4	o	540,630 [1]
E – 5	o	2560
E – 6	o	1710

Ephemeral Pool – Chlordane and PCB Distribution in Surface Soils.

LEGEND :

Surface Soil Sampling Location and Number.

x PCB Concentration (micro-g/kg).

o Chlordane Concentration (micro-g/kg).

1 Duplicate

N

0 30 60 METERS

0 100 200 FEET

Contour Interval is 0.5 meter.

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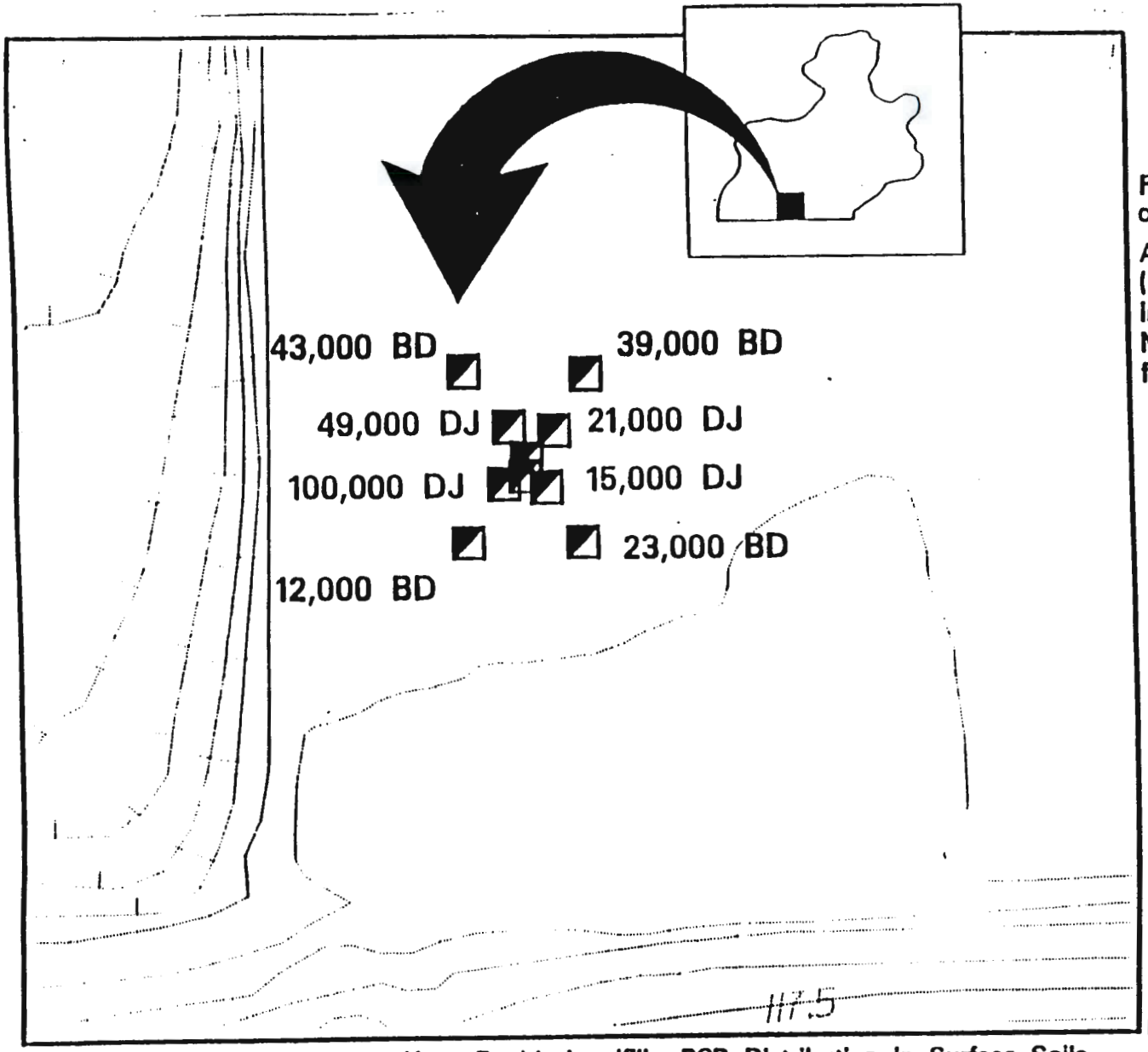
DISTRIBUTION OF PCBs AND CHLORDANE IN SURFACE SOILS OF THE EPHEMERAL POOL SITE (MODIFIED FROM DOE 1993)

11/94

Figure No 2-4



Horn Rapids Landfill – PCB Distribution in Surface Soils.

LEGEND :

Soil Sampling Location

PCB Isomer Anchor 1248 only one detected.

Aroclor 1248 Concentrations (micro-g/kg) for values exceeding UTL of 170 micro-g/kg. Maximum concentration shown for the depth interval 0 – 1.5 ft.

N

Contour interval is 0.5 meter.

NOTE :

B – Laboratory analysis qualifier indicating analyte was found in associated blank as well as in sample.

D – Laboratory analysis qualifier indicating compound identified at a secondary dilution factor.

J – Laboratory analysis qualifier indicating an estimated quanity.

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DISTRIBUTION OF PCBs IN SURFACE SOILS
OF THE HORN RAPIDS LANDFILL SITE AT CONCENTRATIONS
EXCEEDING THE UTL OF 170 Mg/Kg
(' DIFIED FROM DOE 1993)

11/94

ure No. 2-5

of PCB exceeding the cleanup criteria established in the ROD) was estimated to be approximately 230 to 460 cubic meters (300 to 600 cubic yards) (DOE 1993). The 1100 Area ROD (EPA 1993) also required that a cap be constructed over the entire landfill and that five groundwater-monitoring wells be installed. These remedial objectives were accomplished by other USACE contractors.

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3.0 REMEDIATION APPROACH

Remediation of the 1100-EM-1 operable unit was accomplished by two USACE contractors, CDM Federal and Morrison Knudsen Environmental Corporation (Morrison Knudsen), and several subcontractors. In this section, activities conducted by CDM Federal are described in detail. The final subsection presents a summary of remedial activities completed by Morrison Knudsen.

CDM Federal conducted the sampling, excavation, and stockpiling of contaminated soils at the three 1100-EM-1 sites between January 30, 1995, and March 16, 1995. These tasks were accomplished according to procedures contained in the following documents:

- Remedial Action Work Plan, Removal and Stockpiling of Contaminated Soil, EM-1 Operable Unit, Hanford 1100 Area, Washington; CDM Federal, 1995.

- Remediation Design and Remedial Action Plan for the 1100 Area, Hanford Site; USACE, Walla Walla, 1994.

- Remedial Design Field Sampling Plan for Field Investigations Supporting Remedial Design/Remedial Action Activities in the 1100 Area; USACE, Walla Walla, 1994.

- Quality Assurance Project Plan for Field Investigations Supporting Remedial Design/Remedial Action Activities in the 1100 Area; USACE, Walla Walla, 1994

Deviations from the procedures outlined in these documents are described in Section 5.5.

3.1 REMOVAL AND SEGREGATION OF CONTAMINATED SOILS

Prior to the excavation of contaminated soils from the Discolored Soil Site, the Ephemeral Pool Site, and the Horn Rapids Landfill, the locations at which soil samples were collected during the RI/FS were surveyed and staked by the USACE. Removal of contaminated soils was accomplished using a track hoe. Excavation at each site began in the area of known contamination (based on RI/FS sample results) and proceeded downward and outward based on visual evidence of contamination and the results of onsite screening analyses conducted in the mobile laboratory. Contaminated soils were stockpiled on 10-mil plastic sheeting and covered with heavy-gauge tarps at the end of each day.

3.2 SAMPLING

3.2.1 TYPES OF SAMPLES COLLECTED

At the direction of the USACE, sampling and analysis was conducted at the three EM-1 sites for five separate purposes. The types of samples collected and the intended purpose of each is described below:

Screening Samples - Once excavation of suspect contaminated materials had begun, soil samples were collected from the base and walls of the excavation at regular intervals to determine the presence or absence of contaminants above the cleanup levels established in the 1100 Area ROD (EPA 1993). These samples were analyzed in an onsite laboratory facility providing rapid turnaround and at least U.S. Environmental Protection Agency (EPA) QC Level II analytical results. Analytical results were typically available within three hours of sample collection.

Confirmation Samples - Once all contaminated soil had been removed from a site, as demonstrated by the analytical results of screening samples collected from the excavated area, confirmation samples were collected for off-site laboratory analysis. Analyses were performed on a quick turnaround basis with initial results available within 48 hours of sample receipt by the laboratory. These analyses were conducted in accordance with EPA QC Level III data requirements, with 10% meeting EPA QC Level IV equivalent data requirements. Additionally, at least 10% of all confirmation samples were split and submitted to the USACE North Pacific Division (NPD) Laboratory for analysis as QA samples.

Rinsate Samples - Aqueous samples consisting of water from the final rinse in sample equipment decontamination were collected during confirmation sampling at each site to evaluate the potential for cross-contamination. These samples were analyzed for the cleanup target constituents at the offsite laboratory in accordance with EPA QC Level III data requirements. These samples were also split and submitted to the USACE NPD Laboratory as QA samples.

Waste Characterization Samples - Composite samples were collected from contaminated soil stockpiles at each site to quantify the concentration of target contaminants and to determine the presence or absence of other hazardous constituents. These data were used to identify transportation and disposal requirements for each waste stream. Analyses of waste characterization samples were conducted by the offsite laboratory according to EPA QC Level III data requirements.

Profile Samples - A single composite sample was collected to represent each of the two categories of contaminated soils stockpiled; (1) BEHP-contaminated soils from the Discolored Soil Site, and, (2) PCB-contaminated soils from the Ephemeral Pool Site and the Horn Rapids

Landfill. The sample of BEHP-contaminated soil was shipped to APTUS for evaluation of incineration characteristics while the PCB-contaminated soil sample was shipped to Chemical Waste Management for determination of suitability and acceptance for land disposal. Assessment of these profile samples by the two treatment and disposal facilities resulted in the acceptance of both waste streams.

3.2.2 SAMPLE IDENTIFICATION AND MAPPING

Identification or labelling of samples collected during the remediation of the EM-1 sites followed protocols outlined in the Remedial Design Field Sampling Plan for the 1100 Area, Hanford Site (USACE 1994b). A field coding system was used to identify each sample during the sampling program. Samples were numbered according to the following system:

Example Sample Number: EM-1/01 - CM - 15 - 3; where

EM-1	=	Hanford 1100 Area, EM-1 OU
01	=	Site #01 (Discolored Soil Site); alternatively,
02	=	Site #02 (Ephemeral Pool Site)
03	=	Site #03 (Horn Rapids Landfill)
CM	=	Confirmatory/Mobile Lab (screening sample); alternatively,
C	=	Confirmatory/Offsite Lab
W	=	Waste Characterization Sample
15	=	Sampling Location
3	=	Collection Depth (in feet unless otherwise specified)

Equipment rinsate blanks were designated by adding the letters "EB" to the front of the sample number for the soil sample collected immediately prior to the decontamination event. The letters "QA" were added to the front of the sample number for split samples shipped to the USACE NPD Laboratory for QA analyses. Split samples analyzed by CDM Federal's subcontract offsite laboratory were submitted as blind duplicates (i.e., split samples were given different location numbers than corresponding original samples).

Sample locations were recorded and plotted with respect to an arbitrary grid established at each of the sites. The temporary grids were installed using a simple tape measure, paint, and pin flags. These grids were not surveyed. Therefore, sample locations must be considered approximate.

3.3 ONSITE LABORATORY ANALYSES

A mobile laboratory was used to provide same-day analytical results for screening samples collected during excavation at the three EM-1 sites. QA/QC procedures employed in the analysis of samples in the mobile laboratory met or exceeded the certification/accreditation requirements of the Washington Department of Ecology. All samples were hand delivered to the mobile laboratory under standard chain-of-custody protocols.

All screening samples were extracted with hexane using a sonication method (SW-846 Method 3550), and analyzed by gas chromatograph and capillary column. Screening samples from the Discolored Soil Site were analyzed by SW-846 Method 8060 for the presence of BEHP. Screening samples from the Ephemeral Pool Site and the Horn Rapids Landfill were analyzed by SW-846 Methods 8081 (GC with a capillary column) for the presence of PCB. Analytical results were reported on a dry-weight basis, using estimated moisture content for samples as received. Sample data packages produced by the onsite laboratory conformed to EPA Level II QC requirements.

3.4 OFFSITE LABORATORY ANALYSES

Confirmation samples, rinsate samples, and waste characterization samples were shipped offsite for laboratory analysis. The analyses performed and sample data packages provided by the offsite laboratory reflect EPA QC Level III, except for 10% "CLP-type" analyses which reflect EPA QC Level IV. Sample extractions utilized the Soxhlet method (SW-846 Method 3540). BEHP analyses for samples collected at the Discolored Soil Site were by SW-846 Method 8060. Analysis of samples from the Horn Rapids Landfill and the Ephemeral Pool Site was by SW-846 Method 8080 for PCB. For all analyses, moisture content was determined by ASTM Method D2216 and analytical results were reported on a dry-weight basis.

3.5 DATA EVALUATION

Attainment criteria were established by the regulatory agencies to determine when cleanup criteria had been met for the 1100-EM-1 sites. These criteria are based on the cleanup standards provided in the ROD (EPA 1993) and existing state requirements for the remediation of hazardous waste sites.

3.5.1 ATTAINMENT CRITERIA

Attainment criteria for the 1100-EM-1 soil removal actions were developed jointly by EPA and Ecology. Guidance for application of numerical standards established in the Washington Model

Toxics Control Act (MTCA) formalized in WAC 173-340-740(7)(d) was used as the basis for these criteria. For 1100-EM-1, the sites would be considered to be fully remediated if:

(i) The upper confidence interval on a true soil concentration is less than the soil cleanup level. Statistical tests would be performed at a Type I error level of 0.05 (95% upper confidence level);

(ii) No single sample concentration is greater than two times the soil cleanup level; and

(iii) Less than fifteen percent of the sample concentrations exceed the soil cleanup level.

In the development of these criteria, it was recognized that the data sets obtained would probably have sample distributions which were "skewed to the left." In other words, there would be a large number of samples where contaminant concentrations were not detected (thus the leftward skew), some samples where contaminant concentrations were between non-detect and the specified cleanup levels, and a small percentage of samples where contaminant levels ranged between the cleanup level to two times the cleanup level. If the sample sets were tested for normality and log-normality and failed, it was agreed that the approximate method of calculating the one-sided upper confidence limit presented in Section 5.2.1.3 of Ecology's *Statistical Guidance for Ecology Site Managers* (Ecology 1992) would be used.

3.5.2 SAMPLE POPULATION

The sample population for data includes that analyzed by both on-site and off-site laboratories. The analytical methods used by the on-site laboratory were selected to ensure that all data obtained would be reliable. Off-site laboratory analysis was used to provide confirmation that cleanup levels had been met. In some cases, a sample was split and analyzed by both laboratories. A comparison of these data found excellent correlation between results. Blind duplicate analyses were also performed on samples submitted to the on-site laboratory as a quality control check. Again, excellent correlation of the analyses was determined. In cases were duplicate analyses were run, an average of the returned values was used for statistical input.

3.6 OTHER REMEDIAL ACTIVITIES

Several other remedial activities were performed by USACE contractor Morrison Knudsen in fulfillment of the 1100 area ROD (EPA 1993). These activities can be divided into three general categories; closure of the Horn Rapids Landfill, installation of groundwater-monitoring wells, and transport and disposal of wastes. Work accomplished under each category is summarized below.

3.6.1 CLOSURE OF THE HORN RAPIDS LANDFILL

The 1100 area ROD (EPA 1993) required that the Horn Rapids Landfill be closed as an asbestos landfill in accordance with the National Emissions Standards for Hazardous Air Pollutants (NESHAP) contained in the Code of Federal Regulations (CFR) 40, 61.151. Compliance with this requirement involved the construction of an engineered cap and the placement of a notice on the property deed. However, prior to construction of the cap an open landfill cell containing automobile and truck tires required remediation and a burn cage was to be dismantled.

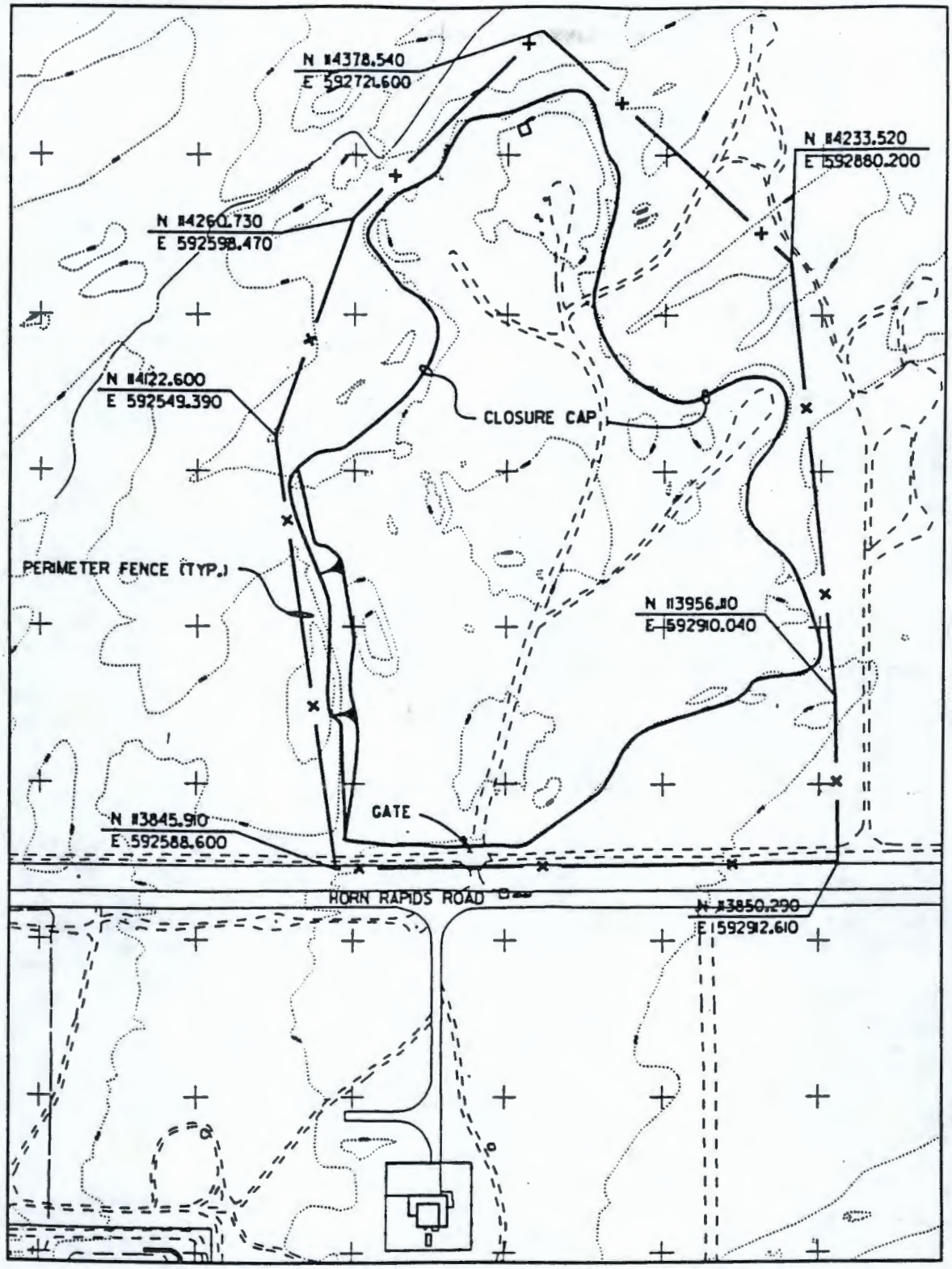
Remediation of the open cell at the Horn Rapids Landfill began with a radiological survey of approximately 200 tires. No detectable activity was observed by the survey. Appendix D contains two memoranda referencing the survey. The tires were transported to Tire Byproducts Company of Spokane, Washington, to be recycled. The burn cage was dismantled and transported to the central portion of the landfill to be covered with the cap.

Construction of the Horn Rapids Landfill cap followed methods given in the *Remedial Action Workplan for the 1100-EM-1 Operable Unit* (DOE 1995a). A random material layer with a thickness of 45 cm (18 in) was overlain by a 15 cm (6 in) layer of topsoil. The location and extent of the cap is shown on Figure 3-1. Construction of the cap was completed on April 13, 1995. Seeding of the cap to promote native vegetation is scheduled for the Fall of 1995.

3.6.2 GROUNDWATER-MONITORING WELLS

The 1100 Area ROD (EPA 1993) specified compliance with the Safe Drinking Water Act (SDWA) maximum contaminant level (MCL) of 5 μg/l for trichloroethylene (TCE) in groundwater at the Horn Rapids Landfill. The remedial action for achieving this goal was identified as natural attenuation. Groundwater monitoring was specified to confirm that the remedial action objectives were being achieved. In addition, controls were initiated to prevent the installation of groundwater wells in the path of contaminated groundwater until remedial action objectives have been attained.

In August, 1995, five groundwater-monitoring wells were installed down gradient of the Horn Rapids Landfill. Figure 3-2 illustrates the location and provides the coordinates for these wells. Well logs for these five wells are presented in Appendix E. Well installation and periodic sampling are described in the *Additional Monitoring Well Installation and Field Sampling Plan* (DOE 1995b).



SCALE IN METERS

100m 0 100m

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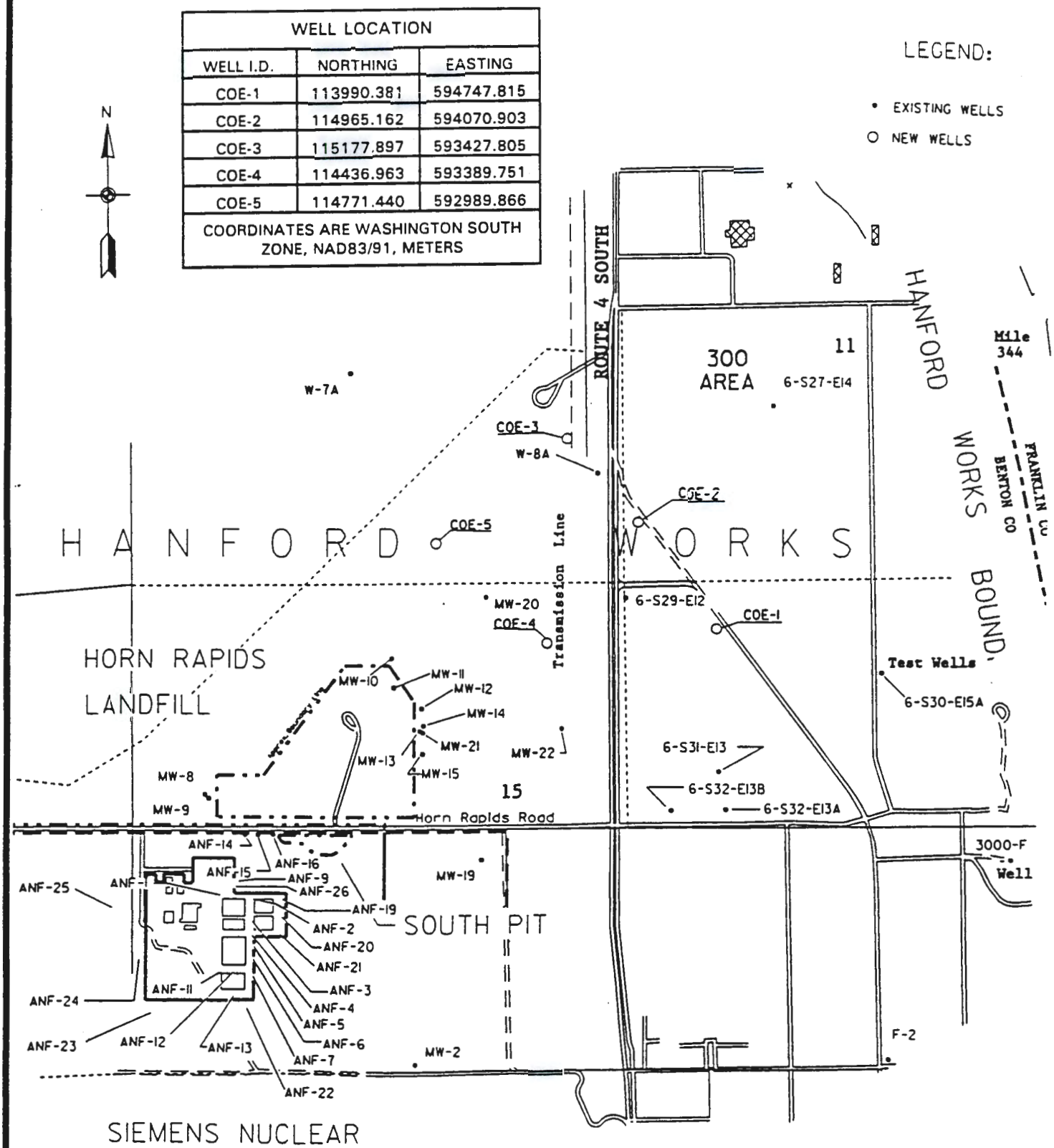
PERIMETER FENCE AND CLOSURE CAP HORN RAPIDS LANDFILL

Figure 3-1

WELL LOCATION		
WELL I.D.	NORTHING	EASTING
COE-1	113990.381	594747.815
COE-2	114965.162	594070.903
COE-3	115177.897	593427.805
COE-4	114436.963	593389.751
COE-5	114771.440	592989.866
COORDINATES ARE WASHINGTON SOUTH ZONE, NAD83/91, METERS		



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NEW MONITORING WELL LOCATIONS

Figure 3-2

3.6.3 TRANSPORT AND DISPOSAL OF WASTES

Contaminated soils from the Horn Rapids Landfill, Discolored Soil Site, and Ephemeral Pool were transported and disposed by Morrison Knudsen. PCB contaminated soil from the Horn Rapids Landfill and Ephemeral Pool were disposed of at the Chemical Waste Management Facility in Arlington, Oregon. That facility is a RCRA, Class C/Toxic Substances Control Act (TSCA) disposal location. The BEHP contaminated soil was subject to thermal treatment at the Aptus, Incorporated Incineration Facility in Aragonite, Utah.

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4.0 SITE REMEDIATION AND ANALYTICAL RESULTS

This section presents the results and findings of the remedial action conducted by CDM Federal at the Hanford 1100-EM-1 sites. The first three subsections describe the excavation, screening, and confirmation sample results for each of the three sites. The fourth subsection provides a summary of the final disposition for wastes generated at each site. Application of the attainment criteria established by the regulatory agencies is discussed in Section 4.5.

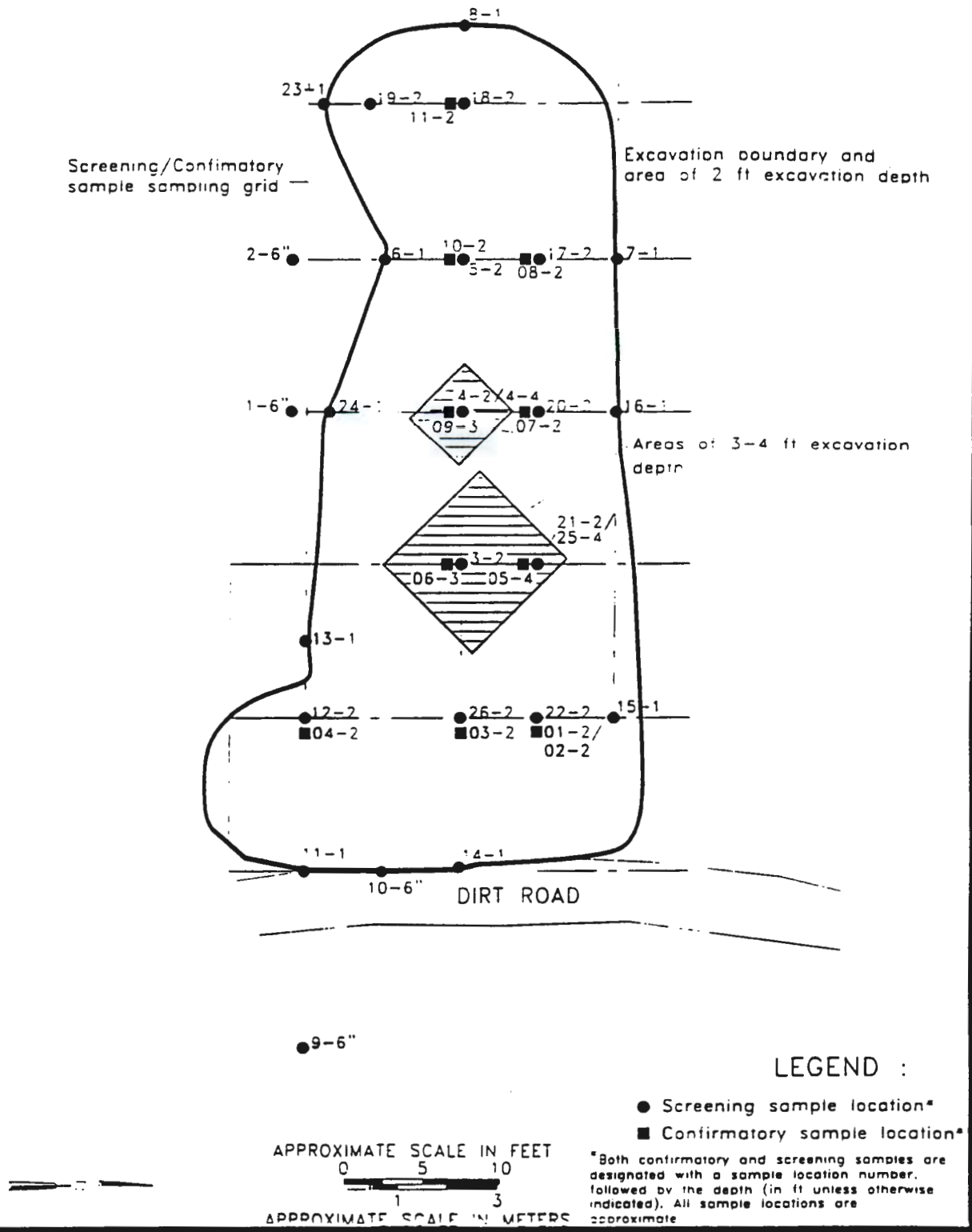
4.1 DISCOLORED SOIL SITE

Excavation and stockpiling of BEHP-contaminated soils at the Discolored Soil Site were accomplished on February 13 and 14, 1995. Figure 4-1 depicts the depths of excavation and the screening and confirmatory sample locations at the Discolored Soil Site. Initial soil removal to a depth of 60 cm (2 ft) was accomplished based on field observations of stained soils. Previous investigations demonstrated elevated concentrations of BEHP associated with the discolored soils in this area (DOE 1993). Staining of soil was darkest in the uppermost 20 cm (8 in) of the soil profile.

Once all stained soils had been removed, screening samples were collected to determine if additional excavation would be necessary. Analytical results for each screening sample are provided in Appendix A of this report. Samples were collected from the perimeter of the excavation (from the excavation walls) and from the base of the excavation. Of the 25 samples collected and subsequently analyzed by the onsite laboratory, results from two samples indicated the presence of BEHP at concentrations exceeding the established cleanup level of 71 mg/kg. Additional excavation was conducted in the area of these two samples and the areas were resampled. The results of the deeper sampling in these areas demonstrated that soils contaminated by BEHP at concentrations greater than the cleanup level had been removed. A total of approximately 61 cubic meters (80 cubic yards) of BEHP-contaminated soil were excavated and stockpiled at the Discolored Soil Site.

Eleven confirmatory samples (including one duplicate sample) were collected from the excavation for offsite laboratory analyses. These samples were collected as discrete samples rather than by the composite sampling procedures described in the Remedial Action Work Plan (CDM Federal 1995). Discrete samples were collected because of the relatively small areal extent of the excavated area. This change was discussed with the regulatory agencies prior to sampling.

Confirmatory sample locations are illustrated in Figure 4-1. The sample which was split for duplicate analysis was also submitted to the USACE NPD Laboratory as a QA split sample. Sample locations were selected to provide uniform coverage of the excavated area. Table 4-1



SCREENING AND CONFIRMATORY SAMPLE LOCATIONS AT THE DISCOLORED SOIL SITE/EM-1 1100 AREA

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FIGURE No. 4-1

154-1/10APR95/1-1

TABLE 4-1
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
DISCOLORED SOIL SITE CONFIRMATORY SAMPLES

SAMPLE NUMBER	HEIS NUMBER[1]	DATE COLLECTED	BIS(2-ETHYLHEXYL)PHTHALATE (mg/kg)
EM-1/01-C-01-2	BODSL0	2/14/95	10.4
EM-1/01-C-02-2[2]	BODSL1	2/14/95	9.39
EM-1/01-C-03-2	BODSL3	2/14/95	7.31
EM-1/01-C-04-2	BODSL4	2/14/95	0.108
EM-1/01-C-05-4	BODSL5	2/14/95	112
EM-1/01-C-06-3	BODSL6	2/14/95	0.683
EM-1/01-C-07-2	BODSL7	2/14/95	4.23
EM-1/01-C-08-2	BODSL8	2/14/95	2.35
EM-1/01-C-09-3	BODSL9	2/14/95	1.67
EM-1/01-C-10-2	BODSM0	2/14/95	11.3
EM-1/01-C-11-2	BODSM1	2/14/95	6.12
EBEM-1/01-C-11-0[3]	BODSM2	2/14/95	0.522

[1] HEIS = Hanford Enviornmental Information System

[2] Sample EM-1/01-C-02-2 collected as a blind duplicate of sample EM-1/01-C-01-2. Original sample also split for QA Analysis by USACE NPD Laboratory.

[3] EB indicates sample is an equipment (rinsate) blank. Analytical aresults for this sample reported in mg/l.

presents the results from these sample analyses. Evaluation of these data indicated that the remediation goals had been achieved. Application of the attainment criteria is discussed in Section 4.5.

4.2 EPHEMERAL POOL SITE

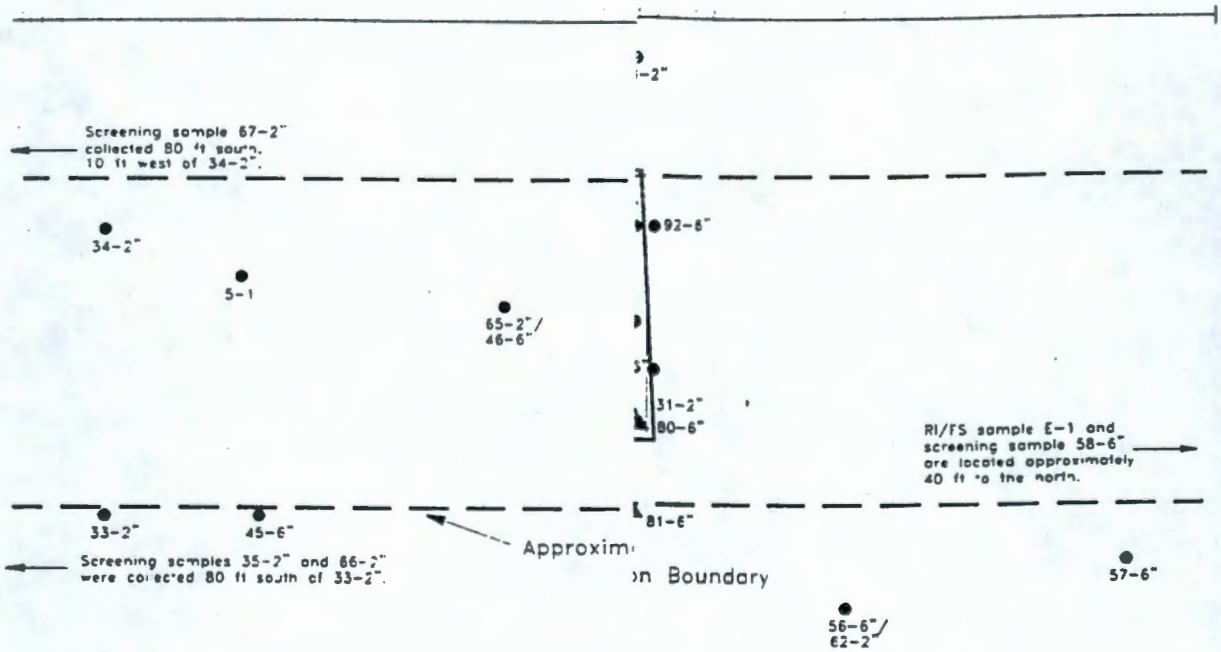
The excavation and stockpiling of PCB-contaminated soils at the Ephemeral Pool Site was accomplished in two phases. The first phase occurred on February 10 and between February 15 and 17, 1995. The second phase was conducted between March 13 and 15, 1995.

Phase I

Initial sampling was conducted at the Ephemeral Pool Site in areas where RI/FS (DOE 1993) sample results had previously demonstrated the presence of PCB-contaminated soils. This consisted of the area surrounding RI/FS sample locations E-2 and E-3 (Figure 4-2), the positions of which were surveyed by the USACE prior to mobilization of the excavation crew to the site. The first 14 screening samples collected were from a depth of approximately 30 cm (1 ft) to determine an appropriate depth for initial excavation (samples 1-1 through 14-1 on Figure 4-2). Of these samples, only five contained PCB at concentrations exceeding the 1.0 mg/kg cleanup standard for total PCB. All of these samples were from an area near the E-2 RI/FS sample point marker. Soils were excavated to a depth of 30 cm (1 ft) from the area surrounding the E-2 and E-3 sample location markers and as indicated by screening sample results.

Evidence from the screening sample results suggested that the elevated PCB concentrations were associated with a dark stained layer present from a depth of 0-5 cm (0 to 2 inches) in some portions of the Ephemeral Pool Site. Screening samples were collected which represented the upper 5-15 cm (2 to 6 inches) of soil in these areas. Excavation at the Ephemeral Pool Site proceeded with the goal of removing this layer where screening sample data indicated that it was contaminated by PCB.

By February 17, 1995, a total of approximately 70 cubic meters (90 cubic yards) of PCB-contaminated soil had been removed and stockpiled at the Ephemeral Pool Site. Data from screening samples collected to that point, particularly samples 43-6" to 67-2", demonstrated that a fairly large area of the site had, at the surface, a shallow layer of soil with PCB concentrations between 0.5 and 2 mg/kg PCB. Work at the Ephemeral Pool Site was suspended by the USACE pending a re-evaluation of the excavation approach and discussions between the USACE and representatives of DOE and the regulatory agencies.



LEGEND :

- ● Screening sample location, PCB cor
- ▲ Screening sample location, PCB cor
- ⧗ RI/FS surface soil sample location

*Screening samples are designated followed by the depth (in ft unless
All sample locations are approxima

Road

154-2/7/Apr95/1=1

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: LOCATIONS
-1 1100 AREA

WASHINGTON

Figure No. 4-2

Phase II

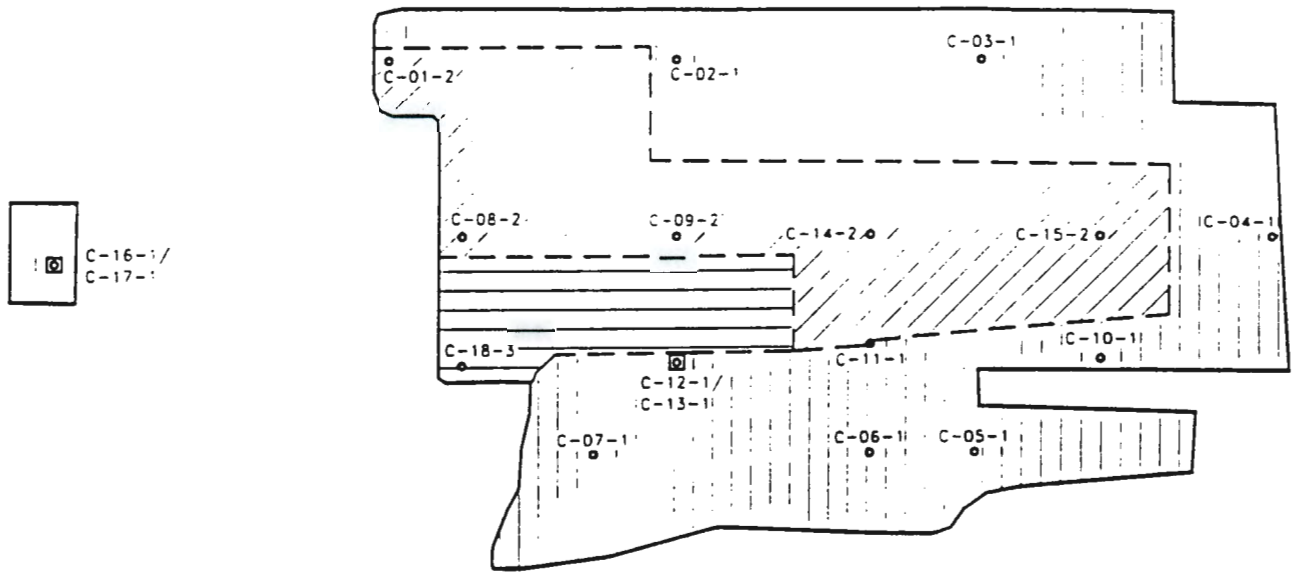
Excavation work resumed at the Ephemeral Pool Site on March 13, 1995. Removal of contaminated soils at the Ephemeral Pool Site continued with the enlargement of the existing excavation surrounding the E-2 RI/FS sample location to remove soils containing PCB at concentrations exceeding the ROD cleanup level (Figure 4-2). Excavation proceeded to depths of approximately 0.6 to 1.0 m (2 to 3 ft) in areas where screening sample data warranted. On March 15, 1995, screening sample data suggested that the remediation criterion for PCB had been achieved. A total of approximately 115 cubic meters (150 cubic yards) of PCB-contaminated soils were excavated and stockpiled at the site.

Eighteen confirmatory samples (including two duplicate samples) were collected from the excavation for offsite laboratory analyses. The two samples which were split for duplicate analyses were also submitted to the USACE NPD Laboratory as QA samples. All of these confirmatory samples were collected as grab samples from sample nodes evenly distributed within the excavation. Sample locations were selected to provide uniform coverage of the excavated area. Confirmatory sample locations are presented in Figure 4-3. Table 4-2 presents the results of analyses for these samples. Data from the confirmation sampling demonstrated the attainment criteria had been satisfied. Application of the criteria is discussed in Section 4.5.

4.3 HORN RAPIDS LANDFILL

Excavation and stockpiling of PCB-contaminated soils at the Horn Rapids Landfill were conducted primarily between January 30 and February 8, 1995, with a brief return to complete the removal on March 13, 1995. Figures 4-4 and 4-5 illustrate the depths of excavation and screening sample locations for several stages of the removal at the Horn Rapids Landfill.

Initial soil removal at the Horn Rapids Landfill was based on the results of the RI/FS (DOE 1993). Soils were removed to a depth of approximately 1 m (3 ft) from a 12 m by 12 m (40 ft by 40 ft) area centered on the earlier RI/FS sample locations, the positions of which had been surveyed by the USACE. All of the RI/FS samples collected in this immediate area had contained detectable concentrations of PCB. Screening samples were then collected from the walls and base of the excavation. Figure 4-1 illustrates the locations of the first 88 screening samples collected (1-1 through 88-1). Data from screening samples 1-1 through 34-1 indicated the need for further excavation to the north, west, and south. The excavation was enlarged in these directions and more screening samples collected (35-1 through 40-1). Removal and sampling proceeded in this manner for several days with the excavation growing in area and, where indicated by screening sample data, in depth.



LEGEND :

- Confirmatory sample location*
- Level IV sample location
- Depth of excavation 1 ft bgs
- Depth of excavation 2 ft bgs
- Depth of excavation 3 ft bgs

*Confirmatory samples are designated with a sample number, followed by the depth in feet. All sample locations are approximate.

NOT TO SCALE

CONFIRMATORY SAMPLE LOCATIONS
AT EPHEMERAL POOL/EM-1 1100 AREA

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FIGURE No. 4-3

A597/7APR95/7905

TABLE 4-2
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
EPHEMERAL POOL SITE CONFIRMATORY SAMPLES

SAMPLE #	HEIS #	DATE COLLECTED	PCB AROCLOR 1016	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/02-C-01-1	BODSQ4	3/14/95	nd[1]	nd	nd	nd	nd	nd	0.119	0.119
EM-1/02-C-02-1	BODSQ5	3/14/95	nd	nd	nd	nd	nd	nd	0.444	0.444
EM-1/02-C-03-1	BODSQ6	3/14/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-04-1	BODSQ7	3/14/95	nd	nd	nd	nd	nd	nd	0.065	0.065
EM-1/02-C-05-1	BODSQ8	3/14/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-06-1	BODSQ9	3/14/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-07-1	BODSR0	3/14/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-08-2	BODSR1	3/15/95	nd	nd	nd	nd	nd	nd	0.135	0.135
EM-1/02-C-09-2	BODSR2	3/15/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-10-1	BODSR3	3/15/95	nd	nd	nd	nd	nd	nd	1.04	1.04
EM-1/02-C-11-1	BODSR4	3/15/95	nd	nd	nd	nd	nd	nd	0.319	0.319
EM-1/02-C-12-1	BODSR5	3/15/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-13-1[1]	BODSR6	3/15/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-14-2	BODSR8	3/15/95	nd	nd	nd	nd	nd	nd	0.080	0.080

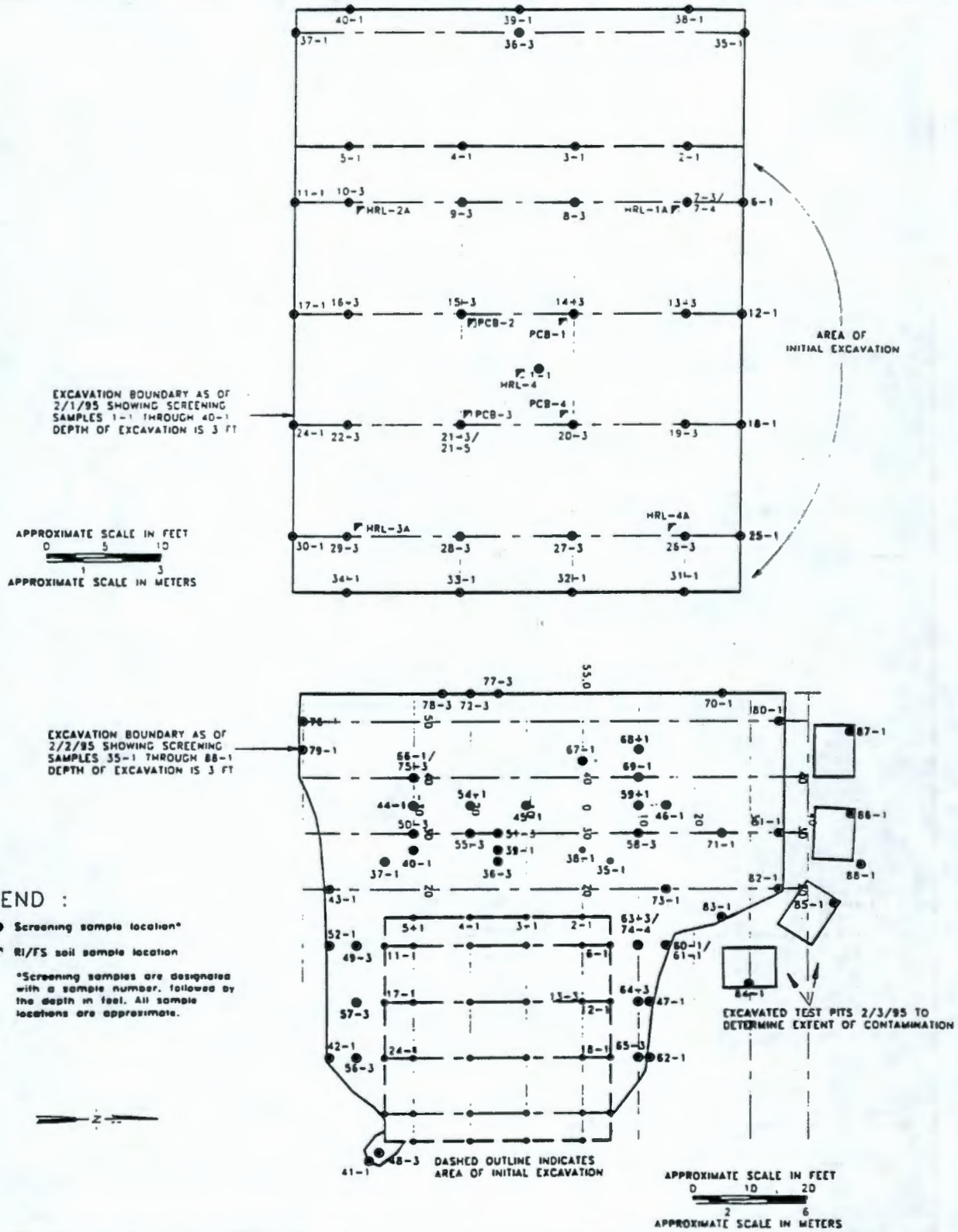
TABLE 4-2 (continued)
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
EPHEMERAL POOL SITE CONFIRMATORY SAMPLES

SAMPLE #	HEIS #	DATE COLLECTED	PCB AROCLOR 1016	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/02-C-15-2	BODSR9	3/15/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-16-1	BODSS0	3/15/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-17-1[2]	BODSS1	3/15/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/02-C-18-3	BODSS3	3/15/95	nd	nd	nd	nd	nd	nd	nd	nd
EBEM-1/02-C-16-0[3]	BODSS4	3/15/95	nd	nd	nd	nd	nd	nd	nd	nd

[1] nd = not detected

[2] Sample EM-1/02-C-13-1 collected as a blind duplicate of EM-1/02-C-12-1. Sample EM-1/02-C-17-1 collected as a blind duplicate of EM-1/02-C-16-1 Original samples also split for QA Analysis by USACE NPD Laboratory.

[3] EB indicates sample is an equipment (rinsate) blank. Analytical results for this sample reported in mg/l.



SCREENING SAMPLE LOCATIONS NO. 1-88 AT HORN RAPIDS LANDFILL

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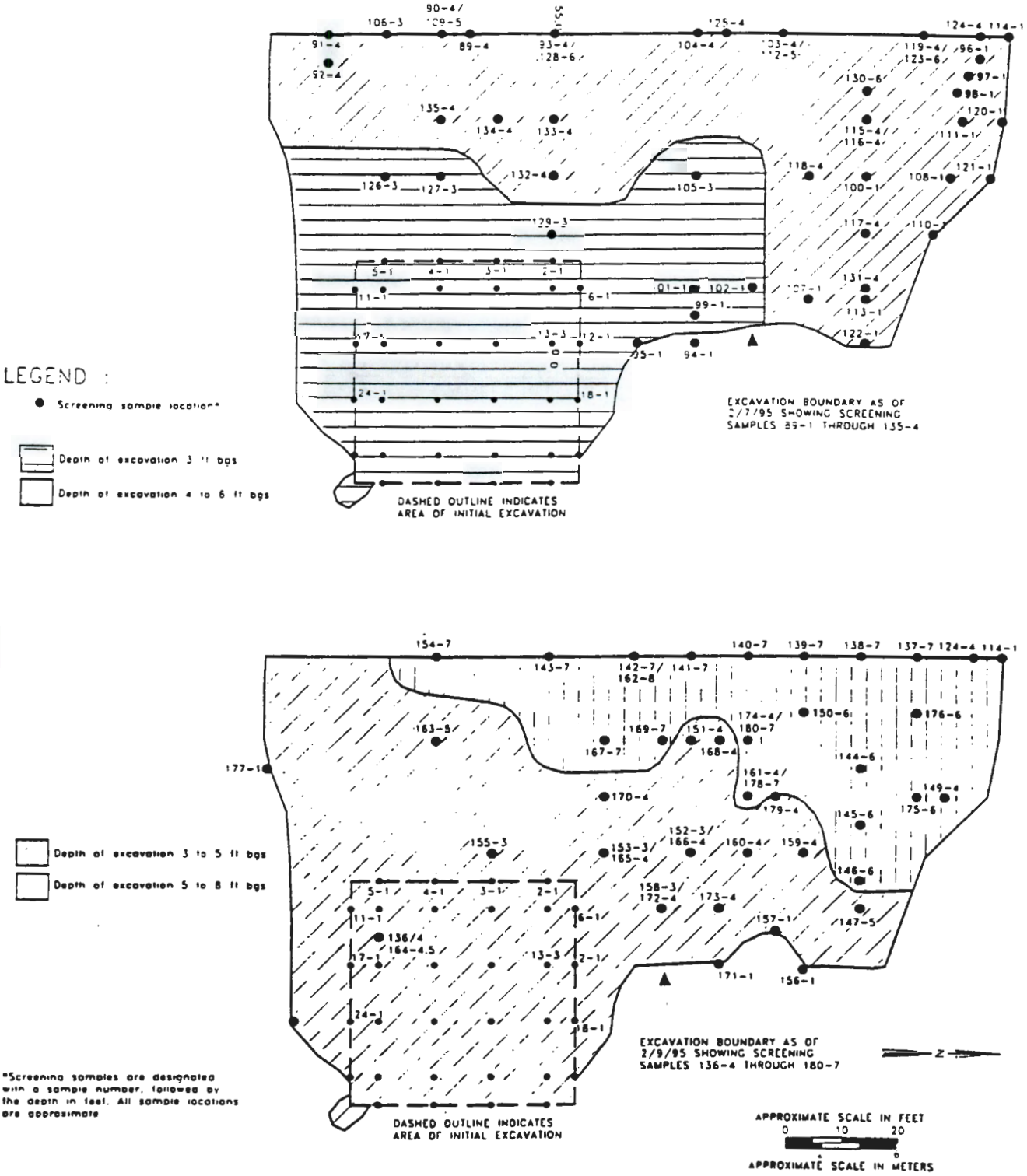
FIGURE No. 4-4

154-4/7APR95/7905



SCREENING SAMPLE LOCATIONS NO. 89-180 AT HORN RAPIDS LANDFILL

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FIGURE No. 4-5

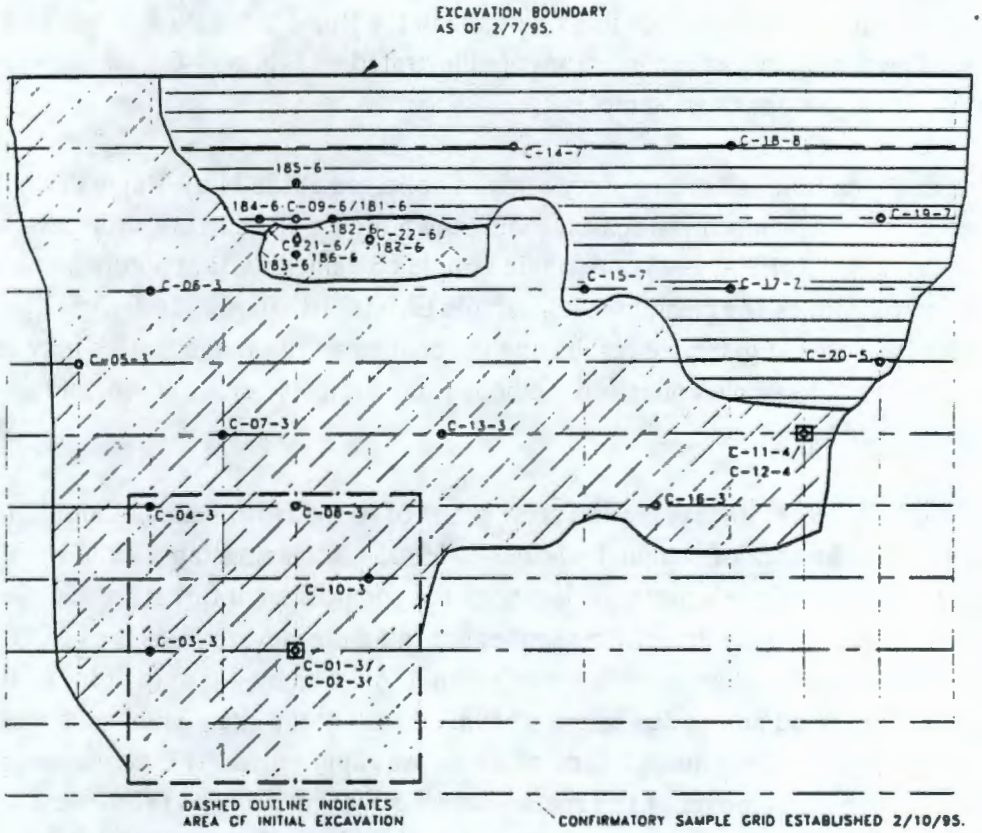
154-5/7APR95/790

On February 9, 1995, screening sample results indicated that all soils at the Horn Rapids Landfill contaminated with PCB at concentrations greater than the site-specific cleanup criterion of 5 mg/kg (EPA 1993) had been excavated. A total volume of approximately 1224 cubic meters (1600 cubic yards) had been removed and stockpiled. The excavated area was overlain with a 3 m by 3 m (10 ft by 10 ft) grid for confirmatory sampling. Eighteen grid nodes were randomly selected for confirmatory sample locations. Two of these samples were split and submitted as duplicates for a total of 20 confirmatory samples. Splits of these two samples were also submitted to the USACE NPD Laboratory for QA analyses. Samples were collected as composite samples using procedures outlined in the Remedial Action Work Plan (CDM Federal 1995). Confirmatory sample locations are illustrated on Figure 4-6. Table 4-3 presents the results of analyses for these samples.

