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Draft for Public Review
Engineering Evaluation/Cost Analysis
Waste Burial Holes
SCDS Environmental Restoration
Davis, California

Job No. 00234-263-044
March 1, 1999

UNIVERSITY OF CALIFORNIA, DAVIS

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March 1, 1999

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Re: Engineering Evaluation/Cost Analysis (EE/CA) Report

Dear Mr. Austin, Ms. Setian, Ms. Timm, and Ms. Brown:

Enclosed please find a draft for public review of the Engineering Evaluation/Cost Analysis Report for the anticipated remedial action in the Waste Burial Holes (WBH) Area at the South Campus Disposal Site. This report identifies the objectives for the remedial action and presents an analysis and recommendation of the likely remedial alternative. The period for public review will be from March 3, 1999 to April 2, 1999.

Responses to agency comments on the draft report are presented in Appendix A and have been incorporated into this Report. Although this report is titled as a draft for public review, in terms of agency review, this is the draft final.

If you have any questions about the enclosed document, please call me at (530) 752-6041. Written comments on the EE/CA Report can be sent to my attention at the following address:

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LIST OF ACRONYMS

ACOE	Army Corps of Engineers
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOE	Department of Energy
DWR	Department of Water Resources
EE/CA	Engineering Evaluation/Cost Analysis
HSUs	Hydrostratigraphic Units
IRA	Interim Removal Action
ITEH	Institute of Toxicology and Environmental Health
LEHR	Laboratory for Energy-related Health Research
LSC	Liquid Scintillation Counter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	Operable Unit
RA	Remedial Action
RAOs	Removal Action Objectives
RAWP	Removal Action Work Plan
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RPMs	Remedial Project Managers
SCDS	South Campus Disposal Site
SVOCs	Semivolatile Organic Compounds
UC	University of California
US EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
WBH	Waste Burial Holes

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WASTE BURIAL HOLES
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DAVIS, CALIFORNIA

EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) Report has been prepared for the anticipated Waste Burial Hole (WBH) Interim Removal Action (IRA) at the former Laboratory for Energy-related Health Research (LEHR) and the South Campus Disposal Site (SCDS) (together referred to as the Site) at the University of California, Davis (UC Davis). The WBH IRA is considered a non-time-critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program currently being conducted at the Site. In general, the IRA is being conducted to prevent, minimize, or mitigate potential damage to the public health and environment.

The WBH removal action was originally conceived as a time-critical removal actionunder CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). However, due to a planning period of more than six months, based primarily on UC Davis' desire to profile WBH waste prior to implementation of the removal action, the United States Environmental Protection Agency (US EPA) requested that the WBH IRA be implemented as a non-time critical removal action. As such, it is a requirement to document removal action objectives (RAOs) and review removal alternatives in an EE/CA.

The WBH area consists of 49 burial pits, excavated between about 1956 and 1974, which were reported to be used by UC Davis to dispose of wastes from general campus activities that potentially contained radiologic materials, campus chemicals, and laboratory wastes. The WBH area is located along the southern end of the Site and is bounded on the north by the Eastern Dog Pens and Landfill Unit #2, on the south by the northern levee of Putah Creek, on the west by the Southern Trench areas, and on the east by the Cobalt-60 field and Landfill Unit #1.

Six previous investigations conducted within the WBH area included two reconnaissance trenching programs (Wahler, 1988; Dames & Moore, 1990), a soil gas investigation, a surface geophysical survey and drilling of one soil boring (PNL, 1995a), and a trenching and soil sampling program (Dames & Moore, 1998a). The purpose of these investigations was to locate the waste burial pits, evaluate the nature of refuse disposed in the pits, and assess the extent of impacts to soil resulting from the refuse. Data from these investigations is summarized in this EE/CA to support the recommended alternative.

In general, the waste cells are found from approximately 2 to 11 feet below ground surface. The overburden overlying the waste appears as a mixture of sand, silt, and clay and is interpreted to represent native material that was reworked during excavation and refuse burial. The refuse itself is typically found

to be one to five feet thick and consists of a mixture of laboratory waste, dog pen-like gravel, and biological waste. Results of sample analyses of the refuse and surrounding soil indicate the presence of both radiological constituents and low levels of organic constituents, predominantly in the waste layer.

The goal of the IRA is to meet the following objectives:

- Prevent, minimize, or mitigate further impact to soil or groundwater from the WBH area;
- Prevent, minimize, or mitigate potential threat to public health or the environment;
- Allow final subsurface characterization work to be conducted in the WBH; and
- Collect additional data in the WBH to assist in selection of the final remedial action for the WBH.

To achieve these objectives, five alternatives were developed and screened based on effectiveness, implementability, and cost. The alternatives can be summarized as: refuse removal with off-site treatment/disposal; refuse and soil removal with off-site treatment/disposal; removal of a portion of Landfill Unit #2 to support further investigation; refuse and soil removal with on-site disposal; and in-situ containment.

The alternative selected in this EE/CA includes excavation of refuse for off-site treatment/disposal. Conducting a waste-only removal action will allow:

- The action to be limited and controlled with regard to waste profiling, handling, and disposal requirements;
- A more complete characterization of soil impacts below the waste;
- A more complete scoping of the final remedial action for the WBH area during the SCDS soil area remedial investigation (RI); and
- Reduction of impacts to soil and groundwater, and a reduction of risk at the Site.

A schedule for implementing the WBH IRA has been developed with the goal of completing the work by November 1999. Upon release of the final EE/CA, the US EPA will complete the IRA Action Memorandum, and UC Davis will complete a Removal Action Work Plan (RAWP). Design of the removal action will be initiated and, upon approval of regulatory and design documents, a contractor will be selected and the removal action will be conducted. After completion of field activities, a Final Completion Report will be produced documenting field activities, outlining waste handling procedures, and reporting characterization sample results.

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1.0 INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA) has been prepared for the anticipated Waste Burial Holes (WBH) Interim Removal Action (IRA) at the former Laboratory for Energy-related Health Research (LEHR) and the South Campus Disposal Site (SCDS) (together referred to as the Site) at the University of California, Davis (UC Davis) (Figure 1). This EE/CA identifies the objectives for the anticipated WBH IRA, presents WBH characterization data, discusses removal action alternatives, and provides the justification for the proposed action.

Though being implemented voluntarily by UC Davis, the WBH IRA is being conducted in conformance with a Draft Administrative Order on Consent (AOC) that is in the process of being finalized between UC Davis and the US Environmental Protection Agency (US EPA). Once finalized the AOC will formalize the documentation, review, and schedule requirements for completion of the WBH IRA as part of the overall Remedial Investigation/Feasibility Study (RI/FS) and Remedial Action (RA) process at the Site. The schedule presented in this EE/CA is consistent with the draft schedule presented to the US EPA by UC Davis and, therefore, should be consistent with the Draft AOC.

The WBH removal action was originally conceived as a time-critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). However, due to a planning period of more than six months, based primarily on UC Davis' desire to profile WBH waste prior to implementation of the removal action, the US EPA requested that the WBH IRA be implemented as a non-time critical removal action. As such, it is a requirement to document removal action objectives and review removal alternatives in an EE/CA.

This EE/CA has been prepared to comply with CERCLA, and with section 330.415, "Removal Action," of the NCP, and in accordance with US EPA Guidance for Conducting Non-Time Critical Removal Actions (US EPA, 1993). The goals of an EE/CA are to identify objectives of the removal action and analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. Based on the analysis, a preferred alternative is selected and presented.

When the results of this document are approved, an Action Memorandum will be prepared by the US EPA and Remedial Project Managers (RPMs) to authorize the WBH IRA. A draft of the Action Memorandum is enclosed as Appendix B. Upon authorization, the recommendations of this EE/CA document will form the technical basis for the design and implementation of the WBH IRA and a

Removal Action Work Plan (RAWP) detailing the scope and process of the IRA will be prepared. The RAWP requires regulatory review and approval before the IRA can be implemented.

1.1 PURPOSE AND SCOPE OF EE/CA DOCUMENT

The purpose of this EE/CA is to present background data and information that is relevant to IRA activities, to identify and describe the objectives of the IRA, and to present the rationale for selection of the remedial alternative to satisfy the objectives of the IRA. After agency review, the EE/CA will be used to present the IRA for public review. Based on public comment, the EE/CA and proposed IRA will be revised as necessary prior to implementation.

The following goals have been established for the WBH IRA:

- Prevent, minimize, or mitigate further impact to soil or groundwater from the WBH area;
- Prevent, minimize, or mitigate potential threat to public health or the environment;
- Allow final subsurface characterization work to be conducted in the WBH; and
- Collect additional data in the WBH area to assist in selection of the final remedial action for the WBH area.

Five alternatives are presented to meet the goals presented above. They include:

- Refuse Removal with Off-Site Treatment/Disposal;
- Refuse and Soil Removal with Off-Site Treatment/Disposal;
- Removal of a Portion of Landfill Unit #2 to Support Further Investigation;
- Refuse and Soil Removal with On-Site Disposal; and
- In-Situ Containment.

A qualitative evaluation of the alternatives is included which discusses effectiveness, implementability, and cost. Based on this review, a preferred alternative is recommended for implementation.

1.2 ORGANIZATION AND CONTENT

This EE/CA follows the US EPA guidance and is organized into eight sections as follows:

- Section 1.0 – presents the purpose and scope of the EE/CA, a summary of the EE/CA, and report organization;
- Section 2.0 – presents a description of the Site and a summary of background information;
- Section 3.0 – describes geology and hydrogeology of the Site;

- Section 4.0 – presents a summary of the nature, source, and extent of contamination in the WBH area;
- Section 5.0 – presents the removal action objectives for the IRA;
- Section 6.0 – identifies removal action alternatives;
- Section 7.0 – discusses implementation of the proposed schedule; and
- Section 8.0 – lists references.

2.0 SITE BACKGROUND AND DESCRIPTION

This section presents a review of background information that is relevant to the WBH IRA. A detailed description of the Site and its history and data collected as part of previous soil and groundwater investigations has been presented in several previous Site documents. These documents include:

- Initial Assessment Survey (Rockwell, 1984);
- Environmental Survey Preliminary Report (US DOE, March 1988);
- Groundwater and Soils Investigation (Wahler Associates, 1988);
- Phase II Site Characterization Report (Dames & Moore, 1993);
- Final Draft Remedial Investigation/Feasibility Study Work Plan (PNL, 1994);
- Revised Data Gaps Work Plan (Dames & Moore, 1996);
- Waste Burial Hole Data Transmittal, (Dames & Moore, 1998a); and
- Annual Water Monitoring Reports that have been published for the DOE and UC Davis since 1994 (PNL, 1994; PNL, 1995b; PNNL, 1996).

The applicable sections of these previous documents are included by reference in this EE/CA.

2.1 SITE LOCATION

The Site is located immediately east of Old Davis Road, south of Interstate 80 in Solano County, California, in the southeast quarter of Section 21, Township 8 North, Range 2 East, Mount Diablo Base and Meridian (Figure 1). It is approximately 1.5 miles south of the city of Davis and occupies the southeast portion of the UC Davis campus.

The WBH area is located along the southern end of the Site and is bounded by the eastern dog pens and Landfill Unit #2 to the north, the cobalt-60 field and Landfill Unit #1 to the east, Putah Creek and its northern levee to the south, and the Southern Trench area to the west (Figure 2).

2.2 SITE DESCRIPTION

The Site encompasses approximately 15 acres and is located on and immediately surrounded by UC Davis property. Currently, the Site consists of one- and two-story laboratory and office buildings, and animal-handling facilities in a rural-type setting. Most of the buildings are currently used by UC Davis as part of the Institute of Toxicology and Environmental Health (ITEH) research facility. The WBH area is situated on a small portion of the approximately 4.5 acres (30 percent) of the Site that is unpaved land and kept relatively free of vegetation. Approximately 5 percent (0.75 acres) is heavily vegetated with large deep-rooted vegetation, including the southern border of the WBH area where 10 large evergreen trees are established.

The Site Operable Units (OUs) have been divided between the United States Department of Energy (US DOE) and UC Davis based on past use. The US DOE areas of responsibility are referred to as the

LEHR facility and the UC Davis areas of responsibility are known as the South Campus Disposal Site. Areas that are the responsibility of the US DOE were part of a laboratory funded by the US DOE, and include: the southwest corner disposal area, the radium and strontium treatment systems, the western and eastern dog pens, and the domestic septic tanks. Areas that are the responsibility of UC Davis include: the WBH, the southern trenches, the eastern trenches, and the three landfills. UC Davis is taking the lead for investigation and remediation of groundwater, which has shared responsibility between the US DOE and UC Davis.

2.3 HISTORY OF SITE OPERATIONS

UC Davis conducted radiological studies on laboratory animals for the US Atomic Energy Commission (now US DOE) from the 1950s to 1988. Experimental use of radioactive materials, including strontium-90 and radium-226, began at the Site in 1960 and continued until 1988. In the initial stages of operation, waste was handled through a central facility on the main campus. However, due to safety concerns, waste handling responsibilities for LEHR-generated waste returned to the LEHR facility in the early 1960s. Radioactive waste was primarily handled through two on-Site processing systems or disposed of in a variety of disposal pits and trenches. These areas make up the US DOE OUs described above.

Prior to and during research activities conducted at LEHR, municipal, laboratory, and construction wastes generated by UC Davis were disposed into three different landfill units and a series of burial trenches and pits located within and near the Site boundaries. The WBH area consists of 49 burial pits (approximately 4 feet by 4 feet wide with the bottom of waste 3 to 11 feet deep), which were excavated between about 1956 and 1974. These holes were reportedly used to dispose of wastes from general campus activities that potentially contained radiologic materials and other campus chemicals and laboratory wastes. Table 1 presents an inventory of radioactive wastes potentially buried in the 49 WBH pits and dates of disposal for each pit. The information was originally compiled by Warren in 1985, and is based on UC Davis and US DOE records.

2.4 SURROUNDING AREA

Private land is adjacent to UC Davis property in the vicinity of the Site. Most of the private land is used for agricultural purposes. The regional topography surrounding the Site is typical of the broad, relatively flat-lying Sacramento Valley. The Site is situated on relatively flat-lying land termed the Putah Plain (DWR, 1978), with an average elevation at the Site of approximately 50 feet above mean sea level, and relief across the Site of approximately two feet. The greatest relief in the vicinity at the Site occurs as a result of the levee (the local high point) and channel (local low point) for Putah Creek, located immediately south of the Site and the WBH area. The land surface slope in the vicinity of the Site is approximately 0.001 foot/linear foot (5 feet per mile) to the east/northeast toward the Sacramento River.

2.5 SURFACE WATER

The South Fork of Putah Creek is the principal surface water feature of the region with the northern levee of the Creek forming the southern boundary of the WBH area and the Site. Putah Creek flows eastward

from Lake Berryessa, located approximately 20 miles west of the Site, and ultimately empties into the Yolo Bypass, approximately 8 miles east of the Site.

Flow in Putah Creek is regulated by releases from Monticello Dam at Lake Berryessa and from the Solano Diversion Dam. Flow in the Creek varies widely during the course of the year from high flows and flood conditions during the winter rainy season, to dry or low-flow conditions in the summer. Putah Creek is a losing stream, and during several previous drought years, flow in many parts of the creek ceased. The bottom of the creek channel is approximately 25 feet lower in elevation relative to the Site. Near the Site, water is present in the creek all year long due in large part to discharge from the nearby UC Davis wastewater treatment plant outfall (up to 2.1 million gallons per day), and due to recent changes in operation of Monticello Dam regulating discharge from Lake Berryessa.

2.6 METEOROLOGY

The climate in the region of the Site is temperate, with mild, wet winters and long summers. The mean annual precipitation in the vicinity, at the National Oceanic and Atmospheric Administration Davis 2 WSW station, is 17.0 inches, most of which occurs between October and April (National Climatic Data Centers, 1992). The 100-year, 24-hour storm event for this station is 4.45 inches, and the 10-year return period event is 3.15 inches.

The prevailing wind direction in the Davis area is from the south, reflecting a frequent incursion of marine air through the Carquinez Strait into the Sacramento Valley. Changes in wind direction are common, with flows from the northwest occurring diurnally. Several times a year, strong winds blow from the north, generally following the passage of Pacific Ocean storm systems.

3.0 GEOLOGY AND HYDROGEOLOGY

This section reviews Site geology and hydrology. Subsurface investigations conducted at the Site since 1988 have been used to develop an understanding of Site stratigraphy and hydrogeology. The results of previous investigations have been presented in several reports including:

- The Phase II Site Characterization Report (Dames & Moore, 1993);
- The 1994 Annual Water Monitoring Report (PNL, 1995b);
- The Groundwater Characterization Field Activities Report for 1995-1996 (PNNL, 1996a);
- The 1995 Annual Water Monitoring Report (PNNL, 1996b);
- The 1995 AIP Summary Report (Parfitt, 1996);
- The Engineering Evaluation/Cost Analysis, (Dames & Moore, 1997a);
- The Removal Action Work Plan for the Groundwater IRA (Dames & Moore 1997b); and
- The Off-Site Monitoring Well Installation Data Transmittal for the Fourth Hydrostratigraphic Unit (Dames & Moore, 1998b).

Based on the results of these investigations, conceptual geologic and hydrogeologic models have been developed to understand the processes and factors affecting soil and groundwater impacts at the Site.

3.1 REGIONAL GEOLOGY AND HYDROGEOLOGY

The Site and the surrounding area are located on the geomorphic unit termed "low-alluvial plains and fans" (DWR, 1978). In the Davis area, this unit comprises the Putah Plain and represents the distal portions of alluvial fan deposits associated with Putah Creek that are referred as the Putah Creek Fan (Mann, 1992). Sediments that form these alluvial fan deposits consist primarily of silt and clay with coarse-grained sediments occurring locally. The age of these deposits ranges from late Pleistocene to Recent. The thickness of the alluvial fan deposits is reported to be between 140 feet (Mann, 1992) and 180 feet (DWR, 1978).

Underlying the Putah Creek Fan is the Plio-Pleistocene Tehama Formation that was folded or tilted and then eroded prior to the deposition of the alluvial material of the Putah Creek Fan (Mann, 1992). The Tehama Formation consists of fine-grained sands and silts with discontinuous lenses of coarse sand and gravels.

3.2 SITE GEOLOGY

Data collected during several phases of subsurface investigations have been used to develop an understanding of Site stratigraphy. The Site surface soils and underlying shallow stratigraphy, to approximately 130 feet below ground surface (bgs), have been evaluated through numerous test pits, soil borings, well installations, geophysical surveys, and core penetrometer tests. Deeper Site stratigraphy has recently been investigated as part of off-Site well installations (see section 3.3 below).

In general, surface soils are underlain by a sequence of interbedded clay, silty clay, silt, and sand that extends approximately 80 feet bgs. This fine-grained interval is fairly continuous across the Site and contains some coarse sand and gravel. The water table occurs in this stratigraphic unit and varies in depth from approximately 20 to 65 feet bgs, depending on the season. Well-rounded cobbles and gravel are encountered at approximately 80 feet bgs and appear to be laterally continuous beneath most of the Site. Where present, this unit is approximately 35 to 52 feet thick. Soil directly underlying the cobbles and gravel at 130 feet bgs is predominantly silt and clay with thin interbedded sand.

Within the WBH area, stratigraphic data from test pits and soil borings extend to approximately 40 feet bgs. The upper 5 feet of soil in the WBH area is primarily natural silty sand and sand that was disturbed during waste disposal activities. Below 5 feet, soil consists primarily of clay grading at 10 feet bgs to silty sand with interbedded silt and clay. From 20 feet to 40 feet bgs, sediments consist of clay and sandy clay with thin intervals of silt and silty sand.

3.3 SITE HYDROGEOLOGY

The results of previous investigations identified five hydrostratigraphic units (HSUs) beneath the Site. The HSUs identified beneath the Site include the vadose zone, HSU-1, HSU-2, HSU-3, and HSU-4. Descriptions for each of the HSUs are presented below.

- The vadose zone extends from the ground surface to the top of groundwater, which has historically ranged from 15 to 55 feet bgs. This unit consists primarily of unsaturated clay and silt with lesser amounts of interbedded sand and gravel.

- HSU-1 extends from the bottom of the vadose zone to a depth of approximately 76 to 88 feet bgs. This unit is lithologically similar to the vadose zone, and consists primarily of silt and clay with lesser amounts of sand and gravel.

- HSU-2 extends from the bottom of HSU-1 to a depth of approximately 114 to 130 feet bgs. This unit is composed primarily of sand in the upper portion of the unit and gravel in the middle to lower portions of the unit.

- HSU-3, investigated in off-Site areas, extends from the bottom of HSU-2 to a depth of about 250 feet bgs, and is approximately 120 feet thick. The unit consists primarily of relatively fine-grained sediments varying from very fine-grained sandy silt to clayey silt to silty clay.

- HSU-4, investigated in off-Site areas, extends from the bottom of HSU-3 to a depth of about 282 feet bgs, and is approximately 32 feet thick. This unit consists of coarse sand and gravel.

Beneath HSU-4, a sharp contact with a bluish, dark gray silt was encountered at 282 feet bgs in wells UCD4-41 and UCD4-43. The bottom of this unit was not penetrated in any of the Site borings. A schematic cross-section of these hydrostratigraphic units is shown on Figure 3.

Hydrographs have been maintained for HSU-1 and HSU-2 wells for over six years. Water levels across the Site in HSU-1 and HSU-2 are typically highest in March and April, decline rapidly from April to

August, and recover from September through March. Seasonal/annual fluctuations since 1990 range from a maximum of approximately 40 feet between August 1994 and March 1995 to a minimum of 15 feet between August 1993 and March 1994 (PNNL, 1996b). The seasonal changes in water levels are primarily due to pumping from HSU-2 and HSU-4 to supply local agriculture during the summer months. Water levels in both HSU-1 and HSU-2 also respond to changes in river stage in Putah Creek located just south of the WBH. HSU-1 wells located near Putah Creek respond directly to changes in stage level, while HSU-2 wells located near Putah Creek show a dampened response to stage level changes.

On average, lateral hydraulic gradients of both HSU-1 and HSU-2 range from approximately 0.0004 to 0.0015 feet/foot and are shallower in the fall and winter and steeper in the spring and summer. The groundwater flow direction is generally northeast in HSU-1 (30 to 60 degrees from east) and to the east with a northerly component in HSU-2 (5 to 25 degrees from east). These gradients vary based on recharge, vertical gradients, and local use. Vertical gradients between HSU-1 and HSU-2 are variable in January through March, downward from April through August and generally upward from September through December.

Changes in local gradient and flow direction indicate two distinct end member hydrologic conditions. During March, water levels are typically at the highest levels reflecting rebound conditions from the previous season's irrigation pumping and recharge from precipitation. During this time, the horizontal gradient is at its annual low and flow direction in HSU-2 has a larger northerly component. During August, water levels are at their lowest due to pumping effects associated with local irrigation. Horizontal gradients appear to be at their highest. During the remainder of the year, the system appears to be in a state of transition between these two end member conditions.

4.0 SOURCE NATURE AND EXTENT OF CONTAMINATION

This section presents a summary of previously collected investigation data from the WBH area. The purpose of the summary is to review information used to develop the scope and objectives of the WBH IRA. This section describes the nature of past disposal activities in the WBH area, a review of observations made of the nature of refuse encountered during drilling and excavation, and a review of analytical results from the analysis of soil and refuse samples.

4.1 PREVIOUS INVESTIGATIONS

Site records indicate that the LEHR facility and campus radiological and laboratory waste is contained in 19 trenches and 49 pits located along the southern and eastern portion of the former LEHR facility. The 49 pits are referred to as the Waste Burial Holes and are located in an area that is approximately 270 feet long by 30 feet wide located south of the eastern dog pens and Landfill Unit #2 (Figure 4).

Six previous investigations conducted within the WBH area included two reconnaissance trenching programs (Wahler, 1988; Dames & Moore, 1990), a soil gas investigation, a surface geophysical survey and drilling of one soil boring (PNL, 1995a), and a trenching and soil sampling program (Dames & Moore, 1998a). The purpose of these investigations was to locate the waste burial pits, evaluate the nature of refuse disposed in the pits, and assess the extent of impacts to soil resulting from the refuse.

Figure 4 shows the estimated boundary of the WBH area and the locations of previous investigation activities. To date, 12 exploratory trenches have been excavated in three phases. The two initial trenching programs (Wahler, 1988; Dames & Moore, 1990) did not include soil or refuse sampling and did not intersect WBH refuse material. One soil boring was drilled in 1995 (PNL, 1995a) and included collecting and analyzing six soil and refuse samples that ranged in depths from ground surface to 35 feet bgs. Soil gas sampling and analysis was conducted in the WBH area in 1995 and included collecting 26 samples from 12 locations. In addition, a radiation survey instrument was placed down the soil gas probes and readings were recorded at one-half-foot intervals. The 1996 UC Davis trenching program (Dames & Moore, 1998a) intersected refuse in five of six trenches and included collecting and analyzing 17 subsurface soil and refuse samples, and two soil samples collected from the overburden. The results of these investigations are summarized in the following sections.

4.2 NATURE OF WASTE BURIAL HOLES

Surface geophysical testing, trenching, and soil boring results support the historical descriptions of the WBH pits as a number of discrete burial features oriented in east-west trending rows. Based on trenching and soil boring activities, soil in the WBH area is predominantly fine-grained, with the upper several feet apparently disturbed during waste disposal activities. Refuse appears to be deposited in discrete pits that are readily distinguished from surrounding and underlying fill and soil. Refuse typically occurs between 2 and 11 feet bgs, which is consistent with historical references to disposal methods. Soil underlying the waste consists of undisturbed, fine-grained silt and clay. Some staining of the soil below the waste was

observed during investigation activities. Copies of the test pit logs from the Waste Burial Holes Data Transmittal (Dames & Moore, 1998a) are included in Appendix C.

In general, refuse observed in the waste burial holes during boring and trenching activities was comprised of abundant vials like those used with a liquid scintillation counter, as well as syringes and laboratory glassware. A more detailed description of the refuse observed during trenching activities includes:

- Laboratory waste that included syringes, test tubes, vials, flasks, pipettes, planchettes, petri dishes, ampules, vermiculite, and gloves.
- Laboratory and biological waste potentially containing radiologic material which included LSC vials, a 7" by 7" ceramic crock labeled "Funnel for C-14 Base Solns ...," a lead cup containing test tubes labeled "I^{131} 7/17/65," a container lid labeled "assay container, place probe here, ..., to read ... of uranium," animal manure (with radiologic survey readings), and vials with radioactive material labels.
- Gravel with ox or sheep bones and dog feces.
- Dark brown seed pods 2 millimeters in diameter.

As indicated above, the overall depth to the top of the waste material ranged from as shallow as 2 feet bgs to as deep as 8 feet bgs and the refuse ranged in thickness from 1 foot to 5 feet. Waste burial holes appear to be covered with a layer of silty sand fill material. The total depth and thickness of refuse was not investigated at each investigation location.

4.3 ANALYTICAL RESULTS

Chemical and radiological analyses were conducted during three phases of investigation in the WBH area. Soil gas samples were analyzed for volatile organic compounds (VOCs). Soil samples collected from the soil boring and exploratory trenches were analyzed on-Site for tritium using a liquid scintillation counter (LSC) and by an analytical laboratory for a full suite of chemical and radiological constituents including: metals, hexavalent chromium, nitrate, pesticides, VOCs, semi-volatile organic compounds (SVOCs), gross alpha and gross beta, tritium, carbon-14, radium-226, strontium-90, and gamma spectranalysis. A summary of detected constituents reported from the soil gas survey is presented in Table 2, soil sample results are presented in Table 3, and soil sample results for tritium using an LSC are presented in Table 4. Appendix C contains the analytical results of soil samples from SBL00032 (PNL, 1995a) and trenches completed in 1996 (D&M, 1998a), and a data validation report for the trenches completed in 1996.

4.3.1 Organic Constituents

In the WBH area, soil gas samples have been analyzed for VOCs and soil samples have been analyzed for VOCs, SVOCs, and organochlorine pesticides. Results of the analysis of 25 soil gas samples reported low level detections of one VOC (chloroform) with reported detections ranging from 0.0007 parts per billion volume (ppbv) to 7 ppbv. The highest concentrations were reported from location SGL-52 located in the western portion of the WBH area.

Results from organic analyses for soil samples collected in the overburden above the waste reported values for alpha and gamma-chlordane at 1.8 and 2.3 micrograms per kilogram (μg/kg) respectively in sample SSWB0018 at 2 feet bgs (Table 3). In addition, formaldehyde was detected in surface sample SSUT0021 at 180 milligrams per kilogram (mg/Kg). All other analyses for organic constituents in soil samples collected above the waste were below detection limits. Results of organic analyses reported for soil samples collected below or adjacent to waste are below detection limits.

Results of organic analyses from samples collected from the waste show sporadic detections. Waste sample SSUT0024 from SBL00032 reported a concentration of bis(2-ethylhexyl)phthalate at 610,000 μg/Kg (Appendix C). Naphthalene was also detected in four refuse samples with the highest concentration of 92,000 μg/Kg for a refuse sample from trench TRL0054. The VOCs acetone and toluene were reported in one refuse sample from trench location TRL0054. The pesticides 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha chlordane, gamma chlordane, and dieldrin were reported at levels near detection limits from several refuse samples.

4.3.2 Inorganic Constituents

Inorganic analyses within the WBH area have consisted of both metal and nitrate analyses. The results reported from inorganic analyses indicated the presence of nitrate and mercury. These were predominantly reported from waste samples, not soil samples collected from below the waste. The results of soil analyses from shallow samples collected in the WBH area did not indicate the presence of elevated concentrations of inorganic constituents.

4.3.3 Radiological Constituents

Results reported from analysis of soil and refuse samples collected from the WBH area indicates the most significant contaminants observed are radionuclides. Tritium, carbon-14, and gross beta were reported at concentrations above background levels. Other radiological parameters reported in waste burial hole samples include radium-226, gross alpha, and cesium-137. Results of radionuclide analyses conducted on soil samples from the shallow subsurface material did not indicate the presence of total alpha or total beta-gamma levels above background readings.

Table 4 lists results of on-Site tritium screening samples collected during the 1996 trench excavation. Locations of the samples are shown on the trench logs included in Appendix C. As Table 4 shows, the detections with the highest activities occurred in waste. The results of measuring radioactivity at depth in the soil gas probes did not show any significant difference in activity between locations.

4.3.4 Groundwater Impacts

Data generated during quarterly groundwater monitoring have been collected from 1990 to the present and provide data over time from monitoring wells located downgradient from potential source areas. A summary of previous groundwater quality data has been presented in several reports including the Phase II Site Characterization Report (Dames & Moore, 1993) and the 1994 and 1995 Annual Water Monitoring Reports (PNL, 1995b and PNNL 1996b).

Based on results from groundwater monitoring conducted as part of the previous studies referenced above, it has been concluded that the likely source of tritium and carbon-14 reported in groundwater samples from wells UCD1-13 and UCD2-14 is attributed to the WBH area. Sources of other VOCs (mainly chloroform), chromium, nitrate, and TDS are assumed to be associated with other source areas located at the Site.

4.4 SUMMARY OF SOIL AND GROUNDWATER RESULTS

Based on the results of previous soil and groundwater investigations, the physical characteristics of the WBH have a very distinct profile. This profile is consistent with disposal records available for this area. The upper five feet of soil in the WBH area consists of silty sand and material that has been reworked (disturbed) during waste disposal activities. Below the reworked overburden, between the depths of approximately 2 to 11 feet bgs, refuse appears to be deposited in discrete pits that are readily distinguished from the surrounding and underlying soils and fill. As described above, the refuse is comprised of laboratory wastes, such as various types of glassware, gloves, and biologic waste. Soil underlying the refuse in the WBH area is observed to consist of undisturbed fine-grained materials. Trenching showed silty sand immediately below the waste, while the soil boring showed interbedded clays, silts, and sand to a depth of 40 feet bgs.

Analytical results reported from the WBH area confirm the physical profile described above. Analytical results from shallow soil samples collected from the overburden above the waste did not indicate the presence of elevated concentrations of VOCs, inorganic constituents or radionuclides, though chlordanes were detected in one sample. Results of analyses from refuse material indicate the presence of elevated concentrations of VOCs, inorganic constituents (mainly nitrates), and radionuclides. The limited data collected from soil below the refuse suggest that tritium and carbon-14 exceeds the background activity level at depth.

As mentioned above, based on groundwater monitoring conducted over several years and reported in various annual reports, it has been concluded that the waste burial holes are a likely source of tritium and carbon-14 detected in groundwater at the Site.

5.0 REMOVAL ACTION OBJECTIVES

This section presents the regulatory basis supporting the WBH IRA at the Site, the associated scope and objectives of the IRA, and anticipated Applicable or Relevant and Appropriate Requirements (ARARs) considered in determining the removal action objectives (RAOs). Together, these sections constitute the RAOs for the Waste Burial Holes IRA.

5.1 REGULATORY FRAMEWORK

The NCP and CERCLA define removal actions to include "the cleanup or removal of released hazardous substances from the environment, such actions as may necessarily be taken in the event of the threat of release of hazardous substances in the environment, such actions as may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances, the disposal of removed material, or taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat from a release."

The planned WBH IRA described in this document will be implemented to remove waste material that is suspected of acting as a source of groundwater impacts. Further, this IRA has been categorized as a non-time critical removal action, as defined in Section 104 of CERCLA, based on the relative urgency or threat of the situation in the WBH area and the subsequent timeframe in which the action will be initiated. The statutory requirements for removal actions are set forth in Section 300.415 of the NCP.

5.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Section 121 of CERCLA specifies that remedial actions be protective of human health and the environment and meet federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements. State ARARs must also be met if they are promulgated and more stringent than federal requirements. Potential ARARs are generally separated into three categories:

- **Chemical-Specific ARARs** - set health or risk-based concentration limits or ranges for allowable discharge of particular chemicals or presence of chemicals in a particular medium;
- **Action-Specific ARARs** - govern the design and performance of systems or performance activities associated with remedial/removal action; and
- **Location-Specific ARARs** - restrict concentrations of hazardous substances or otherwise govern cleanup activities based on the location of the Site.

5.2.1 Chemical-Specific ARARs

Chemical-specific standards may be applicable or relevant and appropriate for establishing final soil clean-up criteria that are protective of human health and the environment. However, the objective of this action is to collect additional data to better characterize the WBH area and evaluate soil impacts beneath

the waste while mitigating further impact to soil or groundwater. Some of the alternatives evaluated include removal of waste, which may result in soil impacts remaining in place. These impacts would then be characterized for future, final remediation. This follows 40 CFR 300.415 (I) and EPA Guidance where compliance with ARARs would require a degree of cleanup inconsistent with the scope of the removal action.

5.2.2 Action-Specific ARARs

Potential action-specific ARARs that may govern the design or implementation of the removal include waste generator requirements under 40 CFR 261 & 262 and 22 CCR 66261 & 66262. In addition, land disposal restrictions under 40 CFR 268 may apply, as well as, 40 CFR 300.440 (CERCLA Off-Site Rule) and 49 CFR 172 which is applicable for the packaging and transportation of generated wastes. These Action-specific ARARs in addition to location specific and chemical specific ARARs are summarized in Table 5.

5.2.3 Location-Specific ARARs

The action will result in an open excavation in close proximity (within 10-feet) to the toe of an Army Corps of Engineers' levee or in excavations that will intercept the plane created by projecting the outside slope angle of the dike into the subsurface. This will require an Encroachment Permit from the State Water Reclamation Board prior to the start of excavation activities. In addition, the Endangered Species Act and Fish and Wildlife Coordination Act are ARARs for this proposed action.

5.3 OBJECTIVES OF THE INTERIM REMOVAL ACTION

Objectives of the removal action are listed below and are based on the current understanding of soil characterization beneath the WBHs, groundwater impacts outlined in Section 4.3.4 and Section 4.4, and waste characteristics outlined in Section 4.2. This is in addition to the regulatory frame work discussed above and ARARs outlined in Table 5. The objectives of the WBH IRA include:

- Prevent, minimize, or mitigate further impact to soil or groundwater from the WBH area;
- Prevent, minimize, or mitigate potential threat to public health or the environment;
- Allow final subsurface characterization work to be conducted in the WBH; and
- Collect additional data in the WBH area to assist in selection of the final remedial action for the WBH area.

6.0 IDENTIFICATION AND EVALUATION OF REMOVAL ACTION ALTERNATIVES

This section presents a general evaluation of the remedial action alternatives considered for the WBH IRA, describes the rationale for selection of the recommended alternative, and presents a general description of the recommended alternative and the tasks necessary to complete implementation.

6.1 PRESENTATION AND SELECTION OF ALTERNATIVES

Described below are the alternatives developed for this removal action. Five alternatives are presented and include both removal (with either off-Site or on-Site disposal) and containment options. In addition, a characterization option is also included.

6.1.1 Development of Alternatives

An evaluation of remedial and removal action alternatives for the WBHs was considered by the US DOE and UC Davis in 1995. The goal was to streamline the remedial alternative selection and implementation process for LEHR/SCDS OUs. The evaluation refined the Conceptual Site Model from the one presented in the RI/FS Work Plan, developed goals and objectives for remediation of each OU, and reviewed presumptive remedies for each OU at the LEHR/SCDS Site. The evaluation resulted in a short-list of presumptive remedial alternatives for further evaluation based on effectiveness, implementability, and cost.

The presumptive remedial alternatives identified for the WBH area were all removal actions of different degrees. The alternatives included: no action; complete removal of waste and impacted soil; selective removal and capping; and selective removal only. Data needs to implement each of the alternatives were identified (Last, et. al, 1995). For each of the active remedial alternatives (excluding the no action alternative), additional data needs included evaluating WBH waste and soil chemical and radiological characteristics and volume prior to implementation.

Additional data was planned to be collected from the waste and underlying soil in the WBH during the most recent investigation implemented by UC Davis (D&M, 1998a). Waste and overlying soil data was collected successfully; however, a limited number of samples were collected from underlying soil due to safety concerns, and to limit potential release from waste materials. Without these data, it is not feasible to accomplish the WBH removal action in one, more comprehensive action.

6.1.2 Evaluation of Alternatives

Based on the work outlined in the section above and based on comments received during the production of the draft EE/CA, five alternatives were developed for review. These alternatives include:

- Refuse Removal and Off-Site Treatment/Disposal;
- Refuse and Soil Removal and Off-Site Treatment/Disposal;

- Removal of a Portion of Landfill Unit #2 to Support Further Investigation;
- Refuse and Soil Removal with On-Site Disposal; and
- In-Situ Containment.

Each of these additional alternatives is discussed below with respect to implementability, effectiveness and cost.

6.1.2.1 Refuse Only Removal with Off-Site Treatment/Disposal

This alternative consists of removing refuse from the WBH. Overburden covering the refuse would be removed and stockpiled on-Site. Once the refuse is exposed, it would be removed by an excavator, placed in containers, and shipped off-Site. The excavation would be shored to protect sidewall stability at the foot of the Putah Creek Levee and adjacent to Landfill Unit #2. After refuse removal, soil samples would be collected and the excavation would be backfilled using stockpiled soil and additional clean fill as necessary.

This alternative would be effective in meeting the objectives of the removal action, sources of impacts to soil and groundwater would be minimized and further characterization of the WBH area would be possible. This alternative is also implementable and cost effective. Depending on the extent of shoring, the cost for this alternative is estimated to be $750,000 (Table 7).

6.1.2.2 Refuse and Soil Removal with Off-Site Treatment/Disposal

This alternative consists of removing refuse and impacted soil from the WBH area. Refuse and impacted soil would be excavated and disposed off-Site.

This alternative would be effective in meeting the objectives of the removal action; however, it would be very difficult to implement at this time. With a lack of data on the chemical and radiologic characteristics or volume of soils next to or below the refuse, it would be difficult to scope and implement this action, and as stated above, the presence of the refuse in place makes data collection very difficult. As refuse is removed from the WBH it will have to be separated based on a pre-determined disposal profile (see refuse handling description below). In order to be implementable, a general estimate of the volume of soil to be removed would need to be obtained prior to initiation of the action. This data is not available.

