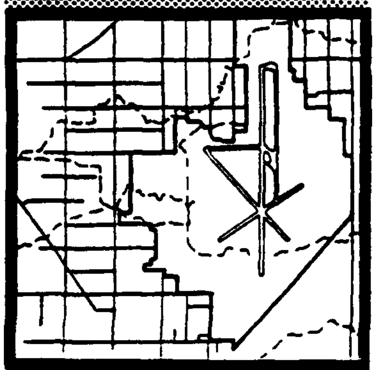
INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

McCLELLAN AIR FORCE BASE



PREPARED BY:
Radian Corporation
10395 Old Placerville Road
Sacramento, California 95827

OCTOBER 1991

OPERABLE UNIT B PRELIMINARY ASSESSMENT SUMMARY REPORT

VOLUME I: TEXT, APPENDIX A, & APPENDIX B (Part 1)

FINAL

PREPARED FOR:
McCLELLAN AFB / EM
McCLELLAN AFB, CALIFORNIA 95652-5990

Environmental Services Office/Environmental Restoration Division (ESO/ER)
United States Air Force Center For Environmental Excellence
Brooks Air Force Base, Texas 78235-5501

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INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

OPERABLE UNIT B PRELIMINARY ASSESSMENT SUMMARY REPORT

FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

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10395 Old Placerville Road
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USAF Contract No. F33615-87-D-4023, Delivery Order NO. 0012
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United States Air Force Center for Environmental Excellence
Mr. Patrick Haas (Technical Project Manager)
Environmental Services Office/Environmental Restoration Division (AFCEE/ESR)
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DEPARTMENT OF THE AIR FORCE

HEADQUARTERS SACRAMENTO AIR LOGISTICS CENTER (AFLC)
McCLELLAN AIR FORCE BASE, CALIFORNIA 95652-5990

REPLY TO ATTN OF: EMR

1 7 OCT 1991

SUBJECT: Operable Unit (OU) B Preliminary Assessment Summary Report - Final

TO: See Distribution

1. The referenced document is attached for your record (See Atch 1). Our responses to your comments had been sent to you earlier. This is a secondary document as per Section 7 of the Interagency Agreement (IAG). We are; however, finalizing the report as it is an important document that summarizes all the site data.

2. In addition to your comments on the subject report, we have also incorporated relevant comments on the OU A Preliminary Assessment Summary Report to improve the format of the report and define investigative procedures in more detail. Our responses to your comments are included in the appendixes of relevant site reports.

3. This document has been prepared for the United States Air Force for the purpose of aiding in the implementation of a final remedial action plan. The ongoing nature of the Remedial Investigation/Feasibility Study, also with the evolving knowledge of site conditions and chemical effects on the environmental and health, must be considered when evaluating this document, since subsequent facts may become known which may make this document premature or inaccurate. Acceptance of this document in performance of the contract under which it was prepared does not mean that the United States Air Force or the Department of Defense adopts the conclusions, recommendations, or other views expressed herein which are those of the contractor only and do not necessarily reflect the official positions of either department. The attached Radian document has been reviewed as matter involved in litigation and has been approved for release to the general public.

4. If your have any questions, please contact me at (916) 643-0531.

B. Hoda

BUD HODA
Project Officer

file - FDAC

1 Atch
Report

Distribution:
Cal-EPA (M. Malinowski)
EPA (L. Mitani)
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NOTICE

This report has been prepared for the Air Force by Radian Corporation for the purpose of aiding in the implementation of a final remedial action plan under the Air Force Installation Restoration Program (IRP). As the report relates to actual or possible releases of potentially hazardous substances, its release prior to an Air Force final decision on remedial action may be in the public's interest. The limited objectives of this report and the ongoing nature of the IRP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this report, since subsequent facts may become known which may make this report premature or inaccurate. Acceptance of this report in performance of the contract under which it is prepared does not mean that the Air Force adopts the conclusions, recommendations, or other views expressed herein, which are those of the contractor only and do not necessarily reflect the official position of the Air Force.

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This document presents a summary of preliminary assessment work done within Operable Unit B at McClellan AFB including a McClellan AFB General Information Document, Technical Memorandums and Preliminary Assessments for Operable Unit B Sites and Potential Release Locations, and Information Summary Sheets and maps for all Sites, Potential Release Locations, and Study Areas.

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PREFACE

Radian Corporation is the contractor for the RI/FS program at McClellan AFB, California. This work was performed for the Air Force Center for Environmental Excellence/Environmental Services Restoration (AFCEE/ESR) under Air Force Contract No. F33615-87-D-4023, Delivery Order 0012.

Key Radian project personnel were:

Nelson H. Lund, P.E. – Contract Program Manager
Jack D. Gouge' – Delivery Order Manager
William Knight – Project Manager
Richard Van Dyke – Project Director

Radian would like to acknowledge the cooperation of the McClellan AFB Office of Environmental Management. In particular, Radian acknowledges the assistance of Mr. Mario Ierardi, Mr. Bud Hoda, and Mr. Gerald Robbins.

The work presented herein was accomplished between September 1988 and September 1991. Mr. Patrick Haas was the Technical Program Manager, United States Air Force Center for Environmental Excellence.

Approved: ______________________
Nelson H. Lund, P.E.
Contract Program Manager

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EXECUTIVE SUMMARY

In support of ongoing Remedial Investigation/Feasibility Study (RI/FS) activities at McClellan Air Force Base (AFB), California, the Air Force conducted preliminary assessments of Sites, Potential Release Locations (PRLs), and any other currently or historically operating facilities within Operable Unit (OU) B at McClellan AFB. For convenience, any area assessed in this summary but not previously designated as a Site or PRL is referred to as a Study Area (SA). The assessment activities included:

- Review of aerial photography;
- Site visits and inspections;
- Records searches;
- Personnel interviews; and
- Review of previous investigations.

The objectives of this preliminary assessment work were to:

- Identify possible sources of soil, soil gas, surface water, and/or groundwater contamination within OU B;
- Collect and summarize available information for potential contaminant sources to determine if historic or current operations have affected the environment;
- Provide recommendations for further investigations or no further action at Sites/PRLs or SAs;
- Identify any immediate response needs including removal actions; and
- Provide data to support site prioritization and grouping.

To satisfy these objectives, information regarding current and historic site operations, waste management practices, waste characteristics, and contaminant migration pathways was compiled and assessed. For each of the 29 previously identified sites and locations in OU B, the compiled information has been reported in a Technical Memorandum or Preliminary Assessment document (Appendix B); information obtained on each study area was compiled in an Information Summary Sheet (Appendix C). To provide a consistent focus for future sampling and analysis efforts, summary sheets also were prepared for the previously identified sites and locations.

Recommendations and the rationale used for making each recommendation are presented for each Site, PRL, and SA. Of the 29 previously identified sites and locations, 24 are recommended for further investigation to determine if any contamination has been released (Table 5-1); 5 are recommended for no further action and removal from the list of PRLs (Table 5-2). Of the 33 newly-identified Study Areas, 19 are recommended for further investigation (Table 5-3); 14 had no evidence of contaminant releases and are recommended for no further investigation (Table 5-4). The investigations recommended for PRLs and SAs are intended to confirm or disprove the release of contaminants. For a number of PRLs and SAs, there is only the unconfirmed potential for contaminant release.

Site-specific recommendations for further investigations for sites and locations are presented in the Technical Memorandums and Preliminary Assessments for those sites (Appendix B). Site-specific recommendations for study areas are presented in the Information Summary Sheets for those areas (Appendix C).

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1.0 INTRODUCTION

This report summarizes the preliminary assessments of the Sites, Potential Release Locations (PRLs) and other currently or historically operating facilities in Operable Unit (OU) B at McClellan Air Force Base (AFB), California. The task of compiling information for preliminary assessments originated as part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP).

The objectives of this preliminary assessment work were to:

- Identify possible sources of soil and/or groundwater contamination within OU B;
- Collect and summarize available information for potential contaminant sources to determine if historic or current operations have affected the environment;
- Provide recommendations for further investigations or no further action at Sites/PRLs or Study Areas (SAs);
- Identify any immediate response needs including removal actions; and
- Provide data to support site prioritization and grouping.

Since the environmental investigation of McClellan AFB began in 1979, the terminology used to identify areas of contamination at the base has evolved. Initially, all of the areas thought to be possible sources of contamination were identified as *sites*. In 1985, the term *additional potential sources* was used to designate areas where additional information was needed to determine whether contaminants could have been released to the environment. In 1988, the *sites* thought to require remedial action were designated as *Confirmed Sites*; the remaining sites were renamed *Partially Studied Potential Release Locations (PSPRLs)*; and the additional potential sources were renamed *Unstudied Potential Release Locations (UPRLs)*. No distinction is made in this report between PSPRLs and UPRLs; they are all identified as *Potential Release Locations (PRLs)*. Confirmed Sites, and any other PRL with detected contamination from soil sample analyses, have now been designated as *Sites*.

During the early environmental investigations at McClellan AFB, the sites were grouped into four geographic areas: *Areas A, B, C, and D*. The boundaries of these areas evolved over the years as additional information was obtained. In 1989, McClellan AFB was divided into eight geographic *operable units (OUs)* to facilitate groundwater investigations at the base (Figure 1-1). In general, the boundaries of these operable units have been maintained for this assessment of potential contaminant sources. However, some boundaries were modified to more accurately reflect surface features of the OU (i.e., buildings and roads) (see Section 3.0, Historical and Current Activities). Figure 1-2 is a map of McClellan AFB showing the boundaries of OU B used in this assessment.

To ensure that all sources of contamination within OU B have been identified, a systematic search for possible contaminant sources was conducted. Areas within OU B that have not been previously evaluated as possible contaminant sources are referred to throughout this report as *SAs*. This designation simply refers to previously unstudied areas where hazardous materials were handled and/or stored. Study Areas which require further investigation for possible contamination are listed in Section 5, Conclusions and Recommendations.

This report summarizes the information compiled for the Sites, PRLs, and SAs within OU B at McClellan AFB. This report is organized in the following manner:

- Description of procedures used in this investigation (Section 2);
- Summary of historical and current activities in OU B (Section 3);
- Summary of the Operable Unit B investigation (Section 4);
- Conclusions and recommendations (Section 5);
- General background information about McClellan AFB (Appendix A);
- Site-specific Technical Memorandums and Preliminary Assessments for the previously studied sites and locations (Appendix B); and
- Information Summary Sheets for all sites, locations and study areas that have been identified (Appendix C).

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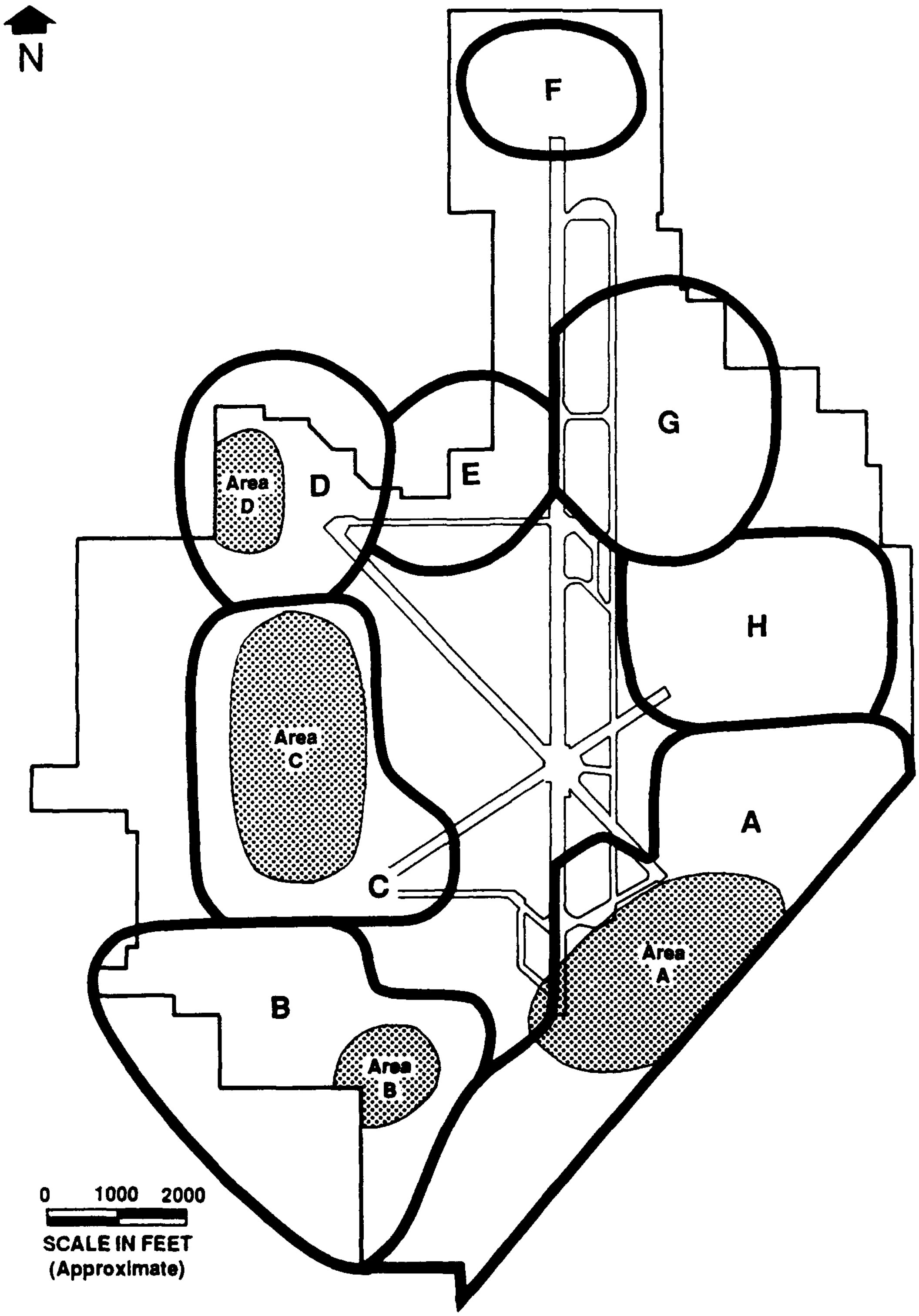

Figure 1-1. Approximate Boundaries of Operable Units and Former "Area" Designations.

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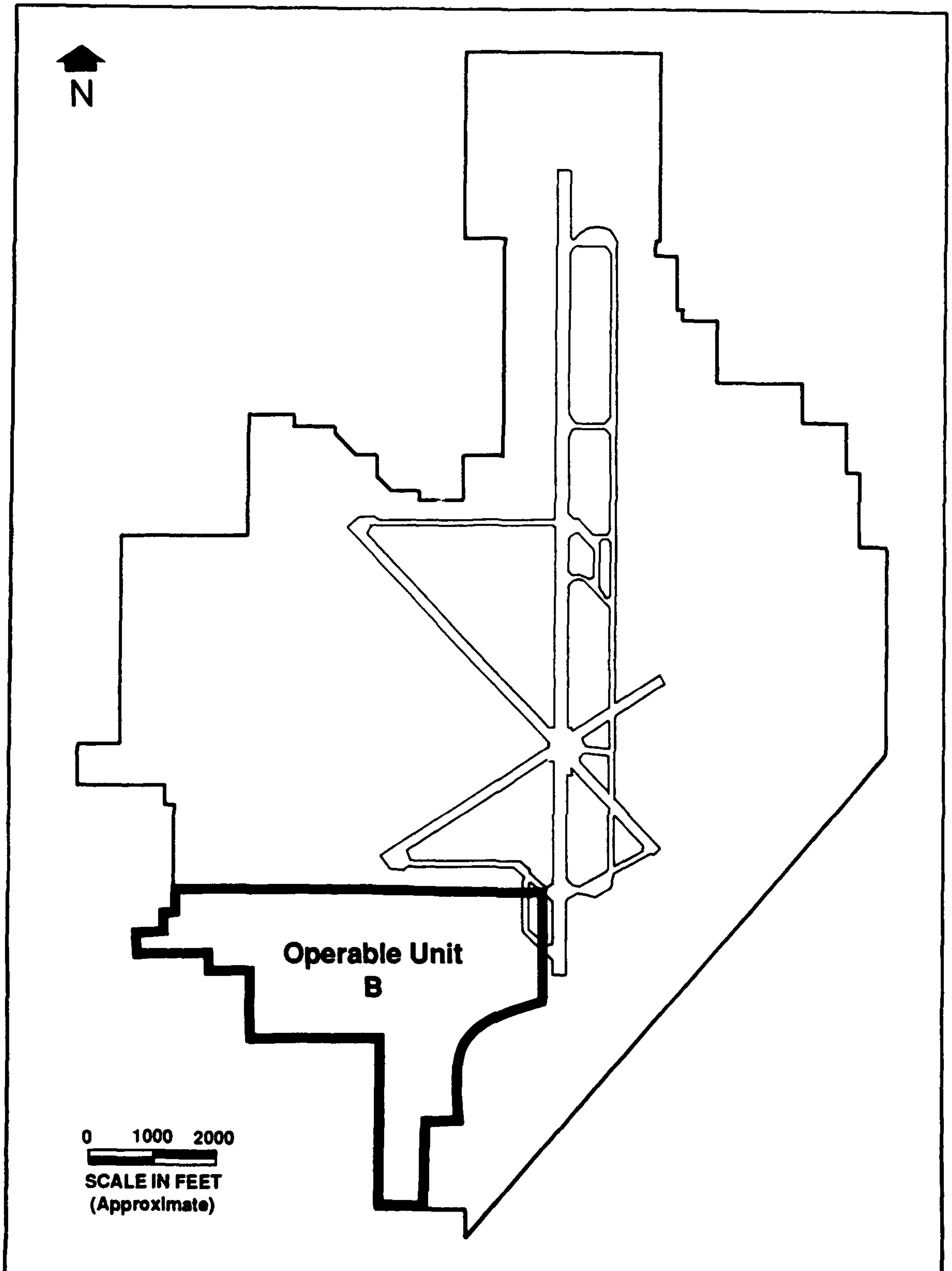

Figure 1-2. Approximate Area of OU B Included in Preliminary Assessment Investigation

2.0 PROCEDURES

The information included in this report was obtained during three separate investigations. During the *Preliminary Assessments/Site Files (PA/SF)* investigation, data were collected and examined for each previously identified Site and Potential Release Location (PRL) in Operable Unit (OU) B. Subsequently, a *records search* was conducted to identify any additional areas within OU B, including those associated with currently operating facilities, where hazardous materials have been used or handled. Based on the records search, *Study Areas* were identified and assessed.

Site-specific information which was used to prepare the preliminary Assessment report or the Information Summary Sheet was obtained from three primary sources: site inspections, file searches for historical waste management practices, and personnel interviews. The types of information obtained during the site inspection included the following:

- Building number/area description;
- Date of inspection;
- Inspector;
- Contacts (name, title, directorate, phone number);
- Current building operations information:
  - Operations
  - Dates of Operations
  - Materials handled/stored and method
  - Wastes generated and quantity
  - Disposal practices
  - Hazardous material containers and quantity
  - Release control features
  - Flooring characteristics
  - Drains/sumps/tanks use and location
  - Exterior use/features
- Historical operations information:
  - Building/area use
  - Exterior use
  - Dates of operations
  - Previous employees (potential contacts)
  - Materials handled
  - Wastes generated
  - Disposal practices

- -- Drains/sumps/tanks
- Detailed site map with inspector's notes.

McClellan Air Force Base (AFB) file search procedures included the following:

- Construction and schematic drawings were catalogued and included on an index list for cross referencing by building number and site/PRL/SA number.

- Previous McClellan AFB sampling and analysis data was accessed using the Environmental Management Master Sample Log Book which was then indexed by building number and site number.

- Bioenvironmental Engineering files were organized by building number and contained hazardous material data sheets in addition to other miscellaneous information on the types of hazardous materials handled in buildings on base.

- All pertinent file materials on the use, handling, or storage of hazardous materials were copied and included in the individual site/PRL/SA file.

Procedures used to obtain and conduct personnel interviews included:

- Potential interviewees were identified using the following primary sources:

  -- Requests from EM to various base directorates for lists of personnel who had worked at various facilities;

  -- Site inspection contacts and references;

  -- Bioenvironmental Engineering files; and

  -- Contact database for the project listing personnel interviewed and areas of base familiarity.

- During the initial interview, information regarding the interviewee's general knowledge of base operations, previous base workplaces, referrals for additional interviewees, and site familiarity was obtained.

- The types of information obtained on a specific site, PRL, or SA would be similar to that obtained during the site inspection as outlined above.

- Information from personnel interviews has been included in a contact database organized by data of interview, name of interviewee, building number/area, and site/PRL/SA number for future contact references.

The decision point in which a search for knowledgeable personnel is deemed complete is when all potential knowledgeable personnel from the sources listed above have been contacted and interviewed; however, it is not always possible to fill all data gaps.

Information obtained during site inspections is included within the various sections of the Preliminary Assessment Report or Information Summary Sheet, and copies of the site inspection notes are located in the site files.

2.1 PA/SF Investigation

The primary objective of the PA/SF investigation was to collect and summarize available information for the previously identified Sites and PRLs at McClellan Air Force Base (AFB), including the 29 sites or locations in OU B (Figure 2-1). The McClellan AFB files that were reviewed to obtain information for the PA/SF investigation are listed in Table 2.1. Procedures used for the file search are described in Section 2.0, Procedures. Previously collected data were reviewed and summarized, McClellan AFB personnel were interviewed, McClellan AFB files were inspected, site visits were conducted, and aerial photographs were reviewed. All of the site-specific information collected during this investigation is contained in the Site or Location Files prepared for each site. The Technical Memorandums for studied sites or locations and Preliminary Assessments for unstudied locations in OU B are presented in Appendix B.

2.2 Records Search

The records search was intended to identify previously uninvestigated areas in OU B that had any potential for being sources of contamination. Previous

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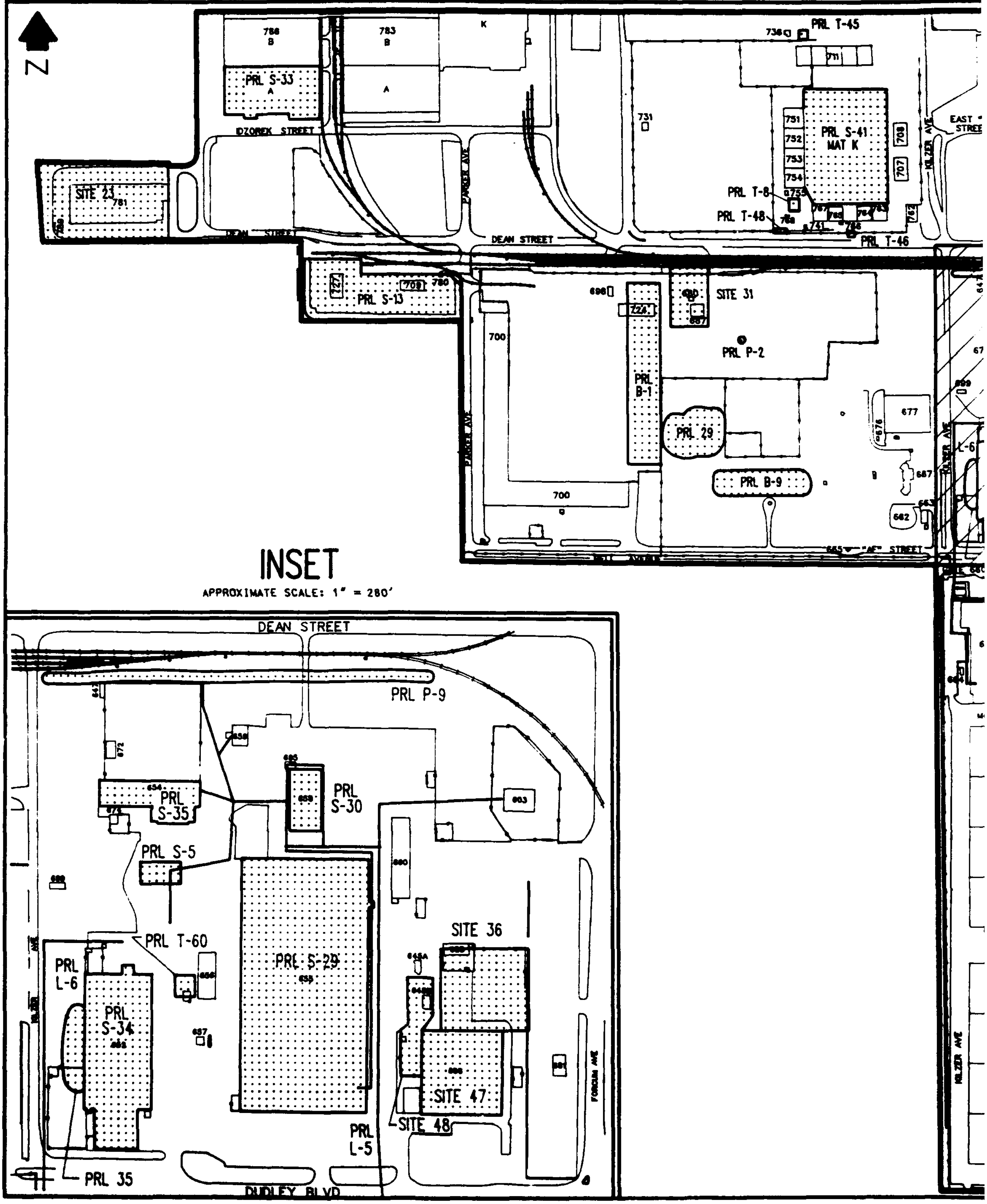

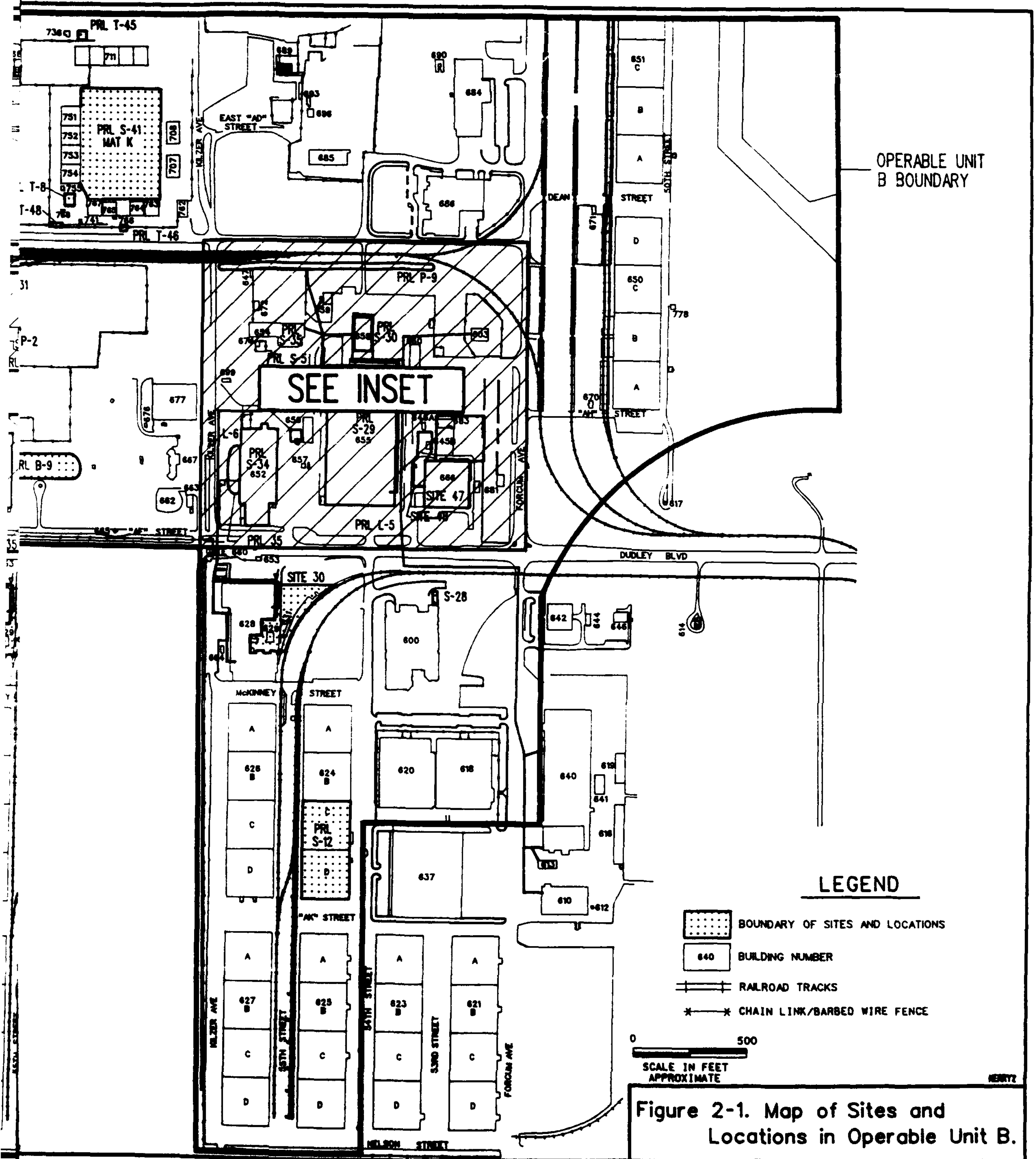

Figure 2-1. Map of Sites and Locations in Operable Unit B.

contractors' reports were reviewed, McClellan AFB personnel were interviewed, McClellan AFB files were inspected, and aerial photographs were reviewed. Table 2-1 lists the sources of information reviewed during the records search; Table 2-2 lists the aerial photographs reviewed.