Of the eighteen unique confirmatory samples collected at the Horn Rapids Landfill, seven contained PCB at concentrations exceeding the 5 mg/kg cleanup criterion established in the 1100-EM-1 ROD (EPA 1993). A single sample contained PCB at a concentration which exceeded two times the cleanup level (sample EM-1/03-C-09-06, 14.0 mg/kg). Variability between the screening sample results and the confirmatory sample results may be attributable to the differences in sample collection methods (grab samples versus composite samples) and to matrix variability.

On March 13, 1995, the excavation crew returned to the Horn Rapids Landfill to complete excavation in the area of sample EM-1/03-C-09-06. Screening samples 181-6 through 185-6 were collected from the subsample locations for composite confirmatory sample EM-1/03-C-09-06. The results of these screening samples indicated the elevated levels of PCB were associated with shallower soils on an unexcavated "bench." A 1.5 m by 4.6 m (5 ft by 15 ft) section of the bench was removed and added to the stockpiled soils at the site. The bench was approximately 0.9 m (3 ft) high. The volume of soil removed was approximately 6 cubic meters (8 cubic yards). Following removal of this material, two screening samples (186-6 and 187-6) were collected from the newly excavated area and analyzed. Both samples were below the cleanup level of 5 mg/kg PCB. Two confirmatory samples were also collected from this area (EM-1/03-C-21-6 and EM-1/03-C-22-6). PCB concentrations in both confirmatory samples were below 5 mg/kg (Table 4-3).

Statistical evaluation of the screening and confirmatory data demonstrated that the attainment criteria had been achieved. Section 4.5 presents a discussion of the attainment criteria to this site.



LEGEND :

- ● Screening sample location*
- ○ Confirmatory sample location*
- ⊠ Level IV sample location
- Depth of excavation 3 to 5 ft bgs
- Depth of excavation 5 to 8 ft bgs
- Area excavated on 3/13/95, 5 to 8 ft bgs

*Both confirmatory and screening samples are designated with a sample location number, followed by the depth (in ft unless otherwise indicated). All sample locations are approximate.

N

APPROXIMATE SCALE IN FEET
0 10 20
2 6
APPROXIMATE SCALE IN METERS

154-6/10APR95/1=1

CONFIRMATORY SAMPLE LOCATIONS AND FINAL SCREENING SAMPLE LOCATIONS NO. 181-187 AT HORN RAPIDS LANDFILL

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

HANFORD RESERVATION, WASHINGTON

FIGURE No. 4-6

TABLE 4-3
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL CONFIRMATORY SAMPLES

SAMPLE #	HEIS #	DATE COLLECTED	PCB AROCLOR 1016	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-C-01-3	BODSM7	2/16/95	nd[1]	nd	nd	nd	nd	nd	nd	nd
EM-1/03-C-02-3[2]	BODSM8	2/16/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/03-C-03-3	BODSN0	2/16/95	nd	nd	nd	nd	0.385	nd	nd	0.385
EM-1/03-C-04-3	BODSN1	2/16/95	nd	nd	nd	nd	5.35	nd	nd	5.35
EM-1/03-C-05-3	BODSN2	2/16/95	nd	nd	nd	nd	0.682	nd	nd	0.682
EM-1/03-C-06-3	BODSN3	2/16/95	nd	nd	nd	nd	0.585	nd	nd	0.585
EM-1/03-C-07-3	BODSN4	2/16/95	nd	nd	nd	nd	0.473	nd	nd	0.473
EM-1/03-C-08-3	BODSN5	2/16/95	nd	nd	nd	nd	5.30	nd	nd	5.30
EM-1/03-C-09-6	BODSN6	2/16/95	nd	nd	nd	nd	14.0	nd	nd	14.0
EM-1/03-C-10-3	BODSN7	2/16/95	nd	nd	nd	nd	7.97	nd	nd	7.97
EM-1/03-C-11-4	BODSN8	2/16/95	nd	nd	nd	nd	0.193	nd	nd	0.193
EM-1/03-C-12-4[2]	BODSN9	2/16/95	nd	nd	nd	nd	0.154	nd	nd	0.154
EM-1/03-C-13-3	BODSP0	2/16/95	nd	nd	nd	nd	5.48	nd	nd	5.48
EM-1/03-C-14-7	BODSP1	2/16/95	nd	nd	nd	nd	1.01	nd	nd	1.01
EM-1/03-C-15-7	BODSP2	2/16/95	nd	nd	nd	nd	1.65	nd	nd	1.65
EM-1/03-C-16-3	BODSP3	2/16/95	nd	nd	nd	nd	7.74	nd	nd	7.74

TABLE 4-3 (continued)
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL CONFIRMATORY SAMPLES

SAMPLE #	HEIS #	DATE COLLECTED	PCB AROCLOR 1016	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-C-17-7	BODSP4	2/16/95	nd	nd	nd	nd	0.541	nd	nd	0.541
EM-1/03-C-18-8	BODSP5	2/16/95	nd	nd	nd	nd	9.19	nd	nd	9.19
EM-1/03-C-19-7	BODSP6	2/16/95	nd	nd	nd	nd	1.39	nd	nd	1.39
EM-1/03-C-20-5	BODSP7	2/16/95	nd	nd	nd	nd	2.95	nd	nd	2.95
EM-1/03-C-21-6	BODSQ2	3/13/95	nd	nd	nd	nd	nd	nd	nd	nd
EM-1/03-C-22-6	BODSQ3	3/13/95	nd	nd	nd	nd	3.04	nd	0.0765	3.117
EBEM-1/03-C-11-0[3]	BODSP9	2/16/95	nd	nd	nd	nd	nd	nd	nd	nd

[1] nd - not detected
[2] Sample EM-1/03-C-02-3collected as a blind duplicate of EM-1/03-C-01-3.
Sample EM-1/03-C-12-4 collected as a blind ducpliate of EM-1/03-C-11-4. Orginal samples also split for QA Analysis by USACE NPD Laboratory.
[3] EB indicates sample is an equipment (rinsate) blank. Analytical results for this sample reporteded in mg/l.

4.4 WASTE CHARACTERIZATION SAMPLES

Six waste characterization samples were collected and sent offsite for laboratory analysis and sample data package preparation meeting the EPA QC Level III data requirements. Analytical results from the waste characterization samples were used to determine waste codes for proper transportation and disposal of the contaminated soil stockpiles. Waste characterization samples were collected as composites representing each waste type and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), Pesticides/PCB, Resource Conservation and Recovery Act (RCRA) Metals, and Toxicity Characteristic Leaching Procedure (TCLP) for chlordane only. Analytical results for all waste characterization samples are summarized in Appendix B to this report.

Two waste characterization samples were collected from the stockpiled soils at the Discolored Soil Site (EM-1/01-W-01-0 and EM-1/01-W-02-0). In addition to BEHP (ranging from 50 to 250 mg/kg), other analytes detected and concentration ranges include: arsenic (1.29 to 1.43 mg/kg), barium (70.2 to 78.8 mg/kg), chromium (4.44 to 4.58 mg/kg), toluene (0.007 mg/kg), di-n-octylphthalate (0.650 mg/kg), and total chlordane (0.464 to 0.599 mg/kg). Chlordane was not detected in the TCLP leachate.

Due to the relative volumes of PCB-contaminated soils stockpiled at each site, it was decided to collect one waste characterization sample from the Ephemeral Pool Site and three from the Horn Rapids Landfill. The single sample collected from the soils stockpiled at the Ephemeral Pool Site contained PCB Aroclor 1260 at a concentration of 4.73 mg/kg as well as the following analytes: arsenic (1.96 mg/kg), barium (118 mg/kg), chromium (8.74 mg/kg), lead (40.6 mg/kg), fluoranthene (1.10 mg/kg), phenanthrene (0.880 mg/kg), pyrene (1.10 mg/kg), and total chlordane (6.95 mg/kg). Chlordane was not detected in the TCLP leachate. The three Horn Rapids Landfill samples contained PCB Aroclor 1248 at 5.72 to 11.0 mg/kg, PCB Aroclor 1260 at 0.237 to 0.691 mg/kg, and several other analytes including: arsenic (0.697 to 1.04 mg/kg), barium (44.3 to 55.3 mg/kg), chromium (1.92 to 3.48 mg/kg), and di-n-butylphthalate (0.180 to 1.10 mg/kg).

4.5 APPLICATION OF ATTAINMENT CRITERIA

Completion of cleanup at each site was confirmed through the application of the attainment criteria established by the regulatory agencies. These criteria are described in Section 3.5. Application of the criteria at each of the sites is described.

4.5.1 DISCOLORED SOIL SITE

The 1100-EM-1 Operable Unit ROD (EPA 1993) established the BEHP soil cleanup level for the Discolored Soil Site at 71 mg BEHP/kg of soil. All data obtained from post remediation sampling to verify that this cleanup level was met at the Discolored Soil site are presented in Appendix C, Table C-1. The data were tested graphically and rejected for both normality and log-normality, therefore the approximate method of calculating the 95% upper confidence limit (UCL_{95}) is appropriate. In accordance with Ecology's *Statistical Guidance for Ecology Site Managers* (Ecology 1992) for distributions with large sample size the following formula is used:

$$UCL_{95} = \bar{X} \cdot Z_{1-\alpha} \frac{s}{\sqrt{n}}$$

Where:

UCL_{95} = 95% Upper Confidence Level
$\bar{x}$ = Sample Mean

s = Sample Standard Deviation
n = Number of Compliance Monitoring Samples
$Z_{1-\alpha}$ = Value of the Z parameter = 1.645 for one-sided 95% confidence limit

For the Discolored Soil Site data:

$\bar{x}$ = 12.29

s = 21.32
n = 36
Z_{95} = 1.645

Therefore:

$$(UCL)_{95} = 12.29 + 1.645 \frac{21.32}{\sqrt{36}} = 18.14$$

The attainment criteria for the Discolored Soil Site are met for the following reasons:

(i) The 95% UCL of 18.14 mg of BEHP/kg of soil is less than the 71 mg of BEHP/kg of soil cleanup level;

(ii) No sample concentration is greater than twice the cleanup level (142 mg of BEHP/kg of soil); and

(iii) Only 1 of 36 samples (2.77%) was determined to be greater than the cleanup level.

4.5.2 EPHEMERAL POOL SITE

All data obtained from post remediation sampling to verify that the cleanup level was met at the Ephemeral Pool site are presented in Appendix C, Table C-2. The data were tested graphically and rejected for both normality and log-normality. The ROD established the PCB soil cleanup level for the Ephemeral Pool Site at 1 mg PCB/kg of soil.

For the Ephemeral Pool Site data:

$\bar{x} = 0.340$

$s = 0.438$
$n = 92$
$Z_{95} = 1.645$

Therefore:

$$(UCL)_{95} = 0.340 + 1.645 \frac{0.438}{\sqrt{92}} = 0.415$$

The attainment criteria for the Ephemeral Pool Site are met for the following reasons:

(i) The 95% UCL of 0.415 mg of PCB/kg of soil is less than the 1 mg of PCB/kg of soil cleanup level;

(ii) No sample concentration is greater than twice the cleanup level (2 mg of PCB/kg of soil); and

(iii) Only 10 of 92 samples (10.9%) were determined to be greater than the cleanup level.

4.5.3 HORN RAPIDS LANDFILL

The ROD established the PCB soil cleanup level for the Horn Rapids Landfill at 5 mg PCB/kg of soil. All data obtained from post remediation sampling to verify that this cleanup level was met at this site are presented in Appendix C, Table C-3. The data were tested graphically and

rejected for both normality and log-normality and the approximate method of calculating the UCL_{95} is appropriate.

For the Horn Rapids Landfill data:

$\bar{x} = 1.287$

$s = 1.761$
$n = 144$
$Z_{95} = 1.645$

Therefore:

$$(UCL)_{95} = 1.287 + 1.645 \frac{1.761}{\sqrt{144}} = 1.528$$

The attainment criteria for the Horn Rapids Landfill are met for the following reasons:

(i) The 95% UCL of 1.528 mg of PCB/kg of soil is less than the 5 mg of PCB/kg of soil cleanup level;

(ii) No sample concentration is greater than twice the cleanup level (10 mg of PCB/kg of soil); and

(iii) Only 8 of 144 samples (5.6%) were determined to be greater than the cleanup level.

4.5.4 SUMMARY

The compliance monitoring data and subsequent statistical analyses for all three sites confirm that the attainment criteria have been met. Based on this evidence, the sites have been backfield with clean material. At the Ephemeral Pool Site, the final surface will be graveled to match per-existing conditions. For the Discolored Soil Site, minor site revegetation is planned for the fall of 1995. At the Horn Rapids Landfill, an additional two-feet of cover material will be placed to match the asbestos cap thickness. Final revegetation will occur in the fall of 1995 in conjunction with the total revegetation of the entire Horn Rapids Landfill.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

This section discusses QA and QC procedures regarding the CDM Federal subcontract laboratories utilized for sample analyses. The quantitative and qualitative data quality objectives for this project were presented in the Remedial Action Work Plan (CDM Federal 1995). A cursory review was completed of data generated by both the onsite and offsite analytical laboratories in order to provide a limited assessment of data quality. Field QA/QC (in addition to the onsite lab QA/QC) is also discussed, particularly deviations from the work plan and Quality Assurance Project Plan (QAPjP). Section 5.6 presents an overview of the USACE QA laboratory data review.

5.1 ONSITE LABORATORY

Onsite laboratory analytical work associated with the Hanford 1100-EM-1 sites was conducted by CDM Federal subcontractor, Transglobal Environmental Geosciences Northwest, Inc. (TEG-NW) utilizing a mobile laboratory facility transported to and operated onsite. Analytical data analyses and packages met the requirements for EPA QC Level II. The total number of samples submitted for analysis to the onsite laboratory facility is as follows:

Discolored Soil Site - 27 samples, SW-846 Method 8060 - BEHP,

Ephemeral Pool Site - 108 samples, SW-846 Method 8080 - PCB,

Horn Rapids Landfill - 190 samples, SW-846 Method 8080 - PCB.

Analytical data for all samples analyzed is included as Appendix A of this report.

5.2 OFFSITE LABORATORY

Offsite laboratory analytical work associated with the Hanford 1100-EM-1 sites was completed by CDM Federal subcontract laboratory, Environmental Science and Engineering, Inc. (ESE) of Gainesville, Florida. Data generated by the offsite laboratory met the reporting requirements for EPA QC Levels III and IV. Table 5-1 summarizes the total number of samples submitted for analysis. Data for samples analyzed by the offsite laboratory are summarized in Tables 4-1 through 4-3 and in Appendix B.

5.3 CHEMICAL DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative goals and limits established for field and laboratory data that provide the means by which data reviewers can assess whether the goals of an investigation have been met. The qualitative objectives provide descriptions of what questions must be answered, what data must be collected, how the data will be collected, what analyses are required, and how the data will be used. Essentially, the qualitative objectives

TABLE 5-1
SUMMARY OF SAMPLES SUBMITTED FOR OFFSITE ANALYSIS

Site	Sample Type	QC Level	Matrix	Quantity	Analyses (SW-846)
Discolored Soil Site	Confirmatory Sample	III IV	Soil Soil	9 1	BEHP (8060) BEHP (8060)
	Confirmatory Sample (QC)	III	Soil	1	BEHP (8060)
	Confirmatory Sample (QA)		Soil	1	BEHP (8060)
	Equipment Rinsate	III	Water	1	BEHP (8060)
	Waste Characterization	III	Soil	2	RCRA Metals (6010/7000), Volatile Organic Compounds (8240), Semivolatile Organic Compounds (8270), Pesticides/PCBs (8080), TCLP-Chlordane only (1311/8080)
Ephemeral Pool Site	Confirmatory Sample	III IV	Soil Soil	14 2	PCB (8080) PCB (8080)
	Confirmatory Sample (QC)	III	Soil	2	PCB (8080)
	Confirmatory Sample (QA)		Soil	2	PCB (8080)
	Equipment Rinsate	III	Water	1	PCB (8080)
	Waste Characterization	III	Soil	1	RCRA Metals (6010/7000), Volatile Organic Compounds (8240), Semivolatile Organic Compounds (8270), Pesticides/PCBs (8080), TCLP-Chlordane only (1311/8080)

TABLE 5-1 (continued)
SUMMARY OF SAMPLES SUBMITTED FOR OFFSITE ANALYSIS

Site	Sample Type	QC Level	Matrix	Quantity	Analyses (SW-846)
Horn Rapids Landfill	Confirmatory Sample	III IV	Soil Soil	18 2	PCB (8080) PCB (8080)
	Confirmatory Sample (QC)	III	Soil	2	PCB (8080)
	Confirmatory Sample (QA)		Soil	2	PCB (8080)
	Equipment Rinsate	III	Water	1	PCB (8080)
	Waste Characterization	III	Soil	3	RCRA Metals (6010/7000), Volatile Organic Compounds (8240), Semivolatile Organic Compounds (8270), Pesticides/PCBs (8080), TCLP-Chlordane only (1311/8080)

provide descriptions of how the data will be used to support site restoration decisions. Qualitative DQOs for this field investigation are reviewed in the following section. Quantitative DQOs establish numeric limits for acceptable results. The numeric limits aid in establishing a level of confidence and the degree of usefulness for the data collected as part of the field investigation. The numeric limits are tied directly to the intended end use of the data and include analytical detection limits, precision, accuracy, QC frequency, and completeness.

5.3.1 METHOD DETECTION LIMITS

Method detection limits vary with analytical method, matrix type, and concentration of interfering contaminants. The method detection limits presented in the Remedial Action Work Plan establish goals for all samples collected and submitted to the onsite and offsite analytical laboratories for analysis. These limits were met for most samples analyzed. In a small portion of the samples analyzed, substantial dilution was necessary to quantify the concentration of analytes present. In these few samples with high dilution rates method detection limits were not achieved.

5.3.2 PRECISION

Precision is a quantitative term that estimates the reproducibility of measurements under a given set of conditions. Precision for a given set of tests is reflected by the analytical results of field and laboratory duplicates, and is influenced by both field sampling and laboratory techniques.

For this project, all field duplicates were submitted blind (i.e., not marked as a duplicate sample) to the onsite and offsite analytical laboratories. Field duplicate samples are processed and analyzed by the same laboratory. Laboratory precision is much simpler to quantitate, while field precision is unique to each site and sampling matrix.

Field and laboratory precision is expressed as relative percent difference (RPD) defined by the following formula:

$$RPD = \frac{|X1 - X2|}{(X1 + X2)/2} \times 100$$

where RPD	=	relative percent difference between duplicate results
X1 and X2	=	results of duplicate analyses
|X1 - X2|	=	absolute difference between duplicates X1 and X2

Sections 5.5.1 and 5.5.2 address issues of comparison with field duplicate samples.

Laboratory Control Samples/Laboratory Duplicates - Onsite Analyses

In most cases, laboratory precision goals were met for onsite laboratory analytes (PCB and BEHP). Laboratory duplicate sample results were utilized to assess laboratory analytical precision. Table 5-2 presents the RPD values for laboratory duplicates samples analyzed by the onsite laboratory. Laboratory control samples (LCS) were not required for onsite analyses. One of two sets of duplicate samples analyzed for BEHP contained no detectable concentration of the analyte. The RPD value for the second set was within acceptable limits. One of 15 RPD values for laboratory duplicates for PCB analyses was outside the acceptable range.

Laboratory Control Samples/Laboratory Duplicates - Offsite Analyses

Laboratory precision goals were also achieved in nearly all instances by the offsite laboratory. A small number of laboratory duplicate samples slightly exceeded (less than 25% above) the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate - Onsite Analyses

Matrix spike duplicate (MSD) samples were not analyzed by the onsite laboratory.

Matrix Spike/Matrix Spike Duplicate - Offsite Analyses

Matrix Spike (MS)/Matrix Spike Duplicate RPD values provide a means of assessing the precision of a method. A random check of MS/MSD sample results for the offsite laboratory indicate that most RPDs are in good agreement and within acceptable EPA QC limits for analytical data associated with the Hanford 1100-EM-1 sites.

5.3.3 ACCURACY

Accuracy is a quantitative term that estimates the bias in a measurement system. Accuracy for the entire data collection activity is difficult to measure because several sources for error can exist. Errors can be introduced by any of the following:

- Sampling procedure
- Field contamination
- Sample preservation and handling
- Sample matrix
- Sample preparation
- Analytical techniques

Field sampling accuracy can be audited using field spiked samples, and laboratory accuracy can be audited using matrix spikes and surrogate recovery results.

TABLE 5-2
RPD FOR LABORATORY DUPLICATE SAMPLES ANALYZED BY ONSITE LABORATORY

		ANALYTE (mg/kg)/RPD					
SITE	SAMPLE NO.	PCB 1248	RPD	PCB 1260	RPD	BEHP	RPD
DISCOLORED SOIL SITE	EM-1/01-CM-01-6"	na[1]		na		nd[2]	
	EM-1/01-CM-01-6" (DUP.)[3]	na		na		nd	
	EM-1/01-CM-17-2	na		na		58	
	EM-1/01-CM-17-2 (DUP.)	na		na		70	19
EPHEMERAL POOL SITE	EM-1/02-CM-10-1	nd		1.86		na	
	EM-1/02-CM-10-1 (DUP.)	nd		1.97	3	na	
	EM-1/02-CM-25-2"	nd		1.28		nd	
	EM-1/02-CM-25-2" (DUP.)	nd		0.99	26	nd	
	EM-1/02-CM-41-12"	nd		0.22		na	
	EM-1/02-CM-41-12" (DUP.)	nd		0.27	20	na	
	EM-1/02-CM-52-6"	nd		1.95		na	
	EM-1/02-CM-52-6" (DUP.)	nd		1.38	34[4]	na	
	EM-1/02-CM-97-1	nd		5.41		na	
	EM-1/02-CM-97-1 (DUP.)	nd		4.38	21	na	
HORN RAPIDS LANDFILL	EM-1/03-CM-01-1	25.6		nd		na	
	EM-1/03-CM-01-1 (DUP.)	21.8	16	nd		na	
	EM-1/03-CM-07-4	0.18		nd		na	
	EM-1/03-CM-07-4 (DUP.)	0.22	20	nd		na	
	EM-1/03-CM-08-3	2.06		nd		na	
	EM-1/03-CM-08-3 (DUP.)	1.91	8	nd		na	
	EM-1/03-CM-58-3	3.90		nd		na	
	EM-1/03-CM-58-3 (DUP.)	3.74	4	nd		na	
	EM-1/03-CM-90-4	6.44		nd		na	
	EM-1/03-CM-90-4 (DUP.)	5.77	11	nd		na	
	EM-1/03-CM-99-1	9.67		nd		na	
	EM-1/03-CM-99-1 (DUP.)	9.80	1	nd		na	
	EM-1/03-CM-125-4	11.8		nd		na	
	EM-1/03-CM-125-4 (DUP.)	12.3	4	nd		na	
	EM-1/03-CM-156-1	1.47		nd		na	
	EM-1/03-CM-156-1 (DUP.)	1.56	6	nd		na	
	EM-1/03-CM-173-4	0.23		nd		na	
	EM-1/03-CM-173-4 (DUP.)	0.24	4	nd		na	
	EM-1/03-CM-185-6	3.12		nd		na	
	EM-1/03-CM-185-6 (DUP.)	3.18	2	nd		na	

1 na = not analyzed
2 nd = not detected
3 DUP = duplicate sample
4 This value represents precision outside of the control limit of 30%.

TBL5-2/04/12/95/CDP

Analyses of several types of QC samples provide data concerning the accuracy of laboratory results. Analytical data for the following types of QC samples were evaluated:

- Surrogate Spike Recoveries
- MS/MSD Recoveries
- Laboratory Control Sample Recoveries

Surrogate Spike Recoveries - Onsite Analyses

Surrogate spike recoveries were within acceptable limits for all BEHP (SW-846 Method 8060) analyses conducted by the onsite laboratory. However, interference peaks prevented determination of surrogate spike recoveries for 119 of 330 (36%) PCB (SW-846 Method 8080) analyses. Of the analyses where surrogate spike values are available, all 211 were within the acceptable range.

Surrogate Spike Recoveries - Offsite Analyses

Surrogate recoveries were within acceptable limits for the majority of the samples analyzed. A review of ESE analytical data indicates that a limited number of surrogate recoveries were outside acceptable QC limits for various analyses. However, per method criteria, data are acceptable based on remaining surrogate recoveries within EPA QC limits, for each respective sample batch.

Matrix Spike Recoveries - Onsite Analyses

All MS recoveries were within acceptable limits for both BEHP and PCB analyses. Duplicate samples (MSD) were not analyzed.

Matrix Spike Recoveries - Offsite Analyses

Recoveries associated with MS/MSD samples indicate that the majority of spike recoveries are within acceptable QC limits. Limited review of analytical data indicates, for various methods performed, some MS/MSD recoveries were outside acceptable EPA QC limits. Per method criteria, for each respective analysis, data are acceptable based on the remaining MS/MSD recoveries within established EPA QC limits.

Laboratory Control Sample Recoveries - Onsite Analyses

Laboratory control samples were not analyzed by the onsite laboratory.

Laboratory Control Sample Recoveries - Offsite Analyses

Spike recoveries in LCS, per a cursory review of analytical data, indicate that LCS recoveries are within acceptable EPA QC limits for each method performed.

5.3.4 QUALITY CONTROL FREQUENCY

Duplicate samples were to be collected for submittal to the offsite laboratory at a per-established rate for quality control purposes. Field quality control samples were collected at the required frequency of 10% and submitted to the laboratory "blind." The sample QC frequency for the laboratory was at a rate of 5% or 1 sample per 20 samples analyzed.

"Blind" duplicate samples were submitted to the onsite laboratory at a lesser frequency (approximately 1 duplicate sample per 75 samples analyzed) than to the offsite laboratory. This QC reduced frequency was necessary due to the limited number of samples which could be analyzed by the onsite lab each day. All determinations made by the onsite laboratory were eventually confirmed by offsite analyses.

5.3.5 COMPLETENESS

Completeness is defined as the percentage of measurement data usable for the intended purposes. It estimates the amount of valid data from a measurement system required to achieve a particular statistical level expected under correct, normal conditions in order to meet project data goals. The level of completeness goal for this project was defined as 90%. The level of completeness achieved for both onsite and offsite analytical data exceeded this goal.

5.3.6 COMPARABILITY

Comparability is a qualitative term that expresses the confidence with which one data set can be compared with another. Strict adherence to standard sample collection procedures, analytical detection limits, quantitation value units, and analytical methods assures that data from like samples and sample conditions are comparable. This comparability is independent of laboratory personnel, data reviewers, and sampling personnel. Comparability criteria are met for the project if DQOs described in this document are achieved, or defined to show that variations did not affect the values reported.

To assure comparability of data generated for the Hanford 1100-EM-1 sites, CDM Federal utilized standard procedures, such as EPA-approved analytical methods. Utilizing such procedures and methods enable current data to be comparable to previous data sets generated with similar methods. Additionally, future data sets generated, utilizing standard methods of analysis, will be comparable to this data. Data available through the field activities allows for comparisons to established cleanup requirements (federal and state) for the 1100-EM-1 sites.

5.3.7 REPRESENTATIVENESS

Representativeness is a qualitative term that expresses the degree to which sample data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It estimates the effectiveness of the sampling scheme and indicates whether sufficient samples were collected at the appropriate sampling locations.

Analytical results from field equipment rinsate blanks provide an additional indication of data representativeness. Rinsate blank results indicate whether cross-contamination of samples may have occurred, potentially affecting representativeness.

Samples collected at each site are representative of that respective site. Sampling procedures identified in the Remedial Action Work Plan (CDM Federal 1995) and the Remediation Design and Remedial Action Plan (USACE 1994a) were followed explicitly to assure representative samples were collected and sampling procedures were consistent with QC protocol. Significant deviations to the procedures outlined in these documents are described in Section 5.5.3. One equipment rinsate blank collected at the Discolored Soil Site contained a detectable concentration of a target analyte (BEHP at 0.522 mg/l). As discussed in section 5.5.2, this evidence of low-level cross-contamination does not impact data-usability for this site.

5.4 OFFSITE LABORATORY QUALITY CONTROL

Laboratory QC parameters that are discussed include: analytical methods, holding times, batch method blank analysis, MS/MSD pair analysis, and surrogate analysis. A limited QC evaluation was completed using the applicable portions of the contract laboratory program (CLP) protocols where appropriate and SW-846 criteria. Each of these QC parameters is discussed in the following subsections.

5.4.1 ANALYTICAL METHODS

Several analytical procedures were utilized to assess contaminant concentrations in a variety of environmental samples. Table 5-3 presents the methods used for this sampling program.

5.4.2 HOLDING TIMES

Holding times are the storage times allowed between sample collection and sample extraction/analysis when the designated preservation, container, and storage techniques are employed. The appropriate preservation, container and storage techniques were implemented. All extractions/analyses were completed within the required holding times for all samples.

TABLE 5-3
SOIL/AQUEOUS SAMPLE ANALYTICAL METHODS

Analyte	Technique (a)	Extraction/Analysis Method (b)
Volatile Organics	GC/MS	8240
Semi-Volatile Organic	GC/MS	3540/8270
Pesticides/PCBs	GC	3510/8080
Barium, Cadmium, Chromium, Lead, Silver	ICP	3050/6010
Arsenic	AA	3050/7060
Selenium	AA	3050/7841
Mercury	CV	7471
TCLP Chlordane	GC	1311/8080
Bis(2-ethylhexyl)phthalate	GC	3510/8060

(a) AA = Atomic Absorption
ICP = Inductively Coupled Plasma
CV = Cold Vapor
GC = Gas Chromatography
GC/MS = Gas Chromatography/Mass Spectrometry

(b) Methods are from EPA SW-846 - Test Methods for Evaluating of Solid Waste, Physical/Chemical Methods, 3rd Edition, 1986 and revisions.

5.4.3 LABORATORY QUALITY CONTROL SAMPLES AND DATA QUALIFICATION

Method Blanks

SW-846 defines a method blank as an analyte-free matrix to which reagents are added in the same values or proportions as used in sample processing. The method blanks should be carried through the complete sample preparation and analytical procedure. The blank is used to document any contamination resulting from the analytical process.

A limited evaluation of method blank analytical data from offsite laboratory analyses indicates low-level blank contamination by BEHP for the SW-846 Method 8060 analyses. Therefore, BEHP data in the lower concentration ranges should be considered estimated. However, samples with these low concentrations are well below the cleanup criterion of 71 mg/kg indicating a minimum impact on overall data quality.

Laboratory Control Samples

An LCS is defined as a control sample of known composition. Aqueous and solid LCSs are analyzed using the same sample preparation, reagents, and analytical methods employed for the samples received.

A limited review of LCS results indicates that LCS percent recoveries (%R) are within acceptable EPA QC limits for all analytes. RPDs for LCS/LCSD pairs are discussed in Section 5.3.2, Precision.

Matrix Spike/Matrix Spike Duplicates

MS/MSD samples are created by taking additional aliquots of the sample collected in the field and spiking at the laboratory with a known concentration of representative compounds of interest. This technique allows for the evaluation of the effect of matrix interference on the precision and accuracy of the data. Matrix interference is indicated when the spike compound recovery is inhibited but not affected in a blank. Spike recovery inhibition or enhancement in the spike blank usually indicates laboratory/instrument analysis bias. Since an MS/MSD usually represents one sample for the batch, no qualification of the sample data is employed beyond that sample unless other QC data suggests that the performance inhibition is broad based. For this to be true, surrogate recovery would have to be similarly affected for other samples. Decisions to further qualify data based upon spike recoveries requires professional judgement. MS/MSDs were required to be analyzed at a frequency of 1 in 20 samples analyzed per sample matrix. RPDs for MS/MSDs are discussed in Section 5.3.2, Precision.

Surrogate Spikes

Surrogates are organic compounds similar in chemical nature to contaminants of interest. Known amounts are injected into each sample as in the case of the LCS and MS. Surrogate spikes allow for an evaluation of sample preparation and system accuracy with respect to each sample and chemical class. Surrogate analysis is method specific. Additionally, the use of surrogate spikes serves effectively as a standard addition procedure to verify the absence of matrix effects.

A limited review of surrogate spike recoveries (%R) indicates that most are within acceptable EPA QC limits for most analytes. Problems associated with poor surrogate recoveries include: dilution of matrix spikes, sample heterogeneity, and matrix interference. Data quality is not affected since most of the surrogates were within acceptable QC limits and/or laboratory established QC limits.

5.5 FIELD QUALITY CONTROL

Activities performed and procedures followed in the field that can potentially affect the quality of data obtained include: sampling methods, sample handling and shipping, sample preservation, holding times, equipment decontamination, and calibration of field equipment.

All sampling was performed in accordance with the Remedial Action Work Plan (CDM Federal 1995) and the Remediation Design and Remedial Action Plan (USACE 1994a). Additionally, sample handling, shipping, and equipment decontamination were performed in accordance with the aforementioned documents.

5.5.1 FIELD DUPLICATE SAMPLES

A field duplicate sample is a field replicate of the sample from an identical sampling point. Field duplicate results can indicate sampling technique precision. An evaluation of relative percent difference (RPD) values between positive contaminant values contained in both sample and sample duplicate is made, and the results are compared to previously accepted RPD criteria for sample collection precision for the matrix. RPD performance is highly matrix and method dependent therefore, a high degree of variability is usually indicated.

Acceptance criteria used for the soil field duplicates are as follows:

RPD $\leq$ 35% - Good field sampling precision
RPD $\leq$ 60% - Fair field sampling precision
RPD $\geq$ 61% - Poor field sampling precision

Field duplicate samples results, indicating significant dilution or variation in detection limits are not typically assessed. RPD values for field duplicate samples analyzed by the onsite and offsite laboratories are summarized in Table 5-4 and Table 5-5, respectively. RPD values

TABLE 5-4
RPD FOR FIELD DUPLICATE SAMPLES
ANALYZED BY ONSITE LABORATORY

		ANALYTE (mg/kg)/RPD					
SITE	SAMPLE NO.	PCB 1248	RPD	PCB 1260	RPD	BEHP	RPD
EPHEMERAL POOL SITE	EM-1/02-CM-83-6"	nd[1]		0.75		na[2]	
	EM-1/02-CM-84-6"(DUP.)[3]	nd		0.63	17	na	
HORN RAPIDS LANDFILL	EM-1/03-CM-22-3	1.46		nd		na	
	EM-1/03-CM-23-3(DUP.)	1.17	22	nd		na	
	EM-1/03-CM-60-1	40.9		nd		na	
	EM-1/03-CM-61-1(DUP.)	49.4	19	nd		na	
	EM-1/03-CM-99-1	9.67		nd		na	
	EM-1/03-CM-100-1(DUP.)	6.77	35	nd		na	

[1] nd = not detected
[2] na = not analyzed
[3] DUP. = Duplicate Sample

TABLE 5-5
RPD FOR OFFSITE LABORATORY ANALYSIS OF FIELD DUPLICATE SAMPLES

		ANALYTE (mg/kg)/RPD					
SITE	SAMPLE NO.	PCB 1248	RPD	PCB 1260	RPD	BEHP	RPD
DISCOLORED SOIL SITE	EM-1/01-C-01-2	na[1]		na		10.4	
	EM-1/01-C-02-2 (DUP.)[2]	na		na		9.39	10
EPHEMERAL POOL SITE	EM-1/02-C-12-1	nd[3]		nd		na	
	EM-1/02-C-13-1 (DUP.)	nd		nd		na	
	EM-1/02-C-16-1	nd		nd		na	
	EM-1/02-C-17-1 (DUP.)	nd		nd		na	
HORN RAPIDS LANDFILL	EM-1/03-C-01-3	nd		nd		na	
	EM-1/03-C-02-3 (DUP.)	nd		nd		na	
	EM-1/03-C-11-4	0.193		nd		na	
	EM-1/03-C-12-4 (DUP.)	0.154	22	nd		na	

[1] na = not analyzed
[2] DUP. = Duplicate Samples
[3] nd = not detected

were within acceptable agreement for all field duplicate samples analyzed by both the onsite and offsite laboratories.

5.5.2 RINSATES

Rinsate analytical data indicates that no target analytes were present within rinsate samples, with the exception of bis(2-ethylhexyl)phthalate detected at 0.522 mg/l within rinsate sample EBEM-1/01-C-11-0. Detection of this analyte may be due to inadequate sample equipment decontamination. However, at the level detected, it is unlikely that related cross-contamination could impact a determination of whether or not a sample meets the 71 mg/kg cleanup criteria.

5.5.3 DEVIATIONS FROM FIELD PROCEDURES

Methods and procedures employed in the field during the Hanford 1100-EM-1 remediation followed the Remedial Action Work Plan (CDM Federal 1995) and the Remediation Design and Remedial Action Plan (USACE 1994a). Significant changes in technical approach (e.g., the change from composite sampling to grab sampling for confirmatory samples at the Ephemeral Pool Site) were made and documented in the field with the concurrence of USACE site representatives. A summary of these deviations is provided in Table 5-6.

5.6 RESULTS OF DATA EVALUATION BY THE USACE QA LABORATORY

The USACE North Pacific Division (NPD) laboratory served as the QA laboratory for this project. The NPD laboratory analyzed one rinsate sample and five soil samples (splits of confirmation samples). The NPD laboratory also reviewed data packages prepared by CDM Federal's subcontracted laboratories. A Quality Assurance Report (QAR) prepared by the NPD laboratory is included in Appendix D.

The majority of the analytical data submitted by CDM Federal subcontracted laboratories was judged as acceptable by the NDP laboratory. Selenium data for several waste characterization samples was questioned because of low matrix spike recovery. However, selenium has never been identified as a contaminant of potential concern at these sites. The BEHP result for one of the Discolored Soil Site confirmation samples was questioned. Analytical data indicate that all other confirmation samples contained BEHP at concentrations substantially below the action level. The NPD laboratory concurred that a low concentration of toluene detected in one waste characterization sample is likely a laboratory contaminant. It was noted that insufficient QC data were provided to evaluate a portion of the PCB analytical data. A subsequent memorandum included in the QAR indicates that upon review of supplementary data, the PCB data are considered acceptable. Similarly, the QA laboratory could not conduct a complete evaluation of the TCLP chlordane data for waste characterization samples.

TABLE 5-6
DEVIATIONS FROM FIELD PROCEDURES

Location of Requirement	Requirement	Deviation
Remedial Action Work Plan, 3.1	One waste profile sample was to be collected at each site at the start of the field project.	In order to better represent the range of contaminants and concentrations present at in each waste stream, profile samples were collected from stockpiled soil at the completion of excavation activities. Also, because the wastes from the Ehpemeral Pool Site and the Horn Rapids Landfill were combined to form a single waste stream, only one profile sample was collected to represent the PCB-contaminated soils.
Remedial Action Work Plan, 3.3	Two waste characterization samples were to be collected from stockpiled contaminated soils at each site.	Due to the contaminant types and relative volumes of wastes generated at each site, the USACE directed that two samples be collected at the Discolored Soil Site, one at the Ephemeral Pool Site, and three at the Horn Rapids Landfill.
Remedial Action Work Plan, 3.3	All soils exceeding the target cleanup levels established in the ROD were to be excavated and removed from the 1100 Area sites.	Based on a statistical evaluation of the confirmatory sampling results and discussions with representatives of the regulatory agencies, the USACE determined that remedial objectives had been satisfied at both the Ephemeral Pool Site and the Horn Rapids Landfill when small volumes of soil containing PCB at concentrations slightly exceeding the target cleanup levels remained.
Remedial Action Work Plan, 4.3.1	Anticipated numbers of confirmatory samples at each site were as follows: Discolored Soil Site 10 samples Ephemeral Pool Site 20 samples Horn Rapids Landfill 10 samples	Actual number of samples collected at each site was determined by the USACE based on field conditions. Actual numbers of confirmatory samples were as follows: Discolored Soil Site 11 samples Ephemeral Pool Site 18 samples Horn Rapids Landfill 22 samples
Remedial Action Work Plan, 4.3.1	Confirmatory samples were to be collected as composites with 10% collected as grab samples in locations selected by regulatory agency representatives.	At the direction of the USACE, and with concurrence from regulatory agencies, all confirmatory samples collected at the Discolored Soil Site and the Ephemeral Pool Site were collected as grab samples, while at the Horn Rapids Landfill, confirmatory samples were collected as composites with 10% randomly located grab samples.

5.7 DATA USABILITY SUMMARY

Based on a limited review of analytical data generated by the TEG onsite and ESE offsite laboratories, and an evaluation of the USACE QAR, these data meet the basic requirements outlined at the start of the project. In order to develop a more definitive description of data usability, a more extensive review would be required. Overall, the data should be considered acceptable for their intended use.

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6.0 CONCLUSIONS

6.1 SUMMARY OF FINDINGS

Excavation and stockpiling of contaminated soils at three Hanford 1100-EM-1 sites was accomplished between January 30 and March 15, 1995. The target contaminants and approximate volumes of contaminated soils excavated and stockpiled at each of the three sites are summarized below:

Discolored Soil Site - 70 cubic meters (90 cubic yards) of soils primarily contaminated by BEHP.

Ephemeral Pool Site - 115 cubic meters (150 cubic yards) of soils primarily contaminated by PCB Aroclor 1260.

Horn Rapids Landfill - 1224 cubic meters (1600 cubic yards) of soils primarily contaminated by PCB Aroclor 1248.

Contaminated soils were excavated based on the results of screening analyses conducted in an onsite laboratory. Excavation to depths of 0.9 to 1.2 m (3 to 4 ft) was necessary to remove contaminated soil at both the Discolored Soil Site and the Ephemeral Pool Site. At the Horn Rapids Landfill, contaminated soils were removed from depths of up to 2.5 m (8 ft). Soils were stockpiled on 10 mil plastic sheeting and secured with heavy gauge tarps pending transportation and treatment or disposal offsite. Disposition of these waste materials are discussed in Section 6.2.

Analytical data generated by the onsite laboratory is summarized in Appendix A. Results of confirmatory sample analyses conducted by an offsite laboratory are outlined in Tables 4-1 through 4-3. Data from the offsite analysis of waste characterization samples are presented in Appendix B.

Remedial activities completed by others at the Horn Rapids Landfill included the surveying and recycling of tires from an open cell, dismantling and disposal of a burn cage, construction of an engineered landfill cap and installation of five groundwater-monitoring wells.

6.2 DISPOSITION OF CONTAMINATED SOILS

Loading, transportation, treatment, and disposal of contaminated soils was the responsibility of others. All wastes were removed from the Hanford 1100-EM-1 by April 26, 1995.

Wastes from the three sites comprised two separate waste streams for the purposes of treatment and disposal. BEHP-contaminated soils from the Discolored Soil Site were transported to the APTUS incineration facility in Aragonite, Utah for thermal destruction of organic contaminants.

PCB-contaminated soils from the Ephemeral Pool Site and the Horn Rapids Landfill represented the second waste stream. These PCB-contaminated materials were transported to the Chemical Waste Management Facility in Arlington, Oregon for disposal in a RCRA Class C/TSCA hazardous waste landfill.

7.0 REFERENCES

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APPENDIX A

ONSITE LABORATORY ANALYTICAL DATA SUMMARY

SCREENING SAMPLES

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TABLE A-1
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
DISCOLORED SOIL SITE

SAMPLE NUMBER	DATE COLLECTED	BIS(2-ETHYLHEXYL) PHTHALATE (mg/kg)
EM-1/01-CM-1-6"	2/13/95	nd[1]
EM-1/01-CM-1-6" (DUPLICATE)	2/13/95	nd
EM-1/01-CM-2-6"	2/13/95	nd
EM-1/01-CM-3-2	2/13/95	nd
EM-1/01-CM-4-2	2/13/95	605
EM-1/01-CM-4-4	2/13/95	nd
EM-1/01-CM-5-2	2/13/95	nd
EM-1/01-CM-6-1	2/13/95	nd
EM-1/01-CM-7-1	2/13/95	nd
EM-1/01-CM-8-1	2/13/95	nd
EM-1/01-CM-9-1	2/13/95	nd
EM-1/01-CM-10-6"	2/13/95	nd
EM-1/01-CM-11-1	2/13/95	nd
EM-1/01-CM-12-2	2/13/95	nd
EM-1/01-CM-13-1	2/13/95	nd
EM-1/01-CM-14-1	2/13/95	nd
EM-1/01-CM-15-1	2/13/95	nd
EM-1/01-CM-16-1	2/13/95	nd
EM-1/01-CM-17-2	2/13/95	58
EM-1/01-CM-17-2 (DUPLICATE)	2/13/95	70
EM-1/01-CM-18-2	2/13/95	nd
EM-1/01-CM-19-2	2/13/95	nd
EM-1/01-CM-20-2	2/13/95	nd
EM-1/01-CM-21-2	2/13/95	147

TABLE A-1 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
DISCOLORED SOIL SITE

SAMPLE NUMBER	DATE COLLECTED	BIS(2-ETHYLHEXYL) PHTHALATE (mg/kg)
EM-1/01-CM-22-2	2/13/95	14
EM-1/01-CM-23-1	2/13/95	nd
EM-1/01-CM-24-1	2/13/95	nd
EM-1/01-CM-25-4	2/14/95	56
EM-1/01-CM-26-2	2/14/95	nd

[1] nd = not detected
[2] (DUPLICATE) - duplicate analysis by onsite laboratory

TABLE A-2
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
EPHEMERAL POOL SITE

SAMPLE #	DATE COLLECTED	PCB AROCLOR 1221[1]	PCB AROCLOR 1232[1]	PCB AROCLOR 1242[1]	PCB AROCLOR 1248[1]	PCB AROCLOR 1254[1]	PCB AROCLOR 1260[1]	TOTAL PCB[1]
EM-1/02-CM-1-1	2/2/95	nd[2]	nd	nd	nd	nd	nd	nd
EM-1/02-CM-2-1	2/2/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-3-1	2/2/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-4-1	2/2/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-5-1	2/2/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-6-1	2/6/95	nd	nd	nd	nd	nd	12.2	12.2
EM-1/02-CM-7-1	2/6/96	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-8-1	2/9/95	nd	nd	nd	nd	nd	1.12	1.12
EM-1/02-CM-9-1	2/9/95	nd	nd	nd	nd	nd	0.10	0.10
EM-1/02-CM-10-1	2/9/95	nd	nd	nd	nd	nd	1.86	1.86
EM-1/02-CM-10-1 (DUP.)[2]	2/9/95	nd	nd	nd	nd	nd	1.97	1.97
EM-1/02-CM-11-1	2/9/95	nd	nd	nd	nd	nd	1.43	1.43
EM-1/02-CM-12-1	2/9/95	nd	nd	nd	nd	nd	0.17	0.17
EM-1/02-CM-13-1	2/9/95	nd	nd	nd	nd	nd	2.38	2.38
EM-1/02-CM-14-1	2/9/95	nd	nd	nd	nd	nd	0.38	0.38
EM-1/02-CM-15-6"	2/9/95	nd	nd	nd	nd	nd	0.28	0.28
EM-1/02-CM-16-6"	2/9/95	nd	nd	nd	nd	nd	0.05	0.05
EM-1/02-CM-17-18"	2/10/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-18-1	2/10/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-19-18"	2/10/95	nd	nd	nd	nd	nd	0.11	0.11
EM-1/02-CM-20-18"	2/10/95	nd	nd	nd	nd	nd	0.17	0.17
EM-1/02-CM-21-6"	2/10/95	nd	nd	nd	nd	nd	2.17	2.17
EM-1/02-CM-22-6"	2/10/95	nd	nd	nd	nd	nd	0.25	0.25
EM-1/02-CM-23-6"	2/10/95	nd	nd	nd	nd	nd	0.07	0.07
EM-1/02-CM-24-6"	2/10/95	nd	nd	nd	nd	nd	0.67	0.67
EM-1/02-CM-24A-2"	2/15/95	nd	nd	nd	nd	nd	12.8	12.8
EM-1/02-CM-24B-2"	2/15/95	nd	nd	nd	nd	nd	3.81	3.81

TBLA-2/04/12/95/CDP

TABLE A-2 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
EPHEMERAL POOL SITE

SAMPLE #	DATE COLLECTED	PCB AROCLOR 1221[1]	PCB AROCLOR 1232[1]	PCB AROCLOR 1242[1]	PCB AROCLOR 1248[1]	PCB AROCLOR 1254[1]	PCB AROCLOR 1260[1]	TOTAL PCB[1]
EM-1/02-CM-25-2"	2/15/95	nd	nd	nd	nd	nd	1.28	1.28
EM-1/02-CM-25-2 (DUP.)	2/15/95	nd	nd	nd	nd	nd	0.99	0.99
EM-1/02-CM-26-2"	2/15/95	nd	nd	nd	nd	nd	25.0	25.0
EM-1/02-CM-27-2"	2/15/95	nd	nd	nd	nd	nd	4.98	4.98
EM-1/02-CM-28-2"	2/15/95	nd	nd	nd	nd	nd	1.64	1.64
EM-1/02-CM-29-2"	2/15/95	nd	nd	nd	nd	nd	1.58	1.58
EM-1/02-CM-30-2"	2/15/95	nd	nd	nd	nd	nd	10.3	10.3
EM-1/02-CM-31-2"	2/15/95	nd	nd	nd	nd	nd	1.86	1.86
EM-1/02-CM-32-2"	2/15/95	nd	nd	nd	nd	nd	0.66	0.66
EM-1/02-CM-33-2"	2/15/95	nd	nd	nd	nd	nd	0.42	0.42
EM-1/02-CM-34-2"	2/15/95	nd	nd	nd	nd	nd	nd	
EM-1/02-CM-35-2"	2/16/95	nd	nd	nd	nd	nd	0.68	0.68
EM-1/02-CM-36-6"	2/16/95	nd	nd	nd	nd	nd	4.94	4.94
EM-1/02-CM-37-6"	2/16/95	nd	nd	nd	nd	nd	3.77	3.77
EM-1/02-CM-38-18"	2/16/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-39-12"	2/16/95	nd	nd	nd	nd	nd	0.15	0.15
EM-1/02-CM-40-3"	2/16/95	nd	nd	nd	nd	nd	2.07	2.07
EM-1/02-CM-41-12"	2/16/95	nd	nd	nd	nd	nd	0.22	0.22
EM-1/02-CM-41-12" (DUP.)	2/16/95	nd	nd	nd	nd	nd	0.27	0.27
EM-1/02-CM-42-24"	2/16/95	nd	nd	nd	nd	nd	0.14	0.14
EM-1/02-CM-43-6"	2/16/95	nd	nd	nd	nd	nd	0.63	0.63
EM-1/02-CM-44-6"	2/16/95	nd	nd	nd	nd	nd	0.24	0.24
EM-1/02-CM-45-6"	2/16/95	nd	nd	nd	nd	nd	0.71	0.71
EM-1/02-CM-46-6"	2/16/95	nd	nd	nd	nd	nd	0.14	0.14
EM-1/02-CM-47-6"	2/16/95	nd	nd	nd	nd	nd	0.43	0.43
EM-1/02-CM-48-6"	2/16/95	nd	nd	nd	nd	nd	1.73	1.73
EM-1/02-CM-49-6"	2/16/95	nd	nd	nd	nd	nd	0.38	[illegible]

TABLE A-2 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
EPHEMERAL POOL SITE

SAMPLE #	DATE COLLECTED	PCB AROCLOR 1221[1]	PCB AROCLOR 1232[1]	PCB AROCLOR 1242[1]	PCB AROCLOR 1248[1]	PCB AROCLOR 1254[1]	PCB AROCLOR 1260[1]	TOTAL PCB[1]
EM-1/02-CM-50-6"	2/16/95	nd	nd	nd	nd	nd	0.51	0.51
EM-1/02-CM-51-6"	2/16/95	nd	nd	nd	nd	nd	2.92	2.92
EM-1/02-CM-52-6"	2/16/95	nd	nd	nd	nd	nd	1.95	1.95
EM-1/02-CM-52-6" (DUP)	2/16/95	nd	nd	nd	nd	nd	1.38	1.38
EM-1/02-CM-53-6"	2/16/95	nd	nd	nd	nd	nd	8.46	8.46
EM-1/02-CM-54-6"	2/16/95	nd	nd	nd	nd	nd	2.24	2.24
EM-1/02-CM-55-6"	2/16/95	nd	nd	nd	nd	nd	0.54	0.54
EM-1/02-CM-56-6"	2/17/95	nd	nd	nd	nd	nd	0.30	0.30
EM-1/02-CM-57-6"	2/17/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-58-6"	2/17/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-59-6"	2/17/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-60-2"	2/17/95	nd	nd	nd	nd	nd	0.49	0.49
EM-1/02-CM-61-2"	2/17/95	nd	nd	nd	nd	nd	3.64	3.64
EM-1/02-CM-62-2"	2/17/95	nd	nd	nd	nd	nd	0.61	0.61
EM-1/02-CM-63-2"	2/17/95	nd	nd	nd	nd	nd	0.25	0.25
EM-1/02-CM-64-2"	2/17/95	nd	nd	nd	nd	nd	1.56	1.56
EM-1/02-CM-65-2"	2/17/95	nd	nd	nd	nd	nd	0.52	0.52
EM-1/02-CM-66-2"	2/17/95	nd	nd	nd	nd	nd	0.48	0.48
EM-1/02-CM-67-2"	2/17/95	nd	nd	nd	nd	nd	1.11	1.11
EM-1/02-CM-68-6"	3/13/95	nd	nd	nd	nd	nd	1.29	1.29
EM-1/02-CM-69-6"	3/13/95	nd	nd	nd	nd	nd	1.52	1.52
EM-1/02-CM-70-6"	3/13/95	nd	nd	nd	nd	nd	4.65	4.65
EM-1/02-CM-71-6"	3/13/95	nd	nd	nd	nd	nd	1.16	1.16
EM-1/02-CM-72-6"	3/13/95	nd	nd	nd	nd	nd	0.49	0.49
EM-1/02-CM-73-6"	3/13/95	nd	nd	nd	nd	nd	5.73	5.73
EM-1/02-CM-74-6"	3/13/95	nd	nd	nd	nd	nd	0.08	0.08
EM-1/02-CM-75-6"	3/13/95	nd	nd	nd	nd	nd	0.11	0.11

TABLE A-2 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
EPHEMERAL POOL SITE

SAMPLE #	DATE COLLECTED	PCB AROCLOR 1221[1]	PCB AROCLOR 1232[1]	PCB AROCLOR 1242[1]	PCB AROCLOR 1248[1]	PCB AROCLOR 1254[1]	PCB AROCLOR 1260[1]	TOTAL PCB[1]
EM-1/02-CM-76-6"	3/13/95	nd	nd	nd	nd	nd	2.21	2.21
EM-1/02-CM-77-6"	3/13/95	nd	nd	nd	nd	nd	0.12	0.12
EM-1/02-CM-78-6"	3/13/95	nd	nd	nd	nd	nd	0.20	0.20
EM-1/02-CM-79-6"	3/13/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-80-6"	3/13/95	nd	nd	nd	nd	nd	4.70	4.70
EM-1/02-CM-81-6"	3/13/95	nd	nd	nd	nd	nd	1.59	1.59
EM-1/02-CM-82-6"	3/14/95	nd	nd	nd	nd	nd	0.31	0.31
EM-1/02-CM-83-6"	3/14/95	nd	nd	nd	nd	nd	0.75	0.75
EM-1/02-CM-84-6"	3/14/95	nd	nd	nd	nd	nd	0.63	0.63
EM-1/02-CM-85-1	3/14/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-86-1	3/14/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-87-1	3/14/95	nd	nd	nd	nd	nd	nd	[illegible]
EM-1/02-CM-88-1	3/14/95	nd	nd	nd	nd	nd	0.17	0.17
EM-1/02-CM-89-1	3/14/95	nd	nd	nd	nd	nd	0.73	0.73
EM-1/02-CM-90-1	3/14/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-91-1	3/14/95	nd	nd	nd	nd	nd	0.08	0.08
EM-1/02-CM-92-6"	3/14/95	nd	nd	nd	nd	nd	0.67	0.67
EM-1/02-CM-93-6"	3/14/95	nd	nd	nd	nd	nd	0.60	0.60
EM-1/02-CM-94-6"	3/14/95	nd	nd	nd	nd	nd	0.19	0.19
EM-1/02-CM-95-2	3/15/95	nd	nd	nd	nd	nd	0.23	0.23
EM-1/02-CM-96-2	3/15/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-97-1	3/15/95	nd	nd	nd	nd	nd	5.41	5.41
EM-1/02-CM-97-1 (DUP.)	3/15/95	nd	nd	nd	nd	nd	4.38	4.38
EM-1/02-CM-98-1	3/15/95	nd	nd	nd	nd	nd	1.96	1.96
EM-1/02-CM-99-1	3/15/95	nd	nd	nd	nd	nd	1.39	1.39
EM-1/02-CM-100-1	3/15/95	nd	nd	nd	nd	nd	0.46	0.46
EM-1/02-CM-101-1	3/15/95	nd	nd	nd	nd	nd	nd	[illegible]

TABLE A-2 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
EPHEMERAL POOL SITE