If characterization is done properly, material characterized and profiled for disposal can immediately be placed in containers and expeditiously removed from the Site. Material that does not fit the profile would have to be segregated for further characterization prior to disposal and would most likely be stored on-Site for a longer period of time, which results in ineffective handling of refuse material. Handling of the refuse would need to be conducted in a well-planned area to have proper control of health & safety and storage requirements, which would also require additional characterization prior to

the action. The areas available at the Site to complete these activities are limited due to other waste storage and handling activities being conducted by the US DOE and the location of the WBH area (between the levee and Landfill Unit #2). With the lack of data from the WBH area and the logistical constraints discussed above, this alternative does not appear implementable.

Costs for this alternative are based on the costs developed for the refuse only alternative, described above. It is assumed the amount of soil removed would be equal to the amount of refuse removed (150 cubic yards). In addition, a larger contingency (30 percent) is included to account for the uncertainty in the soil volume that might be removed. Based on these assumptions (Table 8), the cost for conducting this alternative is estimated to be $990,000.

Though removal of refuse and soil would be more effective at this time than refuse removal alone, this alternative was not considered implementable or cost effective.

6.1.2.3 Removal of a Portion of Landfill Unit #2 To Support Further Investigation

This option would consist of removing the southern portion of Landfill Unit #2. Removing the southern portion of Landfill Unit #2 would allow access for additional investigation in and below the WBHs (i.e., angle borings). This would result in a more complete characterization of the surrounding soils prior to removal of WBH refuse or impacted soil. In order to remove and dispose of the refuse from the southern portion of Landfill Unit #2, additional data on the refuse, beyond that currently obtained, would need to be collected. Also, the eastern dog pens are located on top of the southern portion of Landfill Unit #2 and little is known about the characteristics or impacts from this area. Assuming the material from Landfill Unit #2 could be removed, limited backfill would need to be placed in the area in order to obtain access with investigation equipment. This activity, characterizing and removing Landfill Unit #2 refuse and investigating WBH soil, would take a considerable amount of planning and documentation to implement and would lose effectiveness with time. During this period, the WBH refuse would still be in the ground and have the potential to impact surrounding soil and groundwater.

Costs associated with this alternative are estimated to be $670,000 (Table 9). This cost includes:

- Removal of soil and refuse along the southern portion of Landfill Unit #2 (2,000 yards);
- Sheet piling the southern portion of the excavation (to keep WBH refuse from entering the excavation);
- Refuse profiling and disposal;
- Backfill of 1,000 cubic yards;
- Four angle borings to collect 20 soil samples; and
- Soil analytical costs.

It does not include the US DOE's costs for removing the Eastern Dog Pens, which would need to be accomplished prior to this action. This option would not meet the objective of the WBH IRA to prevent, minimize, or mitigate further impact to soil or groundwater. This option would have to be performed in conjunction with another action to address the waste and soil impacts in the WBH Area. Based on the limited effectiveness and implementability of this alternative, it was removed from consideration.

6.1.2.4 Refuse and Soil Removal with On-Site Disposal

This option would include excavation and on-Site disposal of the refuse and impacted soil. It would require long term storage of the material after it is removed from the subsurface until an on-Site disposal cell is designed, approved, and constructed. It is anticipated a disposal cell would not be constructed until after the completion of the site-wide RI/FS. To store the waste on-Site (prior to disposal) would require constructing the appropriate storage area to Resource Conservation and Recovery Act (RCRA) standards. This would be difficult, considering that the amount of time and material to be stored is unknown. Development of an on-Site disposal cell would require extensive review under both the California Environmental Quality Act (CEQA) and CERCLA processes and would receive substantial public scrutiny. Continual long term operation and maintenance of the facility would also be required.

The cost of this alternative would be similar to the excavation costs for the refuse and soil removal alternative plus the cost of constructing an on-Site disposal cell. The size of the cell would be unknown since the amount of material has not been characterized. Assuming a cell size large enough to hold 500 yards of material, it would cost approximately $980,000 for on-Site disposal (Table 10). Please note this does not include operation and maintenance costs over the life of the storage cell.

Due to the low effectiveness, implementability, and increased cost, this alternative has been eliminated from further consideration.

6.1.2.5 In-Situ Containment

This option includes driving sheet piles vertically around the entire perimeter of the WBH area. In addition, the soil below the WBHs within the sheet pile perimeter would be grouted to reduce vertical permeability of the soil underlying soils. To place the grout, access would be required from the Eastern Dog Pens. This would minimize the risk of boring through refuse in the WBH area; however, waste from Landfill Unit #2 would need to be removed. Once waste from the southern portion of Landfill Unit #2 was removed, grout would be injected from angle borings starting along the north side of the WBH area (access to the south side of the WBH area is restricted by the Putah Creek Levee). After driving sheet pile and placing grout, a clay cap with geotextile would be placed over the entire WBH area.

This alternative is not effective in meeting all the objectives of this IRA. It would not allow final subsurface characterization work to be conducted in the WBH area and it would not allow additional soil data in the WBH area to be collected to assess soil impacts below the refuse. The alternative is implementable, though it would require characterization and remediation of the Eastern Dog Pens and the

southern portion of Landfill Unit #2. It would reduce exposure of refuse to site workers unless the refuse is removed at a later date (exposure would then occur at that later date).

The cost of this alternative is $890,000 (Table 11). This cost assumes 350 cubic yards of grout are used beneath the refuse, an average of one foot of clay for depth of cover and sheet pile to 25 feet below ground surface. The cost for removing the Eastern Dog Pens is not included.

Because this alternative is not effective, it was not retained for further consideration.

6.1.3 Rationale for Alternative Selection

The alternative selected includes excavation of only refuse for off-Site treatment and disposal. This is the only viable alternative given the requirements for waste handling and removal, the limited access and space available proximal to the WBH area and the present level of understanding of waste characterization, Site characterization, potential site hazards, and worker health & safety concerns. Conducting a refuse-only removal action will allow the action to be limited and controlled with regard to waste profiling, handling, and disposal requirements. Removal of the refuse will allow more complete characterization to occur below the refuse, which will allow better scoping of the final remedial action for the WBH area during the SCDS soil areas RI. Within reasonable bounds, this alternative can be implemented cost effectively because of the defined nature and volume of the refuse material.

The nature of the refuse and limited access has made Site characterization through the use of soil borings and trenching very difficult. Because the refuse contains glassware that may contain free liquids, drilling borings or digging test pits through the waste burial holes is not practical due to the potential for breaking containers and releasing unknown material. Also, the position of the refuse in relation to physical obstructions (Landfill Unit #2 to the north and the levee to the south) preclude the use of techniques such as angle borings to sample the soil beneath the refuse without boring through the refuse.

Removal of the WBH refuse should result in distinct reductions in impacts to groundwater downgradient of the WBH area. Tritium and carbon-14 have been reported in groundwater samples collected from monitoring wells UCD1-13 and UCD2-14 located directly downgradient of the WBH area, though concentrations of tritium and carbon-14 reported in these monitoring wells have decreased gradually over time. It is suspected that the tritium and carbon-14 reported are a result of buried refuse in the WBH area. Removal of this refuse should result in a decrease in tritium and carbon-14 mass that may contribute to groundwater impacts.

Removal of the refuse from the WBH area will reduce overall Site hazard and risk. Though the refuse is in the subsurface, it presents a potential continued health threat and potential for continued or additional release. Currently, intact containers in the subsurface may continue to degrade over time. Expeditious removal of the refuse from the WBH will eliminate this possibility.

6.2 ALTERNATIVE DESCRIPTION

The proposed IRA will consist generally of the following tasks:

1) Removal, stockpiling, and sampling of overburden;
2) Stabilization of the excavation as necessary;
3) Excavation and separation of refuse material;
4) Additional characterization of refuse as necessary for the purpose of disposal;
5) Placement and/or storage of refuse in the proper containers;
6) Soil sample collection from below the refuse;
7) Preparation of the excavation and backfilling; and
8) Off-site disposal of excavated refuse.

These tasks have been developed so that the alternative will meet the ARARs identified in Section 5.0 and summarized in Table 6. These activities are described below. A more detailed plan for implementation of these tasks will be presented in the RAWP.

6.2.1 Excavation Activities

The top of the laboratory refuse in the burial holes is between 2 and 8 feet bgs. Based on previous sample collection data the overburden material does not contain added chemical or radiologic constituents. In order to remove this laboratory refuse, overburden soil will be removed using an excavator to expose the refuse. The overburden will be stockpiled on-Site and sampled for reuse as backfill after removal of the laboratory refuse. A staging area for overburden and waste handling is planned to be set up in the Eastern Dog Pen area.

When refuse is removed from the excavation (via excavator), the plan is to place the material directly into containers. No entry of personnel into the excavation is expected during the work. Sorting and waste inspection is anticipated to occur outside the excavation.

Dust control during excavation will be implemented by wetting down excavated soil. Surface water run-on will be controlled by placement of diversion ditches or use of grading to control the direction of surface water flow. In addition, dust and run-on/run-off from soil stockpiles will be controlled by using water spray (or cover with plastic sheeting) and either hay bales or temporary berms. Details will be provided in the RAWP.

6.2.2 Excavation Stabilization

As described in Section 5.2.3, the edge of the proposed excavation would likely extend within 10-feet of the toe of a US Army Corps of Engineers levee along the southern edge of the excavation. As such, excavation with vertical side walls in close proximity to the levee may cause concerns associated with the structural integrity of the levee. A limited geotechnical evaluation of the strength of the soils and stability of the open excavation will be performed prior to implementation of excavation activities. The purpose

of the geotechnical investigation will be to collect information on soil properties. The information will be used to evaluate and select a method to maintain excavation sidewall stability. Approval for the method of excavation would be required from the State Water Reclamation Board before proceeding with the work. Currently, it is assumed that three excavation approaches are most likely to occur. These excavation approaches include:

- Excavation with vertical sidewalls;
- Excavation with sheet pile wall on the South Fork Putah Creek side and 1:1 slope on the northern sidewall; or
- Excavation with sheet piles on both southern and northern sidewalls.

Once the overburden is removed, the laboratory refuse in the WBHs would be removed, segregated, and temporarily stored on-Site for profiling. Excavation activities will be conducted in a manner that minimizes or eliminates spread of contamination or the possibility of creating new mixed waste. A more detailed description of waste management is provided in the following sections.

6.2.3 Waste Removal and Handling

A conceptual waste classification and disposition process is shown as Figure 5. This process will be incorporated into a detailed waste management procedure that will be prepared as part of the RAWP and will be provided for review prior to implementation. All waste excavated from the proposed removal action will be packaged and shipped to off-site facilities for disposal or treatment. No on-site waste treatment or disposal is anticipated.

6.2.3.1 Waste Description

The total volume of laboratory waste material expected to be excavated from the WBHs is approximately 120 cubic yards. As described in Section 4.2, based on field observations during previous exploratory trenching (Dames & Moore, 1998a), waste materials from the burial holes are expected to consist of:

- Laboratory waste including syringes, test tubes, vials, flasks, pipettes, planchettes, petri dishes, ampules, vermiculite, and gloves.
- Other laboratory type waste including glassware, plastic, and LSC vials.
- Gravel, dog feces, and animal bones.
- Potentially contaminated soil from pit walls and some sloping/over-excavation.

The majority of the excavated refuse material from the burial holes is expected to consist of low-level radioactive waste. Limited quantities of mixed waste and/or hazardous waste may also be generated during the removal action. The primary radiological contaminant is tritium, which was detected at levels between 320 pCi/L and 38,300,000 pico Curies per liter (pCi/L). Other contaminants expected to be

present in waste from the WBHs include bis(2-ethylhexyl) phthalate, organochlorine pesticides, Cobalt-60, toluene, and xylene. Lead pigs may also be encountered based on previous investigations.

6.2.3.2 Waste Removal, Segregation and Interim Storage

As mentioned above, the proposed removal action involves excavation, removal, segregation, and interim storage of the burial holes' waste. Excavation activities will be conducted in a manner that minimizes or eliminates spread of contamination or the possibility of creating new mixed waste. For example, bottles or containers observed to contain liquids will be carefully removed to avoid breakage and will be placed in proper waste containers. If containers containing liquid are broken during excavation, the waste and affected soils will be removed. The extent of the affected soil removed will be based on field observations including odor, visual staining, observed soil wetness, or field instrument readings from a photoionization detector (PID) or field radiation detector.

Waste sorting and segregation will be performed in a manner that prevents cross contamination and minimizes potential mix of incompatible wastes. Different waste streams (low level radioactive, mixed, hazardous, or designated) will be inventoried and containerized in such a manner that no intermingling of wastes occurs, no wastes are released to the environment, and no water infiltrates the wastes. These waste streams will then be transferred to a secured on-Site temporary storage area until off-Site disposal or disposition options have been determined. While in storage, waste containers will be visually inspected on a regular basis and managed in accordance with all applicable laws and regulations.

6.2.3.3 Waste Profiling

Waste characterization data will be thoroughly reviewed, validated, and used to designate various waste types that will be excavated during the removal action. Based on physical characteristics, excavated waste will be classified as refuse or soil. Refuse-type waste includes syringes, needles, dried animal bones, wood, empty bottles and laboratory glassware. Any bottles containing liquids will not be profiled for off-Site disposal but will be set aside for further characterization and evaluation of proper disposition options. Soil over excavation-type waste includes contaminated gravel fill and sand. Based on chemical and radiological characteristics, excavated refuse will be classified as low level radioactive, mixed, or hazardous.

After waste is designated, waste information, including physical description and chemical and radiological characterization will be compiled into a waste profile document that will be submitted to the off-Site disposal site for approval. The waste profile document will address all the requirements and will comply with the disposal site waste acceptance criteria, including proper characterization, designation, and packaging.

6.2.4 Post Excavation Sample Collection

Once the waste is removed, samples will be collected from the bottom of the excavation. Soil samples will be collected using the excavator. Samples will be collected either from the bucket or by pushing a

drive sampler with the bucket. Samples will be collected from soil that was underneath the waste. The purpose of collecting the samples is to provide characterization data that was unattainable while the waste was in place, document level of impacts in underlying soils, and provide a basis for further investigation. The samples may also be used to determine the course of action for backfilling the excavations. Soil sampling procedures, locations, and type of analyses will be outlined in the RAWP after approval of the EE/CA.

6.2.5 Excavation Preparation and Backfilling

Prior to backfilling, the bottom of the excavation will be lined with plastic. Overburden removed from the excavation will be placed into the hole and additional material required to bring the excavation to finished grade will be imported and compacted. In addition, the RPMs will be notified that the waste has been removed and soil samples have been collected. Observed condition of the sidewalls and excavation bottom, as well as field monitoring results, will be forwarded to the RPMs and soil sampling results will also be included, if available.

The purpose of the notification is to allow the RPMs to review field data and soil analytical data (if available) prior to backfilling the excavation. It is likely that soil impacts left in place will be identified as a result of the post-excavation sampling. These soil impacts will be addressed as part of the remedial action for UC Davis soil OUs.

6.2.6 Waste Disposal

Once the disposal site approves the waste profile document and provides UC Davis with a shipment schedule, preparation for waste transportation and off-Site disposal will begin. Waste preparation includes packaging, labeling, and securing waste containers to ensure safe transportation. Radioactive and mixed waste (excluding lab pack waste) is expected to be shipped to an off-Site facility for possible treatment and disposal. Any waste found to have no added radioactivity but exhibit RCRA or State of California hazardous characteristics will be properly packaged, manifested and shipped to a Class I landfill facility.

6.2.7 Cost

The cost for implementing the action is estimated to be $750,000. The basis for this estimate and the underlying assumptions used to develop the costs are outlined below:

- Sidewalls are supported by sheet piles and battering;
- Initial excavation to remove overburden soil would be performed in a 270 feet long by approximately 30 feet wide area. The depth of initial excavation was assumed to be approximately 8 feet;
- After completion of excavation to this depth, further excavation would be performed at the locations of the waste burial holes to remove the buried refuse;
- Excavated overburden soil would be sampled and reused for backfilling purposes;

- After completion of excavation activities, the excavated area would be backfilled with clean soil and compacted;

- Imported fill would be used to bring the excavation to grade and drain;

- Total in-place volume of overburden excavation would be approximately 2,400 cubic yards;

- A bulking-factor of 1.25 was assumed and therefore, the ex-situ volume was estimated to be 3,000 cubic yards;

- Thickness of refuse buried in the waste burial holes was assumed to be approximately 4 feet. Therefore, total in-place volume of refuse and refuse mixed with soil was assumed to be approximately 120 cubic yards. Assuming a bulking factor of 1.25, the ex-situ volume of refuse was estimated to be 150 cubic yards;

- The laboratory refuse would be segregated from the surrounding soil and disposed off-Site; and

- Approximately 90% of excavated refuse and surrounding soil would be disposed off-Site as low-level radiological waste and 10% would be disposed off-Site as mixed waste. Further classification activity and a different distribution of waste than planned could increase the cost of this action.

A summary of the costs associated with this approach is presented in Table 7.

7.0 INTERIM REMOVAL ACTION SCHEDULE

This section provides a brief summary of the implementation schedule for completing the required documentation, performing field activities at the Site, and finalizing the report. Upon completion of regulatory documentation and selection of a contractor to perform field activities at the Site, excavation activities will be initiated. Public notice is shown to occur on February 26, 1999. Public review for the EE/CA is shown to occur from March 3, 1999 to April 2, 1999. July 1999 is proposed as the tentative date for start-up of field activities. Field activities are expected to be completed by the middle of September 1999. In addition, construction is followed by a final inspection and then by a Final Construction Report.

The proposed implementation schedule is depicted on Figure 6. This implementation schedule assumes a conservative excavation approach of sheet piling on the South Fork Putah Creek side and battering of the northern sidewall. Depending upon the geotechnical evaluation, the proposed excavation approach could be modified and the time required for implementation of field activities may be altered.

8.0 REFERENCES

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TABLE 1
RADIOACTIVE WASTE BURIAL DATA
ENGINEERING EVALUATION/COST ANALYSIS – WASTE BURIAL HOLES
LEHR/SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

HOLE NO.	DATE	DESCRIPTION AND ESTIMATED RADIONUCLIDE QUANTITY
1	Unknown	Radioactive cow buried. Exact location and date not known. Cow burned on a Sunday.
2	1956	Dug in 1956. Exact location not known.
3	5/16/61	Radioactive calves buried 6' -0" from Vet. Med., Armstrong Tract. Exact location not known.
4	Unknown	Unknown
5	Unknown	Unknown
6	Unknown	Unknown
7	Unknown	Unknown
8	Unknown	Unknown
9	2/5/63	Not included in original table.
10	4/23/63	Not included in original table.
11	7/9/63	Not included in original table.
12	9/5/63	0.537 nCi ^{14}C
13	9/28/63	.005 mCi ^{59}Fe
14	10/8/63	.03 mCi ^{59}Fe
15	10/18/63	0.102 nCi ^{59}Fe
16	3/3/64	3 nCi ^{45}Ca + 0.05 nCi ^{14}C + 4nCi ^{32}P
17	6/5/64	2.5 nCi ^{35}S + 4 nCi ^{14}C
18	9/9/64	.4 mCi c14 + .5 mCi ^{35}S + .75 mCi ^{14}C
19	9/20/64	8 mCi ^{45}Ca + .1 mCi ^{3}H
20	12/14/64	.015 mCi ^{85}Sr + .06 mCi ^{137}Cs
21	3/16/97	6 nCi ^{45}Ca + .1 mCi ^{14}C
22	2/1/65	0.5 nCi ^{45}Ca
23	2/12/65	.06 mCi ^{59}Fe
24	4/22/65	0.560 mCi ^{45}Ca, 8 mCi ^{32}P
25	8/17/65	^{14}C-0.2 mCi, ^{3}H-0.1 mCi, ^{35}S-0.01 mCi, ^{59}Fe-0.06 nCi
26	9/8/65	^{3}H-0.005 mCi, ^{35}S-0.05 mCi, ^{65}Zn-0.503 mCi, ^{22}Na-0.02 mCi ^{45}Ca-0.24 mCi, ^{131}I-0.50 mCi, ^{14}C-0.334 mCi, ^{59}Fe-0.99 mCi
27	4/26/66	^{14}C-0.8 mCi
28	10/24/66	^{14}C-0.16 mCi, ^{59}Fe-0.05 mCi, ^{238}U-0.002 mCi, ^{226}Ra-0.018 mCi ^{203}Hg-1.5mCi
29	2/6/68	^{137}Cs-.05 mCi, ^{14}C-11.174 mCi ^{3}H110.001 mCi, ^{131}I-1.026 mCi
30	6/14/68	^{14}C-32.1992 mCi, ^{60}Co-.23 mCi, unknown .005mCi
31	7/12/68	^{137}Cs-.15 mCi, ^{3}H-2.21 mCi, ^{60}Co-.003 mCi, ^{14}C 18.276 mCi
32	7/17/69	^{14}C-44.77 mCi
33	8/7/69	^{14}C-27.033 mCi

TABLE 1
RADIOACTIVE WASTE BURIAL DATA
ENGINEERING EVALUATION/COST ANALYSIS – WASTE BURIAL HOLES
LEHR/SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

HOLE NO.	DATE	DESCRIPTION AND ESTIMATED RADIONUCLIDE QUANTITY
34	9/11/69	^{3}H-55.282 mCi, ^{14}C-32.251 mCi
35	3/19/70	^{3}H-26.388 mCi, ^{14}C-42.699 mCi
36	5/21/70	^{3}H-24.903 mCi, ^{14}C-45.2547 mCi, ^{60}Co-.005 mCi
37	6/25/70	^{3}H-4.4083 mCi, ^{14}C-47.9436 mCi, ^{35}S-.5 mCi
38	4/13/71	^{3}H-19.621 mCi, ^{14}C-33.318 mCi, ^{35}S-0.6 mCi
39	1/4/72	^{3}H-24.451 mCi, ^{14}C32.392 mCi, ^{35}S-6.3 mCi, ^{22}Na-1.051 mCi
40	7/14/72	^{3}H-93.4 mCi, ^{14}C-30 mCi
41	8/22/72	^{3}H-38.85 mCi, ^{14}C-33.1 mCi, ^{125}I-1.5 mCi
42	11/2/72	^{14}C-15.294 mCi, ^{3}H-44.035 mCi, ^{125}I-4.5 mCi
43	2/1/73	^{14}C-35.1 mCi, ^{3}H-26.0 mCi, ^{125}I-5.0 mCi
44	4/2/73	^{14}C-60.1 mCi, ^{3}H-75.0 mCi, ^{125}I-5.0 mCi
45	6/5/73	^{14}C-32.55 mCi, ^{3}H-42.7 mCi, ^{32}P-46.66 mCi
46	10/18/73	^{3}H-51.96 mCi, ^{14}C-45.55 mCi, ^{32}P-67.26 mCi
47	2/20/73	^{14}C-28.63 mCi, H-3 30.17 mCi, ^{32}P-90.31 mCi
48	4/4/74	^{32}P-89.401 mCi, ^{3}H-45.286, ^{14}C-25.53 mCi, ^{125}I-.8768 mCi, ^{45}Ca-.31 mCi, ^{22}Na-.1351 mCi, ^{86}Rb-3.8 mCi, ^{57}Co-.0065 mCi, ^{51}Cr/^{75}Se/^{59}Fe/^{99}Mo/^{198}Au/^{133}Xe/^{111}In/^{203}Hg/^{67}Ga (approximately 1.3 mCi each)
49	7/16/74	^{14}C-24.506 mCi, ^{3}H-83.981 mCi, ^{32}P-79.55 mCi, ^{35}S-11.05 mCi, ^{22}Na-.114 mCi, ^{86}Rb-4.2 mCi, ^{75}Se-.2 mCi, ^{45}Ca-.001 mCi, ^{59}Fe-.1 mCi, ^{36}Ci-.254 mCi

TABLE 2
SUMMARY OF ANALYTICAL RESULTS FOR SOIL GAS SAMPLING
ENGINEERING EVALUATION / COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

						Parameter	Chloroform
						Units	(ug/L)
						PRG(Residential)	250
						Background (2)	--
Sampling Event	**Location**	**Sample**	**Depth**	**(1)**	**Type**	**QA**	
1995 Soil Gas Waste Burial Holes Sampling	SGL0046	SGUT0029	03.0				<0.0003
		SGUT0030	10.0				<0.0003
		SGUT0031	06.0				<0.0003
	SGL0047	SGUT0033	03.0				**0.02**
		SGUT0034	10.0				**0.3**
	SGL0048	SGUT0035	03.0				<0.0003
		SGUT0036	10.0				<0.0003
	SGL0049	SGUT0037	03.0				<0.0003
		SGUT0038	10.0				**0.1**
	SGL0050	SGUT0039	03.0				<0.0006
		SGUT0040	10.0				<0.0003
	SGL0051	SGUT0041	03.0				<0.0003
		SGUT0042	10.0				**0.09**
	SGL0052	SGUT0043	03.0				**0.02**
		SGUT0044	10.0				**7**
	SGL0053	SGUT0045	03.0				<0.0006
		SGUT0046	10.0				<0.0003
	SGL0054	SGUT0047	03.0				<0.0003
		SGUT0048	10.0				**0.005**
	SGL0055	SGUT0049	03.0				**0.0007**
		SGUT0050	10.0				<0.0003

(1) = Wet Analysis in units (mg/L, ug/L, pCi/L)

(2) = Draft EE/CA for Southwest Trenches Ra/Sr Treatment Systems and Domestic Spectic Areas, Weiss Associates, November 1997

D = Duplicate Sample

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TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLING
ENGINEERING EVALUATION / COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

DAMES & MOORE

							Parameter	Arsenic		Chromium		Lead		Mercury		Nitrate-n		Hexachlorobenzene	
							Units	(mg/Kg)		(mg/Kg)		(mg/Kg)		(mg/Kg)		(mg/Kg)		(ug/Kg)	
							PRG(Residential)	0.32		210		130		6.5		--		.28	
							Background (2)	9.46		178		10.1		0.49		16		--	
Sampling Event	Location	Sample	Depth	(1)	Type	QA													
1995 Waste Burial Holes Soil Sampling	SBL0032	SSUT0021						7.1		145		9.5		0.26		2.2		<390	
		SSUT0033				D		7.1		136		10.8		0.18		0.88		<370	
		SSUT0024	06.50		WASTE			7.2		150		56.7		0.14		4.6		<1900	
		SSUT0027	15.00					8.4		104		9.3		<0.1		55		<400	
		SSUT0031	35.00					8.2		92.4		10.5		0.14		5.9		<420	
		SSUT0034	09.00					7.9		122		12.1		0.34		26		<410	
1996 Waste Burial Holes Soil Sampling	SSWB0018	SSWB0018	02.00					7.3		157	(3)N|Jm	8.5		0.58	N|Jm	0.50		<350	
	SSWB0019	SSWB0019	02.00					7.9		160	N|Jm	9.2		0.59	N|Jm	2.6		<370	
	TRL0049	SSWB0001	07.00		WASTE			4.4		85.5	N*|Jd	13.4		0.38		47.	H|Jh	<440	
		SSWB0002	05.00					9.3		120	N*|Jd	8.8		<0.12		4.7	H|Jh	<380	
	TRL0050	SSWB0003	03.50		WASTE			9.1		127	N*|Jd	64.4		1.3		2.3	H|Jh	<370	
		SSWB0004	05.25					12.9		174	N*|Jd	7.3		0.41		3.6	H|Jh	<380	
	TRL0051	SSWB0005	07.00		WASTE			8.9		114	N*|Jd	9.3		0.21		12.		<380	
		SSWB0006	07.00	W	WASTE			<0.003		<0.006		<0.002		<0.0002		3.8	H|Jh	<13.	|UJs
		SSWB0007	10.00					10.4		103	N*|Jd	7.4		0.13		12.		<380	
		SSWB0008	10.00	W				<0.01	B|	<0.006		<0.002		<0.0002		4.0	H|Jh	<11.	|UJs
		SSWB0009	09.00		WASTE			9.0		117	N*|Jd	20.3		0.22		15.		<400	
	TRL0052	SSWB0010	10.00		WASTE			9.3		134	N*|Jd	34.0		0.53		110		<370	
		SSWB0011	12.00					8.5		96.2	N*|Jd	7.2		<0.11		57.		<370	
	TRL0053	SSWB0012	09.00		WASTE			9.4		125	N*|Jd	11.1		1.4		420		<380	
		SSWB0013	11.00					9.2		121	N*|Jd	7.4		0.26		90.		<380	
	TRL0054	SSWB0014	07.00		WASTE			7.8		131	N|Jm	10.3		0.53	N|Jm	36.		<370	
		SSWB0015	12.00					8.8		126	N|Jm	8.6		<0.12	N|UJm	25.		<380	
		SSWB0016	12.00					10.2		144	N|Jm	10.3		0.19	N|Jm	25.		<460	
		SSWB0017	07.00		WASTE														

(1) Wet Analysis in units (mg/L, ug/L, pCi/L)

(2) Draft EE/CA for Southwest Trenches Ra/Sr Treatment Systems and Domestic Spectic Areas, Weiss Associates, November 1997

(3) Data qualifiers are explained in Appendix D.

D = Duplicate Sample.

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLING
ENGINEERING EVALUATION / COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

DAMES & MOORE

							Parameter	Naphthalene		4,4'-dde		4,4'-ddt		Alpha-chlordane		Dieldrin		Gamma-chlordane	
							Units	(ug/Kg)		(ug/Kg)		(ug/Kg)		(ug/Kg)		(ug/Kg)		(ug/Kg)	
							PRG(Residential)	--		1300		1300		340		28		340	
							Background (2)	--		--		--		--		--		--	
Sampling Event	Location	Sample	Depth	(1)	Type	QA													
1995 Waste Burial Holes Soil Sampling	SBL0032	SSUT0021						<390		<3.9		<3.9		**3.6**		<3.9		**3.7**	
		SSUT0033				D		<370		<3.7		<3.7		<1.9		<3.7		<1.9	
		SSUT0024	06.50		WASTE			<1900		<18		<18		<9.2		<18		<9.2	
		SSUT0027	15.00					<400		<4.1		<4.1		<2		<4.1		<2	
		SSUT0031	35.00					<420		<4.1		<4.1		<2.1		<4.1		<2.1	
		SSUT0034	09.00					<410		<4.1		<4.1		<2		<4.1		<2	
1996 Waste Burial Holes Soil Sampling	SSWB0018	SSWB0018	02.00					<350		<3.5	J|	<3.5	|UJc	**1.8**		<3.5	J|	**2.3**	
	SSWB0019	SSWB0019	02.00					<370		<3.7	J|	<3.7	J|UJc	<1.8	JP|UJu	<3.7		<1.8	J|
	TRL0049	SSWB0001	07.00		WASTE			<440		**38**		**9.7**		<2.2		<4.4		<2.2	
		SSWB0002	05.00					<380		<3.8		<3.8		<1.9		<3.8		<1.9	
	TRL0050	SSWB0003	03.50		WASTE			<370		<3.8		<3.8		**4.2**		<3.8		**5.4**	
		SSWB0004	05.25					<380		<3.8		<3.8		<1.9		<3.8		<1.9	
	TRL0051	SSWB0005	07.00		WASTE			**1700**	|JI	<3.8	JP|Ju	<3.8	J|	**2.1**		<3.8		**2.9**	
		SSWB0006	07.00	W	WASTE			<13.	|UJs	<0.13		<0.13		<0.064		<0.13		<0.064	
		SSWB0007	10.00					<380		<3.9		<3.9		<1.9		<3.9		<1.9	
		SSWB0008	10.00	W				<11.	|UJs	<0.12		<0.12		<0.06		<0.12		<0.06	
		SSWB0009	09.00		WASTE			**420**	|JI	<4.1		<4.1		**4.1**		<4.1		**5.1**	
	TRL0052	SSWB0010	10.00		WASTE			**1200**		<3.8		<3.8		**3.2**	P|Ju	<3.8		**3.4**	
		SSWB0011	12.00					<370		<3.7		<3.7		<1.9		<3.7		<1.9	
	TRL0053	SSWB0012	09.00		WASTE			<380		<3.9		<3.9		<2		<3.9		<2	
		SSWB0013	11.00					<380		<3.8		<3.8		<1.9		<3.8		<1.9	
	TRL0054	SSWB0014	07.00		WASTE			**92000**		<3.7	J|	<3.7	JP|Ru	<1.9	J|	<3.7		<1.9	J|
		SSWB0015	12.00					<380		<3.9		<3.9	|UJc	<1.9		<3.9		<1.9	
		SSWB0016	12.00					<460		<4.6		<4.6	|UJc	<2.3		<4.6		<2.3	
		SSWB0017	07.00		WASTE														

(1) Wet Analysis in units (mg/L, ug/L, pCi/L)

(2) Draft EE/CA for Southwest Trenches Ra/Sr Treatment Systems and Domestic Spectic Areas, Weiss Associate

(3) Data qualifiers are explained in Appendix D.

D = Duplicate Sample.

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLING
ENGINEERING EVALUATION / COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

					Parameter		Carbon-14		Cesium-137	Gross Alpha		Gross Beta
					Units		(pCi/g)		(pCi/g)	(pCi/g)		(pCi/g)
					PRG(Residential)		909		--	--		--
					Background (2)		0.87		0.053	11.8		11.8
Sampling Event	Location	Sample	Depth	(1)	Type	QA						
1995 Waste Burial Holes Soil Sampling	SBL0032	SSUT0021					**2.8±1.1**		**0.013±0.035**	**11.4±5.4**		**15.8±4.1**
		SSUT0033				D	**1.03±0.54**		**0.019±0.031**	**3.9±3.8**		**11±3.7**
		SSUT0024	06.50		WASTE		**54.4±4.8**		-0.18±0.15	**6±3.8**		**257±17**
		SSUT0027	15.00				**0.9±1.4**		**0.012±0.023**	**8.4±4.6**		**12.9±3.9**
		SSUT0031	35.00				**1.9±1.2**		**0.008±0.025**	**4.8±3.9**		**15.3±4**
		SSUT0034	09.00				**9.6±1.7**		-0.019±0.03	**5.6±4**		**14.3±4.1**
1996 Waste Burial Holes Soil Sampling	SSWB0018	SSWB0018	02.00				<-2.2±5.8	JJd	<0.019±0.028	<5.6±4.9	CJ	**18.0±4.5**
	SSWB0019	SSWB0019	02.00				<1.5±5.4	JJd	<0.024±0.029	<4.7±4.5	CJ	**11.8±3.8**
	TRL0049	SSWB0001	07.00		WASTE		<-0.2±5.9		<0.020±0.027	<1.03±0.82	JJ	**1.56±0.62**
		SSWB0002	05.00				<-3.7±5.0		<-0.031±0.022	**1.8±1.1**	JJ	**1.79±0.65**
	TRL0050	SSWB0003	03.50		WASTE		<-5.3±5.4		<-0.006±0.030	**2.8±1.4**	JJ	<1.21±0.90
		SSWB0004	05.25				<-3.7±5.5		<-0.003±0.017	<1.13±0.97	JJ	**1.90±0.98**
	TRL0051	SSWB0005	07.00		WASTE		**32.7±8.8**		<0.001±0.035	<5.5±4.9	CJ	**26.3±4.6**
		SSWB0006	07.00	W	WASTE		**8530±470**		<-4.0±3.4	<1.±1.2	CJJ	**12.6±2.0**
		SSWB0007	10.00				<-5.4±5.4		<-0.017±0.032	<5.9±4.5	CJ	**15.3±4.1**
		SSWB0008	10.00	W			**135.±36.**		<0.8±5.9	**6.2±1.8**	JJ	**4.6±1.5**
		SSWB0009	09.00		WASTE		**230.±21.**		<-0.009±0.012	**6.9±4.6**	CJ	**54.7±6.7**
	TRL0052	SSWB0010	10.00		WASTE		**23.6±7.9**	JJd	<-0.022±0.020	<3.0±3.8	CJ	**33.9±5.2**
		SSWB0011	12.00				**15.7±7.3**	JJd	<0.021±0.028	<4.6±4.2	CJ	**18.9±4.2**
	TRL0053	SSWB0012	09.00		WASTE		**55.±11.**	JJd	**0.084±0.027**	**8.9±5.5**	CJ	**71.5±7.6**
		SSWB0013	11.00				<-0.7±5.0	JJd	<0.011±0.040	<3.1±4.1	CJ	**15.1±4.3**
	TRL0054	SSWB0014	07.00		WASTE		**1442.±84.**	JJd	**3.28±0.35**	<4.7±5.4	CJ	**884.±49.**
		SSWB0015	12.00				<1.4±6.1	JJd	<0.004±0.021	**10.3±5.5**	CJ	**16.6±4.4**
		SSWB0016	12.00				<1.4±6.2	JJd	<-0.006±0.021	<6.2±4.7	CJ	**17.0±4.5**
		SSWB0017	07.00		WASTE		**100±13.**	JJd	**4610±460**	<0.4±3.4	CJ	**4280±220**

(1) Wet Analysis in units (mg/L, ug/L, pCi/L)

(2) Draft EE/CA for Southwest Trenches Ra/Sr Treatment Systems and Domestic Spectic Areas, Weiss Associate

(3) Data qualifiers are explained in Appendix D.

D = Duplicate Sample.

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TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLING
ENGINEERING EVALUATION / COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

						Parameter	Radium-226		Sr-89,90		Tritium	
						Units	(pCi/g)		(pCi/g)		(pCi/L)	
						PRG(Residential)	--		--		14706	
						Background (2)	0.77		0.36		105	
Sampling Event	Location	Sample	Depth	(1)	Type	QA						
1995 Waste Burial Holes Soil Sampling	SBL0032	SSUT0021					**0.25±0.17**		**0.19±0.5**		**22000±1600**	
		SSUT0033				D	**0.24±0.17**		-0.3±0.63		**262400±9500**	
		SSUT0024	06.50		WASTE		**0.37±0.2**		-0.45±0.56		**409000000±1**	
		SSUT0027	15.00				**0.41±0.18**		-0.3±0.55		**26300000±93**	
		SSUT0031	35.00				**0.33±0.19**		**0.11±0.68**		**982000±3500**	
		SSUT0034	09.00				**0.64±0.21**		-0.38±0.5		**39400000±14**	
1996 Waste Burial Holes Soil Sampling	SSWB0018	SSWB0018	02.00				<0.74±0.24	|Uz	**0.53±0.31**	|Jd	**1030±220**	
	SSWB0019	SSWB0019	02.00				<0.56±0.20	|Uz	<0.28±0.29	|Jd	**340±150**	
	TRL0049	SSWB0001	07.00		WASTE		**0.58±0.26**		<0.69±0.39	B|Uz	**320±160**	
		SSWB0002	05.00				**0.63±0.24**		<0.91±0.47	B|Uz	**1830±310**	
	TRL0050	SSWB0003	03.50		WASTE		**0.56±0.23**		<0.59±0.35	B|Uz	<-30±120	
		SSWB0004	05.25				**0.61±0.20**		<0.44±0.25	B|Uz	<0±120	
	TRL0051	SSWB0005	07.00		WASTE		**0.78±0.24**		**0.91±0.32**	|Jd	**38300000±1900000**	B|Jl
		SSWB0006	07.00	W	WASTE		<0.52±0.68		<0.7±1.2		**796000±40000**	
		SSWB0007	10.00				**0.43±0.18**		<0.16±0.30	|Jd	**23600000±1200000**	B|Jl
		SSWB0008	10.00	W			<0.79±0.69		<1.1±1.1		**451000±23000**	
		SSWB0009	09.00		WASTE		**0.43±0.20**		<0.33±0.31	|Jd	**233000±12000**	B|Jl
	TRL0052	SSWB0010	10.00		WASTE		<0.84±0.25	|Uz	<0.07±0.30	|Jd	**47000±2700**	B|Jl
		SSWB0011	12.00				<0.77±0.25	|Uz	<0.24±0.30	|Jd	**32000±2000**	B|Jl
	TRL0053	SSWB0012	09.00		WASTE		<0.30±0.15	|Uz	<0.32±0.30	|Jd	**2600000±130000**	B|Jl
		SSWB0013	11.00				<0.65±0.20	|Uz	**0.56±0.33**	|Jd	**1081000±54000**	|Jl
	TRL0054	SSWB0014	07.00		WASTE		<0.56±0.21	|Uz	<0.17±0.31	|Jd	**18100±1200**	
		SSWB0015	12.00				<0.59±0.21	|Uz	**25.5±1.6**	|Jd	**810±210**	
		SSWB0016	12.00				<0.60±0.21	|Uz	<0.22±0.27	|Jd	**780±210**	
		SSWB0017	07.00		WASTE		<0.26±0.17	|Uz	**1.06±0.31**	|Jd	**3030±380**	

(1) Wet Analysis in units (mg/L, ug/L, pCi/L)

(2) Draft EE/CA for Southwest Trenches Ra/Sr Treatment Systems and Domestic Spectic Areas, Weiss Associate

(3) Data qualifiers are explained in Appendix D.