2.3 Study Area Assessment

Thirty-three Study Areas were identified during the records search (Figure 2-2). Criteria used to select Study Areas included:

- Evidence of historical or current use or handling of hazardous materials (e.g., interview information pertaining to the use of hazardous materia-ls);

- Areas with contaminants detected in previous investigations; and

- Indications in aerial photographs of areas of soil disturbance or operations that may have had the potential for contributing to contaminant release.

Only those areas within OU B that were identified during this assessment were investigated (Figure 2-2). Criteria used to identify the Study Areas were similar to those applied to the Confirmed Sites and PRLs.

Study Areas were assessed in a manner similar to the previously identified Sites and PRLs; however, their potential for contaminant release cannot be defined until additional subsurface data are obtained. Information obtained in the Study Area investigation will help determine the need for further investigation by identifying any potential contaminant sources. Assessments of the Study Areas were conducted using data from sources listed in Table 2-1, including aerial photographs, McClellan AFB records, previous investigations, interviews, and site inspections. Information Summary Sheets presenting pertinent assessment data for the Study Areas are included in Appendix C. To help evaluate and compare the Study Areas to the previously identified and assessed Sites and PRLs and to provide a consistent focus for future sampling and analysis efforts, Information Summary Sheets were also prepared for the previously identified Sites and PRLs and are contained in Appendix C.

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TABLE 2-1. SOURCES OF INFORMATION USED TO IDENTIFY STUDY AREAS AND PREPARE PRELIMINARY ASSESSMENTS

Type of Information
Civil Engineering Drawings[1]
• Composite Utilities Drawings
• Construction Drawings
Hazardous Material Data Sheets[2]
• Historical Files
• Current Files
Environmental Management Compliance Documents[3]
• Historical and Current Site Files
• Sample Log Book
• Analytical Data
Previous Reports
• EG&G Idaho Underground Storage Tank Report[4]
• EG&G Idaho Industrial Wastewater Collection System Characterization Report[5]
• CH2M Hill 1981 Installation Restoration Program Phase I Records Search[6]
• Water Pollution and Verification of Industrial Waste Drains[7]
• McLaren Environmental Area B Reports[8]
• McClellan AFB Brunner & Zipfel Report[9]
Building/Site Inspections
Aerial Photograph Review[10]
• Years 1928 through 1989
Interviews with McClellan AFB Personnel

1 McClellan AFB, Civil Engineering Division.
2 McClellan AFB, Directorate of Environmental Management, Bioenvironmental Engineering Division Files.
3 McClellan AFB, Directorate of Environmental Management, Compliance Division (EMC) Files.
4 EG&G Idaho, 1987.
5 EG&G Idaho, 1988.
6 CH2M Hill, 1981.
7 McClellan AFB, Environmental Industrial Safety Branch (MAQV), 1985.
8 McLaren, 1986.
9 McClellan AFB, 1981.
10 (See Table 2-2.)

TABLE 2-2. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1989) REVIEWED DURING THE ASSESSMENT OF STUDY AREAS

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 1000' S
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1000' S
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 1000' S
1947	U.S. Geological Survey	1" = 1000' S
1949	Whittier College	1" = 1000' S
1951	Whittier College	1" = 770'
1953	U.S. Department of Agriculture, ASCS[1]	1" = 1000' S
1955	U.S. Army Corps of Engieers, Sacramento District Office	1" = 1690'
1957	U.S. Department of Agriculture, ASCS	1" = 1000' S
1962	McClellan AFB, History Office	1" = 150'
1963	Cartwright Aerial Surveys	1" = 1000' S
1965	McClellan AFB, History Office	1" = 150'
1966	U.S. Geological Survey	1" = 1000' S
1968	Cartwright Aerial Surveys	1" = 1000' S
1971	Cartwright Aerial Surveys	1" = 1000' S
1972	Cartwright Aerial Surveys	1" = 1000' S
1973	Radman Aerial Surveys	1" = 1000' S
1974	Cartwright Aerial Surveys	1" = 1200' S
1975	Radman Aerial Surveys	1" = 1000' S
1976	Cartwright Aerial Surveys	1" = 1000' S
1978	Cartwright Aerial Surveys	1" = 2000' S
1979	Radman Aerial Surveys	1" = 1000' S
1981	Cartwright Aerial Surveys	1" = 1000' S
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000' S
1987	Cartwright Aerial Surveys	1" = 1000' S
1988	Cartwright Aerial Surveys	1" = 400'
1989	Cartwright Aerial Surveys	1" = 1000' S

[1] United States Department of Agriculture, Agricultural Stabilization and Conservation Service.

S = Stereo coverage.

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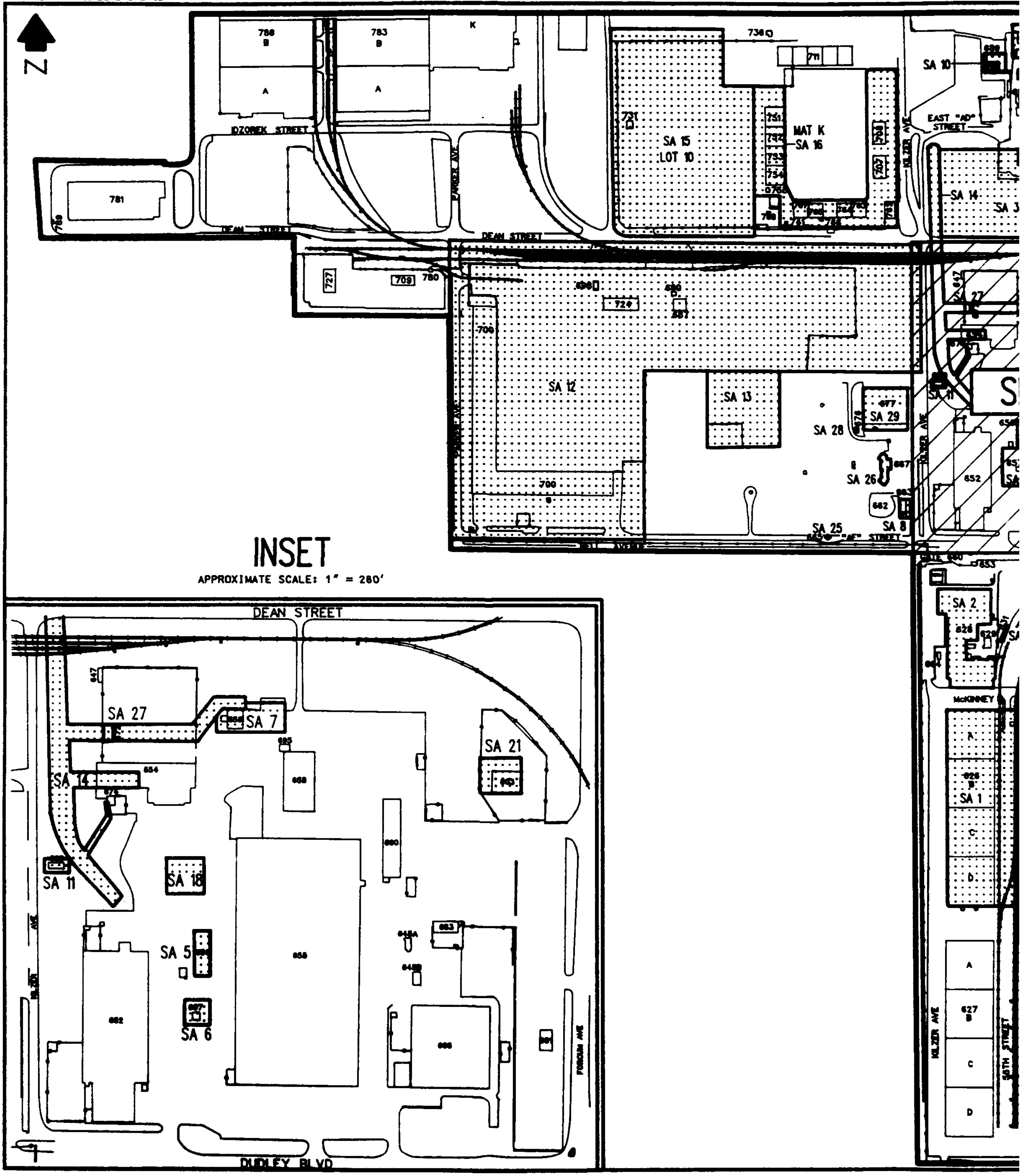

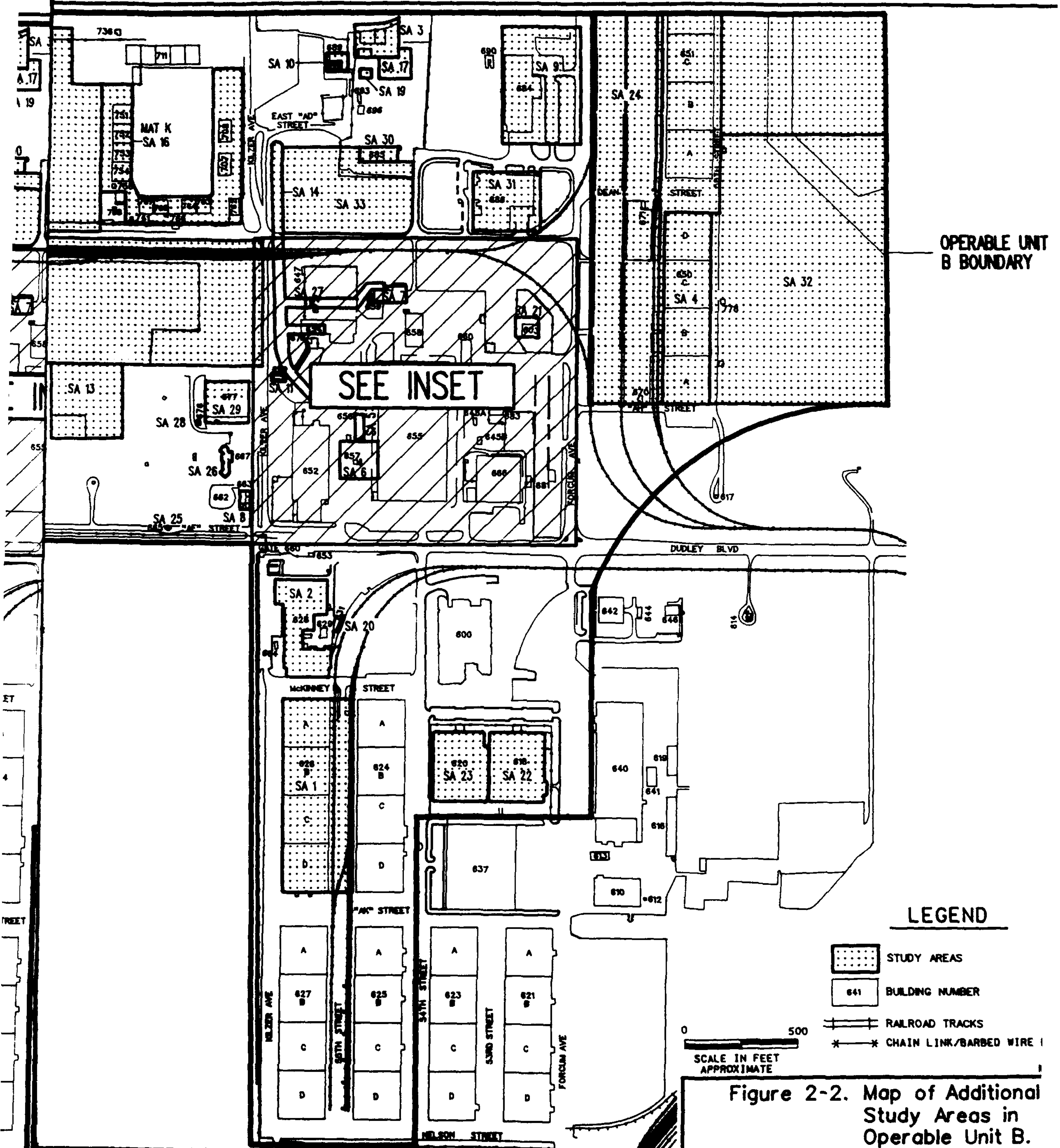

Figure 2-2. Map of Additional Study Areas in Operable Unit B.

Criteria used to evaluate the Study Areas and make recommendations for further action were also similar to that of the Sites and PRLs and included:

- Historical or current hazardous material use, handling, or disposal;
- Documented contaminant release;
- Confirmed soil contamination from previous sampling and analysis supporting ongoing base activities; and
- Any other evidence of potential release (e.g., from aerial photography).

Based on these criteria, Study Areas and PRLs are recommended for no further action if no evidence of hazardous material use or contaminant release has occurred or if previous investigations showed no contamination. Soil gas sampling results or ground penetrating radar investigations were not available for any of the Study Areas assessed during the OU B preliminary assessment investigation.

3.0 HISTORICAL AND CURRENT ACTIVITIES

This section describes the development of Operable Unit (OU) B and the historical and current activities within OU B. It provides a brief overview of the activities that may have led to the release of contaminants to the environment. Operable Unit B is an area historically used for maintenance and storage activities. Some of the activities in the area that did not require the storage, handling, or use of hazardous materials have been included in this report in the interest of completeness. For reference, Figure 3-1 shows the current features and boundaries of OU B.

Development of OU B began shortly after the dedication of McClellan Air Force Base (AFB) in 1939. Before that, the area consisted primarily of undeveloped grassland. Most of the military and industrial development took place from 1940 through 1970.

In the mid-1940s, the eastern half of OU B was used predominantly for indoor and outdoor storage. By 1946, eight large warehouses had been built: Buildings 620, 622, 624, 625, 626, and 627 located in the area south of Dudley Boulevard and east of Kilzer Avenue; and Buildings 650 and 651 east of Forcum Avenue and north of Dudley Boulevard (see Figure 3-1). Building 652, an automotive repair shop, was built by 1946 and was the first industrial facility to operate in OU B.

Three outdoor storage areas in the central and northeastern sections of OU B were in use by the mid-1940s. Lot 1 (between Forcum Avenue and Buildings 650 and 651) and the area bounded by Forcum Avenue, Dudley Boulevard, Dean Street, and Building 652 were used for material storage. The area north of Dean Street, between Kilzer Avenue and Forcum Avenue, was used for aircraft parking. In later decades, this area was used for material storage.

Most of the industrial buildings in OU B were constructed during the 1950s, in the area bordered by Kilzer Avenue, Dudley Boulevard, Forcum Avenue, and Dean Street (see Figure 3-1 inset). Buildings 655, 656, 657, 658, 659, and 666 were all constructed during the 1950s. These buildings were used for aircraft and automotive maintenance, except Building 666, which was a plating shop. Industrial Wastewater Treatment Plants (IWTPs) Nos. 2 and 4 began operating in the middle of the decade. Building 628, a laboratory, was built between 1955 and 1957 just south of Dean Street.

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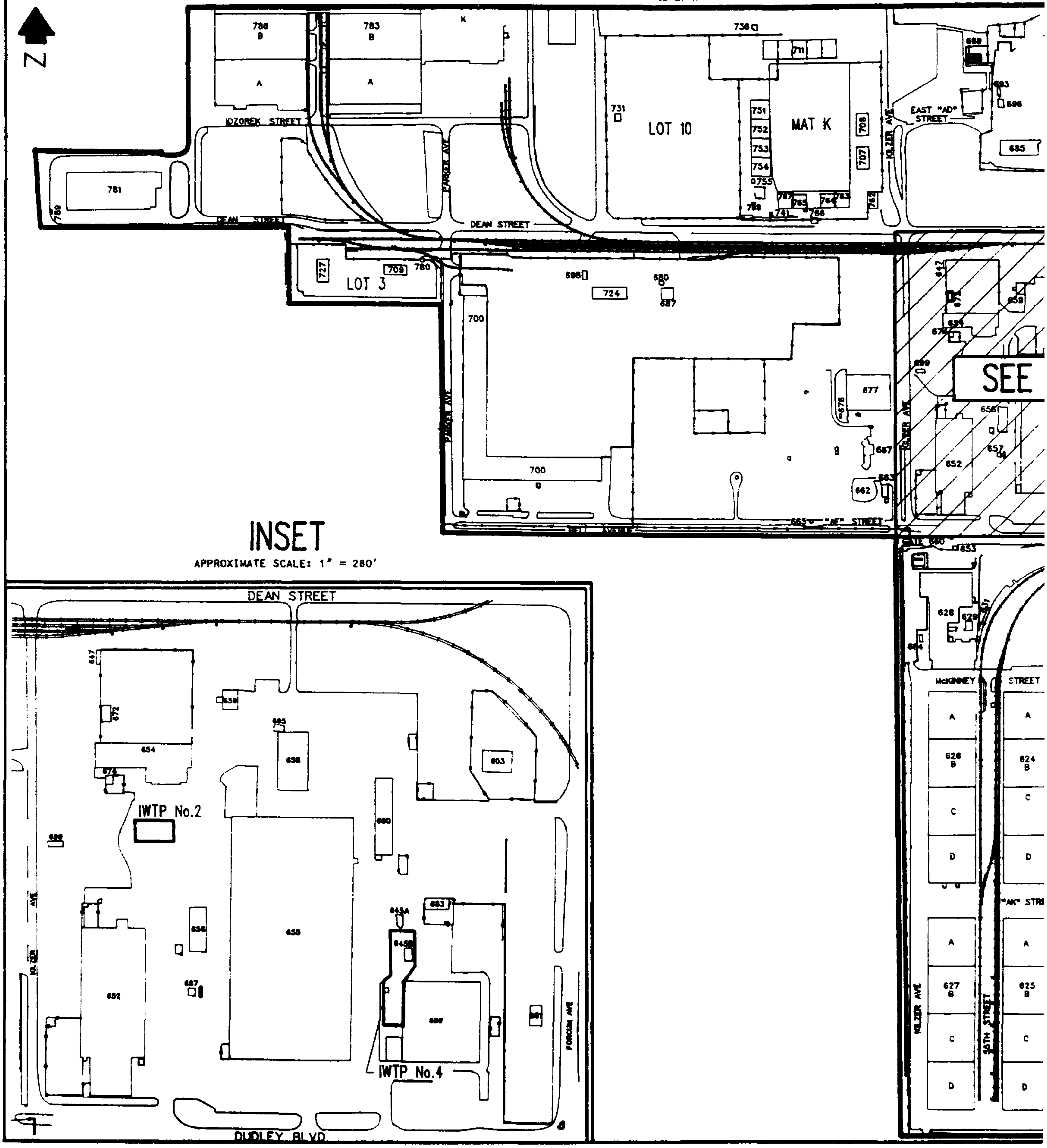

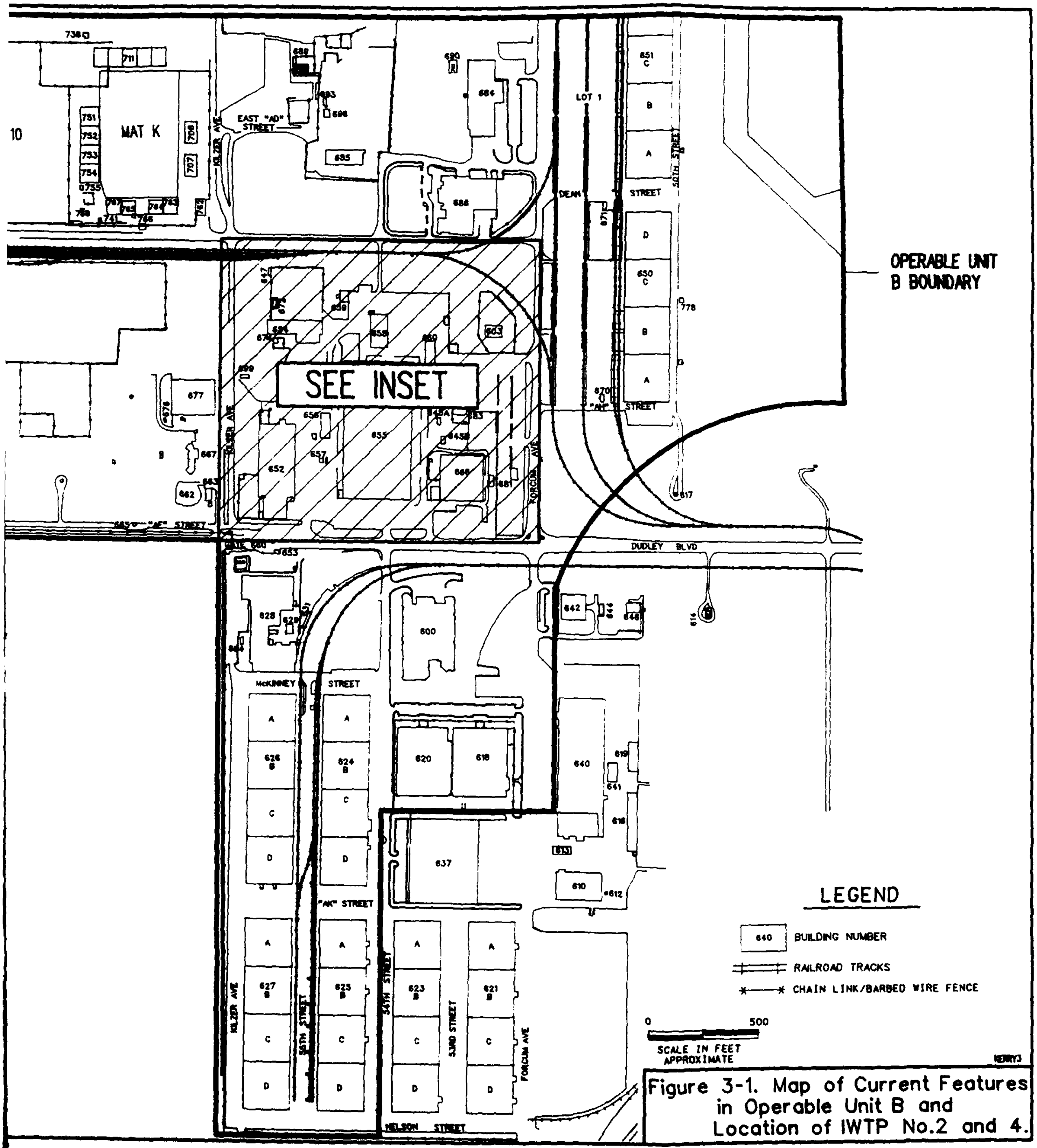

Figure 3-1. Map of Current Features in Operable Unit B and Location of IWTP No.2 and 4.

The western half of OU B was first used for storage during the 1950s. Mat K and Storage Lot 10 were paved and used for aircraft parking. Storage Lot 3 was also in use by the mid-1950s. A disposal pit on the far western side of OU B, where Building 781 presently stands, was in use in the late 1950s.

In the 1960s, the area west of Kilzer Avenue and south of Dean Street was first developed. Building 700, a storage facility, was built by 1962. The area northeast of the building as far east as Kilzer Avenue was used for material storage and as a soil holding area starting in the early 1960s. A refuse incinerator, adjacent to the north wall of Building 687, operated between 1963 and 1968. By the end of the 1960s, most of the development within OU B was complete.

Several changes took place during the 1970s and 1980s. In the early part of the 1970s, Buildings 684 and 685 were constructed north of Dean Street and east of Kilzer Avenue, an area previously used for open storage. Building 781 was also built at the western boundary of the base, over a former disposal pit. Industrial Wastewater Treatment Plant No. 2 ceased operating in 1974 and was dismantled in 1976. During the 1980s, the portion of OU B south of Dean Street and east of Kilzer Avenue was redeveloped. Two of the six warehouses were demolished by 1982, and Buildings 600, 618, and 620 were constructed in their place.

Three major industrial facilities were taken out of operation during the 1980s. Building 666 and IWTP No. 4, which treated waste from Building 666, were dismantled in 1988. Building 628, the research laboratory, was also closed in 1988. During 1989, Building 628 was being decommissioned, after which it will be reoccupied. A field investigation is being conducted as part of the decommissioning process.

In OU B, most of the buildings, constructed for use as maintenance facilities or storage warehouses, continue to be used for those purposes. Lots 1, 3, and 10 continue to be used for open storage.