SAMPLE #	DATE COLLECTED	PCB AROCLOR 1221[1]	PCB AROCLOR 1232[1]	PCB AROCLOR 1242[1]	PCB AROCLOR 1248[1]	PCB AROCLOR 1254[1]	PCB AROCLOR 1260[1]	TOTAL PCB[1]
EM-1/02-CM-102-2	3/15/95	nd	nd	nd	nd	nd	0.18	0.18
EM-1/02-CM-103-2	3/15/95	nd	nd	nd	nd	nd	nd	nd
EM-1/02-CM-104-2	3/15/95	nd	nd	nd	nd	nd	13.1	13.1
EM-1/02-CM-105-1	3/15/95	nd	nd	nd	nd	nd	0.08	0.08
EM-1/02-CM-106-3	3/15/95	nd	nd	nd	nd	nd	nd	nd

[1] All data reported in mg/kg
[2] nd = not detected
[3] (DUP.) - duplicate analysis by onsite laboratory

TABLE A-3
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL

SAMPLE NUMBER	DATE COLLECTED	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-CM-01-1	1 30/95	nd[1]	nd	nd	25.6	nd	nd	25.6
EM-1/03-CM-01-1(DUP.)[2]	1 30/95	nd	nd	nd	21.8	nd	nd	21.8
EM-1/03-CM-02-1	1 30/95	nd	nd	nd	62.5	nd	nd	62.5
EM-1/03-CM-03-1	1 30/95	nd	nd	nd	64.9	nd	nd	64.9
EM-1/03-CM-04-1	1 30/95	nd	nd	nd	32.2	nd	nd	32.2
EM-1/03-CM-05-1	1 30/95	nd	nd	nd	24.5	nd	nd	24.5
EM-1/03-CM-06-1	1 30/95	nd	nd	nd	165	nd	nd	165
EM-1/03-CM-07-3	1 30/95	nd	nd	nd	6.62	nd	nd	6.62
EM-1/03-CM-07-4	1 31/95	nd	nd	nd	0.18	nd	nd	0.18
EM-1/03-CM-07-4(DUP.)	1 31/75	nd		nd	0.22	nd	nd	0.22
EM-1/03-CM-08-3	1 30/95	nd	nd	nd	2.06	nd	nd	2.06
EM-1/03-CM-08-3(DUP.)	1 30/95	nd	nd	nd	1.91	nd	nd	
EM-1/03-CM-09-3	1 30/95	nd	nd	nd	2.06	nd	nd	2.06
EM-1/03-CM-10-3	1 30/95	nd	nd	nd	0.14	nd	nd	0.14
EM-1/03-CM-11-1	1 30/95	nd	nd	nd	72.0	nd	nd	72.0
EM-1/03-CM-12-1	1 30/95	nd	nd	nd	7.33	nd	nd	7.33
EM-1/03-CM-13-3	1 30/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-14-3	1 30/95	nd	nd	nd	0.08	nd	nd	0.08
EM-1/03-CM-15-3	1 30/95	nd	nd	nd	0.12	nd	nd	0.12
EM-1/03-CM-16-3	1 30/95	nd	nd	nd	1.77	nd	nd	1.77
EM-1/03-CM-17-1	1 30/95	nd	nd	nd	16.8	nd	nd	16.8
EM-1/03-CM-18-1	1 31/95	nd	nd	nd	0.09	nd	nd	0.09
EM-1/03-CM-19-3	1 31/95	nd	nd	nd	1.26	nd	nd	1.26
EM-1/03-CM-20-3	1 31/95	nd	nd	nd	0.27	nd	nd	0.27
EM-1/03-CM-21-3	1 31/95	nd	nd	nd	12.5	nd	nd	12.5
EM-1/03-CM-21-5	1 31/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-22-3	1 31/95	nd	nd	nd	1.46	nd	nd	1.46
EM-1/03-CM-23-3	1 31/95	nd	nd	nd	1.17	nd	nd	

TABLE A-3 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL

SAMPLE NUMBER	DATE COLLECTED	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-CM-24-1	1/31/95	nd	nd	nd	23.1	nd	nd	23.1
EM-1/03-CM-25-1	1/31/95	nd	nd	nd	<1.0	nd	nd	<1.0
EM-1/03-CM-26-3	1/31/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-27-3	1/31/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-28-3	1/31/95	nd	nd	nd	0.20	nd	nd	0.20
EM-1/03-CM-29-3	1/31/95	nd	nd	nd	0.22	nd	nd	0.22
EM-1/03-CM-30-1	1/31/95	nd	nd	nd	1.01	nd	nd	1.01
EM-1/03-CM-31-1	1/31/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-32-1	1/31/95	nd	nd	nd	1.63	nd	nd	1.63
EM-1/03-CM-33-1	1/31/95	nd	nd	nd	1.54	nd	nd	1.54
EM-1/03-CM-34-1	1/31/95	nd	nd	nd	22.4	nd	nd	22.4
EM-1/03-CM-35-1	1/31/95	nd	nd	nd	70.1	nd	nd	70.1
EM-1/03-CM-36-3	1/31/95	nd	nd	nd	1.92	nd	nd	1.92
EM-1/03-CM-37-1	1/31/95	nd	nd	nd	11.3	nd	nd	11.3
EM-1/03-CM-38-1	1/31/95	nd	nd	nd	13.2	nd	nd	13.2
EM-1/03-CM-39-1	1/31/95	nd	nd	nd	25.7	nd	nd	25.7
EM-1/03-CM-40-1	1/31/95	nd	nd	nd	6.28	nd	nd	6.28
EM-1/03-CM-41-1	2/1/95	nd	nd	nd	2.12	nd	nd	2.12
EM-1/03-CM-42-1	2/1/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-43-1	2/1/95	nd	nd	nd	3.79	nd	nd	3.79
EM-1/03-CM-44-1	2/1/95	nd	nd	nd	5.09	nd	nd	5.09
EM-1/03-CM-45-1	2/1/95	nd	nd	nd	43.9	nd	nd	43.9
EM-1/03-CM-46-1	2/1/95	nd	nd	nd	9.54	nd	nd	9.54
EM-1/03-CM-47-1	2/1/95	nd	nd	nd	5.33	nd	nd	5.33
EM-1/03-CM-48-3	2/1/95	nd	nd	nd	0.19	nd	nd	0.19
EM-1/03-CM-49-3	2/1/95	nd	nd	nd	3.57	nd	nd	3.57
EM-1/03-CM-50-3	2/1/95	nd	nd	nd	0.78	nd	nd	0.78
EM-1/03-CM-51-3	2/1/95	nd	nd	nd	3.40	nd	nd	3.40

TABLE A-3 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL

SAMPLE NUMBER	DATE COLLECTED	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-CM-52-1	2/1/95	nd	nd	nd	3.07	nd	nd	3.07
EM-1/03-CM-53-1	2/1/95	nd	nd	nd	4.75	nd	nd	4.75
EM-1/03-CM-54-1	2/1/95	nd	nd	nd	9.77	nd	nd	9.77
EM-1/03-CM-55-3	2/1/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-56-3	2/1/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-57-3	2/1/95	nd	nd	nd	0.13	nd	nd	0.13
EM-1/03-CM-58-3	2/1/95	nd	nd	nd	3.90	nd	nd	3.90
EM-1/03-CM-58-3(DUP)	2/1/95	nd	nd	nd	3.74	nd	nd	3.74
EM-1/03-CM-59-1	2/1/95	nd	nd	nd	40.7	nd	nd	40.7
EM-1/03-CM-60-1	2/1/95	nd	nd	nd	40.9	nd	nd	40.9
EM-1/03-CM-61-1	2/1/95	nd	nd	nd	49.4	nd	nd	49.4
EM-1/03-CM-62-1	2/1/95	nd	nd	nd	3.05	nd	nd	
EM-1/03-CM-63-3	2/1/95	nd	nd	nd	36.5	nd	nd	36.5
EM-1/03-CM-64-3	2/1/95	nd	nd	nd	1.59	nd	nd	1.59
EM-1/03-CM-65-3	2/1/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-66-1	2/1/95	nd	nd	nd	39.2	nd	nd	39.2
EM-1/03-CM-67-1	2/1/95	nd	nd	nd	0.81	nd	nd	0.81
EM-1/03-CM-68-1	2/1/95	nd	nd	nd	89.3	nd	nd	89.3
EM-1/03-CM-69-1	2/1/95	nd	nd	nd	65.4	nd	nd	65.4
EM-1/03-CM-70-1	2/2/95	nd	nd	nd	9.99	nd	nd	9.99
EM-1/03-CM-71-1	2/2/95	nd	nd	nd	76.3	nd	nd	76.3
EM-1/03-CM-72-3	2/2/95	nd	nd	nd	6.81	nd	nd	6.81
EM-1/03-CM-73-1	2/2/95	nd	nd	nd	135	nd	nd	135
EM-1/03-CM-74-1	2/2/95	nd	nd	nd	0.41	nd	nd	0.41
EM-1/03-CM-74-4	2/2/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-75-3	2/2/95	nd	nd	nd	0.23	nd	nd	0.23
EM-1/03-CM-76-1	2/2/95	nd	nd	nd	0.55	nd	nd	0.55
EM-1/03-CM-77-3	2/2/95	nd	nd	nd	5.44	nd	nd	

TBLA-3/04/12/95/CDP

TABLE A-3 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL

SAMPLE NUMBER	DATE COLLECTED	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-CM-78-3	2/2/95	nd	nd	nd	8.00	nd	nd	8.00
EM-1/03-CM-79-1	2/2/95	nd	nd	nd	2.52	nd	nd	2.52
EM-1/03-CM-80-1	2/2/95	nd	nd	nd	21.5	nd	nd	21.5
EM-1/03-CM-81-1	2/2/95	nd	nd	nd	63.7	nd	nd	63.7
EM-1/03-CM-82-1	2/2/95	nd	nd	nd	43.4	nd	nd	43.4
EM-1/03-CM-83-1	2/2/95	nd	nd	nd	20.5	nd	nd	20.5
EM-1/03-CM-84-1	2/3/95	nd	nd	nd	52.2	nd	nd	52.2
EM-1/03-CM-85-1	2/3/95	nd	nd	nd	19.4	nd	nd	19.4
EM-1/03-CM-86-1	2/3/95	nd	nd	nd	1.09	nd	nd	1.09
EM-1/03-CM-87-1	2/3/95	nd	nd	nd	19.3	nd	nd	19.3
EM-1/03-CM-88-1	2/3/95	nd	nd	nd	4.47	nd	nd	4.47
EM-1/03-CM-89-4	2/3/95	nd	nd	nd	9.10	nd	nd	9.10
EM-1/03-CM-90-4	2/3/95	nd	nd	nd	6.44	nd	nd	6.44
EM-1/03-CM-90-4(DUP.)	2/3/95	nd	nd	nd	5.77	nd	nd	5.77
EM-1/03-CM-91-3	2/3/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-92-3	2/3/95	nd	nd	nd	2.43	nd	nd	2.43
EM-1/03-CM-93-4	2/3/95	nd	nd	nd	25.6	nd	nd	25.6
EM-1/03-CM-94-1	2/3/95	nd	nd	nd	2.91	nd	nd	2.91
EM-1/03-CM-95-1	2/3/95	nd	nd	nd	0.86	nd	nd	0.86
EM-1/03-CM-96-1	2/3/95	nd	nd	nd	9.86	nd	nd	9.86
EM-1/03-CM-97-1	2/3/95	nd	nd	nd	5.27	nd	nd	5.27
EM-1/03-CM-98-1	2/3/95	nd	nd	nd	14.5	nd	nd	14.5
EM-1/03-CM-99-1	2/3/95	nd	nd	nd	9.67	nd	nd	9.67
EM-1/03-CM-99-1(DUP.)	2/3/95	nd	nd	nd	9.80	nd	nd	9.80
EM-1/03-CM-100-1	2/3/95	nd	nd	nd	6.77	nd	nd	6.77
EM-1/03-CM-101-1	2/3/95	nd	nd	nd	1.46	nd	nd	1.46
EM-1/03-CM-102-1	2/3/95	nd	nd	nd	8.97	nd	nd	8.97
EM-1/03-CM-103-4	2/3/95	nd	nd	nd	11.8	nd	nd	11.8

TABLE A-3 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL

SAMPLE NUMBER	DATE COLLECTED	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-CM-104-4	2/3/95	nd	nd	nd	3.28	nd	nd	3.28
EM-1/03-CM-105-3	2/3/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-106-3	2/3/95	nd	nd	nd	0.24	nd	nd	0.24
EM-1/03-CM-107-1	2/6/95	nd	nd	nd	0.63	nd	nd	0.63
EM-1/03-CM-108-1	2/6/95	nd	nd	nd	42.4	nd	nd	42.4
EM-1/03-CM-109-5	2/6/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-110-1	2/6/95	nd	nd	nd	2.01	nd	nd	2.01
EM-1/03-CM-111-1	2/6/95	nd	nd	nd	16.3	nd	nd	16.3
EM-1/03-CM-112-4	2/6/95	nd	nd	nd	7.65	nd	nd	7.65
EM-1/03-CM-113-1	2/6/95	nd	nd	nd	8.90	nd	nd	8.90
EM-1/03-CM-114-1	2/6/95	nd	nd	nd	6.70	nd	nd	6.70
EM-1/03-CM-115-4	2/6/95	nd	nd	nd	34.7	nd	nd	
EM-1/03-CM-116-4	2/6/95	nd	nd	nd	129	nd	nd	129
EM-1/03-CM--117-4	2/6/95	nd	nd	nd	3.24	nd	nd	3.24
EM-1/03-CM-118-4	2/6/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-119-4	2/6/95	nd	nd	nd	178	nd	nd	178
EM-1/03-CM-120-1	2/6/95	nd	nd	nd	1.99	nd	nd	1.99
EM-1/03-CM-121-1	2/6/95	nd	nd	nd	0.58	nd	nd	0.58
EM-1/03-CM-122-1	2/7/95	nd	nd	nd	3.09	nd	nd	3.09
EM-1/03-CM-123-6	2/7/95	nd	nd	nd	33.9	nd	nd	33.9
EM-1/03-CM-124-4	2/7/95	nd	nd	nd	2.13	nd	nd	2.13
EM-1/03-CM-125-4	2/7/95	nd	nd	nd	11.8	nd	nd	11.8
EM-1/03-CM-125-4(DUP.)	2/7/95	nd	nd	nd	12.3	nd	nd	12.3
EM-1/03-CM-126-1	2/7/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-127-3	2/7/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-128-6	2/7/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-129-3	2/7/95	nd	nd	nd	3.53	nd	nd	3.53
EM-1/03-CM-130-5	2/7/95	nd	nd	nd	2.27	nd	nd	

TABLE A-3 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL

SAMPLE NUMBER	DATE COLLECTED	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-CM-131-4	2/7/95	nd	nd	nd	0.26	nd	nd	0.26
EM-1/03-CM-132-4	2/7/95	nd	nd	nd	4.92	nd	nd	4.92
EM-1/03-CM-133-4	2/7/95	nd	nd	nd	1.23	nd	nd	1.23
EM-1/03-CM-134-4	2/7/95	nd	nd	nd	2.38	nd	nd	2.38
EM-1/03-CM-135-4	2/7/95	nd	nd	nd	6.56	nd	nd	6.56
EM-1/03-CM-136-4	2/7/95	nd	nd	nd	16.5	nd	nd	16.5
EM-1/03-CM-137-7	2/8/95	nd	nd	nd	0.90	nd	nd	0.90
EM-1/03-CM-138-7	2/8/95	nd	nd	nd	1.34	nd	nd	1.34
EM-1/03-CM-139-7	2/8/95	nd	nd	nd	3.22	nd	nd	3.22
EM-1/03-CM-140-7	2/8/95	nd	nd	nd	0.18	nd	nd	0.18
EM-1/03-CM-141-7	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-142-7	2/8/95	nd	nd	nd	10.5	nd	nd	10.5
EM-1/03-CM-143-7	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-144-6	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-145-6	2/8/95	nd	nd	nd	0.20	nd	nd	0.20
EM-1/03-CM-146-6	2/8/95	nd	nd	nd	0.21	nd	nd	0.21
EM-1/03-CM-147-5	2/8/95	nd	nd	nd	0.77	nd	nd	0.77
EM-1/03-CM-148-4	2/8/95	nd	nd	nd	103	nd	nd	103
EM-1/03-CM-149-4	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-150-6	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-151-4	2/8/95	nd	nd	nd	34.5	nd	nd	34.5
EM-1/03-CM-152-3	2/8/95	nd	nd	nd	22.5	nd	nd	22.5
EM-1/03-CM-153-3	2/8/95	nd	nd	nd	13.3	nd	nd	13.3
EM-1/03-CM-154-7	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-155-3	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-156-1	2/8/95	nd	nd	nd	1.47	nd	nd	1.47
EM-1/03-CM-156-1(DUP.)	2/8/95	nd	nd	nd	1.56	nd	nd	1.56
EM-1/03-CM-157-1	2/8/95	nd	nd	nd	14.0	nd	nd	114.0

TABLE A-3 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL

SAMPLE NUMBER	DATE COLLECTED	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-CM-158-3	2/8/95	nd	nd	nd	30.9	nd	nd	30.9
EM-1/03-CM-159-4	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-160-4	2/8/95	nd	nd	nd	0.96	nd	nd	0.96
EM-1/03-CM-161-4	2/8/95	nd	nd	nd	28.0	nd	nd	28.0
EM-1/03-CM-162-8	2/8/95	nd	nd	nd	0.86	nd	nd	0.86
EM-1/03-CM-163-5	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-164-4	2/8/95	nd	nd	nd	0.72	nd	nd	0.72
EM-1/03-CM-165-4	2/8/95	nd	nd	nd	1.03	nd	nd	1.03
EM-1/03-CM-166-4	2/8/95	nd	nd	nd	0.25	nd	nd	0.25
EM-1/03-CM-167-7	2/8/95	nd	nd	nd	0.37	nd	nd	0.37
EM-1/03-CM-168-4	2/8/95	nd	nd	nd	1.02	nd	nd	1.02
EM-1/03-CM-169-7	2/8/95	nd	nd	nd	1.17	nd	nd	
EM-1/03-CM-170-4	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-171-1	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-172-4	2/8/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-173-4	2/8/95	nd	nd	nd	0.23	nd	nd	0.23
EM-1/03-CM-173-4(DUP.)	2/8/95	nd	nd	nd	0.24	nd	nd	0.24
EM-1/03-CM-174-4	2/8/95	nd	nd	nd	192	nd	nd	192
EM-1/03-CM-175-5	2/9/95	nd	nd	nd	1.97	nd	nd	1.97
EM-1/03-CM-176-5	2/9/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-177-1	2/9/95	nd	nd	nd	0.88	nd	nd	0.88
EM-1/03-CM-178-7	2/9/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-179-4	2/9/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-180-7	2/9/95	nd	nd	nd	2.96	nd	nd	2.96
EM-1/03-CM-181-6	3/9/95	nd	nd	nd	2.22	nd	nd	2.22
EM-1/03-CM-182-6	3/9/95	nd	nd	nd	17.6	nd	nd	17.6
EM-1/03-CM-183-6	3/9/95	nd	nd	nd	12.8	nd	nd	12.8
EM-1/03-CM-184-6	3/9/95	nd	nd	nd	1.33	nd	nd	

TABLE A-3 (continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
HORN RAPIDS LANDFILL

SAMPLE NUMBER	DATE COLLECTED	PCB AROCLOR 1221	PCB AROCLOR 1232	PCB AROCLOR 1242	PCB AROCLOR 1248	PCB AROCLOR 1254	PCB AROCLOR 1260	TOTAL PCB
EM-1/03-CM-185-6	3/9/95	nd	nd	nd	3.12	nd	nd	3.12
EM-1/03-CM-185-6(DUP)	3/9/95	nd	nd	nd	3.18	nd	nd	3.18
EM-1/03-CM-186-6	3/13/95	nd	nd	nd	nd	nd	nd	nd
EM-1/03-CM-187-6	3/13/95	nd	nd	nd	5.70	nd	nd	5.70
EM-1/03-CM-187-6(DUP)	3/13/95	nd	nd	nd	5.85	nd	nd	5.85

[1] nd - not detected
[2] (DUP) = duplicate analysis by onsite laboratory

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APPENDIX B

OFFSITE LABORATORY ANALYTICAL DATA SUMMARY

WASTE CHARACTERIZATION SAMPLES

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TABLE B-1
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
WASTE CHARACTERIZATION SAMPLES

SITE	DISCOLORED SOIL SITE	DISCOLORED SOIL SITE	EPHEMERAL POOL	HORN RAPIDS LANDFILL	HORN RAPIDS LANDFILL	HORN RAPIDS LANDFILL
SAMPLE #	EM-1/01-W-01-0	EM-1/01-W-02-0	EM-1/02-W-01-0	EM-1/03-W-01-0	EM-1/03-W-02-0	EM-1/03-W-03-0
HEIS #	BODSK7	BODSK8	BODSQ1	BODSM4	BODSM5	BODSM6
DATE COLLECTED	2/14/95	2/14/95	2/17/95	2/15/95	2/15/95	2/15/95
METHOD/ANALYTE						
6010/7000						
ARSENIC	1.29	1.43	1.96	1.04	0.697	0.880
BARIUM	70.2	78.8	118	55.3	44.3	49.4
CHROMIUM	4.58	4.44	8.74	3.48	1.92	2.51
LEAD	nd[1]	nd	40.6	nd	nd	nd
8240						
TOLUENE	0.007	nd	nd	nd	nd	nd
8270						
BIS(2-ETHYLHEXYL) PHTHALATE	250	50	nd	nd	nd	nd
DI-N-BUTYL-PHTHALATE	nd	nd	nd	0.180	1.10	nd
DI-N-OCTYL-PHTHALATE	0.650	nd	nd	nd	nd	nd
FLUORANTHENE	nd	nd	1.10	nd	nd	nd
PHENANTHRENE	nd	nd	0.880	nd	nd	nd
PYRENE	nd	nd	1.10	nd	nd	nd
8080						
PCB-1248	nd	nd	nd	11.0	5.72	6.39
PCB-1260	nd	nd	4.73	0.237	0.552	0.691
TECH. CHLORDANE	0.599	0.464	6.95	nd	nd	nd
TCLP-8081 CHLORDANE	nd	nd	nd	nd	nd	nd

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APPENDIX C

DATA SETS USED FOR APPLICATION

OF ATTAINMENT CRITERIA

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TABLE C-1
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA, DISCOLORED SOIL SITE

SAMPLE NUMBER	BEHP CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	BEHP CONCENTRATION (mg/kg)	REMARKS
CM-1-6	6.50		CM-16-1	6.50	
CM-2-6	6.50		CM-17-2*	64.00	
CM-3-2	6.50		CM-18-2	6.50	
CM-4-2	605	EXCAVATED	CM-19-2	6.50	
CM-4-4	6.50		CM-20-2	6.50	
CM-5-2	6.50		CM-21-2	147	EXCAVATED
CM-6-1	6.50		CM-22-2	14.0	
CM-7-1	6.50		CM-23-1	6.50	
CM-8-1	6.50		CM-24-1	6.50	
CM-9-1	6.50		CM-25-4	56.0	
CM-10-6	6.50		CM-26-2	6.50	
CM-11-1	6.50		C-01-2	10.4	
CM-12-2	6.50		C-02-2	9.39	
CM-13-1	6.50		C-03-2	7.31	
CM-14-1	6.50		C-04-2	0.11	
CM-15-1	6.50		C-05-4	112	

TABLE C-1 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
DISCOLORED SOIL SITE

SAMPLE NUMBER	BEHP CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	BEHP CONCENTRATION (mg/kg)	REMARKS
C-06-3	0.683		C-09-3	1.67	
C-07-2	4.23		C-10-2	11.0	
C-08-2	2.35		C-11-2	6.12	

NOTES:
1. * indicates average of duplicate samples.
2. For samples which were collected from areas later excavated, sampling results were not used in final statistics.
3. When not detected, concentrations used for statistical purposes are 0.5 times detection limit.

TABLE C-1 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA, EPHEMERAL POOL SITE

SAMPLE #	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE #	PCB CONCENTRATION (mg/kg)	REMARKS
CM-71-6"	1.16		CM-89-1	0.73	
CM-72-6"	0.49		CM-90-1	0.015	
CM-73-6"	5.73	EXCAVATED	CM-91-1	0.08	
CM-74-6"	0.08		CM-92-6"	0.67	
CM-75-6"	0.11		CM-93-6"	0.6	
CM-76-6"	2.21	EXCAVATED	CM-94-6"	0.19	
CM-77-6"	0.12		CM-95-2	0.23	
CM-78-6"	0.2		CM-96-2	0.015	
CM-79-6"	0.015		CM-97-1*	4.9	EXCAVATED
CM-80-6"	4.7	EXCAVATED	CM-98-1	1.96	EXCAVATED
CM81-6"	1.59		CM-99-1	1.39	EXCAVATED
CM-82-6"	0.31		CM-100-1	0.46	
CM-83-6"	0.75		CM-101-1	0.015	
CM-84-6"	0.63		CM-102-2	0.18	
CM-85-1	0.015		CM-103-2	0.015	
CM-86-1	0.015		CM-104-2	13.1	EXCAVATED
CM-87-1	0.015		CM-105-1	0.08	
CM-88-1	0.17		CM-106-3	0.015	

TABLE C-1 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA, EPHEMERAL POOL SITE

SAMPLE #	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE #	PCB CONCENTRATION (mg/kg)	REMARKS
02-C-01-1	0.119		02-C-10-1	1.01	
02-C-02-1	0.444		02-C-11-1	0.319	
02-C-03-1	0.007		02-C-12-1	0.007	
02-C-04-1	0.065		02-C-13-1	0.007	
02-C-05-1	0.007		02-C-14-2	0.081	
02-C-06-1	0.007		02-C-15-2	0.007	
02-C-07-1	0.007		02-C-16-1	0.007	
02-C-08-2	0.135		02-C-17-1	0.007	
02-C-09-2	0.007		02-C-18-3	0.007	

NOTES:
1. * indicates an average of duplicate samples.
2. For samples which were collected from areas later excavated, sampling results were not used in final statistics.
3. When not detected, concentrations used for statistical purposes are 0.5 times detection limit.

TABLE C-2
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA, EPHEMERAL POOL SITE

SAMPLE #	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE #	PCB CONCENTRATION (mg/kg)	REMARKS
CM-1-1	0.1		CM-19-18"	0.015	
CM-2-1	0.1		CM-20-18"	0.017	
CM-3-1	0.1		CM-21-6"	2.17	EXCAVATED
CM-4-1	0.1		CM-22-6"	0.25	EXCAVATED
CM-5-1	0.1		CM-23-6"	0.07	EXCAVATED
CM-6-1	12.2	EXCAVATED	CM-24-6"	0.67	EXCAVATED
CM-7-1	0.1		CM-24A-2"	12.8	EXCAVATED
CM-8-1	1.12	EXCAVATED	CM-24B-2"	3.81	EXCAVATED
CM-9-1	0.1	EXCAVATED	CM-25-2"*	1.14	
CM-10-1*	1.92	EXCAVATED	CM-26-2"	25	EXCAVATED
CM-11-1	1.43	EXCAVATED	CM-27-2"	4.98	EXCAVATED
CM-12-1	0.17		CM-28-2"	1.64	
CM-13-1	2.38	EXCAVATED	CM-29-2"	1.58	
CM-14-1	0.38	EXCAVATED	CM-30-2"	10.3	EXCAVATED
CM-15-6"	0.28		CM-31-2"	1.86	EXCAVATED
CM-16-6"	0.05		CM-32-2"	0.66	
CM-17-18"	0.015		CM-33-2"	0.42	
CM-18-1	0.015		CM-34-2"	0.015	

TABLE C-2 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA, EPHEMERAL POOL SITE

SAMPLE #	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE #	PCB CONCENTRATION (mg/kg)	REMARKS
CM-35-2"	0.68		CM-53-6"	8.46	EXCAVATED
CM-36-6"	4.94	EXCAVATED	CM-54-6"	2.24	EXCAVATED
CM-37-6"	3.77	EXCAVATED	CM-55-6"	0.54	
CM-38-18"	0.015		CM-56-6"	0.3	
CM-39-12"	0.15		CM-57-6"	0.015	
CM-40-3"	2.07	EXCAVATED	CM-58-6"	0.015	
CM-41-12"*	0.25		CM-59-6"	0.015	
CM-42-24"	0.14		CM-60-2"	0.49	
CM-43-6"	0.63		CM-61-2"	3.64	EXCAVATED
CM-44-6"	0.24		CM-62-2"	0.61	
CM-45-6"	0.71		CM-63-2"	0.25	
CM-46-6"	0.14		CM-64-2"	1.56	
CM-47-6"	0.43		CM-65-2"	0.52	
CM-48-6"	1.73		CM-66-2"	0.48	
CM-49-6"	0.38		CM-67-2"	1.11	
CM-50-6"	0.51		CM-68-6"	1.29	EXCAVATED
CM-51-6"	2.92	EXCAVATED	CM-69-6"	1.52	
CM-52-6"*	1.67	EXCAVATED	CM-70-6"	4.65	EXCAVATED

TABLE C-3
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA, HORN RAPIDS LANDFILL

SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS
CM-1-1*	23.7	EXCAVATED	CM-18-1	0.09	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
CM-3-1	64.9	EXCAVATED	CM-20-3	0.27	
CM-4-1	32.2	EXCAVATED	CM-21-3	12.5	EXCAVATED
CM-5-1	24.5	EXCAVATED	CM-21-5	0.1	
CM-6-1	165	EXCAVATED	CM-22-3	1.46	
CM-7-3	6.62	EXCAVATED	CM-23-3	1.17	
CM-7-4*	0.2		CM-24-1	23.1	EXCAVATED
CM-8-3*	1.99		CM-25-1	1	
CM-9-3	2.06		CM-26-3	0.1	
CM-10-3	0.14		CM-27-3	0.1	
CM-11-1	72	EXCAVATED	CM-28-3	0.2	
CM-12-1	7.33	EXCAVATED	CM-29-3	0.22	
CM-13-3	0.1		CM-30-1	1.01	
CM-14-3	0.08		CM-31-1	0.1	
CM-15-3	0.12		CM-32-1	1.63	
CM-16-3	1.77		CM-33-1	1.54	
CM-17-1	16.8	EXCAVATED	CM-34-1	22.4	EXCAVATED

TABLE C-3 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
HORN RAPIDS LANDFILL

SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS
CM-35-1	70.1	EXCAVATED	CM-53-1	4.75	
[illegible]	[illegible]		[illegible]	[illegible]	EXCAVATED
CM-37-1	11.3	EXCAVATED	CM-55-3	0.1	
CM-38-1	13.2	EXCAVATED	CM-56-3	0.1	
CM-39-1	25.7	EXCAVATED	CM-57-3	0.13	
CM-40-1	6.28	EXCAVATED	CM-58-3*	3.82	
CM-41-1	2.12		CM-59-1	40.7	EXCAVATED
CM-42-1	0.1		CM-60-1	40.9	EXCAVATED
CM-43-1	3.79		CM-61-1	49.4	EXCAVATED
CM-44-1	5.09		CM-62-1	3.05	
CM-45-1	43.9	EXCAVATED	CM-63-3	36.5	EXCAVATED
CM-46-1	9.54	EXCAVATED	CM-64-3	1.59	
CM-47-1	5.33	EXCAVATED	CM-65-3	0.1	
CM-48-3	0.19		CM-66-1	39.2	EXCAVATED
CM-49-3	3.57		CM-67-1	0.81	
CM-50-3	0.78		CM-68-1	89.3	EXCAVATED
CM-51-3	3.4		CM-69-1	65.4	EXCAVATED
CM-52-1	3.07		CM-70-1	9.99	EXCAVATED

TABLE C-3 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
HORN RAPIDS LANDFILL

SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS
CM-71-1	76.3	EXCAVATED	CM-88-1	4.47	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CM-73-1	135	EXCAVATED	CM-90-4*	6.11	EXCAVATED
CM-74-1	0.41		CM-91-3	0.1	
CM-74-4	0.1		CM-92-3	2.43	
CM-75-3	0.23		CM-93-4	25.6	EXCAVATED
CM-76-1	0.55		CM-94-1	2.91	
CM-77-3	5.44	EXCAVATED	CM-95-1	0.86	
CM-78-3	8	EXCAVATED	CM-96-1	9.86	EXCAVATED
CM-79-1	2.52		CM-97-1	5.27	EXCAVATED
CM-80-1	21.5	EXCAVATED	CM-98-1	14.5	EXCAVATED
CM-81-1	63.7	EXCAVATED	CM-99-1*	9.74	EXCAVATED
CM-82-1	43.4	EXCAVATED	CM-100-1	6.77	EXCAVATED
CM-83-1	20.5	EXCAVATED	CM-101-1	1.46	
CM-84-1	52.2	EXCAVATED	CM-102-1	8.97	EXCAVATED
CM-85-1	19.4	EXCAVATED	CM-103-4	11.8	EXCAVATED
CM-86-1	1.09		CM-104-4	3.28	
CM-87-1	19.3	EXCAVATED	CM-105-3	0.1	

TABLE C-3 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA, HORN RAPIDS LANDFILL

SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS
CM-106-3	0.24		CM-124-4	2.13	
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
CM-108-1	42.4	EXCAVATED	CM-126-3	0.1	
CM-109-1	0.1		CM-127-3	0.1	
CM-110-1	2.01		CM-128-6	0.1	
CM-111-1	16.3	EXCAVATED	CM-129-3	3.53	
CM-112-3	7.65	EXCAVATED	CM-130-6	2.27	
CM-113-1	8.9	EXCAVATED	CM-131-4	0.26	
CM-114-1	6.7	EXCAVATED	CM-132-4	4.92	
CM-115-4	34.7	EXCAVATED	CM-133-4	1.23	
CM-116-4	129	EXCAVATED	CM-134-4	2.38	
CM-117-4	3.24		CM-135-4	6.56	EXCAVATED
CM-118-4	0.1		CM-136-4	16.5	EXCAVATED
CM-119-4	178	EXCAVATED	CM-137-7	0.1	
CM-120-1	1.99		CM-138-7	0.1	
CM-121-1	0.58		CM-139-7	0.1	
CM-122-1	3.09		CM-140-7	0.1	
CM-123-6	33.9	EXCAVATED	CM-141-7	0.1	

TABLE C-3 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
HORN RAPIDS LANDFILL

SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS
CM-142-7	0.1		CM-160-4	0.1	
[illegible]	[illegible]		[illegible]	0.1	
CM-144-6	0.1		CM-162-8	0.1	
CM-145-6	0.1		CM-163-5	0.1	
CM-146-6	0.1		CM-164-4	0.72	
CM-147-5	0.1		CM-165-4	1.03	
CM-148-4	0.1		CM-166-4	0.25	
CM-149-4	0.1		CM-167-7	0.37	
CM-150-6	0.1		CM-168-4	1.02	
CM-151-4	0.1		CM-169-4	1.17	
CM-152-3	0.1		CM-170-4	0.1	
CM-153-3	0.1		CM-171-1	0.1	
CM-154-7	0.1		CM-172-4	0.1	
CM-155-3	0.1		CM-173-4*	0.24	
CM-156-2*	0.1		CM-174-4	192	EXCAVATED
CM-157-1	0.1		CM-175-5	1.97	
CM-158-3	0.1		CM-176-5	0.1	
CM-159-4	0.1		CM-177-1	0.88	

TABLE C-3 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA, HORN RAPIDS LANDFILL

SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	PCB CONCENTRATION (mg/kg)	REMARKS
CM-178-7	0.1		03-C-07-3	0.473	
[illegible]	[illegible]		[illegible]	[illegible]	
CM-180-7	2.96		03-C-09-6	14	EXCAVATED
CM-181-6	2.22		03-C-10-3	7.97	
CM-182-6	17.6	EXCAVATED	03-C-11-4	0.193	
CM-183-6	12.8	EXCAVATED	03-C-12-4*	0.154	
CM-184-6	1.33		03-C-13-3	5.48	
CM-185-6	3.12		03-C-14-7	1.01	
CM-186-6	0.1		03-C-15-7	1.65	
CM-187-6	5.7		03-C-16-3	7.74	
03-C-01-3	0.007		03-C-17-7	0.541	
03-C-02-3*	0.007		03-C-18-8	9.19	
03-C-03-3	0.385		03-C-19-7	1.39	
03-C-04-3	5.35		03-C-20-5	2.95	
03-C-05-3	0.682		03-C-21-6	0.07	
03-C-06-3	0.585		03-C-22-6	3.12	

NOTES:
1. * indicates average of duplicate samples.
2. For samples collecteed in areas later excavated, sampling results were not used in final statistics.
3. When not detected, concentrations used for statistical purposes are 0.5 times detection limit.

APPENDIX D

USACE NORTH PACIFIC DIVISION QUALITY ASSURANCE REPORT

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CHEMICAL QUALITY ASSURANCE REPORT

HANFORD 1100-EM-1 REMEDIATION

1. **SUMMARY:**

a. The project data are accepted based on the majority of acceptable internal quality control (QC) except for the following qualifications. Low levels of selenium might not have been detected, if present, in samples EM1/01-W-01-0, EM1/01-W-02-0 (ES&E Level III-Site One-February 1995 report) EM1/03-W-01-0, EM1/03-W-02-0 and EM1/03-W-03-0 (ES&E Level III-Sample Arrival 02-17-95-February 1995 report) based on low MS recovery. The phthalate ester data for sample EM1/01/C-01-2 should be considered questionable (ES&E Level IV-Site One-February 1995 report) due to lack of acceptable internal QC results. The toluene detected in sample EM1/01-W-01-0 (ES&E Level III-Site One-February 1995 report) at a level of 7.0 ppb, should be considered due to laboratory contamination as this analyte was detected in the method blank at a level of 2.9 ppb. The project laboratory did not report MS, MSD, LCS or sample duplicate data for the analysis of PCBs (ES&E reports: Site One-Level III-February 1995, Site Two-Level III-March 1995, Site Two-Level IV-March 1995, Site Three-Level III-March 1995(03-09), Site Three-Level III-March 1995(03-29) and Site Three-Level IV-March 1995). The PCB sample data in these reports could not be completely evaluated. The project laboratory did not report MS, MSD, LCS or sample duplicate data for the analysis of chlordane leachate data (ES&E reports: Sample Arrival 02/17/95-Level III-February 1995, Site Three-Level III-March 1995(03-09)). Chlordane leachate sample data in these reports could be completely evaluated.

b. The project and QA data comparisons are shown in Tables III through VIII. All data agree with the following exception. The QA laboratory's value for Bis(2-ethylhexyl)phthalate in Table IV is considered to be a high estimate based on high MS and MSD recoveries. The project laboratory's data could not be verified due to lack of acceptable internal QC results (use of wrong surrogates).

2. **BACKGROUND:** The samples were collected on February 14 through 17 and March 13 through 15, 1995 and were received by the analytical laboratories on February 16, 17, 18 and 21, and March 17, 1995.

3. **OBJECTIVES:**

a. Fifty-seven soil samples and three rinsates were collected from the site to determine the extent of the chemical contamination.

b. Five soil samples and one rinsate were submitted to evaluate the project laboratory's data.

4. **PROJECT ORGANIZATION:**

a. The samples were collected by CDM Federal Programs Corporation, Richland, Washington.

b. The project samples were analyzed by Environmental Science & Engineering (ES&E) Inc, Gainsville, Florida.

c. The QA samples were analyzed by Columbia Analytical Services (CAS), Inc., Kelso, Washington and CENPD-ET-P-L, Troutdale, Oregon.

5. **ANALYTICAL REFERENCES:**

Number	Title	Date
a. SW-846, Third Edtion	Test Methods for Evaluating Solid Waste - Final Update	8/93

6. **EVALUATION OF THE PROJECT LABORATORY'S DATA:**

a. Surrogate Recoveries: All surrogate recoveries were within EPA or laboratory established (LE) quality control (QC) limits and are acceptable with the following exceptions. The recoveries of tetrachloro-m-xylene (TCMX), one of two polychlorinated biphenyls (PCBs) surrogates, were above LE QC limits for samples EM1/02-C-09-2, EM1/02-C-13-1 and EM1/02-C-14-2 (ES&E Site Two-Level; III-March 1995 report). The data are acceptable as the recoveries of the primary surrogate, decachlorobiphenyl (DCB), were within the recommended limits. The percent recoveries of the water PCB

surrogate DCB, were below LE QC limits in a method blank and a sample (ES&E Level III, Site Three, March 1995 report). Data are acceptable due to acceptable recoveries of the other PCB surrogate, TCMX.

b. Matrix Spike (MS), Matrix Spike Duplicate (MSD), Continuing Calibration Verification Standards (CCVS) and Laboratory Control Sample (LCS) Recoveries: All MS, MSD, CCVS and LCS recoveries were within EPA or LE QC limits and are acceptable with the following exceptions. The percent recoveries of phenol, 4-chloro-3-methylphenol, 1,2,4-trichlorobenzene and and 2,4-dinitrotoluene in the semi-volatile organic analysis (BNA) LCS and phenol in the MSD for samples EM1/01-W-01-0 and EM1/01-W-02-0,(ES&E Level III, Site One, February 1995 report) were above QC limits. The sample data are acceptable based on acceptable MS and MSD recoveries of the neutral components which were the only analytes detected in the samples. The percent recoveries of the soil BNA spike 2,4-dinitrotoluene, one of five neutral compound spikes, were above QC limits in LCS, MS and MSDs (ES&E Level III-Site Three-March 1995 report and ES&E Level III-Sample Arrival 02-17-95-February 1995 report). Sample data are acceptable based on the acceptable recoveries of the other four neutral compound spikes.The percent recoveries of selenium in a MS and MSD (ES&E Level III-Site One-February 1995 report) and a LCS, MS and MSD (ES&E Level III-Sample Arrival 02-17-95-February 1995 report) were below EPA QC limits. Low levels of selenium might not have beeen detected, if present, in samples EM1/01-W-01-0, EM1/01-W-02-0 (ES&E Level III, Site One, February 1995 report) EM1/03-W-01-0, EM1/03-W-02-0 and EM1/03-W-03-0 (ES&E Level III, Sample Arrival 02-17-95, February 1995 report). The recovery of one of seven compound spikes in a soil PCB MSD was not calculated (ES&E Level III-Sample Arrival 02-17-95-February 1995 report). Data are acceptable based on the other six recoveries in the MSD and and the seven acceptable recoveries in the MS and LCS. The recoveries of the compound spike could not be calculated in soil phthalate esters MS amd MSD as the sample concentration was greater than four times the spike amount (ES&E Level IV-Site One-February 1995 report). No other QC data were reported. The phthalate ester data for sample EM1/01/C-01-2 could not be completely evaluated.

c. Laboratory Duplicates: All relative percent differences (RPD) were within EPA or LE QC limits and are acceptable with the following notation. ES&E did not calculate RPDs from MS/MSDs recoveries for soil volatiles and BNA (Site One, Level III, Feb 95). Calculations using the data resulted in acceptable RPDs.

d. Project Blind Duplicates: Project blind duplicates were not indicated in the sample key of this proect.

e. Laboratory Blanks: All laboratory method blanks were free of targeted analytes with the following exceptions. Methylene chloride at 0.6 ppb, acetone at 2.4 ppb and toluene at 2.9 ppb were found in the volatile organic compounds (VOC) method blank associated with sample EM1/01-W-01-0 (ES&E Level III, Site One, February 1995 report). The toluene detected in this sample, at a level of 7.0 ppb, should be considered due to laboratory contamination. Methylene chloride at 1.8 ppb and acetone at 3.2 ppb were found in the VOC method blank associated with samples EM1/03-W-01-0, EM1/03-W-02-0 and EM1/03-W-03-0 (ES&E Level III, Sample Arrival 02-17-95, February 1995 report). Sample data are acceptable as none of these analytes were detected in any of these samples.

f. Rinsate Blanks: Rinsate blank data are show in Tables I, through III. The presence of Bis (2-ethylhexyl) phthalate in the rinsate EB EM1/01-C-11-0, Table II, indicates that cross contamination occurred during sampling.

g. Holding Times and Detection Limits and Mass Calibration/Tuning : All holding times, detection limits and instrument calibrations met method requirements.

h. Chain of Custody: All Chain of Custody (COC) records met requirements per U.S. Army Corps of Engineers ER-1100-1-263.

i. Overall Evaluation of the Project Laboratory Data: Overall, the project data are accepted except for the following qualifications. . Low levels of selenium might not have beeen detected, if present, in samples EM1/01-W-01-0, EM1/01-W-02-0 (ES&E Level III-Site One-February 1995 report) EM1/03-W-01-0, EM1/03-W-02-0 and EM1/03-W-03-0 (ES&E Level III-Sample Arrival 02-17-95-February 1995 report). The phthalate ester data for sample EM1/01/C-01-2 should be considered questionable based on low MS recovery (ES&E Level IV-Site One-February 1995 report) due to lack of acceptable internal QC results. The toluene detected in sample EM1/01-W-01-0 (ES&E Level III-Site One-February 1995 report), at a level of 7.0 ppb, should be considered due to laboratory contaminationas this analyte was detected in the method blank at a level of 2.9 ppb. The project laboratory did not report MS, MSD, LCS or sample duplicate data for the analysis of PCBs (ES&E reports: Site One-Level III-February 1995, Site Two-Level III-March 1995, Site Two-Level IV-March 1995, Site Three-Level III-March 1995(03-09), Site Three-Level III-March 1995(03-29) and Site Three-Level IV-March 1995). The

PCB sample data of these reports could not be completely evaluated. The project laboratory did not report MS, MSD, LCS or sample duplicate data for the analysis of chlordane leachate data (ES&E reports:, Sample Arrival 02/17/95-Level III-February 1995, Site Three-Level III-March 1995(03-09)). Sample data could not be completetly evaluated.

7. **EVALUATION OF THE QA LABORATORIES' DATA**:

a. CAS, Inc.: All laboratory method blanks were free of targeted analytes. Holding times and detection limits met method requirements. All percent surrogate recoveries of p-terphenyl for phthalate ester were 75-101 and are considered acceptable. The laboratory did not have established limits for this method. The percent recoveries for of the three compound (phthalate ester) spikes in the MS and MSD on sample AEM1/01-C-01-2 (CAS report # K950960) and the LCS were between 132 and 170. The data for the sample could be considered a high estimate. The RPDs calculated for the MS/MSD were below 20 and should be considered acceptable. The phthalate ester data for sample EM1/01/C-01-2 should be considered as a high estimate.

b. CENPD: All laboratory method blanks were free of targeted analytes. Holding times and detection limits met method requirements. All surrogate recoveries were within EPA, or LE QC limits and are acceptable with the following exceptions. The recovery of the Pest/PCB surrogate TCMX was below EPA recommended QC limits of 60-150 in sample QAEM1/02-C-16-1 and the MS and MSD of sample QAEM1/02-C-12-1 (CENPD report # H-95-0056). Whereas the recovery of the primary surrogate DCB was within QC limits, the data are acceptable. MS, MSD, LCS and LCSD recoveries were within EPA, or LE limits and are acceptable with the following exceptions. The recoveries of one of six compound spikes in the MS and MSD of sample QAEM1/02-C-12-1 (CENPD report # H-95-0056) were below acceptable QC limits. The data are acceptable based on the recoveries of the remaining five compound spikes. The RPDs of all laboratory duplicates were within QC limits with the exception that three of six RPDs in a LCS/LCSD were above EPA QC limits. Sample data should be acceptable based on the acceptable RPDs for the MS/MSD sample QAEM1/02-C-12-1 (CENPD report # H-95-0056). Overall, the QA laboratory's data are accepted.

8. **PROJECT AND QA LABORATORIES' DATA COMPARISON**: All data comparisons are shown in Tables III through VIII. All data agree and are comparable with the following exception. The data in Table IV do not agree within a factor of five for Bis(2-ethylhexyl)phthalate. The QA laboratory's data should be considered as a high

estimate. Due to the lack of acceptable project laboratory QC data, the project data is considered questionable.

9. PROBLEMS ENCOUNTERED/CORRECTIVE ACTION TAKEN:

a. No sample control sheets were submitted to CENPD-ET-P-L for determining the presence of project blind duplicates. No action was taken.

b. CAS, one of the QA laboratories, did not have established QC limits for phthalate ester analysis. Recoveries above 130 percent were considered out of control.

c. The project laboratory, ES&E, did not report acceptable QC data for the analysis of phthalate esters (EPA method 8060) and their use of DCB and TCMX as suitable surrogates are questionable. Data for this analysis are considered questionable.

d. The project laboratory, ES&E, did not report QC data for the analysis of PCBs (EPA method 8080). The data are considered questionable.

e. Total metals, volatile organic compounds , semi-volatile organics and chlordane leachate samples were not submitted for analysis by a QA laboratory. The contractor should be reminded that ten percent of the samples should be submitted for analysis by the QA laboratory.

PROJECT RINSATE RESULTS

Table I

Project: Hanford 1100 EM-1 Remediation Matrix: Water
Project Laboratory: ES & E

Method: Polychlorinated Biphenyls (EPA 8080) Units: ug/L (ppb)

Analytes Detected	Project Lab EB-EM1/ 01-C-11-0	Detection Limits
Aroclor 1016	ND	.105
Aroclor 1221	ND	.105
Aroclor 1232	ND	.105
Aroclor 1242	ND	.105
Aroclor 1248	ND	.105
Aroclor 1254	ND	.105
Aroclor 1260	ND	.105

ND = Not detected

SUMMARY: The absence of targeted analytes indicates that proper decontamination procedures were followed during sampling.

PROJECT RINSATE RESULTS

Table II

Project: Hanford 1100 EM-1 Remediation Matrix: Water
Project Laboratory: ES & E

Method: Phthalate Esters (EPA 8060) Units: ug/L (ppb)

Analytes Detected	Project Lab EB EM1/ 01-C-11-0	Detection Limits
Bis(2-ethylhexyl)phthalate	522	0.1

SUMMARY: The presence of Bis(2-ethylhexyl)phthalate in the rinsate indicates that contamination occurred during sampling.

COMPARISON OF PROJECT AND QA RINSATE RESULTS

Table III

Project: Hanford 1100 EM-1 Remediation Matrix: Water
Project Laboratory: ES & E QA Laboratory: CENPD-ET-P-L

Method: Polychlorinated Biphenyls (EPA 8080) Units: ug/L (ppb)

Analytes Detected	Project Lab EB-EM1/ 03-C-11-0	Detection Limits	QA Lab QA-EB-EM1/ 03-C-11-0	Detection Limits
Aroclor 1016	ND	.105	ND	0.96
Aroclor 1221	ND	.105	ND	1.6
Aroclor 1232	ND	.105	ND	0.65
Aroclor 1242	ND	.105	ND	0.61
Aroclor 1248	ND	.105	ND	0.26
Aroclor 1254	ND	.105	ND	0.69
Aroclor 1260	ND	.105	ND	0.24

ND = Not detected

SUMMARY: The absence of targeted analytes in the rinsates indicates that proper decontamination procedures were followed during sampling.

COMPARISON OF PROJECT AND QA RESULTS

Table IV

Project: Hanford 1100 EM-1 Remediation Matrix: Soil
Project Laboratory: ES & E QA Laboratory: CAS, Inc.

Method: Phthalate Esters (EPA 8060) Units: mg/Kg (ppm)

Analytes Detected	Project Lab EM1/ 01-C-01-2	Detection Limits	QA Lab QA-EM1/ 01-C-01-2	Detection Limits
Dimethyl	--		ND	0.5
Diethyl	--		ND	0.5
Di-n-butyl	--		ND	0.5
Butylbenzyl	--		ND	0.5
Bis(2-ethylhexyl)phthalate	10.4	--	66	0.5
Di-n-octyl	--		ND	0.5
Percent Solids	90.4		89.7	

-- = Not reported
ND = Not detected

SUMMARY: The project and QA data do not agree. Due to high surrogate and spike recoveries, the QA data is considered as a high estimate. The accuracy of the project laboratory data could not be verified due to lack of acceptable internal QC data (use of wrong surrogate and lack of internal QC data).

COMPARISON OF PROJECT AND QA RESULTS

Table V

Project: Hanford 1100 EM-1 Remediation Matrix: Soil
Project Laboratory: ES & E QA Laboratory: CENPD-ET-P-L

Method: Polychlorinated Biphenyls (EPA 8080) Units: ug/Kg (ppb)

Analytes Detected	Project Lab EM1/ 03-C-11-4	Detection Limits	QA Lab QA-EM1/ 03-C-11-4	Detection Limits
Aroclor 1016	ND	13.9	ND	89
Aroclor 1221	ND	13.9	ND	323
Aroclor 1232	ND	13.9	ND	79
Aroclor 1242	ND	13.9	ND	111
Aroclor 1248	193	13.9	210	81
Aroclor 1254	ND	13.9	ND	17
Aroclor 1260	ND	13.9	ND	72
Percent Solids	95.6		96	

ND = Not detected

SUMMARY: The project and QA data agree within a factor of two to each other.

COMPARISON OF PROJECT AND QA RESULTS

Table VI

Project: Hanford 1100 EM-1 Remediation Matrix: Soil
Project Laboratory: ES & E QA Laboratory: CENPD-ET-P-L

Method: Polychlorinated Biphenyls (EPA 8080) Units: ug/Kg (ppb)

Analytes Detected	Project Lab EM1/ 03-C-01-3	Detection Limits	QA Lab QA-EM1/ 03-C-01-3	Detection Limits
Aroclor 1016	ND	13.8	ND	90
Aroclor 1221	ND	13.8	ND	327
Aroclor 1232	ND	13.8	ND	80
Aroclor 1242	ND	13.8	ND	112
Aroclor 1248	ND	13.8	ND	82
Aroclor 1254	ND	13.8	ND	17
Aroclor 1260	ND	13.8	ND	73
Percent Solids	96.3		97	

ND = Not detected

SUMMARY: The project and QA data agree.

COMPARISON OF PROJECT AND QA RESULTS

Table VII

Project: Hanford 1100 EM-1 Remediation Matrix: Soil
Project Laboratory: ES & E QA Laboratory: CENPD-ET-P-L

Method: Polychlorinated Biphenyls (EPA 8080) Units: ug/Kg (ppb)

Analytes Detected	Project Lab EM1/ 02-C-12-1	Detection Limits	QA Lab QA-EM1/ 02-C-12-1	Detection Limits
Aroclor 1016	ND	14.7	ND	98
Aroclor 1221	ND	14.7	ND	358
Aroclor 1232	ND	14.7	ND	87
Aroclor 1242	ND	14.7	ND	123
Aroclor 1248	ND	14.7	ND	89
Aroclor 1254	ND	14.7	ND	19
Aroclor 1260	ND	14.7	ND	79
Percent Solids	89.3		89	

ND = Not detected

SUMMARY: The project and QA data agree for all targeted analytes.

COMPARISON OF PROJECT AND QA RESULTS

Table VIII

Project: Hanford 1100 EM-1 Remediation Matrix: Soil
Project Laboratory: ES & E QA Laboratory: CENPD-ET-P-L

Method: Polychlorinated Biphenyls (EPA 8080) Units: ug/Kg (ppb)

Analytes Detected	Project Lab EM1/ 02-C-16-1	Detection Limits	QA Lab QA-EM1/ 02-C-16-1	Detection Limits
Aroclor 1016	ND	14.9	ND	94
Aroclor 1221	ND	14.9	ND	340
Aroclor 1232	ND	14.9	ND	83
Aroclor 1242	ND	14.9	ND	117
Aroclor 1248	ND	14.9	ND	85
Aroclor 1254	ND	14.9	ND	18
Aroclor 1260	ND	14.9	ND	76
Percent Solids	91		91	

ND = Not detected

SUMMARY: The project and QA data agree for all targeted analytes.

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1401 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-0503

CENPD-ET-EN-L (1110-1-8100c) 02 Sep 95

MEMORANDUM FOR: Commander, Walla Walla District, ATTN: CENPW-EN-EE (Greenwald)

SUBJECT: W.O. 95-140, Results of Chemical Analysis-Addendum

Project: HANFORD 1100-EM-1 REMEDIATION
Intended Use: Site Evaluation
Source of Material: Reference Chain of Custody Records
Submitted by: CDM Federal Programs Corporation
Date Sampled: 14, 15, 16 and 17 Feb and 13, 14 and 15 Mar 95
Date Received: 16,17, 18 and 20 Feb and 17 Mar 95
Method of Test or Specification: Reference Enclosure 1
Reference: a) Chemical Quality Assurance Report dated May 17, 1995
b) Revised project reports Site One-Level III- February 1995, Site Two- Level III-March 1995, Site Two-Level IV-March 1995, Site Three and Waste Charcterization-Level-March 1995, Site Three-Level III-March 1995, and Site Three- Level IV-March 1995 from Environmental Science & Engineering, Inc. (ES&E) submitted to your office by the contractor.

1. Enclosed is an addendum for the Chemical Quality Assurance Report for Project 95-0140 dated May 17, 1995. The earlier project reports did not include matrix spike (MS), matrix spike duplicate (MSD), laboratory control sample (LCS) and sample duplicate data for the Polychlorinated Biphenyl (PCB) analyses.