D = Duplicate Sample.

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TABLE 4
SOIL TRITIUM LSC LOG
ENGINEERING EVALUATION/COST ANALYSIS – WASTE BURIAL HOLES
LEHR/SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

Item ID	Item Description	cpm	dpm	Corrected pCi/L	Corrected pCi/g
TRL49, 50 Bkg	Background vial	3.50	9.61	n/a	n/a
TRL49-1	Trench sample	2.92	11.43	*	*
TRL49-2	Trench sample	3.47	12.31	*	*
TRL50-1	Trench sample	3.42	12.04	*	*
TRL51 Bkg	Background vial	2.48	3.15	n/a	n/a
TRL51 Bkg	Background vial	2.48	4.54	n/a	n/a
TRL51-1	Trench sample	5,503	29,893	3.6×10^7	4,426
TRL51-2	Trench sample	34,252	187,110	1.71×10^8	32,819
TRL51-3	Trench sample	309	1,450	1.55×10^6	183
TRL51-4	Trench sample	41.6	216.5	202,602	27
TRL50,52,53,54 Bkg	Background vial	3.75	11.79	n/a	n/a
TRL50-2	Trench sample	14.28	71.57	139,602	18.51
TRL52-1	Trench sample	6.53	28.42	43,473	3.66
TRL52-2	Trench sample	16.5	77.66	141,360	15.15
TRL53-1	Trench sample	257.67	1,517.1	2.6×10^6	354
TRL53-2	Trench sample	210.4	1,292.91	1.9×10^6	292
TRL54-1	Trench sample	39.08	214.95	173,590	24.18
TRL54-2	Trench sample	16	90.02	64,655	7.34

TABLE 5
SUMMARY OF
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
ENGINEERING EVALUATION/COST ANALYSIS – WASTE BURIAL HOLES
LEHR/SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

ARAR	Type	Description	Comment
CCR Title 22 66261	Chemical Specific	Outlines tests for identifying hazardous waste. TTLC and STLC used in establishing if a waste is hazardous	Applicable
40 CFR 300.440	Action Specific	CERCLA Off-Site Rule	Applicable
40 CFR 261 & 262	Action Specific	Waste generator Requirements	Applicable
40 CFR 268	Action Specific	Land Disposal Restrictions	Applicable
49 CFR 172	Action Specific	Packaging and transportation of generated waste	Applicable
10 CFR 61	Action Specific	Licensing Requirements for Land Disposal of Radioactive Waste	Applicable
10 CFR 20	Action Specific	Sets standards for protection against radiation	Applicable
Health and Safety Code	Action Specific	Regulate discharge of pollutants into the air	Applicable
22 CCR Section 66261 & 66262	Action Specific	Waste Generator Requirements	Applicable
22 CCR Section 66268	Action Specific	Land Disposal Restrictions	Applicable
17 CCR Section 30100 to 30397	Action Specific	Occupational Health and Exposure Limits	Applicable
Yolo-Solano AQMD, Rule 2.3	Action Specific	Dust control during construction	Applicable
State Reclamation Board Permit	Location Specific	To allow excavation in proximity of levee	Applicable
Endangered Species Act	Location Specific	Requires preservation of threatened or endangered species	Relevant and Appropriate
Fish and Wildlife Coordination Act	Location Specific	Requires preservation of threatened or endangered species	Relevant and Appropriate

TABLE 6
SUMMARY OF ARAR COMPLIANCE
RECOMMENDED ALTERNATIVE
ENGINEERING EVALUATION/COST ANALYSIS – WASTE BURIAL HOLES
LEHR/SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

ARAR	Description	Compliance
CCR Title 22 66261	Outlines tests for identifying hazardous waste. TTLC and STLC used in establishing if a waste is hazardous	Yes
40 CFR 300.440	CERCLA Off-Site Rule	Yes
40 CFR 261 & 262	Waste generator Requirements	Yes
40 CFR 268	Land Disposal Restrictions	Yes
49 CFR 172	Packaging and transportation of generated waste	Yes
10 CFR 61	Licensing Requirements for Land Disposal of Radioactive Waste	Yes
10 CFR 20	Sets standards for protection against radiation	Yes
Health and Safety Code	Regulate discharge of pollutants into the air	Yes
22 CCR Section 66261 & 66262	Waste Generator Requirements	Yes
22 CCR Section 66268	Land Disposal Restrictions	Yes
17 CCR Section 30100 to 30397	Occupational Health and Exposure Limits	Yes
Yolo-Solano AQMD, Rule 2.3	Dust control during construction	Yes
State Reclamation Board Permit	To allow excavation in proximity of levee	Yes
Endangered Species Act	Requires preservation of threatened or endangered species	Yes
Fish and Wildlife Coordination Act	Requires preservation of threatened or endangered species	Yes

TABLE 7
COST ESTIMATE, REFUSE REMOVAL
ENGINEERING EVALUATION/COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

Item #	Item Description	Estimated Quantity	Unit	Unit Cost ($)	Total Cost ($)
1	Excavation of overburden	2,400	CY	$15	$36,000
2	Sheet Pile on Both Side Walls	7,200	SF	$30	$216,000
3	Stockpiling Overburden Excavation on Plastic	3,000	CY	$4	$12,000
4	Laboratory Testing -Waste Profiling Purposes[1]	1	LS	$35,000	$35,000
5	Further excavation to remove refuse	1	LS	$25,000	$25,000
6	Stockpiling of refuse and refuse mixed with soil in rolloff bins	150	CY	$6	$1,000
7	Import of Clean Fill Soil[2]	180	tons	$15	$3,000
8	Disposal as Low Level Radiological Waste[3]	3,645	CF	$25	$91,000
9	Disposal as Mixed Waste[4]	405	CF	$75	$30,000
10	Backfilling of Excavated Area	2,400	CY	$10	$24,000
11	Mobilization/Demobilization	1	LS	$25,000	$25,000
				Contingency (20%)	$100,000
				Sub total cost including contingency[5]	$600,000
				Design	$50,000
				Sub total cost including design	$650,000
				Construction management	$75,000
				Closure Report Preparation	$25,000
				Total Costs	**$750,000**

Notes:

1) This includes costs for laboratory testing of samples from the waste to evaluate disposal options.
2) This includes costs for transportation of clean fill soil from a soil facility to the Site.
3) It is assumed that 90% of refuse and surrounding soils from waste burial holes would be disposed off-site as low level radiological waste.
4) It is assumed that 10% of refuse and surrounding soils from waste burial holes would be disposed off-site as mixed waste
5) Costs are rounded.

TABLE 8
COST ESTIMATE, REFUSE AND SOIL REMOVAL
ENGINEERING EVALUATION/COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

Item #	Item Description	Estimated Quantity	Unit	Unit Cost ($)	Total Cost ($)
1	Excavation of overburden	2,400	CY	$15	$36,000
2	Sheet Pile on Both Side Walls	7,200	SF	$30	$216,000
3	Stockpiling Overburden Excavation on Plastic	3,000	CY	$4	$12,000
4	Laboratory Testing -Waste Profiling Purposes[1]	1	LS	$35,000	$35,000
5	Further excavation to remove refuse and Soil	1	LS	$50,000	$50,000
6	Stockpiling of refuse and soil in rolloff bins[2]	300	CY	$6	$2,000
7	Import of Clean Fill Soil[3]	360	tons	$15	$5,000
8	Disposal as Low Level Radiological Waste[4]	7,290	CF	$25	$182,000
9	Disposal as Mixed Waste[5]	810	CF	$75	$61,000
10	Backfilling of Excavated Area	2,400	CY	$10	$24,000
11	Mobilization/Demobilization	1	LS	$25,000	$25,000
				Contingency (30%)[6]	$190,000
				Sub total cost including contingency	$840,000
				Design	$50,000
				Sub total cost including design	$890,000
				Construction management	$75,000
				Closure Report Preparation	$25,000
				Total Costs	**$990,000**

Notes:

1) This includes costs for laboratory testing of samples from the waste to evaluate disposal options.
2) Assumes 150 cubic yards of impacted soil are removed in addition to refuse.
3) This includes costs for transportation of clean fill soil from a soil facility to the Site.
4) It is assumed that 90% of refuse and surrounding soils from waste burial holes would be disposed off-site as low level radiological waste.
5) It is assumed that 10% of refuse and surrounding soils from waste burial holes would be disposed off-site as mixed waste.
6) Costs are rounded.

TABLE 9
COST ESTIMATE, REMOVE SOUTHERN PORTION OF LFU #2
ENGINEERING EVALUATION/COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

Item #	Item Description	Estimated Quantity	Unit	Unit Cost ($)	Total Cost ($)
1	Excavation of Southern Portion of LF#2, overburden	850	CY	$15	$13,000
2	Sheet Pile on Both Side Walls[1]	7,200	SF	$30	$216,000
3	Stockpiling Overburden Excavation on Plastic[2]	850	CY	$4	$3,000
4	Laboratory Testing -Waste Profiling Purposes	1	LS	$15,000	$15,000
5	Further excavation to remove refuse	1,000	CY	$15	$15,000
6	Stockpiling of refuse in rolloff bins	1,000	CY	$6	$6,000
7	Import of Clean Fill Soil[3]	1,500	tons	$15	$23,000
8	Disposal of LFU #2 Waste	1,000	CY	$25	$25,000
9	Backfilling of Excavated Area	1,850	CY	$10	$19,000
10	Angle soil boring, sample collection, analysis	4	EA	$10,000	$40,000
11	Mobilization/Demobilization	1	LS	$25,000	$25,000
				Contingency (30%)	$120,000
				Sub total cost including contingency	$520,000
				Design	$50,000
				Sub total cost including design	$570,000
				Construction management	$75,000
				Report Preparation	$25,000
				Total Costs[4]	**$670,000**

Notes:

1) Sheet pile used on north side of excavation to stabilize waste that may be present. Sheet pile on south side to keep WBH waste from excavation.
2) Assumes trench 3 feet deep, 30 feet wide, and 250 feet long.
3) This includes costs for transportation of clean fill soil from a soil facility to the Site.
4) The total cost does not include removal of the WBH waste. After this alternative is completed, the refuse in the WBH area would still be in place and need to be removed.

TABLE 10
COST ESTIMATE, ON SITE DISPOSAL
ENGINEERING EVALUATION/COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

Item #	Item Description	Estimated Quantity	Unit	Unit Cost ($)	Total Cost ($)
1	Excavation of overburden	2,400	CY	$15	$36,000
2	Sheet Pile on Both Side Walls	7,200	SF	$30	$216,000
3	Stockpiling Overburden Excavation on Plastic	3,000	CY	$4	$12,000
4	Laboratory Testing	1	LS	$35,000	$35,000
5	Further excavation to remove refuse and soil	1	LS	$50,000	$50,000
6	Stockpiling of refuse and impacted	300	CY	$6	$2,000
7	Import of Clean Fill Soil[1]	360	tons	$15	$5,000
8	Siting and Locating Cell	1	LS	$50,000	$50,000
9	Cell Construction	2,500	SF	$40	$100,000
10	Waste Placement	300	CY	$10	$3,000
11	Mobilization/Demobilization	1	LS	$50,000	$50,000
				Contingency (30%)[2]	$170,000
				Sub total cost including contingency[2]	$730,000
				Design	$100,000
				Sub total cost including design	$830,000
				Construction management	$100,000
				Closure Report Preparation	$50,000
				Total Costs[3]	**$980,000**

Notes:

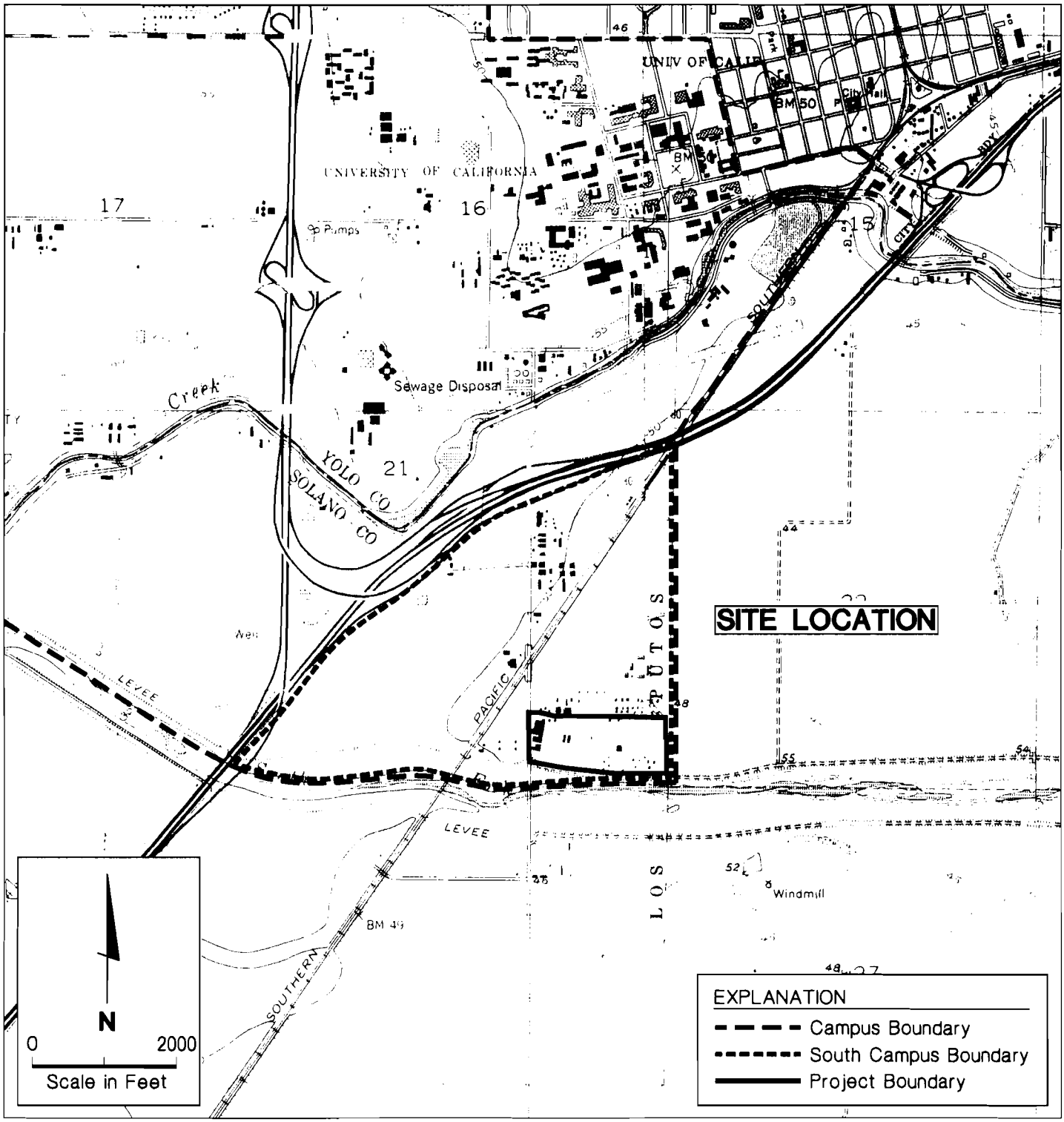
1) This includes costs for transportation of clean fill soil from a soil facility to the Site.
2) Costs are rounded.
3) Costs for developing, installing, and sampling a ground water monitoring network to monitor the on-site cell are not included.

TABLE 11
COST ESTIMATE, IN-SITU CONTAINMENT
ENGINEERING EVALUATION/COST ANALYSIS
WASTE BURIAL HOLES
SCDS ENVIRONMENTAL RESTORATION
DAVIS, CALIFORNIA

Item #	Item Description	Estimated Quantity	Unit	Unit Cost ($)	Total Cost ($)
1	Excavation of Southern Portion of LF#2, overburden	850	CY	$15	$13,000
2	Sheet Pile on Both Side Walls	9,000	SF	$30	$270,000
3	Stockpiling Overburden Excavation on Plastic	850	CY	$4	$3,000
4	Laboratory Testing -Waste Profiling Purposes	1	LS	$15,000	$15,000
5	Further excavation to remove refuse	1,000	CY	$15	$15,000
6	Stockpiling of refuse in rolloff bins	1,000	CY	$6	$6,000
7	Import of Clean Fill Soil[1]	1,500	tons	$15	$23,000
8	Disposal of LFU #2 Waste	1,000	CY	$25	$25,000
9	Backfilling of Excavated Area	1,850	CY	$10	$19,000
10	Cap Construction	7,500	SF	$10	$75,000
11	Grout	350	CY	$150	$53,000
12	Mobilization/Demobilization	1	LS	$50,000	$50,000
				Contingency (30%)	$170,000
				Sub total cost including contingency	$737,000
				Design	$50,000
				Sub total cost including design	$787,000
				Construction management	$75,000
				Closure Report Preparation	$25,000
				Total Costs[2]	**$890,000**

Notes:

1) This includes costs for transportation of clean fill soil from a soil facility to the Site.
2) Costs are rounded.



REFERENCE: USGS 7.5 Quadrangle; Merritt, CA, 1952, photorevised 1981; and Davis, CA, 1952, photorevised 1981.

SITE VICINITY MAP

EE/CA Report - Waste Burial Holes IRA
SCDS Environmental Restoration
Davis, California

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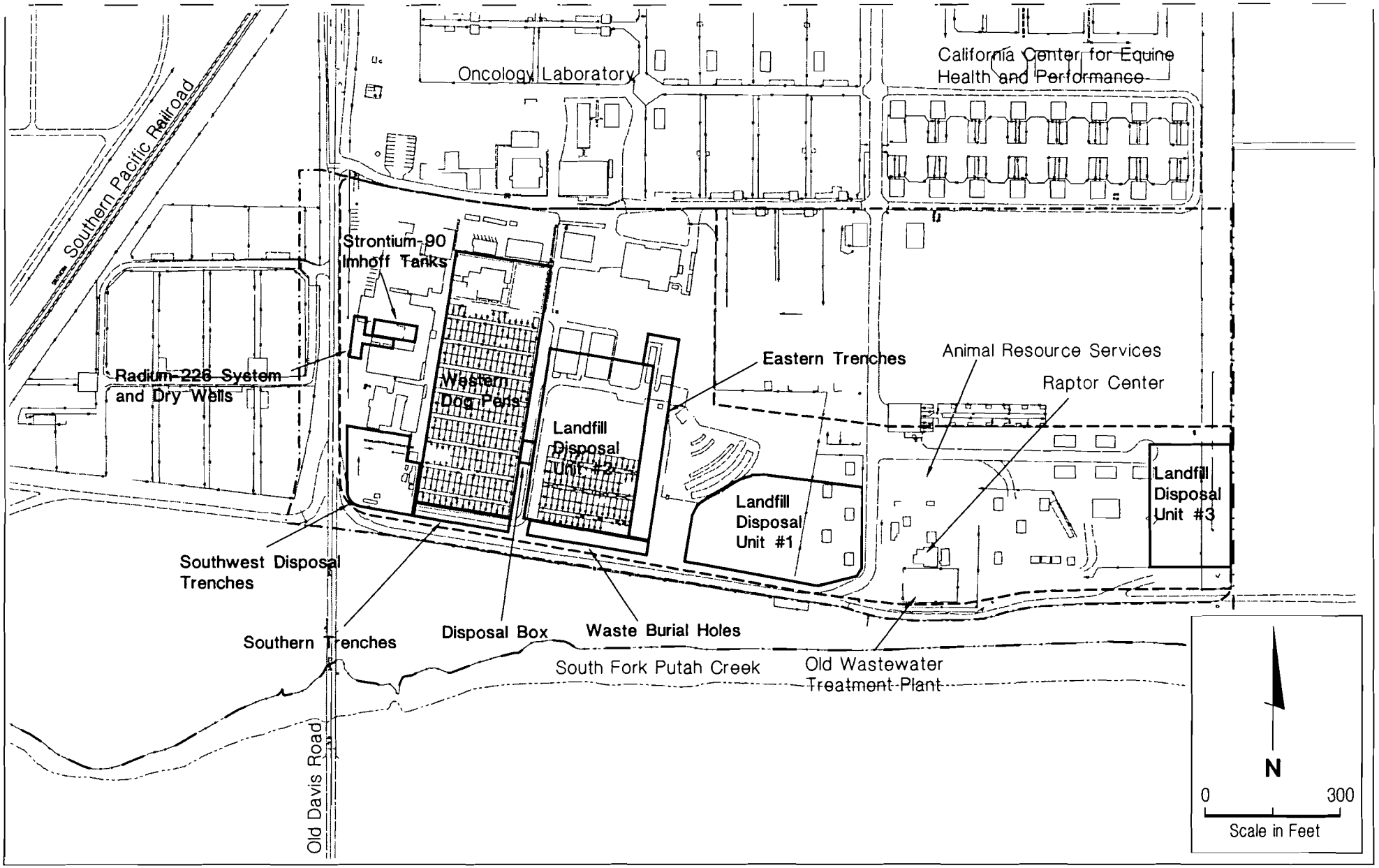
FIGURE 1



EXPLANATION

— · · — · · — Campus Boundary

· — — — — — — LEHR/SCDS Boundary

· — · — · — · — Project Boundary

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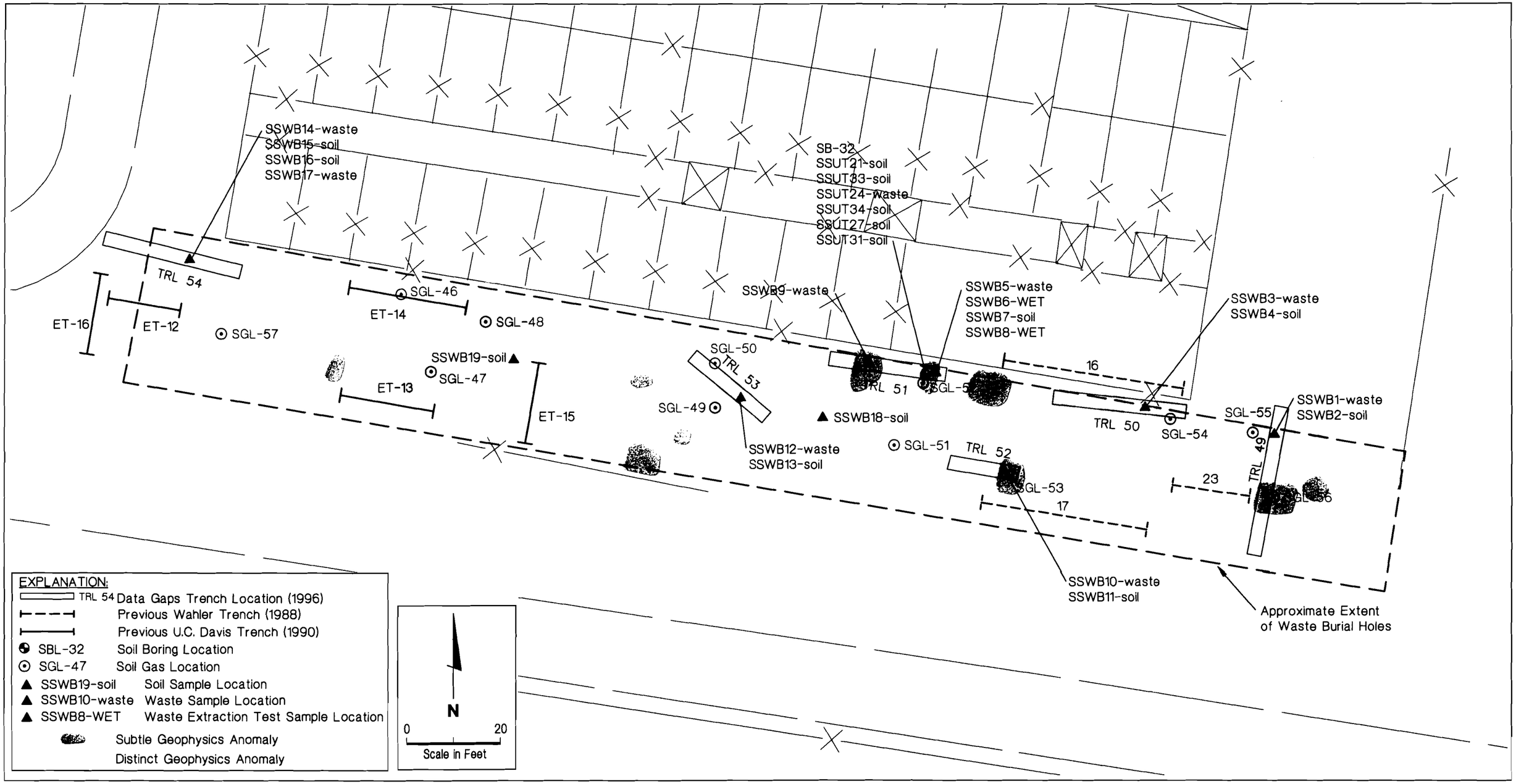
WASTE DISPOSAL AREAS

EE/CA Report - Waste Burial Holes IRA
SCDS Environmental Restoration
Davis, California

FIGURE 2



SOIL DATA COLLECTION LOCATIONS
WASTE BURIAL HOLES

EE/CA Report - Waste Burial Holes IRA
SCDS Environmental Restoration
Davis, California

FIGURE 4

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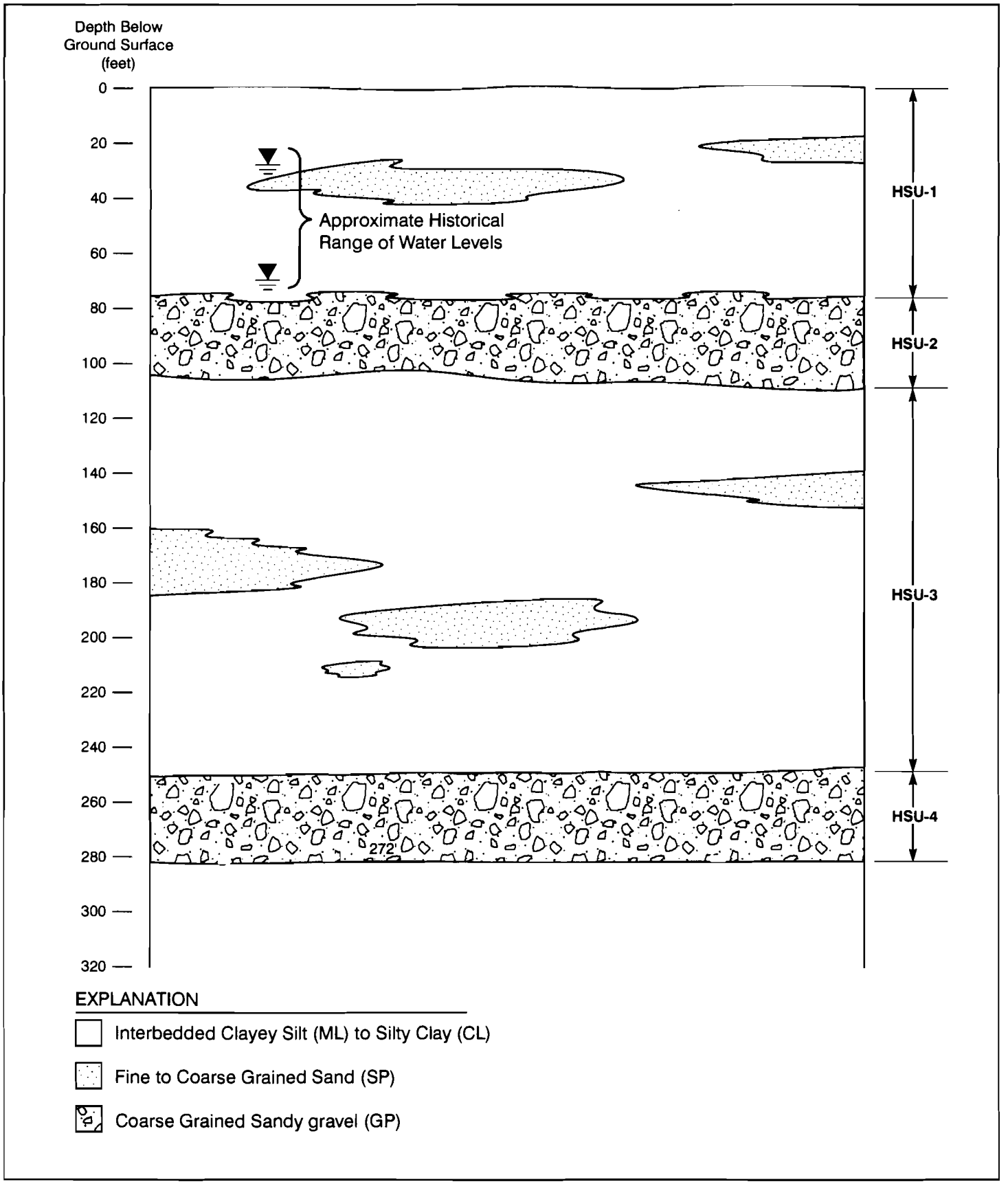

SCHEMATIC CROSS SECTION

EE/CA Report - Waste Burial Holes IRA
SCDS Environmental Restoration
Davis, California

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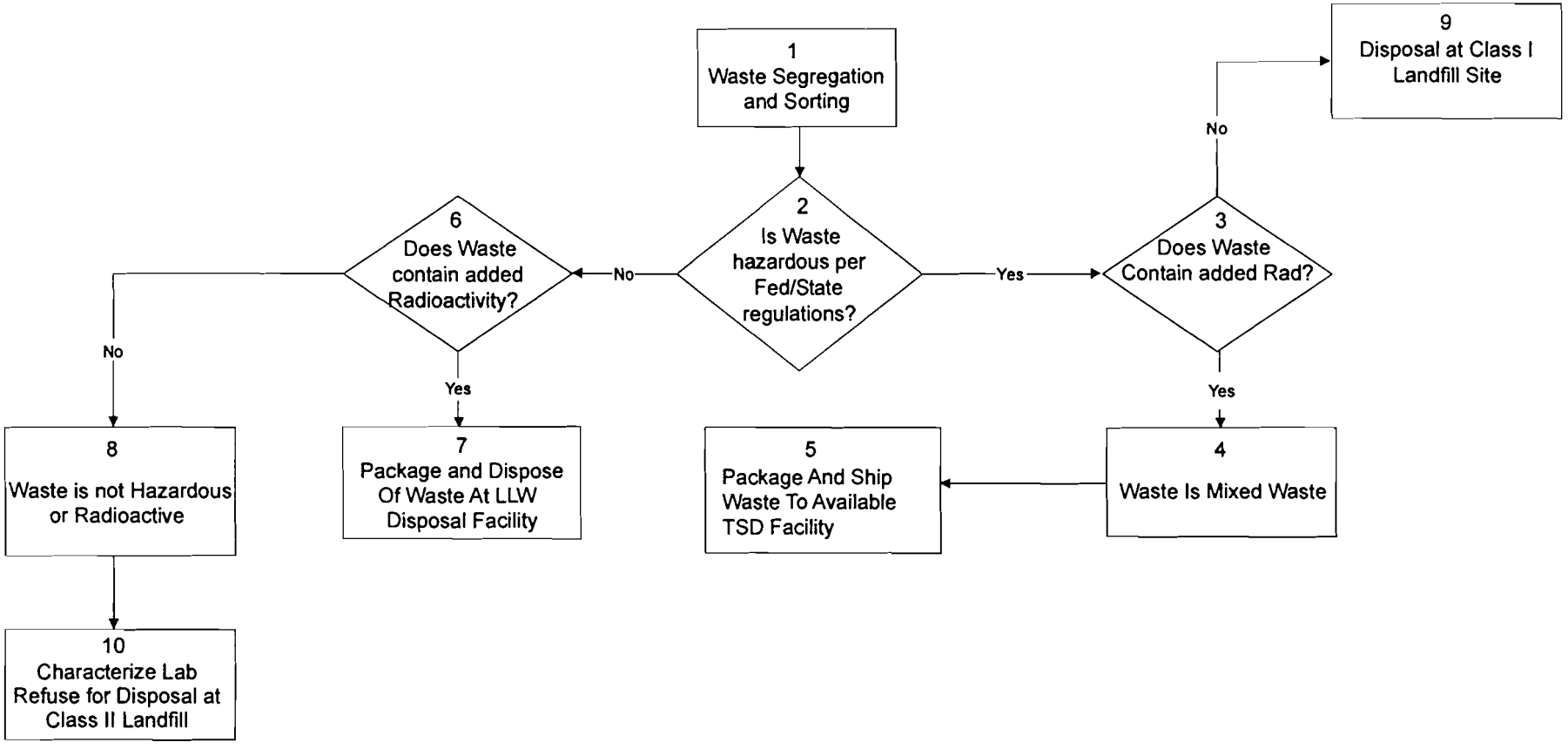
00234000-119808 maj 119808C 11/24/98

FIGURE 3



WASTE CLASSIFICATION AND DISPOSITION PROCESS

EE/CA Report - Waste Burial Holes IRA
SCDS Environmental Restoration
Davis, California

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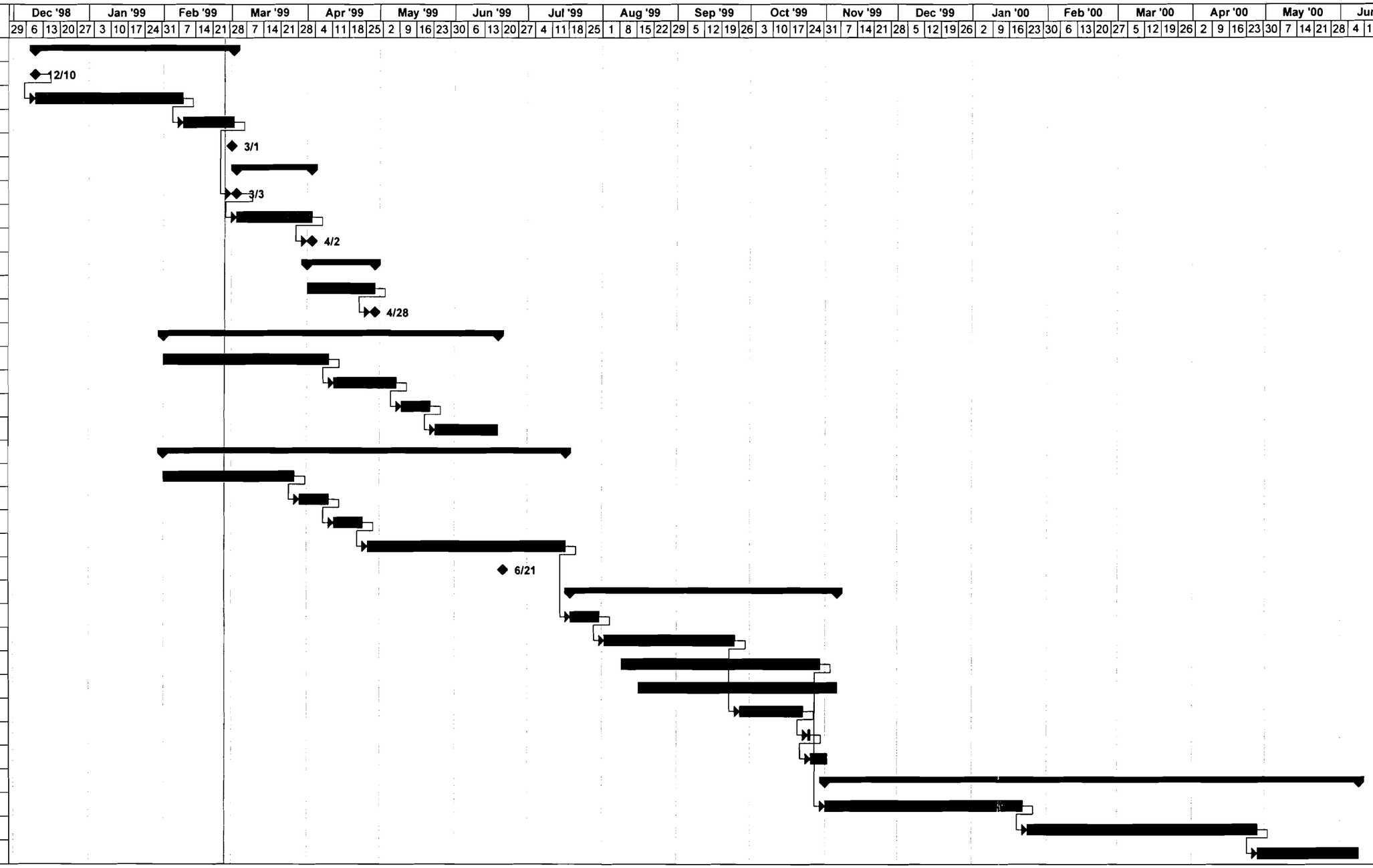
00234258-119802 maj 119802B 11/25/98

FIGURE 5

Proposed Schedule
EE/CA - Waste Burial Holes
SCDS Environmental Restoration

ID	Task Name
1	**EE/CA**
2	EE/CA to RPMs
3	RPM Review
4	Address RPM Comments
5	Public Notice
6	**Public Review**
7	Submit Copy for Public Review
8	Public Review of EE/CA
9	Receive Public Comments
10	**Produce Final EE/CA**
11	Respond to Comments
12	Final EE/CA
13	**Work Plan**
14	Draft Work Plan
15	RPM Review of Draft Work Plan
16	Response to RPM Comments
17	Finalize Work Plan
18	**Design**
19	Develop Plan and Specifications
20	UCD Review of Plans and Specs
21	Finalize Plans and Specs
22	Bidding and Contract Award
23	Public Notice of Construction
24	**Construction**
25	Mobilization
26	Excavation Activities
27	Soil Sampling and Analysis
28	Waste Disposal
29	Backfilling
30	Final Inspection
31	Demobilization
32	**Final Construction Report**
33	Draft Report
34	Review and Comment
35	Final Report



Date Printed: 2/26/99

Task ▬ Milestone ◆ Summary ▬

FIGURE - 6

APPENDIX A

RESPONSE TO COMMENTS

Response to Comments – Kathy Setian – USEPA
Engineering Evaluation/Cost Analysis (EE/CA)
Waste Burial Hole – Interim Removal Action
LEHR/SCDS Environmental Restoration

Item	Comment	Response
	General	
1	The WBH EE/CA should provide a conceptual overview of the methods to be used for excavation, interim storage of hazardous materials, control of hazardous emissions (fugitive dust and surface water run-off), characterization of site soils below the waste, protection of site workers, and backfilling. This information in conceptual form is needed in the EE/CA to assess feasibility and cost of the proposed remedy. The details can be provided in the Removal Action Work Plan (RAWP).	The requested information will be represented in conceptual form in the EE/CA. Text will be revised in Section 6.2.
2	The WBH EE/CA presents only limited data regarding the contents of the WBH. What precautions have been taken to investigate the possible presence of hazards such as ether? Was ether ever used at LEHR during research on dogs? Under certain conditions, ether tends to form peroxide crystals over time, which react explosively to slight vibrations, and if present, could pose a lethal threat to excavation workers. The EE/CA should include a better description of what site excavation workers may encounter in the WBH (chemical as well as radioactive hazards) in order to better assess the feasibility of the proposed action.	The WBH are one of the better understood areas of the SCDS site. Site disposal inventories, based on inspection data, appear accurate to what was actually disposed of in the WBH. Chemical wastes, such as ether , were not known to have been or expected to have been, disposed of in the WBH which primarily took radiologic waste and a small amount of chemicals in the form of scintillation fluids or similar agents.
3	The EE/CA indicates on page 18 that, "Excavation activities will be conducted in a manner that minimizes or eliminates spread of contamination or the possibility of creating new mixed waste." The EE/CA does not specify how the excavation may be performed. It appears that the excavation work may be performed in a confined space (an eight-foot-deep trench) and would possibly have to be performed by workers using supplied air (again, not discussed in the EE/CA). It may be overly optimistic to presume that this work could be performed for $25,000, as estimated in Table 5.	Details on how the excavation will be performed will be presented in the Removal Action Work Plan (RAWP). Planned excavation activities will not involve personnel entering the excavation. Issues with entering an excavation (limited access/egress and hazardous atmosphere), therefore, are not outlined. Text will be added to Section 6.2.1 to state that personnel will not enter the excavation The costs have been developed by personnel familiar with the waste to be encountered and site conditions and are representative of what is planned. The details of the excavation plan will be presented in the RAWP.