4.0 SUMMARY OF THE OPERABLE UNIT B INVESTIGATION

This section summarizes information on the six Sites and 23 Potential Release Locations (PRLs) that were identified in investigations from 1979 to 1989. Thirty-three Study Areas (SAs) were identified in Operable Unit (OU) B for preliminary assessment. Criteria used to assess the additional SAs were similar to those used to assess PRLs. Assessment of the potential for contaminant release from PRLs and SAs is based on the available data. The purpose of this section is to categorize the Sites, PRLs, and SAs in OU B, to provide a focus for ongoing remedial investigations. Table 4-1 (page 4-12) lists all of the Sites, PRLs, and SAs in OU B with descriptions of the operations, years of operation, and types of hazardous materials handled. Information Summary Sheets for each of the Sites, PRLs, and SAs are contained in Appendix C. Figure 4-1 shows the boundaries of each Site, PRL, and SA in OU B.

The following sections describe and categorize the Sites, PRLs, and SAs by operation, types of hazardous materials handled, and types of contaminants detected in the soil, if any.

4.1 Operations

Based on the available operational information, the OU B locations and facilities have been grouped into the following categories:

- Open Storage Lots;
- Warehouses;
- Waste Disposal and Treatment Areas;
- Maintenance Facilities;
- Underground Facilities;
- Plating Shop Area; and
- Laboratories.

Figures 4-2 and 4-3 illustrate each Site, PRL, and SA by category.

Open Storage Lots and Warehouses

Open storage lots and warehouses are spread throughout OU B and occupy approximately half of its surface area (Figure 4-2). The areas where hazardous

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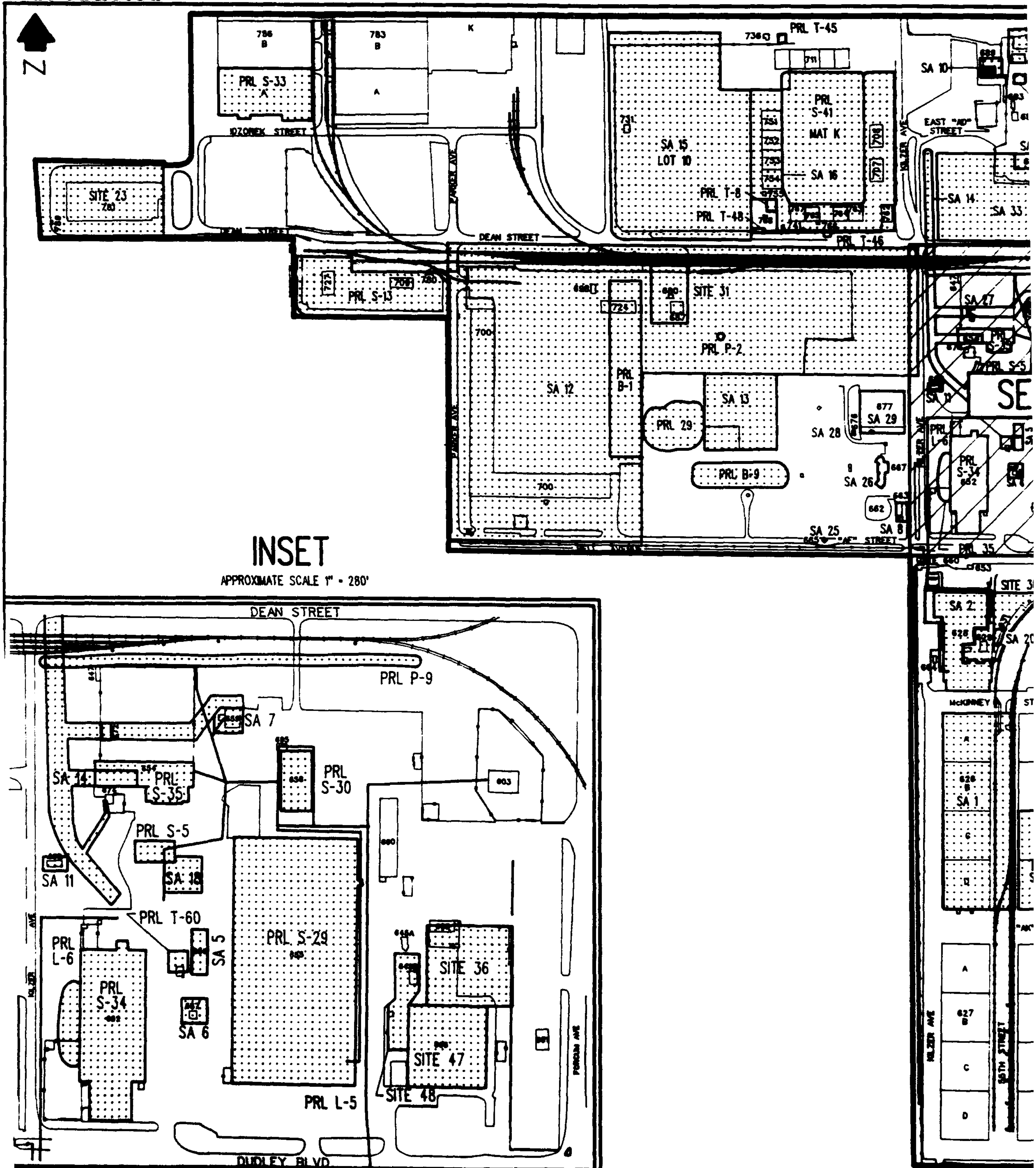

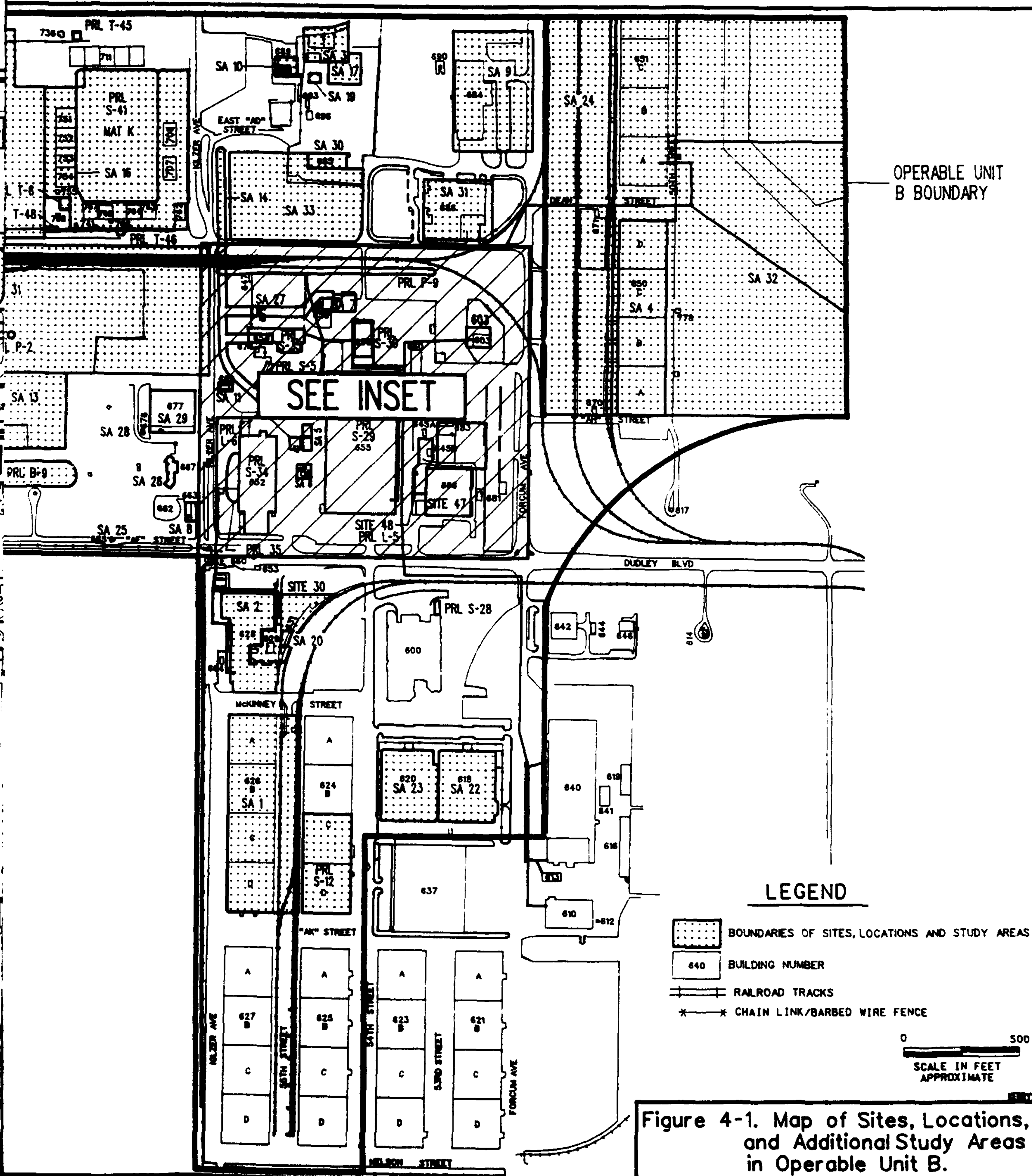

Figure 4-1. Map of Sites, Locations, and Additional Study Areas in Operable Unit B.

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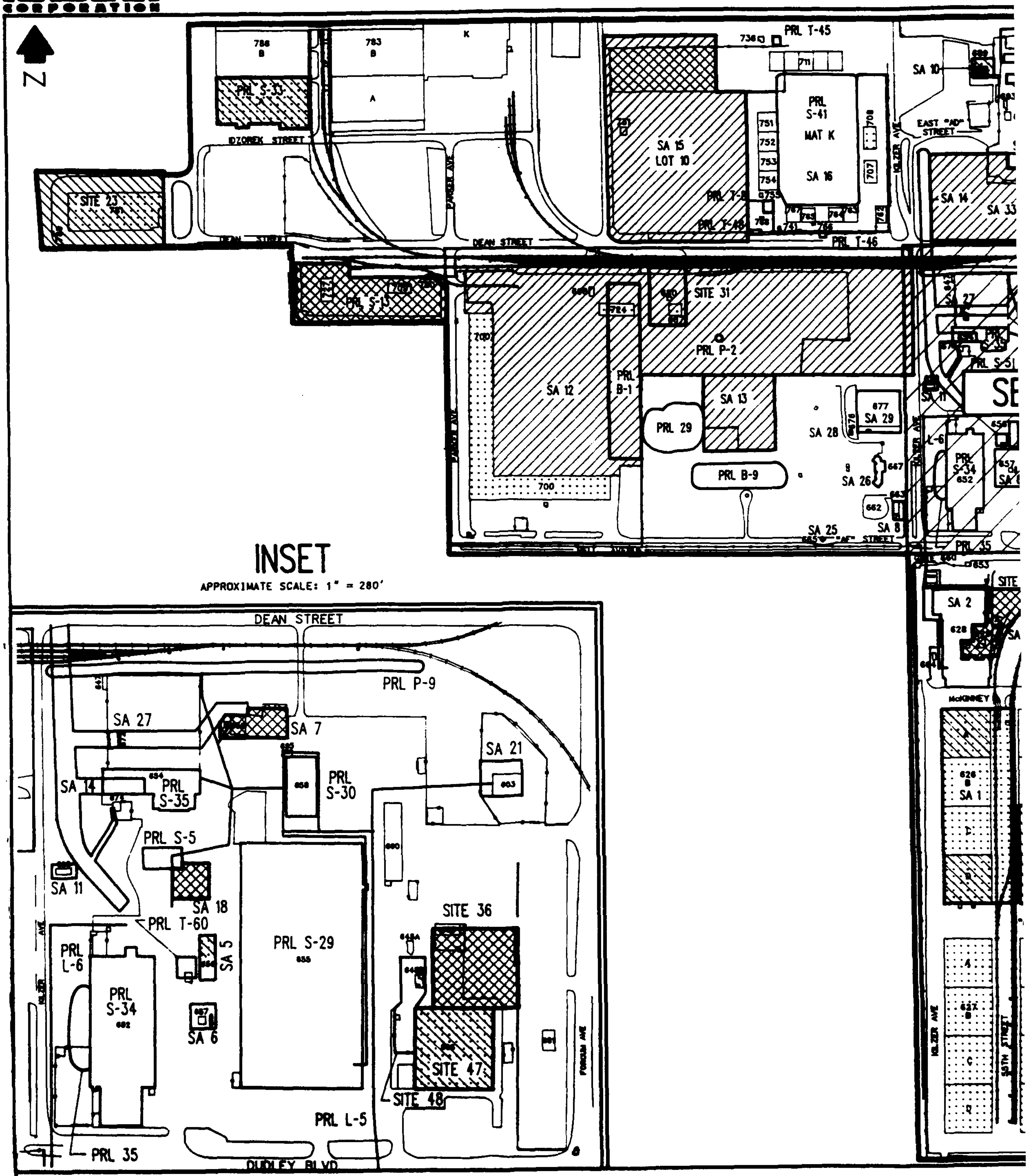

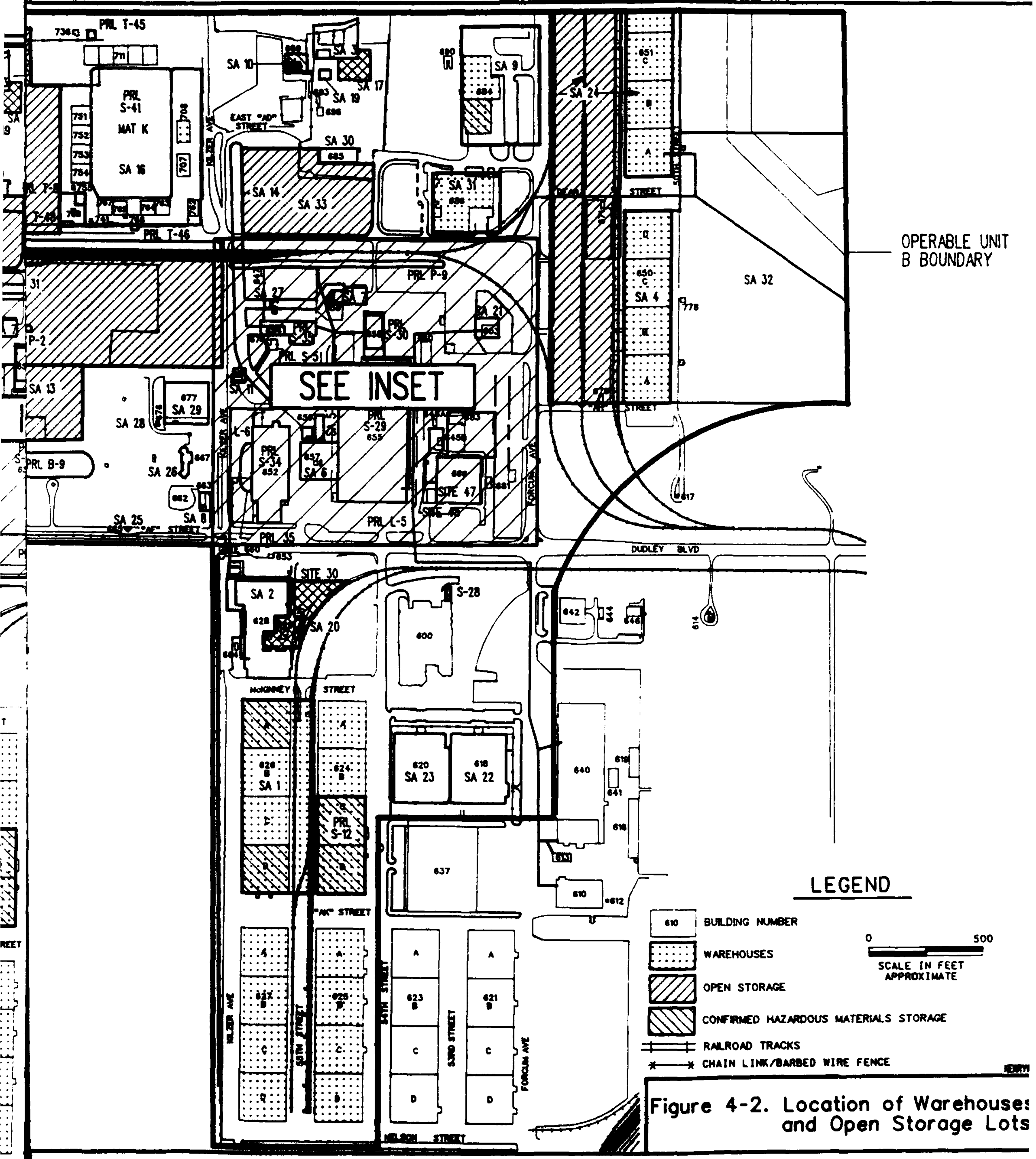

Figure 4-2. Location of Warehouses and Open Storage Lots

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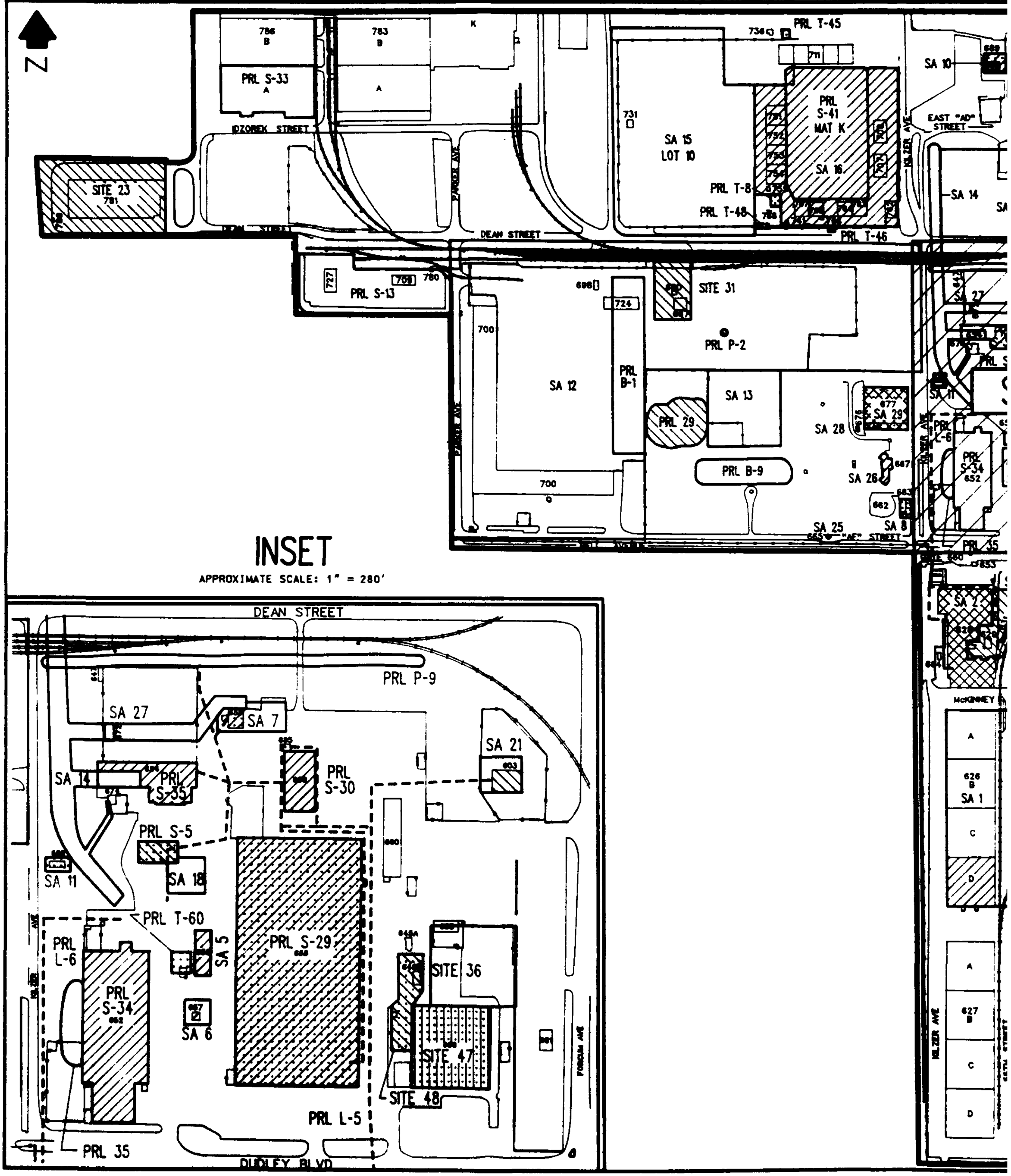

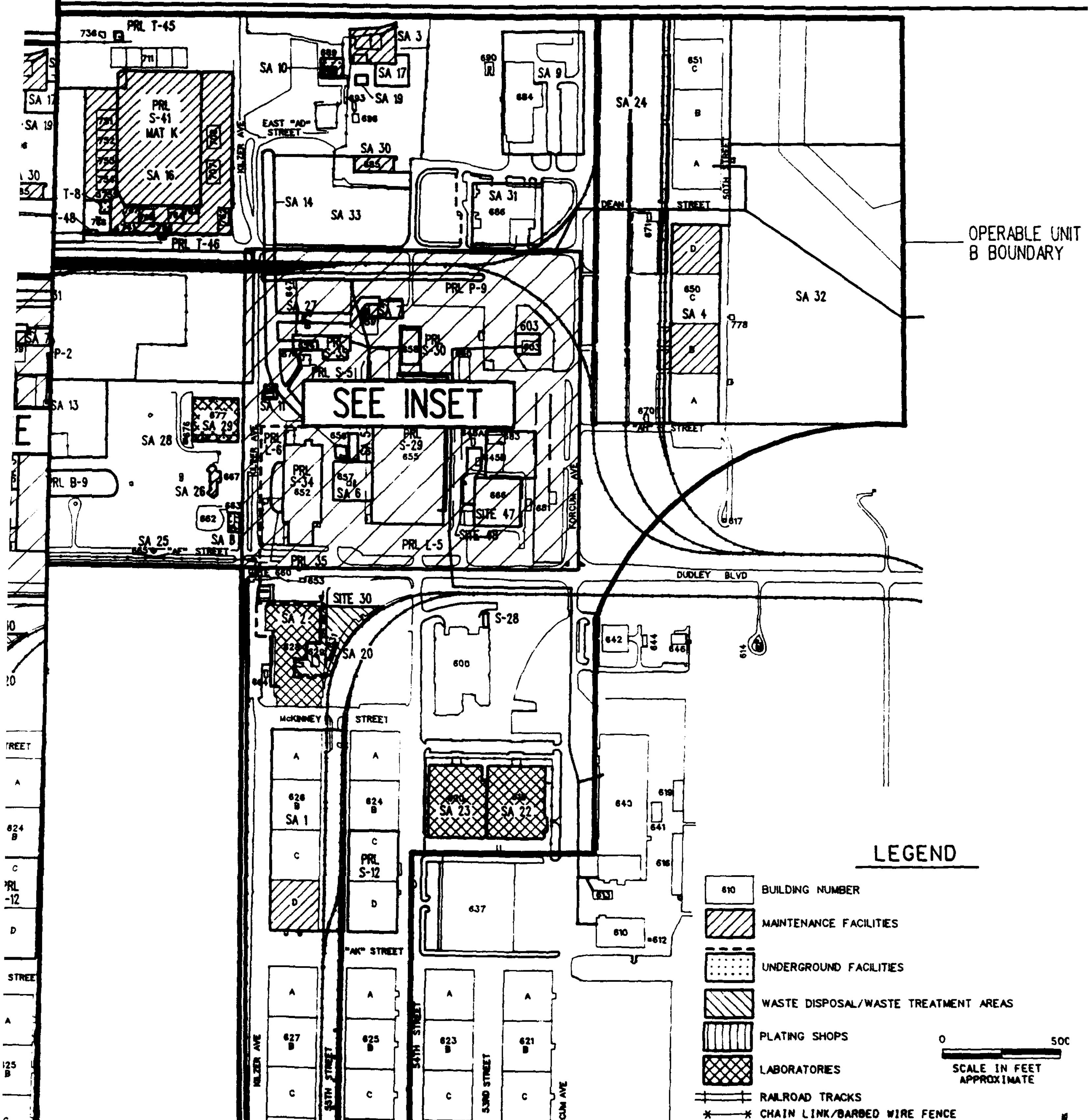

Figure 4-3. Location of Industrial Facilities and Waste Disposal/Treatment Are

material storage has been confirmed are specifically identified on Figure 4-2. The remaining storage areas are not known to have been hazardous material storage facilities.

Waste Disposal Areas and Treatment Facilities

Four historic waste disposal areas are located in OU B (Figure 4-3). The burial pit (CS 23) located along the western edge of McClellan Air Force Base (AFB) operated between 1957 and 1971. Potential Release Location 30 (east of the Building 628 laboratory) was used as a disposal area for laboratory chemicals between approximately 1960 and 1971. Potential Release Location 29 was reportedly used to bury aircraft generators, and PRL P-2 was reportedly used to dispose of oil; however, these reports have not been confirmed.

Three historic treatment facilities were located in OU B (Figure 4-3). A refuse incinerator (Site 31) adjacent to Building 687 operated between 1963 and 1968. Industrial Wastewater Treatment Plant (IWTP) No. 2 (PRL S-5) and IWTP No. 4 (Site 48) operated in OU B until they were dismantled in 1976 and 1980, respectively. Industrial Wastewater Treatment Plant No. 2 treated wastewater generated from buildings in the vicinity of Building 655 (i.e., Buildings 652, 655, and 658). Industrial Wastewater Treatment Plant No. 4 treated wastewater generated in the Building 666 plating shop.

Background information regarding treatment and waste disposal practices are included in the individual Preliminary Assessment Reports for Sites 23, 31, and 48 and PRLs P-2, S-5, 29 and 30.

Maintenance Facilities

Most of the aircraft and vehicle maintenance facilities are centered around the Building 655 area (Figure 4-3) and include a paint-stripping washrack, vehicle maintenance shops, a steam boiler plant, and vehicle fueling/defueling areas. The maintenance facilities surrounding Building 655 have operated since the 1950s. The two maintenance facilities that are not located in the vicinity of Building 655 are the aircraft maintenance hangars located on the perimeter of Mat K (PRL S-41) and the washracks located near Building 688 (SA 3 and SA 10).

Underground Facilities

The underground facilities include the Industrial Wastewater Line (IWL) that runs through the central portion of OU B and the underground storage tanks located throughout OU B (Figure 4-3). The portion of the IWL delineated as PRL L-6 historically collected laboratory wastewater from Building 628; this portion of the IWL line is no longer used because Building 628 is being decommissioned. The portion of the IWL delineated as PRL L-5 collects wastewater from 10 buildings located near Building 655. In 1988, EG&G Idaho, Inc. leak-tested portions of the IWL in OU B and found a number of leaks. As a result of those findings, PRL L-5 and PRL L-6 were added to the Site-PRL list. Most of the leaks found in the operating IWL at PRL L-5 have been repaired. To date, leaks in PRL L-6 have not been repaired.