2. Revaluation of the Project Laboratory's (ESE) Polychlorinated Biphenyl Data: The percent recoveries of the two compound spikes in the LCS, MS and MSD and the relative percent difference (RPD) of the MS/MSD were within laboratory established (LE) quality control (QC) limits for the two associated soil samples in report Site One-Level III-February 1995. PCB data for the two soil samples EM1/01-W-01-0 and EM1/01-W-02-0 are acceptable. The percent recovery of PCB-1016 in the MS for reports Site Two-Level III-March 1995 and Site Two-Level IV-March 1995 was 165.5, above LE QC limits of 80-120. The PCB data for the soil samples in these reports are acceptable based on acceptable recoveries of PCB-1016 in the LCS and MSD, acceptable recoveries of PCB-1260 in the LCS, MS and MSD and that PCB-1260 was the only analyte detected in the associated samples. The percent recoveries of the two compound spikes in the LCS, MS and MSD and the RPD of the MS/MSD were within LE QC limits for the nineteen associated soil samples in reports Site Three and Waste Characterization-Level III-March 1995 and Site Three-Level-March 1995. PCB data are acceptable for these samples. The percent recoveries of PCB-1016 in the LCS, MS and MSD for the associated samples in report Site III-Level III-March 1995 were above LE QC limits of 80-120. Based on the acceptable recoveries of PCB-1260 in the LCS, MS and MSD

CENPD-ET-EN-L (1110-1-8100c)
Subject: W.O. 95-140, Results of Chemical Analysis-Addendum

and RPD and that PCB-1260 was the only detected analyte, the PCB data for sample EM1/03-C-22-6 are acceptable. Overall, the PCB data for the samples in the cited reports are acceptable.

3. The addendum has not been forwarded to CDM Federal Program Corporation, Richland, Washington.

4. If you have any questions or comments regarding the this addendum, please contact Dr. Ajmal M. Ilias at (503) 669-0246

5. This completes all work requested for this project.

Enclosures

TIMOTHY J. SEEMAN
Director

Copy Furnished: CENPD-ET-EN
CEMRD-ED-EC
CEMP-RT

APPENDIX E

TIRE SURVEY RADIOLOGICAL DATA

Author: David L Stanton at :PA1
Date: 1/10/95 10:22 AM
Priority: Normal
Subject: radon survey HRL tires

---------- Message Contents ----------

On Jan 10, 1995, a survey of approximately 200 tires was performed. The survey was performed to detect the presence of radioactive materials, specifically Radon and it's progeny. The survey was required for off-site disposal of the tires.

No detectable activity was observed.

Survey was performed using an Eberline BNW-1-1 with a pancake probe. The calibration due date was 2-11-95. A self check was performed prior and after the survey. The check source read 2000 CPM.

Survey was performed by the undersigned.

David L. Stanton
Health Physicist

Author: Michael B Remir n at ~TPA1
Date: 1/5/95 1:30 PM
Priority: Normal
Subject: Radiation Screen, Horn Rapids Landfill

---------- Message Contents ----------

At 1130 hrs on 1/5/95 a preliminary screening check was performed on the tire pit at the Horn Rapids Landfill. Background readings levels for Alpha radiation taken on soil and sand samples in the vicinity of the pit ranged from 50-100 counts per minute. All measurements taken on the tires were well below the soil background readings. The tires averaged from 10-60 cpm. The contractor is cleared to remove the tires from the pit and dispose of them in accordance with the work plan.

The test instrument was a Radiacmeter IM-263/PDR-77 (SN. PQT002) equipped with an alpha probe (Radiac DT-669/PDR-77 SN. PTQ-002. The instrument was source checked before and after use and measured within the appropriate source range of 7,000-14,000 cpm.

Michael B. Remington

Note - Will work with worker TK.
Make prep's to ship out.
01/06/95

APPENDIX F

HORN RAPIDS LANDFILL GROUNDWATER-MONITORING WELL LOGS

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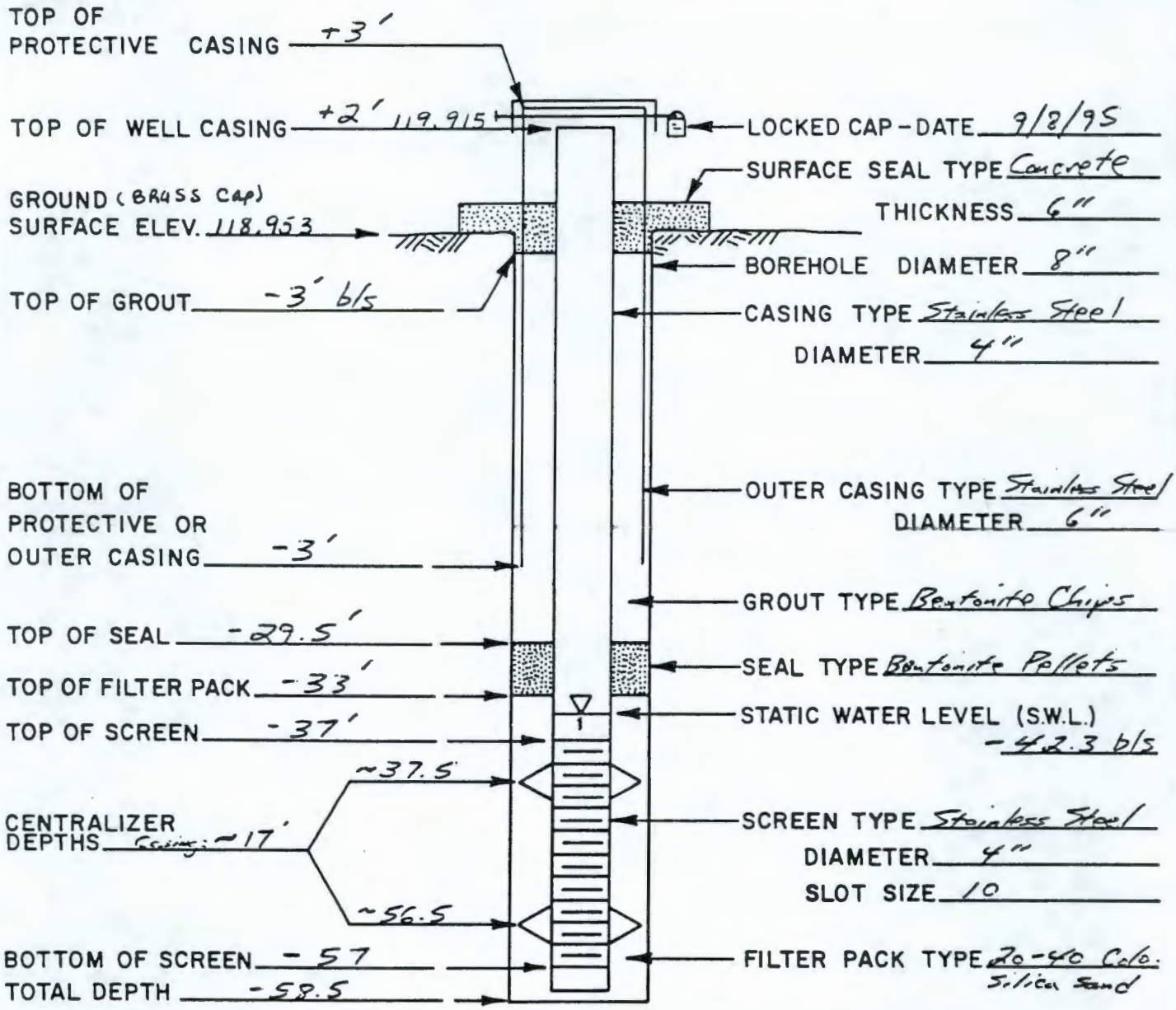
WELL COMPLETION RECORD

PROJECT Horn Rapids Landfill - MW Installation LOCATION Richland, WA.

WELL NUMBER COE-MW1 DATE INSTALLED 9/5/95

MKE REPRESENTATIVE Dario Whitney DRILLER Staco - Robert Stadell



COMMENTS Water level on 9/13/95 = 43.22' b/s
Bottom of sampling pump = 53.5' b/s

MKE REPRESENTATIVE SIGNATURE [signature] DATE 9/8/95

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

Hole No.

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 2 SHEETS

1. PROJECT: Horn Rapids Landfill - MW Installation
2. LOCATION (Coordinates or Station): COE-1 - Richland WA.
3. DRILLING AGENCY: Sparo Well Services
4. HOLE NO. (As shown on drawing title and file number): COE-1.
5. NAME OF DRILLER: Robert Stadeli
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: None
8. DEPTH DRILLED INTO ROCK: None
9. TOTAL DEPTH OF HOLE: 58.5'
10. SIZE AND TYPE OF BIT: Down Hole Hammer
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL: Barber: Dual Rotary - Air
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED None; UNDISTURBED None
14. TOTAL NUMBER CORE BOXES: None
15. ELEVATION GROUND WATER: (42.3' b.l.s)
16. DATE HOLE: STARTED 9/5/95; COMPLETED 9/5/95
17. ELEVATION TOP OF ~~HOLE~~ (casing) 119.915
18. TOTAL CORE RECOVERY FOR BORING: NA %
19. SIGNATURE OF INSPECTOR: COORDINATES N: 113990 E: 594747.815

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Sand, yellowish brown (10YR 5/4) fn-md grained, rounded to subrd.			
	5		Sandy Gravel, pale brn (10YR 6/3) Sand, fn-md gr., subang to subrd; gravel, fn, subang. to subrd, ≈ 60% basalt, 40% granite/qtz.			
			Sand, v.dk. gray (5Y 3/1), coarse gr. angular to subangular			
	10		Sandy Gravel, dk. gray (5Y 4/1), sand, fn-md gr. subrounded; gravel, fn-coarse, well rounded to subrd, ≈ 60% basalt, 40% granite/qtz.			
			Gravel, dk. gray (5Y 4/1) coarse, rounded, mostly basalt			
	15		Sandy Gravel, v. dk. gray (5Y 3/1) sand, fn-cs gr., subang.-subrded; gravel, fn, subang. to rounded, 90% basalt.			
	20		-from 20'-2 fn-cs			
			-col. gra			
	25					
	45		50			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS. (TRANSLUCENT)

Hole No.

DRILLING LOG	DIVISION	INSTALLATION	SHEET 2 OF 2 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
12. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) COE-1	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED: — UNDISTURBED:
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	16. DATE HOLE — STARTED 9/5/95 — COMPLETED 9/5/95
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 58.5	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			color change @ 52' → pale brown (10YR6/3)			
	55					
			Silty clay, lt. olive brn (2.5Y5/3) med. plasticity.			
	60					

ENG FORM 1836 MAR 71 PREVIOUS EDITION (TRANSLUCE

WELL COMPLETION RECORD

PROJECT Horn Rapids Landfill-MW Installation LOCATION Richland, WA

WELL NUMBER COE-MW2 DATE INSTALLED 9/6/95

MKE REPRESENTATIVE Daniel Whitney DRILLER Stoco - Robert Stadeli

TOP OF PROTECTIVE CASING +3'

TOP OF WELL CASING +2' a/s (119.A5)

GROUND (BRASS CAP) SURFACE ELEV. 118.920

TOP OF GROUT -3' b/s

BOTTOM OF PROTECTIVE OR OUTER CASING -3'

TOP OF SEAL -30.5'

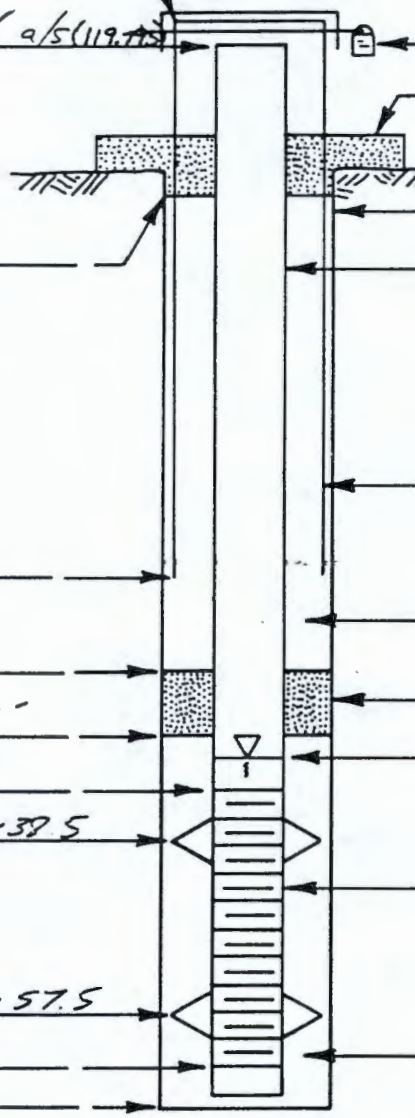
TOP OF FILTER PACK -34.5'

TOP OF SCREEN -38.0'

CENTRALIZER DEPTHS (Casing ~18') ~38.5, ~57.5

BOTTOM OF SCREEN -58

TOTAL DEPTH -59



LOCKED CAP - DATE 9/8/95

SURFACE SEAL TYPE Concrete

THICKNESS 6"

BOREHOLE DIAMETER 8"

CASING TYPE Stainless Steel

DIAMETER 4"

OUTER CASING TYPE Stainless Steel

DIAMETER 6"

GROUT TYPE Bentonite Chips

SEAL TYPE Bentonite Pellets

STATIC WATER LEVEL (S.W.L.) ~43.5'

SCREEN TYPE Stainless Steel

DIAMETER 4"

SLOT SIZE 10

FILTER PACK TYPE 20-40 Colo. Silica Sand

COMMENTS Static level on 9/13/95 = 42.18' b/s
Bottom of sampling pump = 54.5' b/s

MKE REPRESENTATIVE SIGNATURE [signature] DATE 9/8/95

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

Hole No.

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT: Horn Rapids Landfill - Monitoring Well Instal.
2. LOCATION (Coordinates or Station): COE-2 - Richland, WA
3. DRILLING AGENCY: Staco Well Services
4. HOLE NO. (As shown on drawing title and file number): COE-2
5. NAME OF DRILLER: Robert Stadeli
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: None
8. DEPTH DRILLED INTO ROCK: None (Unconsolidated)
9. TOTAL DEPTH OF HOLE: 59.0 feet
10. SIZE AND TYPE OF BIT: DOWN HOLE HAMMER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL: Barber; Dual Rotary-Air
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: None; UNDISTURBED: None
14. TOTAL NUMBER CORE BOXES: None
15. ELEVATION GROUND WATER: (≈ 43.5' b/s)
16. DATE HOLE: STARTED 9/6/95; COMPLETED 9/6/95
17. ELEVATION TOP OF ~~HOLE~~ Casing: 119.795
18. TOTAL CORE RECOVERY FOR BORING: NA %
19. SIGNATURE OF INSPECTOR: coordinates N: 114965 E: 594070.903

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Sand, brown (7.5YR 5/3), fn-md grained, subrounded to rounded.			
	10		Sandy Gravel, dk. gray (10YR 4/1) sand, md-cs gr., subangular to subrounded; gravel, coarse, sub angular to subrounded, 90% basalt & 10% granite/qtz.			
			-@ 11 ft. gravel ⇒ fn-coarse			
	20		-@ 12 ft. gravel ⇒ 60% basalt, 40% granite/qtz, gray (10YR 5/1)			
			-@ 14 ft gravel ⇒ coarse, mainly basalt, dk gray (10YR 4/1)			
	30		@ 21-21.5 ft, sand lens, dk gray, md-cs gr, subrd to subang.			
			Sandy Gravel, lt olive gray (5Y 6/2) sand, fn-cs gr., subang-subrd, gravel, fn-cs, subrounded, 60% basalt, 40% granite qtz.			
	40		@ 30', gravel ⇒ 90% gran/qtz, 10% basalt			
			-@ 34', color change ⇒ lt olive brn (2.5Y 5/3)			
			-@ 37-39			
	50		@			
	60					

PREVIOUS EL (TRANSM)

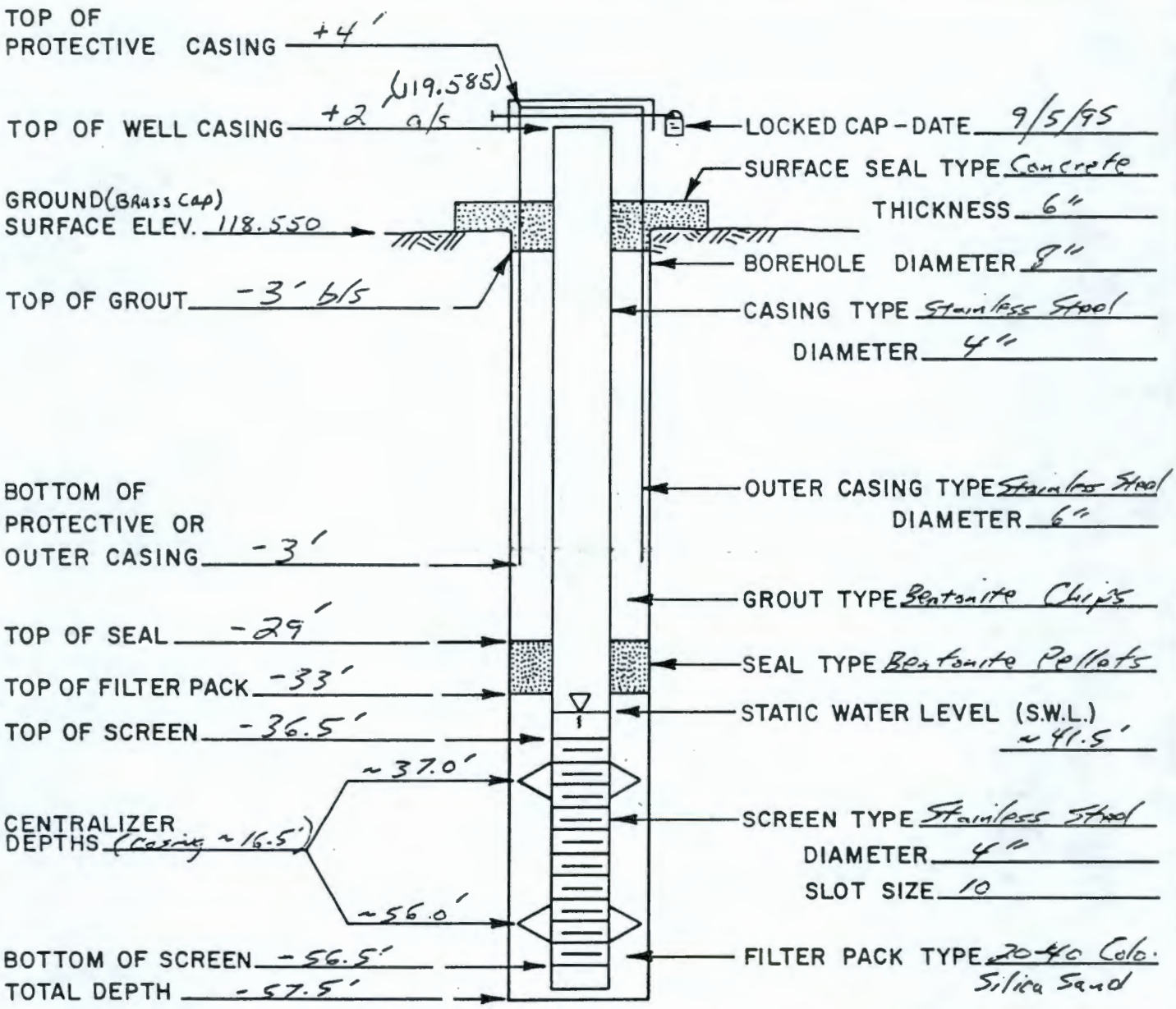
ENG FORM 1836 MAR 71

WELL COMPLETION RECORD

PROJECT Horn Rapids Landfill - MW Install. LOCATION Richland, WA

WELL NUMBER COE-MW3 DATE INSTALLED 8/28/95

MKE REPRESENTATIVE Daniel Whitney DRILLER Stare - Robert Stadeli



COMMENTS Water level on 9/13/95 = 41.64' b/s
Bottom of Sampling Pump = 53.5' b/s

MKE REPRESENTATIVE SIGNATURE [signature] DATE 9/5/95

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT: Horn Rapids Landfill - Monitoring Well Install.
2. LOCATION (Coordinates or Station): COE - MW3
3. DRILLING AGENCY: Stone Drilling Company
4. HOLE NO. (As shown on drawing title and file number): COE-3
5. NAME OF DRILLER: Robert Stadeli
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 0
8. DEPTH DRILLED INTO ROCK: None - Unconsolidated
9. TOTAL DEPTH OF HOLE: 57.5 feet
10. SIZE AND TYPE OF BIT: Down hole hammer
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL: Barber - Air Dual Rotary
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED NA; UNDISTURBED NA
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER: (41.5 'bls)
16. DATE HOLE: STARTED 8/25/95; COMPLETED 8/28/95
17. ELEVATION TOP OF ~~HOLE~~ Casing: 119.585
18. TOTAL CORE RECOVERY FOR BORING: NA %
19. SIGNATURE OF INSPECTOR: Coordinates N: 115177.897 E: 593422.805

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Sand, brown (7.5YR 5/3), v. fn.-md. gr., subrounded to rounded			
	5		Sand, Gravel, pale brown (10YR 6/3) fn-md. gr. sand, angular to subrounded; fn gravel, angular to rounded, ~60% basalt, ~40% quartz.			
	10		Small pebbles, rounded at ≈7'			
			Boulders from 8-10 feet.			
	15		Silty Sand, pale brn. (10YR 6/3)			
			Sandy Gravel, dark gray (10YR 4/1), v. fn - coarse sand, ang. to subrounded, fn. gravel, ang. to rounded, mostly basalt, some granite/quartz.			
	20					
	25		- Basalt boulders at 16 feet.			
	30		- Gravel becomes ≈50% granite & ≈50% basalt from 32-38 feet.			
	35					
	40		= less sand from 44-46 feet.			
	45		- sand			
	50					
	55					

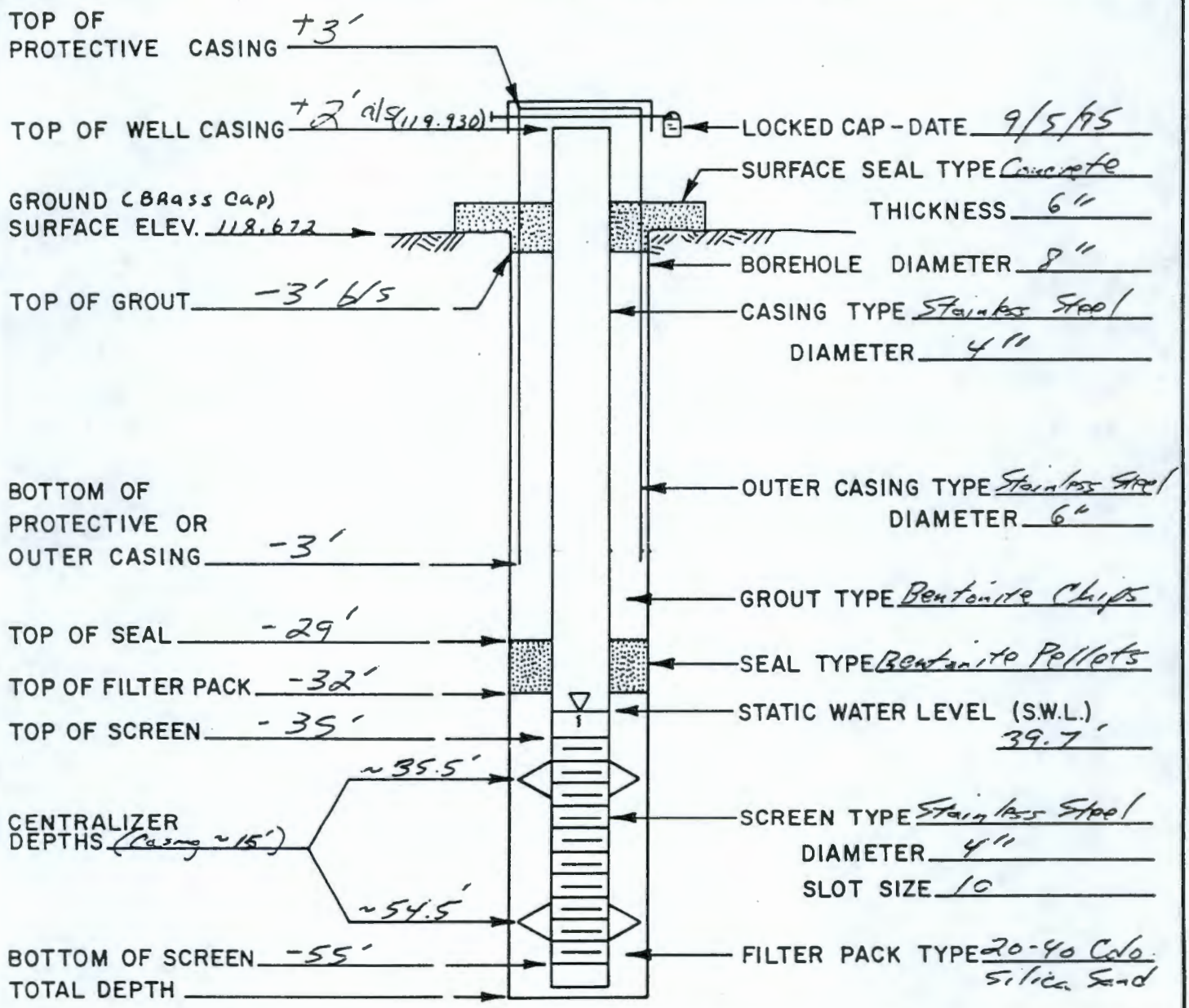
ENG FORM 1836 MAR 71 PREVIOUS EDITIONS (TRANS)

WELL COMPLETION RECORD

PROJECT Horn Rapids Landfill - MW Install. LOCATION Richland, WA.

WELL NUMBER COE - MW4 DATE INSTALLED

MKE REPRESENTATIVE Daniel Whitney DRILLER Stoco - Robert Stadeli



COMMENTS Water level on 9/13/95 = 39.62' b/s
Bottom of sampling pump = 52.5' b/s

MKE REPRESENTATIVE SIGNATURE [signature] DATE 9/5/95

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

DRILLING LOG

DIVISION	
INSTALLATION	
SHEET 1 OF 2 SHEETS	
1. PROJECT	Horn Rapids Landfill - Monitoring Well Install.
2. LOCATION (Coordinates or Station)	COE-MW4
3. DRILLING AGENCY	Staco Drilling Company
4. HOLE NO. (As shown on drawing title and file number)	COE-4
5. NAME OF DRILLER	Robert Stadeli
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	0
8. DEPTH DRILLED INTO ROCK	None - Unconsolidated
9. TOTAL DEPTH OF HOLE	58 feet
10. SIZE AND TYPE OF BIT	Tri-cone
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL	Barber - Air Dual Rotary
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED: NA; UNDISTURBED: NA
14. TOTAL NUMBER CORE BOXES	none
15. ELEVATION GROUND WATER	(39.7' b/s)
16. DATE HOLE	STARTED 8/22/95; COMPLETED 8/23/95
17. ELEVATION TOP OF ~~HOLE~~	Casing : 119.930
18. TOTAL CORE RECOVERY FOR BORING	NA %
19. SIGNATURE OF INSPECTOR	
	Coordinates N: 114436.963 E: 593389.751

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Sand, yellowish brown (10YR 5/4), fn-med gr. subrounded to rounded.			
	5		Sandy Gravel w/ small % of silt, pale brown (10YR 6/3); fn-med gr. sand, subrounded; fn gravel - v. angular to subrounded, mostly basalt, some granite/quartz.			
	10		sand becomes med-coarse gr from 12-14'			
	15		Gravel, fine, v. dk gray (5Y 3/1) subrounded to rounded, mostly basalt, some granite.			
			- 90% basalt gravel from 16-18'.			
	20		- basalt boulder at 18.5'			
			- 100% granite gravel from 19'-21'			
			- color change from 22'-31.5': pale			
	25					
	50					

ENG FORM 1836 PREVIO
MAR 71

HOLE NO.

DRILLING LOG	DIVISION	INSTALLATION	SHEET 2 OF 2 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) CoE-MW4	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	16. DATE HOLE — STARTED 8/22/95 — COMPLETED 8/23/95
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	50		Sand, lt. olive gray (5Y6/2), med-coarse gr. angular, very micaceous.			
			Gravel, coarse, very well rounded, some very coarse pebbles, rounded.			
	55		Sandy Gravel, (10YR6/3) - same as above w/ very micaceous sand.			
	60					

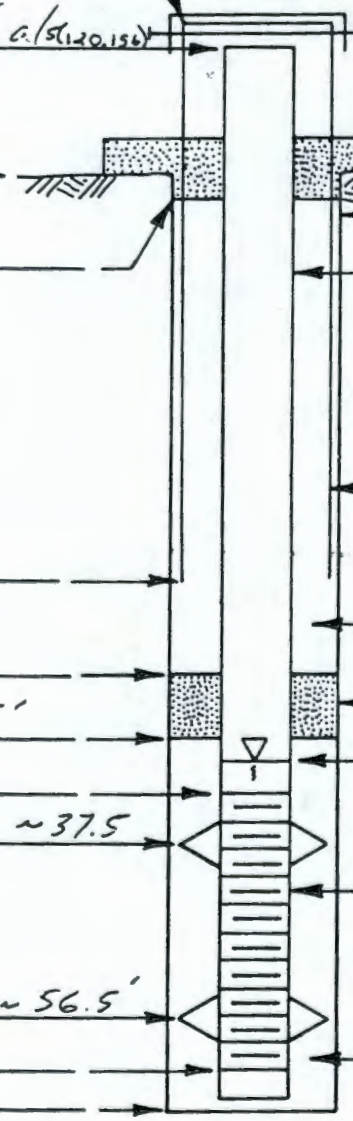
ENG FORM 1836 MAR 71 PREVIOUS (TRA

WELL COMPLETION RECORD

PROJECT Horn Rapids Landfill - MW Installation LOCATION Horn Rapids Landfill - Richland, WA

WELL NUMBER COE - MW5 DATE INSTALLED 8/29/95

MKE REPRESENTATIVE Daniel Whitney DRILLER Robert Stadeli - Stacy Drill Co.



TOP OF PROTECTIVE CASING +3' a/s

TOP OF WELL CASING +2' a/s (120.156)

GROUND (BRASS CAP) SURFACE ELEV. 119.109

TOP OF GROUT -3' b/s

BOTTOM OF PROTECTIVE OR OUTER CASING -3'

TOP OF SEAL -30'

TOP OF FILTER PACK -33.5'

TOP OF SCREEN -37'

CENTRALIZER DEPTHS ~37.5 ~56.5' (Casing 17')

BOTTOM OF SCREEN -57'

TOTAL DEPTH -58.5'

LOCKED CAP - DATE 9/5/95

SURFACE SEAL TYPE Concrete

THICKNESS 6"

BOREHOLE DIAMETER 8"

CASING TYPE Stainless Steel

DIAMETER 4"

OUTER CASING TYPE Stainless Steel

DIAMETER 6"

GROUT TYPE Bentonite Chips

SEAL TYPE Bentonite Pellets

STATIC WATER LEVEL (S.W.L.) ~42'

SCREEN TYPE Stainless Steel

DIAMETER 4"

SLOT SIZE 10

FILTER PACK TYPE 20-40 Colo. Silica Sand

COMMENTS Water Level on 9/13/95 = 39.85' b/s
Bottom of sampling pump = 53.5' b/s

MKE REPRESENTATIVE SIGNATURE [signature] DATE 8/30/95

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

DRILLING LOG

DIVISION	
INSTALLATION	
SHEET	1 OF 1 SHEETS
1. PROJECT	Horn Rapids Landfill - Monitoring Well Install
2. LOCATION (Coordinates or Station)	COE-MW5
3. DRILLING AGENCY	Staro Drilling Company
4. HOLE NO. (As shown on drawing title and file number)	COE-5
5. NAME OF DRILLER	Robert Stadeli
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	—
8. DEPTH DRILLED INTO ROCK	None - Unconsolidated
9. TOTAL DEPTH OF HOLE	59.5'
10. SIZE AND TYPE OF BIT	Down hole hammer
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL	Barber - Air Dual Rotary
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED: NA / UNDISTURBED: NA
14. TOTAL NUMBER CORE BOXES	None
15. ELEVATION GROUND WATER	(42' bls)
16. DATE HOLE	STARTED: 8/29/95 / COMPLETED: 1/27/95
17. ELEVATION TOP OF ~~HOLE~~	Casing: 120.156
18. TOTAL CORE RECOVERY FOR BORING	NA %
19. SIGNATURE OF INSPECTOR	Coordinates: N: 114771.440 E: 592989.866

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Sand, yellowish brown (10YR 5/4), fn-md. gr. subrounded.			
	5		Sandy Gravel, pale brown (10YR 6/3) fn-md. gr. sand, angular to sub. rnd. gravel, angular to rounded, 50% granite, qtz & 50% basalt.			
	10		- color change: v. dk gray (5Y 3/1) from 6-9'; ≈ 80% basalt			
	15		- color change: grayish brown (10YR 5/2) from 9-19'; 60% basalt, 40% granite; sand → md. to coarse gr., ang. to subrounded			
	20		Sand, v. dk. gray (5Y 3/1), md. to coarse gr., ang to subrounded.			
	25		Sandy gravel, v. dk. gray (5Y 3/1), coarse gr. sand, ang to subrounded fn. gravel, subrounded, mostly basalt.			
	30		- boulders @ ≈ 23 & 25 feet.			
	35		- color change: pale brown (10YR 6/3) from 32-56'. sand → fn. to coarse gr. gravel → 90% granite/qtz			
	40		- pebbles - [illegible] to rounded,			
	45					
	50					
	55					

ENG FORM 1836 MAR 71 PREV.

SECTION 3

SUMMARY OF REMEDIAL ACTIVITIES FOR THE 1100-EM-2 AND 1100-EM-3 OPERABLE UNITS, HANFORD, WASHINGTON

3.0 SUMMARY OF REMEDIAL ACTIVITIES FOR THE 1100-EM-2 AND 1100-EM-3 OPERABLE UNITS, HANFORD, WASHINGTON

SUMMARY OF REMEDIAL ACTIVITIES FOR THE 1100-EM-2 AND 1100-EM-3 OPERABLE UNITS HANFORD, WASHINGTON

CONTRACT NO. DACW68-94-D-0001

DELIVERY ORDER NO. 019

September 26, 1995

Prepared by:

CDM FEDERAL PROGRAMS CORPORATION
1010 Jadwin Avenue
Richland, Washington 99352

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
Walla Walla District
201 North 3rd Street
Walla Walla, Washington 99362

SUMMARY OF REMEDIAL ACTIVITIES FOR THE
1100-EM-2 AND 1100-EM-3 OPERABLE UNITS
HANFORD, WASHINGTON

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RoseMary Ellersick	1
George DeLullo	1
Golden Project File	1
Richland Project File	1

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Underground Storage Tank Decommissioning Report, Building 1262 Solvent Tanks, Hanford 1100 Area, Richland, Washington

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LIST OF ABBREVIATIONS AND ACRONYMS

BEHP	Bis(2-ethylhexyl)phthalate
CDM Federal	CDM Federal Programs Corporation
CLP	Contract Laboratory Program
COPC	Contaminant of Potential Concern
CWM	Chemical Waste Management
DOE	U.S. Department of Energy
DQOs	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
HEIS	Hanford Environmental Information System
HTRW	Hazardous, Toxic, and Radiological Waste
LFI/FFS	Limited Field Investigation/Focused Feasibility Study
mg/kg	milligrams per kilogram
MTCA	Washington Model Toxics Control Act
NPD	North Pacific Division
NPL	National Priorities List
OU	Operable Unit
PCB	Polychlorinated Biphenyl
QAPjP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QAR	Quality Assurance Report
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SOW	Statement of Work
SVOCs	Semi-volatile Organic Compounds
TCLP	Toxicity Characteristic Leaching Procedure
USTs	Underground Storage Tanks
USACE	U.S. Army Corps of Engineers Walla Walla District

VOCs	Volatile Organic Compounds
μg/L	micrograms per Liter
WMU	Waste Management Unit
WTPH	Washington Total Petroleum Hydrocarbons

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1.0 INTRODUCTION

CDM Federal Programs Corporation (CDM Federal) has prepared this Summary Report for the U.S. Army Corps of Engineers, Walla Walla District (USACE) under Contract No. DACW68-94-D-0001. The report describes the removal and stockpiling of contaminated soil and removal of underground storage tanks at the Hanford 1100 Area, EM-2/EM-3 Operable Units (1100-EM-2/EM-3), Hanford Reservation, Richland, Washington. Activities described in this Summary Report were conducted as part of the remedial action for the 1100-EM-2/EM-3 portion of the 1100 Area National Priorities List (NPL) Site. This work was conducted in accordance with the USACE Statement of Work (SOW) dated April 5, 1995, and subsequent modifications.

1.1 OBJECTIVES

The objectives of the tasks described in this Summary Report were to excavate and stockpile, for offsite treatment and/or disposal, soils contaminated with hazardous materials that have been shown to present potential long-term risks to human health. The objectives also included removing two underground storage tanks (USTs) no longer in service. The soil remediation objectives were accomplished through the excavation of suspected contaminated soils and segregation of confirmed contaminated materials. Sampling and analyses were performed to determine the amount of excavation necessary and to verify the concentration of contaminants in remaining soils with respect to the remediation criteria. The contents of the USTs were sampled, followed by removal of the tanks from the ground and disposal at a recycling facility.

1.2 SCOPE

The scope of this project included the removal and stockpiling of soils from areas of one EM-2 site and two EM-3 sites where previous investigations (USACE 1994a) have demonstrated the presence of contaminants exceeding remediation criteria. These three sites are the Tar Flow Area, the 1240 Suspect Spill Area, and the 1240 French Drain. The scope also included the sampling and removal of the two EM-3 USTs, designated as the 1262 Solvent Tanks. Contaminated soils were stockpiled on and covered with plastic sheeting pending transportation and disposal by others. Determination of the concentration of contaminants in soils excavated from the Tar Flow Area, the 1240 Suspect Spill Area, and the 1240 French Drain sites was made using onsite laboratory capabilities and confirmed by offsite laboratory analyses. Determination of the concentration of contaminants in soils excavated from the 1262 Solvent Tanks was made using only offsite laboratory analyses.

1.3 REPORT ORGANIZATION

This Summary Report is organized into seven sections. Introduction and site background are presented in Section 1.0. Previous investigation results are summarized in Section 2.0. Methods

used for remediation of the 1100-EM-2/EM-3 sites are discussed in Section 3.0. A summary of the results of remediation of the three sites is provided in Section 4.0. Section 5.0 details Quality Assurance/Quality Control (QA/QC) protocols implemented, and provides an assessment of data usability. A brief statement of conclusions is included as Section 6.0 of the report. Section 7.0 is a listing of references cited. Appendix A contains the 1262 Solvent Tanks report.

Appended to this Summary Report is a summary of the analytical data generated by the onsite laboratory during the site remediation activities (Appendix B). Offsite laboratory analytical data are presented in table form within the main portion of the report, except for offsite data from the 1262 Solvent Tanks and waste characterization sample results. Data for the offsite analytical results for the 1262 Solvent Tanks are provided in Appendix A and data for the waste characterization samples are provided in summary form in Appendix C. Full analytical data sets as reported by the offsite laboratory have been provided to USACE and will be entered on the Hanford Environmental Information System (HEIS). All sample tables presenting the results of offsite analyses include HEIS numbers for each sample to allow cross-reference. Appendix D presents the data set used in the application of cleanup attainment criteria. The USACE North Pacific Division Laboratory (NPD) Quality Assurance Report (QAR) is included as Appendix E.

2.0 BACKGROUND

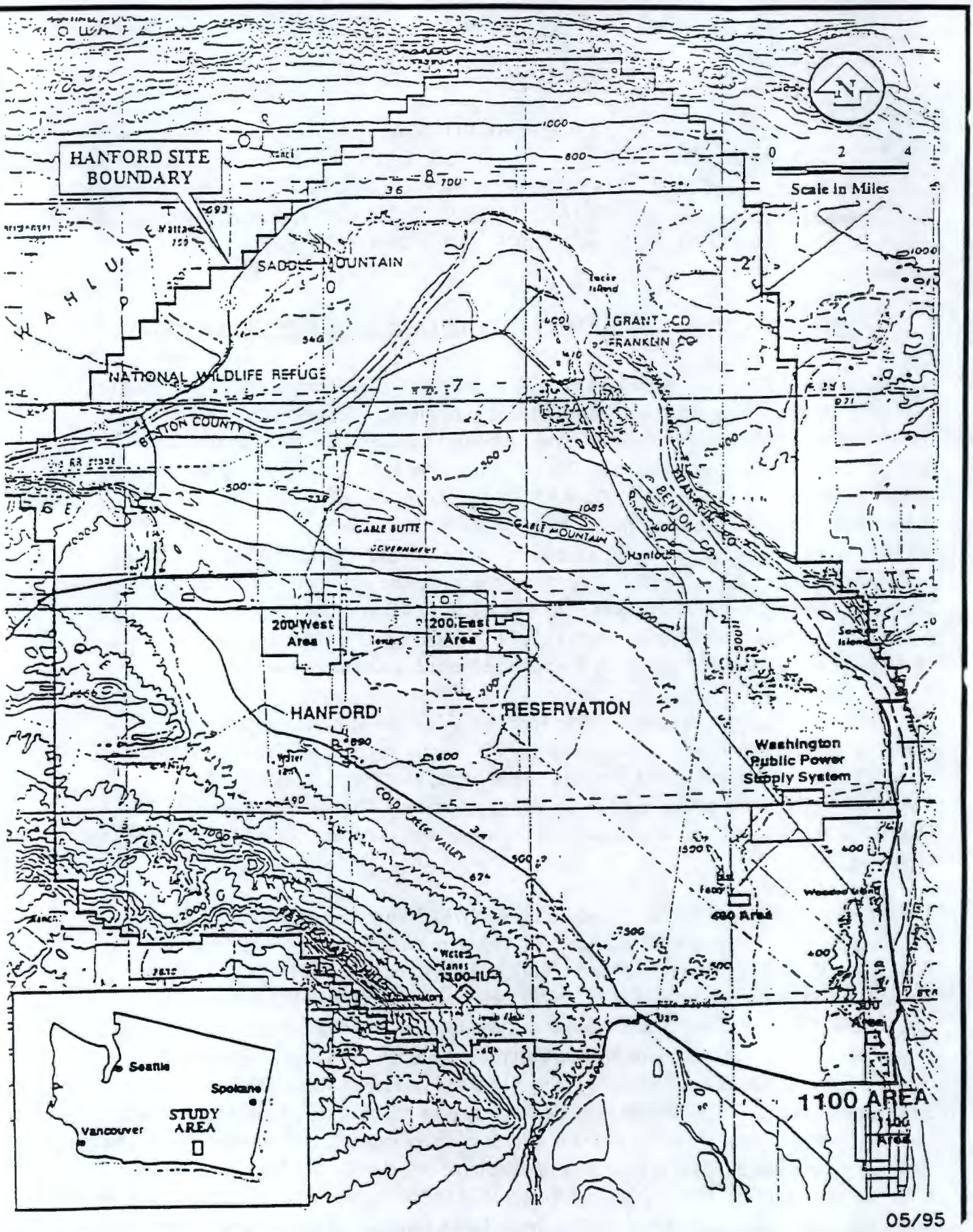
A detailed background of the Hanford 1100 Area is presented in the Remedial Investigation/Feasibility Study (RI/FS) Report (DOE 1992), and in the Remediation Design and Remedial Action Plan for the 1100 Area (USACE 1994b). This section provides a brief summary of site history and setting.

2.1 LOCATION AND DESCRIPTION OF THE EM-2/EM-3 OPERABLE UNITS

The Hanford 1100 Area was placed on the NPL in July 1989. The location of the Hanford Site and the 1100 Area are depicted on Figure 2-1. To facilitate the assessment and remediation of 1100 Area, potential hazardous waste sites were divided into four OUs based on geographic area and common waste sources. The four OUs are identified as 1100-EM-1 (EM-1), 1100-EM-2 (EM-2), 1100-EM-3 (EM-3), and 1100-IU-1 (IU-1). Due to the close proximity of the 1100-EM-1 to the North Richland well field, which constitutes the water supply for the town of Richland, EM-1 was assigned the highest priority of the Hanford 1100 Area OUs. The 1100-EM-1 underwent a full-scale RI/FS to determine the nature and extent of contamination and to identify preferred remedial alternatives. The EM-2/EM-3 OUs underwent a limited field investigation and focused feasibility study (LFI/FFS) (DOE 1993) to determine the nature and extent of contamination and to identify the preferred remedial alternatives at those sites.

The EM-2 OU encompasses an area on the southeast side of the Hanford Site and north of the town of Richland. Operable Unit EM-3 is about 600 meters (m) or 1,000 feet (ft), northeast of EM-2. The main structure of EM-2 is the 1171 Building, which is a vehicle service, maintenance, and repair facility. EM-3 contains approximately 20 permanent structures. Operations at EM-2 and EM-3 have included the use of solvents, fuels, oils, and polychlorinated biphenyls (PCBs).

Based on the LFI/FFS, 43 waste management units (WMUs) were considered to be likely or potential sites of releases or spills and seven WMUs were identified as sites of known releases or spills at the 1100-IU-1, 1100-EM-2, and 1100-EM-3 OUs. Additional post ROD and pre-remedial action investigations (USACE 1994a) were conducted at the 1100-EM-2 and 1100-EM-3 OUs. The purpose of these investigations was to determine if contaminant concentrations present at the WMUs exceeded the cleanup criteria in the ROD. As a result of these pre-remedial action investigations, one area within EM-2 and two areas within EM-3 were determined to contain contaminants at levels that may pose potential long-term risks to human health. The area of concern within EM-2 is an area of discolored soil, the Tar Flow Area. The areas of concern within EM-3 are one area of discolored soil, the Suspect Spill Area, and the 1240 French Drain, which is adjacent to a former PCB collection area. At a third EM-3 site, two abandoned USTs, designated as the 1262 Solvent Tanks, were identified as requiring removal. The location of the EM-2 and EM-3 areas are depicted in Figures 2-2 and 2-3, respectively.



LOCATION OF THE HANFORD SITE AND THE 1100 AREA (MODIFIED FROM USACE 1994a)

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

FIGURE No. 2-1

Explanation

- Gravel Road
- Electrical Power Lines
- Railroad Tracks

N

0 106 212

METERS

TOPOGRAPHIC BASE: Digitized 1992 USACE Hanford Flyover Data.

05/95

LOCATION OF THE TAR FLOW AREA AT THE EM-2 OPERABLE UNIT (MODIFIED FROM USACE 1994a)

CDM FEDERAL PROGRAMS CORPORATION
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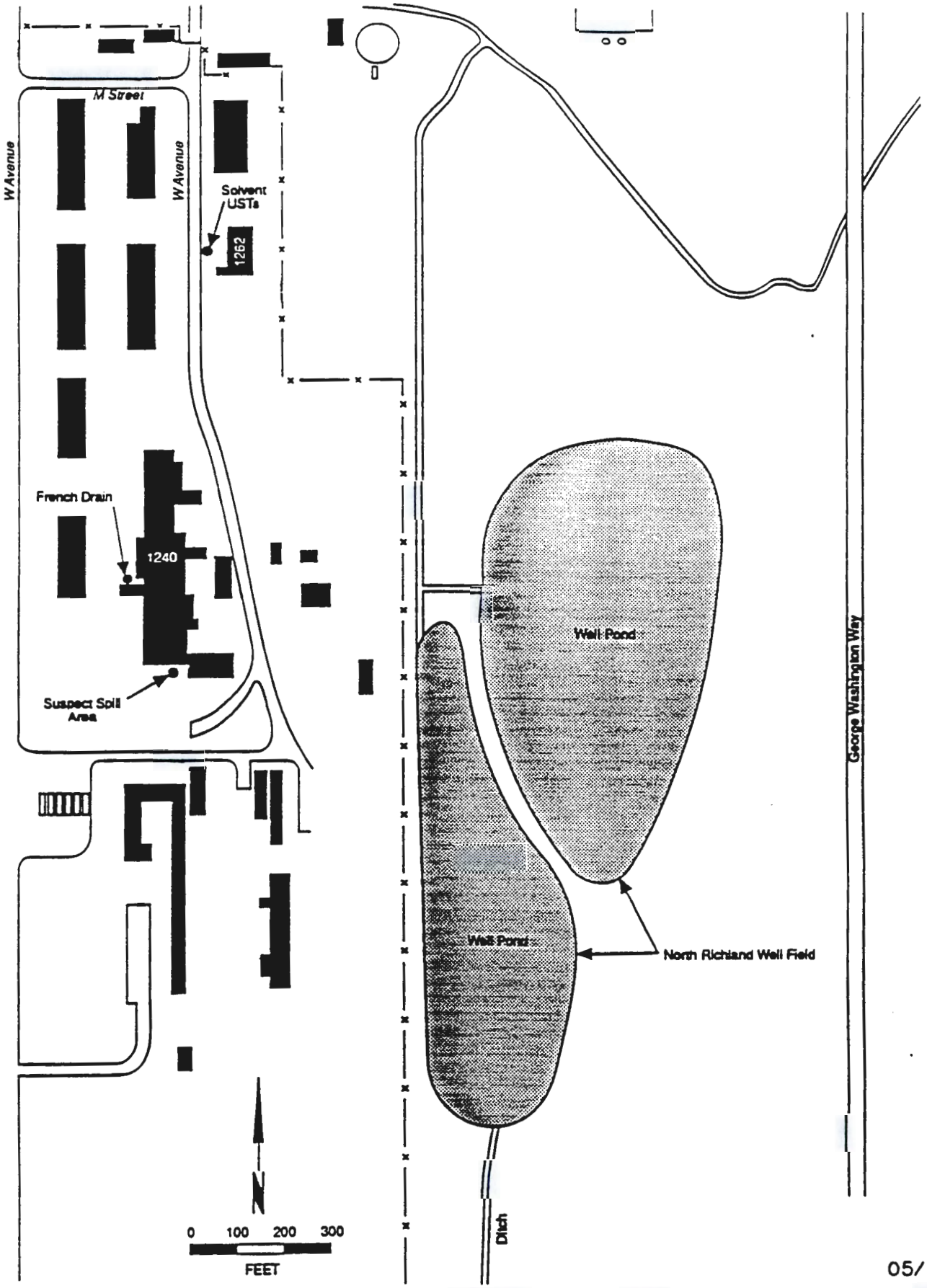
FIGURE No. 2-2



05/.

LOCATION OF THE 1240 FRENCH DRAIN
1240 SUSPECT SPILL AREA, AND 1262 SOLVENT
TANKS AT THE 1100 EM-3 OPERABLE UNIT
(MODIFIED FROM USACE 1994a)

CDM FEDERAL PROGRAMS CORPORATION
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FIGURE No. 2-3

2.2 SUMMARY OF PREVIOUS INVESTIGATIONS

Data from previous investigations were used to identify areas of contaminated soils requiring excavation. The 1100-EM-2/EM-3 OU RI/FS Report (USACE 1994a) served as the source for the information presented in this section and provides a more detailed description of the methods and results of the investigations. The investigation results for the four sites are presented separately.

2.2.1 TAR FLOW AREA

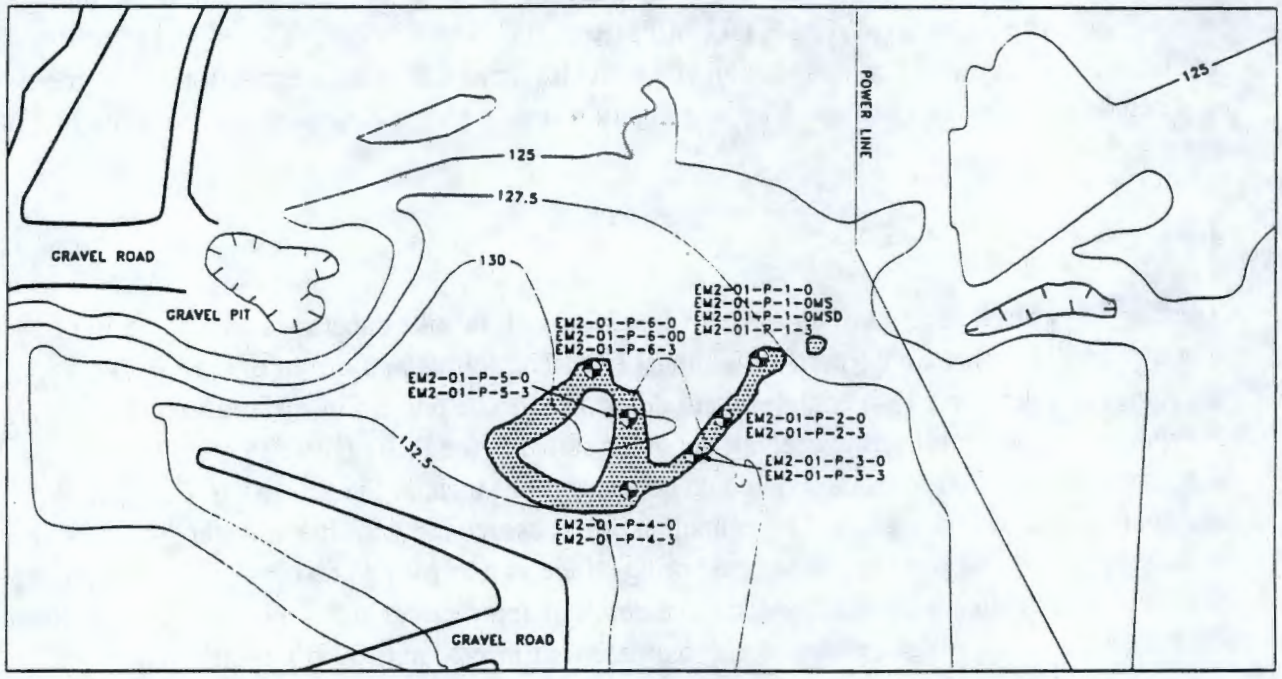
The Tar Flow Area consists of an area covered by a soft, tar-like substance about 318 m (1,050 ft) north of the northwest corner of Building 1171. The source and origin of the tar-like substance is unknown. Two analytes were determined to be present in surface soils of the Tar Flow Area at concentrations exceeding the goals stated in the ROD (EPA 1993). These contaminants and their maximum detected concentrations include the following: TPH at 80,000 mg/kg, and lead at 404 mg/kg. The contamination is associated with the soft, tar-like substance visible on the ground surface. Based on borings done as part of the pre-remedial characterization activities, this tar-like substance extends to a depth of approximately 5 cm (2 in). The tar-like substance covers an irregular area of approximately 61 m x 20 m (200 ft x 65 ft). The approximate areal extent of soil that required excavation is shown in Figure 2-4. The cleanup criteria established in the 1100 Area ROD (EPA 1993) for TPH and lead are 200 mg/kg and 250 mg/kg, respectively. The volume of contaminated soil to be removed was estimated to be 385 cubic meters (500 cubic yards) assuming an excavation depth of 5 cm (2 in).

2.2.2 1240 SUSPECT SPILL AREA

The Suspect Spill Area consists of an area of visibly stained soil at the south end of Building 1240 (Fig. 2-5). The soil staining was the result of a spill of a pliable adhesive mixed with metal fragments and floor sweepings. One contaminant, lead, was determined to be present in surface soils of the Suspect Spill Area at a concentration exceeding the ROD goals (USACE 1994a). The maximum detected lead concentration was 44,200 mg/kg. The cleanup criteria established in the 1100 Area ROD (EPA 1993) for lead is 250 mg/kg. Figure 2-5 depicts the approximate areal extent of soil that required excavation. The volume of contaminated soil to be removed was estimated to be 92 cubic meters (120 cubic yards) based on a depth of 15 cm (6 in).