Response to Comments – Kathy Setian – USEPA
Engineering Evaluation/Cost Analysis (EE/CA)
Waste Burial Hole – Interim Removal Action
LEHR/SCDS Environmental Restoration

Item	Comment	Response
4	The EE/CA does not evaluate containment of the WBH wastes as an alternative. While containment would not be a permanent remedy, it would not involve the exposure of site workers to potential excavation hazards mentioned in comments #2 and #3 above. As the wastes are relatively shallow, UCD could evaluate driving sheet piling under the waste and then grouting. A low-permeability cover consisting of clay and a geomembrane could be installed over the WBH. In addition to the safety concerns noted above, the cost of containment might be less than the cost of excavation. UCD should consider this alternative in the EE/CA for completeness.	Containment options were qualitatively considered as part of the EE/CA process, but they did not meet the objectives of the WBH IRA, which is to remove the waste. The proposed option also does not meet this objective in addition it would be very difficult, given the limited access, to drive sheet piles under the waste. However, the proposed containment option will be included in the EE/CA including a qualitative evaluation of the feasibility, effectiveness, and cost.
5	The EE/CA does not provide any information regarding how the soils below the waste will be characterized or any criteria to be used by field personnel to determine if the soils should be excavated. This information is needed to assess effectiveness, feasibility and cost of the proposed remedy.	No criteria were presented for soil removal because the objective of the IRA is to remove the waste. Soil sampling is planned to occur after waste removal to take advantage of the open excavation. The purpose of the soil sampling is to provide characterization information, not to guide the limit of excavation. Soils below the waste will be collected from the excavator bucket or by drive sample (pushed by the excavator bucket). Detailed sampling protocol will be outlined in the RAWP.

Response to Comments – Kathy Setian – USEPA
Engineering Evaluation/Cost Analysis (EE/CA)
Waste Burial Hole – Interim Removal Action
LEHR/SCDS Environmental Restoration

Item	Comment	Response
6	EPA Guidance states that removal actions should meet Applicable, or Relevant and Appropriate Requirements (ARARs) to the degree practical, with a higher expectation of compliance for non-time-critical removal actions. Please see Exhibit 4 of EPA *Guidance on the Consideration of ARARs During Removal Actions.* The discussion of ARARs in the EE/CA is inadequate. The EE/CA should be revised to include a table of ARARs such as the CERCLA Off-Site Rule (Section 300.440 of the NCP), and RCRA (e.g., the Land Disposal Regulations, characterization of waste requirements, transport requirements, temporary storage requirements, transport requirements, and disposal requirements). Applicable or relevant and appropriate state requirements should also be included. The table should include the ARAR, the reason the item is an ARAR, and how the alternative will satisfy the ARAR.	The EE/CA will be revised to include a table of ARARs including: CERCLA Off-Site Rule (Section 300.440 of the NCP), and RCRA (e.g., the Land Disposal Regulations, characterization of waste requirements, transport requirements, temporary storage requirements, transport requirements, and disposal requirements, as well as, state requirements.
7	It is entirely possible that in the near or long-term future, it will be determined that additional excavation of the WBH site will be required. It does not appear that the current EE/CA contains any provisions to assist future excavators in determining where the previous excavation activities were conducted. Please provide plans for this, such as lining the excavations with plastic and then backfilling with gravel to delineate the excavation.	This detail had planned to be provided in the RAWP, and will be added to the EE/CA.
8	Based on Figure 4, it does not appear that a 30-foot-wide trench will adequately cover the entire zone of the WBH. Please revise the EE/CA to better delineate the area where debris is buried, or provide contingency plans and cost estimates for unknowns. If sheetpiling must be altered further than 30 feet apart, revise the cost estimate accordingly.	The excavation will be wide enough to adequately cover the entire zone of the WBH. A more detailed description of the limit of excavation and potential location of shoring will be presented in the RAWP.

Response to Comments – Kathy Setian – USEPA
Engineering Evaluation/Cost Analysis (EE/CA)
Waste Burial Hole – Interim Removal Action
LEHR/SCDS Environmental Restoration

Item	Comment	Response
9	Page 14, Section 5.1. Please remove the last sentence. Section 300.415(b)(5) only pertains to EPA Superfund-financed removal actions.	The sentence will be removed.
10	The draft Statement of Work (SOW) attached to the Administrative Order on Consent requests that certain information typically found in an Action Memorandum be included in the EE/CA. Please refer to the SOW and provide an appendix with the requested information, referring to Action Memorandum Guidance as appropriate.	An appendix will be added as requested.
11	Please revise Table 6 (Schedule) to include the Final Inspection and Final Construction Report as specified in the draft SOW of the AOC. Also include dates for publishing the public notice, and the start and end dates for a public comment period.	Figure 6 (Schedule) will be revised to include final inspection and final construction report. The schedule shows the time for public comment on the EE/CA, however dates will be more clearly outlined along with a date for publishing the public notice.
12	Page 5, History of Site Operations. EPA is aware that LEHR studies included gamma-irradiation. (We are not aware of x-irradiation.) Please verify and correct if necessary.	The term x-irradiation has been used in a variety of reports dating back to 1992 to describe the type of past studies conducted on campus. The sentence has been removed, since it does not reflect the types of studies conducted on-site.

Response to Comments – Susan Timm – RWQCB
Engineering Evaluation/Cost Analysis (EE/CA)
Waste Burial Hole – Interim Removal Action
LEHR/SCDS Environmental Restoration

Item	Comment	Response
1	**Page 16, Previous Evaluation of Alternative** As discussed during the 16 December 1998 teleconference on the EECA, UCD's reference to the "Phase III program initiated in 1995" is confusing in that there was not, to my knowledge, a "Phase III program." If UCD wants to include a discussion of previous evaluation is of possible remedial alternatives, they should not be referred to as the "Phase III program."	The EE/CA text will be modified as noted.
2	**Page 20, Post Excavation Sample Collection** UCD states that "Soil sampling procedures and type of analyses will be outlined in the RAWP [Removal Action Work Plan] after EE/CA approval." UCD should clarify what it means by soil sampling procedures. The RAWP should describe criteria to be used to determine the number of soil samples, depths of soil samples and sampling methods. Also, UCD should state that the RAWP requires regulatory approval prior to implementation.	Procedures for soil sampling include sampling from the excavator bucket and drive samples in the bottom of the excavation. These procedures will be added to the EE/CA. The RAWP will describe criteria used to determine the number of soil samples, sample depth and sampling methods. The EE/CA will be modified to include text that will state that the RAWP requires regulatory approval prior to implementation (in Section 1.0).
3	**Page 20, Excavation Preparation and Backfilling** UCD states that "Prior to backfilling, the RPMs will be notified that the waste has been removed and soil samples have been collected . . . to allow the RPMs a review of the field data prior to backfilling of the excavation. It is not the intent of this action to remove soil impacted by the waste." Specifically, what field data will be available for review and to what purpose is the review if UCD plans no additional action after the soil samples are taken? UCD should include time in the schedule for the RPMs to review all available data and the option of hotspot soil removal if discrete areas of contamination are detected either visually or in analyses of soil samples. Also, UCD should consider some way of lining the base of waste excavation to facilitate fill removal when the holes are re-excavated for the remedial action.	It is anticipated that visual observation, field instrument screening and some field laboratory analysis (liquid scintillation counter) data will be available for review. Based on the current waste excavation plan for the WBH, it is not feasible to hold the excavation open for a period of time in order to evaluate the need for additional excavation. This plan is in the process of being developed, but the current approach involves excavating WBH waste in 10 foot long by 30 foot wide increments, backfilling each area prior to exposing the next area. Approximately 20 such areas would need to be exposed, excavated and backfilled, making a decision process for each area impractical.. The limit of the excavation will be lined with plastic to help with delineating the extent of the excavation. Detail of this activity will be presented in the RAWP.

Response to Comments – Edgar D. Bailey, DHS
Engineering Evaluation/Cost Analysis (EE/CA)
Waste Burial Hole – Interim Removal Action
LEHR/SCDS Environmental Restoration

Item	Comment	Response
1	**Page 15, Section 5.3.2** As noted, the proposed removal action will involve excavation of low-level radioactive waste material and physical sorting of that material. It is required that proper occupational protection is provided from potential external exposure and inhalation hazards. Title 17 of the California code or Regulations sections 30100-30397 should be referenced as an action-specific requirement. Title 17 incorporates the occupational health requirements and exposure limits for radioactive materials of 10 CFR 20 as well as disposal and transportation requirements for low-level waste. It is understood that this work will be performed in compliance with UC Davis' Radioactive Materials License No. 1334-57. The procedures to satisfy these requirements should be identified in the Health and Safety Plan and/or the Removal Action Work Plan.	Title 17 of CCR Section 30100-30397 will re referenced. Procedures to satisfy Title 17 will be included in the Health and Safety Plan and the RAWP. The work will be performed in compliance with UC Davis' Broadscope License for Radioactive Materials, and procedures for the work will be reviewed and approved by the campus Radiation Safety Committee.
2	**Section 6.2.3 and Figure 5** The proposed Waste Profiling, in section 6.2.3.3, states that waste will be classified as low-level radioactive, mixed or hazardous. Figure 5, the Waste Classification and Disposition Process, illustrates these waste classifications and an additional waste stream classification that is neither hazardous nor radioactive. Please explain how the additional waste stream will be handled in this removal action process. If the additional waste stream is expected to be the overburden, it should be stated. Also include what actions will be taken if the overburden material is not suitable for reuse.	Figure 5 will be revised to show final disposition of waste that is neither hazardous nor radioactive. If the material is soil and suitable for backfill it will be placed in the excavation. If the material is not suitable for backfill it will be characterized and disposed off-site. Please note that it is unlikely that any waste material removed from the WBH area (glass, lab waste) will not be either hazardous, low-level radioactive, or both (mixed waste).

Response to Comments – Edgar D. Bailey, DHS
Engineering Evaluation/Cost Analysis (EE/CA)
Waste Burial Hole – Interim Removal Action
LEHR/SCDS Environmental Restoration

Item	Comment	Response
3	**Table 3, Summary of Analytical Results for Soil Sampling** There are several items requiring clarification in Table 3. The units given for the tritium results are listed as pCi/L; however, the tables in Appendix B indicate pCi/g. Please provide a reference for the PRG values given in the table. Are the values given in the table commercial or residential PRG values? Please include a key for the data qualifier flags for both Table 3 and Appendix B. There were not found in front of Table 2 or in Appendix B as referenced in the Appendix B tables.	Units in Appendix B should be pCi/L for tritium. A note will be added to the table to clarify. PRG values are residential and will be referenced in the revised EE/CA. A key for qualifiers in Table 3 and Appendix B will be included.
4	**Figure 6, Proposed Schedule** Please include a task heading and time frame for the Characterization Sampling.	The task and time frame for characterization will be added to the schedule.

Response to Comments – Duncan Austin – DTSC
Engineering Evaluation/Cost Analysis (EE/CA)
Waste Burial Hole – Interim Removal Action
LEHR/SCDS Environmental Restoration

Item	Comment	Response
Alternative Analysis		
1	As was discussed in the conference call, the justification for not considering alternatives is insufficient. Based on those discussions, additional alternative analysis language was developed for incorporation into the EE/CA. A copy of that language is enclosed for reference. The additional language is acceptable with regard to the scope and implementability of the alternatives. However, additional cost analysis information needs to be developed for the final EE/CA.	A qualitative discussion of costs for different alternatives will be added to the EE/CA.
2	We suggest deletion of paragraph 2 on page vii and the last sentence of paragraph 1 in section 6.1.1 regarding the Phase III program. The Phase III program was focused on identifying additional data needs based on likely remedies and was not intended to foreclose later alternative analysis. Also, appropriate changes to paragraph 4 on page 1 are needed.	The suggested edits will be incorporated into the EE/CA.
3	Section 6.1.2.3 of the additional analysis is incorrect in that Resource Conservation and Recovery Act (RCRA) permitting would not be required, although on-site disposal would have to comply with the substantive provisions of RCRA.	The text will be corrected.
Applicable or Relevant and Appropriate Requirements		
1	Section 5.3.1 indicates that because this action is an interim action, the EE/CA does not list chemical-specific ARARs. However, CERCLA requires that the interim measure "will become a part of a total remedial action that *will* attain applicable or relevant and appropriate federal or state requirements." (See 40 CFR 430(f)(1)(ii)©(1), emphases added). We do not believe that it is appropriate to rely on the interim action ARAR waiver in this circumstance when it is not clear whether the to-be-determined final action will attain to-be-determined ARARs.	Comment noted, see response to comment below.

Item	Comment	Response
2	However, it is apparent that removal of the intact containerized waste and the contaminated soil in the immediate vicinity of broken containers will reduce the threat of continued contaminant loading to the groundwater. It is also apparent that investigation of the soils and groundwater below the intact containers and potentially highly contaminated soils is not practicable until the containers are removed due to the likelihood of causing additional contamination in so doing (i.e., investigations, such as soil borings, would cause containers to break and spread contamination downward). Thus, rather than rely on the interim action ARARs waiver, we believe that this action and its non-attainment of ARARs, more appropriately relies on the issue of practicality given the exigencies of the situation as is allowed under 40 CFR 30.415(I). EPA guidance (EPA/540/P91/011, page 23-24) discusses the limited scope of removal actions and states, "in some cases, compliance with ARARs is outside the scope of the removal action because the ARAR requires a degree of cleanup that would be inappropriate or inconsistent with the limited scope and purpose of the removal action . . . "	A reference to 40 CFR 300.415(I) and EPA guidance 540/P91/011 will be added to the ARARs section. In addition, reference to the interim action waiver will be removed. The text in Section 5.2.1 will be edited to reflect these changes.
3	We note that Section 5.3.2, Action-Specific ARARs, fails to include regulations concerning the handling and disposal of radiological material.	Handling and disposal of radiologic material will be added to the action specific ARARs.

Post-Excavation Sampling and Backfilling		
4	The removal of the waste will provide an opportunity to characterize the soil below the waste. As stated in Section 6.2.4 of the EE/CA, post-excavation sampling "may also be used to determine the course of action for backfilling the excavations." Post-excavation sampling procedures will be outlined in the Removal Action Work Plan. Section 6.2.5 of the EE/CA provides for notifying the Remedial Project Managers (RPMs) that the waste has been removed and provide an opportunity to review the field data prior to backfilling. That section also indicates that it is not the intent of the action to remove soil impacted by the waste.	Comment noted.
5	Section 6.2.4 leaves the impression that sampling results will be available prior to backfilling. Those results should be provided to the RPMs in addition to the field data. We understand that it is not the intention of the removal action to remove all contaminated soil beneath the waste burial holes. On the other hand, it is practical to remove some of the highly contaminated soils, if such conditions exist, immediately below the waste matrix. We propose that the removal action include the removal of contaminated soils below the waste matrix, if sample results warrant, up to a depth of three feet.	The sampling results available prior to backfilling will be field data collected during excavation (see response to RWQCB Comment 3, Page 4). An action that includes removal of contaminated soil would be difficult to implement and plan. The action outlined in the EE/CA is focused on removing the waste. It may leave soil that is a continued threat to ground water in place. The advantage of having the waste removed (in addition to removing the primary source of impacts to ground water) is to allow further characterization of the area without the risk of creating more problems by drilling through waste (as noted in the comment above). Adding three feet of soil removal could double the volume of material required to be handled, containerized, and stored. Further characterization will allow the collection of information to define soil cleanup levels. These cleanup levels can then be compared to levels found in soil to determine a final action for the WBH area.

Waste Removal and Handling		
6	Section 6.2.3 refers to Figure 5 which presents a conceptual waste classification and disposition process. This figure should be revised to include consideration of wastes which, while non-hazardous under RCRA, may still be wastes exceeding designated levels under the California Water Code and wastes which exceed risk-based levels (Preliminary Remediation Goals).	Figure 5 will be edited accordingly to include designated waste.
7	Backfill placed in the waste burial holes area should be properly compacted. As the soils below the removed waste will still contain contaminants and a final remedy is not expected for some time, the area should be graded to provide for adequate drainage and temporarily capped to prevent infiltration and erosion. Revise section 6.2.5 and section 6.2.7 (cost) accordingly.	Compaction was planned during backfilling. Backfill will be imported to complete backfilling of the WBH area. It will be graded to minimize ponding of surface water run-off. This will be more clearly outlined in Sections 6.2.5 and 6.2.7.
Schedule		
8	The schedule should include additional tasks associated with the following activities: 1) Public participation, 2) Sampling and analysis, and 3) Report preparation Some mention should be made of the expected time frames for the preparation of documentation and implementation of the final action for the waste burial hole areas.	Public participation is currently included in the EE/CA schedule in Figure 6. Text regarding public participation will be added to Section 7. Scheduling of sampling and analysis will be included in the RAWP. Report preparation after the removal action will be added to the Schedule in the EE/CA. The time frame for the final action for the WBH area will be defined in the RI/FS. This statement will be added to Section 7.0 of the EE/CA.

Incorrect Interpretation of the National Contingency Plan		
9	In section 5.1, the last sentence of the second paragraph refers to section 300.15(b)(5) as imposing $2 million and 2-year time limit on removal actions. Those limits apply to removal actions financed by Superfund and as such, they would not apply to the Waste Burial Holes removal action (see also 40 CFR 300.415(j)(3)).	The language in Section 5.1 will be modified as noted.

APPENDIX B

INFORMATION TO SUPPORT ACTION MEMORANDUM

APPENDIX B
INFORMATION TO SUPPORT ACTION MEMORANDUM

Outlined below is information to be included in this EE/CA as outlined in the draft Statement of Work attached to the Administrative Order on Consent. Specifically, the information includes three sections of the Action Memorandum: Section III – Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities; Section IV – Endangerment Determination; and Section VI – Expected Change in the Situation Should Action Be Delayed or Not Taken. In addition, as per comment from the EPA, this Appendix also includes language justifying the use of a non-time critical removal action.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES.

Historical activities at the Waste Burial Holes (WBH) located at the former Laboratory for Energy-related Health Research (LEHR) and the South Campus Disposal Site (SCDS) (together referred to as the Site) at the University of California, Davis (UC Davis) reportedly included disposal of radioactive waste. The WBH were reportedly used to dispose of wastes from general campus activities that potentially contained radiological materials and other campus chemicals and laboratory wastes. The majority of the refuse material from the burial holes is expected to consist of low level Category 3 radioactive waste. Limited quantities of mixed waste and/or hazardous waste may also be generated during the removal action.

A. Threats to Public Health or Welfare

Soil and groundwater beneath the Site has been impacted from wastes contained within the WBH. The primary radiological contaminant is tritium and carbon-14. Other contaminants expected to be present in the burial holes' waste include bis(2-ethylhexyl) phthalate, organochlorine pesticides, Co-60, toulene, and xylene. Lead pigs may also be encountered based on previous investigation results.

Tritium has been found in soil and waste within the WBH area above EPA Region 9 Preliminary Remediation Goals (PRGs) for residential exposure. Carbon-14 has been found in waste samples above PRGs. A description of the concentrations of tritium and carbon-14 in the WBH is presented in Table 3 of the Draft EE/CA report prepared by Dames & Moore (1999).

Tritium and carbon-14 has been found in groundwater that underlies the site. The hydrogeologic zone that is impacted (HSU-1) is in hydraulic connection to an aquifer (HSU-2) that is used for irrigation of nearby agricultural fields. Sampling of monitoring wells at the site and nearby irrigation wells has indicated that the carbon-14 and tritium impacts in HSU-1 and HSU-2 are limited to the area immediately adjacent to the WBH.

B. Threats to the Environment

Though the waste from the WBH is in the subsurface, its presence represents a potential continued health threat and potential for continued release to the environment. As discussed above, ground water and soil underlying the site have been impacted.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delays in the action would result in source material remaining in contact with subsurface soils. If the action is delayed or not taken, it is likely that contamination will continue to be released to soil and groundwater. Expected decreases in concentrations of radiological constituents of concern in ground water would not occur. In addition, site characterization of soils beneath the waste could not occur without the risk of creating additional impacts due to increased potential of breaking liquid filled containers.

JUSTIFICATION FOR THE USE OF A NON-TIME-CRITICAL ACTION

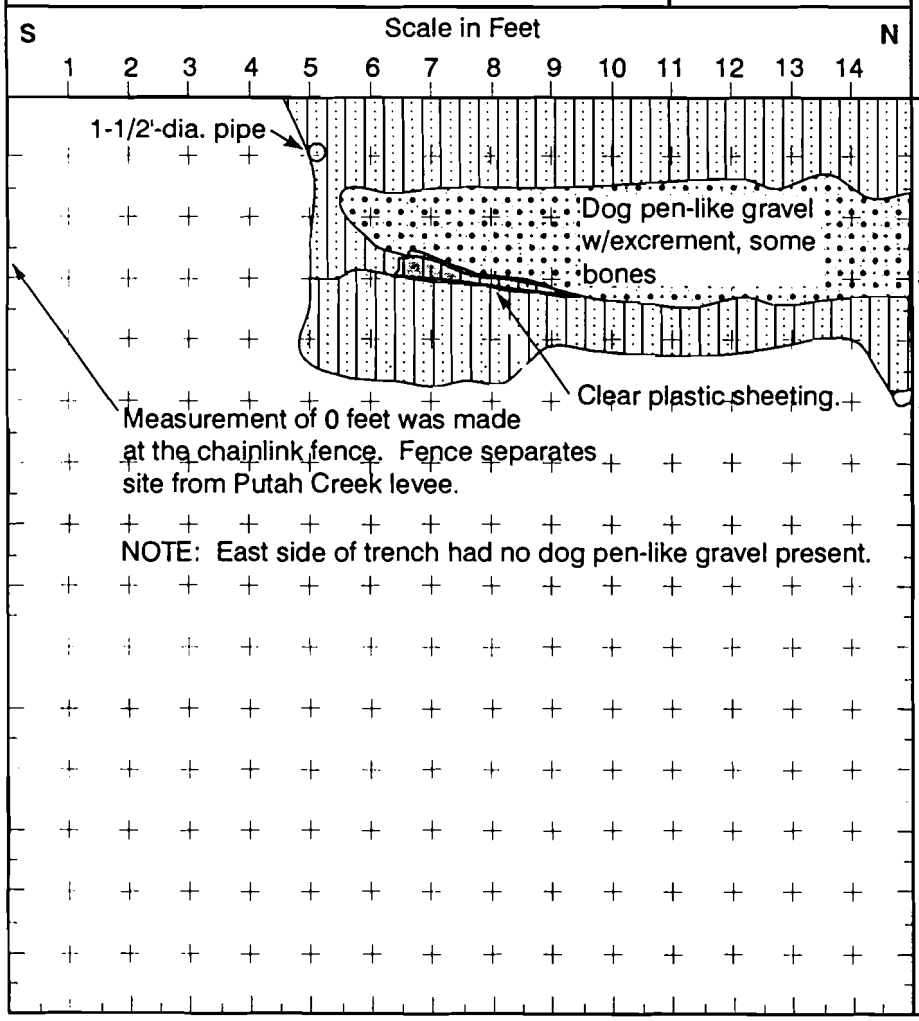
This work is proposed as a removal action to expedite removal of waste that is recognized to contribute to soil and ground water impacts. In addition, the removal action will allow for a more complete characterization of the subsurface beneath the waste. Currently, collection of characterization data from under the waste would be very difficult. With the waste in place, there is the potential for additional impacts to be created if a liquid filled container is broken (i.e. during drilling) in addition to the risk of carrying these impacts to depth during the investigation. With the waste removed, subsurface characterization data could be collected for use in the Soils Remedial Investigation (RI) and development of a final remedial action for the WBH.

APPENDIX C
TRENCH LOGS AND SOIL BORING LOGS

Date Started: 8/27/96 Date Completed: 8/27/96
Water Level: Dry
Orientation: S-N
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear

EXPLANATION

- ⊠ Grab Sample for Chemical Analysis
- ○ Hand Driven Sampler
- ——— Formation Contact
- - - - Inferred Contact
- ╲ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols	DESCRIPTION Surface Conditions: Gravel, sparse, vegetation
1			SM (Fill)	SILTY SAND with gravel, brown to dark brown, dry to moist, well graded, fine to coarse sand, fine to coarse gravel, some waste material including wire, metal, and glass, a few whole clear glass bottles (3), ceramic, wallboard, some laboratory glassware, waste material is sporadic, roots.
2–3			GP (Fill)	GRAVEL, grey, dry, loose, poorly graded, fine to medium gravel, fill, dog pen-like gravel, some bones (ox or sheep vertebrae and tail), some dog feces.
4			SM	SAND with silt, brown to brownish yellow, dense, poorly graded, fine sand, some interbedded SAND with fine gravel lenses.
5			CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity.
6				
7				
8				
9				
10				
11				
12				
13				
14				

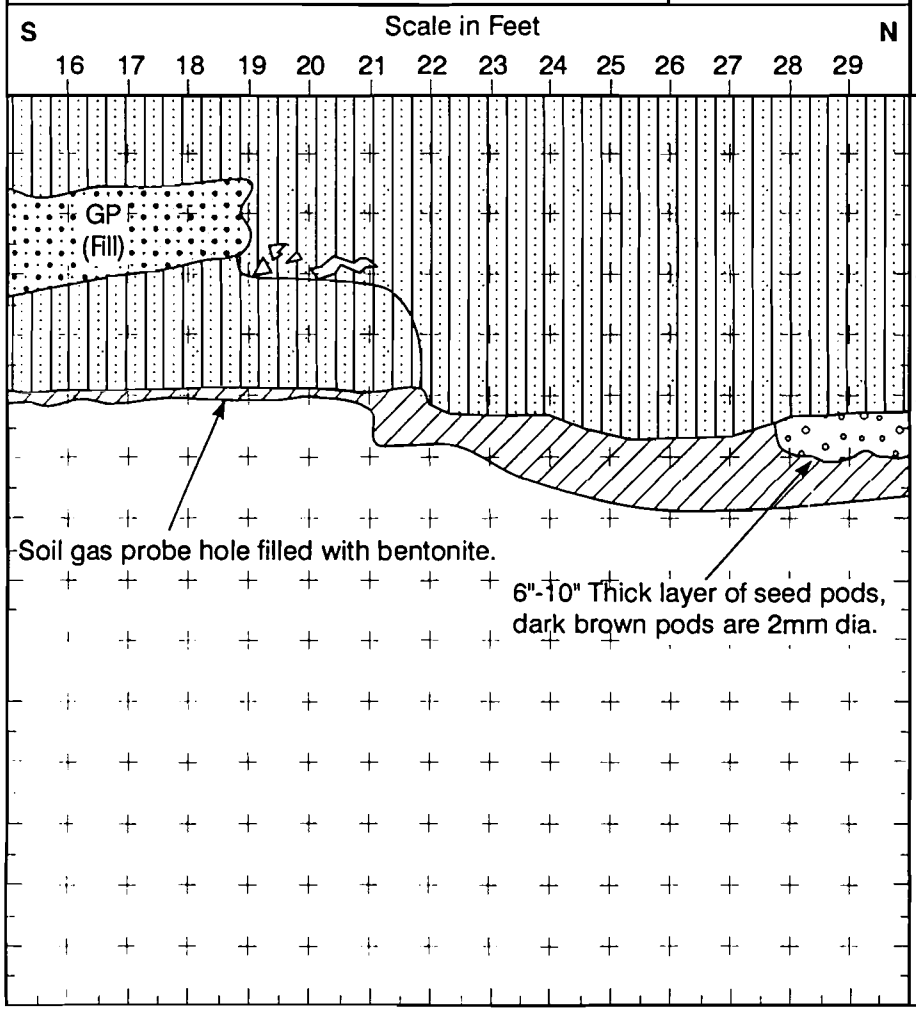
WASTE BURIAL HOLES - TRENCH LOG TRL 49

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

Date Started: 8/27/96 Date Completed: 8/27/96
Water Level: Dry
Orientation: S-N
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear

EXPLANATION

- ⊠ Grab Sample for Chemical Analysis
- ○ Hand Driven Sampler
- ——— Formation Contact
- - - - Inferred Contact
- Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols	DESCRIPTION Surface Conditions: Gravel, sparse, vegetation
1–2			SM (Fill)	SILTY SAND with gravel, brown to dark brown, dry to moist, well graded, fine to coarse sand, fine to coarse gravel, some waste material including wire, metal, and glass, a few whole clear glass bottles (3), ceramic, wallboard, some laboratory glassware, waste material is sporadic, roots.
2–4			GP (Fill)	GRAVEL, grey, dry, loose, poorly graded, fine to medium gravel, fill, dog pen-like gravel, some bones (ox or sheep vertebrae and tail), some dog feces.
4–6			SM	SAND with silt, brown to brownish yellow, dense, poorly graded, fine sand, some interbedded SAND with fine gravel lenses.
6–7			CL	SILTY CLAY, dark brown, moist, stiff, PC<PL, low plasticity.

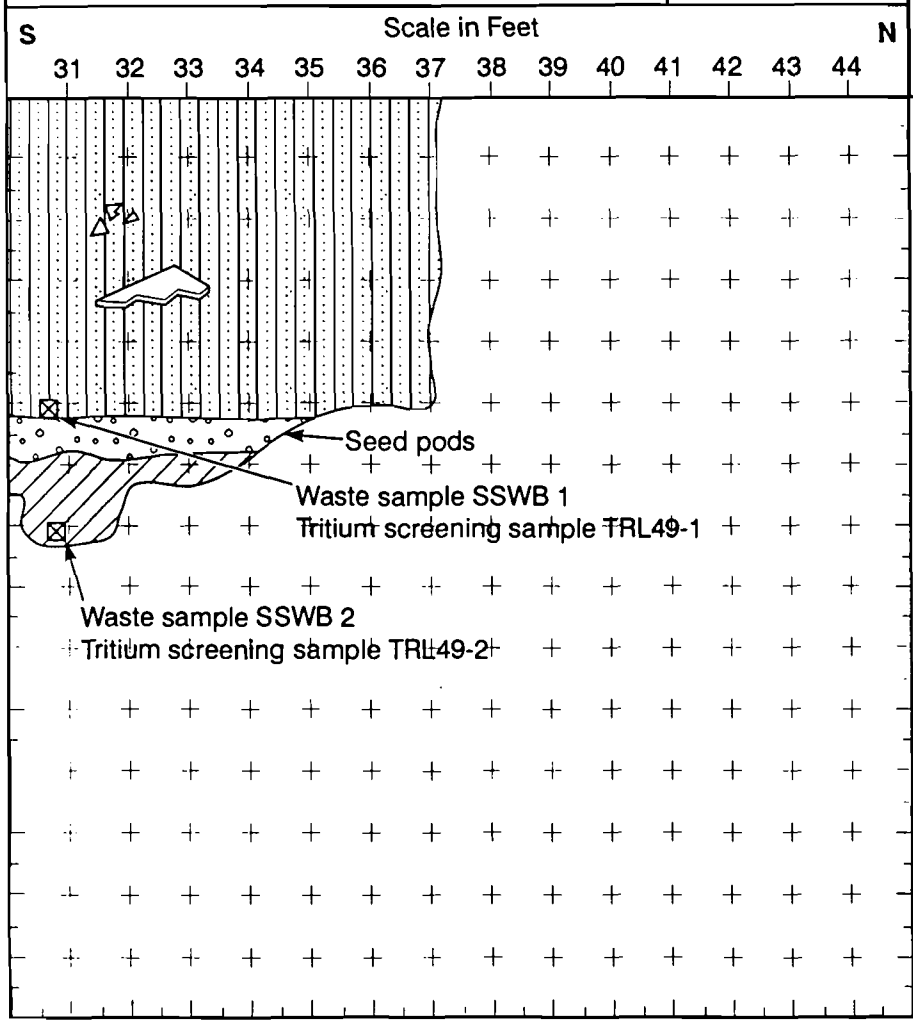
WASTE BURIAL HOLES - TRENCH LOG TRL 49

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

Date Started: 8/27/96 Date Completed: 8/27/96
Water Level: Dry
Orientation: S-N
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear

EXPLANATION

⊠ Grab Sample for Chemical Analysis
○ Hand Driven Sampler
—— Formation Contact
- - - - Inferred Contact
\ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols		DESCRIPTION Surface Conditions: Gravel, sparse, vegetation
1				SM (Fill)	SILTY SAND with gravel, brown to dark brown, dry to moist, well graded, fine to coarse sand, fine to coarse gravel, some waste material including wire, metal, and glass, a few whole clear glass bottles (3), ceramic, wallboard, some laboratory glassware, waste material is sporadic, roots.
2					
3					
4					
5		⊠			
					6" - 10" Thick layer of seed pods, dark brown pods are 2mm diameter, fill.
6				CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity.
7		⊠			
8					
9					
10					
11					
12					
13					
14					

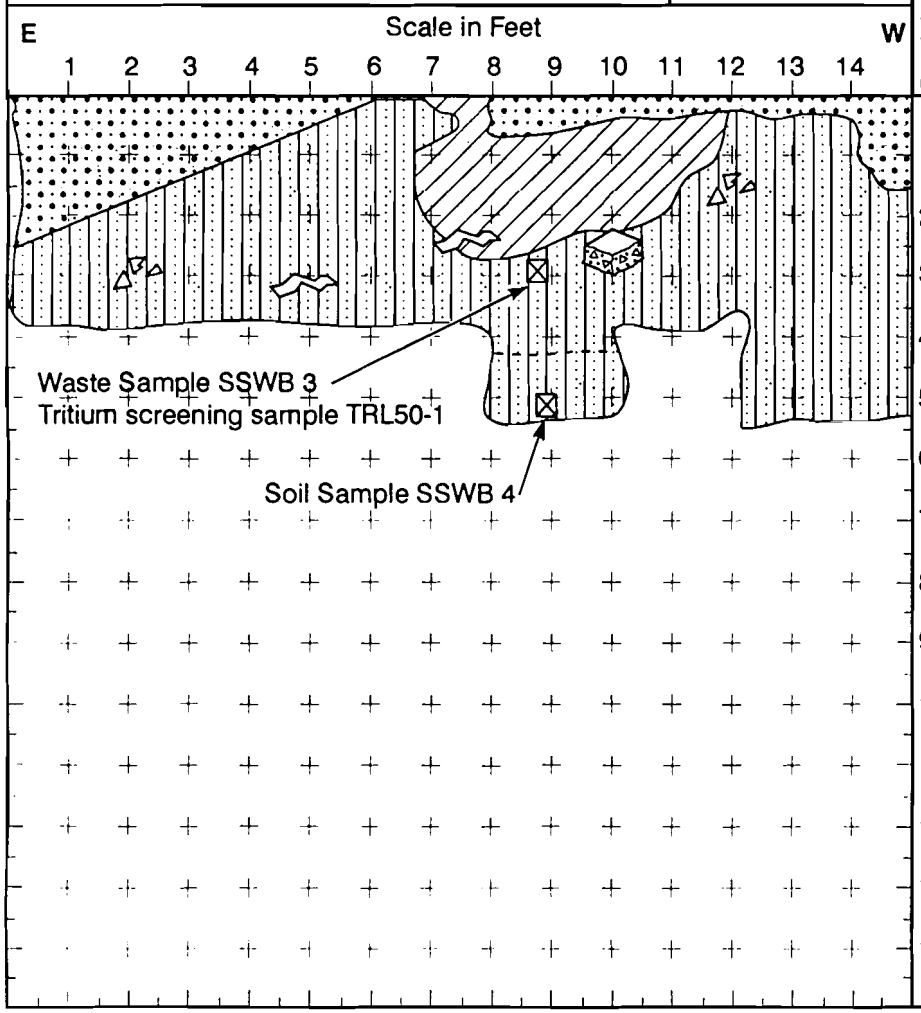
WASTE BURIAL HOLES - TRENCH LOG TRL 49

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

Date Started: 8/27/96 Date Completed: 8/27/96
Water Level: Dry
Orientation: E-W
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear

EXPLANATION

⊠ Grab Sample for Chemical Analysis
○ Hand Driven Sampler
——— Formation Contact
- - - - Inferred Contact
Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols		DESCRIPTION Surface conditions: Gravel, some vegetation.
1				GP (Fill)	GRAVEL, grey, dry, loose, poorly graded, fine to medium gravel, fill, dog pen-like gravel.
2				CL	SILTY CLAY, dark brown, dry, hard, no structure, fill.
3		⊠		SM (Fill)	SILTY SAND with gravel, brown, moist, dense, poorly graded, fine sand, fine gravel, fill, trace glass, ceramic, and oxidized metals.
4					
5		⊠		SM	SAND with silt, brown to brownish yellow, moist, medium dense, poorly graded, fine sand, some interbedded sand with fine gravel lenses.
6					
7					
8					
9					
10					
11					
12					
13					
14					

WASTE BURIAL HOLES - TRENCH LOG TRL 50

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

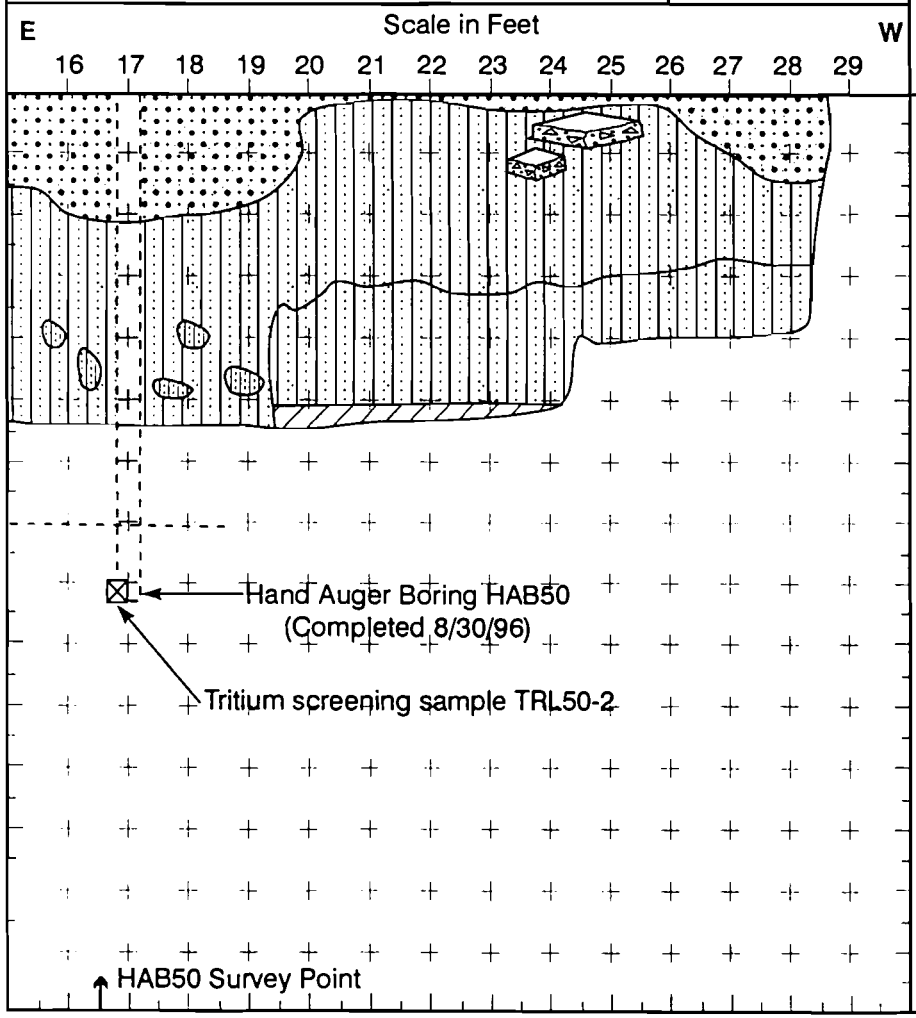
DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

00234258-119802 ac 119802-50A 11/1/96

Date Started: 8/27/96 Date Completed: 8/27/96
Water Level: Dry
Orientation: E-W
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear

EXPLANATION

- ⊠ Grab Sample for Chemical Analysis
- ○ Hand Driven Sampler
- ——— Formation Contact
- - - - Inferred Contact
- ╲ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols		DESCRIPTION Surface conditions: Gravel, some vegetation.
1				GP (Fill)	GRAVEL, grey, dry, loose, poorly graded, fine to medium gravel, fill, dog pen-like gravel.
2				SM (Fill)	SILTY SAND with gravel, brown, moist, dense, poorly graded, fine sand, fine gravel, some dark brown SILTY CLAY inclusions, fill, trace glass, ceramic, oxidized metals, concrete, and asphalt.
3				SM	SAND with silt, brown to brownish yellow, moist, medium dense, poorly graded, fine sand, some interbedded sand with fine gravel lenses.
4					
5				CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity, no structure, fill.
6					
7				W	LABORATORY WASTE: Abundant laboratory glassware, syringes, LSC vials, test tubes, and clear plastic bags.
8		⊠			
9					
10					
11					
12					
13					
14					

WASTE BURIAL HOLES - TRENCH LOG TRL 50

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

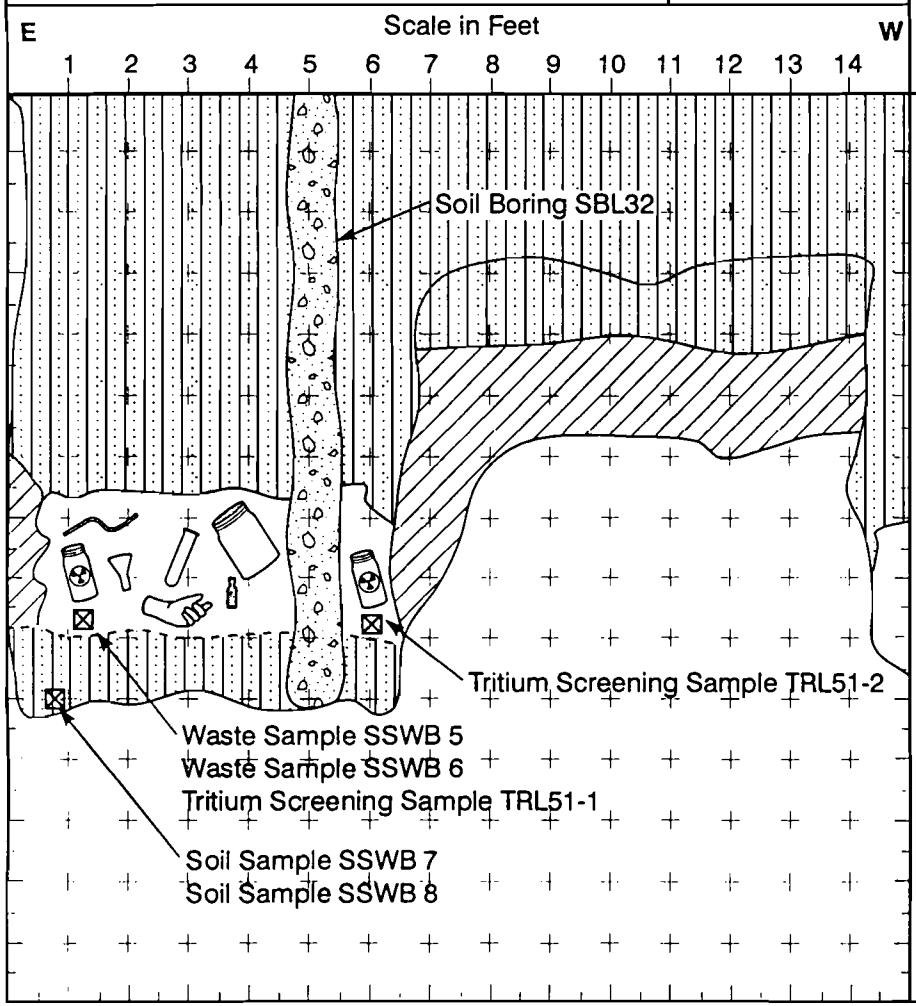
DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

00234258-119802 ac 119802-50B 11/1/96

Date Started: 8/29/96 Date Completed: 8/29/96
Water Level: Dry
Orientation: E-W
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, hot

EXPLANATION

⊠ Grab Sample for Chemical Analysis
○ Hand Driven Sampler
——— Formation Contact
- - - - Inferred Contact
\ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols	DESCRIPTION Surface Conditions: Gravel
1–3			SM (Fill)	SILTY SAND with gravel and clay, brown to dark brown, dry, very dense, fine to medium sand, fine to coarse gravel, fill.
3–4			SM	SAND with silt, brown to brownish yellow, dry, dense, poorly graded, fine sand, some interbedded SAND with gravel lenses, fine to medium gravel.
4–7			CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity, blocky structure, root pores up to 0.25 mm diameter.
7–10		⊠ ⊠	W	LABORATORY WASTE: 7"x7" ceramic crock labeled "Funnel for C-14 Base Solns-- -- --," glass and plastic LSC vials containing liquid, vials with radioactive material labels, 5 gal. metal drums (PID reading of 50-200 ppm) pipettes, test tubes, rubber gloves. Waste appears to be contained in clear plastic bags.
10–14			SM	SAND with silt, brownish yellow, moist, dense, poorly graded, fine sand. NOTE: Lab waste was observed from the center of the trench toward the south side of the trench. The north side wall of the trench had no waste.