The OU B underground storage tanks are generally located adjacent to or beneath maintenance facilities and historical Industrial Wastewater Treatment Plants. Fifteen tanks in OU B were assessed as PRLs and are identified as underground facilities in Figure 4-3.

Plating Shop and Laboratories

The location of the plating shop (Building 666) and the laboratories (Buildings 618, 620, 628, and 677) in OU B are shown in Figure 4-3. Situated in the central portion of OU B, the plating shop operated between 1957 and 1980. The building was dismantled in 1988. The chemistry/radionuclide laboratory in Building 628 was used for research and chemical analysis and generated hazardous materials. Building 677 is an equipment calibration laboratory, and Buildings 618 and 620 are software and electronics laboratories; these three laboratories generate very little or no hazardous waste.

4.2 Materials Handled/Stored

Information gathered during the OU B investigations was used to identify, whenever possible, the specific hazardous materials handled or stored at each OU B location and facility. The specific hazardous materials identified are listed on the respective Information Summary Sheets (Appendix C). The materials handled or stored at each location and facility are categorized by type (e.g., acids and bases, fuels and oils, polychlorinated biphenyls [PCBs]) in Table 4-2. Although these materials were used or stored in the various facilities, they were not necessarily released to the environment.

TABLE 4-2. MATERIALS HANDLED AT SITES, LOCATIONS, AND STUDY AREAS IN OU B

Site/PRL/SA No.	Fuels and Oils	Solvents/ Paints	Acids/ Bases	Heavy Metals	PCBs	Radionu- clides	Burn Residues	Cyanide Compounds
Site 23	C	C	C	C			H	
Site 30		C	C			H		
Site 31							H	
Site 36		H	H	H				H
Site 47	H	H	H	H				H
Site 48			H	H				H
PRL 29					H		H	
PRL 35[1]								
PRL B-1[2]								
PRL B-9[2]								
PRL L-5	C	C	C	C				
PRL L-6		H		H		H		
PRL P-2[2]								
PRL P-9		H	H	H				H
PRL S-5	H	H		H				
PRL S-12					C			
PRL S-13[3]	C	C	C	C	C			C
PRL S-28	H	H						
PRL S-29	H	C			H			
PRL S-30	H	C	H					
PRL S-33	H	H	H					
PRL S-34	H	H						
PRL S-35	C	C						
PRL S-41	C							
PRL T-8	C							
PRL T-45	H							
PRL T-46	H	H						
PRL T-48	C							
PRL T-60	H							
SA 1[4]	C	C	C					
SA 2	H	H	H	H		H		
SA 3[2]								
SA 4[5]	H	C						
SA 5	C	C						
SA 6	C							

(Continued)

TABLE 4-2. (Continued)

Site/PRL/SA No.	Fuels and Oils	Solvents/ Paints	Acids/ Bases	Heavy Metals	PCBs	Radionu-clides	Burn Residues	Cyanide Compounds
SA 7	C	C						
SA 8	C							
SA 9[6]	C	C	C					
SA 10[7]								
SA 11	H							
SA 12	C	C	C		C	C	C	
SA 13					C			
SA 14	H	H		H				
SA 15		H						
SA 16	C							
SA 17	H							
SA 18	H							
SA 19[2]								
SA 20[4]		C						
SA 21	C	C						
SA 22[2]								
SA 23		C	C					
SA 24[1]								
SA 25[2]								
SA 26[2]								
SA 27[1]								
SA 28[2]								
SA 29	C	C		C		C		
SA 30	C	C						
SA 31		C						
SA 32[2]								
SA 33[2]								

[1] No hazardous materials handled.
[2] Materials handled unknown.
[3] Poisons currently stored.
[4] Compressed gas cylinders currently stored.
[5] Pesticides and herbicides historically stored.
[6] Explosives currently stored.
[7] Pesticides and herbicides currently stored.

NOTES: H = Materials that were only handled historically.
C = Materials which continue to be handled.
PRL = Potential Release Location
SA = Study Area

Fuels, oils, and solvents are the principal types of materials handled historically or currently within the various facilities. While acids and bases were in widespread use historically, they are currently used in only a few facilities (see Table 4-2). Toxic metals were historically used at 12 facilities and are currently used or stored in three: Buildings 677, 781, and Lot 3 (PRL S-13). Polychlorinated biphenyls historically were used or handled at five locations and facilities; currently, PCBs are handled at PRL S-12, PRL S-13, and SA 12 in Building 724. Historically, burn residues were generated or stored in four areas located near Building 700 (SA 12). No burn residues are currently generated in OU B. Cyanide compounds were historically used in the Building 666 plating shop (Site 47) and adjacent areas (the old storage area, Site 36, and the old Industrial Wastewater Treatment Plant, Site 48). With the exception of the hazardous materials storage lot (PRL S-13) in the western portion of OU B, the handling of cyanide compounds in OU B appears to have ceased.

4.3 Areas of Confirmed Soil Contamination and Suspected Contaminant Releases

Soil samples have been collected in OU B as part of the investigations of Sites and PRLs and in preparation for construction projects in OU B. Table 4-1 identifies the Sites and SAs where soil contamination has been confirmed. The specific contaminants detected at each Site and SA are identified in the Information Summary Sheets contained in Appendix C. In Table 4-3, the contaminants detected have been categorized into the following chemical classes: volatile organic compounds (VOCs), semivolatile organic compounds, toxic metals, and PCBs.

Based on the analytical soil data and historical information contained in Appendix C and summarized in Tables 4-1 and 4-3, the areas of the highest levels of confirmed soil contamination are:

- Building 666 (the old plating shop [Site 47]) and adjacent areas (the old Industrial Wastewater Treatment Plant No. 4 [Site 48] and a storage area [Site 36]) at which 10 different VOCs were detected in soil samples from depths of 9.5 to 80 feet below ground surface (BGS);

- The former landfill along the western base boundary (Site 23) where ten VOCs and four semivolatile organic compounds were detected in soil samples from depths of 4.5 to 70 feet BGS;

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TABLE 4-3. SITES AND STUDY AREAS WITH CONFIRMED SOIL CONTAMINATION

Site/PRL/SA	Volatiles	Semivolatiles	PCBs	Cyanide	Oil and Grease
Site 23	X	X			X
Site 30	X	X			X
Site 31					X
Site 36	X	X			X
Site 47	X	X			X
Site 48	X	X		X	
SA 3	X	X			
SA 9	X				
SA 12	X	X	X		2

SA = Study Area

- The Building 628 research laboratory (SA 2) and the open lot east of the laboratory (Site 30), where six VOCs were detected in soil samples from depths of 24 to 60 feet BGS; and

- The Building 700 storage area (SA 12) where PCB contamination was detected in soils from depths of 0-10 inches BGS.

Lower concentrations of soil contamination have been confirmed at and SAs 3, 9, and 12.

Documentation from historical operations indicates contaminant releases to the environment at some of the sites, locations, and Study Areas. Documented releases include leakage from underground storage tanks, leakage from the Industrial Wastewater Line, and spills in storage lots resulting from operational practices. Table 4-3 identifies those Sites and Study Areas where releases of contaminants to the environment have been documented (also indicated in Table 4-1). Specific details of the contaminant releases are contained in the Information Summary Sheets (Appendix C) and in the site/location files. Based on a review of this information, the largest documented contaminant releases are:

- A number of confirmed leaks in the underground Industrial Wastewater Line (PRLs L-5 and L-6). (This pipeline has transported industrial wastewater for approximately 30 years.)

- Reported spills at PRL S-13, a hazardous materials storage lot that has operated since 1955. (Stored materials include fuels, oils, acids, bases, solvents, and PCBs.)

TABLE 4-1. OPERATIONS AT THE SITES, LOCATIONS, AND STUDY AREAS

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
Site 23	Bldg. 781; chemical storage and distribution	1971 - present	A, B, F, M, P, S	Yes	Yes
	Burial pit	1957 - 1971	BR, SV, V		
Site 30	Surface disposal area east of Bldg. 628	1960 - 1971	R, SV, V	Yes	Yes
	Bldg. 629; chemical storage building	1957 - present	A, B, S		
Site 31	Refuse incinerator (Bldg. 687)	1963 - 1968	BR	Yes	Yes
	Open storage	? - present	None		
Site 36	Chemical storage for the Building 666 plating shop	1958 - 1980	A, B, C, M, S	Yes	Yes
	Miscellaneous nonhazardous storage	1980 - present	None		

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

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TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
Site 47	Bldg. 666; plating shop and chemical storage	1956 - 1980	A, B, C, F, M, S	Yes	Yes
	Hazardous materials storage	1980 - 1982	A, B, C, F, M, S		
Site 48	Industrial Wastewater Treatment Plant No. 4	1957 - 1980	A, B, C, M	Yes	Yes
PRL 29	Scrap material burn pit	1950 - 1960	BR	No	No
	Aircraft generator burial	1974	None		
	Transformer storage	Unknown	PCB		
PRL 35	Possible burial pit	1945	None	No	No
PRL B-1	Possible burial pit	Unknown	Unknown	Yes[1]	Yes
	Open storage	1971 - present	Unknown		

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

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TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
PRL B-9	Possible burial pit	Unknown	Unknown	No	No
PRL L-5	Industrial Wastewater Line	1953 - present	A, B, F, M, P, S	No	Yes
PRL L-6	Industrial Wastewater Line connected to Bldg. 628	1957 - 1988	M, R, SV, V	No	No
PRL P-2	Possible waste pit	1962 - 1968	Unknown	No	No
PRL P-9	Ditch; received pretreated wastewater from IWTP No. 4	1957 - 1980	A, B, C, M, S, SV	No	No
	Ditch; receives storm water runoff	1957 - present	None		
PRL S-5	Industrial Wastewater Treatment Plant No. 2	1956 - 1974	F, M, P, S	No	No

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

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TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
PRL S-12	PCB storage (Bldgs. 624C & 624D)	1970 - present	PCB	No	No[2]
PRL S-13	Open storage	1955 - present	A, B, C, F, M, P, S	No	Yes
	Hazardous materials storage facility (Bldgs. 709 & 727)	1981 - present	A, B, O[3], P, PCB, S		
PRL S-28	Possible paint and oil storage	1968 - 1987	F[4], P[4]	No	No
	Parking lot	1987 - present	None		
PRL S-29	Fuel-tanker servicing	Unknown	F	No	No
	Aircraft, vehicle painting	Unknown	P		
	PCB storage	Unknown	PCB		
	Electronic and radar van repair, painting	? - present	P, S		

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

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TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
PRL S-30	Solvent/steam cleaning of parts; paint stripping (Bldg. 658)	1953 - 1986	A, F, P, S	No	No
	Media-blast paint removal; steam/solvent cleaning, paint stripping of parts	1986 - present	P, S		
PRL S-33	Chemical and chemical waste storage facility (Bldg. 786A)	? - 1984	A, B, F, P, S, SV, V	No	No
PRL S-34	Bldg. 652; automotive equipment repair and cleaning	Unknown	F, S	No	No
	Paint spray booth	Unknown	P		
	Washrack used to steam clean air conditioning units	Unknown	Unknown		
	Degreaser booth	Unknown	F, S		

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
PRL S-35	Bldg. 654; power equipment repair	1965 - present	F, SV	No	No
	Solvent spray booth (Bldg. 654)	Unknown - 1981	S		
PRL S-41	Aircraft fueling, defueling, servicing	1955 - present	F	No	No
PRL T-8	Three underground fuel storage tanks	1968 - present	F	No	No
PRL T-45	Underground oil-water separator tank (abandoned)	1968 - ?	F, SV	No	No
PRL T-46	Underground oil-water separator tank (abandoned)	1968 - ?	F, S	No	No

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

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TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
PRL T-48	Underground storage tanks	1968 - 1979	F	No	No
	Aboveground fuel-water separator	1979 - present	F		
PRL T-60	Underground storage tank	1953 - 1988	F	No	No
SA 1	Bldg. 626; staging area	? - present	A, B, O[5], P, S	No	No
	Bldg. 626; maintenance shop	1960 - present	F, P, S		
	Bldg. 626; spheres washrack	? - present	S		
	Outdoor Freon® disposal	1979	V		
SA 2	Bldg. 628; laboratory performed gas, applied physics, and radiation analysis	1959 - 1988	A, B, F, M, P, R, S	No	No
	Outdoor storage of low-level radioactive waste	1981 - 1988	R		
	Underground fuel tank	1959 - unknown	F		

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

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TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
SA 3	Washrack north of Building 685	1966 - present	Unknown	Yes	Yes
SA 4	Bldgs. 650A, 650B; paint shop	1970 - present	P, S	No	No
	Bldg. 650D, radar equipment installation	1970 - ?	F, P, S, H		
SA 5	Bldg. 656; steam boilers	1953 - present	F	No	No
	Bldg. 656; paint storage warehouse	? - present	P		
SA 6	Bldg. 657; gas station	1955 - present	F	No	No
SA 7	Bldg. 659; washrack and fueling area	1951 - 1981	F	No	No
	Staging area	? - present	F, S		

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
SA 8	Underground gasoline storage tanks (Bldg. 663)	1955 - present	F	No	No
SA 9	Bldg 684; hazardous materials temporary storage; air freight terminal	? - present	A, B, F, O[6], P, S	Yes	Yes
SA 10	Bldg. 688; herbicide/pesticide storage; washrack; herbicide/pesticide wastewater storage tank	1980 - present	H, SV	No	No
SA 11	Underground storage tank and associated piping, pumphouse (Bldg. 699)	1966 - ?	F	No	No

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
SA 12	Bldg. 700; storage and resale of usable material	1962 - present	P, S	Yes	Yes
	Open storage of scrap metal, equipment, chemicals (Lot north of Bldg. 700)	1962 - present	BR, F, PCB, S		
	Soils holding area (Lot east of Bldg. 700)	1962 - 1968	Unknown		
	Bldg. 724; recovery of precious metals from scrap	1982 - present	A, B, PCB, R		
SA 13	Civil Engineering open storage yard	1960 - present	PCB[4]	No	No
SA 14	Ditch west of Building 654; collected effluent from Bldgs. 659, 654, 699, and IWTP No. 2	1946 - 1984	F, M, P, S, SV	No	No

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
SA 15	Chemical storage (northwest corner of Lot 10)	1969 - 1970	P, S, SV	No	Yes
	Nonhazardous material storage	1957 - present	None		
SA 16	Aircraft maintenance hangars (perimeter of Mat K)	1963 - present	F	No	No
	Underground 10/10 oil tanks (south of Mat K)	1968 - 1986	F		
SA 17	Oil storage yard (east of Bldg. 688)	1955 - 1974	F	No	No
SA 18	Oil storage yard (northwest of Bldg. 656)	1957 - 1975	F	No	No
SA 19	Spray booth (Bldg. T-690, dismantled)	1951 - 1974	Unknown	No	No

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

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TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
SA 20	Compressed gas cylinder storage yard	1968 - present	O[5]	No	No
	Paint storage sheds	1989 - present	P		
SA 21	Bldg. 603; vehicle refuel and maintenance facility	1984 - present	F, P, S	No	No
SA 22	Bldg. 618; computer software laboratories	1984 - present	None	No	No
SA 23	Bldg. 620; computer microchip design and testing	1987 - present	A, S	No	No
SA 24	Bldg. 651; large equipment storage warehouse	1946 - present	None	No	No
	Open storage of equipment	1946 - present	None		

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

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TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
SA 25	Reported JP-4 fuel spill near Bldg. 665	Unknown	Unknown	No	No
SA 26	Bldg. 667; Radome Repair Unit	1957 - present	None	No	No
	Mobil Maintenance Unit	1980 - present	Unknown		
SA 27	Bldg. 672; office building	1982 - present	None	No	No
SA 28	Bldg. 676; storage shed	1972 - 1988	Unknown	No	No
SA 29	Bldg. 677; flow-meter testing and equipment calibration	? - present	F, S	No	No
	Bldg. 677; removal of mercury from manometers	? - present	M		
	Bldg. 677; radiation rooms	? - present	R		
	Underground storage tanks	? - present	F		

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

(Continued)

OUBSum/030890/jks

TABLE 4-1. (Continued)

Site/PRL/SA	Operation	Approximate Years of Operation	Materials Handled On Site	Confirmed Soil Contamination at Site/PRL/SA	Documented Contaminant Releases at Site/PRL/SA
SA 30	Bldg. 685; engine repair	1974 - present	F, P, S, SV, V	No	No
	Bldg. 685; paving; construction of sidewalks, storm drains, signs	1974 - present	None		
SA 31	Bldg. 686; administration and *electronic installation* training	1987 - present	P, S	No	No
SA 32	Reported ditch northeast of Building 650	Unknown	Unknown	No[7]	No
SA 33	Open storage lot south of Building 685	1949 - 1968	Unknown	No	No

NOTE: Footnotes and abbreviations are listed on the last page of the table (page 4-26).

OUBSum/030890/jks

TABLE 4-1. (Continued)

[1] Will be included with investigation of SA 12
[2] Spills have been documented, but contaminants were not released to the environment
[3] Corrosives, poisons
[4] Unconfirmed
[5] *Compressed gas cylinders*
[6] Explosives
[7] Soil contamination detected, but location unknown

PRL = Potential release location
SA = Study area
A = Acids
B = Bases
BR = Burn residue
C = Cyanide compound
F = Fuels and oils
H = Herbicides and pesticides
M = Metals listed in California *Code of Regulations*, Title 22
O = Other
P = Paint
PCB = Polychlorinated biphenyls
R = Radionuclides or low-level radioactive waste
S = Solvents
SV = Unspecified semivolatile organic compounds
V = Unspecified volatile organic compounds

5.0 CONCLUSIONS AND RECOMMENDATIONS

Preliminary assessments were prepared for 29 previously identified Sites and Potential Release Locations (PRLs) in Operable Unit (OU) B at McClellan Air Force Base (AFB). In addition, preliminary assessments for 33 Study Areas (SAs) were conducted to determine if areas other than Sites and PRLs in OU B require further investigation. Further investigation of a number of PRLs and SAs is considered necessary only because the potential exists for contaminant release. Investigation is recommended to confirm or disprove any release.

Each Site, PRL, and Study Area was evaluated according to whether or not the area has: confirmed soil contamination, documented contaminant releases, a history of hazardous material use, or other evidence of contaminant release. After applying those criteria, the following recommendations are made:

- All six Sites (23, 30, 31, 36, 47, and 48) in OU B should be further investigated to fully characterize the nature and extent of soil contamination (Table 5-1 [page 5-3]).
- Eighteen of the previously identified PRLs should be investigated further for soil contamination (Table 5-1).
- Five previously identified PRLs require no further action and are recommended for removal from the list of Potential Release Locations; these are PRL 35, PRL B-1, PRL B-9, PRL S-12, and PRL S-41 (Table 5-2 [page 5-5]).
- Nineteen Study Areas identified in the assessment of OU B should be investigated further (Table 5-3 [page 5-6]). The boundaries of the SAs delineating the portion that requires further action are shown in Figure 5-1 (page 5-9).
- Fourteen Study Areas identified in the assessment of OU B require no further action (Table 5-4 [page 5-8]).
- **Data collected during this investigation should be used in the Sampling and Analysis Plan for the Contaminant Source Investigation for OU B.**

The 44 Sites, PRLs, and Study Areas that require further investigation are shown in Figure 5-1. Detailed rationale and specific recommendations for further action may be found in the Technical Memorandum, Preliminary Assessment, or Information Summary Sheet prepared for each site, location, or Study Area. Investigations of the areas shown in Figure 5-1 will be described in the Sampling and Analysis Plan for OU B. That investigation is intended to confirm or disprove contaminant releases at PRLs and SAs. McClellan AFB personnel interviewed for site-specific information during the preliminary assessment investigation are listed in Appendix D.

TABLE 5-1. SITES AND LOCATIONS RECOMMENDED FOR FURTHER INVESTIGATION

Location No.	Rationale for Recommendations
Site 23	Contamination detected in soil. Additional data needed to characterize.
Site 30	Contamination detected in soil. Additional data needed to characterize.
Site 31	Burn residues from former refuse incinerator are a potential contaminant source.
Site 36	Contamination detected in soil. Additional data needed to characterize.
Site 47	Contamination detected in soil. Additional data needed to characterize.
Site 48	Contamination detected in soil. Additional data needed to characterize.
PRL 29	Reported burn pit or transformer storage area may be a contaminant source.
PRL L-5	Confirmed leaks in IWL are suspected contaminant sources.
PRL L-6	Confirmed leaks in IWL are suspected contaminant sources.
PRL P-2	Possible former waste pit may be a contaminant source.
PRL P-9	Ditch that collected waste from IWTP is a suspected contaminant source.
PRL S-5	Former IWTP is a suspected contaminant source.
PRL S-13	Documented releases of hazardous materials. Suspected contaminant source.
PRL S-28	Former paint and oil storage facility is a potential contaminant source.
PRL S-29	Underground piping may have leaked. Potential contaminant source.
PRL S-30	Trench, catch basin, and pipes which transport wastes may have leaked. Potential contaminant source.
PRL S-33	Former chemical storage facility is a potential contaminant source.

(Continued)

TABLE 5-1. (Continued)

Location No.	Rationale for Recommendations
PRL S-34	Pits, sumps, trenches, and pipelines may have leaked. Potential contaminant source.
PRL S-35	Trench, underground drain, and piping which transport wastes may have leaked. Potential contaminant source.
PRL T-8	Underground fuel storage tanks leaked in the past. Suspected contaminant source.
PRL T-45	Abandoned tank and piping may have leaked. Potential contaminant source.
PRL T-46	Abandoned tank and piping may have leaked. Potential contaminant source.
PRL T-48	Abandoned tank and piping may have leaked. Potential contaminant source.
PRL T-60	Underground storage tank may have leaked. Potential contamination source.

PRL = Potential Release Location
IWL = Industrial Wastewater Line
IWTP = Industrial Wastewater Treatment Plant

TABLE 5-2. LOCATIONS RECOMMENDED FOR NO FURTHER ACTION

Location No.	Rationale for Recommendations
PRL 35	No evidence that hazardous materials have been handled.
PRL B-1	No evidence that a burial pit existed at the location.
PRL B-9	No evidence that a burial pit existed at the location.
PRL S-12	No evidence of contaminant release.
PRL S-41	No evidence of contaminant release.

PRL = Potential Release Location

TABLE 5-3. STUDY AREAS RECOMMENDED FOR FURTHER INVESTIGATION

Study Area	Rationale for Recommendations
SA 1	Freon® waste reportedly dumped outside building. Potential contaminant source.
SA 2	Laboratory and former outdoor radioactive storage areas are potential contaminant sources.
SA 3	Washrack is a suspected contaminant source.
SA 4	Large quantities of paints and solvents handled. Potential contaminant source.
SA 5	Fuels, oils, and paints are potential contaminants. Further investigation necessary.
SA 6	Underground fuel storage tanks may have leaked. Potential contaminant source.
SA 7	Previously analyzed soil data unavailable. Further investigation of Underground Storage Tanks is necessary.
SA 8	Underground storage tanks may have leaked. Potential contaminant source.
SA 9	Contamination detected in soil. Additional data needed to characterize.
SA 10	Concrete wastewater sump may have leaked. Potential contaminant source.
SA 11	Underground storage tank and associated piping may have leaked. Potential contaminant source.
SA 12	Contamination detected in soil. Additional data needed to characterize.
SA 13	Open storage of hazardous materials. Suspected contaminant source.
SA 14	Ditch transported wastewater. Suspected contaminant source.
SA 15	Contaminants potentially released during fire in a chemical storage area.
SA 16	Underground tanks and piping may have leaked. Potential contaminant source.
SA 17	Open storage of hazardous materials. Suspected contaminant source.

(Continued)

TABLE 5-3. (Continued)

Study Area	Rationale for Recommendations
SA 18	Open storage of hazardous materials. Suspected contaminant source.
SA 19	Former spray booth is a suspected contaminant source.

SA = Study area

TABLE 5-4. STUDY AREAS RECOMMENDED FOR NO FURTHER ACTION

Study Area	Rationale for Recommendations
SA 20	Building is within boundaries of PRL 30. Include with Site 30 investigation.
SA 21	Low potential for release of contaminants. No evidence of previous release.
SA 22	No hazardous materials employed. No evidence of contaminant release.
SA 23	Very small quantities of hazardous materials used. No evidence of contaminant release.
SA 24	No evidence of contaminant release.
SA 25	Documentation of reported spill not available and location not known.
SA 26	No evidence that hazardous materials have been used.
SA 27	No evidence that hazardous materials have been used.
SA 28	No evidence that hazardous materials have been used.
SA 29	No evidence of contaminant release.
SA 30	No evidence of contaminant release.
SA 31	Very small quantities of hazardous materials used. No evidence of contaminant release.
SA 32	Existence of a ditch could not be verified.
SA 33	No evidence of hazardous materials storage.