2.2.3 1240 FRENCH DRAIN

The 1240 French Drain is located on the west side of Building 1240 (Figure 2-6). There is no documented evidence of spills into the drain that might have discharged into the surrounding soils; however, a former collection area for PCBs was located close to the drain. Three analytes



LEGEND :

- Previous soil sampling location, designation, and depth
- Approximate extent of contamination
- 127.5 — Contour line, contour interval is 2.5 m

-N-

APPROXIMATE SCALE IN FEET
0 80 160
16 48
APPROXIMATE SCALE IN METERS

SOURCE: Golder 1994 (Modified)

TARFLOW/30MAY95/6110

APPROXIMATE EXTENT OF CONTAMINATION
AT THE TAR FLOW AREA

CDM FEDERAL PROGRAMS CORPORATION
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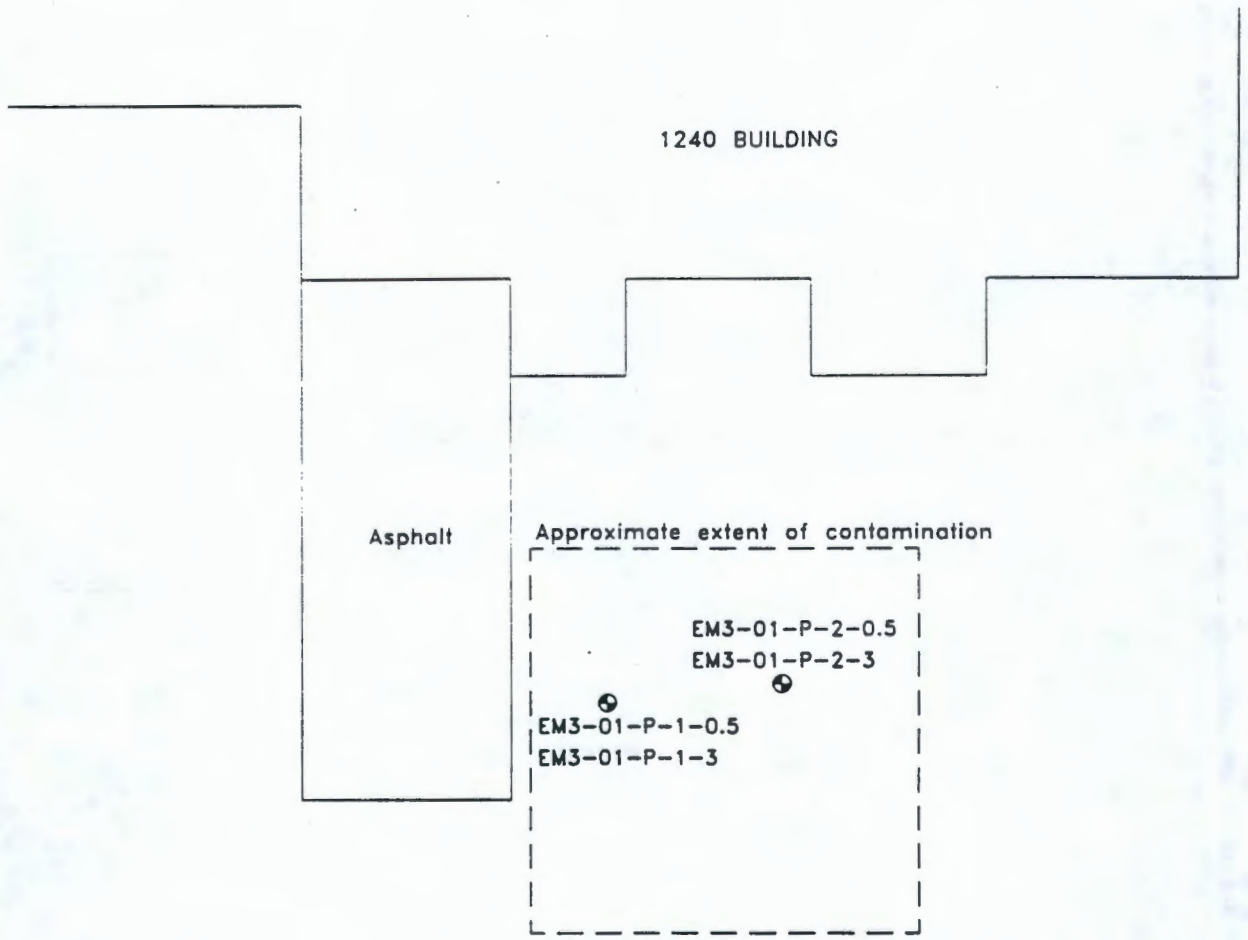
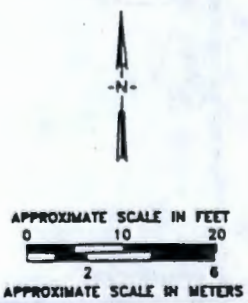
HANFORD RESERVATION, WASHINGTON

FIGURE No. 2-4



LEGEND :

Previous soil sampling location, designation, and depth



SOURCE: Golder 1994 (Modified)

APPROXIMATE EXTENT OF CONTAMINATION AT THE 1240 SUSPECT SPILL AREA

CDM FEDERAL PROGRAMS CORPORATION
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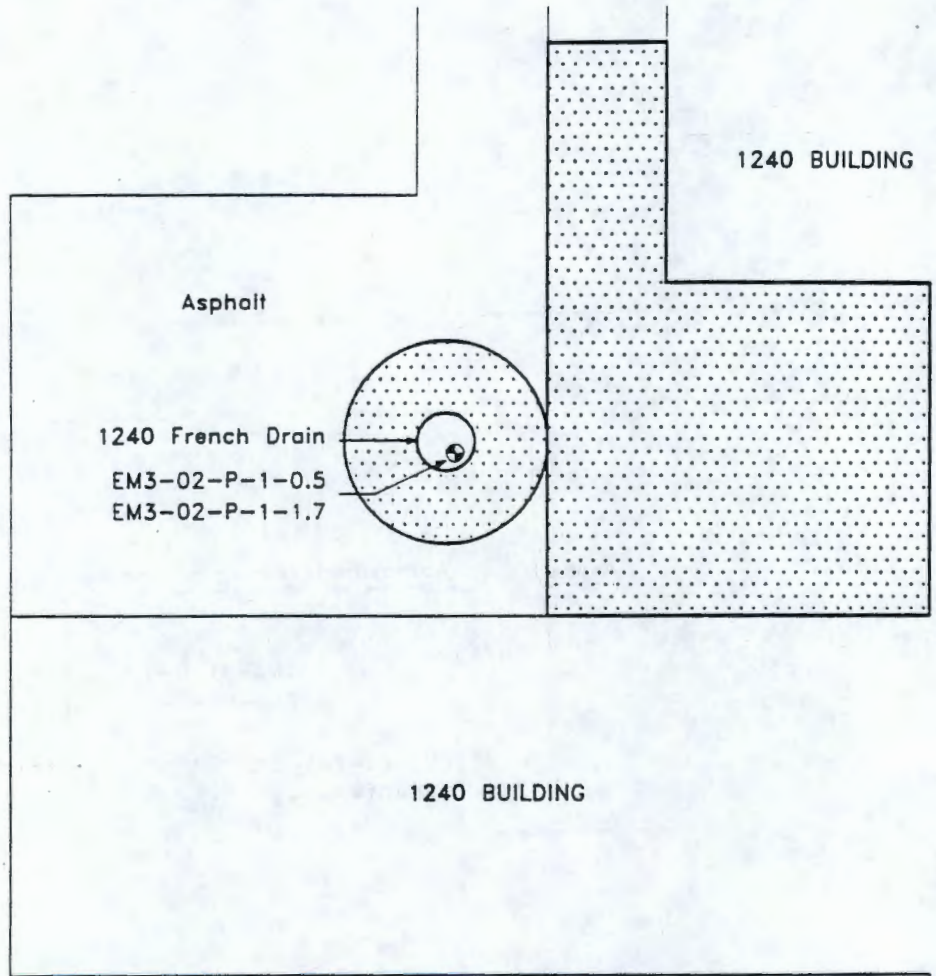
HANFORD RESERVATION, WASHINGTON

FIGURE No. 2-5

SUSPECT/30MAY95/6110



LEGEND :

Previous soil sampling location, designation, and depth

Concrete

-N-

APPROXIMATE SCALE IN FEET
0 5 10
1 3
APPROXIMATE SCALE IN METERS

SOURCE: Golder 1994 (Modified)

PREVIOUS SAMPLING LOCATIONS AT THE
1240 FRENCH DRAIN

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

HANFORD RESERVATION, WASHINGTON

FIGURE No. 2-6

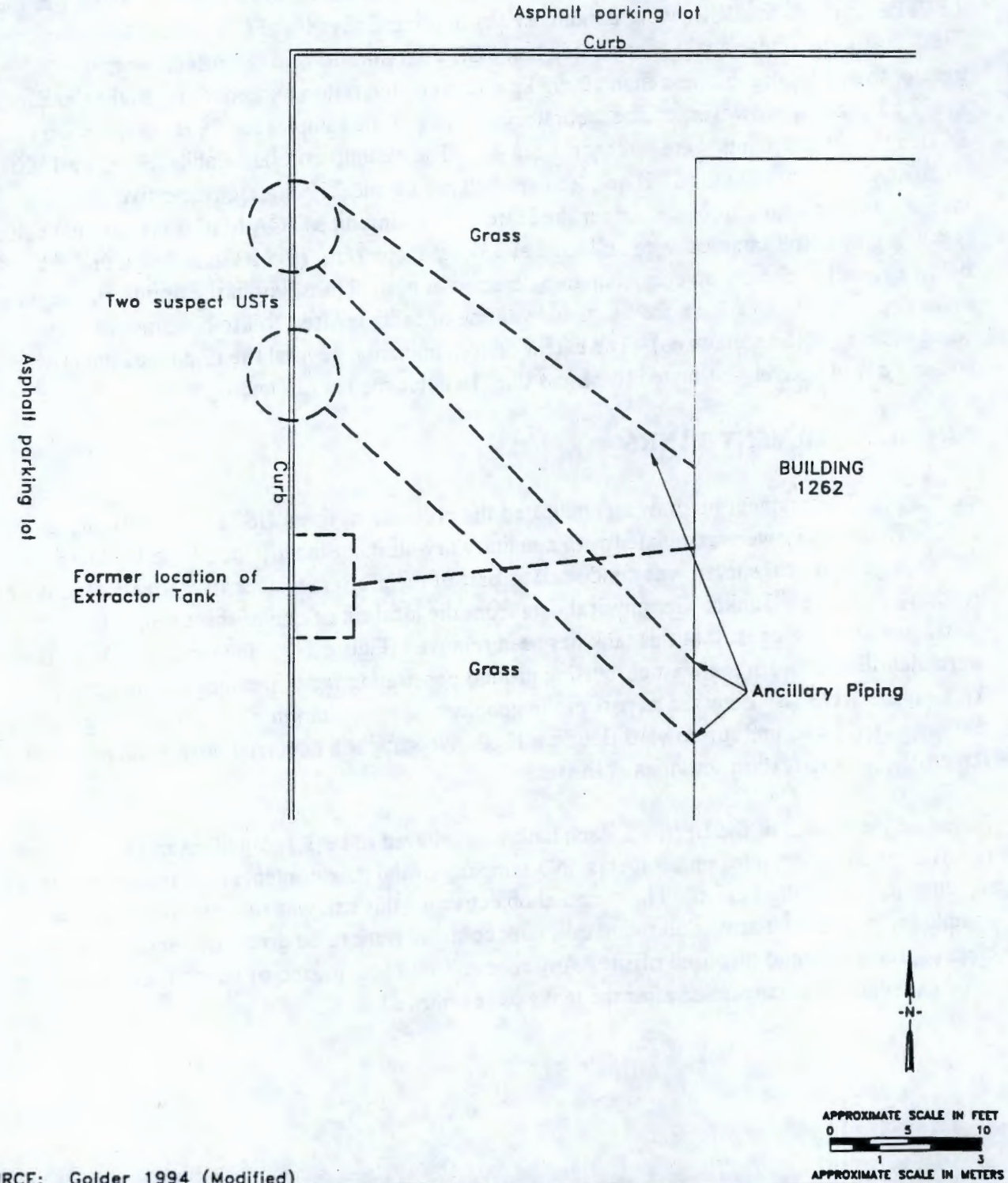
FDRAIN/9MAY95/61019

were determined to be present in soils at the 1240 French Drain at concentrations exceeding ROD goals. These contaminants and their maximum detected concentrations include the following: TPH (80,000 mg/kg), lead (619 mg/kg), and chromium (949 mg/kg). As part of the LFI/FFS analyses for PCBs were conducted onsite using EnSys Inc. PCB RISc® Immunoassay Field Test kits. These analyses indicated that PCB concentrations in drain sediments were greater than 1 mg/kg, but less than 10 mg/kg. This concentration exceeded the ROD cleanup goal of 1 mg/kg. However, offsite laboratory analysis of the samples for PCBs determined that PCBs in drain sediments were less than 1 mg/kg. The cleanup criteria established in the 1100 Area ROD (EPA 1993) for TPH and lead are 200 mg/kg and 250 mg/kg, respectively. The . cleanup criterion for chromium, under the State of Washington MTCA Method B formula value, is 400 mg/kg. Soil samples were collected at 15 centimeter (cm) (0.5 ft) and 0.5 m (1.7 ft) below ground surface, with contamination detected at both depths within the drain. Based on a drain depth of 0.5 m (1.7 ft), the estimated volume of contaminated soil to be removed was 0.5 cubic meters (<0.5 cubic yards). The extent of contamination beyond the drain was unknown, but was conservatively estimated to be less than 19 cubic meters (25 cubic yards).

2.2.4 1262 SOLVENT TANKS

Existing facility engineering drawings indicated the presence of three USTs west of Building 1262. These USTs were associated with a military dry-cleaning facility located in Building 1262. A geophysical survey was conducted as part of the pre-remedial characterization activities at the 1262 Solvent Tanks. Geophysical data from the location of one of these tanks, the "extractor tank," suggest that this tank has been removed (Figure 2-7). Two tank-like objects were identified beneath the west curb using ground penetrating radar and magnetometer surveys. Three pipes were also detected as part of the geophysical investigation. These pipes originate at the suspected tanks and run toward Building 1262. No sampling occurred during the pre-remedial characterization activities at the tanks.

Based on the results of the LFI/FFS, each tank was believed to be 1,125 gallons in capacity, and to have contained dry-cleaning solvents. No sampling of the tank contents had occurred prior to the current remediation effort. The remedial objective for this site was to open the tanks and sample the contents, if any. Following this, tank contents were to be drummed, and the tanks cleaned, removed, and disposed offsite. Any contaminated soil around or beneath the tanks was to be excavated and stockpiled after the tanks were removed.



SOURCE: Golder 1994 (Modified)

RESULTS OF GEOPHYSICAL INVESTIGATION
AT THE 1262 SOLVENT TANKS

CDM FEDERAL PROGRAMS CORPORATION
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HANFORD RESERVATION, WASHINGTON

FIGURE No. 2-7

SVTANKS/30MAY95/6110

3.0 REMEDIATION APPROACH

Sampling, excavation, and stockpiling of contaminated soils, UST removal, and backfilling at the 1100-EM-2/EM-3 sites occurred between June 22, 1995, and July 18, 1995. The exposing and sampling of the USTs occurred June 22 and 23, 1995. Following receipt of analytical results for the UST contents, the USTs were removed and disposed of July 10 and 11, 1995. These tasks were accomplished according to procedures contained in the following documents:

- Remedial Action Work Plan, Removal and Stockpiling of Contaminated Soil and Removal of Underground Storage Tanks, EM-2 AND EM-3 Operable Units, Hanford 1100 Area, Washington; CDM Federal, 1995 (CDM Federal 1995a).

- Remediation Design and Remedial Action Plan for the 1100 Area, Hanford Site; USACE, Walla Walla, 1994.

- Remedial Design Field Sampling Plan for Field Investigations Supporting Remedial Design/Remedial Action Activities in the 1100 Area; USACE, Walla Walla, 1994.

- Quality Assurance Project Plan for Field Investigations Supporting Remedial Design/Remedial Action Activities in the 1100 Area; USACE, Walla Walla, 1994.

Deviations from the procedures outlined in these documents are described in Section 5.5.

3.1 REMOVAL AND SEGREGATION OF CONTAMINATED SOILS

Prior to the excavation of contaminated soils from the Tar Flow Area, the 1240 Suspect Spill Area, and the 1240 French Drain, the locations at which soil samples were collected during the LFI/FFS were surveyed and staked by the USACE. Removal of contaminated soils was accomplished using a track hoe. Excavation at each site began in the area of known contamination (based on LFI/FFS sample results) and proceeded downward and outward based on visual evidence of contamination and the results of onsite screening analyses conducted in the mobile laboratory. Contaminated soils were stockpiled on 10-mil plastic sheeting and covered with heavy-gauge tarps at the end of each day.

3.2 EXPOSING AND SAMPLING USTs

Removal of the sod, curb, and asphalt pavement at the 1262 Solvent Tanks was also accomplished with a track hoe. Excavation at this site began where the geophysical investigation had identified the two tank-like anomalies. The tops of the USTs were uncovered

and the contents sampled and characterized, and the volume of the contents determined. A complete description of the activities at the 1262 Solvent Tanks is provided in Appendix A.

3.3 SAMPLING

The following subsections discuss the various types of samples collected as part of the EM-2/EM-3 remediation and how they were identified.

3.3.1 TYPES OF SAMPLES COLLECTED

At the direction of the USACE, sampling and analysis were conducted at the four EM-2/EM-3 sites for four separate purposes. The types of samples collected and the intended purpose of each is described below:

Screening Samples - Once excavation of suspect contaminated materials had begun, soil samples were collected from the base and walls of the excavation at regular intervals to determine the presence or absence of contaminants above the cleanup levels established in the 1100 Area ROD (EPA 1993). These samples were analyzed in an onsite laboratory facility providing rapid turnaround and at least U.S. Environmental Protection Agency (EPA) QC Level II analytical results. Analytical results were typically available within three hours of sample collection.

Confirmation Samples - Once all contaminated soil had been removed from a site, as demonstrated by the analytical results of screening samples collected from the excavated area, confirmation samples were collected for offsite laboratory analysis. Analyses were performed on a quick turnaround basis with initial results available within seven days of sample receipt by the laboratory. For samples collected at the 1262 Solvent Tanks, analyses were completed within a 48-hour turnaround. These analyses were conducted in accordance with EPA QC Level III data requirements, with 10% meeting EPA QC Level IV equivalent data requirements. Additionally, at least 10% of all confirmation samples were split and submitted to the USACE NPD Laboratory for analysis as QA samples.

Rinsate Samples - Aqueous samples consisting of water from the final rinse in sample equipment decontamination were collected during confirmation sampling at each site to evaluate the potential for cross-contamination. These samples were analyzed for the cleanup target constituents at the offsite laboratory in accordance with EPA QC Level III data requirements.

Waste Characterization Samples - Composite samples were collected from contaminated soil stockpiles at the Tar Flow Area, 1240 Suspect Spill Area, and 1240 French Drain to quantify the concentration of target contaminants and to determine the presence or absence of other hazardous constituents. These data were used to identify the transportation and disposal

requirements for each waste stream. Analyses of waste characterization samples were conducted by the offsite laboratory according to EPA QC Level III data requirements.

Profile Samples - Composite samples of the waste stockpiles at the 1240 Suspect Spill Area and the 1240 French Drain were submitted to a potential disposal site for determination of suitability and acceptance for land disposal. Both samples were submitted to the Chemical Waste Management Facility in Arlington, Oregon for assessment. Evaluation of these two samples by the disposal facility resulted in the acceptance of both waste streams at the Arlington facility.

3.3.2 SAMPLE IDENTIFICATION AND MAPPING

Identification or labelling of samples collected during the remediation of the EM-2/EM-3 sites followed protocols outlined in the Remedial Design Field Sampling Plan for the 1100 Area, Hanford Site (USACE 1994c). A field coding system was used to identify each sample during the sampling program. Samples were numbered according to the following system:

Example Sample Number: EM-2/01 - CM - 003- 015; where

EM-2	=	Hanford 1100 Area, EM-2 OU; alternatively
EM-3	=	Hanford 1100 Area, EM-3 OU
EM-2/01	=	EM-2, Site #01 (Tar Flow Area); alternatively,
EM-3/01	=	EM-3, Site #01 (1240 Suspect Spill Area)
EM-3/02	=	EM-3, Site #02 (1240 French Drain)
EM-3/06	=	EM-3, Site #06 (1262 Solvent Tanks)
CM	=	Confirmatory/Mobile Lab (screening sample); alternatively,
C	=	Confirmatory/Offsite Lab
W	=	Waste Characterization Sample
003	=	Sampling Location
015	=	Collection Depth (in centimeters unless otherwise specified)

Equipment rinsate blanks were designated by adding the letters "EB" to the front of the sample number for the soil sample collected immediately prior to the decontamination event. The letters "QA" were added to the front of the sample number for split samples shipped to the USACE NPD Laboratory for QA analyses. Split samples analyzed by CDM Federal's subcontract offsite laboratory were submitted as blind duplicates (i.e., split samples were given different location numbers than corresponding original samples).

Sample locations were recorded and plotted with respect to an arbitrary grid established at each of the sites, with the exception of the 1240 French Drain. Due to the vertical excavation walls and depth, no grid could be established there. The temporary grids were installed using a simple tape measure, paint, and pin flags. These grids were not surveyed. Therefore, sample locations must be considered approximate.

3.4 ONSITE LABORATORY ANALYSES

A mobile laboratory was used to provide same-day analytical results for screening samples collected during excavation at the Tar Flow Area, 1240 Suspect Spill Area, and 1240 French Drain. QA/QC procedures employed in the analysis of samples in the mobile laboratory met or exceeded the certification/accreditation requirements of the Washington Department of Ecology. The majority of samples were hand delivered to the mobile laboratory under standard chain-of-custody protocols. However, under direction of USACE, 10 samples were collected for onsite analysis at the Tar Flow Area and submitted to the laboratory without standard chain-of-custody protocol. These samples were designated waste characterization (WC) samples to guide excavation/soil stockpiling.

Screening samples analyzed for metals underwent an acid digestion to dissolve the metals, which were analyzed by atomic absorption. Screening samples analyzed for WTPH were extracted with liquid freon. Screening samples from the Tar Flow Area were analyzed by Method WTPH 418.1 for TPH, and SW-846 Method 7420 for lead. SW-846 Method 7420 for lead was also used for screening analyses at the 1240 Suspect Spill Area and 1240 French Drain. At the 1240 French Drain, WTPH 418.1 was also used for TPH, and SW-846 Method 7190 was used for chromium. Analytical results were reported on a dry-weight basis, using estimated moisture content for samples as received. Sample data packages produced by the onsite laboratory conformed to EPA QC Level II requirements.

3.5 OFFSITE LABORATORY ANALYSES

Confirmation, rinsate, and waste characterization samples were shipped offsite for laboratory analysis. The analyses performed and sample data packages provided by the offsite laboratory reflect EPA QC Level III, except for 10% "CLP-type" analyses which reflect EPA QC Level IV. Sample extractions utilized the Soxhlet method (SW-846 Method 3540). WTPH analyses for samples collected at the Tar Flow Area and 1240 French Drain were by WTPH-418.1. Lead analyses from these two sites, and the 1240 Suspect Spill Area, were by SW-846 Method 7421. In addition to lead analysis at the 1240 French Drain, samples were analyzed by SW-846 Method 6010 for chromium. At the 1262 Solvent Tanks, samples were analyzed for Volatile Organic Compounds (VOCs) by SW-846 Method 8240. All the waste characterization samples from the 1240 Suspect Spill Area and 1240 French Drain were analyzed for gross alpha-beta radiation and

gamma spectroscopy. For all analyses, moisture content was determined by ASTM Method D2216 and analytical results were reported on a dry-weight basis.

3.6 DATA EVALUATION

Attainment criteria were previously established jointly by the EPA, Washington Dept. of Ecology (Ecology) and USACE to determine when cleanup criteria had been met for the 1100 area sites. These criteria are based on the cleanup standards provided in the ROD (EPA 1993) and existing state requirements for the remediation of hazardous waste sites.

3.6.1 ATTAINMENT CRITERIA

Attainment criteria for the 1100-EM-2/EM-3 soil removal actions were developed jointly by EPA, Ecology, and USACE. Guidance for application of numerical standards established in the Washington Model Toxics Control Act (MTCA) formalized in WAC 173-340-740(7)(d) was used as the basis for these criteria. For 1100-EM-2/EM-3, the sites would be considered to be fully remediated if:

(i) The upper confidence interval on a true soil concentration is less than the soil cleanup level. Statistical tests would be performed at a Type I error level of 0.05 (95% upper confidence level);

(ii) No single sample concentration is greater than two times the soil cleanup level; and

(iii) Less than fifteen percent of the sample concentrations exceed the soil cleanup level.

In the development of these criteria, it was recognized that the data sets obtained would probably have sample distributions which were "skewed to the left." In other words, there would be a large number of samples where contaminant concentrations were not detected (thus the leftward skew), some samples where contaminant concentrations were between non-detect and the specified cleanup levels, and a small percentage of samples where contaminant levels ranged between the cleanup level to two times the cleanup level. If the sample sets were tested for normality and log-normality and failed, it was agreed that the approximate method of calculating the one-sided upper confidence limit presented in Section 5.2.1.3 of Ecology's *Statistical Guidance for Ecology Site Managers* (Ecology 1992) would be used.

3.6.2 SAMPLE POPULATION

The sample population for data includes that analyzed by both onsite and offsite laboratories. The analytical methods used by the onsite laboratory were selected to ensure that all data

obtained would be reliable. Offsite laboratory analysis was used to provide confirmation that cleanup levels had been met. In some cases, a sample was split and analyzed by both laboratories. A comparison of these data found excellent correlation between results. Blind duplicate analyses were also performed on samples submitted to the onsite laboratory as a quality control check. Again, excellent correlation of the analyses was determined. In cases were duplicate analyses were run, an average of the returned values was used for statistical input. Screening samples that exceeded the remedial criteria and were excavated were not used as part of the data set used to determine if the attainment criteria had been met. The data sets are provided in Appendix D.

4.0 SITE REMEDIATION AND ANALYTICAL RESULTS

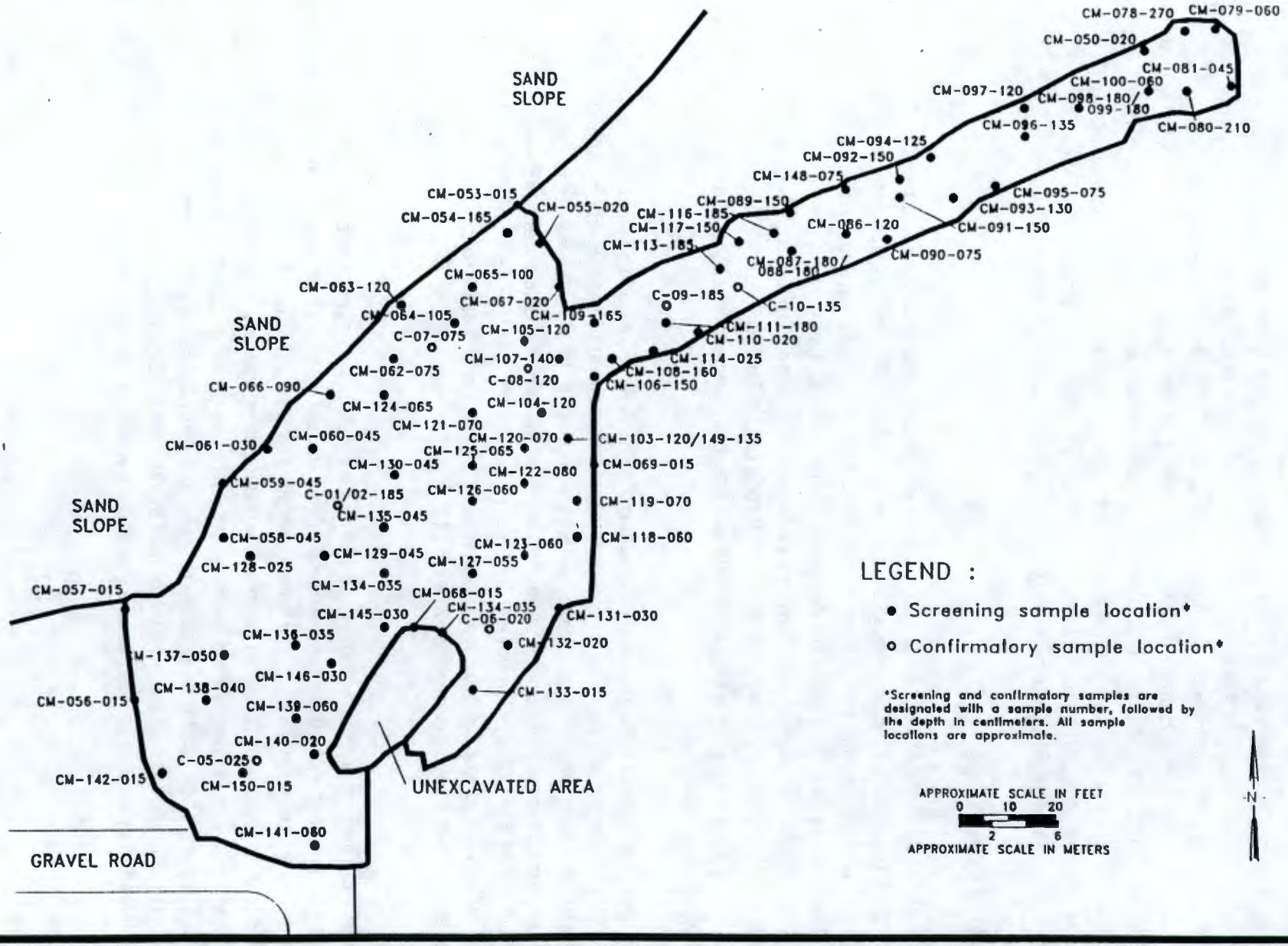
This section presents the results and findings of the remedial actions conducted at the Hanford 1100-EM-2/EM-3 sites, with the exception of the 1262 Solvent Tanks. Remedial action at the 1262 Solvent Tanks Site is detailed in "Underground Storage Tank Decommissioning Report, Building 1262 Solvent Tanks, Hanford 1100 Area, Richland, Washington" (HLA 1995) included as Appendix A. The first three subsections describe the excavation, screening, and confirmation sample results for the Tar Flow Area, the 1240 Suspect Spill Area, and the 1240 French Drain. Results of waste characterization analyses are discussed in Section 4.4. Application of the attainment criteria established by the regulatory agencies is discussed in Section 4.5.

4.1 TAR FLOW AREA

Excavation and stockpiling of petroleum hydrocarbon and lead-contaminated soils at the Tar Flow Area took place from June 26 through July 6, 1995. Figures 4-1 and 4-2 depict the depths of excavation and the screening and confirmatory sample locations at the Tar Flow Area. As shown in these figures, the Tar Flow Area consisted of four discrete areas; the largest contaminated area was adjacent to and northeast of the gravel road shown in Figure 4-1, and the three areally smallest areas were south of the main portion of the Tar Flow Area, as shown in Figure 4-2. In all four areas, the visible contamination originally present consisted of a tar-like substance on the ground surface.

At all four areas the tar-like substance varied in occurrence from discrete nodules to larger continuous "flow" sheets. Previous investigations demonstrated elevated concentrations of TPH and lead associated with the tar-like substance in this area (USACE 1994a). Based on borings conducted as part of the previous investigation, the depth of the contamination was believed to extend to a depth of 5 cm (2 in). However, during excavation activities, the depth of the visible contamination was found to extend from approximately 40 to 90 cm (10 in to 16 in) at the three small excavations, to a maximum depth of 270 cm (8.9 ft) at the main portion of the Tar Flow Area.

During excavation and stockpiling activities, 15 samples were collected of excavated soil within the exclusion zone to assist in guiding the removal of contaminated soil. These samples were collected for onsite laboratory analysis and were designated as waste characterization "-wc" samples. Once all stained soils had been removed, screening samples were collected to determine if additional excavation would be necessary. Samples were collected from the perimeter of the excavation (from the excavation walls) and from the base of the excavation. Of the 135 samples collected and subsequently analyzed by the onsite laboratory, results from six samples indicated the presence of TPH at concentrations exceeding the established cleanup



SCREENING AND CONFIRMATORY SAMPLE LOCATIONS AT THE MAIN PORTION OF THE TAR FLOW AREA

HANFORD RESERVATION, WASHINGTON

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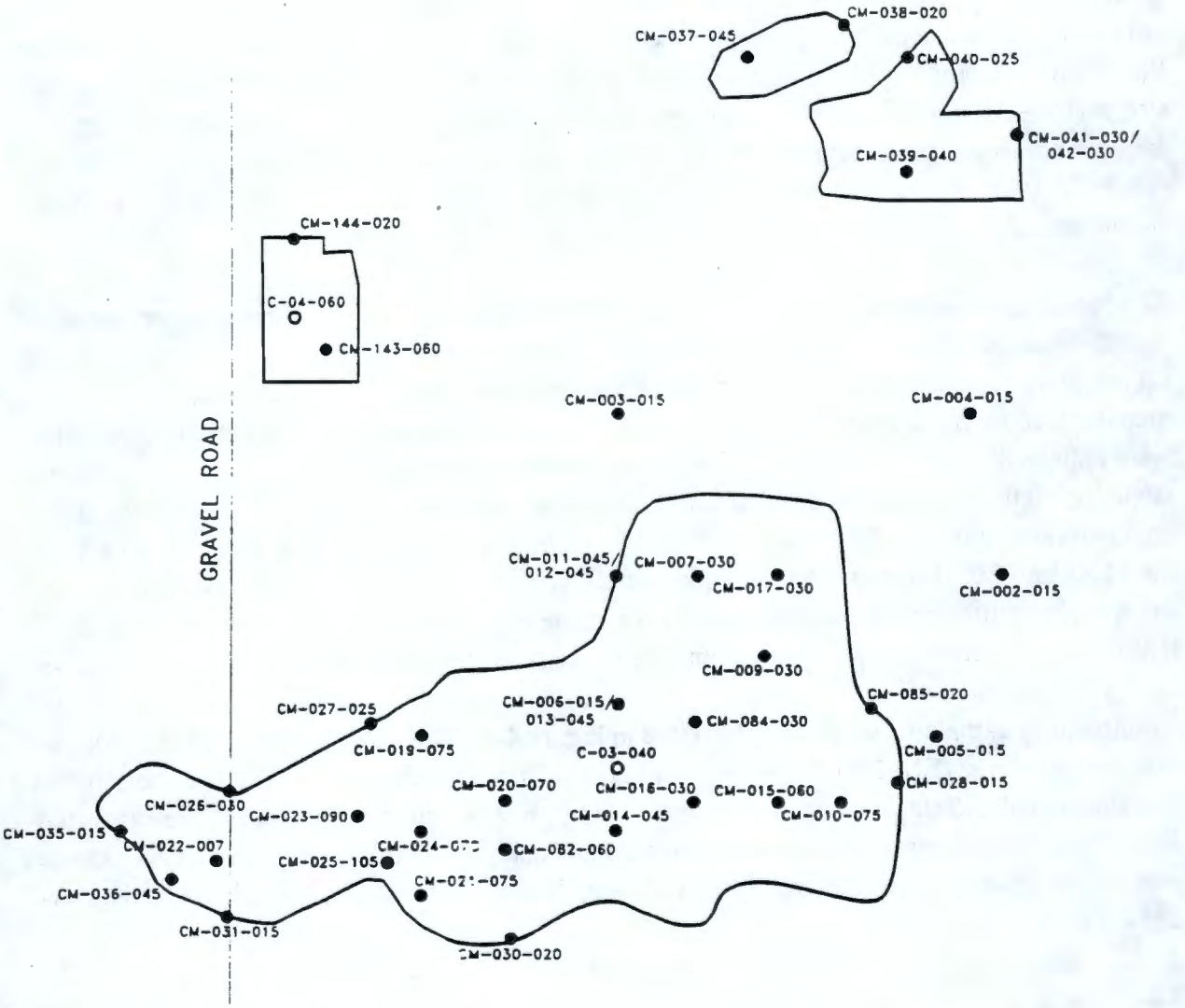
FIGURE No. 4-1



LEGEND :

● Screening sample location*

○ Screening sample location*

*Screening and confirmatory samples are designated with a sample number, followed by the depth in centimeters. All sample locations are approximate

APPROXIMATE SCALE IN FEET
0 10 20
2 6
APPROXIMATE SCALE IN METERS

-N-

SCREENING AND CONFIRMATORY SAMPLE LOCATIONS
SOUTH PORTION OF THE TAR FLOW AREA

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HANFORD RESERVATION, WASHINGTON

FIGURE No. 4-2

level of 200 mg/kg. Additional excavation was conducted in the area of four of the samples which had failed the onsite screening and the areas were resampled. The results of the deeper resampling in these areas demonstrated that soils contaminated with TPH at concentrations greater than the cleanup level had been removed. At the direction of USACE, excavation was not conducted at the other two sample locations as the attainment criteria had been met. Due to the fragmental nature of the tar-like material and the large amount of material removed from the site, scattered fragments are still visible in a few locations. Onsite laboratory analytical results for each screening sample and waste characterization sample are provided in Appendix B of this report. A total of approximately 1,155 cubic meters (1,500 cubic yards) of TPH-contaminated soil was excavated and stockpiled at the Tar Flow Area.

Ten confirmatory samples (including one duplicate sample) were collected from the excavation for offsite laboratory analyses. One of the confirmation samples was collected as a discrete grab sample collected from a single grid node. This sample was analyzed and a data package prepared according to EPA QC Level IV equivalent data requirements. The remaining samples were collected as composites of aliquots, with one aliquot from the selected grid node, plus one aliquot each from the four nodes that surround the selected node. This allowed the greatest areally representative samples to be collected from the Tar Flow Area, which was the largest of the 1100-EM-2/EM-3 sites. At the request of USACE, the confirmatory samples were split and the splits submitted to the onsite laboratory for screening. Onsite laboratory results indicated that the confirmatory samples were within the established cleanup criteria for TPH and lead.

Confirmatory sample locations are illustrated in Figure 4-1. The sample which was split for duplicate analysis, (EM-2/01-C-01-185), was also submitted to the USACE NPD Laboratory as a QA split sample. Sample locations were selected to provide uniform coverage of the excavated area. Table 4-1 presents the results for these sample analyses. Evaluation of these data indicated that the remediation goals had been achieved. Application of the attainment criteria is discussed in Section 4.5.

4.2 1240 SUSPECT SPILL AREA

The excavation and stockpiling of lead-contaminated soils at the 1240 Suspect Spill Area took place July 7 and 8, 1995. Additional limited excavation took place on July 13, 1995. Figure 4-3 depicts the depths of excavation and the screening and confirmatory sample locations at the 1240 Suspect Spill Area.

Soil was initially removed to a depth of 15 cm (6 in) based on the results of previous investigations (USACE 1994a). Following initial soil removal, screening samples were collected from the perimeter of the excavation (from the excavation walls) and from the base

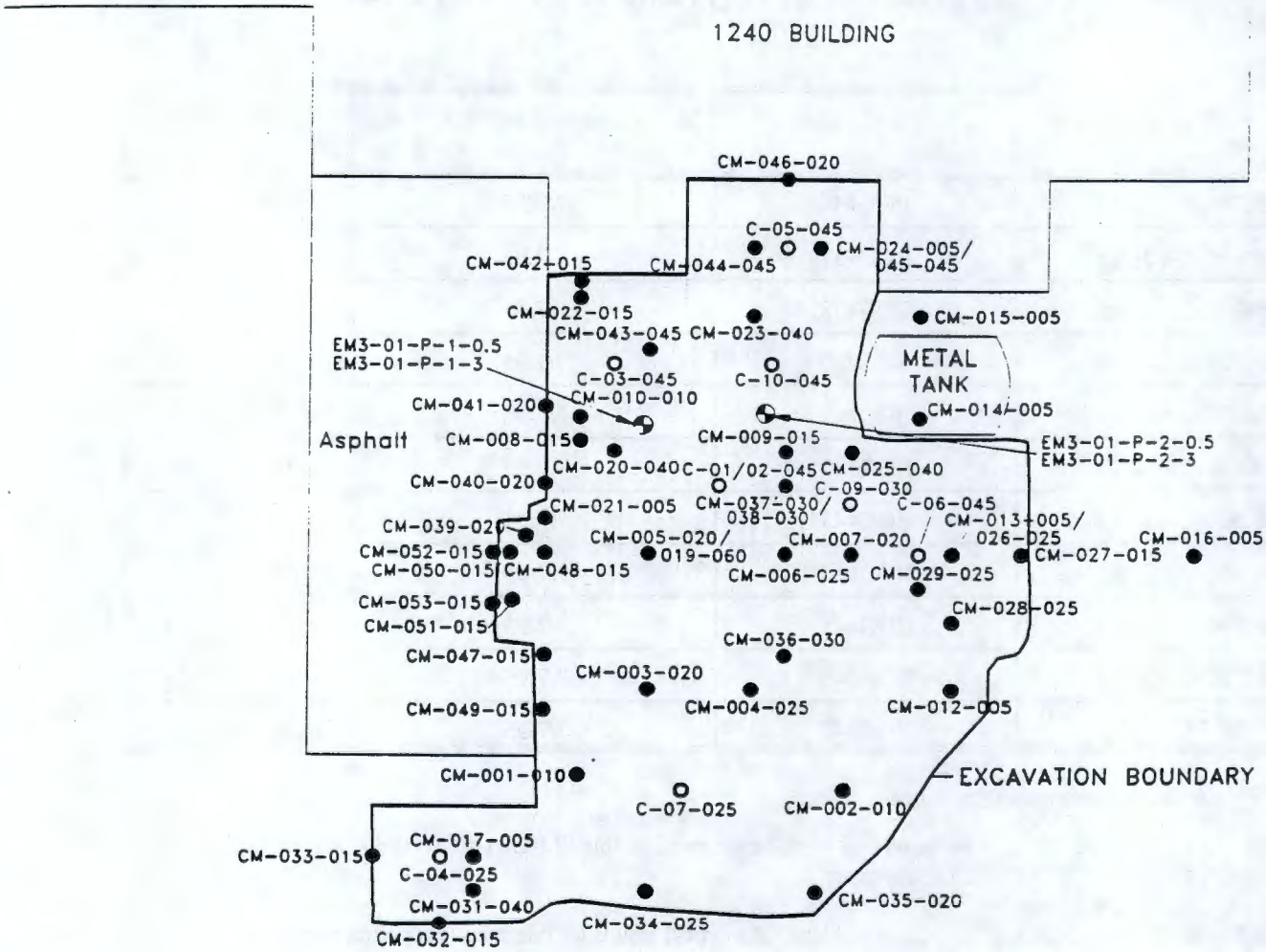
TABLE 4-1
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
TAR FLOW AREA CONFIRMATORY SAMPLES

SAMPLE NUMBER	HEIS NUMBER[1]	DATE COLLECTED	WTPH (mg/kg)	LEAD (mg/kg)
EM-2/01-C-01-185	BOG436	7/7/95	<100	3.7
EM-2/01-C-02-185[2]	BOG437	7/7/95	<100	3.67
EM-2/01-C-03-040	BOG438	7/7/95	<100	3.21
EM-2/01-C-04-060	BOG440	7/7/95	<100	2.87
EM-2/01-C-05-025	BOG441	7/7/95	<100	3.02
EM-2/01-C-06-020	BOG442	7/7/95	<100	3.03
EM-2/01-C-07-075	BOG443	7/7/95	<100	3.5
EM-2/01-C-08-120	BOG444	7/7/95	<100	5.4
EM-2/01-C-09-185	BOG445	7/7/95	<100	4.54
EM-2/01-C-10-135	BOG446	7/7/95	<100	3.06
EB-EM-2/01-C-01-185[3]	BOG447	7/7/95	<1 µg/L	<2 µg/L

[1] HEIS = Hanford Environmental Information System

[2] Sample EM-2/01-C-02-185 was collected as a blind duplicate of sample EM-2/01-C-01-185. Original sample also split for QA analysis by USACE NPD Laboratory.

[3] EB indicates sample is an equipment (rinsate) blank. Analytical results for this sample reported in mg/l and µg/L.



LEGEND :

- ● Screening sample location*
- ○ Confirmatory sample location*
- ◐ Previous soil sampling location, designation, and depth

*Screening and confirmatory samples are designated with a sample number, followed by the depth in centimeters. All sample locations are approximate.

SCREENING AND CONFIRMATORY SAMPLE LOCATIONS
AT THE 1240 SUSPECT SPILL AREA
(MODIFIED FROM USACE 1994a)

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FIGURE No. 4-3

of the excavation. Of the 13 samples initially collected and analyzed by the onsite laboratory, six exceeded the cleanup level of 250 mg/kg for lead. Based on the onsite laboratory results, excavation continued deeper and over a larger areal extent. Subsequent sampling in these areas demonstrated that soils contaminated by lead at concentrations greater than the cleanup level had been removed, with the exception of an area along the asphalt parking area on the west side of the 1240 Suspect Spill Area. This strip of contaminated soil was remediated when the excavation team returned to the 1240 Suspect Spill Area after completing previously scheduled work at another EM-3 site.

A total of 53 screening samples were collected and analyzed by the onsite laboratory at the 1240 Suspect Spill Area. After excavation was complete, screening sampling indicated that the cleanup criterion for lead of 250 mg/kg had been achieved. Analytical results for each screening sample are provided in Appendix B of this report. A total of approximately 69 cubic meters (90 cubic yards) of lead-contaminated soil was excavated and stockpiled at the 1240 Suspect Spill Area.

Ten confirmatory samples (including one duplicate sample) were collected from the excavation for offsite laboratory analyses. These samples were collected as discrete grab samples from single grid nodes that ensured the areal extent of the excavation was representatively sampled. At the request of the USACE, 6 of the confirmatory samples were split and the splits submitted to the onsite laboratory for screening. Samples EM-3/01-C-01-045 through EM-3/01-C-06-045 were analyzed onsite for lead and did not exceed the cleanup criterion of 250 mg/kg for lead.

Confirmatory sample locations are illustrated in Figure 4-3. The sample which was split for duplicate analysis was also submitted to the USACE NPD Laboratory as a QA split sample. Sample locations were selected to provide uniform coverage of the excavated area. Table 4-2 presents the results from these sample analyses. Evaluation of these data indicated that the remediation goals had been achieved. Application of the attainment criteria is discussed in Section 4.5.

4.3 1240 FRENCH DRAIN

Previous investigations (USACE 1994a) identified the presence of TPH, lead, and chromium at the 1240 French Drain. The grate and concrete surrounding the 1240 French Drain were removed on July 8, 1995. Excavation and stockpiling of contaminated soils at the 1240 French Drain took place July 11 through 13, 1995. Figure 4-4 depicts the depth of excavation and the screening and confirmatory sample locations at the 1240 French Drain.

Initial soil removal to a depth of 9.1 m (10 ft) took place based on field observations of stained soil. Initially five screening samples designated "-wc" for waste characterization were

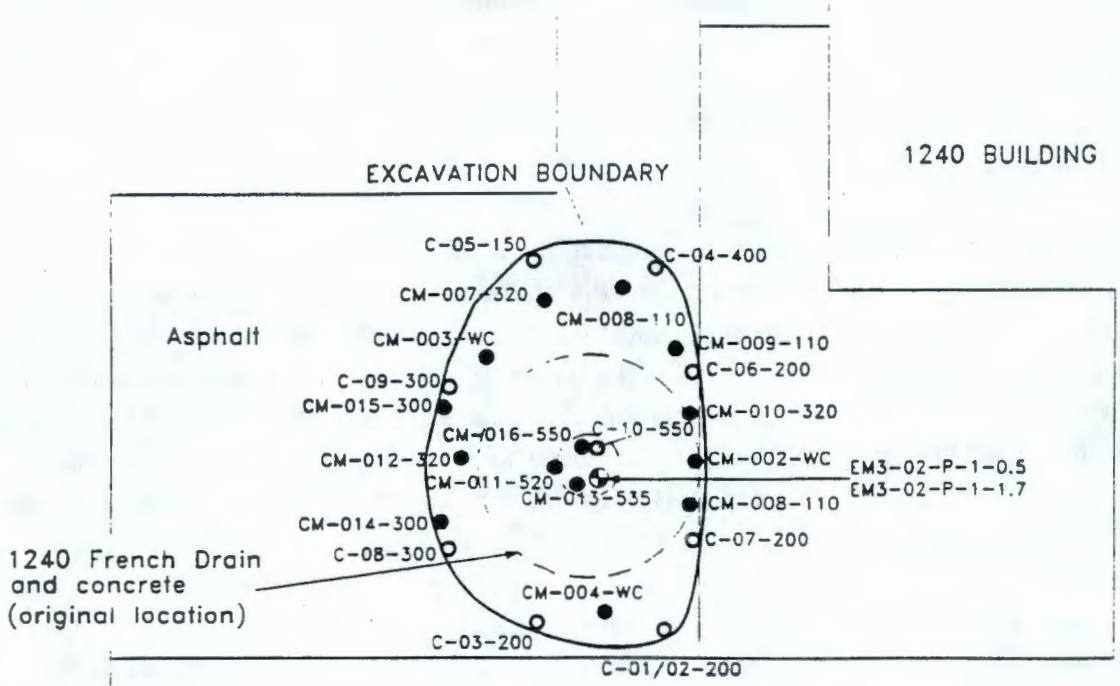
TABLE 4-2
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
1240 SUSPECT SPILL AREA CONFIRMATORY SAMPLES

SAMPLE NUMBER	HEIS NUMBER[1]	DATE COLLECTED	LEAD (mg/kg)
EM-3/01-C-01-045	BOG449	7/8/95	3.96
EM-3/01-C-02-045[2]	BOG450	7/8/95	3.79
EM-3/01-C-03-045	BOG451	7/8/95	3.64
EM-3/01-C-04-025	BOG452	7/8/95	3.82
EM-3/01-C-05-045	BOG453	7/8/95	3.27
EM-3/01-C-06-045	BOG454	7/8/95	3.65
EM-3/01-C-07-025	BOG455	7/13/95	3.74
EM-3/01-C-08-045	BOG456	7/13/95	5.59
EM-3/01-C-09-030	BOG457	7/13/95	3.74
EM-3/01-C-10-045	BOG458	7/13/95	5.2
EB-EM-3/01-C-01-045[3]	BOG461	7/14/95	<2 μg/L

[1] HEIS = Hanford Environmental Information System

[2] Sample EM-3/01-C-02-045 was collected as a blind duplicate of sample EM-3/01-C-01-045. Original sample also split for QA analysis by USACE NPD Laboratory.

[3] EB indicates sample is an equipment (rinsate) blank. Analytical results for this sample reported in μg/L.



LEGEND :

- ● Screening sample location*
- o Confirmatory sample location*
- Previous soil sampling location, designation, and depth
- Concrete

*Screening and confirmatory samples are designated with a sample number, followed by the depth in centimeters. All sample locations are approximate.

-N-

APPROXIMATE SCALE IN FEET
0 5 10
1 3
APPROXIMATE SCALE IN METERS

'RCE: USACE 1995a (Modified)

SCREENING AND CONFIRMATORY SAMPLE LOCATIONS
AT THE 1240 FRENCH DRAIN

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FIGURE No. 4-4

collected and analyzed by the onsite laboratory. These samples were collected from stockpiled soil previously excavated by track hoe, and from the track hoe bucket. Due to the depth of the excavation, no screening grid could be established. During excavation at the 1240 French Drain, all screening and confirmatory samples were collected from the track hoe bucket or after being stockpiled on 10-mil plastic sheeting.

Results from two of the screening samples indicated the presence of TPH at concentrations exceeding the established cleanup criterion for TPH of 200 mg/kg. Additional excavation continued in the walls and base of the subsurface drain area, with additional screening samples collected as excavation progressed. A total of 18 screening samples were collected and analyzed by the onsite laboratory at the 1240 French Drain. The final screening samples indicated that the cleanup criteria for TPH, lead, and chromium had been achieved. Analytical results for each screening sample are provided in Appendix B of this report. A total of 98 cubic meters (75 cubic yards) of contaminated soil were excavated and stockpiled at the 1240 French Drain.

Ten confirmatory samples (including one duplicate sample) were collected from the excavation for offsite laboratory analyses. These samples were collected as discrete grab samples from the walls and base of the excavation by track hoe bucket. At the request of USACE, the confirmatory samples were split and the splits submitted to the onsite laboratory for screening. Onsite laboratory results indicated that confirmation sample EM-3/02-C-01-200 from the south wall had a TPH concentration of 320 mg/kg. This was the only result for samples EM-3/02-C-01-200 through EM-3/02-C-10-550 that exceeded the remediation criterion of 200 mg/kg for TPH.

Confirmatory sample locations are illustrated in Figure 4-3. The sample which was split for duplicate analysis (EM-3/02-C-01-200), was also submitted to the USACE NPD Laboratory as a QA split sample. Sample locations were selected to provide uniform coverage of the excavated area. Table 4-3 presents the results from these sample analyses. As this table shows, confirmatory sample EM-3/02-C-01-200 had a TPH concentration of 130 mg/kg. This amount does not exceed the cleanup criterion of 200 mg/kg for TPH. Evaluation of these data indicated that the remediation goals had been achieved. Application of the attainment criteria is discussed in Section 4.5.

4.4 WASTE CHARACTERIZATION SAMPLES

Six waste characterization samples were collected and sent offsite for laboratory analysis and sample data package preparation meeting the EPA QC Level III data requirements. Two samples were collected each from the stockpiled soils at the Tar Flow Area, 1240 Suspect Spill Area, and 1240 French Drain. At the direction of the USACE, and since no contamination was detected during excavation or sampling of the 1262 Solvent Tanks, no waste

TABLE 4-3
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
1240 FRENCH DRAIN CONFIRMATORY SAMPLES

SAMPLE NUMBER	HEIS NUMBER[1]	DATE COLLECTED	WTPH	LEAD	CHROMIUM
EM3/02-C-01-200	BOG488	7/13/95	130	4.53	6.05
EM3/02-C-02-200[2]	BOG490	7/13/95	<100	3.66	6.35
EM-3/02-C-03-200	BOG491	7/13/95	<100	3.53	5.35
EM-3/02-C-04-400	BOG492	7/13/95	<100	1.54	5.19
EM-3/02-C-05-150	BOG493	7/13/95	<100	3.12	4.88
EM-3/02-C-06-200	BOG494	7/13/95	<100	3.9	10.3
EM-3/02-C-07-200	BOG495	7/13/95	<100	2.04	4.56
EM-3/02-C-08-300	BOG496	7/13/95	<100	2.6	4.89
EM-3/02-C-09-300	BOG497	7/13/95	<100	2.29	4.2
EM-3/02-C-10-200	BOG498	7/13/95	<100	1.79	4.06
EB-EM-3/02-C-01-200[3]	BOG499	7/13/95	<1.1 mg/L	<2 μg/L	<10 μg/L

[1] HEIS = Hanford Environmental Information System

[2] Sample EM-3/02-C-02-200 was collected as a blind duplicate of sample EM-3/02-C-02-200. Original sample also split for QA analysis by USACE NPD Laboratory.

[3] EB indicates sample is an equipment (rinsate) blank. Analytical results for this sample are reported in mg/l and μg/L.

characterization samples were collected at the 1262 Solvent Tanks. Analytical results from the table 4-3 waste characterization samples will be used to determine waste codes for proper transportation and disposal of the contaminated soil stockpiles. Waste characterization samples were collected as composites of aliquots from the soil stockpiles. Analytical results for all waste characterization samples are summarized in Appendix C of this report.

Two waste characterization samples were collected from the stockpiled soils at the Tar Flow Area (EM-2/01-W-01-0 and EM-2/01-W-02-0). The waste characterization samples were analyzed for volatile organic compounds (VOCs), semi-volatile compounds (SVOCs), pesticides/PCBs, total petroleum hydrocarbons (TPH) (WTPH-418.1-Washington State Method), Resources Conservation and Recovery Act (RCRA) metals, and Toxicity Characteristic Leaching Procedure (TCLP) for lead only. Analytical results for all waste characterization samples are summarized in Appendix C to this report.

In both samples, bis(2-ethylhexyl)phthalate (BEHP) was detected; the analyte was present at a concentration of 0.17 mg/kg in EM-2/01-W-01-0, and a concentration of 0.21 mg/kg in EM-2/01-W-02-0. The detection of BEHP in both samples may be due to the close proximity of the EM-1 Discolored Soil Site, as BEHP contamination was found there. The EM-1 Discolored Soil Site was remediated in February 1995.

In addition to BEHP, other analytes detected in samples EM-2/01-W-01-0 and EM-2/01-W-02-0 and concentration ranges include, respectively: TPH (120 and 600 mg/kg), barium (56.7 and 60.6 mg/kg), chromium (7.23 and 7.28 mg/kg), and lead (4.44 and 6.29 mg/kg). Lead was not detected in the TCLP leachate.

Two waste characterization samples were collected from the stockpiled soils at the 1240 Suspect Spill Area (EM-3/01-W-01-0 and EM-3/01-W-02-0). The waste characterization samples were analyzed for the same constituents as the Tar Flow Area waste samples. In addition, both samples were analyzed by gross alpha/beta gas-flow proportional counting and by gamma spectroscopy.

Analytes detected in samples EM-3/01-W-01-0 and EM-3/01-W-02-0 and concentration ranges include, respectively: TPH (270 and 210 mg/kg), barium (71.9 and 76.1 mg/kg), chromium (51.4 and 33 mg/kg), lead (176 and 112 mg/kg), DDT (.009 mg/kg in both samples), and PCB-1254 (.12 and 0.04 mg/kg). Lead was detected in the TCLP leachate of both samples; at a concentration of 3.52 μg/L and 14 μg/L. The gross alpha/beta and gamma spectroscopy results for both samples are shown in Appendix C. The common laboratory contaminant methylene chloride was detected in EM-3/01-W-01-0 at a concentration of <1 mg/kg.

Two waste characterization samples were collected from the stockpiled soils at the 1240 French Drain (EM-3/02-W-01-0 and EM-3/02-W-02-0). The waste characterization samples were analyzed for the same constituents as the Tar Flow Area waste samples plus TCLP for chromium. In addition, both samples were analyzed for gross alpha/beta gas-flow proportional counting and by gamma spectroscopy.

Analytes detected in samples EM-3/02-W-01-0 and EM-3/02-W-02-0 and concentration ranges include, respectively: BEHP (0.630 and 0.150 mg/kg), TPH (450 mg/kg), barium (62.7 and 44.2 mg/kg), chromium (6.08 and 3.68 mg/kg), lead (5.60 and 2.31 mg/kg), and DDE (0.630 and 0.150 mg/kg). Neither lead or chromium were detected in the TCLP leachate. DDE is a degradation product of DDT. The gross alpha/beta and gamma spectroscopy results for both samples are shown in Appendix C.

4.5 APPLICATION OF ATTAINMENT CRITERIA

Completion of cleanup at each site was confirmed through the application of the attainment criteria established by the regulatory agencies. These criteria are described in Section 3.6. Application of the criteria at each of the sites is described below.