WASTE BURIAL HOLES - TRENCH LOG TRL 51

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

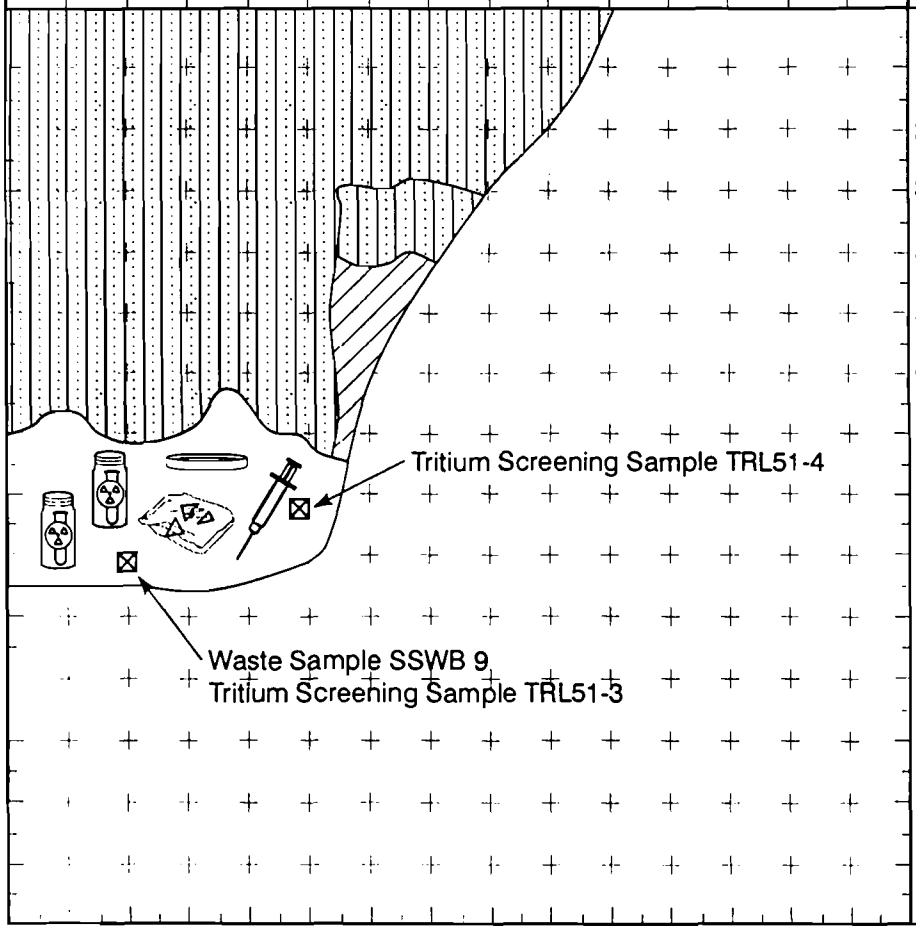
DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

00234258-119802 maj 119802-51A 11/6/96

Date Started: 8/29/96 Date Completed: 8/29/96
Water Level: Dry
Orientation: E-W
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, hot

EXPLANATION

⊠ Grab Sample for Chemical Analysis
○ Hand Driven Sampler
—— Formation Contact
- - - - Inferred Contact
\ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols		DESCRIPTION Surface Conditions: Gravel
1				SM (Fill)	SILTY SAND with gravel and clay, brown to dark brown, dry, very dense, fine to medium sand, fine to coarse gravel, fill.
2					
3				SM	SAND with silt, brown to brownish yellow, dry, dense, poorly graded, fine sand, some interbedded SAND with gravel lenses, fine to medium gravel, fill.
4					
5				CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity, blocky structure, root pores up to 0.25 mm diameter.
6					
7					
8		⊠		W	LABORATORY WASTE: Clear plastic bags containing glass and plastic LSC vials containing scintillation cocktail, syringes, gloves, pipettes, vermiculite, planchette, petri dishes, test tubes, ampules, two approximately 250-ml glass jars, each containing a 20 to 30-ml glass vial. These vials had relatively high beta activity levels (900,000 to 2,400,000 cpm), 250 ml sealed glass jar with a 20 to 30-ml glass vial; this jar had a radioactive material label displaying "Oak Ridge National Laboratory, "C-14," 10 mCi," and "pharmaceutically unrefined, . . .".
9		⊠			
10					
11					
12					
13					
14					

WASTE BURIAL HOLES - TRENCH LOG TRL 51

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

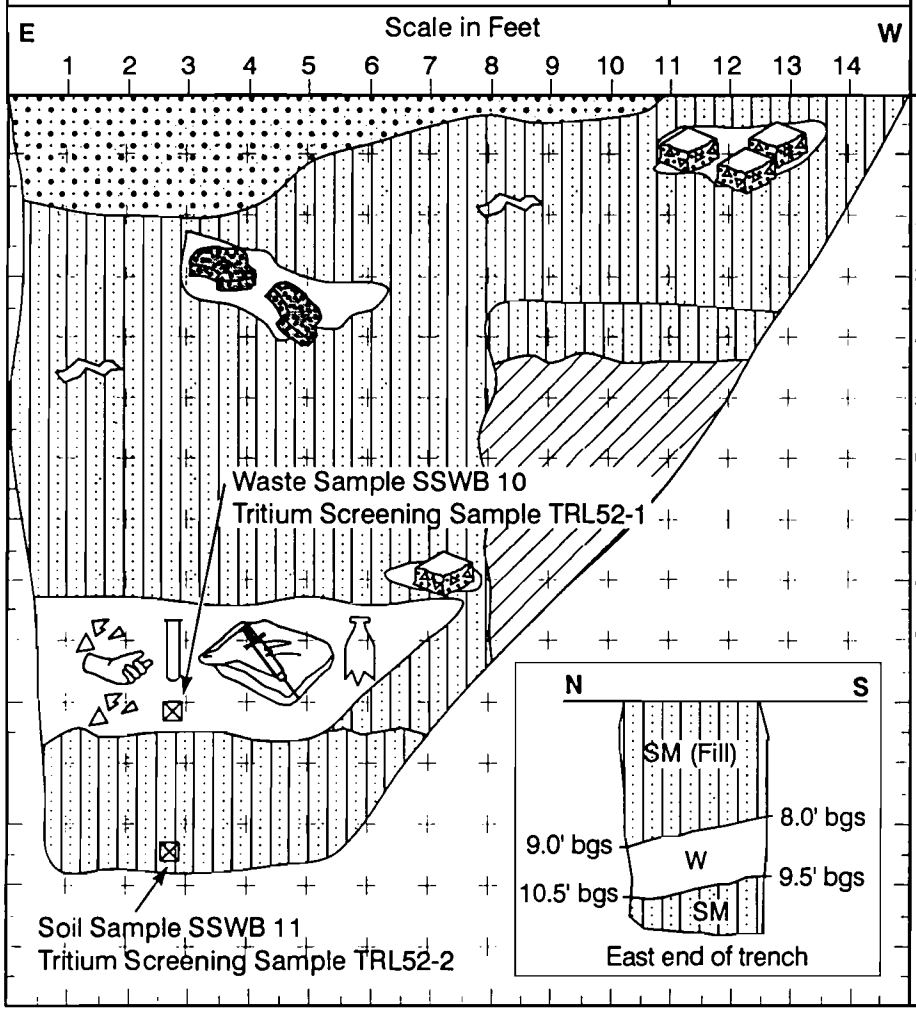
DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

00234258-119802 ac 119802-51B 11/7/96

Date Started: 8/30/96 Date Completed: 8/30/96
Water Level: Dry
Orientation: E-W
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear

EXPLANATION

- ⊠ Grab Sample for Chemical Analysis
- ○ Hand Driven Sampler
- ——— Formation Contact
- - - - Inferred Contact
- ╲ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols		DESCRIPTION Surface Conditions: Pine needles, gravel
1				GP (Fill)	GRAVEL, dry, loose, poorly graded, medium gravel, fill.
2–3				SM (Fill)	SILTY SAND some clay and gravel, brown to dark brown, dry, very dense, fine to medium sand, fine to coarse gravel, some dark brown SILTY CLAY inclusions, trace metal, concrete and asphalt, fill.
4				SM	SAND with silt, brownish yellow, dry, dense, poorly graded, fine sand, some interbedded SAND lenses.
5–9				CL	SILTY CLAY, dark brown, dry to moist, very stiff, MC<PL, low plasticity, blocky structure, root pores up to 0.5 mm diameter.
10		⊠		W	LABORATORY WASTE: Clear plastic bags containing syringes, test tubes, glass and plastic LSC vials containing liquid, flasks, pipettes, gloves.
11–13		⊠		SM	SAND with silt/ SILTY SAND, brownish yellow, dry, dense, poorly graded, very fine to fine sand, abundant pores, blocky structure.
14					

WASTE BURIAL HOLES - TRENCH LOG TRL 52

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

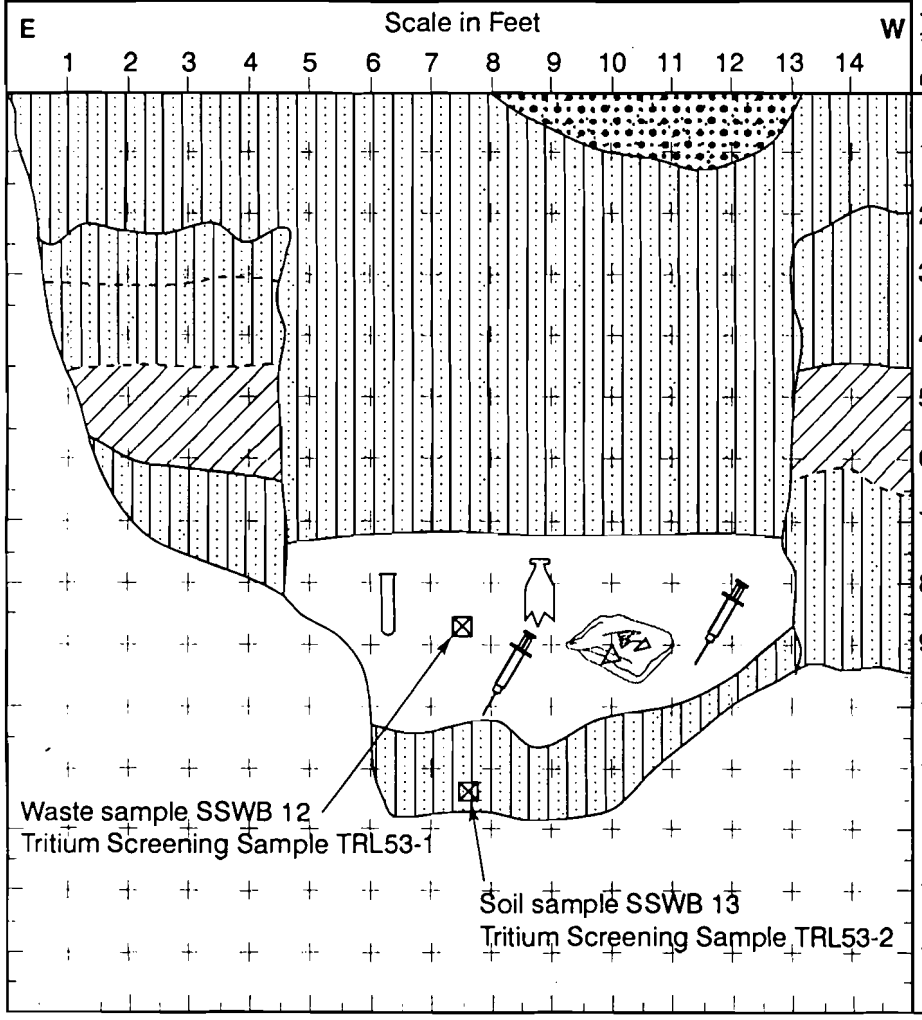
DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

00234258-119802 ac 119802-52a 11/7/96

Date Started: 8/30/96 Date Completed: 8/30/96
Water Level: Dry
Orientation: SE-NW
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear, hot

EXPLANATION

- ⊠ Grab Sample for Chemical Analysis
- ○ Hand Driven Sampler
- —— Formation Contact
- - - - Inferred Contact
- ╲ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols	DESCRIPTION
				Surface Conditions: Pine needles, gravel.
1			GP (Fill)	GRAVEL, grey, dry, loose, poorly graded, fine to medium gravel, fill, dog pen-like gravel.
2			SM (Fill)	SILTY SAND with gravel, brown, moist, dense, poorly graded, fine sand, fine gravel, with dark brown SILTY CLAY inclusions, fill.
3				
4			SM	SAND with silt, brown to brownish yellow, moist, medium dense, poorly graded, fine sand, some interbedded SAND with fine gravel lenses.
5			CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity, blocky structure, root pores up to 0.5 mm diameter.
6				
7			SM	SAND with silt, brown to brownish yellow, moist, medium dense, poorly graded, fine sand.
8			W	LABORATORY WASTE: Clear plastic bags containing glass and plastic LSC vials containing liquid, syringes, laboratory glassware.
9		⊠		
10				
11		⊠	SM	SAND with silt, brown to brownish yellow, moist, medium dense, poorly graded, fine sand.
12				
13				
14				

WASTE BURIAL HOLES - TRENCH LOG TRL 53

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

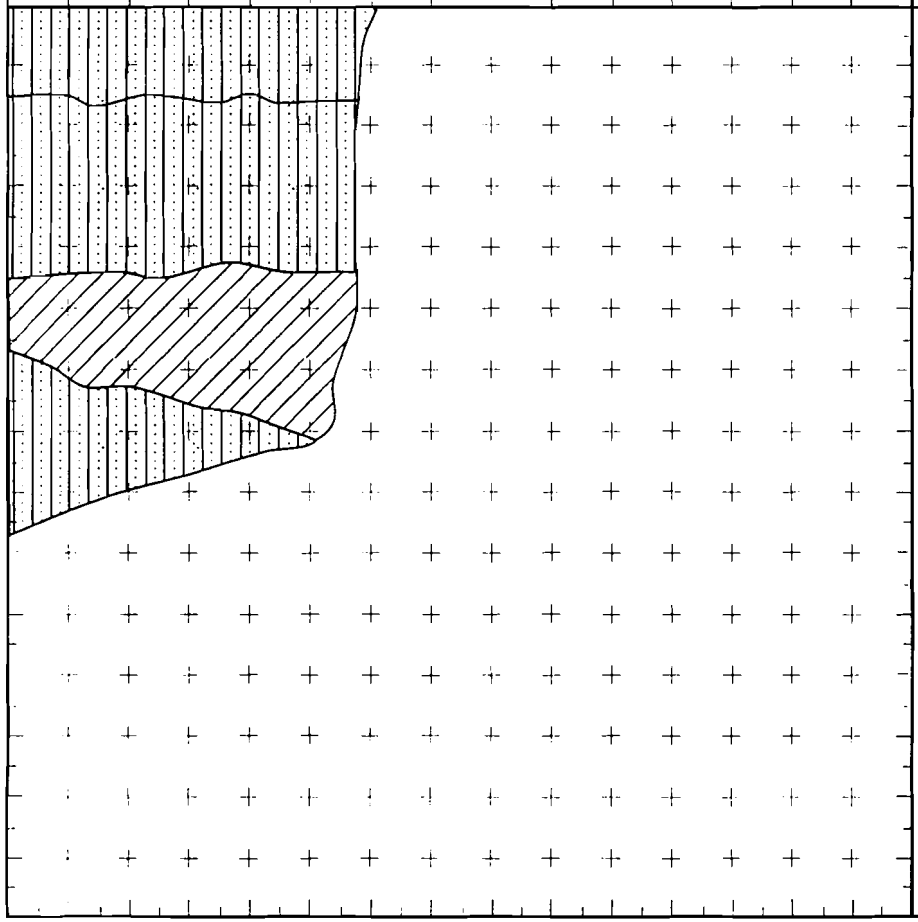
DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

00234258-119802 ac 119802-53a 11/7/96

Date Started: 8/30/96 Date Completed: 8/30/96
Water Level: Dry
Orientation: SE-NW
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear, hot

EXPLANATION

- ⊠ Grab Sample for Chemical Analysis
- ○ Hand Driven Sampler
- ——— Formation Contact
- - - - Inferred Contact
- ╲ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols	DESCRIPTION Surface Conditions: Pine needles, gravel
1			SM (Fill)	SILTY SAND with gravel, brown, moist, dense, poorly graded, fine sand, fine gravel with dark brown SILTY CLAY inclusions, fill.
2			SM	SAND with silt, brown to brownish yellow, moist, medium dense, poorly graded, fine sand, some interbedded SAND with fine gravel lenses.
3				
4				
5			CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity, blocky structure, root pores up to 0.5 mm diameter.
6			SM	SAND with silt, brown to brownish yellow, moist, medium dense, poorly graded, fine sand.
7				
8				
9				
10				
11				
12				
13				
14				

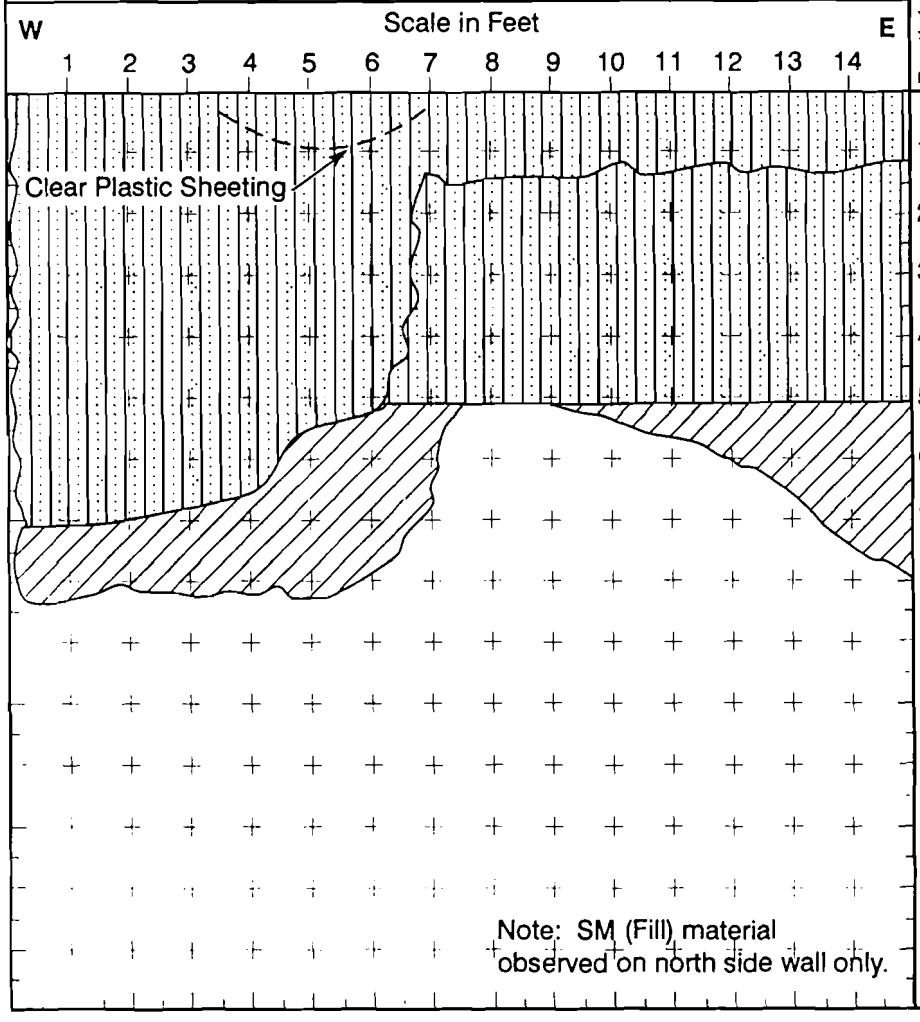
WASTE BURIAL HOLES - TRENCH LOG TRL 53

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

Date Started: 9/3/96 Date Completed: 9/3/96
Water Level: Dry
Orientation: W-E
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear

EXPLANATION

- ⊠ Grab Sample for Chemical Analysis
- ○ Hand Driven Sampler
- ——— Formation Contact
- - - - Inferred Contact
- ╲ Gradational Formation Contact



Depth in Feet	OVM	Sample Type	Symbols	DESCRIPTION Surface Conditions: Gravel
1			SM (Fill)	SILTY SAND with clay, brown to dark brown, dry to moist, very dense, fine sand, trace fine to medium gravel, some dark brown SILTY CLAY inclusions, fill.
2–5			SM	SAND with silt, brown to brownish yellow, moist, dense, poorly graded, fine sand, some interbedded SAND with fine gravel lenses.
6–8	PID =50-150 ppm OVM = 0.0		CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity, blocky structure, some roots, root pores up to 0.5 mm diameter.
9–14				

WASTE BURIAL HOLES - TRENCH LOG TRL 54

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

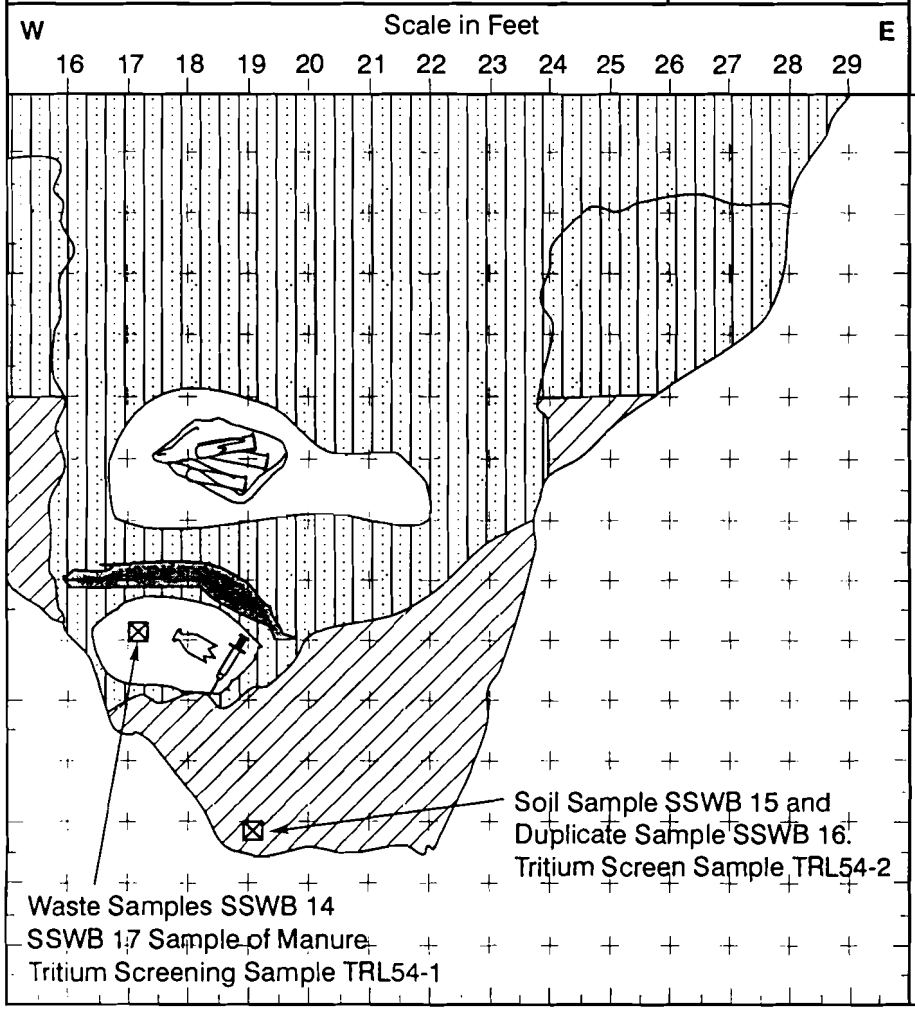
DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

00234258-119802 ac 119802-54a 11/15/96

Date Started: 9/3/96 Date Completed: 9/3/96
Water Level: Dry
Orientation: W-E
Logged By: GAD
Subcontractor: RCI
Equipment: CAT416B
Weather: Sunny, clear

EXPLANATION

⊠ Grab Sample for Chemical Analysis
○ Hand Driven Sampler
——— Formation Contact
- - - - Inferred Contact
\ Gradational Formation Contact

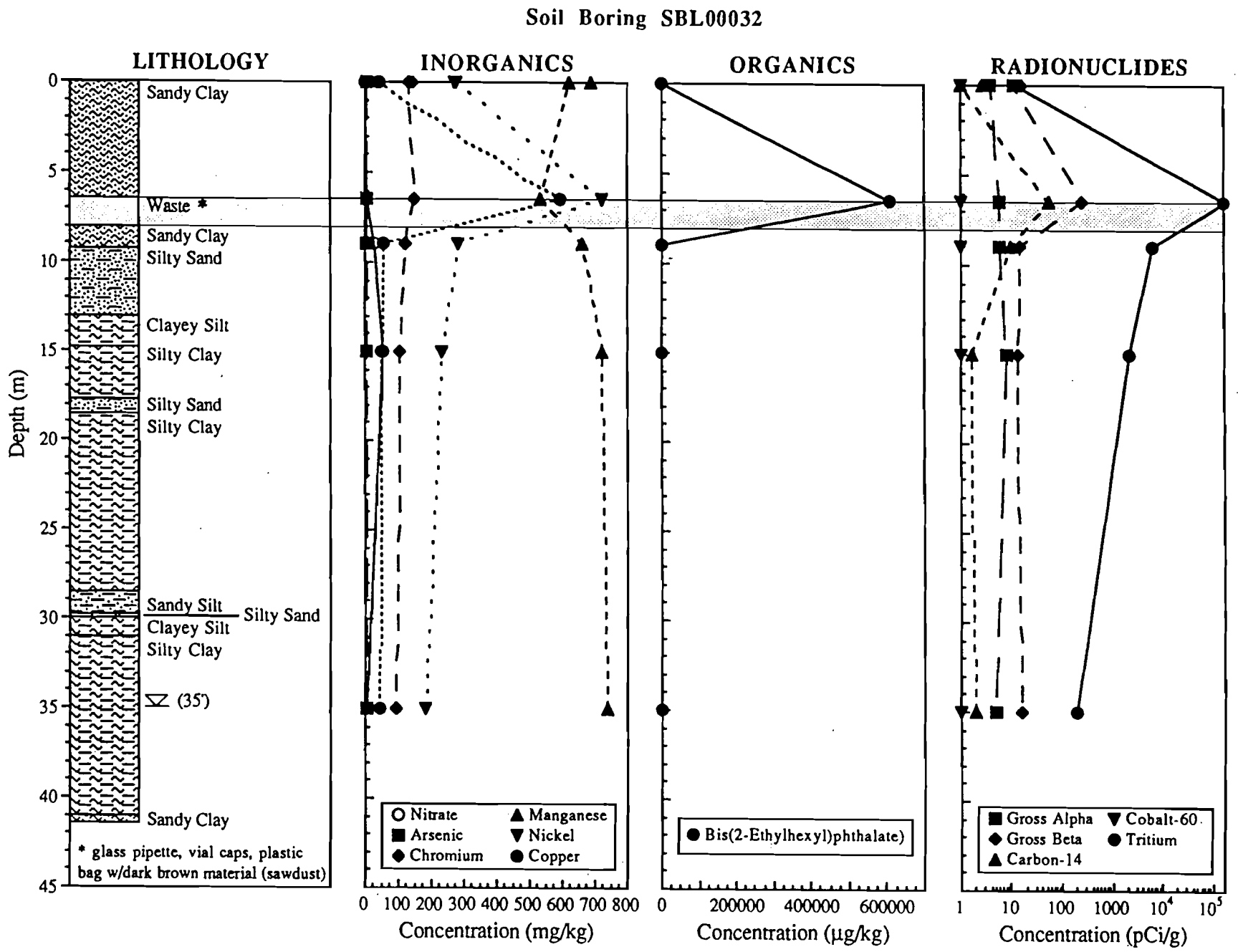


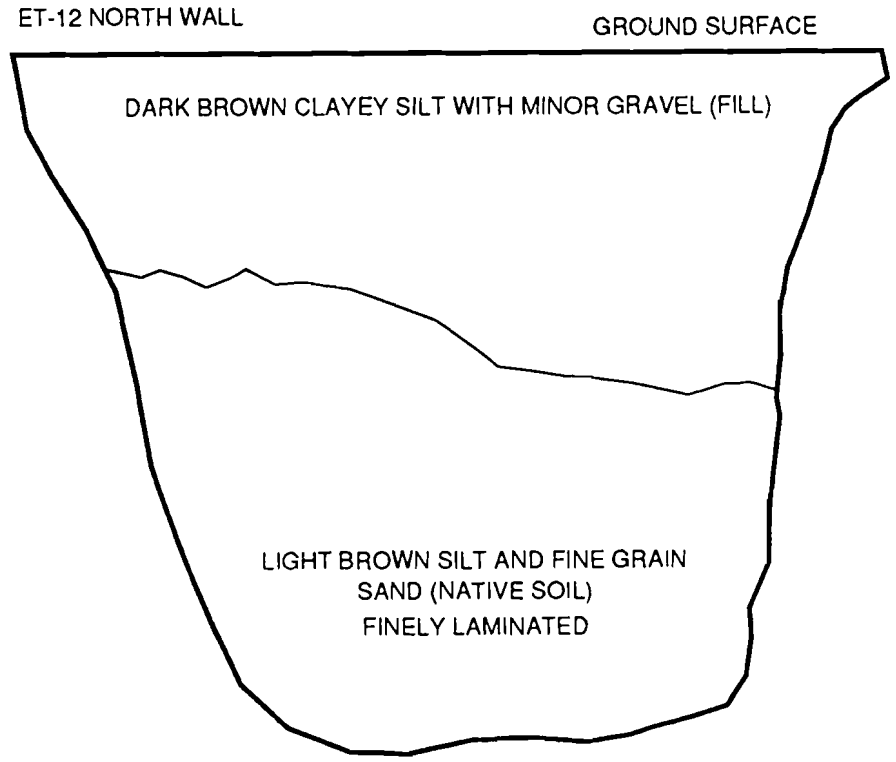
Depth in Feet	OVM	Sample Type	Symbols	DESCRIPTION Surface Conditions: Gravel
1–2	0.0 PID = 50-150 ppm		SM (Fill)	SILTY SAND with clay, brown to dark brown, dry to moist, very dense, fine sand, trace fine to medium gravel, some dark brown CLAY inclusions, fill.
3–4			SM	SAND with silt, brown to brownish yellow, moist, dense, poorly graded, fine sand, some interbedded SAND with fine gravel lenses.
5–6			CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity, blocky structure, some roots, root pores up to 0.5 mm diameter.
7–8			W	LABORATORY WASTE: Clear plastic bags containing syringes, needles, plastic, gloves, lab glassware, 1 gallon clear glass jugs, glass and plastic LSC vials containing liquid, pipettes, jars, 1-liter plastic containers, lead cup containing test tubes with a radioactive material label reading "I^{131} 7/17/65," bags of animal manure (roundish pellets of grass and straw), animal manure with survey readings of 300 to 600 cpm, plastic bag with broken glassware with survey readings of 3,000 cpm, plastic container with plastic test tubes, container lid displayed "Assay container, place probe here," side of the container displayed, "To read... of uranium.", and followed with instructions.
9–10			SM (Fill)	SAND with silt, brown to brownish yellow, moist, dense, poorly graded, fine sand, some interbedded SAND with fine gravel lenses.
11–12			W	LABORATORY WASTE: "Same as above"
13–14			CL	SILTY CLAY, dark brown, moist, stiff, MC<PL, low plasticity, blocky structure, some roots, root pores up to 0.5 mm diameter.