SA = Study area

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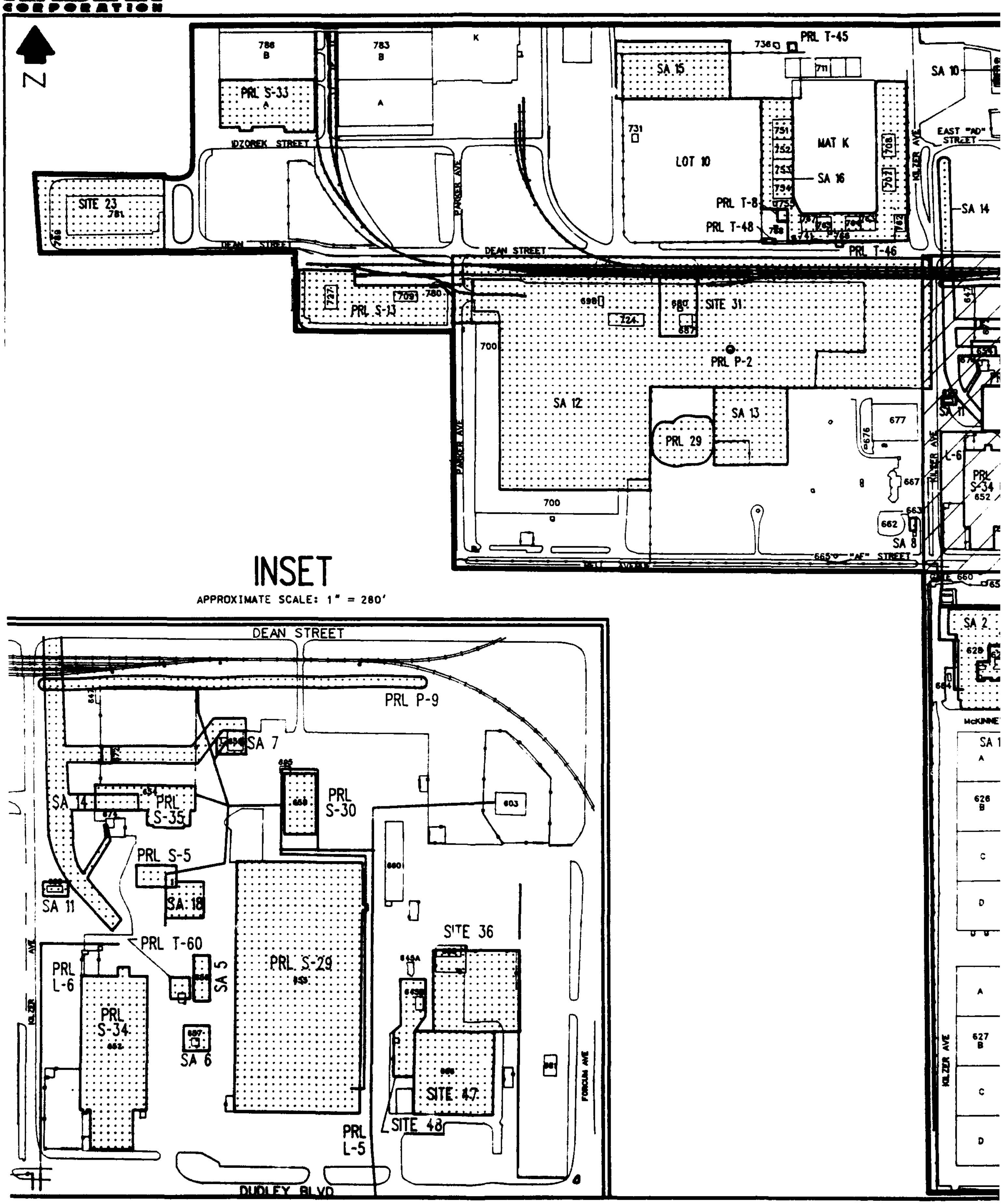

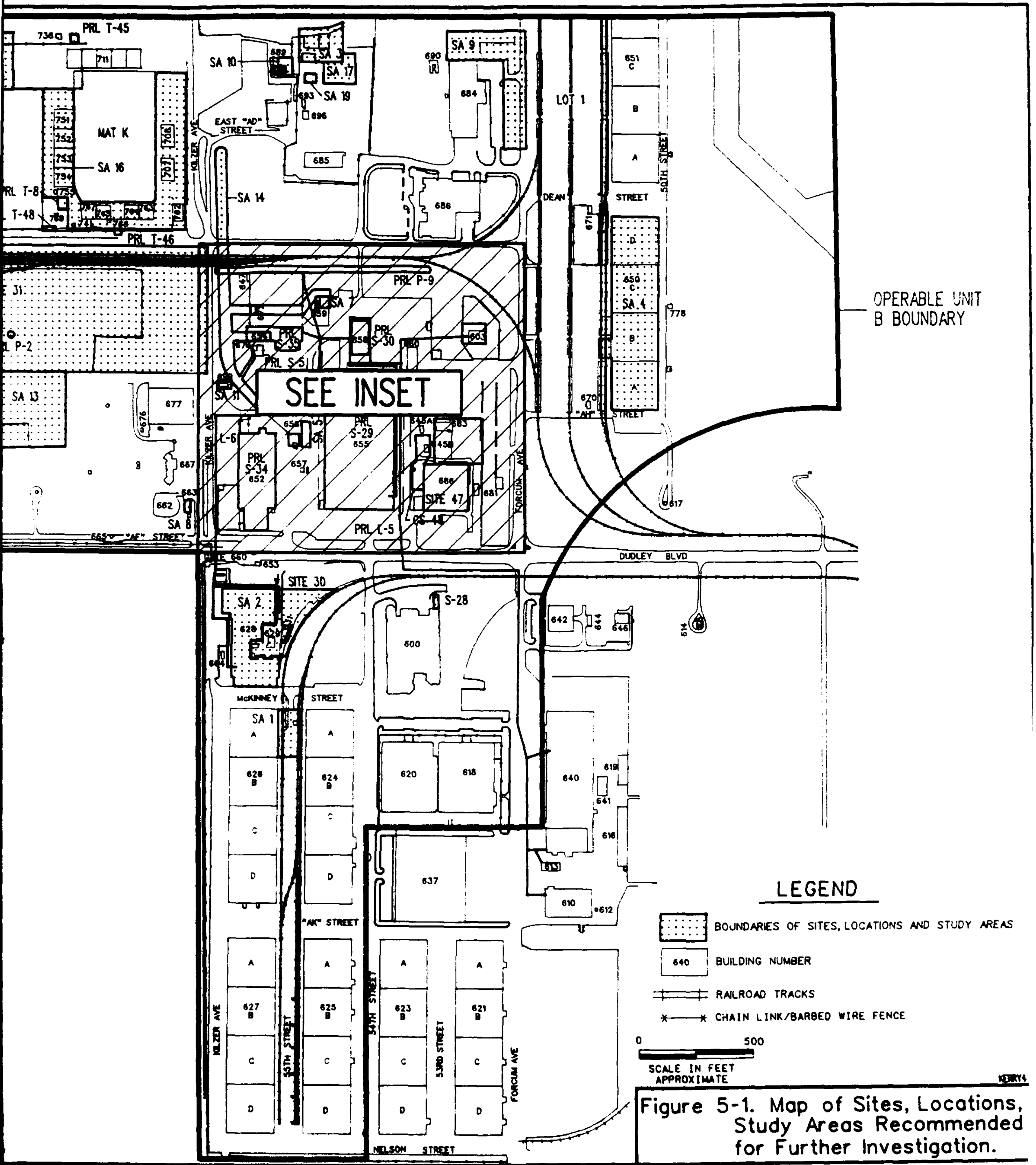

Figure 5-1. Map of Sites, Locations, Study Areas Recommended for Further Investigation.

6.0 REFERENCES

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APPENDIX A

McClellan AFB General Information Document

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10395 Old Placerville Road
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(916) 362-5332

INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

GENERAL INFORMATION DOCUMENT
FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

Radian Corporation
10395 Old Placerville Road
Sacramento, California 95827

USAF CONTRACT NO. F33615-87-D-4023, DELIVERY ORDER NO. 0012
CONTRACTOR CONTRACT NO. 227-005, DELIVERY ORDER NO. 0012

United States Air Force Center for Environmental Excellence
Mr. Patrick Haas (Technical Project Manager)
Environmental Services Office/Environmental Restoration Division (AFCEE/ESR)
Brooks Air Force Base, Texas 78235-5501

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1.0 INTRODUCTION

This General Information Document presents a summary of background information regarding the overall facility description, history, and environmental setting at McClellan Air Force Base (AFB), California. This document is designed to accompany the Preliminary Assessment or Technical Memorandum document as part of the Preliminary Assessment/Site Files (PA/SF) Task. This Task is part of the Remedial Investigation/Feasibility Study (RI/FS) process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill locations on Air Force installations and develop remedial actions consistent with the National Contingency Plan (NCP) for any locations that pose a threat to human health and welfare or the environment. This location assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund locations.

The purpose of the PA/SF Task is to:

- Identify any immediate response needs;
- Determine whether further action is needed at a site or location;
- Provide qualified data to support location operable unit prioritization, location and grouping, and preliminary risk assessment;
- Provide information that can be used to set priorities for site inspections or remedial investigation;
- Evaluate previous contractors' recommendations; and
- Provide recommendations for further investigation or remedial actions.

The scope of a Preliminary Assessment or Technical Memorandum includes site-specific data regarding the following categories of information:

- Facility operations and waste management practices;
- Waste characteristics;
- Contaminant migration pathways; and
- Target populations and environments.

Data on all four categories are necessary to develop an understanding of the location, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Location operations and waste management practices, waste characteristics, and migration pathways are discussed in each Preliminary Assessment or Technical Memorandum. This "General Information" document addresses target populations and environments.

This General Information document includes the following:

- Installation History;

- Location and property ownership;

- Description of base operations;

- Environmental setting of the base, including geology, hydrology, and biota; and

- Land use, population, and water sources.

2.0 INSTALLATION HISTORY

This section describes the history of McClellan Air Force Base (AFB), including location, property ownership and description, base history, and base operations.

2.1 Location

McClellan AFB is located approximately seven miles northeast of downtown Sacramento, California, as shown on Figure 2-1. The base includes approximately 2,950 acres within the irregularly configured boundaries as shown on Figure 2-2.

2.2 Property Ownership and Description

McClellan AFB is owned by the Department of Defense.

Department of Defense
Pentagon Building
Washington, D.C. 20301

McClellan AFB is operated by the United States Air Force.

Sacramento Air Logistics Command
2852 Air Base Group
McClellan AFB, CA 95652

The base property is approximately bounded by Elkhorn Boulevard on the north, Interstate 80 on the south, Watt Avenue on the east, and Raley Boulevard on the west (Figure 2-2).

2.3 History

McClellan AFB dates to 1936 when Congress authorized $7 million for its construction. The Sacramento Air Depot, the main base activity, was dedicated in 1939. In that same year, the base was named McClellan Field in honor of Major Hezekia McClellan.

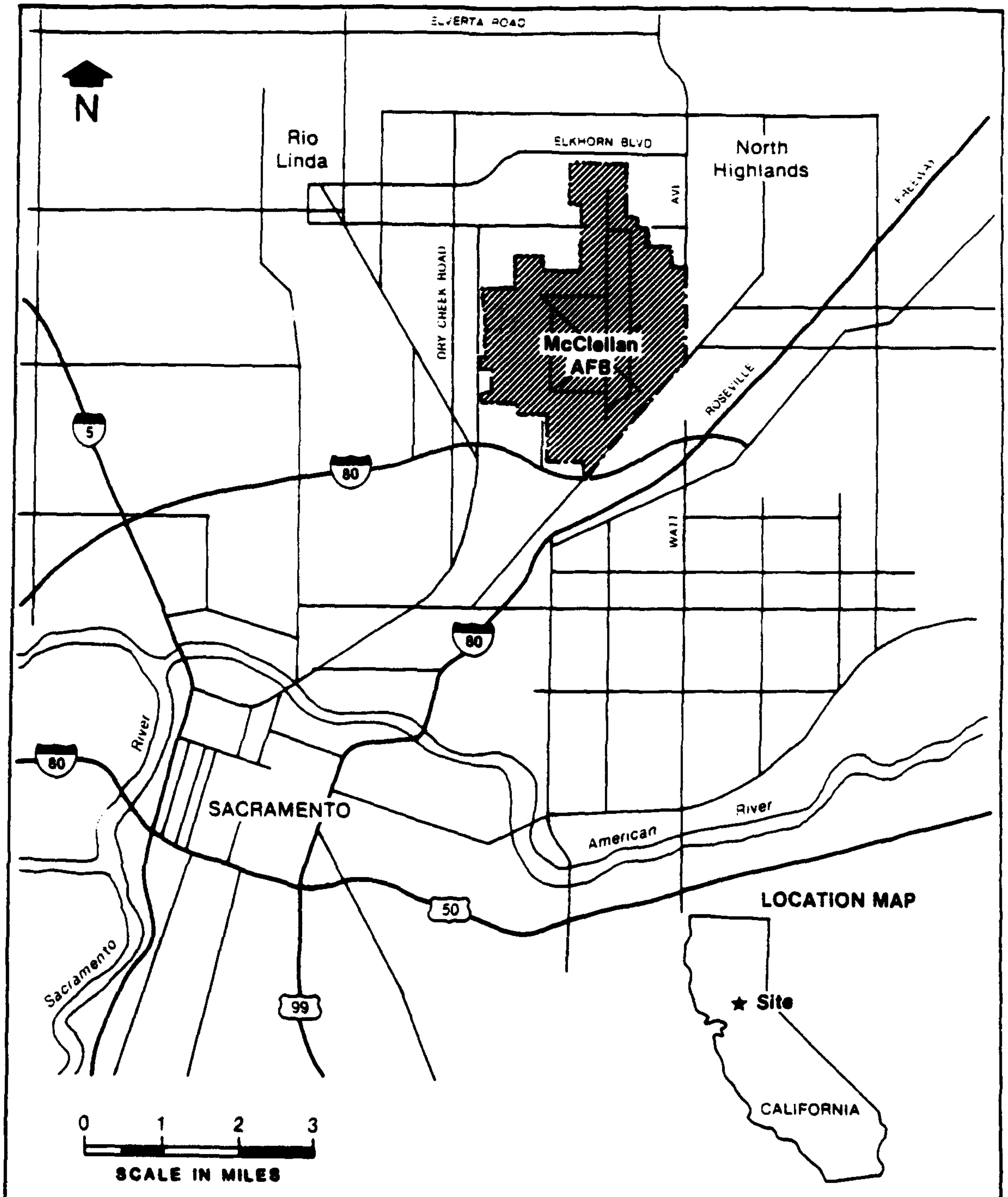

Figure 2-1. Location of McClellan Air Force Base, California

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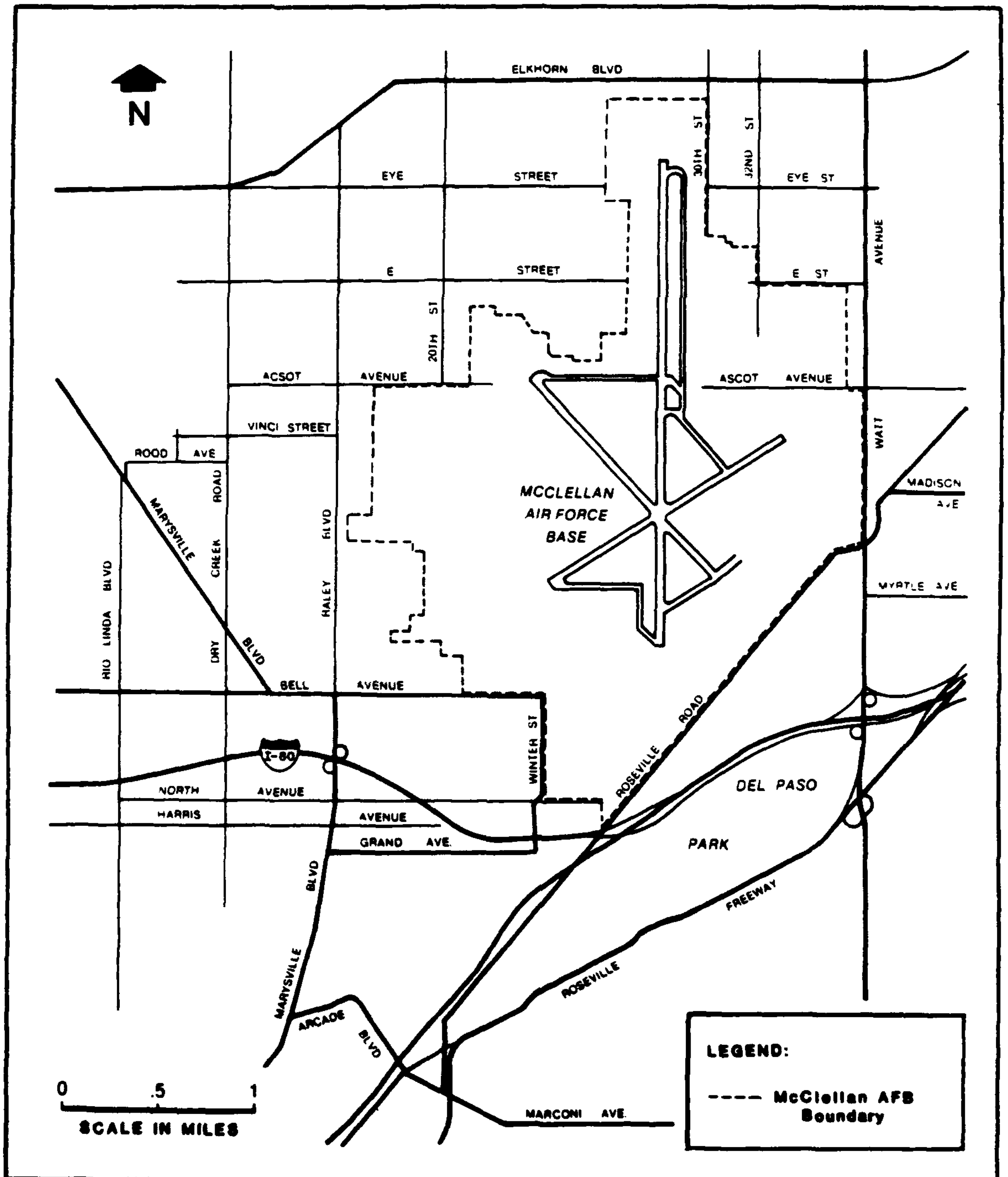

Figure 2-2. McClellan Air Force Base Boundary.

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World War II boosted base employment from a few thousand people to more than 18,000. In the 1950s, activities shifted from a bomber to a fighter depot, and the Sacramento Air Logistics Center (SM/ALC) responsibilities increased to provide worldwide logistics.

In the 1960s, the Sacramento ALC gained responsibility for certain ballistic missile activities, and for the F-111 fighter-bomber aircraft. Today, the center continues to be a fighter maintenance and support facility and a logistics planning base for the Space Shuttle Program. The 1987 workforce at the base numbers 23,431 people.

The mission of the Sacramento Air Logistics Center is twofold:

- Provides worldwide logistics support of assigned weapon systems, equipment, and commodity items; and

- Performs an industrial type mission in providing maintenance, supply, and contracting services essential to Air Force logistics.

2.4 Operations

The operations at McClellan AFB relate to management, maintenance, and repair of various aircraft, electronics and communication equipment. These activities have been conducted since the base was established in 1936 and have required the use of various hazardous and toxic materials. A summary of past waste disposal practices is presented below. The summary was compiled through review of historical data and from published reports (CH2M Hill, 1981, McLaren Environmental Engineering, 1986).

<u>1940s</u>: Trichloroethene, other solvents, and oils were burned at the pit in the vicinity of Building 704 (Disposal Site 22).

<u>1950s to early 1960s</u>: Trichloroethene was distilled on base. Although attempts were made to reuse the chemical on base, the distillation process was ineffective, and significant amounts of trichloroethene wastes were disposed of in the burn pit (Disposal Site 22). The burn pit used in the 1940s, 1950s, and early 1960s was filled and closed.

<u>1962 to 1963</u>: A program was initiated to reclaim commingled oils and solvents for sale through the Defense Property Disposal Office (now Defense

Reutilization and Marketing Office). Trichloroethene disposal through oil/solvent reclamation was ineffective because the trichloroethene settled to the bottom of the holding tanks. It became standard practice to segregate all wastes containing trichloroethene and dispose of them at the base sludge pits (Disposal Sites 2, 4, 5, 7, and 8).

1963 to early 1970s: Trichloroethene wastes continued to be disposed of at the sludge pits. However, due to concerns related to air pollution, the use of trichloroethene at the base was significantly reduced and then phased out. Other cleaning solvents, such as tetrachloroethene, Freon®, and 1,1,1-trichloroethane were substituted for trichloroethene.

1976: Solvent disposal at the sludge pits was significantly reduced. Solvents were containerized and transported to off-base state-approved chemical landfills or reclamation facilities.

Late 1978: The use of trichloroethene on base was banned due to concerns about air pollution.

Late Early 1981: On-base disposal of industrial wastewater sludge was discontinued. All industrial wastewater sludge was transported off base for disposal at a Class I landfill.

1982 to Present: Waste disposal on base has been restricted to small amounts of demolition debris, treated industrial wastewater, and sewage grit. Private contractors and Sacramento County have collected solid refuse since 1968.

3.0 ENVIRONMENTAL SETTING

This section presents a brief description of the physiography, geology, hydrology, meteorology, biota, land use, population, and community water sources in the vicinity of McClellan Air Force Base (AFB).

3.1 Physiography

McClellan AFB is located in the Great Valley Physiographic Province. This province extends north to Red Bluff and approximately 400 miles south to Bakersfield (California Department of Water Resources [CDWR], 1974). The Great Valley Province consists of the Sacramento Valley to the north and San Joaquin Valley to the south and averages 40 miles in width (CDWR, 1974 and 1978). The Sacramento Valley is bordered by the Sierra Nevada to the east, and the Coast Range Mountains to the west as shown on Figure 3-1.

McClellan AFB is located on the east side of the Victor Plain, an alluvial plain which is located along the eastern side of the Sacramento Valley. The Victor Plain was created by deposition of sediments eroded from the Sierra Nevada. The Victor Plain is nearly flat and is dissected by numerous westerly-flowing streams draining the Sierra Nevada (CDWR, 1978).

The land surface at the base slopes very gently to the west. Elevations range from 75 feet above mean sea level (msl) on the east side of the base to approximately 50 feet msl on the west side. The topographic relief is very low. The major drainages in the vicinity of the Victor Plain are the Sacramento and American rivers. The Sacramento River originates from Shasta Lake in Shasta County, and is fed predominantly by the Feather, Yuba, and Bear rivers from the east before reaching its junction with the American River near Sacramento. The Sacramento River collects drainage from the Cascade Range and the Sierra Nevada. It flows approximately six miles west of McClellan AFB. The American River originates in the Sierra Nevada east of the base. It consists of three forks which flow westerly and converge east of Sacramento. The American River is located approximately seven miles south of the base.

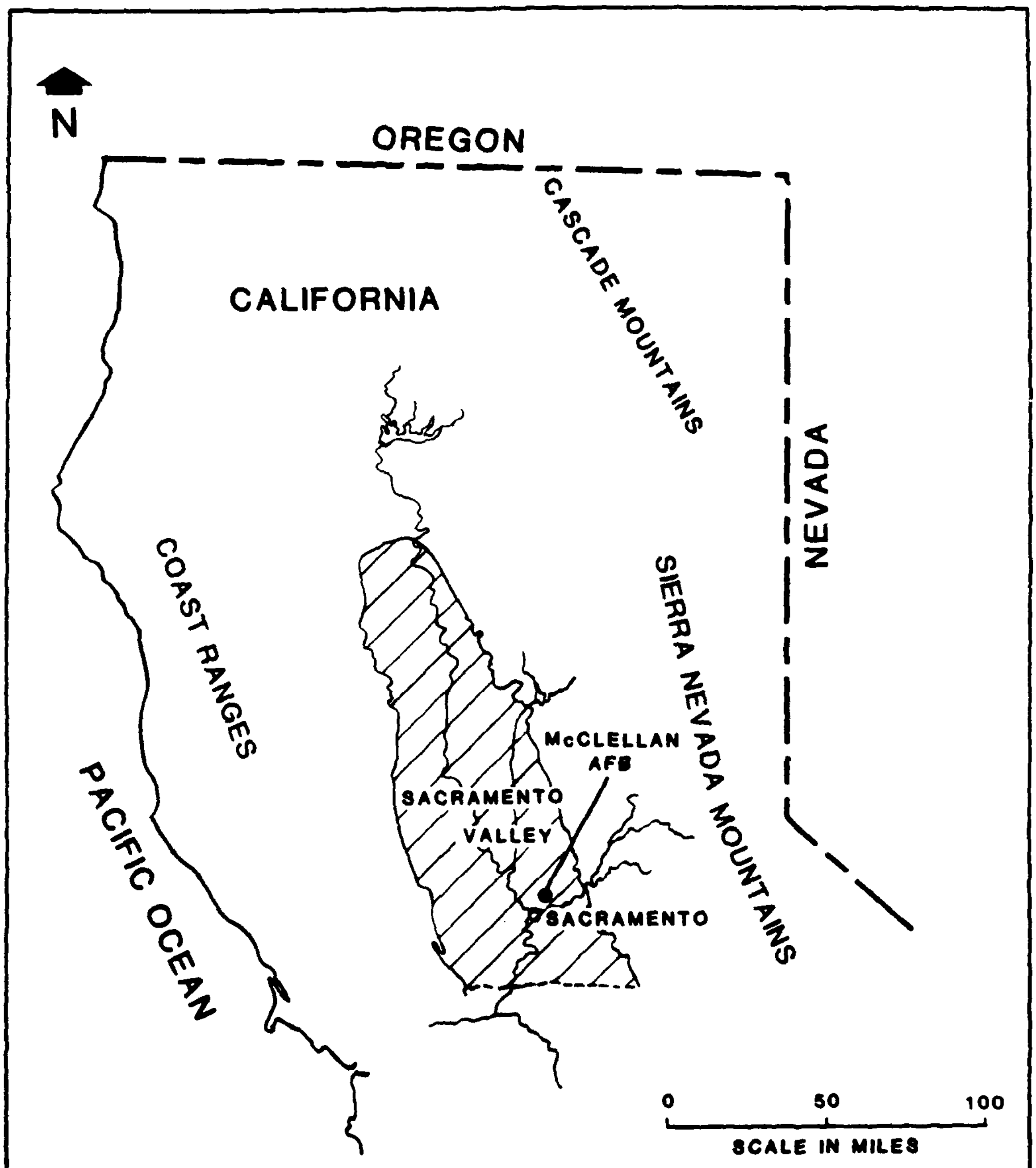

Figure 3-1. Location of the Sacramento Valley.

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3.2 Geology

The regional and local geologic settings of McClellan AFB are discussed in the following subsections.

3.2.1 Regional Geology

The Sacramento Valley is a large depositional basin, filled with sediment eroded from the Sierra Nevada to the east and the Coast Range Mountains to the west. The valley is underlain at depth by Paleozoic and Mesozoic metamorphic and igneous bedrock, overlain by Cretaceous and Eocene sandstone and shale of marine origin (CDWR, 1978). These deposits are overlain by late Eocene and post-Eocene deposits consisting of non-marine and secondary volcanic sediments primarily transported and deposited by fluvial processes. It is estimated that over 4,000 feet of sediments have been deposited in the valley since the Eocene Epoch. These sedimentary deposits are wedge-shaped with the greatest sediment thickness near the west side of the valley, as shown in Figure 3-2. The deposits dip gently to the west. The regional dip ranges from 300 feet per mile near the base of the Sierra Nevada to 5 feet per mile near the center of the Sacramento Valley (CDWR, 1974).

The broad alluvial plain on which Sacramento is located on is termed the Victor Plain. The upper surface of the plain, in most places, represents the upper surface of the Victor Formation, one of four units overlying the volcanoclastic Mehrten Formation. The four units are the Victor Formation, Arroyo Seco Gravels, and the Laguna and Fair Oaks formations. Three of these units are present in the shallow subsurface at the base. The uppermost unit, the Victor Formation, is the youngest unit underlying the Victor Plain. Directly beneath the Victor Formation are the Laguna and Fair Oaks formations which are thought to interfinger in the region east of Sacramento.

Soils

Soils in the vicinity of McClellan AFB are extremely variable. Soil permeabilities range from 0.6 to 2.0 inches per year depending on local amounts of clay and hardpan. The local soils are generally classified as San Joaquin fine sandy loam, Fiddyment fine, sand loam, or San Joaquin-Xeralfic Arents complex. These soils have a low shrink-swell potential, a slight erosion potential, and a very low available water capacity of approximately 0.10 to 0.14 inches per inch.