4.5.1 TAR FLOW AREA

The 1100 Area ROD (EPA 1993) established the TPH and lead soil cleanup levels for the Tar Flow Area at 200 mg/kg and 250 mg/kg, respectively. No lead above background levels was detected in any of the screening or confirmatory samples, therefore no statistical calculations were performed on the lead data set. All data obtained from post remediation sampling to verify that the cleanup levels for TPH and lead were met at the Tar Flow Area are presented in Appendix D, Table D-3. The data were tested graphically and rejected for both normality and log-normality, therefore the approximate method of calculating the 95% upper confidence limit (UCL_{95}) is appropriate. In accordance with Ecology's *Statistical Guidance for Ecology Site Managers* (Ecology 1992) for distributions with large sample size the following formula was used:

$$UCL_{95} = \bar{X} + Z_{1-\alpha} \frac{S}{\sqrt{n}}$$

Where:

UCL_{95} = 95% Upper Confidence Level
$\bar{x}$ = Sample Mean

s = Sample Standard Deviation
n = Number of Compliance Monitoring Samples
$Z_{1-\alpha}$ = Value of the Z parameter = 1.645 for one-sided 95% confidence limit

For the Tar Flow Area data:

$\bar{x}$ = 20.4

s = 37.6
n = 133
Z_{95} = 1.645

Therefore:

$$(UCL)_{95} = 20.4 + 1.645 \frac{37.6}{\sqrt{133}} = 23.66$$

The attainment criteria for the Tar Flow Area are met for the following reasons:

(i) The 95% UCL of 23.66 mg of TPH/kg of soil is less than the 200 mg of TPH/kg of soil cleanup level;

(ii) No sample concentration is greater than twice the cleanup level (400 mg of TPH/kg of soil); and

(iii) Lead results in only 2 of 133 samples (1.5%) were determined to be greater than the cleanup level.

4.5.2 1240 SUSPECT SPILL AREA

All data obtained from post remediation sampling to verify that the cleanup level was met at the 1240 Suspect Spill Area are presented in Appendix D, Table D-2. The data were tested graphically and rejected for both normality and log-normality. The ROD established the lead soil cleanup level for the 1240 Suspect Spill Area at 250 mg lead/kg of soil.

For the 1240 Suspect Spill Area data:

$\bar{x} = 43.2$

s = 65.8
n = 45
$Z_{95} = 1.645$

Therefore:

$$(UCL)_{95} = 43.2 + 1.645 \frac{65.8}{\sqrt{45}} = 59.33$$

The attainment criteria for the 1240 Suspect Spill Area met for the following reasons:

(i) The 95% UCL of 59.33 mg of lead/kg of soil is less than the 250 mg of lead/kg of soil cleanup level;

(ii) No sample concentration is greater than twice the cleanup level (500 mg of lead/kg of soil); and

(iii) No samples contained lead at concentrations greater than the cleanup level.

4.5.3 1240 FRENCH DRAIN

The 1100-EM-1 Operable Unit ROD (EPA 1993) established the TPH, lead, and chromium soil cleanup levels for the 1240 French Drain at 200 mg/kg, 250 mg/kg, and 400 mg/kg, respectively. All data obtained from post remediation sampling to verify that the cleanup levels for TPH, lead, and chromium were met at the 1240 French Drain are presented in Appendix D, Table D-1. The data were tested graphically and rejected for both normality and log-normality, therefore the approximate method of calculating the 95% upper confidence limit (UCL_{95}) is appropriate. In accordance with Ecology's *Statistical Guidance for Ecology Site Managers* (Ecology 1992) for distributions with large sample size the following formula is used:

$$UCL_{95} = \bar{X} + Z_{1-\alpha} \frac{s}{\sqrt{n}}$$

Where:

UCL_{95} = 95% Upper Confidence Level
$\bar{x}$ = Sample Mean

s = Sample Standard Deviation
n = Number of Compliance Monitoring Samples
$Z_{-\alpha}$ = Value of the Z parameter = 1.645 for one-sided 95% confidence limit

For the TPH - Lead - Chromium data at the 1240 French Drain:

$\bar{x}$ = 53.92 - 4.72 - 5.45

s = 31.62 - 4.66 - 1.6
n = 13
Z_{95} = 1.645

Therefore (only TPH shown):

$$(UCL)_{95} = 53.92 + 1.645 \frac{31.62}{\sqrt{13}} = 68.34$$

The 95% UCL for lead and chromium is 6.85 and 6.18, respectively.

The attainment criteria for the 1240 French Drain are met for the following reasons:

(i) The 95% UCL for THP, lead, and chromium /kg, respectively, of soil is less than the 200 mg, 250 mg, and 400 mg/kg of soil cleanup level;

(ii) No sample concentration is greater than twice the cleanup level for TPH, lead, and chromium; and

(iii) None of the samples contained TPH, lead, or chromium at concentrations greater than the cleanup levels.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

This section discusses QA and QC procedures and results regarding CDM Federal field operations and those of subcontract laboratories utilized for sample analyses. The quantitative and qualitative data quality objectives for this project were presented in the Remedial Action Work Plan (CDM Federal 1995a). A cursory review was completed of data generated by both the onsite and offsite analytical laboratories in order to provide a limited assessment of data quality. Field QA/QC is discussed, particularly deviations from procedures outlined in the work plan and QAPjP. This report does not include an evaluation of the quality of the data generated by USACE contract laboratories.

5.1 ANALYTICAL LABORATORIES

A combination of onsite and offsite analytical services were employed during the remediation of the 1100-EM-2/EM-3 sites. Onsite analyses were primarily used for screening purposes to determine the extent of contaminated materials requiring removal. Offsite analytical laboratories were used to provide confirmation of the results obtained by the onsite laboratory and to characterize waste materials for offsite treatment and/or disposal. All onsite and offsite analytical laboratories met the subcontract requirements with respect to data quality.

5.1.1 ONSITE LABORATORY

Onsite laboratory analytical work associated with the Hanford 1100-EM-2/EM-3 sites was conducted by CDM Federal subcontractor, Transglobal Environmental Geosciences Northwest, Inc. (TEG) utilizing a mobile laboratory facility transported to and operated onsite. Analytical methods and data packages met the requirements for EPA QC Level II. The total number of samples submitted for analysis to the onsite laboratory facility is as follows:

Tar Flow Area - 159 samples, SW-846 Method 7420 (lead) and WTPH 418.1 (TPH)

1240 Suspect Spill Area - 58 samples, SW-846 Method 7420 (lead)

1240 French Drain - 25 samples, SW-846 Methods 7420 (lead) and 7190 (chromium), and WTPH 418.1 (TPH)

Analytical data for all samples analyzed onsite are included as Appendix B of this report.

5.1.2 OFFSITE LABORATORIES

The majority of the offsite laboratory analytical work associated with the Hanford 1100-EM-2/EM-3 sites was completed by CDM Federal subcontract laboratory, Environmental Science and Engineering, Inc. (ESE) of Gainesville, Florida. Additional analyses were conducted by Sound Analytical Services, Inc. (SAS) of Tacoma, Washington. SAS operated under separate subcontracts with ESE (for WTPH analyses), and Chemical Waste Management (CWM) (for

tank contents characterization analyses). Data generated by the offsite laboratories met the reporting requirements for EPA QC Levels III and IV. Table 5-1 summarizes the total number of samples submitted and analytical methods used for offsite analysis. Data for samples analyzed by the offsite laboratory are summarized in Tables 4-1 through 4-3 and in Appendix A and C.

5.2 CHEMICAL DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative goals and limits established for field and laboratory data that provide the means by which data reviewers can assess whether the goals of an investigation have been met. The qualitative objectives provide descriptions of what questions must be answered, what data must be collected, how the data will be collected, what analyses are required, and how the data will be used. Essentially, the qualitative objectives provide descriptions of how the data will be used to support site restoration decisions.

Quantitative DQOs establish numeric limits for acceptable results. The numeric limits aid in establishing a level of confidence and the degree of usefulness for the data collected as part of the field investigation. The numeric limits are tied directly to the intended end use of the data and include DQOs for precision, accuracy, completeness, and sensitivity.

A limited QC evaluation of onsite and offsite sample data packages was completed using the applicable portions of the QAPjP, EPA Contract Laboratory Program (CLP) statement of work protocols where appropriate, and SW-846 criteria. Results of this evaluation are summarized in this section. Onsite laboratory QC data are provided where appropriate. The reader is referred to the Remedial Action Work Plan (CDM Federal 1995a) for the project DQOs and to the original sample data packages for offsite laboratory QC data and summaries.

5.2.1 PRECISION

Precision is a quantitative term that estimates the reproducibility of measurements under a given set of conditions. Precision for a given set of tests is reflected by the analytical results of field and laboratory duplicates, and is influenced by both field sampling and laboratory techniques.

For this project, all field duplicates were submitted blind (i.e., not marked as a duplicate sample) to the onsite and offsite analytical laboratories. Field duplicate samples are processed and analyzed by the same laboratory. Laboratory precision is much simpler to quantitate, while field precision is unique to each site and sampling matrix.

Field and laboratory precision is expressed as relative percent difference (RPD) defined by the following formula:

$$RPD = \frac{|X1 - X2|}{(X1 + X2)/2} X\ 100$$

TABLE 5-1
SUMMARY OF SAMPLES SUBMITTED FOR OFFSITE ANALYSIS

Site	Sample Type	QC Level	Matrix	Quantity	Analyses (SW-846)
Tar Flow Area	Confirmatory Sample	III IV	Soil Soil	9 1	Lead (7421), WTPH (418.1) Lead (7421), WTPH (418.1)
	Confirmatory Sample (QC)	III	Soil	1	Lead (7421), WTPH (418.1)
	Confirmatory Sample (QA)	III	Soil	1	Lead (7421), WTPH (418.1)
	Equipment Rinsate	III	Water	1	Lead (7421), WTPH (418.1)
	Waste Characterization	III	Soil	2	RCRA Metals (6010/7000), Volatile Organic Compounds (8240), Semivolatile Organic Compounds (8270), Pesticides/PCBs (8080), TCLP-lead only (1311/7421)
1240 Suspect Spill Area	Confirmatory Sample	III IV	Soil Soil	9 1	Lead (7421) Lead (7421)
	Confirmatory Sample (QC)	III	Soil	1	Lead (7421)
	Confirmatory Sample (QA)	III	Soil	1	Lead (7421)
	Equipment Rinsate	III	Water	1	Lead (7421)
	Waste Characterization	III	Soil	2	RCRA Metals (6010/7000), Volatile Organic Compounds (8240), Semivolatile Organic Compounds (8270), Pesticides/PCBs (8080), TCLP-Lead only (1311/7421), WTPH (418.1)

TABLE 5-1 (continued)
SUMMARY OF SAMPLES SUBMITTED FOR OFFSITE ANALYSIS

Site	Sample Type	QC Level	Matrix	Quantity	Analyses (SW-846)
1240 French Drain	Confirmatory Sample	III IV	Soil Soil	9 1	Lead (7421), Chromium (6010), WTPH (418.1) Lead (7421), Chromium (6010), WTPH (418.1)
	Confirmatory Sample (QC)	III	Soil	1	Lead (7421), Chromium (6010), WTPH (418.1)
	Confirmatory Sample (QA)	III	Soil	1	Lead (7421), Chromium (6010), WTPH (418.1)
	Equipment Rinsate	III	Water	1	Lead (7421), Chromium (6010), WTPH (418.1)
	Waste Characterization	III	Soil	2	RCRA Metals (6010/7000), Volatile Organic Compounds (8240), Semivolatile Organic Compounds (8270), Pesticides/PCBs (8080), TCLP-Lead and Chromium only (1311/7421 and 6010, respectively) , WTPH (418.1)
1266 Solvent Tanks	Confirmatory Sample	III IV	Soil Soil	9 1	Volatile Organic Compounds (8240) Volatile Organic Compounds (8240)
	Confirmatory Sample (QC)	III	Soil	1	Volatile Organic Compounds (8240)
	Confirmatory Sample (QA)	III	Soil	1	Volatile Organic Compounds (8240)
	Equipment Rinsate	III	Water	1	Volatile Organic Compounds (8240)
	Waste Characterization	III	Soil	0[1]	

[1] At the direction of USACE, no waste characterization samples were collected at the 1262 Solvent Tansk site. All stockpiled soils were used for backfill.

where RPD	=	relative percent difference between duplicate results
X1 and X2	=	results of duplicate analyses
$\lvert X1 - X2 \rvert$	=	absolute difference between duplicates X1 and X2

Results of laboratory duplicate sample analyses by both onsite and offsite laboratories are discussed in the next few paragraphs followed by an evaluation of field duplicate sampling.

Laboratory Duplicates

Laboratory duplicates consist of consecutive analysis of selected field samples to evaluate laboratory precision. The onsite mobile laboratory subcontractor, TEG, analyzed laboratory duplicate samples at a frequency of approximately 10%. Table 5-2 presents the RPD values for laboratory duplicate samples analyzed by the onsite laboratory for lead, chromium, and WTPH. All calculated RPD values for laboratory duplicate samples met data quality objectives.

Matrix Spike/Matrix Spike Duplicate Analyses

MS/MSD samples are created by taking additional aliquots of the sample collected in the field and spiking at the laboratory with a known concentration of representative compounds of interest. This technique allows for the evaluation of the effect of matrix interference on the precision and accuracy of the data. Matrix interference is indicated when the spike compound recovery is inhibited but not affected in a blank. Spike recovery inhibition or enhancement in the spike blank usually indicates laboratory/instrument analysis bias. Since an MS/MSD usually represents one sample for the batch, no qualification of the sample data is employed beyond that sample unless other QC data suggests that the performance inhibition is broad based. For this to be true, surrogate recovery would have to be similarly affected for other samples. Decisions to further qualify data based upon spike recoveries requires professional judgement.

MS/MSDs were required to be analyzed by both onsite and offsite laboratories. MS/MSD samples analyzed by the onsite laboratory were within acceptable limits for lead, chromium, and WTPH analyses. Table 5-3 presents the calculated precision data for MS/MSD analyses by the onsite laboratory. A random check of MS/MSD sample results for the offsite laboratory indicate that for most results RPDs are within acceptable EPA QC limits for analytical data associated with the Hanford 1100-EM-2/EM-3 sites.

Field Duplicate Pairs

A field duplicate sample is a field replicate of the sample from an identical sampling point. Field duplicate results can provide information regarding sampling technique precision and matrix homogeniety. An evaluation of relative percent difference (RPD) values between positive contaminant values contained in both sample and sample duplicate is made, and the results are compared to previously accepted RPD criteria for sample collection precision for the matrix. RPD performance is highly matrix and method dependent therefore, a high degree of variability is usually indicated.

TABLE 5-2
RPD FOR LABORATORY DUPLICATE SAMPLES
ANALYZED BY ONSITE LABORATORY

Site	Sample	Analyte/RPD					
		Lead	RPD	Chromium	RPD	WTPH	RPD
Tar Flow Area	EM2/01-CM-002-015	8	13	NA		30	24
	EM2/01-CM-002-015 (DUP)	7		NA		38	
	EM2/01-CM-006-015	ND		NA		ND	
	EM2/01-CM-006-015 (DUP)	ND		NA		ND	
	EM2/01-CM-017-030	ND		NA		9	20
	EM2/01-CM-017-030 (DUP)	ND		NA		11	
	EM2/01-CM-021-075	ND		NA		ND	
	EM2/01-CM-021-075 (DUP)	ND		NA		ND	
	EM2/01-CM-031-015	8	0	NA		ND	
	EM2/01-CM-031-015 (DUP)	8		NA		ND	
	EM2/01-CM-042-030	ND		NA		ND	
	EM2/01-CM-042-030 (DUP)	ND		NA		ND	
	EM2/01-CM-052-020	6	29	NA		ND	
	EM2/01-CM-052-020 (DUP)	8		NA		ND	
	EM2/01-CM-065-100	ND		NA		23	0
	EM2/01-CM-065-100 (DUP)	ND		NA		23	
	EM2/01-CM-067-020	16	21	NA		ND	
	EM2/01-CM-067-020 (DUP)	13		NA		ND	
	EM2/01-CM-072-WC	NA		NA		1260	25
	EM2/01-CM-072-WC (DUP)	NA		NA		983	
	EM2/01-CM-081-045	7	13	NA		ND	
	EM2/01-CM-081-045 (DUP)	8		NA		ND	
	EM2/01-CM-085-020	9	11	NA		ND	
	EM2/01-CM-085-020 (DUP)	10		NA		ND	
	EM2/01-CM-095-075	10	10	NA		ND	
	EM2/01-CM-095-075 (DUP)	11		NA		ND	
	EM2/01-CM-120-070	ND		NA		ND	
	EM2/01-CM-120-070 (DUP)	ND		NA		ND	
	EM2/01-CM-127-055	ND		NA		ND	
	EM2/01-CM-127-055 (DUP)	ND		NA		ND	
	EM2/01-CM-130-045	ND		NA		ND	
	EM2/01-CM-130-045 (DUP)	ND		NA		ND	

TABLE 5-2 (Continued)
RPD FOR LABORATORY DUPLICATE SAMPLES
ANALYZED BY ONSITE LABORATORY

Site	Sample	Analyte/RPD					
		Lead	RPD	Chromium	RPD	WTPH	RPD
Tar Flow Area (continued)	EM2/01-CM-140-020	ND		NA		52	13
	EM2/01-CM-140-020 (DUP)	ND		NA		59	
	EM2/01-CM-145-060	ND		NA		ND	
	EM2/01-CM-145-060 (DUP)	ND		NA		ND	
	EM2/01-CM-150-015	ND		NA		ND	
	EM2/01-CM-150-015 (DUP)	ND		NA		ND	
	EM2/01-C-10-135	ND		NA		ND	
	EM2/01-C-10-135 (DUP)	ND		NA		ND	
1240 Suspect Spill Area	EM3/01-CM-011-010	6930	14	NA		NA	
	EM3/01-CM-011-010 (DUP)	6000		NA		NA	
	EM3/01-CM-018-WC	11	10	NA		NA	
	EM3/01-CM-018-WC (DUP)	10		NA		NA	
	EM3/01-CM-030-025	ND		NA		NA	
	EM3/01-CM-030-025 (DUP)	ND		NA		NA	
	EM3/01-CM-038-030	9	11	NA		NA	
	EM3/01-CM-038-030 (DUP)	10		NA		NA	
	EM3/01-CM-046-020	37	8	NA		NA	
	EM3/01-CM-046-020 (DUP)	40		NA		NA	
	EM3/01-CM-051-015	244	7	NA		NA	
	EM3/01-CM-051-015 (DUP)	261		NA		NA	
1240 French Drain	EM3/02-CM-005-WC	ND		ND		22,400	22
	EM3/02-CM-005-WC (DUP)	ND		ND		18,000	
	EM3/02-CM-010-320	ND		ND		39	
	EM3/02-CM-010-320 (DUP)	ND		ND		NA	
	EM3/02-CM-015-003	ND		ND		ND	
	EM3/02-CM-015-003 (DUP)	ND		ND		ND	
	EM3/02-CM-017-015	19	24	ND		ND	
	EM3/02-CM-017-015 (DUP)	15		ND		ND	

NA = Not Analyzed
ND = Not Detected
DUP = Duplicate Sample

TABLE 5-3
PRECISION AND ACCURACY DATA FOR MS/MSD SAMPLES ANALYZED BY THE ONSITE LABORATORY

Site	Type of Sample	Lead			Chromium			TPH		
		Spiked/Reported Concentration	%R	RPD	Spiked/Reported Concentration	%R	RPD	Spiked/Reported Concentration	%R	RPD
Tar Flow Area	MS MSD	250/245 250/263	98 105	7	NA[1] NA			100/88 100/97	88 97	10
	MS MSD	250/235 250/247	94 99	5	NA NA			100/110 100/102	110 102	8
	MS MSD	250/254 250/214	102 86	17	NA NA			100/95 100/104	95 104	9
	MS MSD	250/259 250/270	104 108	4	NA NA			100/90 100/89	90 89	1
	MS MSD	250/264 250/270	106 108	2	NA NA			100/106 100/102	106 102	4
	MS MSD	250/239 250/254	96 102	6	NA NA			100/108 100/94	108 94	14
1240 Suspect Spill Area	MS MSD	250/228 250/230	91 92	1	NA NA			NA NA		
	MS MSD	250/224 250/237	90 95	6	NA NA			NA NA		
1240 French Drain	MS MSD	250/245 250/268	98 107	9	250/271 250/280	108 112	3	100/102 100/114	102 114	11
	MS MSD	250/233 250/254	93 102	9	250/224 250/238	90 95	6	100/ 100/		
	MS MSD	250/224 250/248	90 99	10	250/217 250/215	87 86	1	100/ 100/		

[1] NA = not analyzed

TBL5-3/25Sep95/CDP

Acceptance criteria used for the soil field duplicates are as follows:

RPD $\leq$ 35% - Good field sampling precision
RPD $\leq$ 60% - Fair field sampling precision
RPD $\geq$ 61% - Poor field sampling precision

Field duplicate samples results, indicating significant dilution or variation in detection limits are not typically assessed. RPD values for field duplicate samples analyzed by the onsite and offsite laboratories are summarized in Table 5-4 and Table 5-5, respectively. RPD values were within acceptable agreement for most field duplicate samples analyzed by both the onsite and offsite laboratories. One onsite field duplicate had a calculated RPD of 82 for WTPH analysis. However, the reported level for WTPH concentrations in both samples was significantly lower than the practical quantitation goal established in the Remedial Action Work Plan and much lower than the site cleanup goal. All RPD values for offsite analytical laboratories were within acceptance criteria except for the WTPH analysis completed on the 1240 French Drain site. In this duplicate pair, one sample contained WTPH at 130 mg/kg while none was detected in the duplicate sample.

5.2.2 ACCURACY

Accuracy is a quantitative term that estimates the bias in a measurement system. Accuracy for the entire data collection activity is difficult to measure because several sources for error can exist. Errors can be introduced by any of the following:

- Sampling procedure
- Field contamination
- Sample preservation and handling
- Sample matrix
- Sample preparation
- Analytical techniques

Field sampling accuracy can be audited using field spiked samples, and laboratory accuracy can be audited using matrix spikes and surrogate recovery results.

Analyses of several types of QC samples provide data concerning the accuracy of laboratory results. Analytical data for the following types of QC samples were evaluated:

- Surrogate Spike Recoveries (organics analyses only)
- MS/MSD Recoveries
- Laboratory Control Sample Recoveries

TABLE 5-4
RPD FOR FIELD DUPLICATE SAMPLES
ANALYZED BY ONSITE LABORATORY

		ANALYTE (mg/kg)/RPD					
SITE	SAMPLE NO.	Lead	RPD	Chromium	RPD	WTPH	RPD
TAR FLOW AREA	EM-2/01-CM-011-045 EM-2/01-CM-012-045(DUP.)	7 6	15	NA NA		5 12	82
	EM-2/01-CM-040-030 EM-2/01-CM-041-030(DUP.)	10 8	22	NA NA		ND ND	
	EM-2/01-CM-087-180 EM-2/01-CM-088-180(DUP.)	9 10	11	NA NA		ND ND	
	EM-2/01-CM-098-180 EM-2/01-CM-099-180(DUP.)	16 14	13	NA NA		ND ND	
1240 SUSPECT SPILL AREA	EM3/01-CM-029-025 EM3/01-CM-030-025(DUP.)	ND ND		NA NA		NA NA	
	EM3/01-CM-037-030 EM3/01-CM-038-030(DUP.)	8 9	12	NA NA		NA NA	

ND = not detected
NA = not analyzed
DUP. = Duplicate Sample

TBL5-4/25Sep95/PAK

TABLE 5-5
RPD FOR OFFSITE LABORATORY
ANALYSIS OF FIELD DUPLICATE SAMPLES

		ANALYTE (mg/kg)/RPD							
SITE	SAMPLE NO.	VOCs	RPD	Lead	RPD	Chromium	RPD	WTPH	RPD
TAR FLOW AREA	EM2//01-C-01-185 EM2/01-C-02-185(DUP.)	NA NA		3.70 3.67	1	NA NA		10.4 9.39	10
1240 SUSPECT SPILL AREA	EM3/01-C-1-045 EM3/01-C-1-145(DUP.)	NA NA		3.96 3.79	4	NA NA		NA NA	
1240 FRENCH DRAIN	EM-3/02-C-01-200 EM3/02-C-02-200(DUP.)	NA NA		4.53 3.66	21	6.05 6.35	5	130 <100	
1262 SOLVENT TANKS	EM3/06-C-01-335 EM3/06-C-02-335(DUP.)	ND ND		0.193 0.154	22	NA NA		NA NA	

NA = not analyzed
DUP. = Duplicate Samples
ND = not detected

TBL5-5/04/12/95/CDP

Surrogate Spike Recoveries

Surrogate spikes are not required for the analytical methods conducted by the onsite laboratory. Based on a limited review of the offsite laboratory data, surrogate recoveries were within acceptable limits for the organic compound analyses performed by offsite laboratory.

Matrix Spike/Matrix Spike Duplicate Recoveries

All MS/MSD recoveries for onsite laboratory analyses were within acceptable limits. The majority of offsite laboratory MS/MSD recoveries also were within acceptable QC limits. Exceptions included lead analysis recoveries for confirmation samples and semivolatile organic compound analyses for waste characterization samples.

Lead analyses for confirmation samples from both the Tar Flow Area and the 1240 Suspect Spill Area were analyzed in a single batch. Lead recovery in the MS/MSD samples for this batch (21.2 and 22.7 percent, respectively) were below the method acceptance criteria (72 to 124 percent). The most probable cause for the low recoveries is a matrix interference in the spiked sample material. Other QC parameters, including initial and continuing calibration samples, method blanks, and standard matrix spike, were within acceptable limits. These QC data suggest that the lead results for these samples may be slightly biased toward lower concentrations. A minor bias in these data is not considered significant due to the low concentrations of lead reported. Samples in this batch all had reported lead values of less than 10 mg/kg. The cleanup criterion was 250 mg/kg.

Semivolatile organic compound recoveries were, in the case of many analytes, slightly higher than the range indicated on the sample data package QC summary checklist. However, the ESE checklists utilize more stringent EPA Contract Laboratory Program (CLP) acceptance criteria than are required by SW-846 Method 8270. The reported high recoveries are most likely due to differences in extraction method (Soxhlet versus sonication) and are within SW-846 method requirements.

Laboratory Control Sample Recoveries

Laboratory control samples were analyzed by the offsite laboratories but not by the onsite laboratory. In offsite laboratory analyses, precision goals were also achieved in nearly all instances. ESE sample data package QC summary checklists for semivolatile organic compound analyses (SW-846 Method 8270) in waste characterization samples indicate that standard matrix spike recoveries were slightly above the acceptance range. As with the matrix spike analyses discussed above, the standard spike recoveries were within the SW-846 method acceptance criteria and can probably be attributed to greater extraction efficiencies.

5.2.3 SENSITIVITY

The achievement of method detection limits depends on instrument sensitivity and matrix effects. Therefore, it is important to monitor the sensitivity of data-gathering instruments to ensure the data quality through constant instrument performance. Instrument sensitivity can be monitored through the analysis of method blanks and assessment of detection limits.

Method Blanks

SW-846 defines a method blank as an analyte-free matrix to which reagents are added in the same values or proportions as used in sample processing. The method blanks should be carried through the complete sample preparation and analytical procedure. The blank is used to document any contamination resulting from the analytical process.

A limited evaluation of method blank analytical data from offsite laboratory analyses indicates that method blank results were acceptable. In onsite analyses, no analytes were detected in any method blank.

Method Detection Limits

Method detection limits vary with analytical method, matrix type, and concentration of interfering contaminants. The method detection limits presented in the Remedial Action Work Plan establish goals for all samples collected and submitted to the onsite and offsite analytical laboratories for analysis.

Method detection limits were achieved for most analytes in all onsite and offsite analyses. Detection limits achieved by the onsite laboratory were consistently lower than the goals identified in the work plan. Quantitation goals were also met for all organic compound and radiologic analyses conducted by the offsite laboratories.

Metals analyses conducted by the offsite laboratories met quantitation goals in most instances. However, analyses of some metals, specifically arsenic, cadmium, mercury, and silver failed to meet data quality objectives for waste characterization samples. The quantitation goals identified in the QAPjP for these analytes were incorrectly established based on SW-846 7000 series methods while the samples were analyzed by SW-846 Method 6010. It should be noted that in all cases actual detection levels achieved were substantially lower than regulatory action levels and that these analytes had not been previously identified as contaminants of concern for these sites.

5.2.4 COMPLETENESS

Completeness is defined as the percentage of measurement data usable for the intended purposes. It estimates the amount of valid data from a measurement system required to achieve a particular statistical level expected under correct, normal conditions in order to meet project data goals.

The level of completeness goal for this project was defined as 90%. It is not possible to calculate the precise level of completeness achieved based on the limited nature of the data validation conducted. However, this limited review suggests that the level of completeness achieved for both onsite and offsite analytical data exceeded this goal.

5.2.5 COMPARABILITY

Comparability is a qualitative term that expresses the confidence with which one data set can be compared with another. Strict adherence to standard sample collection procedures, analytical detection limits, quantitation value units, and analytical methods assures that data from like samples and sample conditions are comparable. This comparability is independent of laboratory personnel, data reviewers, and sampling personnel. Comparability criteria are met for the project if DQOs described in this document are achieved, or defined to show that variations did not affect the values reported.

To assure comparability of data generated for the Hanford 1100-EM-2/EM-3 sites, CDM Federal utilized standard procedures, such as standard operating procedures for field activities and EPA-approved analytical methods. Utilizing such procedures and methods enables current data to be comparable to previous data sets generated by the same methods. Additionally, future data sets generated, utilizing standard methods of analysis, will be comparable to this data. Data available through the field activities allows for comparisons to established cleanup requirements (federal and state) for the 1100-EM-2/EM-3 sites.

5.2.6 REPRESENTATIVENESS

Representativeness is a qualitative term that expresses the degree to which sample data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It estimates the effectiveness of the sampling scheme and indicates whether sufficient samples were collected at the appropriate sampling locations.

Analytical results from field equipment rinsate blanks provide an additional indication of data representativeness. Rinsate blank results indicate whether cross-contamination of samples may have occurred, potentially affecting representativeness. Rinsate analytical data indicates that no target analytes were present within rinsate samples, with the exception of acetone detected at 36 µg/kg within rinsate sample EB-EM-3/06-C-10-274. Detection of this analyte suggests that it may have been present in the water used in the field for equipment decontamination or that it may be a result of cross-contamination in the laboratory. Detection of this compound has no impact on the usability of the data for their intended purpose.

Samples collected at each site are intended to be representative of that respective site. Sampling procedures identified in the Remedial Action Work Plan (CDM Federal 1995a) and the Remediation Design and Remedial Action Plan (USACE 1994a) were followed explicitly to assure representative samples were collected and sampling procedures were consistent with QC

protocol. Significant deviations to the procedures outlined in these documents are described in Section 5.3.

5.3 DEVIATIONS FROM FIELD PROCEDURES

Methods and procedures employed in the field during the Hanford 1100-EM-2/EM-3 remediation followed the Remedial Action Work Plan (CDM Federal 1995a) and the Remediation Design and Remedial Action Plan (USACE 1994a). Significant changes in technical approach (e.g., the decision not to use the mobile laboratory for screening analyses at the 1262 Solvent Tanks site) were made and documented in the field at the direction of or with the concurrence of USACE site representatives. A summary of these deviations with respect to the Tar Flow Area, 1240 Suspect Spill Area, and 1240 French Drain is provided in Table 5-6. Deviations during the remediation of the 1262 Solvent Tanks site are described in Appendix A.

5.4 USACE QA LABORATORY DATA

The USACE NPD Laboratory served as the QA laboratory for this project. The NPD laboratory analyzed four rinsate samples and four soil samples (splits of confirmation samples). NPD also reviewed the data packages generated by CDM Federal's subcontracted laboratories. A QAR prepared by the NPD laboratory is summarized below and included in Appendix E.

The majority of analytical data submitted by CDM Federal subcontracted laboratories were judged as acceptable by the NPD laboratory. Several organic contaminants detected at low concentrations were determined to be the result of laboratory contamination. These contaminants were acetone (in the rinsate blank sample from the 1262 Solvent Tanks Site), methylene chloride (in one waste characterization sample from the 1240 Suspect Spill Area), and Bis-(2-ethylhexyl)phthalate (in the waste characterization samples from the Tar Flow and 1240 French Drain). The QAR states that the lead values reported for the confirmation samples from the 1240 Suspect Spill Area and the 1240 French Drain sites should be considered low estimates due to low percent recoveries in QC samples. However, it should be noted that lead values reported for these samples were approximately two orders of magnitude below the lead cleanup criterion of 250 mg/kg. Finally, the QA laboratory claims that the integrity of sixteen WTPH soil samples and an accompanying rinsate could have been compromised due to cooler temperatures 2°C below the recommended range.

5.5 DATA USABILITY SUMMARY

Based on a limited review of analytical data generated by the TEG onsite laboratory and the ESE and SAS offsite laboratories, and an evaluation of the USACE QAR, these data meet the basic requirements outlined in the Remedial Action Work Plan (CDM Federal 1995a). In order to develop a more definitive description of data usability, a more extensive review would be required. Overall, the data should be considered acceptable for their intended use associated with this project.

TABLE 5-6
DEVIATIONS FROM FIELD PROCEDURES

Location of Requirement	Requirement	Deviation
Remedial Action Work Plan, 3.1, 4.2.2	Radiation surveys were to be conducted by a Westinghouse Hanford Company (WHC) Health Physics Technician (HPT) during initial excavation at each of the EM-3 sites.	The WHC HPT conducted initial surveys at the 1240 French Drain site. USACE HPT, Dave Stanton, conducted radiation surveys at the other EM-3 sites as appropriate.
Remedial Action Work Plan, 4.2.1	A measured grid was to be established at each of the 1100-EM-2/EM-3 sites for sampling purposes.	At both the 1240 French Drain and the 1262 Solvent Tanks site, excavations were too deep for entry of sampling personnel. Samples were collected from the base and walls of the excavations using the trackhoe.
Remedial Action Work Plan, 4.2.2	Onsite mobile laboratory services were to be used for analysis of screening samples at each of the 1100-EM-2/EM-3 sites.	Following receipt of analytical data demonstrating the lack of hazardous materials in the 1262 Solvent Tanks, and given the negative response of field instruments during tank excavation, USACE determined that the mobile laboratory would not be necessary at that site.
Remedial Action Work Plan, 4.4.1	The Work Plan indicated that two waste characterization samples would be collected from contaminated soil stockpiles each site.	Based on the lack of any evidence of soil contamination at the 1262 Solvent Tanks site, USACE directed that no waste characterization samples be collected.
Remedial Action Work Plan, 4.3.3	Waste materials from within the 1262 Solvent Tanks were to be containerized for offsite treatment and/or disposal.	Analysis of samples of the fluids contained in the 1262 Solvent Tanks indicated that no hazardous constituents were present. At the direction of the USACE, and with concurrence from regulatory agencies, waste fluids from the tanks were discharged to a sanitary sewer access near the site.
Remedial Action Work Plan, 4.4.2	Chain-of-custody procedures in CDM Federal SOP 1-2 were to be followed for all onsite and offsite samples collected.	At the direction of USACE, and in an attempt to speed the response of the onsite analytical laboratory, 10 screening samples were submitted to the onsite laboratory without chain of custody documentation. The samples submitted were: EM-2/01-CM-43 and EM-2/01-CM-44 EM-2/01-CM-70 through EM-2/01-CM-77
Quality Assurance Project Plan, 9.1	Blind duplicate samples were to be submitted to the onsite laboratory at an approximate frequency of 1 in 20.	Actual frequency of duplicate samples submitted to the onsite laboratory was approximately 1 in 40. Fewer QC samples were submitted in order to make best use of the limited throughput of the onsite laboratory.

6.0 CONCLUSIONS

A brief discussion of findings is presented below.

6.1 SUMMARY OF FINDINGS

Soil remediation, removal of the USTs, and backfilling at the four Hanford 1100-EM-2/EM-3 sites was accomplished between June 22 and July 18, 1995. The target contaminants and approximate volumes of contaminated soils excavated and stockpiled at each of the three sites where soil remediation occurred are summarized below:

Tar Flow Area - 1,155 cubic meters (1,500 cubic yards) of soils primarily contaminated by TPH.

1240 Suspect Spill Area - 69 cubic meters (90 cubic yards) of soils primarily contaminated by lead.

1240 French Drain - 98 cubic meters (75 cubic yards) of soils primarily contaminated by TPH.

Contaminated soils were excavated based on visible contamination and on the results of screening analyses conducted at an onsite laboratory. Excavation to a maximum depth of 270 cm (8.9 ft) was necessary to remove contaminated soil at the Tar Flow Area. At the 1240 Suspect Spill Area, contaminated soils were removed from depths of 25 to 40 cm (10 to 16 in). At the 1240 French Drain, contaminated soils were removed up to 550 cm (18 ft). Soils were stockpiled on 10 mil plastic sheeting and secured with heavy gauge tarps pending transportation and treatment or disposal offsite.

At the 1240 Solvent Tanks, the contents of the USTs were sampled and characterized. Once the analytical results demonstrated the absence of hazardous constituents in either UST, the contents of the north UST were pumped into a nearby sanitary sewer. The minimal water in the south UST was not removed. The USTs were removed from the ground and disposed of by a recycling facility. The excavated soil above and surrounding the USTs had no indication of contamination and was used as backfill for the excavation.

Analytical data generated by the onsite laboratory is summarized in Appendix B. Results of confirmatory sample analyses conducted by an offsite laboratory are outlined in Tables 4-1 through 4-3 and Appendix A. Data from the offsite analysis of waste characterization samples are presented in Appendix C.

6.2 DISPOSITION OF CONTAMINATED SOILS

Loading, transportation, and disposal of contaminated soils from the Tar Flow Area, the 1240 Suspect Spill Site, and the 1240 French Drain were accomplished by CDM Federal and CWM, a subcontractor, between September 13, 1995, and September 21, 1995. A total of 2215 tons of petroleum-contaminated soils were removed from the Tar Flow Area and disposed at the CWM

Columbia Ridge Landfill Facility in Arlington, Oregon. The total quantity of lead-contaminated soil removed from the 1240 Suspect Spill Area was approximately 139 tons (based on portable scale weights). Because a waste characterization sample collected from these soils failed the TCLP criterion for lead, these wastes required solidification prior to disposal. The wastes were solidified and disposed at a CWM Subtitle C hazardous waste landfill also located in Arlington, Oregon. Based on analytical results from waste characterization samples, the approximately 228 tons (based on portable scale weights) of soil removed from the 1240 French Drain contained petroleum contamination and low concentrations of lead and chromium. However, TCLP criteria were not exceeded. These materials were disposed at the CWM Subtitle C hazardous waste landfill facility in Arlington, Oregon, with no solidification required.

7.0 REFERENCES

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U.S. Army Corps of Engineers (USACE). 1994c. Remedial Design Field Sampling Plan for the 1100 Area, Hanford Site; USACE, Walla Walla, Washington.

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APPENDIX A

UNDERGROUND STORAGE TANK DECOMMISSIONING REPORT

BUILDING 1262 SOLVENT TANKS

HANFORD 1100 AREA

RICHLAND, WASHINGTON

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Underground Storage Tank Decommissioning Report
Building 1262 Solvent Tanks
Hanford 1100 Area
Richland, Washington

Prepared for

CDM Federal Programs Corporation
1010 Jadwin Avenue
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HLA Project No. 32133

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B UST Disposal Certificate And Shipping Order
C Analytical Reports For Site Assessment Sampling
D Washington Department Of Ecology Forms: UST Permanent Closure And Site Assessment Notice
UST Site Check/Site Assessment Checklist

DISTRIBUTION

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1.0 INTRODUCTION AND BACKGROUND

This report was prepared by Harding Lawson Associates (HLA) to document the activities completed during the decommissioning and site assessment sampling of two underground storage tanks (USTs) at Building 1262 (the site) in the Hanford Reservation 1100 Area in Richland, Washington. HLA provided the services of a Washington-licensed UST decommissioning supervisor and Washington-registered site assessor to act as the field team leader and to oversee and direct the field decommissioning process.

HLA's work was performed under subcontract to CDM Federal Programs Corporation (CDM Federal) according to Subcontract No. 6110-CS-9999-01 and pursuant to Prime Contract No. DACW68-94-D-0001 between the U.S. Army Corps of Engineers (USACE) and CDM Federal.

The former location of the Building 1262 solvent tanks is within the EM-3 operable unit of the Hanford 1100 Area (Figure 1). The 1100 Area was placed on the National Priorities List in July 1989. The Building 1262 site is one of several areas of environmental concern within EM-3.

In the 1940s, Building 1262 served as a military dry cleaning plant. Site plans (plumbing drawing #36-04-35 and equipment layout drawing #36-04-31) showed that as many as four USTs, previously used to store dry cleaning solvents, may have been present. It is believed that dry cleaning activities at that location ceased sometime in the mid to late 1940s. The building was renovated and currently provides office space for Hanford employees.

On July 19, 1994, a geophysical survey (by Golder Associates), using ground-penetrating radar, magnetometry, and radiodetection methods was performed around Building 1262 to evaluate the potential presence of the solvent tanks. Two tank-like objects and associated piping were identified near the west side of Building 1262. These objects coincided with the location of two 1,125-gallon solvent tanks shown on the site equipment layout drawing (Figure 2). There were no surface features, such as fill pipes or vent pipes, to confirm the presence of the tanks. Because of their association with the dry cleaning plant, it was assumed that the tanks were used to store tetrachloroethene (PCE). PCE is also commonly known as perchloroethene (PERC). It was not known if the tanks were used to store other substances following closure of the dry cleaning plant.

Prior to the start of the field decommissioning activities, a work plan[1], which included a quality assurance project plan and site safety and health plan, was prepared by CDM Federal as a guidance and control document for the work.

In addition to HLA, several other subcontractors provided field services during the UST decommissioning process:

- Burdine Enterprises (Burdine) served as the excavation contractor. Burdine was responsible for excavating and removing the tanks, loading the tanks for offsite disposal, maintaining the soil stockpiles, and maintaining the security fencing.
- Chemical Waste Management, Inc.(CWM), was responsible for opening and inerting the tanks, sampling their contents, removing the contents for disposal, and cleaning and disposing of the tanks.
- Project samples were submitted to three laboratories for analysis:
  - Environmental Science & Engineering, Inc. (Gainesville, Florida)
  - Sound Analytical, Inc. (Fife, Washington)
  - USACE North Pacific Division Laboratory (Troutdale, Oregon)

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1 *Remedial Action Work Plan, Removal and Stockpiling of Contaminated Soil and Removal of Underground Storage Tanks, EM-2 and EM-3 Operable Units, Hanford 1100 Area, Washington*, prepared for the U.S. Army Corps of Engineers by CDM Federal Programs Corporation, June 14, 1995

2.0 SITE DESCRIPTION

Building 1262 is part of a group of office and warehouse buildings that support the U.S. Department of Energy activities at Hanford. As shown in Figure 1, there is little current development around this group of buildings. The north Richland infiltration ponds and well field for the City water supply system is located immediately to the east. The areas to the north, west, and south are generally flat lying. Land elevations to the east drop about 15 meters (50 feet) between Building 1262 and the Columbia River (a distance of about 1,220 meters [4,000 feet]).

The surface geology around Building 1262 consists of proglacial cataclysmic flood gravels deposited in the late Pleistocene and Holocene time.[2] During the UST decommissioning excavation activities, the soils encountered were a mixture of gravelly, fine to medium sands and well-graded, sandy, coarse gravels, both with up to about 30 percent rounded cobbles and small boulders.

Groundwater was not encountered during the excavation activities. The elevation of unconfined groundwater in this area roughly approximates that of the nearby Columbia River or about 15 to 18 meters (50 to 60 feet) below ground surface near Building 1262.[2]

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2 *Site Characterization Plan, Reference Repository Location, Hanford Site, Washington*, Consultation Draft, Chapter 1 - Geology, and Chapter 3 - Hydrology, U.S. Department of Energy, January 1988.

3.0 FIELD ACTIVITIES AND LABORATORY RESULTS

A phased approach was used to conduct the UST decommissioning process. During the first phase, the tanks were uncovered, opened, and the contents sampled for waste characterization. During the second phase, the contents of the tanks were pumped out, the tanks were removed from the ground and cleaned, and the tanks were transported to a local scrap-metal yard for recycling.

3.1 Phase One Activities

Following the location and marking of underground utility lines, the approximate UST locations were identified based on information from the geophysical survey. The field team, which consisted of personnel from CDM Federal, Burdine, CWM, HLA, and representatives from the USACE, mobilized on June 22, 1995.

Security fencing was installed around the work area and work zones (consisting of an exclusion zone, a contamination reduction zone, and a support zone) were set up to provide access control and for health and safety surveillance. A kickoff meeting was held onsite to review the planned field procedures and discuss health and safety issues. Level D (modified) personal protective equipment was designated for the work and was contingent upon the results of ambient air monitoring in the work zones.

A trackhoe was used to remove concrete curbing, asphalt pavement, and sod from over the excavation area. This material was loaded into a dump truck and hauled to a landfill on the Hanford Reservation. Soil overlying the tanks was then removed to expose the tops of the two tanks. The tops of the tanks were located about one meter (three feet) below ground surface. Excavated soils were stockpiled on 10-mil poly film, which was laid over the asphalt pavement of the adjacent parking areas. Two stockpiles were necessary to accommodate the volume of soil excavated.

As the soil was excavated, it was monitored for the presence of volatile organic compounds (VOCs) and potentially explosive vapors using a photoionization detector (PID) and a combustible gas meter (CGM). No readings exceeded 0.0 parts per million (ppm) on the PID or zero percent lower explosive level (LEL) on the CGM. Soil around the top of the tanks was evaluated by USACE personnel for the presence of radionuclides using a beta/gamma probe. No readings exceeded the background count of 0 to 150 counts per minute. After soil was cleaned from the tops of the tanks, piping openings in the tops of the tanks were monitored and yielded readings between 0.0 and 2.0 ppm on the PID and zero percent LEL on the CGM.

For identification purposes, the tanks were designated the "north tank" and the "south tank." Both were apparently of identical construction and of somewhat unusual shape. The tanks were designed to be installed vertically, i.e., with a vertical long axis. They were cylindrical in section with a flat top and cone-shaped bottom. A manway opening with a bolt-on cover and several piping openings were provided at the top. The tanks had the following approximate dimensions: diameter - 1.52 meters (60 inches), length of cylindrical section - 2.33 meters (92 inches), length of cone section - 0.45 meters (18 inches). This represents a volume of about 4,540 liters (1,200 gallons). The tanks were installed 1.75 meters (69 inches) apart.

When the manways were opened, it was discovered that the north tank was completely full of water. This water presumably collected by gradual infiltration (perhaps via the tank piping) from the sprinkler system used for irrigating the overlying lawn. The south tank was empty except for a few centimeters of water in the bottom. The atmospheres inside both tanks were checked for the presence of VOCs, oxygen, and combustible vapors using the field instruments. VOC concentrations up to 2.0 ppm were momentarily detected within the tank openings, but these levels quickly dissipated. Oxygen levels were normal (about 21 percent) and the LEL was zero percent within the tanks.

On June 23, 1995, CWM personnel collected water samples from both tanks for VOC analyses. Following sampling, the tops of the tanks were covered with 10-mil poly film, the excavation sidewalls were sloped to prevent caving, and the soil piles were covered with heavy tarps to minimize the potential for blowing dust. The field team then demobilized until an evaluation of the water analytical results could be completed.

The samples were transported to Sound Analytical (Fife, Washington) and analyzed for the presence of VOCs using EPA Method 8240. Results showed that no analytes exceeding the method detection limits were detected. One tentatively identified compound, tridecane, was detected in both samples at estimated concentrations of 13 ppb (north tank) and 17 ppb (south tank). The analytical report for these analyses is presented in Attachment A.

3.2 Phase Two Activities

Following evaluation of the VOC analytical results, the field team returned to the site on July 10, 1995, to complete the decommissioning activities.

Because no VOC compounds were identified in the tank water samples, permission was obtained by the USACE from the City of Richland to pump the water into the City sanitary sewer system. An electric submersible pump was used to transfer the water (about 4,500 liters [1,190 gallons]) from the north tank to the nearest sanitary sewer access, which was through a manhole along U Street about 30 meters (100 feet) south of the tanks.

The atmosphere inside each tank was checked using the PID and CGM to evaluate the potential presence of a hazardous vapors. VOC measurements were 0.0 ppm, oxygen levels were normal, and the LEL was zero percent at all levels within the tanks.

Because the tanks had no lifting lugs, an acetylene cutting torch was used to create openings around the tops of the tanks for installation of rigging shackles. Additional soil was then removed from around the tanks and the tanks were lifted from the excavation and laid on poly film next to the north soil stockpile. According to PID measurements, no VOCs were detected in the soils excavated from around the tanks.

A visual inspection of the tanks showed that there were no holes or obvious signs of corrosion. The tanks appeared to be in generally good condition. CWM personnel used a reciprocating saw to remove part of the cone end of each tank to facilitate cleaning. Both tanks were triple rinsed. About 38 liters (10 gallons) of wash water was collected and was poured on the north soil stockpile for disposal. A small quantity of sediment and rusty scale from the tank bottoms was placed with the asphalt and concrete debris for disposal at a Hanford landfill. The exterior of each tank was marked with paint to indicate the date of removal, previous contents, and a warning that the tanks should not be reused for food product storage. Tank piping protruding into the excavation was sawed off.

On July 11, 1995, the tanks were loaded on a flatbed truck and transported by Twin City Metals, Inc., to their scrap metal facility in Kennewick, Washington, for recycling. A disposal certification and a shipping order for the tanks was prepared by CWM and are presented in Attachment B.

3.3 Site Assessment Sampling and Analyses

Following removal of the tanks, site assessment sampling was performed to evaluate the potential presence of VOCs in the soils around and below the tank locations. Ten soil samples were collected from the excavation on July 10 and 11, 1995. Because of the depth to the bottom of the excavation (3 to 3.5 meters[10 to 11.5 feet]), the trackhoe was used to obtain all soil samples.

The soil samples were collected from the bucket of the trackhoe using decontaminated stainless steel trowels. The sand fraction of the soil was preferentially sampled (as opposed to the gravel,

cobble, and boulder fraction) and was tightly packed into 250 milliliter jars. All pertinent sample information was recorded on the sample labels and chain of custody records. Immediately following collection, each sample was placed in an iced cooler for storage.

One sample was collected from each sidewall and six samples were collected from the floor of the tank excavation. The sample locations are shown in Figure 2. Each sample was assigned three sample identification numbers: a Hanford Environmental Information System number (HEIS), a CDM Federal identification number (CDM Federal), and an Environment Science and Engineering laboratory number (ESE). The sample numbers are cross referenced as follows:

HEIS	CDM Federal	ESE
Excavation Soil Samples:		
BOG4J1	EM3/06-C-01-335	HANEM3S6*1
BOG4J2	EM3/06-C-02-335	HANEM3S6*2
(BOG4J2 is a duplicate of BOG4J1)		
BOG4J3	QA-EM3/06-C-01-335	---
BOG4J4	EM3/06-C-03-335	HANEM3S6*3
BOG4J5	EM3/06-C-04-366	HANEM3S6*4
BOG4J6	EM3/06-C-05-245	HANEM3S6*5
BOG4J7	EM3/06-C-06-245	HANEM3S6*6
BOG4J8	EM3/06-C-07-245	HANEM3S6*7
BOG4J9	EM3/06-C-08-366	HANEM3S6*8
BOG4K0	EM3/06-C-09-366	HANEM3S6*9
BOG4K1	EM3/06-C-10-274	HANEM3W6*10
Equipment Rinsate Sample:		
BOG4K2	EM3/06-C-10-274	HANEM3W6*1

The HEIS and CDM Federal numbers are used in Figure 2 to show the soil sample locations. For quality control, sample BOG4J2 was collected as a duplicate of sample BOG4J1 and sample BOG4K2 was an equipment rinsate blank. BOG4J3, a split sample of BOG4J1, was submitted for quality assurance analysis by the USACE laboratory as noted below. Commercially bottled distilled water was used for the rinsate sample.

Based on field screening results for the presence of VOCs in the stockpiled soils, the USACE directed that no stockpile samples be collected for analysis.

The samples were packed in an iced cooler and transported by express mail to the ESE laboratories in Gainesville, Florida. Sample BOG4J3 was sent to the USACE North Pacific Division Laboratory in Troutdale, Oregon. Standard chain of custody procedures were followed. The chain of custody records are included with the analytical reports in Attachment C. Each sample was analyzed for the presence of VOCs by EPA Method 8240. Selected samples were also screened for the presence of alpha/beta particle emissions.

3.4 Laboratory Results

Results of the analyses showed that, for the soil samples, none of the VOC analytes exceeded the method detection limits. For the equipment rinsate blank, none of the VOC analytes exceeded the method detection limits with the exception of acetone. Acetone was detected at a concentration of 36 micrograms per liter. HLA assumes that this compound was either present in the distilled water used for the blank or was the result of cross-contamination in the laboratory. Results of the alpha/beta screening indicated zero to very low emission levels.

The laboratory report for the site assessment analyses is presented in Attachment C.

3.5 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) protocols and procedures were implemented during the field and laboratory activities of this project. These were documented in the Remedial Action Work Plan, the Quality Assurance Project Plan[3], applicable CDM Federal standard operating procedures, and the ESE standard operating procedures. Four deviations from the protocols and procedures were documented during the UST decommissioning activities. These are presented in Table 1.

Duplicate and equipment rinsate samples were collected as field QC samples during the site

3 *Quality Assurance Project Plan, Removal and Stockpiling of Contaminated Soil and Removal of Underground Storage Tanks, EM-2 and EM-3 Operable Units, Hanford 1100 Area, Washington*, prepared for the U.S. Army Corps of Engineers by CDM Federal Program Corporation, June 1995.

assessment sampling. As noted in Section 3.3 of this report, sample number BOG4J2 was a duplicate of BOG4J1. BOG4J3, a split sample of BOG4J1, was sent for analysis to the USACE laboratory in Troutdale, Oregon, which served as the QA laboratory for the project. The laboratory decided not to analyze BOG4J3, however, because of excessive headspace in the sample container. Sample number BOG4K2 was the rinsate sample. QC analyses performed by the analytical laboratories included method blanks, blanks/spikes, surrogates, matrix spikes and matrix spike duplicates, laboratory duplicates, and calibration analyses. All analyses of field samples were performed to meet EPA QC Level III data requirements with the exception of BOG4J1, which was performed to meet EPA QC Level IV data requirements.

An evaluation of the field and laboratory QC sample results are presented in *Draft Remedial Action Close-Out Report for Removal and Stockpiling of Contaminated Soil and Removal of Underground Storage Tanks, EM-2 and EM-3 Operable Units, Hanford 1100 Area, Washington*, by CDM Federal, dated August 11, 1995. The analytical results from the USACE laboratory were not available for review prior to the issue of that report.

3.6 Excavation Closure

Based on field screening data and results of the site assessment sampling, no release of VOCs from the USTs was indicated. The excavation was subsequently backfilled and compacted. The stockpiled soils provided most of the backfill and was supplemented by imported pit-run fill material. Further restoration work was completed to return the area to its previous appearance and configuration.

To conclude the decommissioning process, a UST Temporary/Permanent Closure and Site Assessment Notice was prepared by HLA and issued to the USACE for submittal to the Washington Department of Ecology (Ecology). A UST Site Check/Site Assessment Checklist was also prepared by HLA for submittal to Ecology along with a copy of this report, which will serve as the site check/site assessment report. Copies of the Notice and the Checklist are presented in Attachment D.

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4.0 CONCLUSIONS

Based on the UST decommissioning activities described in this report, HLA offers the following conclusions:

- Two former dry cleaning solvent USTs, of approximately 1,125 gallons capacity each, were located near the west side of Building 1262.
- These tanks were excavated and removed as part of the decommissioning activities described in this report and recycled as scrap steel at the Twin City Metals facility in Kennewick, Washington.
- Based on the results of field observations, field soil screening (using a PID), and site assessment sampling, it appears that no VOCs were present in the soils of the tank excavation.
- It appears that the Washington Department of Ecology requirements for clean closure have been met and that no remediation or further investigative actions are anticipated.