WASTE BURIAL HOLES - TRENCH LOG TRL 54

EE/CA Report - Waste burial Holes IRA
SCDS Environmental Restoration
Davis, California

1995 PNL SOIL SAMPLING
SOIL BORING LOG – SBL0032


Soil Boring SBL00032
LITHOLOGY
INORGANICS
ORGANICS
RADIONUCLIDES
Depth (m)
0
5
10
15
20
25
30
35
40
45
Sandy Clay
Waste *
Sandy Clay
Silty Sand
Clayey Silt
Silty Clay
Silty Sand
Silty Clay
Sandy Silt
Silty Sand
Clayey Silt
Silty Clay
(35')
Sandy Clay
* glass pipette, vial caps, plastic bag w/dark brown material (sawdust)
Nitrate
Arsenic
Chromium
Manganese
Nickel
Copper
0 100 200 300 400 500 600 700 800
Concentration (mg/kg)
Bis(2-Ethylhexyl)phthalate)
0 200000 400000 600000
Concentration (µg/kg)
Gross Alpha
Gross Beta
Carbon-14
Cobalt-60
Tritium
1 10 100 1000 10^4 10^5
Concentration (pCi/g)



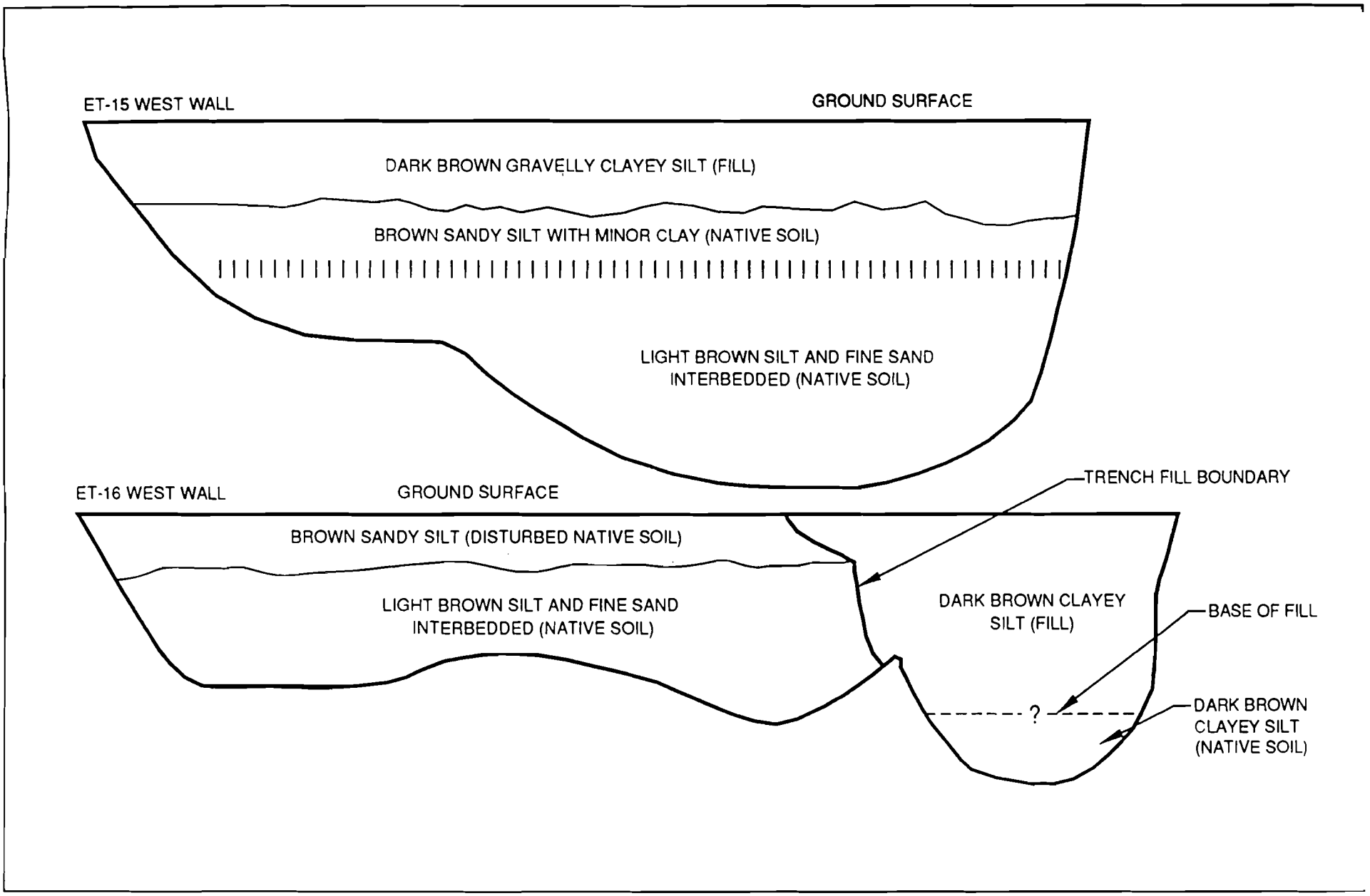
0 2'
Scale in Feet
(Approximate)

SCHEMATIC TRENCH LOG
ET-12

Trench Investigation
UCD LEHR Facility
Davis, California
APRIL 1991

DAMES & MOORE

00234-213-044 LEHR-7



EXPLANATION

| | | | | | | | GRADATIONAL CONTACT IN SOIL

- - - - - - - CONTACT UNCERTAIN

0 2'

Scale in Feet
(Approximate)

SCHEMATIC TRENCH LOG
ET-15, ET-16

Trench Investigation
UCD LEHR Facility
Davis, California
APRIL 1991

DAMES & MOORE

00234-213-044 LEHR-1

1988 WAHLER GROUNDWATER AND SOILS INVESTIGATION
TRENCH LOGS – T16, T17, AND T23

8/83

Wahler Associates

PALO ALTO • CALIFORNIA

UC DAVIS – BURIALS

UCD 201 H

PROJECT NO.

DATE

FIGURE NO.

GRAPHIC TRENCH LOG

TRENCH NO. 16 LOCATION:

SHEET 1 OF 2 NOTES:

UNITS			STRUCTURE			
DEPTH	NO.	DESCRIPTION	NO.	STRIKE	DIP	TYPE
	1	SILTY SAND: Yel brn; ~40% fines, fine sand; slight roots. No apparent disturbance, local lenses of clean sand.				
	2	REFUSE: soil & trash; bottles; test tubes; fork; wire; foil; etc.				
	3	SANDY SILT/GRAVEL/CONCRETE: Back Fill material				

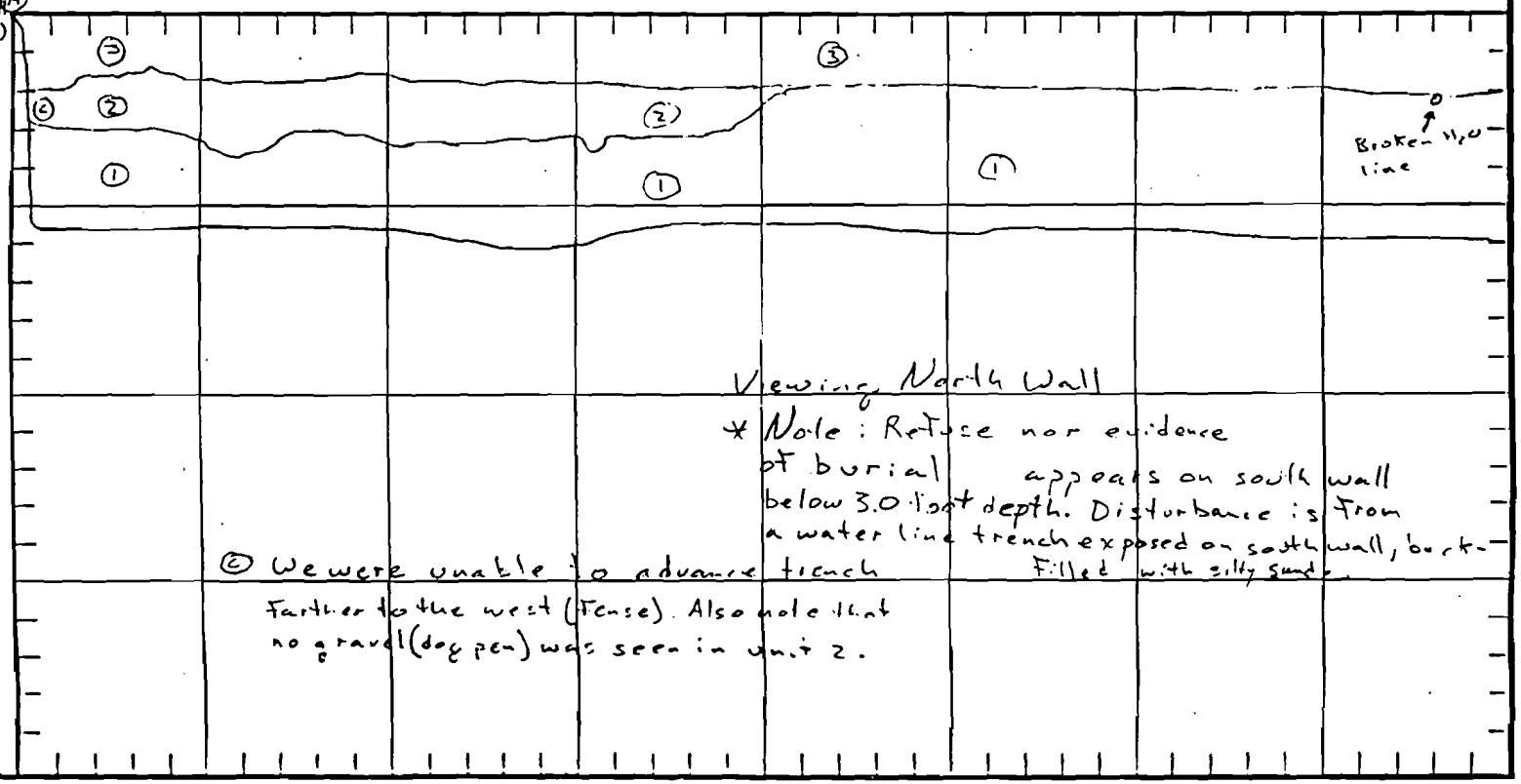
THIS LOG INDICATES CONDITIONS IN THIS TEST PIT OR TRENCH ONLY ON THE DATE INDICATED AND MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND OR OTHER DATES. ANY WATER LEVELS SHOWN ARE SUBJECT TO VARIATION.

STRATIFICATION LINES OR DEPTH INTERVALS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.

SOIL CLASSIFICATIONS SHOWN ON LOG ARE FIELD CLASSIFICATIONS BASED ON THE UNIFIED SOILS CLASSIFICATION SYSTEM.

STATION → 0 5 10 15 20 25 30 35 40

DEPTH (EL.) (A)



19 Feb 88
DATE

G.F.Q
LOGGED BY

SCALE, FT.

095
BEARING

Viewing North Wall

* Note: Refuse nor evidence of burial appears on south wall below 3.0 foot depth. Disturbance is from a water line trench exposed on south wall, back-filled with silty sand.

(C) We were unable to advance trench farther to the west (Tense). Also note that no gravel (dog pen) was seen in unit 2.

8/83

Wahler Associates

PALO ALTO • CALIFORNIA

UC DAVIS - BURIALS

GRAPHIC TRENCH LOG

PROJECT NO. UCD 201 H

DATE

FIGURE NO.

TRENCH NO. 16

SHEET 2 OF 2

LOCATION:

NOTES:

UNITS			STRUCTURE			
DEPTH	NO.	DESCRIPTION	NO.	STRIKE	DIP	TYPE
		THIS LOG INDICATES CONDITIONS IN THIS TEST PIT OR TRENCH ONLY ON THE DATE INDICATED AND MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND ON OTHER DATES. ANY WATER LEVELS SHOWN ARE SUBJECT TO VARIATION. STRATIFICATION LINES OR DEPTH INTERVALS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL. SOIL CLASSIFICATIONS SHOWN ON LOG ARE FIELD CLASSIFICATIONS BASED ON THE UNIFIED SOILS CLASSIFICATION SYSTEM.				

STATION → 40 45 (15) 50

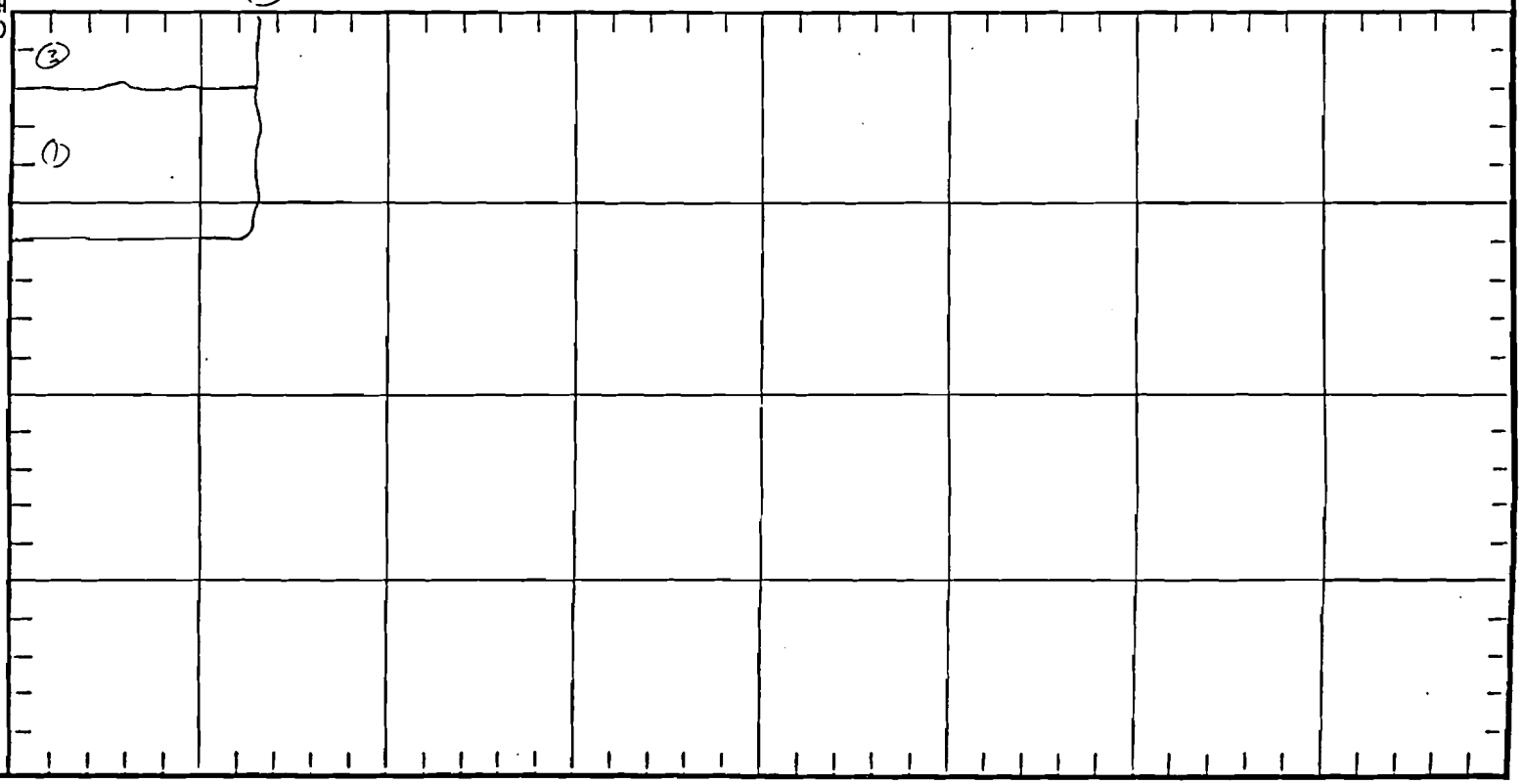
DEPTH (EL.)

19 Feb 88
DATE

Pof. 2.
LOGGED BY

SCALE, FT.

095
BEARING



8/83

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UC DAVIS - BURIALS

GRAPHIC TRENCH LOG

PROJECT NO. UCD 201 H

DATE

FIGURE NO.

TRENCH NO. 17

SHEET 1 OF 2

LOCATION:

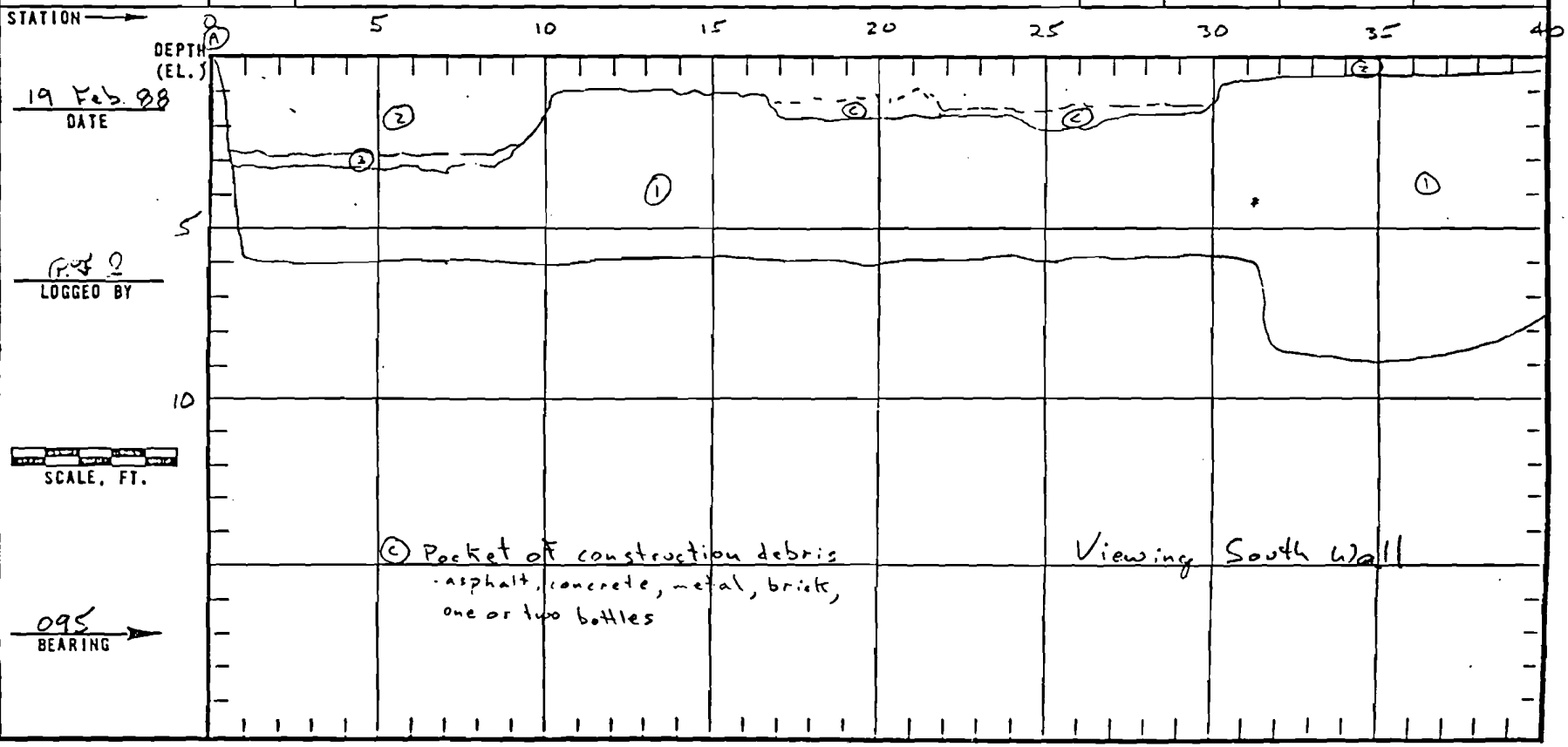
NOTES:

UNITS			STRUCTURE			
DEPTH	NO.	DESCRIPTION	NO.	STRIKE	DIP	TYPE
	(1)	SANDY CLAY: Yel brn to med brn, ~60 % fines; some roots, excavates with slight difficulty				
	(2)	GRAVELLY SANDY CLAY/SILT: Fill material; some angular rocks upper 0.5 to 1.0' of zone is gravel				
	(3)	SANDY CLAY/Debris: ~10-20 debris (glass, wire, metal, slight wood), no test tubes, plastic bags, etc.				

THIS LOG INDICATES CONDITIONS IN THIS TEST PIT OR TRENCH ONLY ON THE DATE INDICATED AND MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND ON OTHER DATES. ANY WATER LEVELS SHOWN ARE SUBJECT TO VARIATION.

STRATIFICATION LINES OR DEPTH INTERVALS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.

SOIL CLASSIFICATIONS SHOWN ON LOG ARE FIELD CLASSIFICATIONS BASED ON THE UNIFIED SOILS CLASSIFICATION SYSTEM.



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UC DAVIS - BURIALS

PROJECT NO. UCD 201 H

DATE

FIGURE NO.

GRAPHIC TRENCH LOG

TRENCH NO. 17

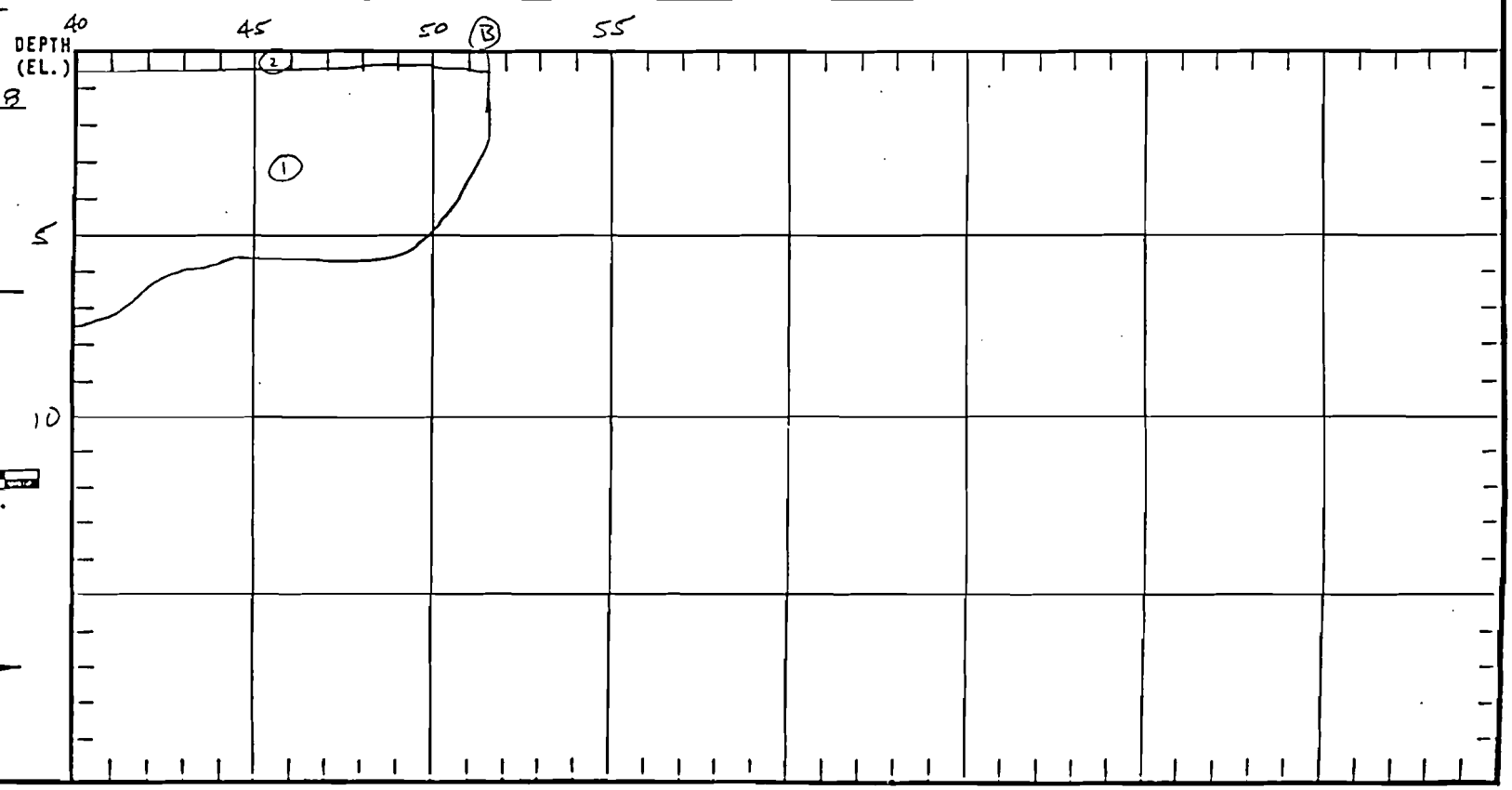
SHEET 2 OF 2

LOCATION:

NOTES:

UNITS			STRUCTURE			
DEPTH	NO.	DESCRIPTION	NO.	STRIKE	DIP	TYPE
		THIS LOG INDICATES CONDITIONS IN THIS TEST PIT OR TRENCH ONLY ON THE DATE INDICATED AND MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND ON OTHER DATES. ANY WATER LEVELS SHOWN ARE SUBJECT TO VARIATION. STRATIFICATION LINES OR DEPTH INTERVALS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL. SOIL CLASSIFICATIONS SHOWN ON LOG ARE FIELD CLASSIFICATIONS BASED ON THE UNIFIED SOILS CLASSIFICATION SYSTEM.				

STATION →



19 Feb 88
DATE

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SCALE, FT.

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UC DAVIS - BURIALS

PROJECT NO. UCD 201 H

DATE

FIGURE NO.

GRAPHIC TRENCH LOG

TRENCH NO. 23

SHEET 1 OF 1

LOCATION:

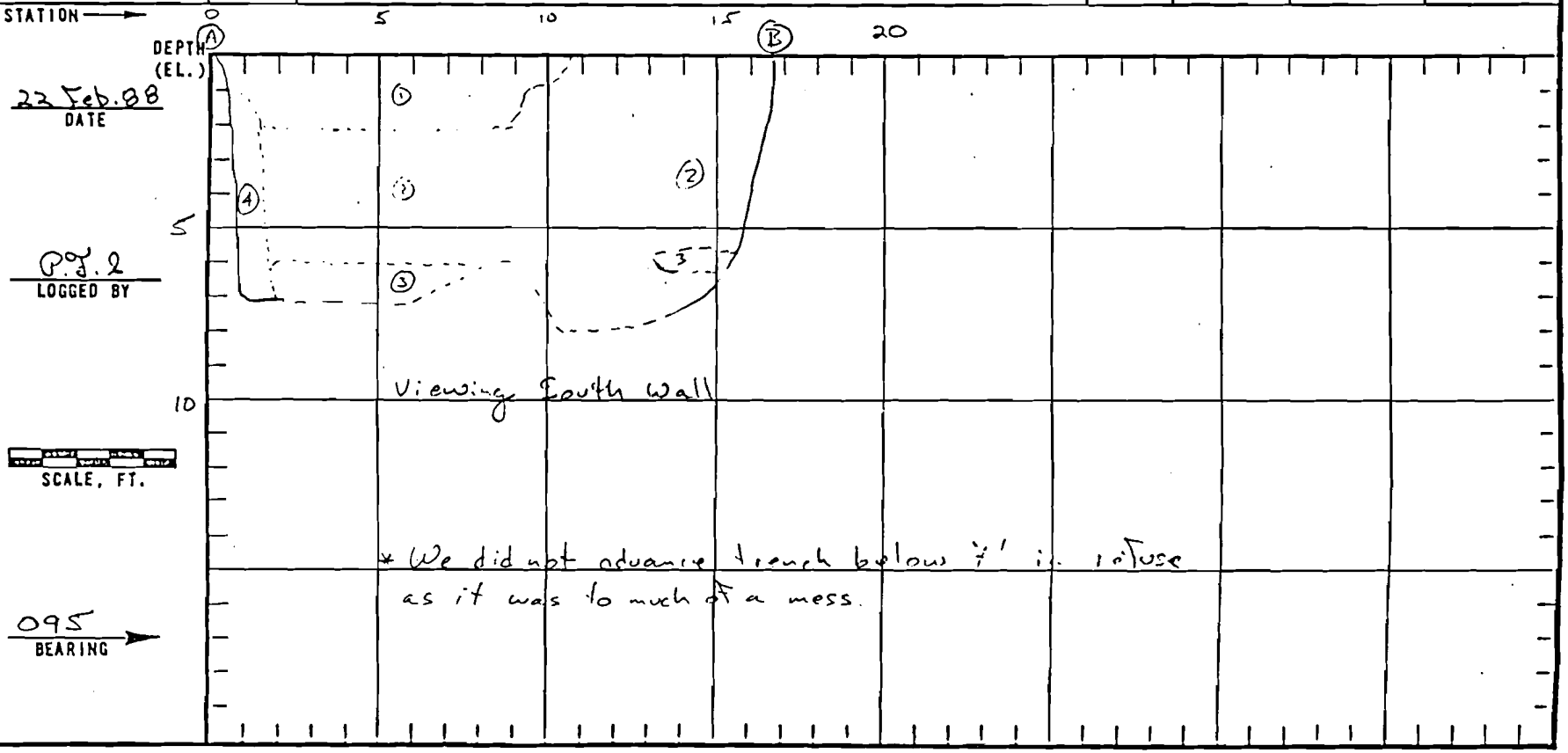
NOTES:

UNITS			STRUCTURE			
DEPTH	NO.	DESCRIPTION	NO.	STRIKE	DIP	TYPE
	1	GRAVEL: No apparent contamination, appears to be just filling the hole.				
	2	GRAVELLY CLAY: Fill material, slight roots, beer bottles, iron				
	3	REFUSE: glass, test tubes, abundant plastic (blue & wht), small plastic bottles, lots of bottle caps (Refuse is mixed with ~10-20% clayey soil)				
	4	SANDY CLAY: DK brn				

THIS LOG INDICATES CONDITIONS IN THIS TEST PIT OR TRENCH ONLY ON THE DATE INDICATED AND MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND ON OTHER DATES. ANY WATER LEVELS SHOWN ARE SUBJECT TO VARIATION.

STRATIFICATION LINES OR DEPTH INTERVALS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.

SOIL CLASSIFICATIONS SHOWN ON LOG ARE FIELD CLASSIFICATIONS BASED ON THE UNIFIED SOILS CLASSIFICATION SYSTEM.



22 Feb. 88
DATE

P.J.L
LOGGED BY

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BEARING

APPENDIX D

ANALYTICAL RESULTS - SOIL SAMPLES

WASTE BURIAL HOLES
ANALYTICAL RESULTS
METALS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0001	SSWB0002	SSWB0003	SSWB0004	SSWB0005	SSWB0007
LOCATION	TRL0049	TRL0049	TRL0050	TRL0050	TRL0051	TRL0051
DATE	08/27/96	08/27/96	08/27/96	08/27/96	08/29/96	08/29/96
DEPTH	7.00	5.00	3.50	5.25	7.00	10.00
TYPE	WASTE		WASTE		WASTE	
ANALYTE						
ANTIMONY	< 0.760 N|UJm	< 0.690 N|UJm	< 0.670 N|UJm	< 13.390 BN|UJm	< 0.680 N|UJm	< 0.680 N|UJm
ARSENIC	4.400	9.300	9.100	12.900	8.900	10.400
BARIUM	148.000	254.000	226.000	182.000	200.000	183.000
BERYLLIUM	< 0.250	< 1.150 B|	< 1.110 B|	< 1.120 B|	< 1.140 B|	< 1.130 B|
CADMIUM	< 0.760	< 0.690	< 1.110 B|	< 0.670	< 0.680	< 0.680
CHROMIUM	85.500 N*|Jd	120.000 N*|Jd	127.000 N*|Jd	174.000 N*|Jd	114.000 N*|Jd	103.000 N*|Jd
CHROMIUM, HEXAVALENT (+6)	< 0.200	< 0.030	< 0.030	< 0.030	< 0.034	< 0.230 B|
COBALT	< 12.670 B|	27.000	23.000	24.900	23.100	21.300
COPPER	54.900	50.900	116.000	36.700	45.300	41.500
LEAD	13.400	8.800	64.400	7.300	9.300	7.400
MERCURY	0.380	< 0.120	1.300	0.410	0.210	0.130
MOLYBDENUM	< 2.500	< 2.300	< 2.200	< 2.200	< 2.300	< 2.300
NICKEL	149.000	251.000	238.000	299.000	234.000	221.000
SELENIUM	1.500	< 1.150 B|	< 0.890	< 1.120 B|	< 1.140 B|	1.400
SILVER	< 1.500	< 1.400	< 1.300	< 1.300	< 1.400	< 1.400
THALLIUM	< 1.500	< 1.400	< 1.300	< 1.300	< 1.400	< 1.400
VANADIUM	37.000	76.200	59.800	65.400	66.700	65.000
ZINC	66.900	88.100	251.000	74.800	108.000	78.800

All units reported as mg/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
METALS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0009	SSWB0010	SSWB0011	SSWB0012	SSWB0013	SSWB0014
LOCATION	TRL0051	TRL0052	TRL0052	TRL0053	TRL0053	TRL0054
DATE	08/29/96	08/30/96	08/30/96	08/30/96	08/30/96	09/03/96
DEPTH	9.00	10.00	12.00	9.00	11.00	7.00
TYPE	WASTE	WASTE		WASTE		WASTE
ANALYTE						
ANTIMONY	< 0.680 N|UJm	< 0.650 N|UJm	< 0.670 N|UJm	< 0.700 N|UJm	< 0.690 N|UJm	< 0.680 N|UJl
ARSENIC	9.000	9.300	8.500	9.400	9.200	7.800
BARIUM	180.000	190.000	174.000	192.000	178.000	215.000
BERYLLIUM	< 1.130 B|	< 1.090 B|	< 1.110 B|	< 1.170 B|	< 1.150 B|	< 1.140 B|
CADMIUM	< 1.130 B|	< 0.650	< 0.670	< 0.700	< 0.690	< 0.680
CHROMIUM	117.000 N*|Jd	134.000 N*|Jd	96.200 N*|Jd	125.000 N*|Jd	121.000 N*|Jd	131.000 N|Jm
CHROMIUM, HEXAVALENT (+6)	< 0.240 B|	< 0.230 B|	< 0.033	< 0.230 B|	< 0.034	< 0.034
COBALT	20.700	23.200	19.900	23.700	22.600	23.500
COPPER	62.300	47.500	35.700	44.600	40.500	55.300
LEAD	20.300	34.000	7.200	11.100	7.400	10.300
MERCURY	0.220	0.530	< 0.110	1.400	0.260	0.530 N|Jm
MOLYBDENUM	< 2.300	< 2.200	< 44.400 B|	< 2.300	< 2.300	< 2.300
NICKEL	227.000	244.000	188.000	243.000	264.000	251.000 N|Jm
SELENIUM	1.800	1.400	< 0.890	1.200	1.300	1.700
SILVER	< 2.260 B|	< 1.300	< 1.300	< 1.400	< 1.400	< 1.400
THALLIUM	< 1.400	< 1.300	< 1.300	< 1.400	< 1.400	< 1.400
VANADIUM	68.500	65.300	59.000	65.900	63.900	66.400
ZINC	112.000	152.000	71.600	129.000	77.200	91.500

All units reported as mg/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
METALS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0015	SSWB0016	SSWB0018	SSWB0019
LOCATION	TRL0054	TRL0054	SSWB0018	SSWB0019
DATE	09/03/96	09/03/96	09/03/96	09/03/96
DEPTH	12.00	12.00	2.00	2.00
TYPE		DUPLICATE		
ANALYTE				
ANTIMONY	< 0.670 N|UJL	< 0.840 N|UJL	< 0.610 N|UJL	< 0.680 N|UJL
ARSENIC	8.800	10.200	7.300	7.900
BARIUM	253.000	273.000	182.000	173.000
BERYLLIUM	< 1.120 B|	< 1.410 B|	< 1.020 B|	< 1.130 B|
CADMIUM	< 1.120 B|	< 0.840	< 1.020 B|	< 0.680
CHROMIUM	126.000 N|Jm	144.000 N|Jm	157.000 N|Jm	160.000 N|Jm
CHROMIUM, HEXAVALENT (+6)	< 0.035	< 0.042	< 0.032	< 0.033
COBALT	28.500	34.400	23.600	25.000
COPPER	58.700	68.100	37.100	36.400
LEAD	8.600	10.300	8.500	9.200
MERCURY	< 0.120 N|UJm	0.190 N|Jm	0.580 N|Jm	0.590 N|Jm
MOLYBDENUM	< 2.200	< 2.800	< 2.000	< 2.300
NICKEL	269.000 N|Jm	318.000 N|Jm	276.000 N|Jm	293.000 N|Jm
SELENIUM	2.800	3.400	1.900	2.200
SILVER	< 1.300	< 1.700	< 1.200	< 1.400
THALLIUM	< 1.300	< 1.700	< 1.200	< 1.400
VANADIUM	75.500	82.700	61.900	60.700
ZINC	101.000	118.000	75.100	74.900

All units reported as mg/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
GENERAL CHEMICALS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	LOCATION	DATE	DEPTH	TYPE	NITRATE-N mg/Kg
SSWB0001	TRL0049	08/27/96	7.00	WASTE	47.0 H|Jh
SSWB0002	TRL0049	08/27/96	5.00		4.7 H|Jh
SSWB0003	TRL0050	08/27/96	3.50	WASTE	2.3 H|Jh
SSWB0004	TRL0050	08/27/96	5.25		3.6 H|Jh
SSWB0005	TRL0051	08/29/96	7.00	WASTE	12.0
SSWB0007	TRL0051	08/29/96	10.00		12.0
SSWB0009	TRL0051	08/29/96	9.00	WASTE	15.0
SSWB0010	TRL0052	08/30/96	10.00	WASTE	110.0
SSWB0011	TRL0052	08/30/96	12.00		57.0
SSWB0012	TRL0053	08/30/96	9.00	WASTE	420.0
SSWB0013	TRL0053	08/30/96	11.00		90.0
SSWB0014	TRL0054	09/03/96	7.00	WASTE	36.0
SSWB0015	TRL0054	09/03/96	12.00		25.0
SSWB0016	TRL0054	09/03/96	12.00	DUPLICATE	25.0
SSWB0018	SSWB0018	09/03/96	2.00		0.5
SSWB0019	SSWB0019	09/03/96	2.00		2.6

DATE refers to date sampled.