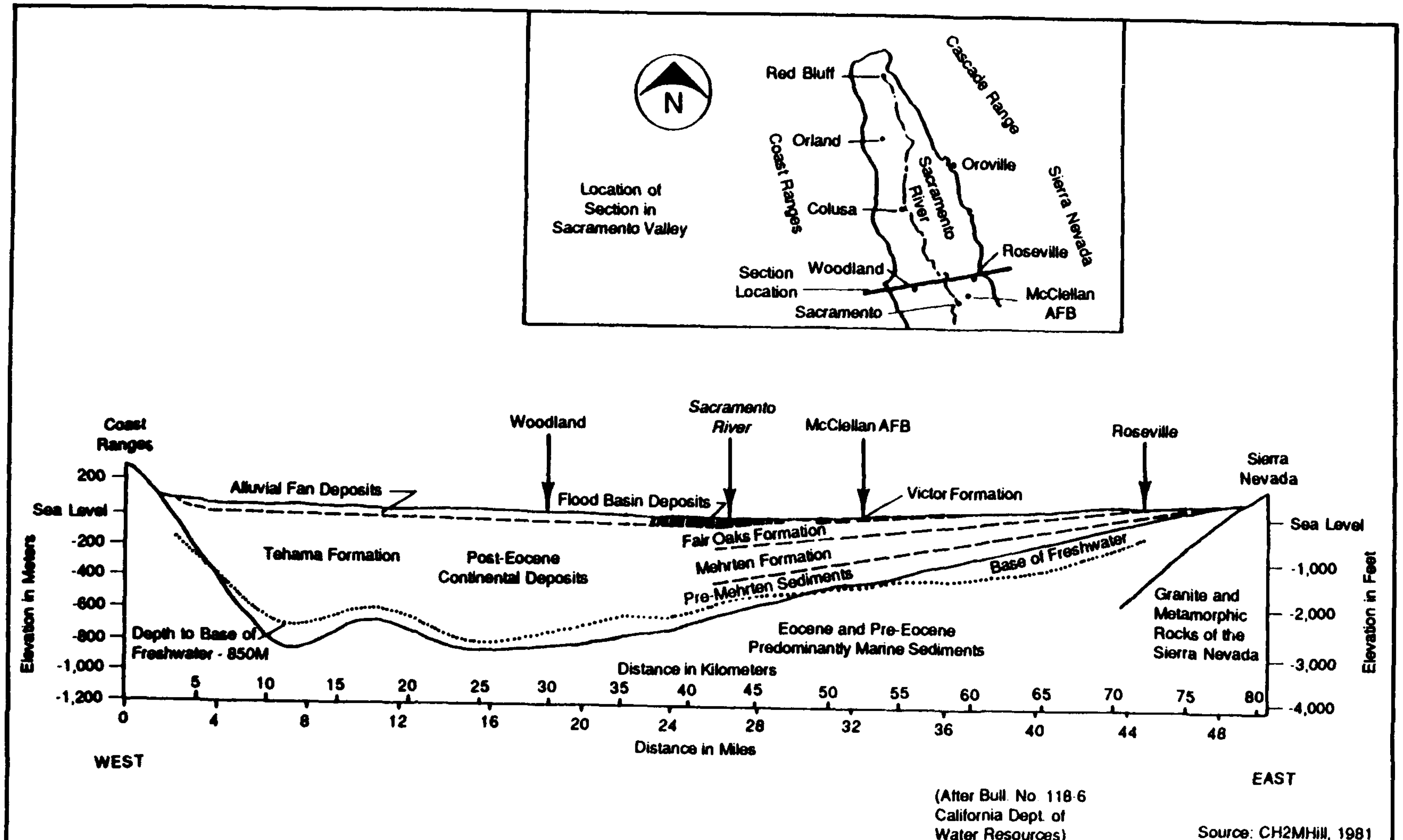

Figure 3-2. Sedimentary Deposits in the Sacramento Valley.

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Geologic Units

The dramatic variation in climatic condition and the increased quantity of sediment generated by successive periods of glacial advancement and retreat during the Pleistocene epoch in the Sierra Nevada created a very complex fluvial environment across the Sacramento Valley. By the close of the Pleistocene epoch, the valley floor had been dissected by numerous large braided streams and smaller meandering channels which had alternately deposited, eroded, and redeposited sediment along ever changing channel courses. As a result, distinct and continuous clay, silt, or sand horizons tend to be both laterally and vertically discontinuous. These interbedded deposits vary dramatically over short distances in texture, porosity, and water transmitting capabilities. However, recent work by Radian geologists using resistivity and spontaneous potential logs indicates possible local correlation of broad lithologic intervals (Radian, 1988).

The Victor Formation is underlain by the Fair Oaks Formation. The sedimentary deposits of the Fair Oaks Formation consist primarily of poorly bedded sand, silt, and clay, with less common gravel lenses. This formation is characterized by beds of volcanic tuff up to one foot thick which have been altered to white clay. The Fair Oaks Formation dips to the west at approximately 15 feet per mile ranging in thickness from 0 to 400 feet; in the vicinity of McClellan AFB it is thought to be approximately 100 feet thick.

The Fair Oaks Formation interfingers with the contemporaneous Laguna Formation in the vicinity of McClellan AFB. The Laguna Formation is predominantly fine-grained, poorly bedded, and moderately compacted. The formation is heterogeneous, with irregular accumulations of silt, sand, clay, and lenticular gravel beds. The most common deposits are light-gray to yellowbrown clayey silt, to silty, fine-grained sand. Clean, well-sorted sand occurs chiefly in relatively thin, laterally extensive beds. Gravel beds are scarce, poorly sorted, and of relatively low hydraulic conductivity. The sands have been eroded from granitic rock and contain abundant weathered feldspars, mica, and quartz grains. Mica particles are locally abundant and serve as a distinguishing characteristic for most of the formation. Regionally, the formation is between 125 and 400 feet thick; in the vicinity of McClellan AFB it is about 125 to 200 feet thick (CDWR, 1974). The sediments of the Laguna and Fair Oaks formations are very similar in the vicinity of McClellan AFB. The presence of the white clay layers in the Fair Oaks Formation is the primary characteristic distinguishing it from the Laguna Formation in this area.

The Mehrten Formation underlies the Fair Oaks and Laguna formations. The Mehrten Formation consists of an upper unit of gray to black sand interbedded with blue to brown clay and a lower unit of hard, gray volcanic tuff breccia. The Mehrten Formation may reach thicknesses up to 1,200 feet in the Sacramento Valley (CDWR, 1974), however, its thickness beneath McClellan AFB has not been determined.

A summary description of the geologic formations found in Sacramento County and their waterbearing characteristics is presented in Table 3-1.

3.3 Groundwater

Groundwater in the vicinity of the base occurs in multiple zones, distinguished by depth, and under both unconfined and confined conditions. Aquifer zone characteristics and background water quality are discussed in the following subsections.

3.3.1 Groundwater Hydrology

The groundwater system in the vicinity of McClellan AFB has been divided into two zones: an upper zone composed of the Fair Oaks, Laguna, and Victor formations and a lower zone composed of the Mehrten and underlying waterbearing formations (CDWR, 1974). The two zones are separated by a buried erosional surface of moderate to high relief.

In the vicinity of the base, groundwater occurs primarily in the Fair Oaks, Laguna, and Mehrten formations. Most groundwater production wells in the area are screened in the Mehrten Formation (Engineering-Science, 1983). Groundwater recharge in the eastern portion of the Sacramento Valley occurs as a result of leakage from streams and rivers, percolation of precipitation and irrigation water through soils, and migration of runoff along fracture zones and formation contacts in the foothills of the Sierra Nevada. The upper waterbearing zone in the Sacramento Valley is recharged predominantly through percolation of water from the ground surface. This process is generally inhibited by the presence of hardpan throughout much of the valley. Therefore, groundwater recharge to the upper zone occurs predominantly through past and present stream channels consisting of permeable sands and gravel which allow percolation of surface waters into the saturated zone. According to the CDWR (1974), the permeable buried stream channels interlayed with less permeable sediments has resulted in a network of tabular, shallow aquifers throughout the county. Hardpan locally restricts downward migration of water to the deeper aquifers.

TABLE 3-1. GEOLOGIC FORMATIONS IN SACRAMENTO COUNTY

Era	Period	Epoch	Formation	Thickness (ft)	Physical Characteristics	Waterbearing Characteristics
Cenozoic	Quaternary	Holocene	Alluvium	0-100±	Unconsolidated gravel, sand, silt, and clay deposited along stream channels, on terraces and floodplains, and in basins.	Gravels and sands act as important recharge areas and yield large amounts of water to wells. Silts and clays are of low permeability and yield little water.
Cenozoic	Quarternary	Pleistocene	Victor Formation	0-100±	Unconsolidated sand, silt, and clay. Hardpan present. Sand and gravel along old stream courses.	Generally yields little water. Yields larger amounts of water if old stream channels tapped.
Cenozoic	Quarternary	Pleistocene	Arroyo Seco Gravel	20-50	Sand and gravel in iron-cemented clay matrix.	Of relatively low permeability and thus would yield only small amounts of water to wells.
Cenozoic	Quarternary/ Tertiary	Pliocene to Pleistocene	Fair Oaks Formation	0-225±	Sand, silt, and clay. Hardpan present. Found principally north of American River. Cemented gravels south of the river.	Similar to the Victor Formation.
Cenozoic	Quarternary/ Tertiary	Pliocene to Pleistocene	Laguna Formation	125-200	Bedded silts, clays, and sands. Non-volcanic.	Sand beds will yield moderate amounts of water to wells; clays yield little water.
Cenozoic	Tertiary	Pliocene	Mehrton Formation	200-1,200	Beds of black volcanic sands, brown clay and sand; zones of volcanic tuff-breccia (lava). All of andesitic origin.	Volcanic sands yield large quantitites of water to wells. Brown sands yield lesser amounts; clays yield little water. Tuff-breccias yield no water.
Cenozoic	Tertiary	Miocene	Valley Springs Formation	75-125	Beds of light colored sand and ash, beds of greenish-brown silty sand, few beds of gravel. All of rhyolitic origin.	Of low overall permeability. Yields only small amounts of water to wells.
Cenozoic	Tertiary	Eocene	Ione Formation	100-400	Medium-grained quartz sandstone, thick beds of white to red clay, blue to gray clay with lignite.	Of low overall permeability. Yields only small amounts of fresh to brackish water to wells.
Mesozoic	Cretaceous		Chico Formation	200-15,000±	Brown marine fossiliferous sandstone and shale. Occurs principally in the subsurface.	Usually nonwaterbearing; contains salt water. Local areas may be flushed and now contain usable groundwater.
Pre-Tertiary			Basement Complex	?	Slate and sandstone of the Mariposa Formation. Greenstone, schist, and assorted metavolcanics of the Logtown Ridge Formation. Granodiorite and other intrusive rocks of the Sierra Nevada.	Essentially nonwaterbearing. Where sufficiently decomposed and/or fractured, may yield small quantitites of water to wells.

SOURCE: CDWR, 1974.

Groundwater discharge in the Sacramento Valley occurs predominantly through pumping. Since the turn of the century, the extraction of groundwater for irrigation, industrial, municipal, and domestic uses has substantially altered the groundwater levels and gradients. The regional groundwater flow direction in the vicinity of Sacramento is southerly toward a pumping trough south of Sacramento.

Where saturated, the Victor Formation has only moderate hydraulic conductivity and generally yields little water to wells unless stream channel deposits are penetrated. The Fair Oaks and Laguna formations have generally low to moderate hydraulic conductivity except where coarse-grained channel deposits are present. In the more permeable materials, well yields may reach 3,500 gallons per minute (GPM) with drawdowns of approximately 30 feet, yielding a specific capacity of about 120 gpm per foot (gpm/ft) of drawdown (CDWR, 1974). The black sands of the Mehrten Formation generally have a specific capacity of approximately 45 gpm/ft. Specific capacities as high as 100 gpm/ft, however, have been noted in the Mehrten Formation (CDWR. 1974). Table 3-1 summarizes the hydraulic characteristics of the Victor, Fair Oaks, Laguna, and Mehrten formations.

The water table in the region surrounding the base is typically 90 to 110 feet below the ground surface. Variations in the depth to water depend predominantly on local topography and locations of cones of depression from high-capacity extraction wells.

Deeper waterbearing zones are semiconfined to confined and are believed to be locally interconnected with the unconfined zone due to the absence of continuous confining layers. Lateral discontinuity and facies changes within confining layers allow for local vertical groundwater movement between the various waterbearing zones.

The water table in the vicinity of the base fluctuates as much as two feet per year. The annual mean water level is declining as a result of groundwater extraction for private, public, industrial, and domestic purposes. The water table declined by 0.9 to 1.7 feet each year between 1955 and 1985 (Radian, 1986). Groundwater levels are expected to continue declining in future years due to overdrafting of the local groundwater aquifers.

Extensive groundwater pumping near McClellan AFB has also altered the flow direction of the local groundwater system. In 1955, groundwater flow was generally to the southwest toward a pumping depression located southwest of the base. By 1965, this depression had deepened, and a second pumping depression developed directly south of the base due to the operation of production wells located near the base boundary. As a result, flow directions were altered as groundwater on base began to flow to the south and groundwater west of the base began to flow in an east and southeast direction in the late 1950s or early 1960s (Radian, 1986).

3.3.2 Groundwater Quality

Natural groundwater quality in the area of the base is excellent for irrigation and domestic use. The groundwater is characterized as a calcium-sodium bicarbonate type. In Sacramento County, the fresh groundwater zone ranges in thickness from several hundred feet near the eastern portion of the county, to an estimated 2,000 feet near the Sacramento River. The fresh water zone at the base is approximately 1,385 feet thick (CH2M Hill, 1981).

3.4 Surface Water

Surface water in the Sacramento Valley originates in the Cascade Range and Sierra Nevada to the north and east and from the east side of the Coast Ranges to the west. The Sacramento and American rivers are the major drainages in the vicinity of the base (Figure 3-3). The drainage patterns of these rivers are described in Subsection 3.1.

Surface water drainage in the vicinity of the base occurs predominantly through Magpie, Don Julio, Rio Linda, and Arcade creeks, shown in Figure 3-4. Magpie Creek enters the base from the east and is joined by several small tributaries before leaving the base to the west. On-base drainages have been modified by construction of a series of storm drains and channels across the base. Runoff from streets and runways is directed into the storm drainage system and exits the base via Magpie Creek. Old channels occupied by Magpie Creek before construction of the storm drainage system are presented in Figure 3-4.

Rio Linda Creek crosses the northern portion of the base. Magpie Creek crosses the southeast and central portions. Arcade Creek is located just south of base property. All three of these drainages flow into the Natomas East Drainage Canal west of the base. The canal flows south and west until it discharges into the American River, just east of the confluence of the American and Sacramento rivers.

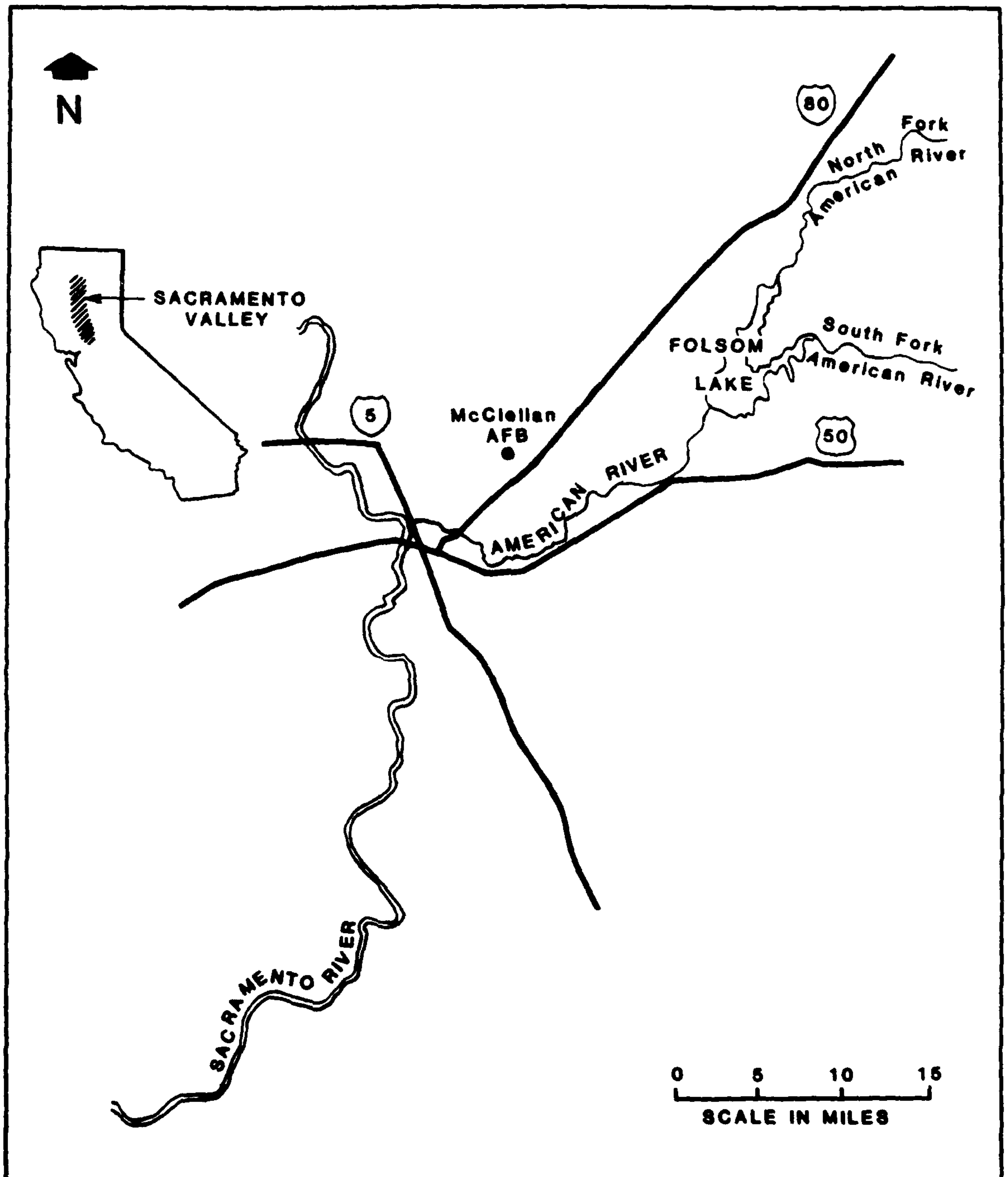

Figure 3-3. Bureau Water Drainage in the Sacramento Valley.

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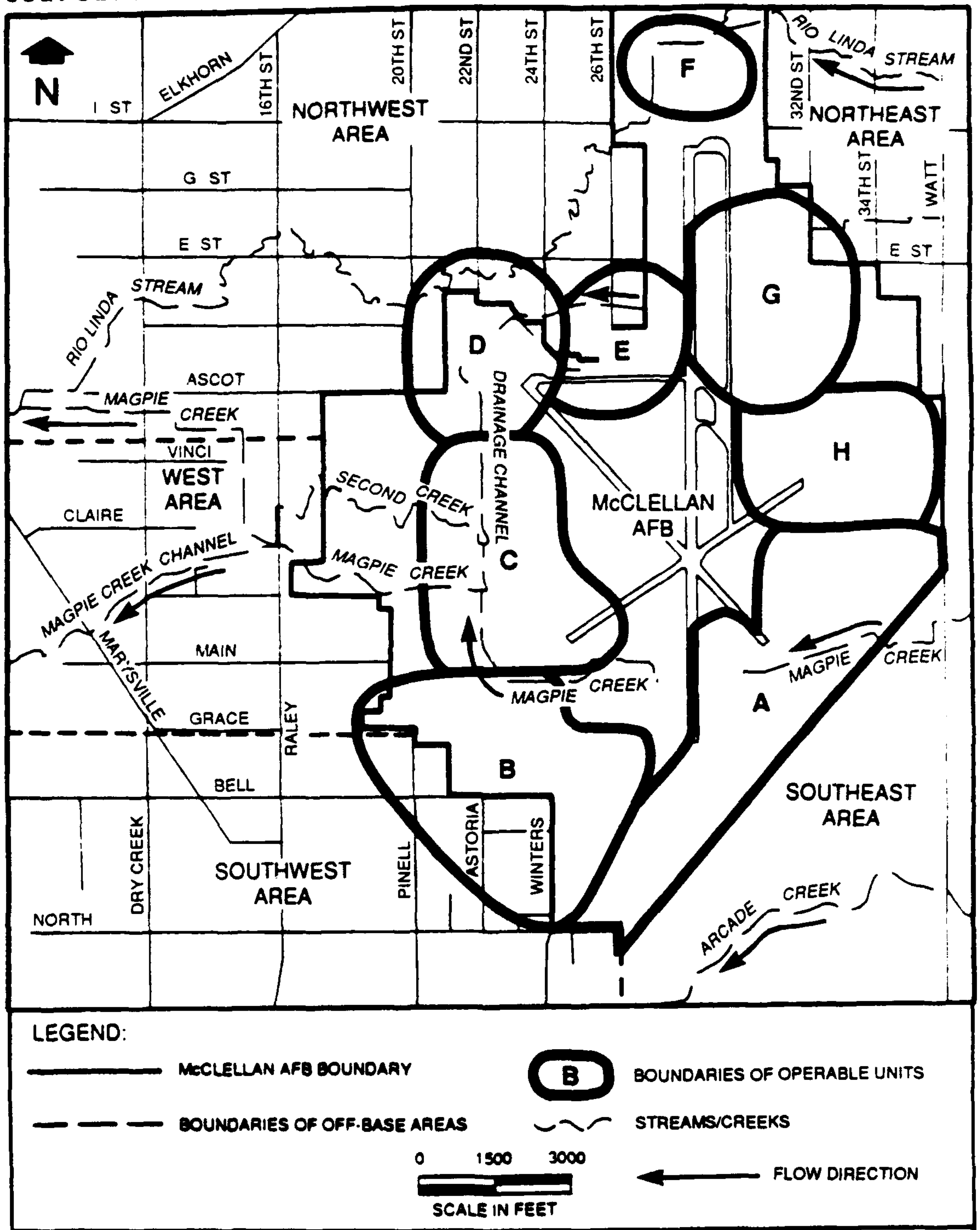


Figure 3-4. Old Channels Occupied by Magpie Creek Before Construction of the Storm Drainage System.

3.5 Meteorology

McClellan AFB and the surrounding Sacramento Valley have a Mediterranean-Subtropical type of climate characterized by hot, dry summers and cool, moist winters. Average temperatures of the area range from the mid-40s during winter months to the mid-70s during the summer, with an average annual temperature of approximately 60°F. Maximum daily summer temperatures frequently reach 90°F and regularly surpass 100°, while minimum winter temperatures seldom drop below 20°. Summer temperatures may vary from 25° to 40° per day, with less variation usually occurring during the winter months.

Most precipitation falls during winter and spring months, with over one-half of the total annual rainfall occurring during December, January, and February. Of an average annual rainfall of approximately 19 inches, 17 inches are usually recorded for November through April and two inches for May through October. Snowfall is rare. The mean annual evapotranspiration rate for the Sacramento area is approximately 45 inches/year. The net precipitation for the area (mean annual precipitation minus mean annual evapotranspiration) is approximately -26 inches per year. Table 3-2 provides a summary of meteorological data for McClellan AFB from 1932 to 1972.

TABLE 3-2. METEOROLOGICAL DATA FOR McCLELLAN AIR FORCE BASE (1932 - 1972)

Parameter	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Temperature (°F)												
Extreme maximum	75	75	80	90	100	110	115	110	110	100	85	75
Extreme minimum	20	25	25	33	35	40	45	45	40	30	25	15
Mean maximum	53.1	59.4	64.5	71.2	78.9	87.2	94.1	92.2	87.6	77.0	63.7	53.6
Mean minimum	38.2	41.5	43.2	46.8	51.8	56.8	60.4	59.8	57.5	51.1	43.8	39.5
Mean monthly	45.8	50.5	54.0	59.2	65.5	72.1	77.4	76.2	72.7	64.2	53.9	46.6
Precipitation (inches)												
Maximum	11.32	12.65	6.04	5.40	2.68	0.79	0.39	0.44	2.30	6.62	7.58	15.78
Minimum	0.57	0.16	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	Trace	0.42
Average	3.94	3.06	2.39	1.63	0.71	0.13	0.00	0.05	0.21	0.98	2.35	3.47

SOURCE: Climatic Data Records for McClellan AFB, California, *from* 1932-1972, Data Processing Branch, USAF ETAC, Air Weathering Service/MAC.

GEN/030890/jks

4.0 TARGET POPULATIONS AND ENVIRONMENTS

This section describes the target populations and environments of McClellan Air Force Base (AFB), including biota, land use, and populations. "Target" refers to all populations and environments within an area surrounding the base which may become affected by environmental hazards originating from base activities.

4.1 Biota

Grasslands are the predominant plant community at the base and most of the surrounding undeveloped region. Small riparian forests and vernal pools also occur within the general area.

A field survey of fauna present on the base was conducted during April of 1981 (CH2M Hill, 1981). During the survey, one fish, one amphibian, one reptile, two mammal, and 24 bird species were sighted. The blacktail hare was the largest mammal permanently residing on base. Muskrats were also observed at a number of locations along Magpie Creek. Game bird species, such as pheasant, morning dove, and California quail were common on the base. Mallards were observed in Magpie Creek.

The vertebrate fauna of Magpie Creek are limited primarily to mosquitofish, waterfowl, muskrats, and amphibians. A study done in 1973 (Pauls and Doane) documented the macroinvertebrate fauna of the creek. Species density and diversity were limited in the portions of the creek lined with concrete where little natural substrate was available. Sludge worms (Tubiflex) were the only species found upstream of McClellan AFB where the San Six Wastewater Treatment Plant provides most of the flow. Further downstream, damselfly (Ischnura), Psychoda fly, and mosquito larvae were prevalent.

Only two endangered plant species are known to occur within Sacramento County, the Sacramento orcutt grass (Orcuttia viscida), which occurs in the vicinity of Phoenix Field, and Boggs Lake hedge hyssop (Gratiola heterosepala), which is found in the vicinity of Rio Linda (CH2M Hill, 1981).

Only three endangered wildlife species are expected to occur within 25 miles of the base: the bald eagle, the peregrine falcon, and the giant garter snake. The nearest eagle nest sites are near Lake Pillsbury (Mendocino County) and in the vicinity of Chico (Butte County) (CH2M Hill, 1981). However, juvenile or non-breeding eagles occasionally pass through the Sacramento area. Peregrine falcons regularly migrate through Sacramento County, and it is possible that some may reside in the area. The giant garter snake is confined to sloughs, marshes, and other permanent freshwater areas. The nearest known location of the giant garter snake is in rivers and associated wetlands south of Sacramento.

Most of the undeveloped grassland areas on the base have been disturbed in the past. Much of the Magpie Creek has been cleared of former riparian vegetation and channelized. Some of the vernal pool areas of the creek have been drained or filled. Most of these actions took place years ago, however, and vegetation growing on the unimproved areas of the base is generally healthy, vigorous, and supporting the appropriate fauna.