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FIGURES

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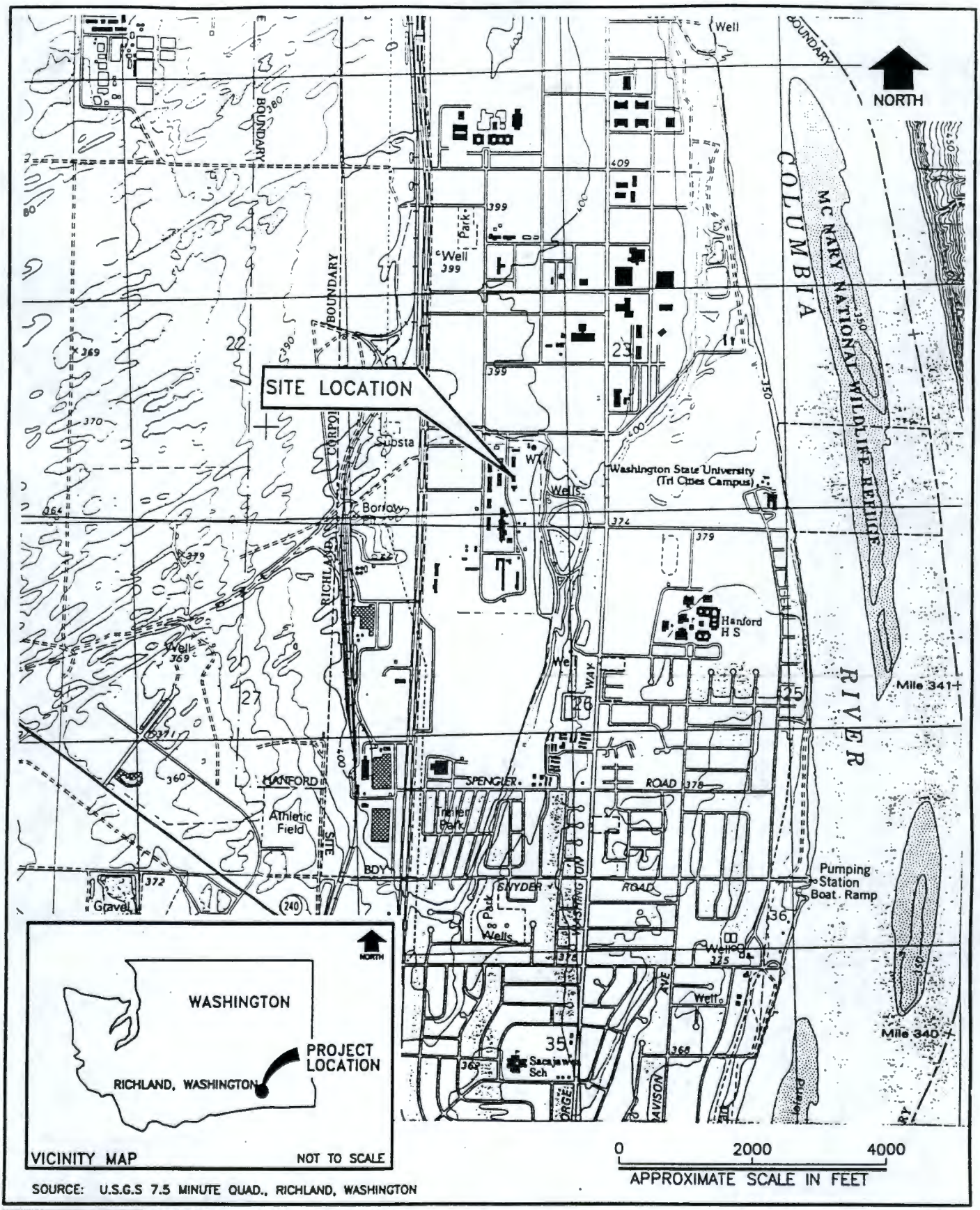


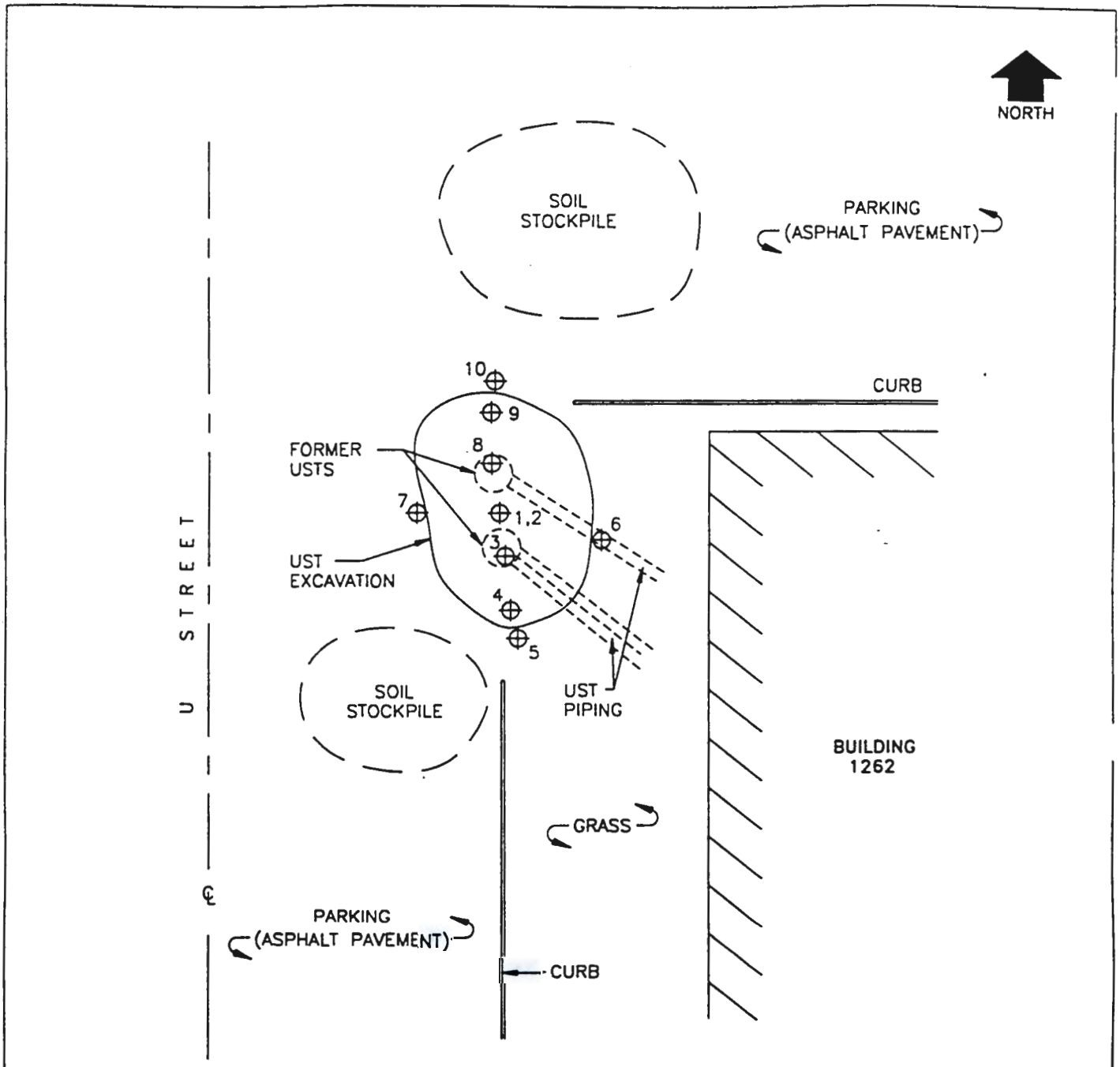
SOURCE: U.S.G.S 7.5 MINUTE QUAD., RICHLAND, WASHINGTON

HARDING LAWSON ASSOCIATES
Engineering and Environmental Services

Site Vicinity Map
Building 1262 Solvent Tanks
Hanford 1100 Area
Richland, Washington

FIGURE 1

DRAWN	JOB NUMBER	APPROVED	DATE	FILE NAME
DC	32133	DML	8/95	540d



SOIL SAMPLE LOCATION	HEIS SAMPLE NUMBER*	CDM FEDERAL SAMPLE NUMBER**	SAMPLE DEPTH BELOW GRADE(m)
1	BOG4J1	EM3/06-C-01-335	3.0
2	BOG4J2	EM3/06-C-02-335	3.0
3	BOG4J4	EM3/06-C-03-335	3.4
4	BOG4J5	EM3/06-C-04-366	3.7
5	BOG4J6	EM3/06-C-05-245	2.4
6	BOG4J7	EM3/06-C-06-245	2.4
7	BOG4J8	EM3/06-C-07-245	2.4
8	BOG4J9	EM3/06-C-08-366	3.7
9	BOG4K0	EM3/06-C-09-366	3.7
10	BOG4K1	EM3/06-C-10-274	2.7

* HANFORD ENVIRONMENTAL INFORMATION SYSTEM SAMPLE NUMBER
** CDM FEDERAL PROGRAMS CORPORATION SAMPLE NUMBER

HARDING LAWSON ASSOCIATES
Engineering and Environmental Services

Site Plan
Building 1262 Solvent Tanks
Hanford 1100 Area
Richland, Washington

FIGURE 2

DRAWN	JOB NUMBER	APPROVED	DATE	FILE NAME
DC	32133	DML	8/95	540d

TABLES

DRAFT

Table 1. Deviations From Field Procedures

Location of Requirement	Requirement	Deviation
Remedial Action Work Plan 4.3.3 - Product Transfer Procedures	The contents of the solvent tanks were to be transferred to drums for offsite disposal.	No VOC analytes exceeding the analytical method detection limits were detected in samples of the contents (water) from the USTs. Therefore, the UST water was pumped to the nearest accessible sanitary sewer inlet for disposal.
Remedial Action Work Plan 4.4.2 - Onsite Laboratory Analyses	An onsite laboratory was to be used to guide the excavation of contaminated soil.	No evidence of VOCs was encountered during the excavation of soil from around the USTs. No contaminated soil was identified. Therefore, use of the onsite laboratory was not needed.
Remedial Action Work Plan 4.4.1 - Sample Collection	Confirmatory soil samples were to be collected at the nodes of a sampling grid established over the UST excavation.	A functional sampling grid could not be established because of the depth of the UST excavation (up to 3.7 meters) and the necessity of using the trackhoe to obtain the samples. Therefore, grab samples were collected from the four sidewall and five bottom locations within the excavation to provide adequate areal coverage.
Remedial Action Work Plan 4.4.1 - Sample Collection	Two waste characterization samples were to be collected from stockpiled soil at each site location.	Because no evidence of VOCs were identified in soil from the UST excavation, the USACE directed that no samples be collected for waste characterization.

DRAFT

ATTACHMENT A

ANALYTICAL REPORT FOR UST CONTENTS SAMPLING

DRAFT

6110-019-DP
SAS SDPs

SOUND ANALYTICAL SERVICES. INC.

ANALYTICAL & ENVIRONMENTAL CHEMISTS
4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 · TELEPHONE (206)922-2310 · FAX (206)922-5047

TRANSMITTAL MEMORANDUM

DATE: July 31, 1995

TO: Larry Petersen
Chemical Waste Management

PROJECT: C.D.M. Federal

LABORATORY NUMBER: 49692

Enclosed are the test results for two samples received at Sound Analytical Services on June 26, 1995.

The report consists of this transmittal memo, analytical results, quality control reports, a copy of the chain-of-custody, a list of data qualifiers when applicable, and a copy of any requested raw data.

Should there be any questions regarding this report, please call me at (206) 922-2310.

Sincerely,

Lila A. Transue
Project Manager

It is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analysis in accordance with

SOUND ANALYTICAL SERVICES, INC.

ANALYTICAL & ENVIRONMENTAL CHEMISTS

2813 PACIFIC HIGHWAY EAST TACOMA WASHINGTON 98424 · TELEPHONE (206) 922 2310 · FAX (206) 922 5047

ANALYTICAL NARRATIVE

Client: Chemical Waste Management Date: July 31, 1995

Project: C. D. M. Federal Lab No.: 49692

Delivered by: SAS Courier Date Received: June 26, 1995

Condition of Samples upon Receipt:

Samples were received cold and in good condition. Chain-of-custody was in order.

Sample Identification:

Lab. No.	Field ID	Date Sampled	Matrix	Description
49692-1	North Tank - 1	6-23-95	Liquid	Clear, with sediment
49692-2	South Tank - 2	6-23-95	Liquid	Clear, with sediment

SAMPLE PREPARATION AND ANALYSIS

F-Listed Solvents

Samples 49692-1 and 49692-2 were analyzed for volatile F-listed solvents by GC/MS. The samples were analyzed on 6-28-95.

The percent recovery for bromofluorobenzene (surrogate) in sample 49692-1 was outside QC limits due to matrix interferences.

All other quality control parameters were within acceptance limits.

SOUND ANALYTICAL SERVICES, INC.

Client Name	Chemical Waste Management
Client ID:	NORTH TANK-1
Lab ID:	49692-01
Date Received:	6/26/95
Date Prepared:	6/28/95
Date Analyzed:	6/28/95
% Solids	-
Dilution Factor	1

Volatile Organics by USEPA Method 8240

Surrogate	% Recovery	Flags	Recovery Limits Low	High
Dibromofluoromethane	104		76	114
Toluene-d8	94		88	110
Bromofluorobenzene	84	X9	86	115

Analyte	Result (ug/L)	MDL	Flags
Chloromethane	ND	3.4	
Bromomethane	ND	2.9	
Vinyl Chloride	ND	3	
Chloroethane	ND	3.1	
Methylene Chloride	ND	3.7	
Acetone	ND	16	
Carbon Disulfide	ND	5.8	
1,1-Dichloroethene	ND	2.6	
1,1-Dichloroethane	ND	3	
1,2-Dichloroethene (total)	ND	2.7	
Chloroform	ND	2.6	
1,2-Dichloroethane	ND	3	
2-Butanone (MEK)	ND	1.9	
1,1,1-Trichloroethane	ND	2.6	
Carbon Tetrachloride	ND	3.6	
Vinyl Acetate	ND	1.5	
Bromodichloromethane	ND	2.2	
1,2-Dichloropropane	ND	3.5	
cis-1,3-Dichloropropene	ND	3	
Trichloroethene	ND	2.4	
Dibromochloromethane	ND	1.8	
1,1,2-Trichloroethane	ND	2.2	
Benzene	ND	2.2	
trans-1,3-Dichloropropene	ND	2.3	
Bromoform	ND	1.9	
4-Methyl-2-pentanone (MIBK)	ND	2.3	

SOUND ANALYTICAL SERVICES, INC.

olatile Organics by USEPA Method 8240 data for 49692-01 continued...

Analyte	Result (ug/L)	MDL	Flags
2-Hexanone	ND	16	
Tetrachloroethene	ND	1.7	
1,1,2,2-Tetrachloroethane	ND	2.2	
Toluene	ND	2	
Chlorobenzene	ND	3.2	
Ethylbenzene	ND	1.6	
Styrene	ND	2.8	
Xylenes (total)	ND	4.5	

SOUND ANALYTICAL SERVICES. INC.

Client Name	Chemical Waste Management
Client ID:	NORTH TANK-1
Lab ID:	49692-01
Date Received:	6/26/95
Date Prepared:	6/28/95
Date Analyzed:	6/28/95
% Solids	-
Dilution Factor	1

Tentatively Identified Volatile Organics by USEPA Method 8240

TIC Name	Result (ug/L)	Ret. Time (Min.)	Flags
Tridecane	13	21.44	J

SOUND ANALYTICAL SERVICES, INC.

Client Name	Chemical Waste Management
Client ID:	SOUTH TANK-2
Lab ID:	49692-02
Date Received:	6/26/95
Date Prepared:	6/28/95
Date Analyzed:	6/28/95
% Solids	-
Dilution Factor	2

Volatile Organics by USEPA Method 8240

Surrogate	% Recovery	Flags	Recovery Limits Low	High
Dibromofluoromethane	102		76	114
Toluene-d8	101		88	110
Bromofluorobenzene	95		86	115

Analyte	Result (ug/L)	MDL	Flags
Chloromethane	ND	6.8	
Bromomethane	ND	5.8	
Vinyl Chloride	ND	6	
Chloroethane	ND	6.1	
Methylene Chloride	ND	7.5	
Acetone	ND	32	
Carbon Disulfide	ND	12	
1,1-Dichloroethene	ND	5.2	
1,1-Dichloroethane	ND	6.1	
1,2-Dichloroethene (total)	ND	5.3	
Chloroform	ND	5.3	
1,2-Dichloroethane	ND	6	
2-Butanone (MEK)	ND	3.8	
1,1,1-Trichloroethane	ND	5.2	
Carbon Tetrachloride	ND	7.3	
Vinyl Acetate	ND	3	
Bromodichloromethane	ND	4.5	
1,2-Dichloropropane	ND	7	
cis-1,3-Dichloropropene	ND	6	
Trichloroethene	ND	4.9	
Dibromochloromethane	ND	3.6	
1,1,2-Trichloroethane	ND	4.4	
Benzene	ND	4.4	
trans-1,3-Dichloropropene	ND	4.5	
Bromoform	ND	3.8	
4-Methyl-2-pentanone (MIBK)	ND	4.5	

SOUND ANALYTICAL SERVICES. INC.

Volatile Organics by USEPA Method 8240 data for 49692-02 continued...

Analyte	Result (ug/L)	MDL	Flags
2-Hexanone	ND	32	
Tetrachloroethene	ND	3.4	
1,1,2,2-Tetrachloroethane	ND	4.4	
Toluene	ND	4	
Chlorobenzene	ND	6.4	
Ethylbenzene	ND	3.2	
Styrene	ND	5.6	
Xylenes (total)	ND	9	

SOUND ANALYTICAL SERVICES. INC.

Client Name	Chemical Waste Management
Client ID:	SOUTH TANK-2
Lab ID:	49692-02
Date Received:	6/26/95
Date Prepared:	6/28/95
Date Analyzed:	6/28/95
% Solids	-
Dilution Factor	2

Tentatively Identified Volatile Organics by USEPA Method 8240

TIC Name	Result (ug/L)	Ret. Time (Min.)	Flags
Tridecane	17	21.45	J

SOUND ANALYTICAL SERVICES, INC.

Lab ID:	Method Blank - A541
Date Received:	-
Date Prepared:	6/28/95
Date Analyzed:	6/28/95
% Solids	-
Dilution Factor	1

Volatile Organics by USEPA Method 8240

Surrogate	% Recovery	Flags	Recovery Limits Low	High
Dibromofluoromethane	101		76	114
Toluene-d8	102		88	110
Bromofluorobenzene	91		86	115

Analyte	Result (ug/L)	MDL	Flags
Chloromethane	ND	3.4	
Bromomethane	ND	2.9	
Vinyl Chloride	ND	3	
Chloroethane	ND	3.1	
Methylene Chloride	ND	3.7	
Acetone	ND	16	
Carbon Disulfide	ND	5.8	
1,1-Dichloroethene	ND	2.6	
1,1-Dichloroethane	ND	3	
1,2-Dichloroethene (total)	ND	2.7	
Chloroform	ND	2.6	
1,2-Dichloroethane	ND	3	
2-Butanone (MEK)	ND	1.9	
1,1,1-Trichloroethane	ND	2.6	
Carbon Tetrachloride	ND	3.6	
Vinyl Acetate	ND	1.5	
Bromodichloromethane	ND	2.2	
1,2-Dichloropropane	ND	3.5	
cis-1,3-Dichloropropene	ND	3	
Trichloroethene	ND	2.4	
Dibromochloromethane	ND	1.8	
1,1,2-Trichloroethane	ND	2.2	
Benzene	ND	2.2	
trans-1,3-Dichloropropene	ND	2.3	
Bromoform	ND	1.9	
4-Methyl-2-pentanone (MIBK)	ND	2.3	

SOUND ANALYTICAL SERVICES. INC.

Volatile Organics by USEPA Method 8240 data for A541 continued...

Analyte	Result (ug/L)	MDL	Flags
2-Hexanone	ND	16	
Tetrachloroethene	ND	1.7	
1,1,2,2-Tetrachloroethane	ND	2.2	
Toluene	ND	2	
Chlorobenzene	ND	3.2	
Ethylbenzene	ND	1.6	
Styrene	ND	2.8	
Xylenes (total)	ND	4.5	

SOUND ANALYTICAL SERVICES. INC.

Lab ID:	Method Blank - A541
Date Received:	-
Date Prepared:	6/28/95
Date Analyzed:	6/28/95
% Solids	-
Dilution Factor	1

Tentatively Identified Volatile Organics by USEPA Method 8240

TIC Name	Result (ug/L)	Ret. Time (Min.)	Flags
Tridecane	5.2	19.43	J
1,3-Butadiene,1,1,2,3,4,4-hexachloro-	14	20.39	J

SOUND ANALYTICAL SERVICES. INC.

Matrix Spike/Matrix Spike Duplicate Report

Client Sample ID:	SOUTH TANK-2
Lab ID:	49692-02
Date Prepared:	3/20/95
Date Analyzed:	3/21/95
QC Batch ID:	A541

Volatile Organics by USEPA Method 8240

Compound Name	Sample Result (ug/L)	Spike Amount (ug/L)	MS Result (ug/L)	MS % Rec.	MSD Result (ug/L)	MSD % Rec.	RPD	Flag
Chloromethane	0	1.3	1.3	100	1.3	100	0.0	
Bromomethane	0	1.3	1.3	105	1.3	101	3.9	

F-Listed Solvents by GC/MS

F-listed solvents matrix spike recovery and relative percent difference advisory limits:

Spike Compound	% Recovery	RPD
Trichloroethene	62 - 137	24
Benzene	66 - 142	21
Toluene	59 - 139	21
Chlorobenzene	60 - 133	21

SOUND ANALYTICAL SERVICES, INC.

4313 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 • TELEPHONE 206-922-2310 • FAX 206-922-5047

DATA QUALIFIERS AND ABBREVIATIONS

The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.

This analyte was also detected in the associated method blank. The reported sample results have been adjusted for moisture, final extract volume, and/or dilutions performed during extract preparation. The analyte concentration was evaluated prior to sample preparation adjustments, and was determined not to be significantly higher than the associated method blank (less than ten times the concentration reported in the blank).

This analyte was also detected in the associated method blank. However, the analyte concentration in the sample was determined to be significantly higher than the method blank (greater than ten times the concentration reported in the blank).

The concentration of this analyte exceeded the instrument calibration range.

The reported result for this analyte is calculated based on a secondary dilution factor.

Contaminant does not appear to be "typical" product. Elution pattern suggests it may be _____ .

Contaminant does not appear to be "typical" product. Further testing is suggested for identification.

identification and quantification of peaks was complicated by matrix interference; GC/MS confirmation is recommended.

RPD for duplicates outside advisory QC limits. Sample was re-analyzed with similar results.

a: RPD for duplicates outside advisory QC limits due to analyte concentration near the method practical quantitation limit/detection limit.

Matrix spike was diluted out during analysis.

5: Recovery of matrix spike outside advisory QC limits. Sample was re-analyzed with similar results.

7: Recovery of matrix spike outside advisory QC limits. Matrix interference is indicated by blank spike recovery data.

7a: Recovery and/or RPD values for MS/MSD outside advisory QC limits due to high contaminant levels.

8: Surrogate was diluted out during analysis.

9: Surrogate recovery outside advisory QC limits due to matrix composition.

See analytical narrative.

Not Detected

QL: Practical Quantitation Limit

CL: Maximum Contaminant Level

ATTACHMENT B

UST DISPOSAL CERTIFICATE AND SHIPPING ORDER

DRAFT

6110-09-FD

CONTAINER DISPOSAL CERTIFICATION

This is to certify to Twin City Metals INC that the container(s) listed below, generated by U.S. Army Corps of Engineers St. Paul Dist and offered to Twin City Metals for disposal by Chemical Waste Management, Inc. are suitable for recycling, and have meet the following requirements:

1. A hole has been cut large enough to adequately inspect the inside of the tank.

2. All containers have been de-gased and are safe for open flame cutting torches.(Free of any oders, e.c., gasoline, fuel oil ect.)

3. All product or residue has been completely removed from the container, either by triple rinse per E.P.A methodology, steam cleaning, or a suitable cleaning technique that meet O.S.H.A. and E.P.A. requirements.

CONTAINER(S) TO BE SCRAPPED

Type of Container	Previous Contents of the Container
Two- 1175 gallon metal Tanks	Water: believed previously contained tetrachloroethylene

7/11/95
Date

Signature and Title Proj. Supt

051795 techserv\cdmfeder.al\.5207\ustwkpln

Figure 5.1

U110-019-F

THIS SHIPPING ORDER must be legibly filled in, in Ink, in Indelible Pencil, or in Carbon, and retained by the Agent.

Shipper's No. _____

Carrier's No. _____

TWIN City Metals INC (NAME OF CARRIER) SCAC _____ Date 7-11-95

TO: Consignee TWIN City Metals INC	FROM: U.S. Army Corps of Engineers Shipper on behalf of D.O.E
Street 4155 E Brennan	Street BLDG 1262 - U. Ave. (1100 Area)
Destination Kennewick WA Zip	Origin Richland WA Zip 99352
Route:	Vehicle Number / U.S. DOT Hazmat Reg. #

No. Shipping Units	Kind of Packages, Description of Articles (IF HAZARDOUS MATERIALS - PROPER SHIPPING NAME)	HAZARD CLASS	I.D. Number	PACKING GROUP	WEIGHT (subject to correction)	RATE	LABELS REQUIRED (or exemption)
2	Material Not Regulated by DOT per 49 CFR 172.101 D	—	—	—	1.5/TON		NONE
	2- Underground Storage Tanks to be scrapped. Tanks have been water cut cleaning triple rinsed & are ready for scrap						

Remit C.O.D. to:
Address:
City: State: Zip:

COD Amt: $ N.A

C. O. D. FEE: Prepaid ☐ Collect ☐ $ Ø

NOTE - Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

$ Ø Per _____

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

_____ (Signature of Consignor)

FREIGHT CHARGES PREPAID ☐ COLLECT ☐ N/A

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destination and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment. Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation

Per _____

PLACARDS REQUIRED NONE **PLACARDS SUPPLIED** ☐ YES ☑ NO - FURNISHED BY CARRIER

DRIVERS SIGNATURE:

SPECIAL INSTRUCTIONS:

Where the applicable tariff provisions specify a limitation of the carrier's liability (NMFC Item 172), if there is no release or value declaration by the shipper, and the shipper does not declare a value or release the carrier's liability that liability shall be limited to the extent provided by NMFC Item 172. California interstate shipments must comply with NMFC Item 173

SHIPPER: U.S. Army Corp of Engineers on behalf of DOE	CARRIER: Twin City Metal Inc
PER: [signature]	PER: [signature]
DATE: 7/10/95	DATE: 7/10/95
EMERGENCY RESPONSE TELEPHONE NUMBER: 206 575-3350	Monitored at all times the Hazardous Material is in transportation including storage incidental to transportation (172.604).

9-BLS-C4

ATTACHMENT C

ANALYTICAL REPORTS FOR SITE ASSESSMENT SAMPLING

DRAFT

Environmental Science & Engineering DATE 07/20/95 STATUS : PAGE 1
PROJECT NUMBER 1944022G 0205 PROJECT NAME CDM FDERAL-MOD #4
FIELD GROUP HANEM3S6 PROJECT MANAGER PATRICK WILBER
ALL LAB COORDINATOR PATRICK WILBER

SOLVENT TANKS
~~#~~ CONF # 1, IV

MPLE ID'S		3/06C01335
RAMETERS	STORET	HANEM3S6
UNITS	METHOD	1
TE		07/10/95
ME		15:00
LIVERY ORDER NUMBER	96338	9
	0	
LIVERABLE LEVEL	95711	IV
	0	
RNAROUND TIME	95712	48HR
	0	
EEN,GR. ALPHA, (ESTIMATE)	96636	Y
NCI/KG-WET	R	
EEN,GR. BETA,(ESTIMATE)	96637	Y
NCI/KG-WET	R	
ISTURE	70320	5.9
%WET WT	ASTM-G	
TONE	75059	<11
UG/KG-DRY	8240-G	
ZENE	34237	<5.3
UG/KG-DRY	8240-G	
MODICHLOROMETHANE	34330	<5.3
UG/KG-DRY	8240-G	
MOFORM	34290	<5.3
UG/KG-DRY	8240-G	
MOMETHANE	34416	<11
UG/KG-DRY	8240-G	
BON DISULFIDE	78544	<5.3
UG/KG-DRY	8240-G	
ION TETRACHLORIDE	34299	<5.3
UG/KG-DRY	8240-G	
ROBENZENE	34304	<5.3
UG/KG-DRY	8240-G	
ROETHANE	34314	<11
UG/KG-DRY	8240-G	
LOROETHYLVINYLETHER	34579	<5.3
UG/KG-DRY	8240-G	
ROFORM	34318	<5.3
UG/KG-DRY	8240-G	
ROMETHANE	34421	<11
UG/KG-DRY	8240-G	
OMOCHLOROMETHANE	34309	<5.3
UG/KG-DRY	8240-G	
ICHLOROETHANE	34499	<5.3
UG/KG-DRY	8240-G	
ICHLOROETHANE	34534	<5.3
UG/KG-DRY	8240-G	
ICHLOROETHYLENE	34504	<5.3
UG/KG-DRY	8240-G	

Environmental Science & Engineering DATE 07/20/95 STATUS : PAGE 2
PROJECT NUMBER 19440220 0205 PROJECT NAME CDM FDERAL-MOD #4
FIELD GROUP HANEM3S6 PROJECT MANAGER PATRICK WILBER
ALL LAB COORDINATOR PATRICK WILBER

MPLE ID'S		3/06C01335
AMETERS	STORET	HANEM3S6
UNITS	METHOD	1
E		07/10/95
IE		15:00
-DICHLOROETHENE(TOTAL)	96464	<5.3
UG/KG-DRY	8240-G	
-DICHLOROPROPANE	34544	<5.3
UG/KG-DRY	8240-G	
-1,3-DICHLOROPROPENE	34702	<5.3
UG/KG-DRY	8240-G	
NS-1,3-DICHLOROPROPENE	34697	<5.3
UG/KG-DRY	8240-G	
YLBENZENE	34374	<5.3
UG/KG-DRY	8240-G	
EXANONE	75166	<11
UG/KG-DRY	8240-G	
HYLENE CHLORIDE	34426	<5.3
UG/KG-DRY	8240-G	
HYL ETHYL KETONE	75078	<11
UG/KG-DRY	8240-G	
HYL ISOBUTYL KETONE	75169	<11
UG/KG-DRY	8240-G	
RENE	75192	<5.3
UG/KG-DRY	8240-G	
2,2-TETRACHLOROETHANE	34519	<5.3
UG/KG-DRY	8240-G	
ACHLOROETHENE	34478	<5.3
UG/KG-DRY	8240-G	
ENE	34483	<5.3
UG/KG-DRY	8240-G	
1-TRICHLOROETHANE	34509	<5.3
UG/KG-DRY	8240-G	
2-TRICHLOROETHANE	34514	<5.3
UG/KG-DRY	8240-G	
HLOROETHENE	34487	<5.3
UG/KG-DRY	8240-G	
L CHLORIDE	34495	<11
UG/KG-DRY	8240-G	
L ACETATE	98583	<11
UG/KG-DRY	8240-G	
NE,TOTAL	45510	<5.3
UG/KG-DRY	8240-G	

000008

ESE Alpha/Beta Screen

Batch Title: HANFORD SCEENS 7/17/95. JIM Count Duration: 20 Minutes
atch Ended: 7/17/95 17:40 Alpha efficiency logfile: AM24118 Beta efficiency logfile: CS13718 Report Date: 7/20/95 9:22
ta file name: ABS0717B Alpha attenuation logfile: ATTA18 Beta attenuation logfile: ATTB18 Activity (pCi/l)=(Gross CPM - Bkg CPM)/(2.22*Volume*Eff*b*m*Res

Detector ID	Sample ID	Alpha Data			Beta Data			Mass/Efficiency Data						Residual Mass	Sample Mass	Release Mass
		Gross CPM	Bkg CPM	pCi/g	Gross CPM	Bkg CPM	pCi/g	Alpha Eff	Alpha m	Alpha b	Beta Eff	Beta m	Beta b	mg	g	g
C1	DA*HANEM3S6*4	0.25	0.12	0.00	2.25	1.36	0.00	0.3021	0.9923	1.0000	0.4963	0.9980	1.0000	101.90	250.0000	5885669.60
C2	DA*HANEM3S6*5	0.30	0.15	0.00	3.50	1.20	0.01	0.3220	0.9923	1.0000	0.5104	0.9981	1.0000	102.30	250.0000	5375001.67
C3	DA*HANEM3S6*6	2.00	0.10	0.02	8.95	1.11	0.03	0.3191	0.9923	1.0000	0.5175	0.9979	1.0000	93.30	250.0000	454766.34
C4	DA*HANEM3S6*7	0.35	0.15	0.00	2.10	1.21	0.00	0.2926	0.9923	1.0000	0.5034	0.9980	1.0000	101.30	250.0000	3700389.43
D1	DA*HANEM3S6*8	0.40	0.11	0.00	2.65	1.07	0.01	0.3035	0.9922	1.0000	0.5091	0.9980	1.0000	103.40	250.0000	2588522.64
D2	DA*HANEM3S6*9	0.60	0.17	0.01	3.45	1.22	0.01	0.3143	0.9921	1.0000	0.4871	0.9982	1.0000	100.00	250.0000	1837841.19
D3	DA*HANEM3S6*10	1.25	0.19	0.01	3.40	1.12	0.01	0.3174	0.9921	1.0000	0.4986	0.9981	1.0000	104.80	250.0000	720680.77
A1	DA*HANEM3S2*6	0.40	0.15	0.00	2.70	1.08	0.01	0.2834	0.9940	0.7737	0.4667	0.9978	1.0381	101.30	250.0000	2643202.50
A2	DA*HANEM3S2*7	0.20	0.16	0.00	2.75	1.50	0.01	0.2879	0.9940	0.7754	0.4777	0.9978	1.0389	99.90	250.0000	#########
A3	DA*HANEM3S2*8	0.35	0.06	0.00	3.45	1.22	0.01	0.2881	0.9939	0.7694	0.4891	0.9978	1.0471	103.60	250.0000	2262221.73
A4	DA*HANEM3S2*9	0.10	0.12	0.00	2.10	1.09	0.00	0.2843	0.9941	0.7760	0.4889	0.9977	1.0433	103.00	250.0000	#########
B1	DA*HANEM3S2*10	0.40	0.24	0.00	3.20	1.22	0.01	0.2982	0.9924	1.0000	0.5090	0.9978	1.0439	103.30	250.0000	4697482.13
B2	DA*HANEM3S6*1	0.40	0.10	0.00	2.55	1.09	0.01	0.3166	0.9921	1.0000	0.5153	0.9978	1.0476	100.20	250.0000	2642370.75
B3	DA*HANEM3S6*2	0.20	0.07	0.00	2.75	1.12	0.01	0.3137	0.9921	1.0000	0.5239	0.9977	1.0512	99.80	250.0000	6068836.62
B4	DA*HANEM3S6*3	0.30	0.12	0.00	2.50	1.12	0.01	0.2892	0.9920	1.0000	0.5218	0.9978	1.0416	103.50	250.0000	3879116.71

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SOLVENT TANKS
CONF # 2-10, III

Environmental Science & Engineering DATE 07/20/95 STATUS : PAGE 1
PROJECT NUMBER 1944022G 0205 PROJECT NAME CDM FDERAL-MOD #4
FIELD GROUP HANEM3S6 PROJECT MANAGER PATRICK WILBER
ALL LAB COORDINATOR PATRICK WILBER

AMPLE ID'S		3/06C023353/	06C033353/	06C043663/	06C052453/	06C062453/	06C072453/	06C083663/	06C093663/	06C10274
ARAMETERS	STORET	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6
UNITS	METHOD	2	3	4	5	6	7	8	9	10
ATE		07/10/95	07/10/95	07/10/95	07/10/95	07/10/95	07/10/95	07/11/95	07/11/95	07/11/95
IME		15:08	15:25	15:40	15:50	16:05	16:10	08:15	08:25	08:35
ELIVERY ORDER NUMBER	96338	9	9	9	9	9	9	9	9	9
	0									
ELIVERABLE LEVEL	95711	III	III	III	III	III	III	III	III	III
	0									
URNAROUND TIME	95712	48HR	48HR	48HR	48HR	48HR	48HR	48HR	48HR	48HR
	0									
CREEN,GR. ALPHA, (ESTIMATE)	96636	Y	Y	Y	Y	Y	Y	Y	Y	Y
NCI/KG-WET	R									
CREEN,GR. BETA,(ESTIMATE)	96637	Y	Y	Y	Y	Y	Y	Y	Y	Y
NCI/KG-WET	R									
OISTURE	70320	6.2	9.6	4.0	5.1	4.1	4.5	6.6	6.2	4.9
%WET WT	ASTM-G									
CETONE	75059	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
ENZENE	34237	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
ROMODICHLOROMETHANE	34330	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
ROMOFORM	34290	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
ROMOMETHANE	34416	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
ARBON DISULFIDE	78544	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
ARBON TETRACHLORIDE	34299	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
HLOROBENZENE	34304	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
HLOROETHANE	34314	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
CHLOROETHYLVINYLETHER	34579	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
HLOROFORM	34318	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
HLOROMETHANE	34421	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
IBROMOCHLOROMETHANE	34309	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
1-DICHLOROETHANE	34499	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
2-DICHLOROETHANE	34534	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
1-DICHLOROETHYLENE	34504	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									

Environmental Science & Engineering DATE 07/20/95 STATUS :
PROJECT NUMBER 1944022G 0205 PROJECT NAME CDM FDERAL-MOD #4
FIELD GROUP HANEM3S6 PROJECT MANAGER PATRICK WILBER
ALL LAB COORDINATOR PATRICK WILBER

SAMPLE ID'S		3/06C023353/	06C033353/	06C043663/	06C052453/	06C062453/	06C072453/	06C083663/	06C093663/	06C10274
PARAMETERS	STORET	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6	HANEM3S6
UNITS	METHOD	2	3	4	5	6	7	8	9	10
DATE		07/10/95	07/10/95	07/10/95	07/10/95	07/10/95	07/10/95	07/11/95	07/11/95	07/11/95
TIME		15:08	15:25	15:40	15:50	16:05	16:10	08:15	08:25	08:35
,2-DICHLOROETHENE(TOTAL)	96464	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
,2-DICHLOROPROPANE	34544	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
IS-1,3-DICHLOROPROPENE	34702	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
RANS-1,3-DICHLOROPROPENE	34697	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
THYLBENZENE	34374	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
HEXANONE	75166	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
ETHYLENE CHLORIDE	34426	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
ETHYL ETHYL KETONE	75078	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
ETHYL ISOBUTYL KETONE	75169	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
TYRENE	75192	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
,1,2,2-TETRACHLOROETHANE	34519	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
TRACHLOROETHENE	34478	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
OLUENE	34483	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
1,1-TRICHLOROETHANE	34509	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
1,2-TRICHLOROETHANE	34514	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
ICHLOROETHENE	34487	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									
NYL CHLORIDE	34495	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
NYL ACETATE	98583	<11	<11	<10.0	<11	<10.0	<10.0	<11	<11	<11
UG/KG-DRY	8240-G									
LENE,TOTAL	45510	<5.3	<5.5	<5.2	<5.3	<5.2	<5.2	<5.4	<5.3	<5.3
UG/KG-DRY	8240-G									

ESE Alpha/Beta Screen

Batch Title: HANFORD SCEENS 7/17/95. JIM Count Duration: 20 Minutes
atch Ended: 7/17/95 17:40 Alpha efficiency logfile: AM24118 Beta efficiency logfile: CS13718 Report Date: 7/20/95 9:22
ta file name: ABS0717B Alpha attenuation logfile: ATTA18 Beta attenuation logfile: ATTB18 Activity (pCi/l)=(Gross CPM - Bkg CPM)/(2.22*Volume*Eff*b*m-Res

Detector ID	Sample ID	Alpha Data			Beta Data			Mass/Efficiency Data						Residual Mass	Sample Mass	Release Mass
		Gross CPM	Bkg CPM	pCi/g	Gross CPM	Bkg CPM	pCi/g	Alpha Eff	Alpha m	Alpha b	Beta Eff	Beta m	Beta b	mg	g	g
C1	DA*HANEM3S6*4	0.25	0.12	0.00	2.25	1.36	0.00	0.3021	0.9923	1.0000	0.4963	0.9980	1.0000	101.90	250.0000	5885669.60
C2	DA*HANEM3S6*5	0.30	0.15	0.00	3.50	1.20	0.01	0.3220	0.9923	1.0000	0.5104	0.9981	1.0000	102.30	250.0000	5375001.67
C3	DA*HANEM3S6*6	2.00	0.10	0.02	8.95	1.11	0.03	0.3191	0.9923	1.0000	0.5175	0.9979	1.0000	93.30	250.0000	454766.34
C4	DA*HANEM3S6*7	0.35	0.15	0.00	2.10	1.21	0.00	0.2926	0.9923	1.0000	0.5034	0.9980	1.0000	101.30	250.0000	3700389.43
D1	DA*HANEM3S6*8	0.40	0.11	0.00	2.65	1.07	0.01	0.3035	0.9922	1.0000	0.5091	0.9980	1.0000	103.40	250.0000	2588522.64
D2	DA*HANEM3S6*9	0.60	0.17	0.01	3.45	1.22	0.01	0.3143	0.9921	1.0000	0.4871	0.9982	1.0000	100.00	250.0000	1837841.19
D3	DA*HANEM3S6*10	1.25	0.19	0.01	3.40	1.12	0.01	0.3174	0.9921	1.0000	0.4986	0.9981	1.0000	104.80	250.0000	720680.77
A1	DA*HANEM3S2*6	0.40	0.15	0.00	2.70	1.08	0.01	0.2834	0.9940	0.7737	0.4667	0.9978	1.0381	101.30	250.0000	2643202.50
A2	DA*HANEM3S2*7	0.20	0.16	0.00	2.75	1.50	0.01	0.2879	0.9940	0.7754	0.4777	0.9978	1.0389	99.90	250.0000	#########
A3	DA*HANEM3S2*8	0.35	0.06	0.00	3.45	1.22	0.01	0.2881	0.9939	0.7694	0.4891	0.9978	1.0471	103.60	250.0000	2262221.73
A4	DA*HANEM3S2*9	0.10	0.12	0.00	2.10	1.09	0.00	0.2843	0.9941	0.7760	0.4889	0.9977	1.0433	103.00	250.0000	#########
B1	DA*HANEM3S2*10	0.40	0.24	0.00	3.20	1.22	0.01	0.2982	0.9924	1.0000	0.5090	0.9978	1.0439	103.30	250.0000	4697482.13
B2	DA*HANEM3S6*1	0.40	0.10	0.00	2.55	1.09	0.01	0.3166	0.9921	1.0000	0.5153	0.9978	1.0476	100.20	250.0000	2642370.75
B3	DA*HANEM3S6*2	0.20	0.07	0.00	2.75	1.12	0.01	0.3137	0.9921	1.0000	0.5239	0.9977	1.0512	99.80	250.0000	6068838.62
B4	DA*HANEM3S6*3	0.30	0.12	0.00	2.50	1.12	0.01	0.2892	0.9920	1.0000	0.5218	0.9978	1.0416	103.50	250.0000	3879116.71

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Environmental Science & Engineering DATE 07/26/95 STATUS : PAGE 1
PROJECT NUMBER 1944022G 0205 PROJECT NAME CDM FEDERAL-MOD #4
FIELD GROUP HANEM3W6 PROJECT MANAGER PATRICK WILBER
ALL LAB COORDINATOR PATRICK WILBER

SOLVENT TANKS
RINSATE SPL

MPLE ID'S		3/06C10274
RAMETERS	STORET	HANEM3W6
UNITS	METHOD	1
TE		07/11/95
ME		08:55
IVERY ORDER NUMBER	96338	9
	0	
IVERABLE LEVEL	95711	III
	0	
NAROUND TIME	95712	7DAY
	0	
EEN,GR. ALPHA, (ESTIMATE)	96634	Y
NCI/L	R	
EEN,GR. BETA,(ESTIMATE)	96635	Y
NCI/L	R	
TONE	81552	36
UG/L	8240-G	
ZENE	34030	<1.0
UG/L	8240-G	
MODICHLOROMETHANE	32101	<2.2
UG/L	8240-G	
MOFORM	32104	<2.6
UG/L	8240-G	
MOMETHANE	34413	<3.5
UG/L	8240-G	
BON DISULFIDE	77041	<4.4
UG/L	8240-G	
BON TETRACHLORIDE	32102	<2.6
UG/L	8240-G	
ROBENZENE	34301	<1.4
UG/L	8240-G	
ROETHANE	34311	<8.2
UG/L	8240-G	
ROFORM	32106	<2.5
UG/L	8240-G	
LOROETHYLVINYLETHER	34576	<3.1
UG/L	8240-G	
ROMETHANE	34418	<4.4
UG/L	8240-G	
OMOCHLOROMETHANE	32105	<2.3
UG/L	8240-G	
DICHLOROETHANE	34496	<2.5
UG/L	8240-G	
DICHLOROETHANE	34531	<2.5
UG/L	8240-G	
DICHLOROETHYLENE	34501	<3.2
UG/L	8240-G	
THLOROETHENE (TOTAL)	96463	<2.4
UG/L	8240-G	

Environmental Science & Engineering DATE 07/26/95 STATUS : PAGE 2
PROJECT NUMBER 1944022G 0205 PROJECT NAME CDM FEDERAL-MOD #4
FIELD GROUP HANEM3W6 PROJECT MANAGER PATRICK WILBER
ALL LAB COORDINATOR PATRICK WILBER

IPLE ID'S		3/06C10274
'AMETERS	STORET	HANEM3W6
UNITS	METHOD	1
E		
'E		07/11/95 08:55
-DICHLOROPROPANE	34541	<2.0
UG/L	8240-G	
-1,3-DICHLOROPROPENE	34704	<2.0
UG/L	8240-G	
NS-1,3-DICHLOROPROPENE	34699	<1.6
UG/L	8240-G	
YLBENZENE	34371	<1.3
UG/L	8240-G	
EXANONE	77103	<21
UG/L	8240-G	
HYLENE CHLORIDE	34423	<6.4
UG/L	8240-G	
HYL ETHYL KETONE	81595	<10.0
UG/L	8240-G	
HYL ISOBUTYL KETONE	81596	<12
UG/L	8240-G	
ENE	77128	<0.50
UG/L	8240-G	
2,2-TETRACHLOROETHANE	34516	<1.5
UG/L	8240-G	
ACHLOROETHENE	34475	<1.9
UG/L	8240-G	
ENE	34010	<1.7
UG/L	8240-G	
1-TRICHLOROETHANE	34506	<2.5
UG/L	8240-G	
2-TRICHLOROETHANE	34511	<2.8
UG/L	8240-G	
HLOROETHENE	39180	<3.0
UG/L	8240-G	
L CHLORIDE	39175	<4.6
UG/L	8240-G	
ACETATE	77057	<10.0
UG/L	8240-G	
ES, TOTAL	81551	<3.7
UG/L	8240-G	

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C' \IN OF CUSTODY RECORD

'M Federal Programs Corporation

PROJECT NAME 1100 AREA (EMS)

PROJECT NUMBER 610-019

Field Log Book Reference No.

SAMPLE NUMBER (CDM #)		HFTS #	DATE	TIME	SAMPLE LOCATION (ESI #)	SAMPLE TYPE	ANALYSES									NUMBER OF CONTAINERS	LOG BOOK PG. NO.	REMARKS
EMS/01	C-07-025	BOG455	7/13/95	1320	HANEMS1 # 7	SOIL	X									1x250 mL		III 7DAY
	C-08-045	BOG456	7/13/95	1325	HANEMS1 # 8		X											
	C-09-030	BOG457	7/13/95	1330	HANEMS1 # 9		X											
	C-10-045	BOG458	7/13/95	1335	HANEMS1 # 10		X											
	W-01-0	BOG459	7/14/95	0745	HANWASS1 # 1	WASTE			X							2x120 mL		
	"	"	"	"	HANWASS1 # 1					X	X	X	X	X	X	3x250 mL		
	W-02-0	BOG460	7/14/95	0800	HANWASS1 # 2				X							2x120 mL		
	"	"	"	"	HANWASS1 # 2					X	X	X	X			3x250 mL		
EB-EMS/01	G-01-045	BOG461	7/14/95	0815	HANEMSW1 # 1	WATER							X	X	X	2x1L PLY		
EB-EMS/02	C-01-202	BOG499	7/13/95	1500	HANEMSW1 # 1								X	X	X	2x1L PLY		
EB-EMS/03	C-10-214	BOG462	7/14/95	0815	HANEMSW1 # 1				X							3x40 mL		
"	"	"	"	0855	"									X	X	1x1L PLY		

SAMPLED BY (SIGN)

RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)
① DATE/TIME (7/14/95 1600)	② DATE/TIME (/)	③ DATE/TIME (/)	④ DATE/TIME (/)	⑤ DATE/TIME (/)
RECEIVED BY (SIGN)	RECEIVED BY (SIGN)	RECEIVED BY (SIGN)	RECEIVED BY (SIGN)	RECEIVED BY (SIGN)
① DATE/TIME (/)	② DATE/TIME (/)	③ DATE/TIME (/)	④ DATE/TIME (/)	⑤ DATE/TIME (/)

METHOD OF SHIPMENT	SHIPPED BY (SIGN)	RECEIVED FOR LABORATORY BY (SIGN)	DATE/TIME
			(/)

LEGEND: Original: Return to Sample Traffic Control Center Copies: Ship with Samples

CHAIN OF CUSTODY RECORD

CDM Federal Programs Corporation

PROJECT NAME 1100/EM13/06 1262 USTs

PROJECT NUMBER 6110-019

Field Log Book Reference No. _____

SAMPLE NUMBER (CPM #)		SAMPLE NUMBER (HEIS #)	DATE	TIME	SAMPLE LOCATION (FSE #)	SAMPLE TYPE	ANALYSES (VOA)	NUMBER OF CONTAINERS	LOG BOOK PG. NO.	REMARKS (Preservel Turnaround)
EM13/06	C-01-335	806411	7/11/95	1500	HANEM356 #1	Soil/Grab	X	6x250ml		IV 48hr
	C-02-335	806412		1508	HANEM356 #2		X			III 48hr
	C-03-335	806414		1525	HANEM356 #3		X			III 48hr
	C-04-366	806415		1540	HANEM356 #4		X			III 48hr
	C-05-245	806416		1550	HANEM356 #5		X			III 48hr
	C-06-245	806417		1605	HANEM356 #6		X			III 48hr
	C-07-245	806418		1610	HANEM356 #7		X			III 48hr
	C-08-366	806419	7/11/95	0815	HANEM356 #8		X			III 48hr
	C-09-366	806420		0825	HANEM356 #9		X			III 48hr
	C-10-274	806421		0835	HANEM356 #10		X			III 48hr

SAMPLED BY (SIGN)

RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)
① Dan B Ertel	②	③	④	⑤
DATE/TIME (7/12/95 0900)	DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)
RECEIVED BY (SIGN)	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**
①	②	③	④	⑤
DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)

METHOD OF SHIPMENT	SHIPPED BY (SIGN)	RECEIVED FOR LABORATORY BY (SIGN)	DATE/TIME
FED EX – 5511980 3346			(/)

LEGEND: Original: Return to Sample Traffic Control Center; Copies: Ship with Samples

F6260

C AIN OF CUSTODY RECORD

OM Federal Programs Corporation

PROJECT NAME Hartshill Area TM-2/TM-3

PROJECT NUMBER 6110-019

Field Log Book Reference No. _____

SAMPLE NUMBER		HFIS #	DATE	TIME	SAMPLE LOCATION	SAMPLE TYPE	ANALYSES									NUMBER OF CONTAINERS	LOG BOOK PG. NO.	REMARKS
H-EM14H-	C-01-165	BQ4Y39	7/3/95	1005	Top Flow Area	Liquid			X	X						2x120ml		
H-EM15H-	C-01-045	BQ4Y48	7/3/95	1500	Surface Spill Area	"				X						1x120ml		
H-EM16H-	C-01-335	BQ4Y53	7/3/95	1510	UGL Solvent Tanks	"					X					2x120ml		

SAMPLED BY (SIGN) [signature]

RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)
① [signature]	②	③	④	⑤
DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)
RECEIVED BY (SIGN)	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**
①	②	③	④	⑤
DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)	DATE/TIME (/)

METHOD OF SHIPMENT	SHIPPED BY (SIGN)	RECEIVED FOR LABORATORY BY (SIGN)	DATE/TIME
Fed Ex 5549803335			( )

LEGEND: Original: Return to Sample Traffic Control Center

Copies: Ship with Samples

ATTACHMENT D

WASHINGTON DEPARTMENT OF ECOLOGY FORMS:

UST PERMANENT CLOSURE AND SITE ASSESSMENT NOTICE
UST SITE CHECK/SITE ASSESSMENT CHECKLIST

DRAFT

WASHINGTON STATE DEPARTMENT OF ECOLOGY

UNDERGROUND STORAGE TANK TEMPORARY/PERMANENT CLOSURE and SITE ASSESSMENT NOTICE

See back of form for instructions

Please ☑ the appropriate box(es)

Please type or print information

For Office Use Only

Owner #

Site #

[ ] Temporary Tank Closure [X] Permanent Tank Closure [ ] Change-In-Service [ ] Site Assessment/ Site Check

SITE INFORMATION:

Site ID Number (on invoice or available from Ecology if the tanks are registered): Tanks not registered

Site/Business Name: Hanford 1100 Area

Site Address: Building 1262, U Street (Street) Telephone: ( ) N/A*

Richland (City) WA (State) 99352 (ZIP-Code)

TANK INFORMATION:

Tank ID	Closure Date	Tank Capacity	Substance Stored
1) Not registered	7/11/95	1125 gal.	Tetrachloroethene
2) Not registered	7/11/95	1125 gal.	Tetrachloroethene

CONTAMINATION PRESENT AT THE TIME OF CLOSURE

[ ] Yes [X] No

[ ] Unknown

Check unknown if no obvious contamination was observed and sample results have not yet been received from analytical lab.

UST SYSTEM OWNER/OPERATOR:

UST Owner/Operator: U.S. Dept. of Energy, Richland Operations, by Joseph Sutey, Director, LMD

Owners Signature: Telephone: ( )

Address: P.O. Box 550, MSIN K8-50 (Street, P.O. Box)

Richland, (City) WA (State) 99352-3562 (ZIP-Code)

TANK CLOSURE/CHANGE-IN-SERVICE PERFORMED BY:

Service Provider: Harding Lawson Associates License Number: S000025

Licensed Supervisor: Donald Lance Decommissioning License Number: ASI ID:32-US-32001689

Supervisors Signature: Donald Lance 7-26-95

Address: 13810 SE Eastgate Way, Suite 250 (Street, P.O. Box)

Bellevue (City) WA (State) 98005 (ZIP-Code)

Telephone: (206) 649-8881

SITE CHECK/SITE ASSESSMENT CONDUCTED BY:

Name of Registered Site Assessor: Donald Lance

elephone: (206) 649-8881

Address: 13810 SE Eastgate Way, Suite 250 (Street, P.O. Box)

Bellevue (City) WA (State) 98005 (ZIP-Code)

ECY 020-34

*N/A= Not Available

PLEASE READ CAREFULLY

INSTRUCTIONS

Return this completed form to:

Underground Storage Tank Section
Department of Ecology
P. O. Box 47655
Olympia, WA 98504-7655

This form is to be completed by the Tank Owner and submitted to Ecology within 30 days of tank closure.

Mark the appropriate box(es) for temporary tank closure, permanent tank closure, change-in-service, or site assessment.

Permanent Closure and Change-in-Service require a site assessment be performed.

SITE INFORMATION:

Fill in the site information. Be sure to include the Ecology site ID number. This number may be found on the invoice or permit. Include a contact telephone number so any problems may be resolved quickly.

TANK INFORMATION:

List the tanks that were closed. Please use tank ID numbers and indicate the date of permanent closure. Be sure to attach your Underground Storage Tank Permits for any tanks that are now closed.

UST SYSTEM OWNER/OPERATOR:

Please fill in the owner's/operator's name, address, and telephone number. **Be sure to sign this form.**

TANK CLOSURE/CHANGE-IN-SERVICE PERFORMED BY:

List the closure company. Companies that provide UST services **MUST** be licensed by Ecology. Ask to see their supervisor's license. Make sure the licensed supervisor signs this form.

SITE CHECK/SITE ASSESSMENT CONDUCTED BY:

Fill in the site assessor information for permanent closure or change-in-service. Mark the appropriate box showing whether contamination from the underground tank(s) was or is present at the site. A site check/site assessment **MUST** be conducted by a site assessor who is registered with Ecology.

If contamination at the site is found or suspected, the appropriate Ecology Regional Office must be notified within 24 hours. If the contamination is confirmed, a site characterization report must be submitted to the regional office within 90 days. If contamination is not confirmed, a site assessment report must be submitted to the above address within 30 days.

Tanks exempt from notification requirements are:

Farm or residential tanks, 1100 gallons or less, used to store motor fuel for personal or farm use only. The fuel must not be for resale or used for business purposes.

Tanks used for storing heating oil that is used on the premises where the tank is located.

Tanks with a capacity of 110 gallons or less.

Equipment or machinery tanks such as hydraulic lifts or electrical equipment tanks.

Emergency overflow tanks, catch basins, or sumps.

For more information call toll free in the state of Washington 1-800-826-7716 or (206) 438-7137

UNDERGROUND STORAGE TANK
Site Check/Site Assessment Checklist

For Office Use Only
Owner # _____
Site # _____

INSTRUCTIONS:

When a release has **not** been confirmed and reported, this Site Check/Site Assessment Checklist must be completed and signed by a person registered with the Department of Ecology. **The results of the site check or site assessment must be included with this checklist.** This form must be submitted to Ecology at the address shown below within 30 days after completion of the site check/site assessment.

SITE INFORMATION: Include the Ecology site ID number if the tanks are registered with Ecology. This number may be found on the tank owner's invoice or tank permit.

TANK INFORMATION: Please list all the tanks for which the site check and site assessment is being conducted. Use the tank ID number if available, and indicate tank capacity and substance stored.

REASON FOR CONDUCTING SITE CHECK/SITE ASSESSMENT: Please check the appropriate item.

CHECKLIST: Please initial each item in the appropriate box.

SITE ASSESSOR INFORMATION: This form must be signed by the registered site assessor who is responsible for conducting the site check/ site assessment.

Underground Storage Tank Section
Department of Ecology
P. O. Box 47655
Olympia, WA 98504-7655

SITE INFORMATION

Site ID Number (on invoice or available from Ecology if the tanks are registered): Tanks not registered

Site/Business Name: Hanford 1100 Area

Address: Building 1262, U Street (Street) Telephone: ( ) N/A*

Richland, (City) WA (State) 99352 (ZIP-Code)

TANK INFORMATION

Tank ID No.	Tank Capacity	Substance Stored
1)Not registered	1125 gal.	Tetrachloroethene
2) Not registered	1125 gal.	Tetrachloroethene

REASON FOR CONDUCTING SITE CHECK/SITE ASSESSMENT

Check one:

- ____ Investigate suspected release due to on-site environmental contamination.
- ____ Investigate suspected release due to off-site environmental contamination.
- ____ Extend temporary closure of UST system for more than 12 months.
- ____ UST system undergoing change-in-service.
- ____ UST system permanently closed-in-place.
- X UST system permanently closed with tank removed.
- ____ Abandoned tank containing product.
- ____ Required by Ecology or delegated agency for UST system closed before 12/22/88.
- ____ Other (describe): _____

CHECKLIST

Each item of the following checklist shall be initialed by the person registered with the Department of Ecology whose signature appears below.