A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0001	SSWB0002	SSWB0003	SSWB0004	SSWB0005	SSWB0007
LOCATION	TRL0049	TRL0049	TRL0050	TRL0050	TRL0051	TRL0051
DATE	08/27/96	08/27/96	08/27/96	08/27/96	08/29/96	08/29/96
DEPTH	7.00	5.00	3.50	5.25	7.00	10.00
TYPE	WASTE		WASTE		WASTE	
ANALYTE						
1,2,4-TRICHLOROBENZENE	< 440 |UJL	< 380 |UJL	< 370 |UJL	< 380 |UJL	< 380	< 380
1,2-DICHLOROBENZENE	< 440	< 380	< 370	< 380	< 380	< 380
1,3-DICHLOROBENZENE	< 440	< 380	< 370	< 380	< 380	< 380
1,4-DICHLOROBENZENE	< 440	< 380	< 370	< 380	< 380	< 380
2,2'-OXYBIS(1-CHLOROPROPANE)	< 440	< 380	< 370	< 380	< 380	< 380
2,4,5-TRICHLOROPHENOL	< 1100	< 920	< 910	< 910	< 920	< 930
2,4,6-TRICHLOROPHENOL	< 440	< 380	< 370	< 380	< 380	< 380
2,4-DICHLOROPHENOL	< 440	< 380	< 370	< 380	< 380	< 380
2,4-DIMETHYLPHENOL	< 440	< 380	< 370	< 380	< 380	< 380
2,4-DINITROPHENOL	< 1100	< 920	< 910	< 910	< 920	< 930
2,4-DINITROTOLUENE	< 440	< 380	< 370	< 380	< 380	< 380
2,6-DINITROTOLUENE	< 440	< 380	< 370	< 380	< 380	< 380
2-CHLORONAPHTHALENE	< 440	< 380	< 370	< 380	< 380	< 380
2-CHLOROPHENOL	< 440	< 380	< 370	< 380	< 380	< 380
2-METHYL-4,6-DINITROPHENOL	< 1100	< 920	< 910	< 910	< 920	< 930
2-METHYLNAPHTHALENE	< 440	< 380	< 370	< 380	< 380	< 380
2-METHYLPHENOL	< 440	< 380	< 370	< 380	< 380	< 380
2-NITROANILINE	< 1100	< 920	< 910	< 910	< 920	< 930
2-NITROPHENOL	< 440	< 380	< 370	< 380	< 380	< 380
3,3'-DICHLOROBENZIDINE	< 440	< 380	< 370	< 380	< 380	< 380
3-NITROANILINE	< 1100	< 920	< 910	< 910	< 920	< 930
4-BROMOPHENYL PHENYL ETHER	< 440	< 380	< 370	< 380	< 380	< 380
4-CHLORO-3-METHYLPHENOL	< 440	< 380	< 370	< 380	< 380	< 380
4-CHLOROANILINE	< 440	< 380	< 370	< 380	< 380	< 380
4-CHLOROPHENYL PHENYL ETHER	< 440	< 380	< 370	< 380	< 380	< 380
4-METHYLPHENOL	< 440	< 380	< 370	< 380	< 380	< 380
4-NITROANILINE	< 1100	< 920	< 910	< 910	< 920	< 930

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0001	SSWB0002	SSWB0003	SSWB0004	SSWB0005	SSWB0007
LOCATION	TRL0049	TRL0049	TRL0050	TRL0050	TRL0051	TRL0051
DATE	08/27/96	08/27/96	08/27/96	08/27/96	08/29/96	08/29/96
DEPTH	7.00	5.00	3.50	5.25	7.00	10.00
TYPE	WASTE		WASTE		WASTE	
ANALYTE						
4-NITROPHENOL	< 1100	< 920	< 910	< 910	< 920	< 930
ACENAPHTHENE	< 440	< 380	< 370	< 380	< 380	< 380
ACENAPHTHYLENE	< 440	< 380	< 370	< 380	< 380	< 380
ANTHRACENE	< 440	< 380	< 370	< 380	< 380	< 380
BENZO(A)ANTHRACENE	< 440	< 380	< 370	< 380	< 380	< 380
BENZO(A)PYRENE	< 440	< 380	< 370	< 380	< 380	< 380
BENZO(B)FLUORANTHENE	< 440	< 380	< 370	< 380	< 380	< 380
BENZO(G,H,I)PERYLENE	< 440	< 380	< 370	< 380	< 380	< 380
BENZO(K)FLUORANTHENE	< 440	< 380	< 370	< 380	< 380	< 380
BENZYL BUTYL PHTHALATE	< 440	< 380	< 370	< 380	< 380	< 380
BIS(2-CHLOROETHOXY)METHANE	< 440	< 380	< 370	< 380	< 380	< 380
BIS(2-CHLOROETHYL)ETHER	< 440	< 380	< 370	< 380	< 380	< 380
BIS(2-ETHYLHEXYL)PHTHALATE	< 440 J|	< 380 J|	< 370 J|	< 380 J|	< 380 J|	< 380
CARBAZOLE	< 440	< 380	< 370	< 380	< 380	< 380
CHRYSENE	< 440	< 380	< 370	< 380	< 380	< 380
DI-N-BUTYLPHTHALATE	< 440	< 380 JB|Uz	< 370 JB|Uz	< 380 JB|Uz	< 380	< 380
DI-N-OCTYLPHTHALATE	< 440	< 380	< 370	< 380	< 380	< 380
DIBENZO(A,H)ANTHRACENE	< 440	< 380	< 370	< 380	< 380	< 380
DIBENZOFURAN	< 440	< 380	< 370	< 380	< 380	< 380
DIETHYL PHTHALATE	< 440	< 380	< 370	< 380	< 380	< 380
DIMETHYL PHTHALATE	< 440	< 380	< 370	< 380	< 380	< 380
FLUORANTHENE	< 440	< 380	< 370	< 380	< 380	< 380
FLUORENE	< 440	< 380	< 370	< 380	< 380	< 380
HEXACHLOROBENZENE	< 440	< 380	< 370	< 380	< 380	< 380
HEXACHLOROBUTADIENE	< 440	< 380	< 370	< 380	< 380	< 380
HEXACHLOROCYCLOPENTADIENE	< 440	< 380	< 370	< 380	< 380	< 380
HEXACHLOROETHANE	< 440	< 380	< 370	< 380	< 380	< 380

All units reported as ug/Kg

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WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0001	SSWB0002	SSWB0003	SSWB0004	SSWB0005	SSWB0007
LOCATION	TRL0049	TRL0049	TRL0050	TRL0050	TRL0051	TRL0051
DATE	08/27/96	08/27/96	08/27/96	08/27/96	08/29/96	08/29/96
DEPTH	7.00	5.00	3.50	5.25	7.00	10.00
TYPE	WASTE		WASTE		WASTE	
ANALYTE						
INDENO(1,2,3-CD)PYRENE	< 440	< 380	< 370	< 380	< 380	< 380
ISOPHORONE	< 440	< 380	< 370	< 380	< 380	< 380
N-NITROSODI-N-PROPYLAMINE	< 440 |UJL	< 380 |UJL	< 370 |UJL	< 380 |UJL	< 380	< 380
N-NITROSODIPHENYLAMINE	< 440	< 380	< 370	< 380	< 380	< 380
NAPHTHALENE	< 440	< 380	< 370	< 380	1700 |JL	< 380
NITROBENZENE	< 440	< 380	< 370	< 380	< 380	< 380
PENTACHLOROPHENOL	< 1100	< 920	< 910	< 910	< 920	< 930
PHENANTHRENE	< 440	< 380	< 370	< 380	< 380	< 380
PHENOL	< 440	< 380	< 370	< 380	< 380	< 380
PYRENE	< 440	< 380	< 370	< 380	< 380	< 380

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0009	SSWB0010	SSWB0011	SSWB0012	SSWB0013	SSWB0014
LOCATION	TRL0051	TRL0052	TRL0052	TRL0053	TRL0053	TRL0054
DATE	08/29/96	08/30/96	08/30/96	08/30/96	08/30/96	09/03/96
DEPTH	9.00	10.00	12.00	9.00	11.00	7.00
TYPE	WASTE	WASTE		WASTE		WASTE
ANALYTE						
1,2,4-TRICHLOROBENZENE	< 400	< 370	< 370	< 380	< 380	< 370 |UJL
1,2-DICHLOROBENZENE	< 400	< 370	< 370	< 380	< 380	< 370
1,3-DICHLOROBENZENE	< 400	< 370	< 370	< 380	< 380	< 370
1,4-DICHLOROBENZENE	< 400	< 370	< 370	< 380	< 380	< 370
2,2'-OXYBIS(1-CHLOROPROPANE)	< 400	< 370 |UJc	< 370 |UJc	< 380 |UJc	< 380 |UJc	< 370
2,4,5-TRICHLOROPHENOL	< 970	< 910	< 890	< 930	< 910	< 890
2,4,6-TRICHLOROPHENOL	< 400	< 370	< 370	< 380	< 380	< 370
2,4-DICHLOROPHENOL	< 400	< 370	< 370	< 380	< 380	< 370
2,4-DIMETHYLPHENOL	< 400	< 370	< 370	< 380	< 380	< 370
2,4-DINITROPHENOL	< 970	< 910 |UJc	< 890 |UJc	< 930 |UJc	< 910 |UJc	< 890
2,4-DINITROTOLUENE	< 400	< 370	< 370	< 380	< 380	< 370
2,6-DINITROTOLUENE	< 400	< 370	< 370	< 380	< 380	< 370
2-CHLORONAPHTHALENE	< 400	< 370	< 370	< 380	< 380	< 370
2-CHLOROPHENOL	< 400	< 370	< 370	< 380	< 380	< 370
2-METHYL-4,6-DINITROPHENOL	< 970	< 910 |UJc	< 890 |UJc	< 930 |UJc	< 910 |UJc	< 890
2-METHYLNAPHTHALENE	< 400	< 370	< 370	< 380	< 380	< 370 J|
2-METHYLPHENOL	< 400	< 370	< 370	< 380	< 380	< 370
2-NITROANILINE	< 970	< 910	< 890	< 930	< 910	< 890
2-NITROPHENOL	< 400	< 370	< 370	< 380	< 380	< 370
3,3'-DICHLOROBENZIDINE	< 400	< 370	< 370	< 380	< 380	< 370
3-NITROANILINE	< 970	< 910	< 890	< 930	< 910	< 890
4-BROMOPHENYL PHENYL ETHER	< 400	< 370	< 370	< 380	< 380	< 370
4-CHLORO-3-METHYLPHENOL	< 400	< 370	< 370	< 380	< 380	< 370
4-CHLOROANILINE	< 400	< 370	< 370	< 380	< 380	< 370
4-CHLOROPHENYL PHENYL ETHER	< 400	< 370	< 370	< 380	< 380	< 370
4-METHYLPHENOL	< 400	< 370	< 370	< 380	< 380	< 370
4-NITROANILINE	< 970	< 910	< 890	< 930	< 910	< 890

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0009	SSWB0010	SSWB0011	SSWB0012	SSWB0013	SSWB0014
LOCATION	TRL0051	TRL0052	TRL0052	TRL0053	TRL0053	TRL0054
DATE	08/29/96	08/30/96	08/30/96	08/30/96	08/30/96	09/03/96
DEPTH	9.00	10.00	12.00	9.00	11.00	7.00
TYPE	WASTE	WASTE		WASTE		WASTE
ANALYTE						
4-NITROPHENOL	< 970	< 910	< 890	< 930	< 910	< 890
ACENAPHTHENE	< 400	< 370	< 370	< 380	< 380	< 370
ACENAPHTHYLENE	< 400	< 370	< 370	< 380	< 380	< 370
ANTHRACENE	< 400	< 370	< 370	< 380	< 380	< 370
BENZO(A)ANTHRACENE	< 400	< 370	< 370	< 380	< 380	< 370
BENZO(A)PYRENE	< 400	< 370	< 370	< 380	< 380	< 370
BENZO(B)FLUORANTHENE	< 400	< 370	< 370	< 380	< 380	< 370
BENZO(G,H,I)PERYLENE	< 400	< 370	< 370	< 380	< 380	< 370
BENZO(K)FLUORANTHENE	< 400	< 370	< 370	< 380	< 380	< 370
BENZYL BUTYL PHTHALATE	< 400	< 370	< 370	< 380	< 380	< 370
BIS(2-CHLOROETHOXY)METHANE	< 400	< 370	< 370	< 380	< 380	< 370
BIS(2-CHLOROETHYL)ETHER	< 400	< 370	< 370	< 380	< 380	< 370
BIS(2-ETHYLHEXYL)PHTHALATE	< 400 J|	< 370 J|	< 370	< 380 J|	< 380	< 370 J|
CARBAZOLE	< 400	< 370	< 370	< 380	< 380	< 370
CHRYSENE	< 400	< 370	< 370	< 380	< 380	< 370
DI-N-BUTYLPHTHALATE	< 400	< 370	< 370	< 380	< 380	< 370 J|
DI-N-OCTYLPHTHALATE	< 400	< 370 |UJc	< 370 |UJc	< 380 |UJc	< 380 |UJc	< 370
DIBENZO(A,H)ANTHRACENE	< 400	< 370	< 370	< 380	< 380	< 370
DIBENZOFURAN	< 400	< 370	< 370	< 380	< 380	< 370
DIETHYL PHTHALATE	< 400	< 370	< 370	< 380	< 380	< 370
DIMETHYL PHTHALATE	< 400	< 370	< 370	< 380	< 380	< 370
FLUORANTHENE	< 400	< 370	< 370	< 380	< 380	< 370
FLUORENE	< 400	< 370	< 370	< 380	< 380	< 370
HEXACHLOROBENZENE	< 400	< 370	< 370	< 380	< 380	< 370
HEXACHLOROBUTADIENE	< 400	< 370	< 370	< 380	< 380	< 370
HEXACHLOROCYCLOPENTADIENE	< 400	< 370	< 370	< 380	< 380	< 370
HEXACHLOROETHANE	< 400	< 370	< 370	< 380	< 380	< 370

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
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WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0009	SSWB0010	SSWB0011	SSWB0012	SSWB0013	SSWB0014
LOCATION	TRL0051	TRL0052	TRL0052	TRL0053	TRL0053	TRL0054
DATE	08/29/96	08/30/96	08/30/96	08/30/96	08/30/96	09/03/96
DEPTH	9.00	10.00	12.00	9.00	11.00	7.00
TYPE	WASTE	WASTE		WASTE		WASTE
ANALYTE						
INDENO(1,2,3-CD)PYRENE	< 400	< 370	< 370	< 380	< 380	< 370
ISOPHORONE	< 400	< 370	< 370	< 380	< 380	< 370
N-NITROSODI-N-PROPYLAMINE	< 400	< 370	< 370	< 380	< 380	< 370
N-NITROSODIPHENYLAMINE	< 400	< 370	< 370	< 380	< 380	< 370
NAPHTHALENE	420 |Jl	1200	< 370	< 380	< 380	92000
NITROBENZENE	< 400	< 370	< 370	< 380	< 380	< 370
PENTACHLOROPHENOL	< 970	< 910	< 890	< 930	< 910	< 890
PHENANTHRENE	< 400	< 370	< 370	< 380	< 380	< 370
PHENOL	< 400	< 370	< 370	< 380	< 380	< 370
PYRENE	< 400	< 370	< 370	< 380	< 380	< 370

All units reported as ug/Kg

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WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0015	SSWB0016	SSWB0018	SSWB0019
LOCATION	TRL0054	TRL0054	SSWB0018	SSWB0019
DATE	09/03/96	09/03/96	09/03/96	09/03/96
DEPTH	12.00	12.00	2.00	2.00
TYPE		DUPLICATE		
ANALYTE				
1,2,4-TRICHLOROBENZENE	< 380 |UJL	< 460 |UJL	< 350 |UJL	< 370 |UJL
1,2-DICHLOROBENZENE	< 380	< 460	< 350	< 370
1,3-DICHLOROBENZENE	< 380	< 460	< 350	< 370
1,4-DICHLOROBENZENE	< 380	< 460	< 350	< 370
2,2'-OXYBIS(1-CHLOROPROPANE)	< 380	< 460	< 350	< 370
2,4,5-TRICHLOROPHENOL	< 930	< 1100	< 840	< 890
2,4,6-TRICHLOROPHENOL	< 380	< 460	< 350	< 370
2,4-DICHLOROPHENOL	< 380	< 460	< 350	< 370
2,4-DIMETHYLPHENOL	< 380	< 460	< 350	< 370
2,4-DINITROPHENOL	< 930	< 1100	< 840	< 890
2,4-DINITROTOLUENE	< 380	< 460	< 350	< 370
2,6-DINITROTOLUENE	< 380	< 460	< 350	< 370
2-CHLORONAPHTHALENE	< 380	< 460	< 350	< 370
2-CHLOROPHENOL	< 380	< 460	< 350	< 370
2-METHYL-4,6-DINITROPHENOL	< 930	< 1100	< 840	< 890
2-METHYLNAPHTHALENE	< 380	< 460	< 350	< 370
2-METHYLPHENOL	< 380	< 460	< 350	< 370
2-NITROANILINE	< 930	< 1100	< 840	< 890
2-NITROPHENOL	< 380	< 460	< 350	< 370
3,3'-DICHLOROBENZIDINE	< 380	< 460	< 350	< 370
3-NITROANILINE	< 930	< 1100	< 840	< 890
4-BROMOPHENYL PHENYL ETHER	< 380	< 460	< 350	< 370
4-CHLORO-3-METHYLPHENOL	< 380	< 460	< 350	< 370
4-CHLOROANILINE	< 380	< 460	< 350	< 370
4-CHLOROPHENYL PHENYL ETHER	< 380	< 460	< 350	< 370
4-METHYLPHENOL	< 380	< 460	< 350	< 370
4-NITROANILINE	< 930	< 1100	< 840	< 890

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WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0015	SSWB0016	SSWB0018	SSWB0019
LOCATION	TRL0054	TRL0054	SSWB0018	SSWB0019
DATE	09/03/96	09/03/96	09/03/96	09/03/96
DEPTH	12.00	12.00	2.00	2.00
TYPE		DUPLICATE		
ANALYTE				
4-NITROPHENOL	< 930	< 1100	< 840	< 890
ACENAPHTHENE	< 380	< 460	< 350	< 370
ACENAPHTHYLENE	< 380	< 460	< 350	< 370
ANTHRACENE	< 380	< 460	< 350	< 370
BENZO(A)ANTHRACENE	< 380	< 460	< 350	< 370
BENZO(A)PYRENE	< 380	< 460	< 350	< 370
BENZO(B)FLUORANTHENE	< 380	< 460	< 350	< 370
BENZO(G,H,I)PERYLENE	< 380	< 460	< 350	< 370
BENZO(K)FLUORANTHENE	< 380	< 460	< 350	< 370
BENZYL BUTYL PHTHALATE	< 380	< 460	< 350	< 370
BIS(2-CHLOROETHOXY)METHANE	< 380	< 460	< 350	< 370
BIS(2-CHLOROETHYL)ETHER	< 380	< 460	< 350	< 370
BIS(2-ETHYLHEXYL)PHTHALATE	< 380	< 460	< 350	< 370
CARBAZOLE	< 380	< 460	< 350	< 370
CHRYSENE	< 380	< 460	< 350	< 370
DI-N-BUTYLPHTHALATE	< 380	< 460	< 350	< 370
DI-N-OCTYLPHTHALATE	< 380	< 460	< 350	< 370
DIBENZO(A,H)ANTHRACENE	< 380	< 460	< 350	< 370
DIBENZOFURAN	< 380	< 460	< 350	< 370
DIETHYL PHTHALATE	< 380	< 460	< 350	< 370
DIMETHYL PHTHALATE	< 380	< 460	< 350	< 370
FLUORANTHENE	< 380	< 460	< 350	< 370
FLUORENE	< 380	< 460	< 350	< 370
HEXACHLOROBENZENE	< 380	< 460	< 350	< 370
HEXACHLOROBUTADIENE	< 380	< 460	< 350	< 370
HEXACHLOROCYCLOPENTADIENE	< 380	< 460	< 350	< 370
HEXACHLOROETHANE	< 380	< 460	< 350	< 370

All units reported as ug/Kg

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WASTE BURIAL HOLES
ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0015	SSWB0016	SSWB0018	SSWB0019
LOCATION	TRL0054	TRL0054	SSWB0018	SSWB0019
DATE	09/03/96	09/03/96	09/03/96	09/03/96
DEPTH	12.00	12.00	2.00	2.00
TYPE		DUPLICATE		
ANALYTE				
INDENO(1,2,3-CD)PYRENE	< 380	< 460	< 350	< 370
ISOPHORONE	< 380	< 460	< 350	< 370
N-NITROSODI-N-PROPYLAMINE	< 380	< 460	< 350	< 370
N-NITROSODIPHENYLAMINE	< 380	< 460	< 350	< 370
NAPHTHALENE	< 380	< 460	< 350	< 370
NITROBENZENE	< 380	< 460	< 350	< 370
PENTACHLOROPHENOL	< 930	< 1100	< 840	< 890
PHENANTHRENE	< 380	< 460	< 350	< 370
PHENOL	< 380	< 460	< 350	< 370
PYRENE	< 380	< 460	< 350	< 370

All units reported as ug/Kg

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WASTE BURIAL HOLES
ANALYTICAL RESULTS
ORGANOCHLORINE PESTICIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0001	SSWB0002	SSWB0003	SSWB0004	SSWB0005	SSWB0007
LOCATION	TRL0049	TRL0049	TRL0050	TRL0050	TRL0051	TRL0051
DATE	08/27/96	08/27/96	08/27/96	08/27/96	08/29/96	08/29/96
DEPTH	7.00	5.00	3.50	5.25	7.00	10.00
TYPE	WASTE		WASTE		WASTE	
ANALYTE						
4,4'-DDD	< 4.4 J|	< 3.8	5.0	< 3.8	< 3.8	< 3.9
4,4'-DDE	38.0	< 3.8	< 3.8	< 3.8	< 3.8 JP|Ju	< 3.9
4,4'-DDT	9.7	< 3.8	< 3.8	< 3.8	< 3.8 J|	< 3.9
ALDRIN	< 2.2	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
ALPHA-BHC	< 2.2 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc
ALPHA-CHLORDANE	< 2.2	< 1.9	4.2	< 1.9	2.1	< 1.9
AROCLOR-1016	< 44.0	< 38.0	< 38.0	< 38.0	< 38.0	< 39.0
AROCLOR-1221	< 88.0	< 76.0	< 76.0	< 76.0	< 77.0	< 77.0
AROCLOR-1232	< 44.0	< 38.0	< 38.0	< 38.0	< 38.0	< 39.0
AROCLOR-1242	< 44.0	< 38.0	< 38.0	< 38.0	< 38.0	< 39.0
AROCLOR-1248	< 44.0	< 38.0	< 38.0	< 38.0	< 38.0	< 39.0
AROCLOR-1254	< 44.0	< 38.0	< 38.0	< 38.0	< 38.0	< 39.0
AROCLOR-1260	< 44.0	< 38.0	< 38.0	< 38.0	< 38.0	< 39.0
BETA-BHC	< 2.2	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
DELTA-BHC	< 2.2 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc
DIELDRIN	< 4.4	< 3.8	< 3.8	< 3.8	< 3.8	< 3.9
ENDOSULFAN I	< 2.2	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
ENDOSULFAN II	< 4.4	< 3.8	< 3.8	< 3.8	< 3.8	< 3.9
ENDOSULFAN SULFATE	< 4.4	< 3.8	< 3.8	< 3.8	< 3.8	< 3.9
ENDRIN	< 4.4	< 3.8	< 3.8	< 3.8	< 3.8	< 3.9
ENDRIN ALDEHYDE	< 4.4	< 3.8	< 3.8	< 3.8	< 3.8	< 3.9
ENDRIN KETONE	< 4.4	< 3.8	< 3.8	< 3.8	< 3.8	< 3.9
GAMMA-BHC	< 2.2 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 1.9 |UJc
GAMMA-CHLORDANE	< 2.2	< 1.9	5.4	< 1.9	2.9	< 1.9
HEPTACHLOR	< 2.2	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
HEPTACHLOR EPOXIDE	< 2.2	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
METHOXYCHLOR	< 22.0	< 19.0	< 19.0	< 19.0	< 19.0	< 19.0

All units reported as ug/Kg

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WASTE BURIAL HOLES
ANALYTICAL RESULTS
ORGANOCHLORINE PESTICIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0001	SSWB0002	SSWB0003	SSWB0004	SSWB0005	SSWB0007
LOCATION	TRL0049	TRL0049	TRL0050	TRL0050	TRL0051	TRL0051
DATE	08/27/96	08/27/96	08/27/96	08/27/96	08/29/96	08/29/96
DEPTH	7.00	5.00	3.50	5.25	7.00	10.00
TYPE	WASTE		WASTE		WASTE	
ANALYTE						
TOXAPHENE	<220.0	<190.0	<190.0	<190.0	<190.0	<190.0

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WASTE BURIAL HOLES
ANALYTICAL RESULTS
ORGANOCHLORINE PESTICIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0009	SSWB0010	SSWB0011	SSWB0012	SSWB0013	SSWB0014
LOCATION	TRL0051	TRL0052	TRL0052	TRL0053	TRL0053	TRL0054
DATE	08/29/96	08/30/96	08/30/96	08/30/96	08/30/96	09/03/96
DEPTH	9.00	10.00	12.00	9.00	11.00	7.00
TYPE	WASTE	WASTE		WASTE		WASTE
ANALYTE						
4,4'-DDD	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7 |UJc
4,4'-DDE	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7 J|
4,4'-DDT	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7 JP|Ru
ALDRIN	< 2.0	< 1.9	< 1.9	< 2.0	< 1.9	< 1.9
ALPHA-BHC	< 2.0 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 2.0 |UJc	< 1.9 |UJc	< 1.9 |UJc
ALPHA-CHLORDANE	4.1	3.2 P|Ju	< 1.9	< 2.0	< 1.9	< 1.9 J|
AROCLOR-1016	< 41.0	< 38.0	< 37.0	< 39.0	< 38.0	< 37.0
AROCLOR-1221	< 81.0	< 76.0	< 74.0	< 78.0	< 76.0	< 75.0
AROCLOR-1232	< 41.0	< 38.0	< 37.0	< 39.0	< 38.0	< 37.0
AROCLOR-1242	< 41.0	< 38.0	< 37.0	< 39.0	< 38.0	< 37.0
AROCLOR-1248	< 41.0	< 38.0	< 37.0	< 39.0	< 38.0	< 37.0
AROCLOR-1254	< 41.0	< 38.0	< 37.0	< 39.0	< 38.0	< 37.0
AROCLOR-1260	< 41.0	< 38.0	< 37.0	< 39.0	< 38.0	< 37.0
BETA-BHC	< 2.0	< 1.9	< 1.9	< 2.0	< 1.9	< 1.9 |UJc
DELTA-BHC	< 2.0 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 2.0 |UJc	< 1.9 |UJc	< 1.9 |UJc
DIELDRIN	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7
ENDOSULFAN I	< 2.0	< 1.9	< 1.9	< 2.0	< 1.9	< 1.9
ENDOSULFAN II	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7
ENDOSULFAN SULFATE	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7
ENDRIN	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7
ENDRIN ALDEHYDE	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7
ENDRIN KETONE	< 4.1	< 3.8	< 3.7	< 3.9	< 3.8	< 3.7
GAMMA-BHC	< 2.0 |UJc	< 1.9 |UJc	< 1.9 |UJc	< 2.0 |UJc	< 1.9 |UJc	< 1.9 |UJc
GAMMA-CHLORDANE	5.1	3.4	< 1.9	< 2.0	< 1.9	< 1.9 J|
HEPTACHLOR	< 2.0	< 1.9	< 1.9	< 2.0	< 1.9	< 1.9
HEPTACHLOR EPOXIDE	< 2.0	< 1.9	< 1.9	< 2.0	< 1.9	< 1.9
METHOXYCHLOR	< 20.0	< 19.0	< 19.0	< 20.0	< 19.0	< 19.0

All units reported as ug/Kg

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WASTE BURIAL HOLES
ANALYTICAL RESULTS
ORGANOCHLORINE PESTICIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0009	SSWB0010	SSWB0011	SSWB0012	SSWB0013	SSWB0014
LOCATION	TRL0051	TRL0052	TRL0052	TRL0053	TRL0053	TRL0054
DATE	08/29/96	08/30/96	08/30/96	08/30/96	08/30/96	09/03/96
DEPTH	9.00	10.00	12.00	9.00	11.00	7.00
TYPE	WASTE	WASTE		WASTE		WASTE
ANALYTE						
TOXAPHENE	<200.0	<190.0	<190.0	<200.0	<190.0	<190.0

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
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WASTE BURIAL HOLES
ANALYTICAL RESULTS
ORGANOCHLORINE PESTICIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0015	SSWB0016	SSWB0018	SSWB0019
LOCATION	TRL0054	TRL0054	SSWB0018	SSWB0019
DATE	09/03/96	09/03/96	09/03/96	09/03/96
DEPTH	12.00	12.00	2.00	2.00
TYPE		DUPLICATE		
ANALYTE				
4,4'-DDD	< 3.9 |UJc	< 4.6 |UJc	< 3.5 |UJc	< 3.7 |UJc
4,4'-DDE	< 3.9	< 4.6	< 3.5 J|	< 3.7 J|
4,4'-DDT	< 3.9 |UJc	< 4.6 |UJc	< 3.5 |UJc	< 3.7 J|UJc
ALDRIN	< 1.9	< 2.3	< 1.8	< 1.8
ALPHA-BHC	< 1.9 |UJc	< 2.3 |UJc	< 1.8 |UJc	< 1.8 |UJc
ALPHA-CHLORDANE	< 1.9	< 2.3	1.8	< 1.8 JP|UJu
AROCLOR-1016	< 39.0	< 46.0	< 35.0	< 37.0
AROCLOR-1221	< 78.0	< 93.0	< 70.0	< 74.0
AROCLOR-1232	< 39.0	< 46.0	< 35.0	< 37.0
AROCLOR-1242	< 39.0	< 46.0	< 35.0	< 37.0
AROCLOR-1248	< 39.0	< 46.0	< 35.0	< 37.0
AROCLOR-1254	< 39.0	< 46.0	< 35.0	< 37.0
AROCLOR-1260	< 39.0	< 46.0	< 35.0	< 37.0
BETA-BHC	< 1.9 |UJc	< 2.3 |UJc	< 1.8 |UJc	< 1.8 |UJc
DELTA-BHC	< 1.9 |UJc	< 2.3 |UJc	< 1.8 |UJc	< 1.8 |UJc
DIELDRIN	< 3.9	< 4.6	< 3.5 J|	< 3.7
ENDOSULFAN I	< 1.9	< 2.3	< 1.8	< 1.8
ENDOSULFAN II	< 3.9	< 4.6	< 3.5	< 3.7
ENDOSULFAN SULFATE	< 3.9	< 4.6	< 3.5	< 3.7
ENDRIN	< 3.9	< 4.6	< 3.5	< 3.7
ENDRIN ALDEHYDE	< 3.9	< 4.6	< 3.5	< 3.7
ENDRIN KETONE	< 3.9	< 4.6	< 3.5	< 3.7
GAMMA-BHC	< 1.9 |UJc	< 2.3 |UJc	< 1.8 |UJc	< 1.8 |UJc
GAMMA-CHLORDANE	< 1.9	< 2.3	2.3	< 1.8 J|
HEPTACHLOR	< 1.9	< 2.3	< 1.8	< 1.8
HEPTACHLOR EPOXIDE	< 1.9	< 2.3	< 1.8	< 1.8
METHOXYCHLOR	< 19.0	< 23.0	< 18.0	< 18.0

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
ORGANOCHLORINE PESTICIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0015	SSWB0016	SSWB0018	SSWB0019
LOCATION	TRL0054	TRL0054	SSWB0018	SSWB0019
DATE	09/03/96	09/03/96	09/03/96	09/03/96
DEPTH	12.00	12.00	2.00	2.00
TYPE		DUPLICATE		
ANALYTE				
TOXAPHENE	<190.0	<230.0	<180.0	<180.0

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0001	SSWB0002	SSWB0003	SSWB0004	SSWB0005	SSWB0007
LOCATION	TRL0049	TRL0049	TRL0050	TRL0050	TRL0051	TRL0051
DATE	08/27/96	08/27/96	08/27/96	08/27/96	08/29/96	08/29/96
DEPTH	7.00	5.00	3.50	5.25	7.00	10.00
TYPE	WASTE		WASTE		WASTE	
ANALYTE						
1,1,1-TRICHLOROETHANE	< 13	< 11	< 11	< 11	< 11	< 12
1,1,2,2-TETRACHLOROETHANE	< 13	< 11	< 11	< 11	< 11	< 12
1,1,2-TRICHLOROETHANE	< 13	< 11	< 11	< 11	< 11	< 12
1,1-DICHLOROETHANE	< 13	< 11	< 11	< 11	< 11	< 12
1,1-DICHLOROETHENE	< 13	< 11	< 11	< 11	< 11	< 12
1,2-DICHLOROETHANE	< 13	< 11	< 11	< 11	< 11	< 12
1,2-DICHLOROETHENE (TOTAL)	< 13	< 11	< 11	< 11	< 11	< 12
1,2-DICHLOROPROPANE	< 13	< 11	< 11	< 11	< 11	< 12
2-BUTANONE	< 13	< 11	< 11	< 11	< 11	< 12
2-HEXANONE	< 13	< 11	< 11	< 11	< 11	< 12
4-METHYL-2-PENTANONE	< 13	< 11	< 11	< 11	< 11	< 12
ACETONE	< 13	< 11	< 11	< 11	< 11	< 12 J
BENZENE	< 13	< 11	< 11	< 11	< 11	< 12
BROMODICHLOROMETHANE	< 13	< 11	< 11	< 11	< 11	< 12
BROMOFORM	< 13	< 11	< 11	< 11	< 11	< 12
BROMOMETHANE	< 13	< 11	< 11	< 11	< 11	< 12
CARBON DISULFIDE	< 13	< 11	< 11	< 11	< 11	< 12
CARBON TETRACHLORIDE	< 13	< 11	< 11	< 11	< 11	< 12
CHLOROBENZENE	< 13	< 11	< 11	< 11	< 11	< 12
CHLOROETHANE	< 13	< 11	< 11	< 11	< 11	< 12
CHLOROFORM	< 13	< 11	< 11	< 11	< 11	< 12
CHLOROMETHANE	< 13	< 11	< 11	< 11	< 11	< 12
CIS-1,3-DICHLOROPROPENE	< 13	< 11	< 11	< 11	< 11	< 12
DIBROMOCHLOROMETHANE	< 13	< 11	< 11	< 11	< 11	< 12
ETHYL BENZENE	< 13	< 11	< 11	< 11	< 11	< 12
METHYLENE CHLORIDE	< 13	< 11	< 11	< 11	< 11	< 12
STYRENE	< 13	< 11	< 11	< 11	< 11	< 12

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0001	SSWB0002	SSWB0003	SSWB0004	SSWB0005	SSWB0007
LOCATION	TRL0049	TRL0049	TRL0050	TRL0050	TRL0051	TRL0051
DATE	08/27/96	08/27/96	08/27/96	08/27/96	08/29/96	08/29/96
DEPTH	7.00	5.00	3.50	5.25	7.00	10.00
TYPE	WASTE		WASTE		WASTE	
ANALYTE						
TETRACHLOROETHENE	< 13	< 11	< 11	< 11	< 11	< 12
TOLUENE	< 13	< 11	< 11	< 11	< 11	< 12
TRANS-1,3-DICHLOROPROPENE	< 13	< 11	< 11	< 11	< 11	< 12
TRICHLOROETHENE	< 13	< 11	< 11	< 11	< 11	< 12
VINYL CHLORIDE	< 13	< 11	< 11	< 11	< 11	< 12
XYLENES (TOTAL)	< 13	< 11	< 11	< 11	< 11	< 12

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0009	SSWB0010	SSWB0011	SSWB0012	SSWB0013	SSWB0014
LOCATION	TRL0051	TRL0052	TRL0052	TRL0053	TRL0053	TRL0054
DATE	08/29/96	08/30/96	08/30/96	08/30/96	08/30/96	09/03/96
DEPTH	9.00	10.00	12.00	9.00	11.00	7.00
TYPE	WASTE	WASTE		WASTE		WASTE
ANALYTE						
1,1,1-TRICHLOROETHANE	< 12	< 11	< 11	< 12	< 11	< 11
1,1,2,2-TETRACHLOROETHANE	< 12	< 11	< 11	< 12	< 11	< 11
1,1,2-TRICHLOROETHANE	< 12	< 11	< 11	< 12	< 11	< 11
1,1-DICHLOROETHANE	< 12	< 11	< 11	< 12	< 11	< 11
1,1-DICHLOROETHENE	< 12	< 11	< 11	< 12	< 11	< 11
1,2-DICHLOROETHANE	< 12	< 11	< 11	< 12	< 11	< 11
1,2-DICHLOROETHENE (TOTAL)	< 12	< 11	< 11	< 12	< 11	< 11
1,2-DICHLOROPROPANE	< 12	< 11	< 11	< 12	< 11	< 11
2-BUTANONE	< 12	< 11	< 11	< 12	< 11	< 11
2-HEXANONE	< 12	< 11	< 11	< 12	< 11	< 11
4-METHYL-2-PENTANONE	< 12	< 11	< 11	< 12	< 11	< 11
ACETONE	< 12	< 11 J|	< 11 J|	< 12 J|	< 11 J|	31
BENZENE	< 12	< 11	< 11	< 12	< 11	< 11
BROMODICHLOROMETHANE	< 12	< 11	< 11	< 12	< 11	< 11
BROMOFORM	< 12	< 11	< 11	< 12	< 11	< 11
BROMOMETHANE	< 12	< 11	< 11	< 12	< 11	< 11
CARBON DISULFIDE	< 12	< 11	< 11	< 12	< 11	< 11
CARBON TETRACHLORIDE	< 12	< 11	< 11	< 12	< 11	< 11
CHLOROBENZENE	< 12	< 11	< 11	< 12	< 11	< 11
CHLOROETHANE	< 12	< 11	< 11	< 12	< 11	< 11
CHLOROFORM	< 12	< 11	< 11	< 12	< 11	< 11
CHLOROMETHANE	< 12	< 11	< 11	< 12	< 11	< 11
CIS-1,3-DICHLOROPROPENE	< 12	< 11	< 11	< 12	< 11	< 11
DIBROMOCHLOROMETHANE	< 12	< 11	< 11	< 12	< 11	< 11
ETHYL BENZENE	< 12	< 11	< 11	< 12	< 11	< 11
METHYLENE CHLORIDE	< 12	< 11	< 11	< 12	< 11	< 11
STYRENE	< 12	< 11	< 11	< 12	< 11	< 11

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0009	SSWB0010	SSWB0011	SSWB0012	SSWB0013	SSWB0014
LOCATION	TRL0051	TRL0052	TRL0052	TRL0053	TRL0053	TRL0054
DATE	08/29/96	08/30/96	08/30/96	08/30/96	08/30/96	09/03/96
DEPTH	9.00	10.00	12.00	9.00	11.00	7.00
TYPE	WASTE	WASTE		WASTE		WASTE
ANALYTE						
TETRACHLOROETHENE	< 12	< 11	< 11	< 12	< 11	< 11
TOLUENE	< 12	< 11 J|	< 11	< 12	< 11	220
TRANS-1,3-DICHLOROPROPENE	< 12	< 11	< 11	< 12	< 11	< 11
TRICHLOROETHENE	< 12	< 11	< 11	< 12	< 11	< 11
VINYL CHLORIDE	< 12	< 11	< 11	< 12	< 11	< 11
XYLENES (TOTAL)	< 12	< 11	< 11	< 12	< 11	< 11

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0015	SSWB0016	SSWB0018	SSWB0019
LOCATION	TRL0054	TRL0054	SSWB0018	SSWB0019
DATE	09/03/96	09/03/96	09/03/96	09/03/96
DEPTH	12.00	12.00	2.00	2.00
TYPE		DUPLICATE		
ANALYTE				
1,1,1-TRICHLOROETHANE	< 12	< 14	< 11	< 11
1,1,2,2-TETRACHLOROETHANE	< 12	< 14	< 11	< 11
1,1,2-TRICHLOROETHANE	< 12	< 14	< 11	< 11
1,1-DICHLOROETHANE	< 12	< 14	< 11	< 11
1,1-DICHLOROETHENE	< 12	< 14	< 11	< 11
1,2-DICHLOROETHANE	< 12	< 14	< 11	< 11
1,2-DICHLOROETHENE (TOTAL)	< 12	< 14	< 11	< 11
1,2-DICHLOROPROPANE	< 12	< 14	< 11	< 11
2-BUTANONE	< 12	< 14	< 11	< 11
2-HEXANONE	< 12	< 14	< 11	< 11
4-METHYL-2-PENTANONE	< 12	< 14	< 11	< 11
ACETONE	< 12 J|UJf	17 |Jf	< 11 J|	< 11 J|
BENZENE	< 12	< 14	< 11	< 11
BROMODICHLOROMETHANE	< 12	< 14	< 11	< 11
BROMOFORM	< 12	< 14	< 11	< 11
BROMOMETHANE	< 12	< 14	< 11	< 11
CARBON DISULFIDE	< 12	< 14	< 11	< 11
CARBON TETRACHLORIDE	< 12	< 14	< 11	< 11
CHLOROBENZENE	< 12	< 14	< 11	< 11
CHLOROETHANE	< 12	< 14	< 11	< 11
CHLOROFORM	< 12	< 14	< 11	< 11
CHLOROMETHANE	< 12	< 14	< 11	< 11
CIS-1,3-DICHLOROPROPENE	< 12	< 14	< 11	< 11
DIBROMOCHLOROMETHANE	< 12	< 14	< 11	< 11
ETHYL BENZENE	< 12	< 14	< 11	< 11
METHYLENE CHLORIDE	< 12	< 14	< 11	< 11
STYRENE	< 12	< 14	< 11	< 11

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0015	SSWB0016	SSWB0018	SSWB0019
LOCATION	TRL0054	TRL0054	SSWB0018	SSWB0019
DATE	09/03/96	09/03/96	09/03/96	09/03/96
DEPTH	12.00	12.00	2.00	2.00
TYPE		DUPLICATE		
ANALYTE				
TETRACHLOROETHENE	< 12	< 14	< 11	< 11
TOLUENE	< 12	< 14	< 11	< 11 J
TRANS-1,3-DICHLOROPROPENE	< 12	< 14	< 11	< 11
TRICHLOROETHENE	< 12	< 14	< 11	< 11
VINYL CHLORIDE	< 12	< 14	< 11	< 11
XYLENES (TOTAL)	< 12	< 14	< 11	< 11

All units reported as ug/Kg

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
RADIONUCLIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS CALIFORNIA

	SAMPLE	SSWB0001			SSWB0002			SSWB0003		
	LOCATION	TRL0049			TRL0049			TRL0050		
	DATE	08/27/96			08/27/96			08/27/96		
	QA									
	DEPTH	7.00			5.00			3.50		
ANALYTE	UNITS		MDA			MDA			MDA	
ACTINIUM-228	pCi/g	0.40±0.11	0.14		0.56±0.17	0.25		0.48±0.15	0.20	
BISMUTH-212	pCi/g	0.04±0.20	0.26		0.43±0.32	0.39		0.27±0.28	0.36	
BISMUTH-214	pCi/g	0.268±0.072	0.078		0.49±0.11	0.11		0.56±0.11	0.099	
CARBON-14	pCi/g	-0.2±5.9	11.		-3.7±5.0	9.8		-5.3±5.4	11.	
CESIUM-137	pCi/g	0.020±0.027	0.035		-0.031±0.022	0.058		-0.006±0.030	0.052	
COBALT-60	pCi/g	0.010±0.017	0.028		0.003±0.028	0.054		-0.005±0.023	0.054	
GROSS ALPHA	pCi/g	1.03±0.82	1.2	|Jl	1.8±1.1	1.5	|Jl	2.8±1.4	1.5	|Jl
GROSS BETA	pCi/g	1.56±0.62	0.92		1.79±0.65	0.94		1.21±0.90	1.4	
LEAD-210	pCi/g	2.3±2.9	3.7		1.04±0.78	1.1		0.76±0.78	1.2	
LEAD-212	pCi/g	0.371±0.068	0.061		0.76±0.12	0.086		0.503±0.089	0.074	
LEAD-214	pCi/g	0.398±0.067	0.066		0.73±0.11	0.096		0.614±0.098	0.093	
POTASSIUM-40	pCi/g	8.2±1.1	0.42		13.5±1.9	0.59		10.4±1.5	0.47	
RADIUM-223	pCi/g	-0.23±0.12	0.62		0.04±0.34	0.91		-0.25±0.20	0.94	
RADIUM-226	pCi/g	0.58±0.26	0.28		0.63±0.24	0.16		0.56±0.23	0.22	
SR-89,90	pCi/g	0.69±0.39	0.61	B|Uz	0.91±0.47	0.73	B|Uz	0.59±0.35	0.55	B|Uz
THALLIUM-208	pCi/g	0.107±0.036	0.038		0.262±0.061	0.049		0.190±0.053	0.051	
THORIUM-234	pCi/g	0.32±0.44	1.3		0.46±0.41	1.1		0.88±0.42	1.2	
TRITIUM	pCi/L	320±160	220		1830±310	230		-30±120	230	
URANIUM-235	pCi/g	0.09±0.13	0.18		0.05±0.16	0.25		0.06±0.14	0.22	

A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
RADIONUCLIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS CALIFORNIA

	SSWB0004			SSWB0005			SSWB0007		
	TRL0050			TRL0051			TRL0051		
	08/27/96			08/29/96			08/29/96		
	5.25			7.00			10.00		
ANALYTE		MDA			MDA			MDA	
ACTINIUM-228	0.492±0.095	0.099		0.61±0.15	0.18		0.56±0.16	0.21	
BISMUTH-212	0.20±0.16	0.21		0.25±0.27	0.35		0.29±0.28	0.37	
BISMUTH-214	0.430±0.071	0.057		0.51±0.11	0.097		0.417±0.10	0.10	
CARBON-14	-3.7±5.5	11.		32.7±8.8	11.		-5.4±5.4	11.	
CESIUM-137	-0.003±0.017	0.026		0.001±0.035	0.051		-0.017±0.032	0.057	
COBALT-60	0.008±0.013	0.021		0±0.027	0.057		0.007±0.018	0.036	
GROSS ALPHA	1.13±0.97	1.4	|Jl	5.5±4.9	7.5	C|	5.9±4.5	6.4	C|
GROSS BETA	1.90±0.98	1.5		26.3±4.6	5.2		15.3±4.1	5.5	
LEAD-210	0.8±2.1	3.0		0.77±0.72	1.0	B|Uz	0.48±0.84	1.3	B|Uz
LEAD-212	0.448±0.066	0.048		0.646±0.10	0.080		0.603±0.10	0.082	
LEAD-214	0.520±0.066	0.051		0.574±0.093	0.089		0.499±0.093	0.099	
POTASSIUM-40	9.7±1.2	0.35		11.0±1.5	0.44		10.6±1.5	0.47	
RADIUM-223	-0.08±0.11	0.48		0±0.29	0.79		-0.26±0.19	0.84	
RADIUM-226	0.61±0.20	0.16		0.78±0.24	0.19		0.43±0.18	0.17	
SR-89,90	0.44±0.25	0.39	B|Uz	0.91±0.32	0.47	|Jd	0.16±0.30	0.51	|Jd
THALLIUM-208	0.171±0.034	0.027		0.182±0.050	0.047		0.185±0.055	0.054	
THORIUM-234	0.37±0.34	1.2		0.65±0.36	0.97		0.54±0.41	1.2	
TRITIUM	0±120	220		38300000±1900000	250	B|Jl	23600000±1200000	240	B|Jl
URANIUM-235	0.135±0.10	0.15		-0.06±0.14	0.22		0.08±0.15	0.22	

All units reported as pCi/g, except
Tritium reported as pCi/L.