In addition to its physical modification, Magpie Creek has been affected by the effluent from the San Six County Wastewater Treatment Plant located north of the base. In 1977, a fish kill of 100 to 150 minnows in Magpie Creek was traced to high chlorine residuals originating from the treatment plant. This problem has since been corrected.

The historical use of persistent, and later non-persistent, pesticides for mosquito control on base affected the natural invertebrate fauna of Magpie Creek and the vernal pools. However, this impact is considered minor as CH2M Hill found no evident stress on biota due to the use and disposal of waste pesticides at McClellan AFB.

4.2 Land Use

Land use in the vicinity of McClellan AFB (presented in Figure 4-1) consists of a combination of military, industrial, commercial, residential, and agricultural zones.

Much of the land use around the base is residential. In the Rio Linda area northwest of the base, most of the land is categorized as agricultural-residential. This land category identifies areas which are reserved for large lot rural residential uses where animals may be kept and crops raised for recreational, educational, personal consumption or income supplement purposes (Sacramento County, 1985). Many of these residences use private well water for nonpotable uses.

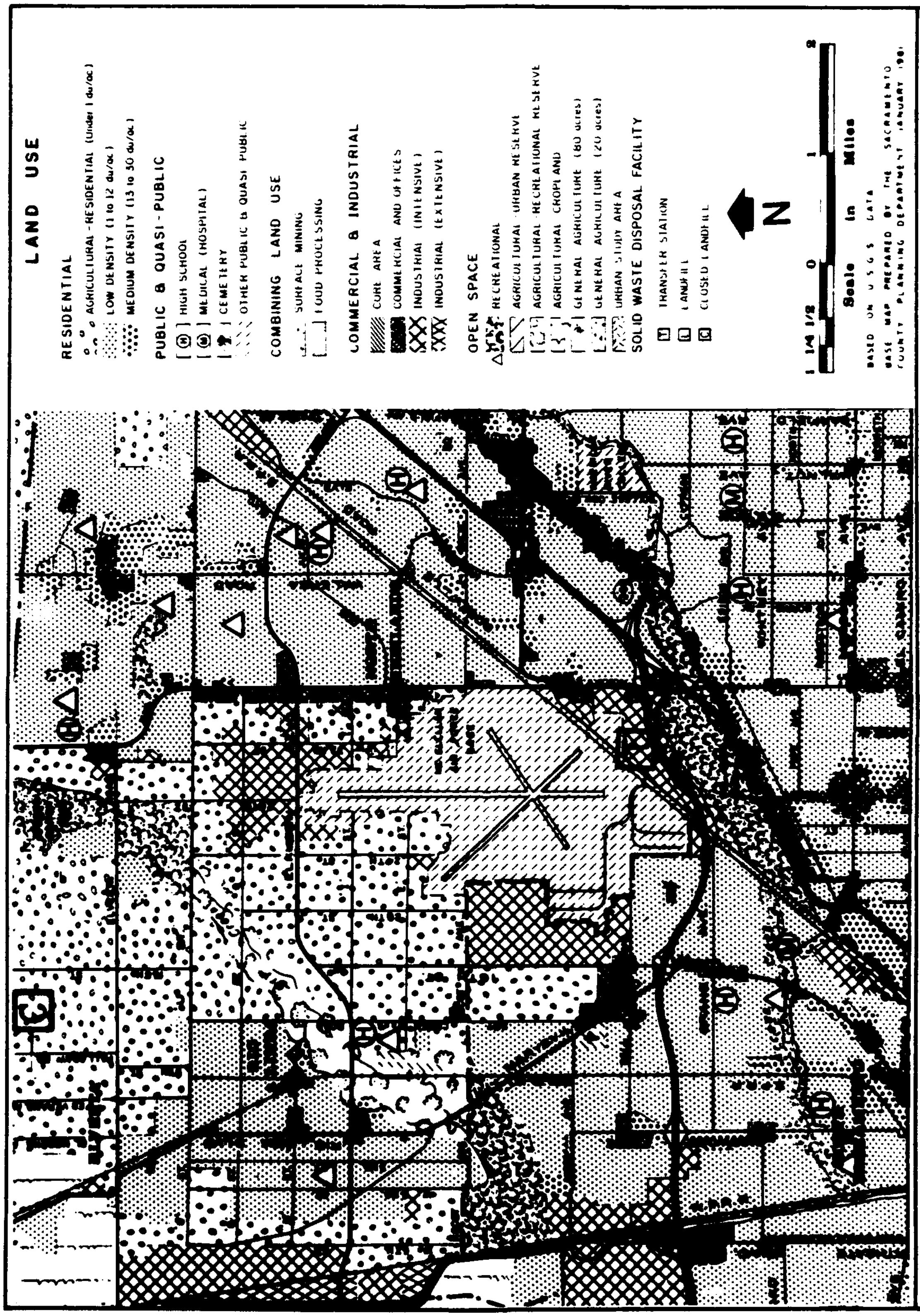


Figure 4-1. Land Use Map of the Vicinity of McClellan Air Force Base.

Several Rio Linda lots directly adjacent to the base have been zoned as industrial-intensive. This land category identifies areas reserved for research, manufacturing, processing, and warehousing activities. Necessary public services, such as sewer and water systems, are available in industrial intensive areas.

Most of the land use to the southwest and east of the base consists of low density residential zones. These areas are reserved for a planned population density range of 5 to 30 persons per acre or a housing density range of 1 to 12 dwelling units per acre. While some of these residences may have private wells, the majority have municipal water supplies.

To the southwest and east of McClellan AFB are parcels designated for commercial and office use which includes shopping centers, large office complexes, and major concentrations of strip commercial development.

Del Paso Park, designated as a recreational area, is located within one mile of the southeast edge of the base. Additional recreational/agricultural-recreational reserve areas are located along Dry Creek, approximately two miles west of the base.

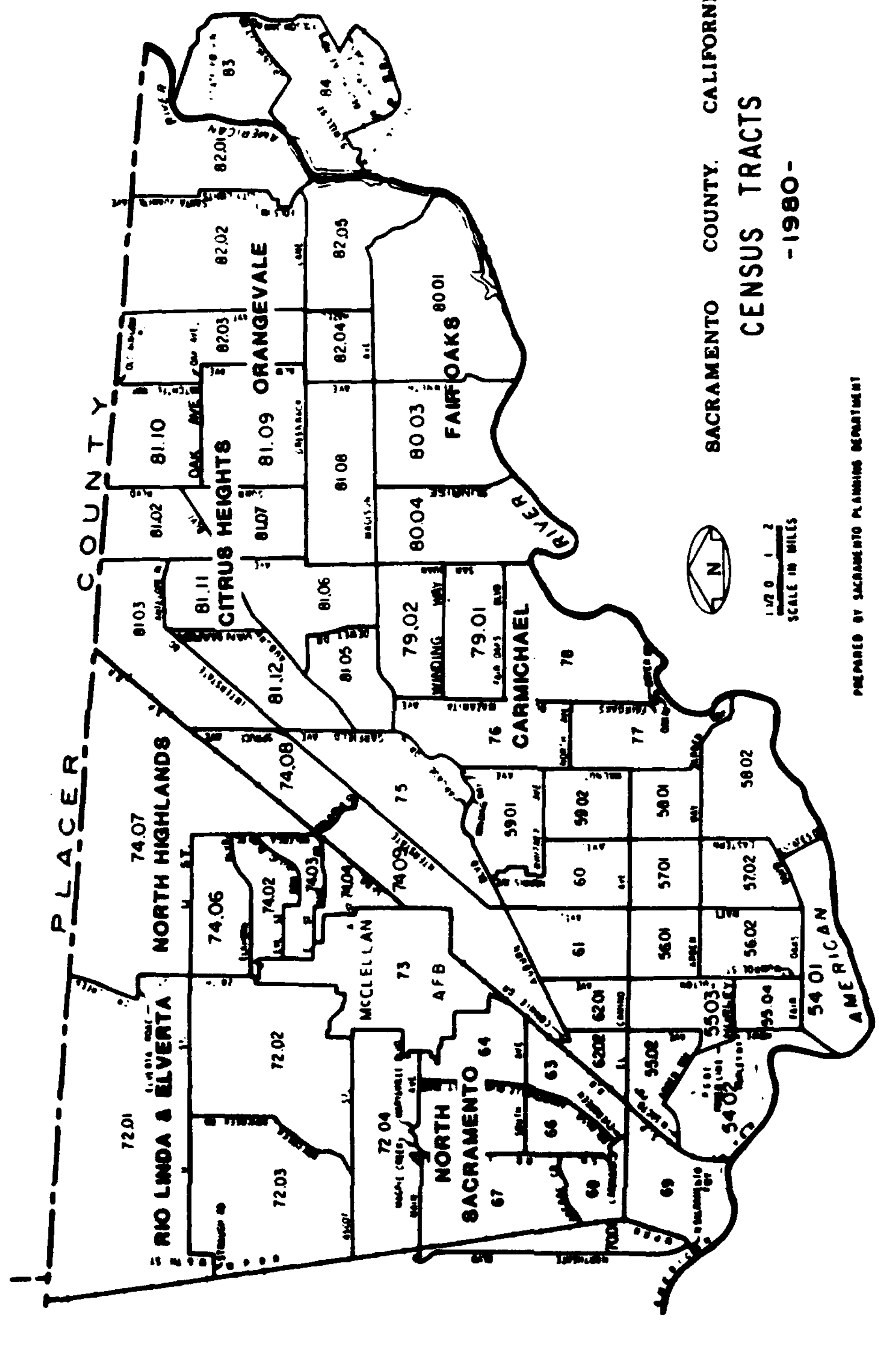
4.3 Population

McClellan AFB is surrounded by three communities, each of which contains residential, commercial, and industrial zones. The communities surrounding McClellan AFB (Figure 4-2) include Rio Linda and Elverta to the northwest, North Sacramento to the west and southwest, and North Highlands to the east. All of these communities are in Sacramento County. Rio Linda and North Highlands are unincorporated.

The population of the surrounding communities as determined by the 1980 census is 107,822. A summary of population by community and tract number, as well as projected populations in the year 2005, is presented in Table 4-1. The tract areas presented in this table are shown in Figure 4-2.

4.4 Community Water Sources

The communities in the vicinity of McClellan AFB receive water from private wells and municipal water supplies; the nearest private wells supplying potable water are located east (upgradient) of the base and west of the base. The nearest



SOURCE: Sacramento County, 1985.

Figure 4-2. Urban Area Surrounding McClellan Air Force Base. (Numbered and Outlined Areas are Census Tracts)

TABLE 4-1. POPULATION DATA AND PROJECTIONS FOR THE COMMUNITIES SURROUNDING McCLELLAN AFB

Tract Community	1980 Census Number	1980 Population	Projected 2005 Population
Rio Linda and Elverta	72.01	3,689	
	72.02	3,547	
	72.03	6,737	
	TOTAL	13,973	26,529
North Highlands	73.00	1,541	
	74.02	6,207	
	74.03	4,451	
	74.04	3,511	
	74.06	7,044	
	74.07	7,959	
	74.08	9,819	
	74.09	7,262	
	75.00	11,010	
	TOTAL	58,804	118,861
North Sacramento	72.04	1,613	
	63.00	3,578	
	64.00	4,514	
	65.00	3,406	
	66.00	4,621	
	67.00	7,365	
	68.00	5,644	
	69.00	4,304	
	TOTAL	35,045	52,682

SOURCE: Sacramento County, 1986

municipal water supply wells are located approximately 1,500 to 4,000 feet west of the base as shown on Figure 4-3. Most of the water for North Highlands is supplied by the Arcade Water District. The Rio Linda Water District and the Northridge Water District also supply water to the North Highlands community. North Sacramento receives water from the City of Sacramento Water Department. Many private wells are still in use in the area north of El Camino Boulevard in North Sacramento.

Rio Linda and Elverta receive water from the Rio Linda Water District and from private wells. In 1986, the Rio Linda Water District and the City of Sacramento Water Department began connecting Rio Linda, Elverta, and North Sacramento residences in adjacent areas to the west of the base to municipal water supplies (see Figure 4-3). The residents in this area previously used private wells for their water needs. The connection of the residences to municipal water supplies was a remedial action initiated by McClellan AFB.

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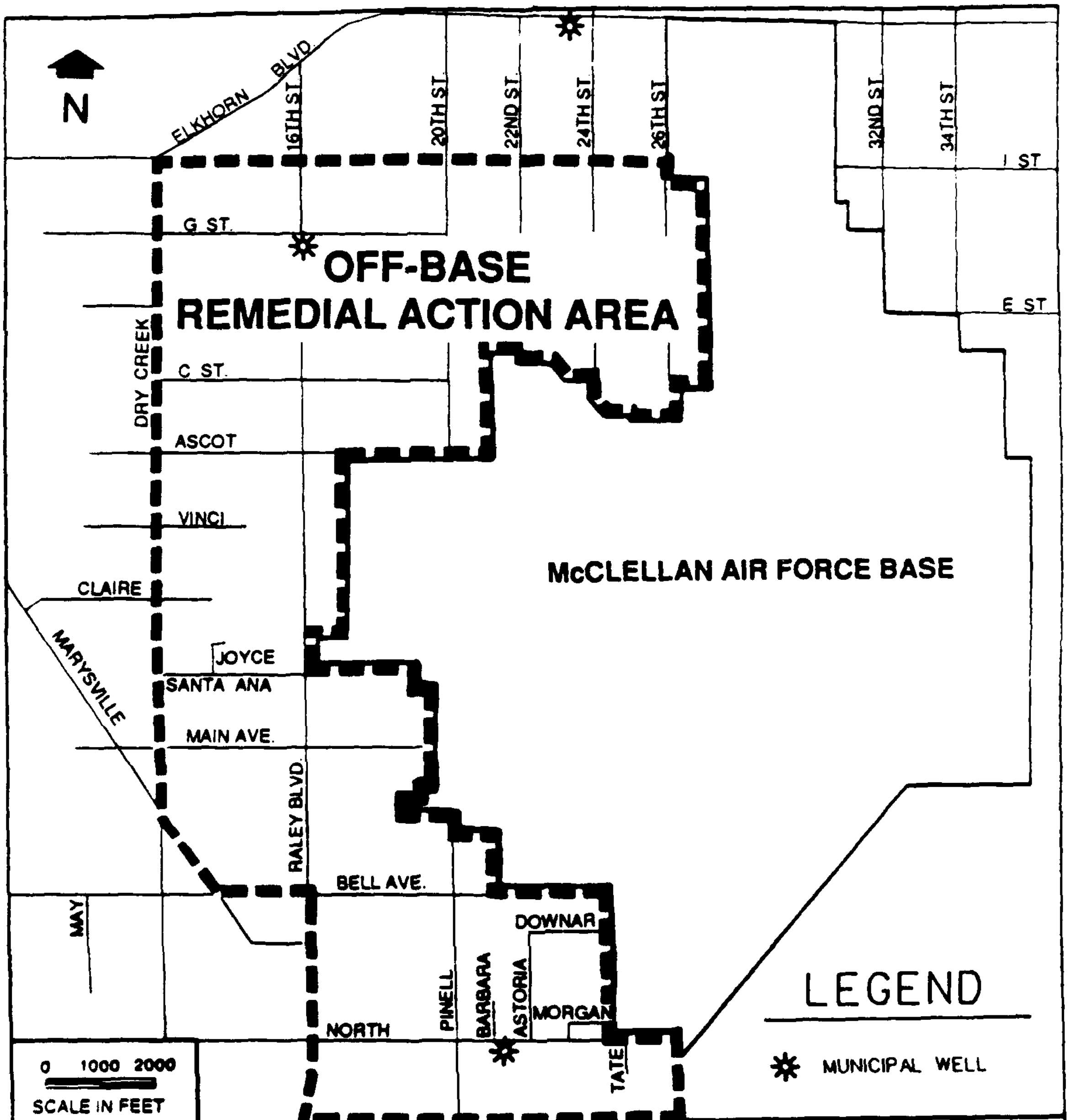

Figure 4-3. Off-Base Remedial Action Area.

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APPENDIX B

Operable Unit B Preliminary Assessments
and Technical Memorandums

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INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

TECHNICAL MEMORANDUM FOR SITE 23
FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

Radian Corporation
10395 Old Placerville Road
Sacramento, California 95827

USAF CONTRACT NO. F33615-87-D-4023, DELIVERY ORDER NO. 0012
CONTRACTOR CONTRACT NO. 227-005, DELIVERY ORDER NO. 0012

United States Air Force Center for Environmental Excellence
Mr. Patrick Haas (Technical Project Manager)
Environmental Services Office/Environmental Restoration Division (AFCEE/ESR)
Brooks Air Force Base, Texas 78235-5501

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1.0 INTRODUCTION

This Technical Memorandum presents a summary of data compiled for Site 23 at McClellan Air Force Base (AFB), California. The location of Site 23 is shown in Figure 1-1. Site 23 is the location of a former burial pit and is currently the location of Building 781, which is a chemical storage facility. The task of compiling data for Technical Memorandums is part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan for any sites that pose a threat to human health and welfare or the environment. This site assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund sites.

The purpose of this Technical Memorandum is to:

- Identify any immediate response needs as required by CERCLA/SARA;
- Determine whether further action is needed at the site;
- Provide qualified data to support operable unit prioritization and grouping;
- Evaluate previous contractors' recommendations; and
- Provide recommendations for further investigation or remedial actions.

The scope of this Technical Memorandum includes site-specific data regarding the following categories of information:

- Site operations and waste management practices;
- Waste characteristics;
- Contaminant migration pathways; and
- Target populations and environments.

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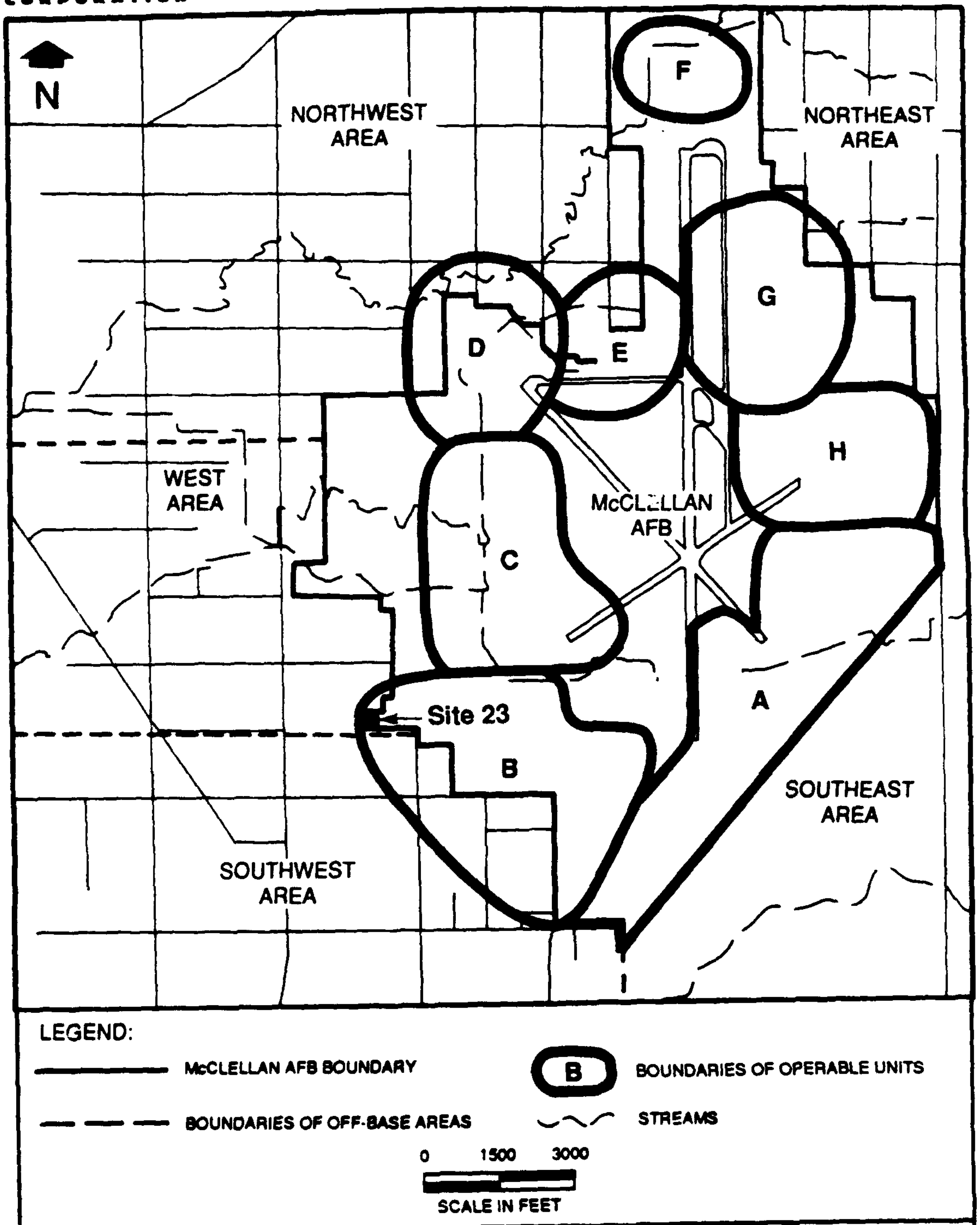

Figure 1-1. Map of Site 23 Within the McClellan AFB Facility.

Data on all four categories are necessary to develop an understanding of the site, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Site operations, waste management practices and waste characteristics, and migration pathways are discussed in this document. A separate General Information document addresses target populations and environments. Background information regarding the overall facility description of McClellan AFB is presented in the General Information document that includes environmental setting, land use, hydrogeologic conditions, facility history, and a discussion of potential receptors.

This Technical Memorandum document includes the following:

- Information sources used to prepare the document;
- Site description, including historical operations;
- Extent of on-site soil contamination with a presentation of previous data;
- Potential hazards;
- An evaluation of previous contractors' recommendations; and
- Conclusions and recommendations.

2.0 SOURCES OF INFORMATION

The following sections describe the sources of information used to develop this Technical Memorandum.

2.1 Previous Investigations

The initial investigation identifying the site now designated as Site 23 was prepared by McClellan Air Force Base (AFB) personnel in 1981. During the preparation of the report, McClellan AFB personnel investigated past disposal activities, reviewed base records, maps, and photographs, and interviewed employees familiar with base disposal practices. The information obtained during the investigation led to the identification of 30 disposal sites at McClellan AFB, including CS 23. The report also presented analytical results for groundwater samples collected from monitoring well (MW) 3, located near the southwest corner of the site. The groundwater samples were collected as part of an initial source exploration project conducted by McClellan AFB (McClellan AFB, 1981, pp. 11-14, 22).

In 1981, CH2M Hill conducted a records search of McClellan AFB files to identify hazardous waste disposal sites on base in order to determine the potential for hazardous materials to migrate off the base. Interviews with past and present employees and the review of McClellan AFB records resulted in the identification of 46 waste disposal locations at McClellan AFB, including the area now designated Site 23. CH2M Hill described Site 23 as a burial pit used from 1966 to 1969 (CH2M Hill, 1981, pp. II-18, II-37, Figure 23).

In 1981, Engineering Science began a monitoring well installation and hydrogeological assessment program at McClellan AFB. As part of the program, Engineering Science collected and analyzed groundwater samples from MW-3 (Engineering Science, 1981, p. 4-8).

McLaren Environmental Engineering, Inc., performed an investigation of Site 23 in 1986. The investigation included physical and chemical characterization of the soil and qualitative characterization of the soil gas (McLaren, 1986a).

Radian Corporation began a groundwater sampling and analysis program at McClellan AFB in 1985. As part of the program, Radian collected and analyzed groundwater samples from MW 116, located in the southwest corner of Site 23 (Radian, 1985-1988e).

2.2 Personnel Interviews

On 8 February 1989, Radian interviewed a base employee who had worked from 1977 to 1978 in Building 781 (Juarez, personal communication, 1989). Documentation of the interview is in the Site 23 Site File. The individual was not knowledgeable about waste disposal at Site 23. The information obtained from the interview was limited to a description of the operations in Building 781. Base personnel who may be able to provide information pertinent to waste disposal activities at Site 23 could not be identified. Although personnel interviews were apparently conducted as part of the McClellan, CH2M Hill, and McLaren investigations, documentation for these interviews was not kept.

2.3 Site Visit

Radian personnel visited Site 23 on 10 March 1989 to document current site features.

2.4 Aerial Photographs

Historical aerial photographs were reviewed for site features and evidence of contamination. Table 2-1 lists the photographs that were reviewed. Interpretation of aerial photographs is discussed in more detail in Section 3, Site Description.

2.5 Review of Base Files

McClellan AFB Civil and Bioenvironmental Engineering files were reviewed for historical information during the preparation of this Technical Memorandum. No pertinent historical information was found in the Bioenvironmental Engineering files for Site 23. Civil Engineering files contained as-built construction drawings prepared for Building 781. Several drawings for Building 781 were reviewed, specifically: "Floor Plan and Elevations," "Foundation Floor Plan," "Footing Schedule," "Utility Plan," "Paving and Grading Plan," and "Site and Removal Plan" (McClellan AFB, 1971, Civil Engineering Files).

TABLE 2-1. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1988) REVIEWED FOR SITE 23

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 400'
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 370'
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 400'
1949	Whittier College	1" = 400'
1951	Whittier College	1" = 770'
1953	U.S. Department of Agriculture, ASCS[1]	1" = 400'
1955	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1690'
1957	U.S. Department of Agriculture, ASCS	1" = 400'
1962	McClellan AFB, History Office	1" = 150'
1963	Cartwright Aerial Surveys	1" = 1667'
1965	McClellan AFB, History Office	1" = 150'
1968	Cartwright Aerial Surveys	1" = 1000'
1971	Cartwright Aerial Surveys	1" = 400'
1972	Cartwright Aerial Surveys	1" = 1000'
1974	Cartwright Aerial Surveys	1" = 1200'
1976	Cartwright Aerial Surveys	1" = 400'
1978	Cartwright Aerial Surveys	1" = 2000'
1981	Cartwright Aerial Surveys	1" = 1000'
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000'
1987	Cartwright Aerial Surveys	1" = 1000'
1988	Cartwright Aerial Surveys	1" = 400'

[1] United States Department of Agriculture, Agricultural Stabilization and Conservation Service.

3.0 SITE DESCRIPTION

Site 23 (shown in Figure 3-1) is located in the west area of McClellan Air Force Base (AFB) near the intersection of Dean Street and Lang Avenue. Prior to construction of Building 781, the site was an on-base burial pit. The site includes Building 781 and vicinity, an area approximately 500 feet long (east/west) and 300 feet wide (north/south). A site map showing the current features at the site and the surrounding area is presented in Figure 3-2.

3.1 Site Delineation

The area now designated as Site 23 was first identified by McClellan AFB during an investigation of past disposal activities on base. Although McClellan AFB personnel did not establish specific site boundaries, they gave a general description of the site's location (McClellan AFB, 1981, pp. 11-14). Engineering Science added to the McClellan AFB description by describing the burial pit as being approximately 280 feet long and 125 feet wide (Engineering Science, 1981, p. 2-17). No information was provided describing how Engineering Science determined these dimensions. McLaren Environmental Engineering, Inc., established detailed site boundaries for Site 23 after reviewing aerial photographs and construction drawings.