		YES	NO
1.	The location of the UST site is shown on the vicinity map.	X	
2.	A brief summary of information obtained during the site inspection is provided. (see Section 3.2 in the Site Assessment Guidance)	X	
3.	A summary of UST system data is provided. (see Section 3.1)	X	
4.	The soils characteristics at the UST site are described. (see Section 5.2)	X	
5.	Is there apparent groundwater in the tank excavation?		X
6.	A brief description of the surrounding land is provided. (see Section 3.1)	X	
7.	Information has been provided indicating the number and types of samples collected, methods used to collect and analyze the samples, and the name and address of the laboratory used to perform the analyses.	X	
8.	A sketch or sketches showing the following items is provided:		
	- location and ID number for all field samples collected	X	
	- groundwater samples distinguished from soil samples (if applicable)	Not applicable	
	- samples collected from stockpiled excavated soil		X
	- tank and piping locations and limits of excavation pit	X	
	- adjacent structures and streets	X	
	- approximate locations of any on-site and nearby utilities	X	
9.	If sampling procedures different from those specified in the guidance were used, has justification for using these alternative sampling procedures been provided? (see Section 3.4)	Not applicable	
10.	A table is provided showing laboratory results for each sample collected including: sample ID number, constituents analyzed for and corresponding concentration, analytical method and detection limit for that method.	X	
11.	Any factors that may have compromised the quality of the data or validity of the results are described.	X	
12.	*The results of this site check/site assessment indicate that a confirmed release of regulated substance has occured.*		X

SITE ASSESSOR INFORMATION

Donald Lance
PERSON REGISTERED WITH ECOLOGY

Harding Lawson Associates
FIRM AFFILIATED WITH

BUSINESS ADDRESS: 13810 SE Eastgate Way, Suite 250

TELEPHONE: (206) 649-8881

Bellevue, WA 98005-4413
CITY STATE ZIP+CODE

I hereby certify that I have been in responsible charge of performing the site check / site assessment described above. Persons submitting false information are subject to penalties under Chapter 173-360 WAC.

8-2-95
Date

Donald Lance
Signature of Person Registered with Ecology

DISTRIBUTION

Underground Storage Tank Decommissioning Report
Building 1262 Solvent Tanks
Hanford 1100 Area
Richland, Washington

August 9, 1995

1 Copy: Mr. Paul Karas
CDM Federal Programs Corporation
1010 Jadwin Avenue
Richland, Washington 99352

1 Copy: Project File

Quality Control Reviewer

Bernard Nidowicz, P.E.
Vice President

DRAFT

APPENDIX B

ONSITE LABORATORY ANALYTICAL DATA SUMMARY

SCREENING SAMPLES

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TABLE B-1
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
TAR FLOW AREA

Sample Number	HEIS #	Date Collected	WTPH (mg/kg)	Lead (mg/kg)
EM2/01-CM-001-015		06/26/95	2750	11
EM2/01-CM-002-015		06/26/95	30	8
EM2/01-CM-002-015 (DUPLICATE)		06/26/95	38	7
EM2/01-CM-003-015		06/26/95	ND	7
EM2/01-CM-004-015		06/26/95	ND	5
EM2/01-CM-005-015		06/26/95	ND	ND
EM2/01-CM-006-015		06/26/95	ND	ND
EM2/01-CM-006-015 (DUPLICATE)		06/26/95	ND	ND
EM2/01-CM-007-030		06/27/95	ND	6
EM2/01-CM-008-030		06/27/95	ND	5
EM2/01-CM-009-030		06/27/95	ND	ND
EM2/01-CM-010-075		06/27/95	ND	ND
EM2/01-CM-011-045		06/27/95	5	7
EM2/01-CM-012-045 (BD)		06/27/95	12	6
EM2/01-CM-013-045		06/27/95	9	5
EM2/01-CM-014-045		06/27/95	18	6
EM2/01-CM-015-060		06/27/95	16	6
EM2/01-CM-016-060		06/27/95	11	5
EM2/01-CM-017-030		06/27/95	9	ND
EM2/01-CM-017-030 (DUPLICATE)		06/27/95	11	ND
EM2/01-CM-018-000		06/27/95	142	6
EM2/01-CM-019-075		06/27/95	49	6
EM2/01-CM-020-070		06/27/95	ND	5
EM2/01-CM-021-075		06/27/95	ND	ND
EM2/01-CM-021-075 (DUPLICATE)		06/27/95	ND	ND
EM2/01-CM-022-007		06/28/95	465	121
EM2/01-CM-023-090		06/28/95	ND	9
EM2/01-CM-024-070		06/28/95	ND	9

TABLE B-1 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
TAR FLOW AREA

Sample Number	HEIS #	Date Collected	WTPH (mg/kg)	Lead (mg/kg)
EM2/01-CM-025-105		06/28/95	ND	5
EM2/01-CM-026-030		06/28/95	ND	7
EM2/01-CM-027-025		06/28/95	ND	6
EM2/01-CM-028-015		06/28/95	ND	10
EM2/01-CM-029-015		06/28/95	82	10
EM2/01-CM-030-020		06/28/95	30	9
EM2/01-CM-031-015		06/28/95	ND	8
EM2/01-CM-031-015 (DUPLICATE)		06/28/95	ND	8
EM2/01-CM-032-WC		06/28/95	2970	6
EM2/01-CM-033-WC		06/28/95	6980	8
EM2/01-CM-034-WC		06/28/95	2630	7
EM2/01-CM-035-015		06/28/95	ND	18
EM2/01-CM-036-045		06/28/95	ND	ND
EM2/01-CM-037-045		06/28/95	ND	ND
EM2/01-CM-038-020		06/28/95	ND	ND
EM2/01-CM-039-040		06/28/95	ND	7
EM2/01-CM-040-025		06/28/95	ND	10
EM2/01-CM-041-030		06/28/95	ND	8
EM2/01-CM-042-030 (BD)		06/28/95	ND	ND
EM2/01-CM-042-030 (DUPLICATE)		06/28/95	ND	ND
EM2/01-CM-043-WC		06/28/95	1340	7
EM2/01-CM-044-WC		06/28/95	672	ND
EM2/01-CM-045-090		06/29/95	ND	ND
EM2/01-CM-046-105		06/29/95	ND	8
EM2/01-CM-047-010		06/29/95	4090	37
EM2/01-CM-048-015		06/29/95	ND	5
EM2/01-CM-049-100		06/29/95	34	16
EM2/01-CM-050-020		06/29/95	ND	ND

TABLE B-1 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
TAR FLOW AREA

Sample Number	HEIS #	Date Collected	WTPH (mg/kg)	Lead (mg/kg)
EM2/01-CM-051-165		06/29/95	3960	19
EM2/01-CM-052-020		06/29/95	ND	6
EM2/01-CM-052-020 (DUPLICATE)		06/29/95	ND	8
EM2/01-CM-053-015		06/29/95	ND	6
EM2/01-CM-054-165		06/29/95	ND	9
EM2/01-CM-055-020		06/29/95	ND	7
EM2/01-CM-056-015		06/29/95	21	7
EM2/01-CM-057-015		06/29/95	20	9
EM2/01-CM-058-045		06/29/95	ND	ND
EM2/01-CM-059-045		06/29/95	ND	6
EM2/01-CM-060-045		06/29/95	ND	13
EM2/01-CM-061-030		06/29/95	ND	6
EM2/01-CM-062-075		06/29/95	ND	25
EM2/01-CM-063-120		06/29/95	ND	12
EM2/01-CM-064-105		06/29/95	ND	7
EM2/01-CM-065-100		06/29/95	23	ND
EM2/01-CM-065-100 (DUPLICATE)		06/29/95	23	ND
EM2/01-CM-066-090		06/29/95	ND	ND
EM2/01-CM-067-020		06/29/95	ND	16
EM2/01-CM-067-020 (DUPLICATE)		06/29/95	ND	13
EM2/01-CM-068-015		06/30/95	ND	ND
EM2/01-CM-069-015		06/30/95	ND	13
EM2/01-CM-070-WC		06/30/95	2430	NA
EM2/01-CM-071-WC		06/30/95	1550	NA
EM2/01-CM-072-WC		06/30/95	1260	NA
EM2/01-CM-072-WC		06/30/95	983	NA
EM2/01-CM-073-WC		06/30/95	345	NA
EM2/01-CM-074-WC		06/30/95	810	NA

TABLE B-1 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
TAR FLOW AREA

Sample Number	HEIS #	Date Collected	WTPH (mg/kg)	Lead (mg/kg)
EM2/01-CM-075-WC		06/30/95	780	NA
EM2/01-CM-076-WC		06/30/95	1930	NA
EM2/01-CM-077-WC		06/30/95	1210	NA
EM2/01-CM-078-270		06/30/95	ND	ND
EM2/01-CM-079-060		06/30/95	86	7
EM2/01-CM-080-210		06/30/95	ND	6
EM2/01-CM-081-045		06/30/95	ND	7
EM2/01-CM-081-045 (DUPLICATE)		06/30/95	ND	8
EM2/01-CM-082-060		07/05/95	ND	ND
EM2/01-CM-083-020		07/05/95	ND	ND
EM2/01-CM-084-030		07/05/95	ND	ND
EM2/01-CM-085-020		07/05/95	ND	9
EM2/01-CM-085-020 (DUPLICATE)		07/05/95	ND	10
EM2/01-CM-086-120		07/05/95	28	17
EM2/01-CM-087-180		07/05/95	ND	9
EM2/01-CM-088-180 (BD)		07/05/95	ND	10
EM2/01-CM-089-150		07/05/95	ND	18
EM2/01-CM-090-075		07/05/95	ND	9
EM2/01-CM-091-150		07/05/95	ND	7
EM2/01-CM-092-150		07/05/95	ND	ND
EM2/01-CM-093-130		07/05/95	ND	7
EM2/01-CM-094-105		07/05/95	ND	10
EM2/01-CM-095-075		07/05/95	ND	10
EM2/01-CM-095-075 (DUPLICATE)		07/05/95	ND	11
EM2/01-CM-096-135		07/05/95	ND	ND
EM2/01-CM-097-120		07/05/95	ND	8
EM2/01-CM-098-180		07/05/95	ND	16
EM2/01-CM-099-180 (BD)		07/05/95	ND	14

TABLE B-1 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
TAR FLOW AREA

Sample Number	HEIS #	Date Collected	WTPH (mg/kg)	Lead (mg/kg)
EM2/01-CM-100-060		07/05/95	ND	ND
EM2/01-CM-101-WC		07/05/95	280	6
EM2/01-CM-102-WC		07/05/95	1010	ND
EM2/01-CM-103-120		07/06/95	415	9
EM2/01-CM-104-120		07/05/95	ND	ND
EM2/01-CM-105-120		07/05/95	ND	ND
EM2/01-CM-106-150		07/05/95	ND	ND
EM2/01-CM-107-140		07/05/95	ND	ND
EM2/01-CM-108-160		07/05/95	ND	8
EM2/01-CM-109-165		07/05/95	ND	ND
EM2/01-CM-110-020		07/05/95	322	ND
EM2/01-CM-111-180		07/05/95	ND	10
EM2/01-CM-112-185		07/05/95	ND	ND
EM2/01-CM-113-185	BOG326	07/06/95	ND	7
EM2/01-CM-114-025	BOG327	07/06/95	ND	13
EM2/01-CM-115-020	BOG328	07/06/95	23	13
EM2/01-CM-116-185	BOG329	07/06/95	ND	ND
EM2/01-CM-117-150	BOG400	07/06/95	ND	9
EM2/01-CM-118-060	BOG401	07/06/95	ND	12
EM2/01-CM-119-070	BOG402	07/06/95	ND	ND
EM2/01-CM-120-070	BOG403	07/06/95	ND	ND
EM2/01-CM-120-070 (DUPLICATE)		07/06/95	ND	ND
EM2/01-CM-121-070	BOG404	07/06/95	ND	ND
EM2/01-CM-122-080	BOG405	07/06/95	ND	ND
EM2/01-CM-123-060	BOG406	07/06/95	ND	ND
EM2/01-CM-124-065	BOG407	07/06/95	ND	ND
EM2/01-CM-125-065	BOG408	07/06/95	ND	ND
EM2/01-CM-126-060	BOG409	07/06/95	ND	ND

TABLE B-1 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
TAR FLOW AREA

Sample Number	HEIS #	Date Collected	WTPH (mg/kg)	Lead (mg/kg)
EM2/01-CM-127-055	BOG410	07/06/95	ND	ND
EM2/01-CM-127-055 (DUPLICATE)		07/06/95	ND	ND
EM2/01-CM-128-025	BOG411	07/06/95	ND	ND
EM2/01-CM-129-045	BOG412	07/06/95	ND	ND
EM2/01-CM-130-045	BOG413	07/06/95	ND	ND
EM2/01-CM-130-045 (DUPLICATE)		07/06/95	ND	ND
EM2/01-CM-131-030	BOG414	07/06/95	ND	ND
EM2/01-CM-132-020	BOG415	07/07/95	ND	ND
EM2/01-CM-133-015	BOG416	07/07/95	ND	ND
EM2/01-CM-134-035	BOG417	07/07/95	271	ND
EM2/01-CM-135-045	BOG418	07/07/95	ND	ND
EM2/01-CM-136-035	BOG419	07/07/95	ND	ND
EM2/01-CM-137-050	BOG420	07/07/95	63	ND
EM2/01-CM-138-040	BOG421	07/07/95	ND	ND
EM2/01-CM-139-060	BOG422	07/07/95	ND	ND
EM2/01-CM-140-020	BOG423	07/07/95	52	ND
EM2/01-CM-140-020 (DUPLICATE)		07/07/95	59	ND
EM2/01-CM-141-060	BOG424	07/07/95	ND	6
EM2/01-CM-142-015	BOG425	07/07/95	ND	ND
EM2/01-CM-143-060	BOG426	07/07/95	ND	ND
EM2/01-CM-143-060 (DUPLICATE)		07/07/95	ND	ND
EM2/01-CM-144-020	BOG427	07/07/95	32	ND
EM2/01-CM-145-030	BOG428	07/07/95	ND	ND
EM2/01-CM-146-030	BOG429	07/07/95	ND	ND
EM2/01-CM-147-WC	BOG430	07/07/95	ND	ND
EM2/01-CM-148-075	BOG431	07/07/95	25	ND
EM2/01-CM-149-110	BOG432	07/07/95	ND	ND
EM2/01-CM-150-015	BOG433	07/07/95	ND	ND

TABLE B-1 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
TAR FLOW AREA

Sample Number	HEIS #	Date Collected	WTPH (mg/kg)	Lead (mg/kg)
EM2/01-CM-150-015 (DUPLICATE)		07/07/95	ND	ND
EM2/01-C-01-185	BOG436	07/07/95	ND	ND
EM2/01-C-03-040	BOG438	07/07/95	ND	ND
EM2/01-C-04-060	BOG440	07/07/95	ND	ND
EM2/01-C-05-025	BOG441	07/07/95	ND	ND
EM2/01-C-06-020	BOG442	07/07/95	34	ND
EM2/01-C-07-075	BOG443	07/07/95	25	ND
EM2/01-C-08-120	BOG444	07/07/95	ND	ND
EM2/01-C-09-185	BOG445	07/07/95	ND	ND
EM2/01-C-10-135	BOG446	07/07/95	ND	ND
EM2/01-C-10-135 (DUPLICATE)		07/07/95	ND	ND

ND Not Detected
(DUPLICATE) Duplicate analysis by onsite laboratory
(BD) Blind duplicate of sample immediately preceding this sample and submitted to the onsite laboratory
NA Not analyzed

TABLE B-2
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
1240 SUSPECT SPILL AREA

Sample Number	Date Collected	Lead (mg/kg)
EM3/01-CM-001-010	07/07/95	79
EM3/01-CM-002-010	07/07/95	94
EM3/01-CM-003-020	07/07/95	6
EM3/01-CM-004-025	07/07/95	9
EM3/01-CM-005-020	07/07/95	510
EM3/01-CM-006-025	07/07/95	156
EM3/01-CM-007-020	07/07/95	169
EM3/01-CM-008-015	07/07/95	68
EM3/01-CM-009-015	07/07/95	554
EM3/01-CM-010-010	07/07/95	2360
EM3/01-CM-011-010	07/07/95	6930
EM3/01-CM-011-010 (DUPLICATE)	07/07/95	6000
EM3/01-CM-012-005	07/07/95	754
EM3/01-CM-013-005	07/07/95	846
EM3/01-CM-014-005	07/08/95	219
EM3/01-CM-015-005	07/08/95	194
EM3/01-CM-016-005	07/08/95	126
EM3/01-CM-017-005	07/08/95	541
EM3/01-CM-018-WC	07/08/95	11
EM3/01-CM-018-WC (DUPLICATE)	07/08/95	10
EM3/01-CM-019-060	07/08/95	10
EM3/01-CM-020-040	07/08/95	10
EM3/01-CM-021-005	07/08/95	1050
EM3/01-CM-022-015	07/08/95	221
EM3/01-CM-023-040	07/08/95	26
EM3/01-CM-024-005	07/08/95	6780
EM3/01-CM-025-040	07/08/95	10
EM3/01-CM-026-025	07/08/95	10

TABLE B-2 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
1240 SUSPECT SPILL AREA

Sample Number	Date Collected	Lead (mg/kg)
EM3/01-CM-027-015	07/08/95	166
EM3/01-CM-028-025	07/08/95	ND
EM3/01-CM-029-025	07/08/95	ND
EM3/01-CM-030-025 (BD)	07/08/95	ND
EM3/01-CM-030-025 (DUPLICATE)	07/08/95	ND
EM3/01-CM-031-040	07/08/95	ND
EM3/01-CM-032-015	07/08/95	56
EM3/01-CM-033-015	07/08/95	132
EM3/01-CM-034-025	07/08/95	10
EM3/01-CM-035-020	07/08/95	124
EM3/01-CM-036-030	07/08/95	ND
EM3/01-CM-037-030	07/08/95	8
EM3/01-CM-038-030 (DB)	07/08/95	9
EM3/01-CM-038-030 (DUPLICATE)	07/08/95	10
EM3/01-CM-039-020	07/08/95	1860
EM3/01-CM-040-020	07/08/95	63
EM3/01-CM-041-020	07/08/95	190
EM3/01-CM-042-015	07/08/95	1030
EM3/01-CM-043-045	07/08/95	ND
EM3/01-CM-044-045	07/08/95	ND
EM3/01-CM-045-045	07/08/95	ND
EM3/01-CM-046-020	07/08/95	37
EM3/01-CM-046-020 (DUPLICATE)	07/08/95	40
EM3/01-CM-047-015	07/12/95	30
EM3/01-CM-048-015	07/12/95	418
EM3/01-CM-049-015	07/12/95	42
EM3/01-CM-049-015 (DUPLICATE)	07/12/95	37
EM3/01-CM-050-015	07/13/95	189

TABLE B-2 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
1240 SUSPECT SPILL AREA

Sample Number	Date Collected	Lead (mg/kg)
EM3/01-CM-051-015	07/13/95	244
EM3/01-CM-051-015 (DUPLICATE)	07/13/95	261
EM3/01-CM-052-015	07/13/95	ND
EM3/01-CM-053-015	07/13/95	ND
EM3/01-C-01-045	07/08/95	13
EM3/01-C-03-045	07/08/95	18
EM3/01-C-04-045	07/08/95	14
EM3/01-C-05-045	07/08/95	15
EM3/01-C-06-045	07/08/95	16

ND Not Detected
(DUPLICATE) Duplicate analysis by onsite laboratory
(BD) Blind duplicate of sample immediately preceding this sample and submitted to the onsite laboratory

TABLE B-3
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
1240 FRENCH DRAIN

Sample Number	Date Collected	WTPH (mg/kg)	Lead (mg/kg)	Chromium (mg/kg)
EM3/02-CM-001-WC	7/11/95	133000	738	962
EM3/02-CM-002-WC	7/11/95	ND	22	ND
EM3/02-CM-003-WC	7/11/95	127	ND	ND
EM3/02-CM-004-WC	7/11/95	3230	ND	ND
EM3/02-CM-005-WC	7/11/95	22400	ND	ND
EM3/02-CM-005-WC (DUPLICATE)	7/11/95	18000	ND	ND
EM3/02-CM-006-004	07/12/95	433	ND	ND
EM3/02-CM-007-320	07/12/95	36	ND	ND
EM3/02-CM-008-110	07/12/95	28	ND	ND
EM3/02-CM-009-110	07/12/95	141	ND	ND
EM3/02-CM-010-320	07/12/95	39	ND	ND
EM3/02-CM-011-520	07/12/95	394	19	ND
EM3/02-CM-012-320	07/12/95	734	12	ND
EM3/02-CM-013-535	07/12/95	3120	15	ND
EM3/02-CM-014-300	07/12/95	101	16	ND
EM3/02-CM-015-300	07/12/95	ND	ND	ND
EM3/02-CM-015-300 (DUPLICATE)	07/12/95	ND	ND	ND
EM3/02-CM-016-550	07/13/95	ND	14	ND
EM3/02-CM-017-015	07/13/95	ND	19	ND
EM3/02-CM-017-015 (DUPLICATE)	07/13/95	ND	15	ND
EM3/02-CM-018-015	07/13/95	ND	6	ND
EM3/02-C-01-200	07/13/95	ND	ND	ND
EM3/02-C-03-200	07/13/95	ND	ND	ND
EM3/02-C-04-400	07/13/95	ND	ND	ND
EM3/02-C-05-150	07/13/95	ND	ND	ND
EM3/02-C-06-200	07/13/95	ND	ND	ND
EM3/02-C-07-200	07/13/95	ND	ND	ND
EM3/02-C-08-300	07/12/95	101	16	ND

TABLE B-3 (Continued)
ONSITE LABORATORY ANALYTICAL DATA SUMMARY
1240 FRENCH DRAIN

Sample Number	Date Collected	WTPH (mg/kg)	Lead (mg/kg)	Chromium (mg/kg)
EM3/02-C-09-300	07/12/95	ND	ND	ND
EM3/02-C-10-550	07/13/95	ND	14	ND

ND Not Detected
(DUPLICATE) Duplicate analysis by onsite laboratory

APPENDIX C

OFFSITE LABORATORY ANALYTICAL DATA SUMMARY

WASTE CHARACTERIZATION SAMPLES

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TABLE C-1
OFFSITE LABORATORY ANALYTICAL DATA SUMMARY
WASTE CHARACTERIZATION SAMPLES

SITE	Tar Flow Area	Tar Flow Area	1240 Suspect Spill Area	1240 Suspect Spill Area	1240 French Drain	1240 French Drain
SAMPLE #	EM-2/01-W-01-0	EM-2/01-W-02-0	EM-3/01-W-01-0	EM-3/01-W-02-0	EM-3/02-W-01-0	EM-3/02-W-02-0
HEIS #	BOG434	BOG 435	BOG 459	BOG 460	BOG 486	BOG 487
DATE COLLECTED	7/6/95	7/6/95	7/14/95	7/14/95	7/13/95	7/13/95
METHOD/ANALYTE (mg/kg)						
6010/7000						
Barium	567	60.6	71.9	76.1	62.7	44.2
Chromium	7.23	7.28	51.4	33.0	6.08	3.68
Lead	4.44	6.29	176	112	5.60	2.31
8240	ND	ND	ND	ND	ND	ND
8270						
Bis(2-ethylhexyl) Phthalate	0.170	0.210	ND	ND	0.630	0.150
8080						
DDT	ND	ND	0.009	0.009	ND	ND
DDE	ND	ND	ND	ND	0.001	ND
PCB-1254	ND	ND	0.120	0.039	ND	ND
TCLP-6010/7000 (µg/L)						
Lead	ND	ND	3.52	14	ND	ND
Chromium	NA	NA	NA	NA	ND	ND
Gross Alpha/Beta-9310						
Gross CPM	NA	NA	0.35/3.9	0.25/3.2	0.25/2.35	0.25/2.45
Background	NA	NA	0.16	0.06	0.12	0.24
pCilg	NA	NA	0.00/0.01	0.00/0.01	0.00/0.01	0.00/0.01
Gamma Spectroscopy ESE SOP ER-130 (pCilg)						
Cesium-134	NA	NA	0.0	0.044	0.019	0.030
Radium-226	NA	NA	0.4	0.4	0.3	0.4

mg/kg = milligrams per kilogram unless noted otherwise.
ND = Not Detected
NA = Not Analyzed
CPM = Counts per minute
pCilg = PicoCuries per gram

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APPENDIX D

DATA SETS USED FOR APPLICATION OF ATTAINMENT CRITERIA

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TABL -1
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
1240 FRENCH DRAIN

SAMPLE NUMBER	TPH	LEAD	CHROMIUM	REMARKS	SAMPLE NUMBER	TPH	LEAD	CHROMIUM	REMARKS
	CONCENTRATION (mg/kg)					CONCENTRATION (mg/kg)			
CM-001-WC	133,000	738	962	Excavated	CM-015*-300	10	2.5	5	
CM-002-WC	ND	22	ND	Excavated	CM-016-550	10	14	5	
CM-003-WC	127	ND	ND	Excavated	CM-017-015	NA	NA	NA	Waste Characterization
CM-004-WC	3,230	ND	ND	Excavated	CM-018-015	NA	NA	NA	Waste Characterization
CM-005-WC	22,400	ND	ND	Excavated	C-01-200	130	4.53	6.05	
CM-006-400	433	ND	ND	Excavated	C-02-200	50	3.66	6.35	
CM-007-320	36	ND	ND	Excavated	C-03-200	50	3.53	5.35	
CM-008-110	28	ND	ND	Excavated	C-04-400	50	1.54	5.19	
CM-009-110	141	ND	ND	Excavated	C-05-150	50	3.12	4.88	
CM-010-320	39	ND	ND	Excavated	C-06-200	50	3.9	10.3	
CM-011-520	394	19	ND	Excavated	C-07-200	50	2.04	4.56	
CM-012-320	734	12	ND	Excavated	C-08-300	50	2.6	4.89	
CM-013-535	3,120	15	ND	Excavated	C-09-300	50	2.29	4.2	
CM-014-300	101	16	5		C-010-550	50	1.79	4.06	

NOTES:
1. * indicates average of duplicate samples.
2. For samples which were collected from areas later excavated, or waste characterization samples, sampling results were not used in final statistics.
3. When not detected, concentrations used for statistical purposes are 0.5 times detection limit.

TABLE D-2
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
1240 SUSPECT SPILL AREA

SAMPLE NUMBER	LEAD CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	LEAD CONCENTRATION (mg/kg)	REMARKS
CM-001-010	79		CM-019-060	10	
CM-002-010	94		CM-020-040	10	
CM-003-020	6		CM-021-005	1050	Excavated
CM-004-025	9		CM-022-015	221	
CM-005-020	510	Excavated	CM-023-040	26	
CM-006-025	156	Excavated	CM-024-005	6,780	Excavated
CM-007-020	169	Excavated	CM-025-040*	10	
CM-008-015	68	Excavated	CM-026-025	10	
CM-009-015	554	Excavated	CM-027-015	166	
CM-010-010	2,360	Excavated	CM-028-025	2.5	
CM-011-010*	6,465	Excavated	CM-029-025	2.5	
CM-012-005	754	Excavated	CM-030-025	2.5	
CM-013-005	846	Excavated	CM-031-040	2.5	
CM-014-005	219		CM-032-015	56	
CM-015-005	194		CM-033-015	132	
CM-016-005	126		CM-034-025	10	
CM-017-005	541	Excavated	CM-035-020	124	
CM-018-WC	11	Waste Characterization	CM-036-030	2.5	

TABLE D-2 (Continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
1240 SUSPECT SPILL AREA

SAMPLE NUMBER	LEAD CONCENTRATION (mg/kg)	REMARKS	SAMPLE NUMBER	LEAD CONCENTRATION (mg/kg)	REMARKS
CM-037-030	8		CM-051-015	252	Excavated
CM-038-030	9		CM-052-015	2.5	
CM-039-020	1,860	Excavated	CM-053-015	2.5	
CM-040-020	63		C-01-045	3.96	
CM-041-015	190		C-02-045	3.79	
CM-042-015	1,030	Excavated	C-03-045	3.64	
CM-043-045	2.5		C-04-045	3.82	
CM-044-045	2.5		C-05-025	3.27	
CM-045-045	2.5		C-06-045	3.65	
CM-046-020	38		C-07-045	3.74	
CM-047-015	30		C-08-025	5.59	
CM-048-015	418	Excavated	C-09-045	3.74	
CM-049-015	39		C-010-045	5.20	
CM-050-015	189	Excavated	C-09-030	3.74	

NOTES:
1. * indicates an average of duplicate samples.
2. For samples which were collected from areas later excavated, sampling results were not used in final statistics.
3. When not detected, concentrations used for statistical purposes are 0.5 times detection limit.

TABLE D-3
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA
TAR FLOW AREA

SAMPLE NUMBER	TPH	LEAD	REMARKS	SAMPLE NUMBER	TPH	LEAD	REMARKS
	CONCENTRATION (mg/kg)				CONCENTRATION (mg/kg)		
CM-001-015	2,750	11	Excavated[2]	CM-019-075	49	6	
CM-002-015*	34	7	Excavated	CM-020-070	10	5	
CM-003-015	10[3]	7		CM-021-075*	10	2.5	
CM-004-015	10	5		CM-022-007	465	121	Excavated
CM-005-015	10	2.5[3]		CM-023-090	10	9	
CM-006-015*	10	2.5		CM-024-070	10	9	
CM-007-030	10	6		CM-025-105	10	5	
CM-008-030	10	5		CM-026-030	10	7	
CM-009-030	10	2.5		CM-027-025	10	6	
CM-010-075	10	2.5		CM-028-015	10	10	
CM-011-045	5	7		CM-029-015	82	10	
CM-012-045	12	6		CM-030-020	30	9	
CM-013-045	9	5		CM-031-015*	10	8	
CM-014-045	18	6		CM-032-WC	2,970	6	
CM-015-060	16	6		CM-033-WC	6,980	8	
CM-016-060	11	5		CM-034-WC	2,630	7	
CM-017-030*	10	2.5		CM-035-WC	10	18	
CM-018-000	142	6	Waste Characterization	CM-036-045	10	2.5	

TABLE D-3 (Continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
TAR FLOW AREA

SAMPLE NUMBER	TPH	LEAD	REMARKS	SAMPLE NUMBER	TPH	LEAD	REMARKS
	CONCENTRATION (mg/kg)				CONCENTRATION (mg/kg)		
CM-037-045	10	2.5		CM-055-020	10	7	
CM-038-020	10	2.5		CM-056-015	21	7	Excavated
CM-039-040	10	7		CM-057-015	20	9	
CM-040-025	10	10		CM-058-045	10	2.5	
CM-041-030	10	8		CM-059-045	10	6	
CM-042-030*	10	2.5		CM-060-045	10	13	
CM-043-WC	1,340	7	Waste Characterization	CM-061-030	10	6	
CM-044-WC	672	2.5	Waste Characterization	CM-062-075	10	25	
CM-045-090	10	2.5		CM-063-120	10	12	
CM-046-105	10	8		CM-064-105	10	7	
CM-047-010	4,090	37	Excavated	CM-065-100*	23	2.5	
CM-048-015	10	5	Excavated	CM-066-090	10	2.5	
CM-049-100	34	16	Excavated	CM-067-020	10	14	
CM-050-020		2.5		CM-068-015	10	2.5	
CM-051-165	3,960	19	Excavated	CM-069-015	10	13	
CM-052-020*	10	7		CM-070-WC	2,430	NA[4]	Waste Characterization
CM-053-015	10	6		CM-071-WC	1,550	NA	Waste Characterization
CM-054-165	10	9		CM-072-WC*	1,260	NA	Waste Characterization

TABLE D-3 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
TAR FLOW AREA

SAMPLE NUMBER	TPH	LEAD	REMARKS	SAMPLE NUMBER	TPH	LEAD	REMARKS
	CONCENTRATION (mg/kg)				CONCENTRATION (mg/kg)		
CM-073-WC	345	NA	Waste Characterization	CM-091-150	10	7	
CM-074-WC	810	NA	Waste Characterization	CM-092-150	10	2.5	
CM-075-WC	780	NA	Waste Characterization	CM-093-130	10	7	
CM-076-WC	1,930	NA	Waste Characterization	CM-094-105	10	10	
CM-077-WC	1,210	NA	Waste Characterization	CM-095-075*	10	10	
CM-078-270	10	2.5		CM-096-135	10	2.5	
CM-079-060	86	7		CM-097-120	10	8	
CM-080-210	10	6		CM-098-180	10	16	
CM-081-045*	10	7		CM-099-180	10	14	
CM-082-060	10	2.5		CM-100-060	10	2.5	
CM-083-020	10	2.5		CM-101-WC		6	
CM-084-030	10	2.5		CM-102-WC		6	
CM-085-020*	10	9		CM-103-120	415	9	Excavated
CM-086-120	28	17		CM-104-120	10	2.5	
CM-087-180	10	9		CM-105-120	10	2.5	
CM-088-180	10	10		CM-106-150	10	2.5	
CM-089-150	10	18		CM-107-140	10	2.5	
CM-090-075	10	9		CM-108-160	10	8	

TABLE D-3 (Continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
TAR FLOW AREA

SAMPLE NUMBER	TPH	LEAD	REMARKS	SAMPLE NUMBER	TPH	LEAD	REMARKS
	CONCENTRATION (mg/kg)				CONCENTRATION (mg/kg)		
CM-109-165	10	2.5		CM-127-055*	10	2.5	
CM-110-020	322	2.5		CM-128-025	10	2.5	
CM-111-180	10	10		CM-129-045	10	2.5	
CM-112-185	10	2.5		CM-130-045*	10	2.5	
CM-113-185	10	7		CM-131-030	10	2.5	
CM-114-025	10	13		CM-132-020	10	2.5	
CM-115-020	23	13		CM-133-015	10	2.5	
CM-116-185	10	2.5		CM-134-035	271	2.5	
CM-117-150	10	9		CM-135-045	10	2.5	
CM-118-060	10	12		CM-136-035	10	2.5	
CM-119-070	10	2.5		CM-137-050	63	2.5	
CM-120-070*	10	2.5		CM-138-040	10	2.5	
CM-121-070	10	2.5		CM-139-060	10	2.5	
CM-122-080	10	2.5		CM-140-020*	55	2.5	
CM-123-060	10	2.5		CM-141-060	10	6	
CM-124-065	10	2.5		CM-142-015	10	2.5	
CM-125-065	10	2.5		CM-143-060*	10	2.5	
CM-126-060	10	2.5		CM-144-020	32	2.5	

TABLE D-3 (continued)
DATA SET FOR APPLICATION OF ATTAINMENT CRITERIA,
TAR FLOW AREA

SAMPLE NUMBER	TPH	LEAD	REMARKS	SAMPLE NUMBER	TPH	LEAD	REMARKS
	CONCENTRATION (mg/kg)				CONCENTRATION (mg/kg)		
CM-145-030	10	2.5		C-05-025	50	3.02	
CM-146-030	10	2.5		C-06-020	50	3.03	
CM-147-WC	10	2.5		C-07-075	50	3.50	
CM-148-075	25	2.5		C-08-120	50	5.40	
CM-149-110	10	2.5		C-09-185	50	4.54	
CM-150-015*	10	2.5		C-10-135	50	3.06	
C-01-185	50	3.70					
C-02-185	50	3.67					
C-03-040	50	3.21					
C-04-060	50	2.87					

NOTES:
1. * indicates average of duplicate samples.
2. For samples collected in areas later excavated, sampling results were not used in final statistics.
3. When not detected, concentrations used for statistical purposes are 0.5 times detection limit.
4. NA = Not analyzed.

APPENDIX E

USACE NORTH PACIFIC DIVISION LABORATORY QUALITY ASSURANCE REPORT

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DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9503

September 05, 1995

Paul Karas
CDM Federal Programs Corporation
1010 Jadwin Avenue
Richland Washington 99352

Dear Mr. Karas,

Enclosed, completing all analyses requested to date, are reports of analytical data for the Hanford 1100 Area EM-2/EM3 Remediation project, sampled by CDM Federal Programs Corporation on July 06 through 14, 1995. Included are:

a. Enclosure 1, Chemical Quality Assurance Report.

b. Enclosure 2, Original QA report numbers 9077 and 9083 from ARDL, Inc.

c. Enclosure 3, Original CENPD-ET-EN-L Sample Cooler Receipt forms.

Reference original project reports; DOE-Hanford EM2 Site 1-Level III-July 1995, DOE-Hanford EM2 Site 1-Level IV-July 1995, DOE-Hanford EM3 Site 1-Level III-July 1995, DOE- Hanford EM3 Site 1-Level IV-July 1995, DOE-Hanford EM3 Site 2-Level III-July 1995, DOE-Hanford EM3 Site 2-Level IV-July 1995, DOE-Hanford EM3 Site 6-Level III-July 1995, DOE-Hanford EM3 Site 6-Level IV-July 1995, DOE-Waste Characterization-(EM2/01-)-Level III-July 1995, DOE-Waste Characterization-(EM3/01-)-Level III-July 1995, and DOE-Waste Characterization-(EM3/02-) Level III-July 1995 from Environmental Science & Engineering (ES&E), Inc. and 49961 and 50119 from Sound Analytical Services (SAS), Inc., submitted to your office by the laboratory.

Please contact Dr. Ajmal Ilias at (503) 669-0246 if you have any questions.

Sincerely,

Ajmal M. Ilias
For TIMOTHY J. SEEMAN, Director
North Pacific Division Laboratory

Enclosures

CHEMICAL QUALITY ASSURANCE REPORT

HANFORD 1100 AREA EM-2/EM-3 REMEDIATION

1. **SUMMARY:**

a. The primary laboratory data are accepted based on the majority of acceptable internal quality control (QC) and quality assurance (QA) data agreements except for the following qualifications. The presence of acetone detected in rinsate EB-EM3/06-C-10-274 (ES&E report DOE-Hanford EM3 Site 6-Level III-July 1995), methylene chloride in soil sample EM3/01-W-01-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995), and Bis-(2-ethylhexyl)phthalate in samples EM2/01-W-01-0 and EM2/01-W-02-0 (ES&E report DOE-Waste Characterization-(EM2/01)-Level III-July 1995), and EM3/02-W-01-0 and EM3/02-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995) should be considered due to laboratory contamination as the sample levels were less than ten times that detected in the associated method blanks. The lead data in the twenty soil samples associated with the MS and MSD of sample EM3/01-C-10-045 should be considered as low estimates due to very low percent recoveries (ES&E reports DOE-Hanford EM3 Site 1-Level III-July 1995, DOE-Hanford EM3 Site 1-Level IV-July 1995, DOE-Hanford EM3 Site 2-Level III-July 1995, DOE-Hanford EM3 Site 2-Level IV-July 1995). The integrity of sixteen WTPH soil samples and the accompanying rinsate could have been compromised before analysis due to low cooler temperatures (SAS report # 50119).

b. The project and QA data comparisons are shown in Tables II through IV. All data agree.

2. **BACKGROUND:** The samples were collected on July 6 through 8 and 10 through 14, 1995 and were received by the analytical laboratories on July 8, 13, 14, 15 and 20, 1995.

3. **OBJECTIVES:**

a. Forty-six soil samples and four rinsates were collected from the site to determine the extent of the chemical contamination.

b. Four soil samples were submitted to evaluate the project laboratories' data.

4. PROJECT ORGANIZATION:

a. The samples were collected by CDM Federal Programs Corporation, Richland, Washington.

b. The project samples were analyzed by Environmental Science & Engineering (ES&E), Inc., Gainsville Florida and Sound Analytical Services (SAS), Inc., Tacoma, Washington.

c. The QA samples were analyzed by Applied Research & Development Laboratory (ARDL), Inc., Mt. Vernon, Illinois.

5. ANALYTICAL REFERENCES:

Number	Title	Date
a. SW-846, Third Edition	Test Methods for Evaluating Solid Waste - Final Update	8/93
b. WTPH 418.1 Mod.	State of Washington TPH Analytical Methods for Soil and Water	4/92

6. EVALUATION OF THE PROJECT LABORATORY'S DATA:

a. Surrogate Recoveries: All surrogate recoveries were within EPA or laboratory established (LE) quality control (QC) limits and are acceptable.

b. Matrix Spike (MS), Matrix Spike Duplicate (MSD), Continuing Calibration Verification Standards (CCVS) Post Spike (PS) and Laboratory Control Sample (LCS) Recoveries: All MS, MSD, CCVS, PS and LCS recoveries were within EPA, Washington State Department of Ecology (WSDOE) or LE QC limits and are acceptable with the following exceptions. Seven of eleven compound spikes in each of the soil semi-volatile organics (BNA) LCS, MS and MSD in batch G62577 were above their respective EPA QC limits. The Bis-(2-ethylhexyl)phthalate data for samples EM2/01-W-01-0 and EM2/01-W-02-0 (ES&E report DOE-Waste Characterization-(EM2/01)-Level III-July 1995) should be considered as high estimates. Five of eleven BNA compound spikes in the LCS and six of eleven in each of the MS and MSD for batch G62751 were

above their respective QC limits. Bis-(2-ethylhexyl)phthalate data for samples EM3/02-W-01-0 and EM3/02-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995) should be considered as high estimates. The percent recoveries of lead in the soil MS and MSD of sample EM3/01-C-10-045 were 21.2 and 22.7, respectively, below EPA QC limits. The lead data in the twenty associated soil samples should be considered as low estimates (ES&E reports DOE-Hanford EM3 Site 1-Level III-July 1995, DOE-Hanford EM3 Site 1-Level IV-July 1995. DOE-Hanford EM3 Site 2-Level III-July 1995, DOE-Hanford EM3 Site 2-Level IV-July 1995). The percent recovery for Gross α in the MS for batch G2866 (ES&E reports DOE-Waste Characterization-(EM3/01)-Level III-July 1995 and DOE-Waste Characterization-(EM3/02)-Level III-July 1995) was 65.3, slightly below LE QC limits of 7-129. The laboratory data are acceptable based on acceptable recoveries for the LCS and MSD.

c. Laboratory Duplicates: All relative percent differences (RPD) were within EPA, WSDOE or LE QC limits and are acceptable.

d. Project Blind Duplicates: Project blind duplicate data are shown in Tables II through V. All data agree and are comparable.

e. Laboratory Blanks: All laboratory method blanks were free of targeted analytes with the following exceptions. Estimated levels of methylene chloride at 2.2 ppb, acetone at 6.2 ppb and 1,1,2,2-tetrachloroethane at 0.35 ppb were found in the volatile organic compounds (VOC) method blank associated with rinsate EB-EM3/06-C-10-274 (ES&E report DOE-Hanford EM3 Site 6-Level III-July 1995). The acetone detected in this rinsate, at a level of 36.0 ppb, should be considered due to laboratory contamination as this level is less than ten times the concentration found in the associated method blank. Estimated levels of methylene chloride at 3.8 ppb, and acetone at 19 ppb were found in the soil VOC method blank associated with batch G62699 (ES&E reports DOE-Hanford EM3 Site 6-Level III-July 1995 and DOE-Hanford EM3 Site 6-Level IV-July 1995). Sample data are not effected as none of the thirty-five targeted analytes were detected in the associated soil samples. Estimated levels of methylene chloride at 1.6 ppb, and acetone at 2.9 ppb were found in the soil VOC method blank associated with batch G62630 (ES&E report DOE-Waste Characterization-(EM2/01)-Level III-July 1995). Sample data are not effected as none of the thirty-five targeted analytes were detected in the associated soil samples. Estimated levels of methylene chloride at 3.5 ppb, methyl ethyl ketone at 1.7 ppb and acetone at 2.9 ppb were found in the soil VOC method blank associated with batch G62832 (ES&E reports DOE-Waste Characterization-(EM3/01)-Level III-July 1995 and DOE-Waste Characterization-(EM3/02)-Level III-July 1995). The presence of methylene chloride at a level of 5.7 ppb in soil sample EM3/01-W-01-0

(ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995) should be considered due to laboratory contamination as this level is less than ten times the concentration found in the associated method blank. Estimated levels of Bis-(2-ethylhexyl)phthalate at 39 ppb and di-n-butylphthalate at 37 ppb were detected in a soil semi-volatile organics (BNA) method blank associated with samples EM2/01-W-01-0 and EM2/01-W-02-0 (ES&E report DOE-Waste Characterization-(EM2/01)-Level III-July 1995). The presence of Bis-(2-ethylhexyl)phthalate at 170 and 210 ppb should be considered due to laboratory contamination as these levels are less than ten times that detected in the associated method blank. Bis-(2-ethylhexyl)phthalate at a level of 110 ppb was detected in a soil BNA method blank associated with samples EM3/01-W-01-0 and EM3/01-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/01)-Level III-July 1995) and EM3/02-W-01-0 and EM3/02-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995). Bis-(2-ethylhexyl)phthalate was not detected in samples EM3/01-W-01-0 and EM3/01-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/01)-Level III-July 1995) and sample data are not effected. The presence of Bis-(2-ethylhexyl)phthalate in EM3/02-W-01-0 and EM3/02-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995) at levels of 630 and 150 ppb, respectively, should be considered due to laboratory contamination as these levels are less than ten times that detected in the associated method blank. Lead at a level of 19.8 ppb and chromium at a level of 6.3 ppb were detected in a TCLP metals method blank associated with samples EM3/01-W-01-0 and EM3/01-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/01)-Level III-July 1995) and EM3/02-W-01-0 and EM3/02-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995). Lead and chromium were not detected in samples EM3/02-W-01-0 and EM3/02-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995) and sample data are not effected. The lead data for samples EM3/01-W-01-0 and EM3/01-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/01)-Level III-July 1995) at levels of 3520 and 1400 ppb, respectively, should be accepted as these levels are greater than ten times that detected in the associated method blank.

f. Rinsate Blanks: Rinsate blank data are show in Tables I-a through I-d. All rinsates were free of targeted analytes with the exception of EB-EM3/06-C-10-274 in Table I-d. The presence of acetone in this rinsate should be considered due to laboratory contamination as this analyte was also detected in the laboratory method blank. The absence of targeted analytes in the rinsate blanks indicates that proper decontamination procedures were followed during sampling.

g. Holding Times and Detection Limits and Mass Calibration/Tuning : All holding times, detection limits and instrument calibrations met method requirements.

h. Chain of Custody: All Chain of Custody (COC) records met requirements per U.S. Army Corps of Engineers ER-1100-1-263 with the following exception. The temperature of a cooler received at SAS, Inc., was 0.0 °C. below USACE recommended range of 4 ± 2°C (SAS report # 50119). The integrity of the sixteen soil samples and the accompanying rinsate could have been compromised before analysis.

i. Overall Evaluation of the Project Laboratory Data: Overall, the project data are accepted except for the following qualifications. Acetone detected in rinsate EB-EM3/06-C-10-274 should be considered due to laboratory contamination as the level was less than ten times the concentration found in the associated method blank.(ES&E report DOE-Hanford EM3 Site 6-Level III-July 1995). The presence of methylene chloride in soil sample EM3/01-W-01-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995) should be considered due to laboratory contamination as the level was less than ten times the concentration found in the associated method blank. The presence of Bis-(2-ethylhexyl)phthalate in samples EM2/01-W-01-0 and EM2/01-W-02-0 (ES&E report DOE-Waste Characterization-(EM2/01)-Level III-July 1995), and EM3/02-W-01-0 and EM3/02-W-02-0 (ES&E report DOE-Waste Characterization-(EM3/02)-Level III-July 1995) should be considered due to laboratory contamination as the levels were less than ten times that detected in the associated method blanks. The lead data in the twenty soil samples associated with the MS and MSD of sample EM3/01-C-10-045 should be considered as low estimates due to very low MS and MSD percent recoveries (ES&E reports DOE-Hanford EM3 Site 1-Level III-July 1995, DOE-Hanford EM3 Site 1-Level IV-July 1995, DOE-Hanford EM3 Site 2-Level III-July 1995, DOE-Hanford EM3 Site 2-Level IV-July 1995). The temperature of a cooler received at SAS, Inc., was 0.0 °C, below USACE recommended range of 4 ± 2°C (SAS report # 50119). The integrity of the sixteen WTPH soil samples and the accompanying rinsate could have been compromised before analysis.

7. **EVALUATION OF THE QA LABORATORIES' DATA:** All laboratory method blanks were free of targeted analytes. Holding times and detection limits met method requirements with one exception. Extraction of the WTPH sample QA-EM2/01C-01-185 occurred four days past the recommended holding time (ARDL report # 9077). The WTPH data for this sample should be considered a low estimate. MS, MSD and LCS percent recoveries were within EPA or WSDOE QC limits with the following exceptions. The recovery of lead in the MSD of QA-EM2/01-C-01-185 was above EPA QC limits (ARDL report # 9077). Data are acceptable based on acceptable MS and LCS recoveries. The recovery of lead in the MSD of QA-EM3/02-C-01-200 was below EPA QC limits (ARDL report # 9083). Data are acceptable based on acceptable MS and LCS recoveries. All RPDs were within acceptable QC limits. All Chain of Custody (COC) records met

requirements per U.S. Army Corps of Engineers ER-1100-1-263 with the following exceptions. VOC sample QA-EM3/06-C-01-335 was kept at CENPD-ET-EN-L as both containers had approximately 1 cm of head space (ARDL report # 9077). The temperature of one cooler received at CENPD-ET-EN-L was 1.9°C, below USACE recommended range of 4 ± 2°C (ARDL report # 9077). The integrity of the soil sample QA-EM3/02-C-01-200 could have been compromised before analysis. Overall, the QA laboratory's data are accepted with the above notations.

8. **PROJECT AND QA LABORATORIES' DATA COMPARISON**: All data comparisons are shown in Tables II through IV. All data agree and are comparable.

9. **PROBLEMS ENCOUNTERED/CORRECTIVE ACTION TAKEN:**

a. No sample control sheets were submitted to CENPD-ET-EN-L for determining the presence of project blind duplicates. Attempts to contact CENPW were not successful. CDM Federal Programs Corporation was contacted and supplied the necessary information.

b. According to the COC attached to SAS report # 50119, WTPH samples EM2/01-W-01-0 and EM2/01-W-02-0 were sampled on 7/14/95. The COC for samples sent to ES&E with the same sample numbers had the sampling date as 7/6/95. CDM Federal Programs Corporation was contacted and replied that the samples were taken from the same site but at different times. A complete explanation will be sent to CENPW.

c. In the case narrative of a project laboratory report, ES&E DOE-Hanford EM3-Site 1-Level III-July 1995, the incorrect prefix EM3/06- was used. The correct prefix should be EM3/01-.

d. A project laboratory report, SAS report # 50119, mislabeled the samples 50119-15 and 50119-16 on page two. These numbers should correspond to EM2/01-W-01-0 and EM2/01-W-02-0, respectively.

PRIMARY RINSATE BLANK RESULTS

Table I-a

Project: Hanford 1100 Area EM-2/EM-3 Matrix: Water Prefix: EB-EM2/01-
Primary Laboratory: Sound Analytical Services, Inc.

1. Method: Washington Total Petroleum Hydrocarbon (EPA 418.1 Mod.) Units: mg/L (ppm)

Analytes Detected	Primary Lab C-01-185	Detection Limits
WTPH	ND	1.0

ND = Not detected

SUMMARY: The absence of the targeted analyte in the primary rinsate blank indicates that proper decontamination procedures were followed during sampling.

2. Method: Total Lead (EPA 7421) Units: ug/L (ppb)
Primary Laboratory: ES&E, Inc.

Analytes Detected	Primary Lab C-01-185	Detection Limits
Lead	ND	2.0

SUMMARY: The absence of the targeted analyte in the primary rinsate blank indicates that proper decontamination procedures were followed during sampling.

PRIMARY RINSATE BLANK RESULTS

Table I-b

Project: Hanford 1100 Area EM-2/EM-3 Matrix: Water Prefix: EB-EM3/01-
Primary Laboratory: ESE, Inc.

Method: Total Lead (EPA 7421) Units: ug/L (ppb)

Analytes Detected	Primary Lab C-01-045	Detection Limits
Lead	ND	2.0

ND = Not detected

SUMMARY: The absence of the targeted analyte in the primary rinsate blank indicates that proper decontamination procedures were followed during sampling.

PRIMARY RINSATE BLANK RESULTS

Table I-c

Project: Hanford 1100 Area EM-2/EM-3 Matrix: Water Prefix: EB-EM3/01-
Primary Laboratory: Sound Analytical Services, Inc.

1. Method: Washington Total Petroleum Hydrocarbon (EPA 418.1 Mod.) Units: mg/L (ppm)

Analytes Detected	Primary Lab C-01-200	Detection Limits
WTPH	ND	1.1

ND = Not detected

SUMMARY: The absence of the targeted analyte in the primary rinsate blank indicates that proper decontamination procedures were followed during sampling.

2. Method: Total Chromium and Lead (EPA 7421) Units: ug/L (ppb)
Primary Laboratory: ES&E, Inc.

Analytes Detected	Primary Lab C-01-200	Detection Limits
Chromium	ND	10.0
Lead	ND	2.0

SUMMARY: The absence of the targeted analytes in the primary rinsate blank indicates that proper decontamination procedures were followed during sampling.

PRIMARY RINSATE BLANK RESULTS

Table I-d

Project: Hanford 1100 Area EM-2/EM-3 Matrix: Water Prefix: EB-EM3/06-
Primary Laboratory: ESE, Inc.

Method: Volatile Organic Compounds (EPA 8240) Units: ug/L (ppb)

Analytes Detected	Primary Lab C-10-274	Detection Limits
Acetone	36 B	9.0

B = Found in method blank at a level of 6.2 ppb

SUMMARY: The presence of acetone in the primary rinsate should be considered due to laboratory contamination as this analyte was also detected in the associated primary laboratory method blank. The absence of the other thirty-four targeted analytes in the primary rinsate blank indicates that proper decontamination procedures were followed during sampling.

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table II

Project: Hanford 1100 Area EM-2/EM-3 Matrix: Soil Prefix: EM3/01-
Primary Laboratory: ESE, Inc. QA Laboratory: ARDL, Inc.

Method: Total Lead (EPA 3050/7421) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab C-01-045	Primary Lab C-02-045	Detection Limits	QA Lab C-01-045	Detection Limits
	3.96	3.79	0.2	4.6	0.11
Percent Solids	91.4	91.1		89.8	

ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other and are comparable.

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table III

Project: Hanford 1100 Area EM-2/EM-3 Matrix: Soil Prefix: EM2/01-
Primary Laboratory: Sound Analytical Services, Inc. QA Laboratory: ARDL, Inc.

Washington
1. Method: Total Petroleum Hydrocarbon (EPA9071/418.1Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab C-01-185	Primary Lab C-02-185	Detection Limits	QA Lab C-01-185	Detection Limits
WTPH	ND	ND	100	14.3	10.4
Percent Solids	96.16	96.49		96.4	

ND = Not detected

SUMMARY: The primary blind duplicate data agree. The QA data confirms the primary blind duplicate data.

2. Method: Total Lead (EPA 3050/7421) Units: mg/Kg (ppm)
Primary Laboratory: ES&E, Inc.

Analytes Detected	Primary Lab C-01-185	Primary Lab C-02-185	Detection Limits	QA Lab C-01-185	Detection Limits
Lead	3.70	3.67	0.2	4.0	0.10
Percent Solids	96.4	96.3		96.4	

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other and are comparable.

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table IV

Project: Hanford 1100 Area EM-2/EM-3 Matrix: Soil Prefix: EM3/02-
Primary Laboratory: Sound Analytical Services, Inc. QA Laboratory: ARDL, Inc.

Washington
1. Method: Total Petroleum Hydrocarbon (EPA9071/418.1Mod.) Units: mg Kg (ppm)

Analytes Detected	Primary Lab C-01-200	Primary Lab C-02-200	Detection Limits	QA Lab C-01-200	Detection Limits
WTPH	130	ND	100	82.8	10.6
Percent Solids	95.18	95.19		93.9	

ND = Not detected

SUMMARY: The primary blind duplicate data agree within a factor of two with each other or their detection limits.

2. Method: Total Chromium and Lead (EPA 3050/6010,7421) Units: mg/Kg (ppm)
Primary Laboratory: ES&E, Inc.

Analytes Detected	Primary Lab C-01-200	Primary Lab C-02-200	Detection Limits	QA Lab C-01-200	Detection Limits
Chromium	6.05	6.35	1.0	3.7	0.53
Lead	4.53	3.66	0.2	5.3	0.53
Percent Solids	94.4	94.6		93.9	

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other and are comparable.

COMPARISON OF PRIMARY BLIND DUPLICATE RESULTS

Table V

Project: Hanford 1100 Area EM-2/EM-3 Matrix: Soil Prefix: EM3/06-
Primary Laboratory: ESE, Inc.

Method: Volatile Organic Compounds (EPA 8240) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab C-01-335	Primary Lab C-02-335	Detection Limits
	ND	ND	5.3-11
Percent Solids	94.1	93.8	

ND = Not detected

SUMMARY: The primary blind duplicate results agree and are comparable.