A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
RADIONUCLIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS CALIFORNIA

	SSWB0009 TRL0051 08/29/96 9.00			SSWB0010 TRL0052 08/30/96 10.00			SSWB0011 TRL0052 08/30/96 12.00		
ANALYTE		MDA			MDA			MDA	
ACTINIUM-228	0.51±0.11	0.12		0.52±0.14	0.19		0.55±0.16	0.21	
BISMUTH-212	0.25±0.18	0.22		0.28±0.26	0.32		0.33±0.30	0.40	
BISMUTH-214	0.469±0.078	0.067		0.433±0.097	0.092		0.483±0.10	0.093	
CARBON-14	230.±21.	11.		23.6±7.9	11.	|Jd	15.7±7.3	11.	|Jd
CESIUM-137	-0.009±0.012	0.031		-0.022±0.020	0.050		0.021±0.028	0.043	
COBALT-60	0.006±0.014	0.025		-0.016±0.018	0.043		0.005±0.021	0.047	
GROSS ALPHA	6.9±4.6	5.9	C|	3.0±3.8	6.2	C|	4.6±4.2	6.2	C|
GROSS BETA	54.7±6.7	6.1		33.9±5.2	5.6		18.9±4.2	5.3	
LEAD-210	3.2±2.5	3.2	B|Uz	0.64±0.69	1.0	B|Uz	1.45±0.83	1.2	B|Uz
LEAD-212	0.498±0.074	0.057		0.600±0.098	0.074		0.640±0.099	0.075	
LEAD-214	0.511±0.069	0.062		0.556±0.092	0.091		0.653±0.097	0.095	
POTASSIUM-40	9.7±1.2	0.38		10.4±1.5	0.56		12.1±1.7	0.50	
RADIUM-223	-0.08±0.12	0.53		-0.09±0.20	0.73		0.01±0.32	0.86	
RADIUM-226	0.43±0.20	0.21		0.84±0.25	0.20	|Uz	0.77±0.25	0.21	|Uz
SR-89,90	0.33±0.31	0.50	|Jd	0.07±0.30	0.51	|Jd	0.24±0.30	0.51	|Jd
THALLIUM-208	0.153±0.035	0.033		0.176±0.048	0.045		0.193±0.051	0.046	
THORIUM-234	0.37±0.38	1.3		0.22±0.36	0.99		1.04±0.40	1.2	
TRITIUM	233000±12000	230	B|Jl	47000±2700	230	B|Jl	32000±2000	220	B|Jl
URANIUM-235	0.007±0.099	0.17		-0.03±0.12	0.21		0.1±0.14	0.21	

All units reported as pCi/g, except
Tritium reported as pCi/L.

A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
RADIONUCLIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS CALIFORNIA

	SSWB0012 TRL0053 08/30/96 9.00			SSWB0013 TRL0053 08/30/96 11.00			SSWB0014 TRL0054 09/03/96 7.00		
ANALYTE		MDA			MDA			MDA	
ACTINIUM-228	0.507±0.098	0.10		0.58±0.15	0.22		0.56±0.14	0.17	
BISMUTH-212	0.32±0.15	0.16		0.31±0.28	0.34		0.33±0.25	0.31	
BISMUTH-214	0.423±0.072	0.063		0.46±0.11	0.11		0.440±0.094	0.086	
CARBON-14	55.±11.	11.	|Jd	-0.7±5.0	9.3	|Jd	1442.±84.	11.	|Jd
CESIUM-137	0.084±0.027	0.028		0.011±0.040	0.055		3.28±0.35	0.048	
COBALT-60	0.008±0.013	0.024		-0.001±0.028	0.058		-0.002±0.019	0.043	
GROSS ALPHA	8.9±5.5	7.0	C|	3.1±4.1	6.9	C|	4.7±5.4	8.9	C|
GROSS BETA	71.5±7.6	6.1		15.1±4.3	5.8		884.±49.	6.1	
LEAD-210	-0.2±2.2	3.2	B|Uz	0.98±0.81	1.2	B|Uz	0.40±0.81	1.2	B|Uz
LEAD-212	0.507±0.072	0.051		0.60±0.11	0.084		0.507±0.087	0.075	
LEAD-214	0.522±0.066	0.058		0.598±0.10	0.097		0.504±0.088	0.10	
POTASSIUM-40	10.8±1.3	0.35		11.9±1.7	0.50		11.4±1.5	0.42	
RADIUM-223	-0.05±0.11	0.51		-0.21±0.24	0.95		-0.01±0.36	0.93	
RADIUM-226	0.30±0.15	0.17	|Uz	0.65±0.20	0.15	|Uz	0.56±0.21	0.21	|Uz
SR-89,90	0.32±0.30	0.50	|Jd	0.56±0.33	0.52	|Jd	0.17±0.31	0.53	|Jd
THALLIUM-208	0.172±0.035	0.030		0.124±0.051	0.058		0.183±0.049	0.049	
THORIUM-234	0.54±0.35	1.2		0.85±0.43	1.1		0.53±0.37	1.1	
TRITIUM	2600000±130000	240	B|Jl	1081000±54000	200	|Jl	18100±1200	210	
URANIUM-235	0.017±0.10	0.16		-0.06±0.14	0.24		0.08±0.14	0.22	

All units reported as pCi/g, except
Tritium reported as pCi/L.

A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
RADIONUCLIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS CALIFORNIA

	SSWB0015			SSWB0016			SSWB0018		
	TRL0054			TRL0054			SSWB0018		
	09/03/96			09/03/96			09/03/96		
							D		
	12.00			12.00			2.00		
ANALYTE		MDA			MDA			MDA	
ACTINIUM-228	0.590±0.10	0.11		0.61±0.14	0.16		0.36±0.12	0.18	
BISMUTH-212	0.39±0.18	0.20		0.29±0.23	0.30		0.33±0.21	0.23	
BISMUTH-214	0.517±0.078	0.059		0.452±0.095	0.093		0.394±0.086	0.079	
CARBON-14	1.4±6.1	11.	|Jd	1.4±6.2	11.	|Jd	-2.2±5.8	11.	|Jd
CESIUM-137	0.004±0.021	0.030		-0.006±0.021	0.047		0.019±0.028	0.036	
COBALT-60	-0.0006±0.0098	0.021		-0.022±0.018	0.056		-0.003±0.017	0.050	
GROSS ALPHA	10.3±5.5	6.6	C|	6.2±4.7	6.7	C|	5.6±4.9	7.5	C|
GROSS BETA	16.6±4.4	5.8		17.0±4.5	6.0		18.0±4.5	5.8	
LEAD-210	0.7±2.3	3.3	B|UJz,f	-0.6±3.1	5.0	B|UJz,f	0.42±0.59	0.87	B|Uz
LEAD-212	0.591±0.080	0.053		0.641±0.099	0.068		0.537±0.088	0.068	
LEAD-214	0.613±0.073	0.056		0.608±0.090	0.081		0.453±0.078	0.072	
POTASSIUM-40	10.6±1.3	0.34		11.3±1.5	0.53		10.6±1.4	0.40	
RADIUM-223	-0.03±0.16	0.52		-0.20±0.21	0.68		0.03±0.25	0.72	
RADIUM-226	0.59±0.21	0.19	|Uz	0.60±0.21	0.19	|Uz	0.74±0.24	0.20	|Uz
SR-89,90	25.5±1.6	0.45	|Jd	0.22±0.27	0.46	|Jd	0.53±0.31	0.49	|Jd
THALLIUM-208	0.214±0.039	0.028		0.166±0.046	0.047		0.181±0.042	0.032	
THORIUM-234	0.28±0.36	1.2		0.34±0.50	1.8		0.52±0.32	0.89	
TRITIUM	810±210	210		780±210	210		1030±220	200	
URANIUM-235	0.07±0.11	0.17		0.06±0.15	0.24		-0.058±0.10	0.18	

All units reported as pCi/g, except
Tritium reported as pCi/L.

A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS
RADIONUCLIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS CALIFORNIA

	SSWB0019			SSWB0017		
	SSWB0019			TRL0054		
	09/03/96			09/03/96		
				D		
	2.00			7.00		
ANALYTE		MDA			MDA	
ACTINIUM-228	0.43±0.12	0.15		0.03±0.85	1.8	
BISMUTH-212	0.30±0.21	0.28		1.7±1.9	2.3	
BISMUTH-214	0.420±0.090	0.090		-0.69±0.89	4.1	
CARBON-14	1.5±5.4	9.6	|Jd	100±13.	10.	|Jd
CESIUM-137	0.024±0.029	0.041		4610±460	2.3	
COBALT-60	-0.003±0.012	0.038		0.03±0.22	0.54	
GROSS ALPHA	4.7±4.5	7.1	C|	0.4±3.4	6.9	C|
GROSS BETA	11.8±3.8	5.4		4280±220	6.1	
LEAD-210	0.5±2.9	4.5	B|Uz	18.±38.	61.	B|Uz
LEAD-212	0.471±0.083	0.069		-2.0±2.6	4.4	
LEAD-214	0.470±0.078	0.082		0.9±3.9	7.6	
POTASSIUM-40	9.9±1.4	0.52		46.8±9.5	3.8	
RADIUM-223	-0.16±0.17	0.68		-10.±27.	68.	
RADIUM-226	0.56±0.20	0.18	|Uz	0.26±0.17	0.22	|Uz
SR-89,90	0.28±0.29	0.48	|Jd	1.06±0.31	0.45	|Jd
THALLIUM-208	0.147±0.041	0.041		-0.9±1.4	2.4	
THORIUM-234	0.32±0.45	1.7		11.±10.	27.	
TRITIUM	340±150	210		3030±380	210	
URANIUM-235	0.06±0.13	0.21		-1.±6.6	12.	

All units reported as pCi/g, except
Tritium reported as pCi/L.

A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
METALS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0006	SSWB0008
LOCATION	TRL0051	TRL0051
DATE	08/29/96	08/29/96
DEPTH	7.00	10.00
TYPE	WASTE	
ANALYTE		
ANTIMONY	<0.0030	<0.0030
ARSENIC	<0.0030	<0.0100 B|
BARIUM	<0.2000 B|	<0.2000 B|
BERYLLIUM	<0.0010	<0.0010
CADMIUM	<0.0030	<0.0030
CHROMIUM	<0.0060	<0.0060
CHROMIUM, HEXAVALENT (+6)	<0.0030 H|UJh	<0.0030 H|UJh
COBALT	<0.0040	<0.0040
COPPER	<0.0060	<0.0060
LEAD	<0.0020	<0.0020
MERCURY	<0.0002	<0.0002
MOLYBDENUM	<0.0100	<0.0100
NICKEL	<0.0120	<0.0120
SELENIUM	<0.0040	<0.0050 B|
SILVER	<0.0060	<0.0060
THALLIUM	<0.0060	<0.0060
VANADIUM	<0.0060	<0.0500 B|
ZINC	<0.0200 B|	0.0212

All units reported as mg/L

< = Constitutes below detection limit. Detection limits may vary depending on interference by other sample constitutes.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
GENERAL CHEMICALS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	LOCATION	DATE	DEPTH	TYPE	NITRATE-N
					mg/L
SSWB0006	TRL0051	08/29/96	7.00	WASTE	3.8 H|Jh
SSWB0008	TRL0051	08/29/96	10.00		4.0 H|Jh

DATE refers to date sampled.

A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0006		SSWB0008	
LOCATION	TRL0051		TRL0051	
DATE	08/29/96		08/29/96	
DEPTH	7.00		10.00	
TYPE	WASTE			
ANALYTE				
1,2,4-TRICHLOROBENZENE	<13	Rl	<11	Rl
1,2-DICHLOROBENZENE	<13	UJs	<11	UJs
1,3-DICHLOROBENZENE	<13	UJs	<11	UJs
1,4-DICHLOROBENZENE	<13	Rl	<11	Rl
2,2'-OXYBIS(1-CHLOROPROPANE)	<13	UJs	<11	UJs
2,4,5-TRICHLOROPHENOL	<31	UJs	<26	UJs
2,4,6-TRICHLOROPHENOL	<13	UJs	<11	UJs
2,4-DICHLOROPHENOL	<13	UJs	<11	UJs
2,4-DIMETHYLPHENOL	<13	UJs	<11	UJs
2,4-DINITROPHENOL	<31	UJs	<26	UJs
2,4-DINITROTOLUENE	<13	UJs	<11	UJs
2,6-DINITROTOLUENE	<13	UJs	<11	UJs
2-CHLORONAPHTHALENE	<13	UJs	<11	UJs
2-CHLOROPHENOL	<13	UJs	<11	UJs
2-METHYL-4,6-DINITROPHENOL	<31	UJs	<26	UJs
2-METHYLNAPHTHALENE	<13	UJs	<11	UJs
2-METHYLPHENOL	<13	UJs	<11	UJs
2-NITROANILINE	<31	UJs	<26	UJs
2-NITROPHENOL	<13	UJs	<11	UJs
3,3'-DICHLOROBENZIDINE	<13	UJs	<11	UJs
3-NITROANILINE	<31	UJs	<26	UJs
4-BROMOPHENYL PHENYL ETHER	<13	UJs	<11	UJs
4-CHLORO-3-METHYLPHENOL	<13	UJs	<11	UJs
4-CHLOROANILINE	<13	UJs	<11	UJs
4-CHLOROPHENYL PHENYL ETHER	<13	UJs	<11	UJs
4-METHYLPHENOL	<13	UJs	<11	UJs
4-NITROANILINE	<31	UJs	<26	UJs

All units reported as ug/L

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0006	SSWB0008
LOCATION	TRL0051	TRL0051
DATE	08/29/96	08/29/96
DEPTH	7.00	10.00
TYPE	WASTE	
ANALYTE		
4-NITROPHENOL	<31 J|UJs	<26 |UJs
ACENAPHTHENE	<13 |UJl	<11 |UJl
ACENAPHTHYLENE	<13 |UJs	<11 |UJs
ANTHRACENE	<13 |UJs	<11 |UJs
BENZO(A)ANTHRACENE	<13 |UJs	<11 |UJs
BENZO(A)PYRENE	<13 |UJs	<11 |UJs
BENZO(B)FLUORANTHENE	<13 |UJs	<11 |UJs
BENZO(G,H,I)PERYLENE	<13 |UJs	<11 |UJs
BENZO(K)FLUORANTHENE	<13 |UJs	<11 |UJs
BENZYL BUTYL PHTHALATE	<13 |UJs	<11 |UJs
BIS(2-CHLOROETHOXY)METHANE	<13 |UJs	<11 |UJs
BIS(2-CHLOROETHYL)ETHER	<13 |UJs	<11 |UJs
BIS(2-ETHYLHEXYL)PHTHALATE	<13 |UJs	<11 J|UJs
CARBAZOLE	<13 |UJs	<11 |UJs
CHRYSENE	<13 |UJs	<11 |UJs
DI-N-BUTYLPHTHALATE	<13 J|UJs	<11 |UJs
DI-N-OCTYLPHTHALATE	<13 |UJs	<11 |UJs
DIBENZO(A,H)ANTHRACENE	<13 |UJs	<11 |UJs
DIBENZOFURAN	<13 |UJs	<11 |UJs
DIETHYL PHTHALATE	<13 |UJs	<11 |UJs
DIMETHYL PHTHALATE	<13 |UJs	<11 |UJs
FLUORANTHENE	<13 |UJs	<11 |UJs
FLUORENE	<13 |UJs	<11 |UJs
HEXACHLOROBENZENE	<13 |UJs	<11 |UJs
HEXACHLOROBUTADIENE	<13 |UJs	<11 |UJs
HEXACHLOROCYCLOPENTADIENE	<13 |UJs	<11 |UJs
HEXACHLOROETHANE	<13 |UJs	<11 |UJs

All units reported as ug/L

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
SEMI-VOLATILE ORGANIC COMPOUNDS
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0006	SSWB0008
LOCATION	TRL0051	TRL0051
DATE	08/29/96	08/29/96
DEPTH	7.00	10.00
TYPE	WASTE	
ANALYTE		
INDENO(1,2,3-CD)PYRENE	<13 |UJs	<11 |UJs
ISOPHORONE	<13 |UJs	<11 |UJs
N-NITROSODI-N-PROPYLAMINE	<13 |UJl	<11 |UJl
N-NITROSODIPHENYLAMINE	<13 |UJs	<11 |UJs
NAPHTHALENE	<13 |UJs	<11 |UJs
NITROBENZENE	<13 |UJs	<11 |UJs
PENTACHLOROPHENOL	<31 |UJs	<26 |UJs
PHENANTHRENE	<13 |UJs	<11 |UJs
PHENOL	<13 |UJs	<11 |UJs
PYRENE	<13 |UJs	<11 |UJs

All units reported as ug/L

< = Constituent below detection limit. Detection limits may vary depending on interference by other sample constituents.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
ORGANOCHLORINE PESTICIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0006		SSWB0008	
LOCATION	TRL0051		TRL0051	
DATE	08/29/96		08/29/96	
DEPTH	7.00		10.00	
TYPE	WASTE			
ANALYTE				
4,4'-DDD	<0.130		<0.120	
4,4'-DDE	<0.130		<0.120	
4,4'-DDT	<0.130		<0.120	
ALDRIN	<0.064		<0.060	
ALPHA-BHC	<0.064	UJc	<0.060	UJc
ALPHA-CHLORDANE	<0.064		<0.060	
AROCLOR-1016	<1.300		<1.200	
AROCLOR-1221	<2.600		<2.400	
AROCLOR-1232	<1.300		<1.200	
AROCLOR-1242	<1.300		<1.200	
AROCLOR-1248	<1.300		<1.200	
AROCLOR-1254	<1.300		<1.200	
AROCLOR-1260	<1.300		<1.200	
BETA-BHC	<0.064		<0.060	
DELTA-BHC	<0.064	UJc	<0.060	UJc
DIELDRIN	<0.130		<0.120	
ENDOSULFAN I	<0.064		<0.060	
ENDOSULFAN II	<0.130		<0.120	
ENDOSULFAN SULFATE	<0.130		<0.120	
ENDRIN	<0.130		<0.120	
ENDRIN ALDEHYDE	<0.130		<0.120	
ENDRIN KETONE	<0.130		<0.120	
GAMMA-BHC	<0.064	UJc	<0.060	UJc
GAMMA-CHLORDANE	<0.064		<0.060	
HEPTACHLOR	<0.064		<0.060	
HEPTACHLOR EPOXIDE	<0.064		<0.060	
METHOXYCHLOR	<0.640		<0.600	

All units reported as ug/L

< = Constitutes below detection limit. Detection limits may vary depending on interference by other sample constitutes.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
ORGANOCHLORINE PESTICIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS, CALIFORNIA

SAMPLE	SSWB0006	SSWB0008
LOCATION	TRL0051	TRL0051
DATE	08/29/96	08/29/96
DEPTH	7.00	10.00
TYPE	WASTE	
ANALYTE		
TOXAPHENE	<6.400	<6.000

All units reported as ug/L

< = Constitutes below detection limit. Detection limits may vary depending on interference by other sample constitutes.
A key to data qualifier flags, and a detailed explanation, is presented at the end of this appendix.

WASTE BURIAL HOLES
ANALYTICAL RESULTS FOR WET ANALYSIS
RADIONUCLIDES
SOUTH CAMPUS DISPOSAL SITE, DAVIS CALIFORNIA

	SAMPLE	SSWB0006			SSWB0008		
	LOCATION	TRL0051			TRL0051		
	DATE	08/29/96			08/29/96		
	QA						
	DEPTH	7.00			10.00		
ANALYTE	UNITS		MDA			MDA	
ACTINIUM-228	pCi/L	10.±19.	33.		-2.±19.	33.	
BISMUTH-212	pCi/L	4.±47.	67.		13.±44.	60.	
BISMUTH-214	pCi/L	1±12.	19.		6.±13.	20.	
CARBON-14	pCi/L	8530±470	43.		135.±36.	44.	
CESIUM-137	pCi/L	-4.0±3.4	10.		0.8±5.9	8.1	
COBALT-60	pCi/L	1.2±4.1	8.9		1.7±3.8	8.3	
GROSS ALPHA	pCi/L	1.±1.2	2.0	C|Jl	6.2±1.8	1.4	|Jl
GROSS BETA	pCi/L	12.6±2.0	2.2		4.6±1.5	2.1	
LEAD-210	pCi/L	10±100	160	B|Uz	70±100	160	B|Uz
LEAD-212	pCi/L	3.1±8.9	13.		-0.4±8.9	13.	
LEAD-214	pCi/L	-7.3±8.0	18.		5.±11.	17.	
POTASSIUM-40	pCi/L	6.±72.	110		-11.±61.	100	
RADIUM-223	pCi/L	-8.±26.	140		-2.±35.	130	
RADIUM-226	pCi/L	0.52±0.68	1.1		0.79±0.69	1.0	
RADIUM-226(GAMMA)	pCi/L	-30±110	170		0±120	180	
SR-89,90	pCi/L	0.7±1.2	2.0		1.1±1.1	1.8	
THALLIUM-208	pCi/L	-0.7±6.1	9.1		0.6±6.8	9.8	
THORIUM-234	pCi/L	9.±68.	170		15.±67.	170	
TRITIUM	pCi/L	796000±40000	240		451000±23000	220	
URANIUM-235	pCi/L	-4.±22.	39.		-8.±22.	38.	

APPENDIX D

DATA QUALITY SUMMARY

This appendix summarizes the quality of the data collected from the Waste Burial Hole investigation as part of the Data Gaps Limited Field Investigation. Soil samples were collected from trench locations August 27, 29, and 30, and September 3, and submitted to Lockheed Analytical Services for analysis. Hardcopy formats of analytical results were received from the laboratory September 17 through October 18, 1996. This section summarizes the data validation process, and reviews validation results

D-1.0 Data Validation

Samples were analyzed and validated according to criteria established in the program's Quality Assurance Project Plan (QAPjP). The QAPjP is presented in an appendix of the Final Draft RI/FS Work Plan-UC Davis Additional Field Investigations/LEHR Environmental Restoration project (Dames & Moore, 1994). In support of the Revised Data Gaps Work Plan (UC Davis, 1996) and other additional investigations conducted by UC Davis an addendum to the QAPjP was prepared and effective July 19, 1996. Included in the QAPjP Addendum are sections identifying quality control sample collection requirements and specific quality assurance objectives for the measurement of data associated with this task. These QA objectives, typically called data quality objectives (DQOs), are quantitative and qualitative statements that specify the quality of data used to support project decisions. They are expressed in terms of precision, accuracy, representativeness, comparability, and completeness (PARCCs).

The criteria for evaluating DQOs is presented in the QAPjP-Addendum (Dames & Moore, 1996). These criteria include review of quality control (QC) samples collected in the field, laboratory QC samples, and analytical method performance. The field QC samples and analytical data reports were reviewed in accordance with validation procedures presented in the QAPjP.

Quality control samples collected in the field and submitted for complete analysis include one field duplicate to assess precision and representativeness, and three associated travel blank samples, analyzed only for volatile organic compounds, to identify contaminants which may have been introduced during sample transit, handling, or during sample storage at the laboratory. No equipment blank samples were collected to evaluate the cleanliness of sampling equipment and containers. The laboratory also analyzed a method blank for each analytical batch to detect reagent contamination. In addition, a laboratory control sample was analyzed for each analytical batch except the volatile organic compounds to detect proper instrument performance. A laboratory control sample is not required by Contract Laboratory Program (CLP) protocol for soil volatile organic analyses.

D-2.0 Review of PARCC Parameters

The three primary objectives of data validation include; review of sampling, analytical, and data reduction protocols for correctness; quantitative assessment of the measurement data validity; and, assessment of data completeness. The project data validation procedures were designed to review each data set and identify biases inherent to the data including assessment of laboratory performance, overall precision and accuracy, representativeness and completeness.

Tables 4 through 6, located in the main body of this transmittal, present the data for the Waste Burial Hole field investigation. Data validation flags have been applied to those sample results which fell outside of specified tolerance limits, and therefore, did not meet the program's quality assurance objectives. An explanation of the data qualifiers presented in this report is provided with the data tables.

D-2.1 Precision

Precision is a measure of the ability to reproduce results under a given set of conditions and is expressed as the relative percent difference (RPD) between a primary result and a duplicate result. The analysis of laboratory duplicates is used to assess precision of analytical procedures. The analysis of blind field duplicate samples evaluates sampling and analytical precision. The results of laboratory and field duplicates for Waste Burial Hole samples are presented below.

Laboratory duplicate samples were analyzed to measure analytical precision for some metals, general chemistry, and radiochemistry methods . Laboratory duplicate samples were reviewed as part of the validation process. The reported detections of chromium, radium-226 (GAMMA), lead-210, radioactive strontium, and carbon-14 were qualified as estimated "J" due to duplicate imprecision.

Matrix spike analyses were performed in duplicate to assess analytical precision for the volatiles, semivolatiles, and pesticides analyses. Associated precision criteria were met for these analyses.

Field duplicates were collected by filling two identical sets of sample containers from the trenches and labeling one set with a fictitious sample identification. Field duplicates are traced using the Field Record of Soil Sampling Form and the Soil Sampling Tracking Form. When laboratory results are received, the fictitious sample name is changed to the appropriate location identification and designated in the database as a "duplicate sample."

Field duplicates were collected from one trench location, SSWB0015. Associated precision criteria

were met for all target analytes reported except acetone. Acetone is a common laboratory contaminant and the reported value for this location was qualified as estimated "J". These data indicate good precision and acceptable sample collection techniques.

D-2.2 Accuracy

Accuracy is a measure of the bias of an analytical method. Accuracy is evaluated by assessing the agreement of a measurement with a known true value, and is expressed using percent recovery. Percent recovery is calculated using matrix or surrogate spike samples and laboratory control spike samples.

The results of the sample matrix, surrogate recoveries, and laboratory control spike samples were reviewed as part of the validation process. Sample results reported above the detection can be qualified as estimated (J) or rejected (R), if QC criteria are not met. For non-detect results, the associated detection limit may be qualified as estimated (UJ) or rejected (R) if QC criteria are not met. Qualifications made to Waste Burial Hole data based on this review are described below.

- Detection limits for 1,4-dichlorobenzene and 1,2,4-trichlorobenzene in the semivolatile analysis have been qualified as rejected "R" in some samples due to extremely low LCS recovery. These results are unusable.

- Slightly low LCS recoveries for N-nitroso-di-n-propylamine, acenaphthene, and 1,2,4-trichlorobenzene in the semivolatile fraction, and antimony in the metals fraction resulted in the qualification of their detection limits as estimated "UJ" in some samples. These results are useable, but indicate some bias.

- The reported activities of gross alpha radioactivity and tritium have been qualified as estimated "J" in some samples due to a low LCS recovery. These results are useable, but indicate some bias.

- Detection limits for antimony and mercury have been qualified as estimated "UJ" and the reported detections for chromium, mercury, and nickel have been qualified as estimated "J" in some samples due to aberrant matrix recoveries. These results are useable, but indicate some bias.

This evaluation indicates acceptable field performance, however, the laboratory performance resulted in some unusable data. Estimated results do not adversely impact data quality.

D-2.3 Representativeness

Representativeness is a qualitative parameter which evaluates how accurately the data represent the actual environmental conditions. Representativeness is determined by evaluating the results of trip blanks, equipment blanks, laboratory method blanks, blind duplicate samples, and laboratory duplicate samples. The evaluations of duplicate samples collected and analyzed for this program are also used to indicate acceptable precision (see section on precision). The results of travel blanks and laboratory method blanks are discussed below. No equipment blanks were collected for this area.

Travel blanks were utilized to identify volatile organic contaminants which may have been introduced during sample transit or during sample storage at the laboratory. The blanks were supplied by Lockheed Analytical Services and returned each sampling day in the cooler used to transport samples for volatile analyses. The analytical results for three associated travel blank samples are presented in Table B. No contaminants were detected in the associated travel blanks.

Laboratory method blanks were prepared and analyzed using identical reagents, technique and instrumentation as for field samples. Laboratory method blanks were reviewed as part of the validation process. The following qualifications were made as part of this review.

- Di-n-butylphthalate and bis(2-ethylhexyl)phthalate were reported in one method blank and at similar levels in some associated samples during the semivolatile analyses.

- Lead-210 and radium-226 were reported in three method blanks, tritium in two method blanks, and radioactive strontium in one method blank for the radiochemistry analyses. Similar levels were detected in associated samples.

All levels of contamination in associated samples similar to blank contamination levels have been qualified as anomalous "U."

D-2.4 Comparability

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability is achieved through the use of standard sampling procedures, analytical methods and units of measurement. Each Waste Burial Hole sample was analyzed in accordance with the procedures outlined in the QAPjP. Laboratory reporting limits met the guidelines established in the QAPjP for those parameters not detected in Waste Burial Hole samples.

D-2.5 Completeness

Completeness is defined as the percentage of valid data relative to the total number of analytes. The completeness goal for this program, as specified in the QAPjP, is ninety percent. For the Waste Burial Holes, 99 percent of the data were completed.

Validation discrepancies identified during this monitoring event included problems with instrument calibrations and column agreement. Data associated with these anomalies have been flagged as estimated or rejected. Significant retention time shifts in the calibration and sample data for the pesticide/PCB analysis were noted. Surrogate recoveries during the semivolatile analysis of some samples did not meet acceptance criteria. After numerous reanalyses, the non-GPC extracts for semivolatile samples was analyzed and the surrogates were recovered at acceptable levels and no data were qualified.

The required holding times for each analytical method were met, with the exception of some nitrate (as N) analyses. Sample results associated with missed holding times were either qualified as estimated "J" if the parameter was reported above the detection limit, or rejected "R" if the parameter was reported below the detection limit and the holding time was missed by twice the method requirement. Ninety-nine percent of the data are valid. Out of a total of 3005 individual analytical results (both detected and nondetected), 3000 data results are deemed reliable for their intended purpose.

DATA VALIDATION QUALIFIER DEFINITIONS AND INTERPRETATION KEY[1]
Assigned by Dames & Moore's Data Review Team

DAMES & MOORE DATA QUALIFIER DEFINITIONS

U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."

NJ The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

DAMES & MOORE DATA QUALIFIER DEFINITIONS — REASON CODE DEFINITIONS

a Analytical sequence deficiency or omission.

b Gross compound breakdown (4,4'-DDT/Endrin).

c Calibration failure; poor or unstable response.

d Laboratory duplicate imprecision.

e Laboratory or field duplicate control sample imprecision.

g Poor chromatography.

h Holding time violation.

i Internal standard failure.

j Poor mass spectrographic performance.

k Serial dilution imprecision.

l Laboratory control sample recovery failure.

m Matrix spike/matrix spike duplicate recovery failure.

n Interference check sample recovery failure.

o Calibration blank contamination (metals/inorganics only).

p Preparation blank contamination (metals/inorganics only).

q No valid quantitation column present.

r Linearity failure in initial calibration.

s Surrogate spike recovery failure (GC organics and GC/MS organics only).

t Instrument tuning failure.

u Failure of confirmation column (GC Organics only).

w Retention time (RT) outside of RT window

x Field blank contamination.

y Trip blank contamination

z Method blank contamination.

(1) The key to laboratory data qualifier flags follows this page.

INTERPRETATION KEY

The following example shows how an analytical result which includes qualifiers assigned by both the Dames & Moore data review team and the analytical laboratory could be displayed in the data tables:

<5.20 JB|Uz

The qualifier assigned by the laboratory preceeds the "|"; the qualifier assigned by the Dames & Moore data review team follows it. In this example, the result is qualified as a non-detection due to the bias introduced by contamination of the associated method blank. Presence of the analyte in the method blank is indicated by the laboratory qualifier (B). The qualifier assigned by the Dames & Moore data review team (Uz) indicates that the analyte concentration is considered to be below the adjusted detection limit (quantitation limit) based on the level of contamination in the method blank.

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DATA QUALIFIERS FOR ORGANIC ANALYSES

[Revised 02/09/1996]

For Use On The Analytical Data Reporting Forms	
A	*For CLP analyses Only* -- The TIC is a suspected aldol-condensation product.
B	Any constituent that was also detected in the associated blank whose concentration was greater than the practical or reporting detection limit (PQL or RDL).
C	Constituent confirmed by GC/MS analysis. *[pesticide/PCB analyses only]*
D	Constituent detected in the diluted sample. It also indicates that an accurate quantitation is not possible due to surrogates being diluted out of the samples during the course of the analysis.
E	Constituent concentration exceeded the calibration range.
G	The quantitation is not gasoline or diesel but believed to be some other combination of hydrocarbons.
H	Sample analysis performed outside of method- or client-specified maximum holding time requirement.
J	*Estimated value* -- (1) constituent detected at a level less than the RDL or PQL and greater than or equal to the MDL; (2) estimated concentration for TICs *(For CLP Reporting Only).*
N	*For CLP Reporting Only* -- Tentatively identified constituents (TICs) identified based on mass spectral library search.
NQ	Analyte detected, but Not Quantified; see result from subsequent analysis
P	*For CLP Reporting Only* -- The percent difference between the concentrations detected on both GC columns was greater than 25 percent *[pesticide/PCB analyses only].*
U	*For CLP Reporting Only* -- Constituent was analyzed for but not detected (sample quantitation must be corrected for dilution and percent moisture).
X, Y, or Z	Analyst-defined qualifier.
N/A (% Moisture)	N/A in the % moisture cell indicates that data are reported on an "*as received*" basis. A value in the % moisture cell indicates that data are reported based on a "*dry weight*" basis.
For Use On The QC Data Reporting Forms	
*	QC data (i.e., percent recovery data for matrix spike, matrix spike duplicate, laboratory control standard, or surrogates; and RPD for matrix spike duplicate or unspiked duplicate) exceeded acceptance limits.
a[1]	The spike recovery and/or RPD for matrix spike and matrix spike duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b[1]	The RPD cannot be computed because the sample and/or duplicate concentration was below the RDL.

[1] Used as footnote designations on the QC Summary Form.

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DATA QUALIFIERS FOR INORGANIC ANALYSES

[Revised 08/28/92]

For Use on the Analytical Data Reporting Forms	
B	*For CLP Analyses Only* -- Reported value is less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).
C	*For Routine, Non-CLP Analyses Only* -- Any constituent that was also detected in the associated blank whose concentration was greater than the reporting detection limit (RDL).
D	Presence of high levels of interfering constituents required dilution of sample which increased the RDL by the dilution factor.
E	Estimated value due to presence of interference.
H	Sample analysis performed outside of method-or client-specified maximum holding time requirement.
M	*For CLP Analyses Only* -- Duplicate injection precision criterion was not met.
N	Matrix spike recovery exceeded acceptance limits.
S	Reported value was determined from the method of standard addition.
U	*For CLP Reporting Only* -- Constituent was analyzed for but not detected (sample quantitation must be corrected for dilution and percent moisture).
W	*For AAS Only* -- Post-digestion spike for Furnace AAS did not meet acceptance criteria and sample absorbance is less than 50% of spike absorbance.
X, Y, or Z	Analyst-defined qualifier.
*	Relative percent difference (RPD) for duplicate analysis exceeded acceptance limits.
+	Correlation coefficient (r) for the MSA is less than 0.995.
For Use on the QC Data Reporting Forms	
a[1]	The spike recovery and/or RPD for matrix spike and matrix spike duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b[1]	The RPD cannot be computed because the sample and/or duplicate concentration was below the RDL.

[1] Used as footnote designations on the QC summary form.

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DATA QUALIFIERS FOR RADIOCHEMICAL ANALYSES

[Revised 04/05/96]

For Use on the Analytical Data Reporting Forms	
B	Any constituent that was detected in the associated method blank at a concentration was greater than the reporting detection limit (RDL).
C	The minimum detectable activity exceeded the RDL due to the residue weight limitations forcing a volume reduction.
D	Constituent detected in the diluted sample.
E	Constituent concentration exceeded the calibration or attenuation curve range.
F	*For Alpha Spectrometry Only*-- Full width half max exceeded the acceptance limits.
H	Sample analysis performed outside of method-specified maximum holding time requirement.
Y	Chemical yield exceeded acceptance limits.
For Use on the QC Data Reporting Forms	
*	QC data (i.e., percent recovery data for laboratory control standard and matrix spike; and RPD for replicate analyses) exceeded acceptance limits.
a[1]	The spike recovery and/or RPD for matrix spike and duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b[1]	The RPD cannot be computed because the sample and/or duplicate concentration was below the MDA.

[1] Used as foot note designations on the QC summary form.