McLaren's boundaries comprised two areas, a 100-foot by 350-foot area south of and under a portion of Building 781, and a 60-foot by 390-foot area north of and under a portion of Building 781. The boundaries of these two areas are shown in Figure 3-3. McLaren identified the southern area from aerial photographs that indicated areas of soil disturbance. McLaren identified the northern area from the "Site and Removal Plans" for Building 781 that showed an area of buried debris to the north of and under Building 781 (McLaren, 1986a, pp. 13-23).

In February 1985, McLaren completed two ground penetrating radar (GPR) transects along the south and west sides of Building 781 to confirm site boundaries. However, McLaren observed interference on the profiles and reported the results were inconclusive (McLaren, 1986a, pp. 13-23).

The historical aerial photographs reviewed by Radian show evidence of soil disturbance outside of McLaren's original boundaries for Site 23. Radian believes the site boundaries shown in Figure 3-2 more adequately encompass the area of concern.

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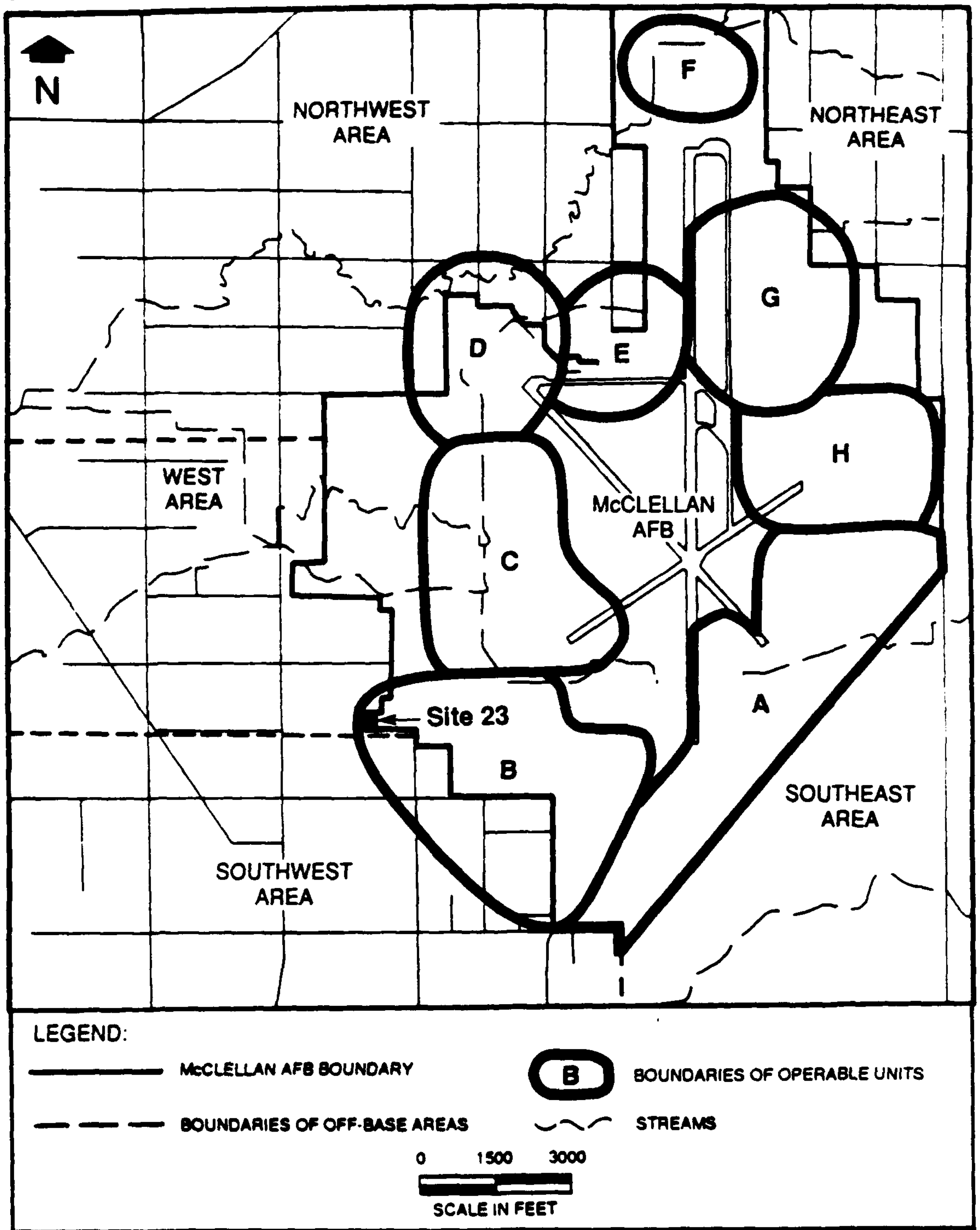

Figure 3-1. Map of Site 23 Within the McClellan AFB Facility.

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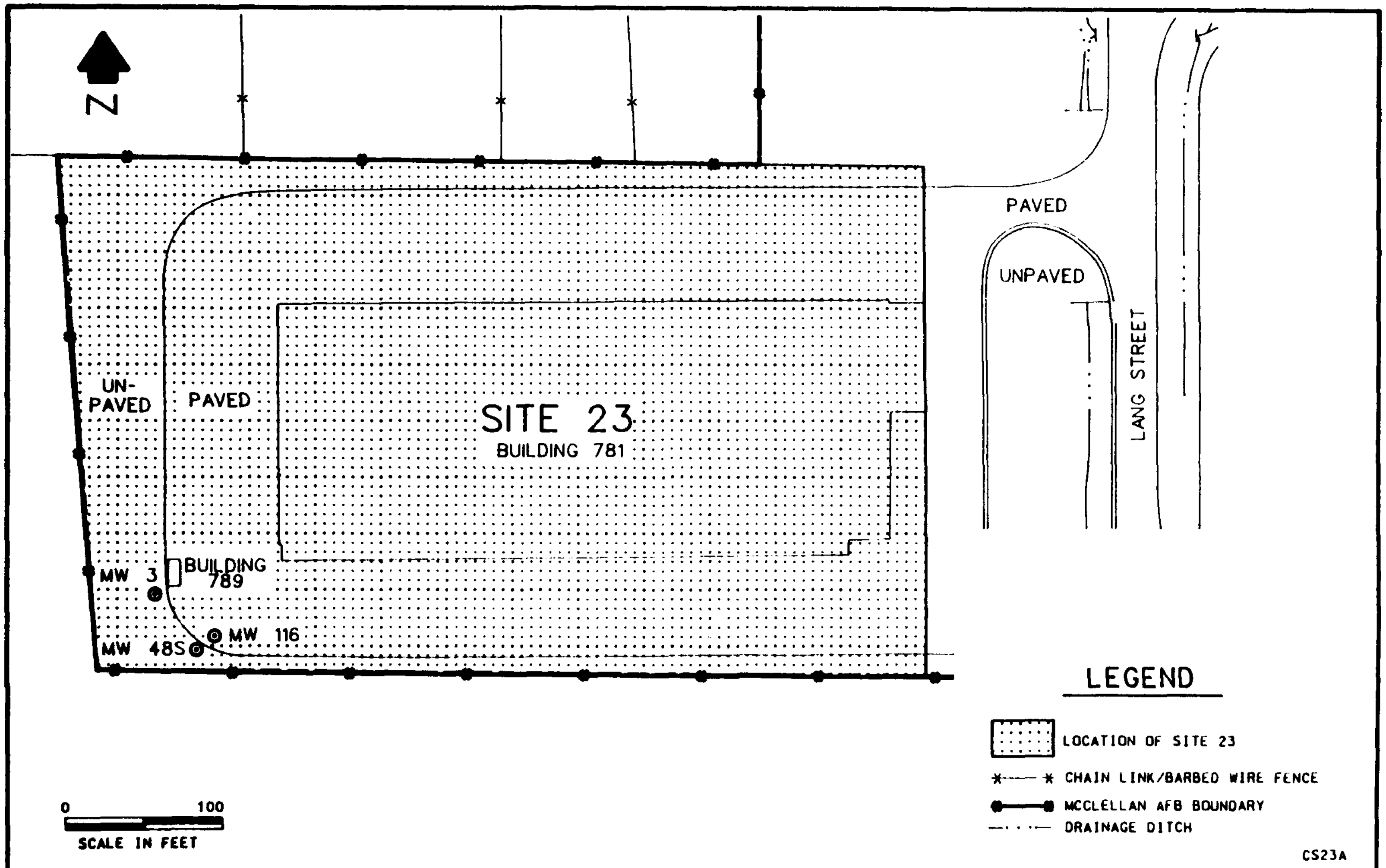

Figure 3-2. Current Features at Site 23 and Vicinity.

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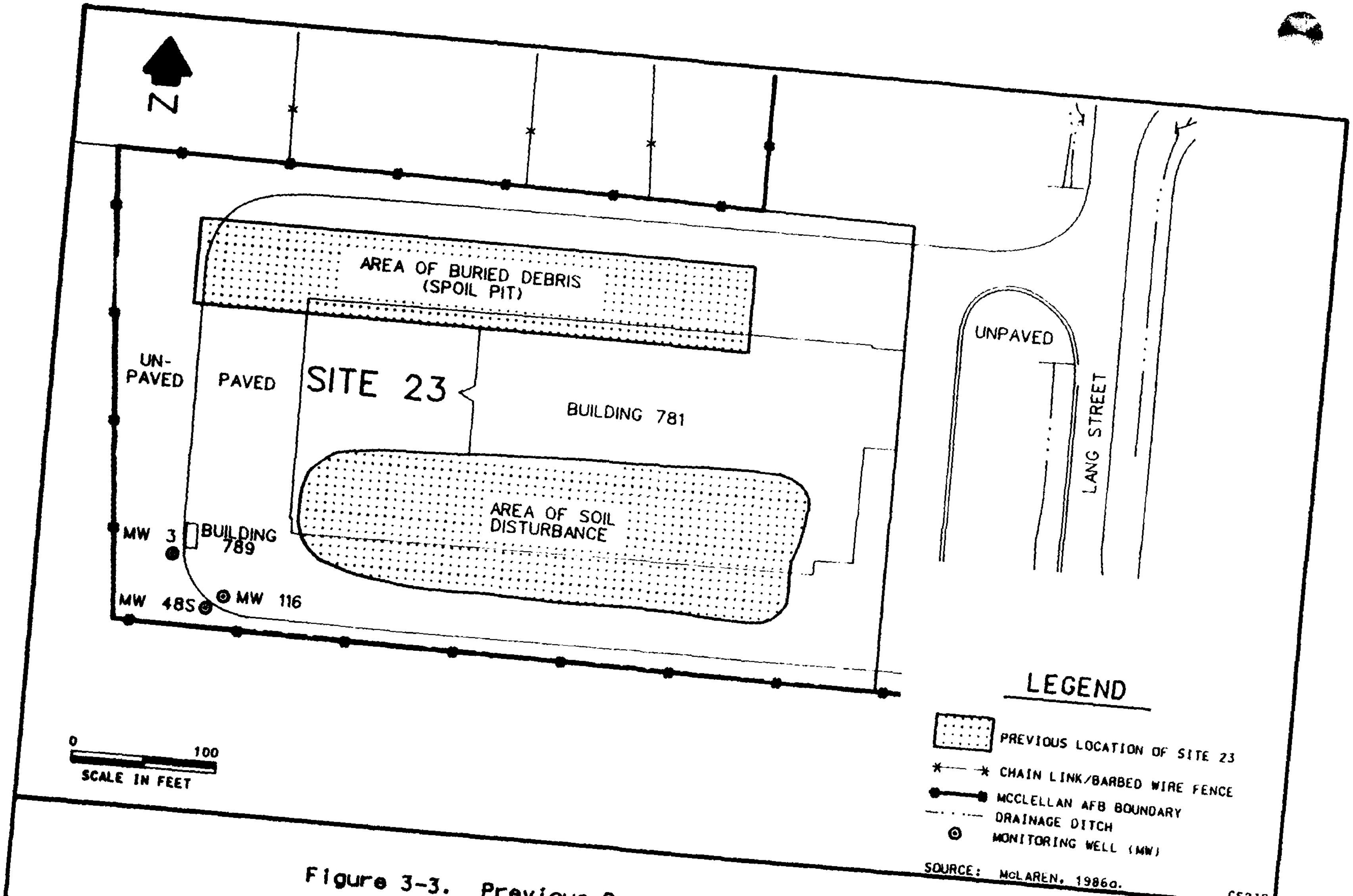

Figure 3-3. Previous Boundaries for Site 23.

3.2 Historical Activities

In their initial investigation, McClellan AFB described Site 23 as a burial pit that had been used prior to the construction of Building 781. The report did not provide site-specific information regarding the types of disposed materials. However, the report did indicate that, in general, on-base burial pits received refuse, demolition material, excess military equipment, and possibly chemicals. The McClellan AFB report estimates that the burial pit was used from 1966 to 1969 (McClellan AFB, 1981, p. 11-14).

As a result of their records search of McClellan AFB files, CH2M Hill personnel reported that buried wastes at Site 23 were removed and transported to an off-base disposal site in 1970, prior to construction of Building 781. In addition, CH2M Hill stated that the burial pit was used primarily for paper scraps (CH2M Hill, 1981, p. II-37).

Notes accompanying a 1971 Building 781 construction drawing included results from a visual inspection of the site, plans for removing debris, and plans for refilling areas of excavation. The notes indicate that fill material covered the entire area now occupied by Building 781 and the surrounding pavement. The depth of the fill averaged 5 feet below ground surface (BGS) and reached 10 to 12 feet BGS in some areas. The notes state that the fill material contained construction waste materials such as concrete, metals, some wood, and asphalt pavement materials. Scattered throughout the surface of Site 23 were concrete rubble, reinforcing steel and wire, metal containers, asphalt pieces, and other debris (McClellan AFB, 1971, Civil Engineering files, Building 781 "Site and Removal Plan").

According to the notes, part of the fill material was excavated from the "spoil pit" located north of and under Building 781 (see Figure 3-3). Waste consisting of paper products, wood, and other combustible materials was found in the spoil pit. The waste in the spoil pit was to be removed and the excavation refilled using soil from the surrounding area (if suitable) or from a mound of soil located at the northern boundary of the site. In addition, the fill material beneath the area now occupied by Building781 was to be removed to a depth of 4 to 5 feet BGS (McClellan AFB, 1971, Building 781 "Site and Removal Plan"). No information was available to confirm whether any of the excavating and filling procedures were completed.

A review of historical aerial photographs shows that the area comprising Site 23 was undeveloped until 1957. Evidence of soil disturbance can be seen in photographs taken in the years between 1957 and 1971. The dimensions of the apparent soil disturbances vary from 150 feet wide (1962 photograph) to 300 feet wide (1971 photograph) and 250 feet long (1957 photograph) to 500 feet long (1971 photograph). Rubble and debris can be seen in the 1957 and 1962 photographs. Vehicle tracks leading from Lang Avenue to the burial pit can be seen in all aerial photographs between the years 1957 and 1971.

A 1967 oblique photograph shows an earth berm surrounding the perimeter of the site. The area inside the berm appears to be below grade. Since 1972, the site has been covered by Building 781 and surrounding pavement.

3.3 Current Activities

Since 1972, Building 781 has been the primary chemical storage and distribution facility for McClellan AFB (Juarez, personal communication, 1989). Chemicals from Building 781 are delivered throughout the base. The types of chemicals stored at the facility include acids, bases, compressed gases, oils, cleaners, solvents, paints, and plating chemicals.

Radian personnel visited Site 23 on 10 March 1989 to observe the current conditions and activities at the site. Building 781 is surrounded by a 75-foot wide strip of asphalt pavement (see Figure 3-2). The paved area is curbed and slopes to the east. Runoff flows towards two storm drains on the eastern boundary of the site. Building 781 and the surrounding pavement is at the same elevation as Lang Street; the land along the north, south and west edges of Site 23 is approximately 4 feet lower in elevation. The site is enclosed on three sides by a barbed wire/chain link fence. Dean Street, an unlined drainage ditch, and a 70-foot by 250-foot unpaved area lie east of and adjacent to the site's eastern boundary. According to construction drawings, the two storm drains discharge to the drainage ditch near the eastern boundary of the site. Approximately four off-base residences are located adjacent to the site's northern boundary.

3.4 Reported Releases

Releases of specific contaminants, if any, have not been documented at Site 23.

3.5 Remedial Actions

No information was available confirming the excavation and refilling procedures used at Site 23; therefore, it is not known if remedial actions have occurred at the location.

4.0 EXTENT OF CONTAMINATION

The following sections present the results of previous investigations at Site 23. Discussions related to soil, soil gas, groundwater, surface water, and air monitoring investigations are presented under separate subsections.

4.1 Soil Results

This section summarizes the physical characterization of the soil, analytical results of soil samples, and an evaluation of the adequacy of the soil characterization. Results presented in this section are from data obtained from the McLaren Environmental Engineering, Inc., 1985 soil investigation (McLaren, 1986a). McLaren drilled a total of 10 borings at Site 23 for that investigation (see Figure 4-1). Three types of borings were drilled: deep auger profile borings (DAPs), waste sample borings (WSBs), and soil sample borings (SSBs).

Four DAPs were drilled to intercept lateral contaminant migration. The DAPs were drilled with 4-inch diameter solid-stem augers to 60 feet below ground surface (BGS). While drilling the DAPs, the cuttings were monitored with a photoionization detector (PID) and logged for soil classification (McLaren, 1986b, p. 10).

Two WSBs were drilled to verify the reported removal of buried waste at the site and to collect soil samples. The two WSBs were drilled four months after the other eight borings were drilled. The WSBs were drilled to depths of 15 and 28 feet BGS using an 8-inch diameter hollow-stem auger. Soil samples were collected approximately every 5 feet with a "down the hole split-spoon sampler/drop-hammer system" (McLaren, 1986b, p. 11).

Four SSBs were drilled around the perimeter of Building 781 to determine the lateral extent of contamination (to depths ranging from 60 to 70 feet BGS). The SSBs were drilled using an 8-inch diameter hollow-stem auger. As in the case of the WSBs, samples were collected approximately every 5 feet (McLaren, 1986b, p. 12).

All of the samples collected for analysis during McLaren's soil investigation were placed in freezer storage until analysis. Chain-of-custody procedures were apparently followed, although specific procedures were not documented (McLaren, 1986b, p. 16).

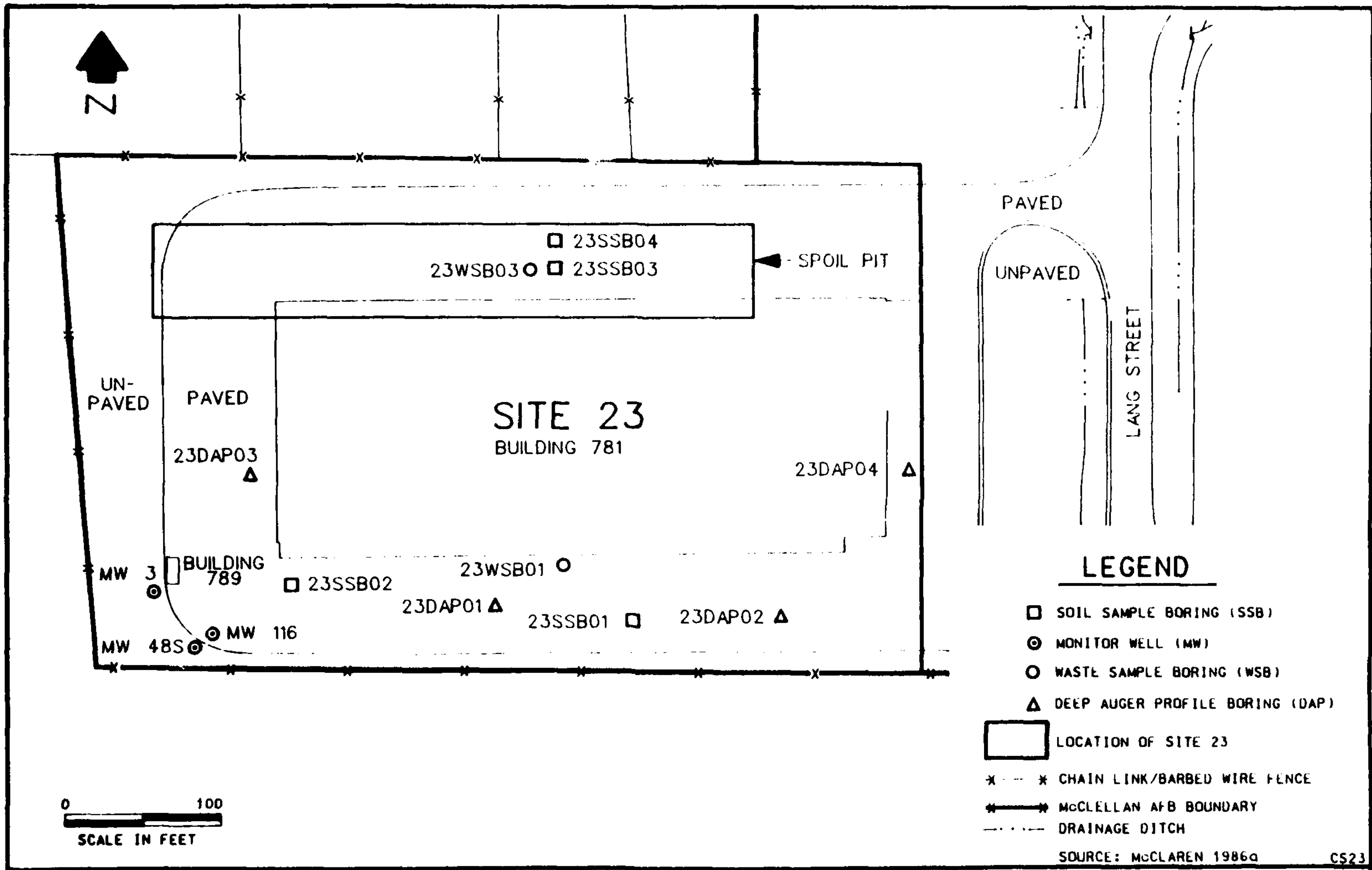

Figure 4-1. Boring Locations for Site 23.

4.1.1 Physical Characteristics

Lithologic logs from McLaren's 10 borings were used to determine the physical characteristics of the soil at Site 23 (McLaren, 1986a). The soils at Site 23 include fine sands, sandy loams, silt loams, loams and clay loams. The soil colors range from dark gray to light yellowish brown, with olive predominating. The surface soils at Site 23 range from slightly moist fine-grained sandy loams to moist gravelly sandy loams. The color of the surface soils range from dark brown to dark yellowish brown with olive-brown predominating.

Odors, discolored soil, or buried debris indicating possible soil contamination were noted in 7 of McLaren's 10 borings. The three borings with no observed evidence of contamination (Borings 23DAP01, 23DAP02, and 23DAP04) were located near the southeast corner of Site 23. The most extensive evidence of contamination was found in the borings located in the center of the former spoil pit (Borings 23SSB03 and 23WSB02).

Odors were noted in Borings 23WSB02, 23SSB02, and 23SSB03. The odor in Boring 23WSB02 was characterized as a "slight solvent/sewage odor" (McLaren, 1986a, 23WSB02 Boring Log); the odors in Borings 23SSB02 and 23SSB03 were not characterized. The odors were observed from 4.5 to 28 feet BGS in Boring 23WSB02, from 2 to 7 feet BGS in Boring 23SSB02, and from 2 to 33.5 feet BGS in Boring 23WSB03.

Discolored soil was described in five of McLaren's 10 borings. Discolored soil was observed at depths ranging from 2 to 7 feet BGS in Borings 23SSB01, 23SSB02, and 23WSB01 and at depths ranging from 2 to 38 feet BGS in Borings 23SSB03, and 23WSB02.

Buried debris was found in Borings 23DAP03, 23WSB02. In Boring 23DAP03, debris consisting of wood, charcoal, and glass was found from 4 to 5 feet BGS. In Boring 23WSB02, debris consisting of building insulation, concrete, and glass was found from 0 to 24 feet BGS.

4.1.2 Analytical Results

The soil samples collected from Site 23 were analyzed for United States Environmental Protection Agency's (U.S. EPA) Priority Pollutant volatile organic compounds (VOCs), semivolatile organic compounds, pesticides and polychlorinated biphenyls (PCBs), metals, and oil and grease. Table 4-1 presents a summary of positive analytical results for soil samples from Site 23. The following subsections discuss the analytical results for these analyses.

Volatile Organic Compounds (VOCs)

Two samples from each of five borings were analyzed for VOCs using U.S. EPA Method 8240. In addition, a duplicate sample from Boring 23SSB03 was analyzed. Table A-1 (Appendix A) presents detailed sampling information and analytical results from these samples.

In total, nine different VOCs were detected in soil samples from the borings from Site 23:

- Acetone;
- 2-Butanone;
- Chloroform;
- Trans-1,2-dichloroethene;
- Methylene chloride;
- Tetrachloroethlyene;
- Toluene;
- 1,1,1-Trichloroethane; and
- Total xylenes.

Semivolatile Organic Compounds

One sample from each of five borings was analyzed for semivolatile organic compounds using U.S. EPA Method 8270. In addition, a duplicate sample from Boring 23SSB01 was analyzed. Table A-2 (Appendix A) presents detailed sampling information and analytical results from these samples.

The only detected semivolatile organic compounds were from the composite sample taken from 7 to 24 feet BGS in Boring 23WSB02. The detected analytes were n-nitrosodiphenylamine, phenanthrene, pentachlorophenol, and 2-methylnaphthalene.

TABLE 4-1. POSITIVE ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 23

Compound Detected	Boring Number	Depth (feet BGS)	Concentration
Volatile Organic Compounds:			
Acetone	23SSB02	4.5 - 5.0	190 μg/kg
	23SSB03	69.5 - 70.0	220 μg/kg
	23SSB04	59.5 - 60.0	120 μg/kg
2-Butanone	23SSB03	69.5 - 70.0	740 μg/kg
Chloroform	23SSB03	29.0 - 29.5	61 μg/kg
		69.5 - 70.0	18 μg/kg
trans-1,2-Dichloroethene	23WSB02	7.0 - 24.0	59 μg/kg
Methylene chloride	23SSB03	29.0 - 29.5	13 μg/kg
Ethyl benzene	23WSB02	7.0 - 24.0	110 μg/kg
Tetrachloroethylene	23WSB02	7.0 - 24.0	24 μg/kg
	23SSB01	69.0 - 69.5	35 μg/kg
Toluene	23WSB02	7.0 - 24.0	400 μg/kg
	23SSB02	4.5 - 5.0	29 μg/kg
1,1,1-Trichloroethane	23SSB03	69.5 - 70.0	11 μg/kg
Xylenes (total)	23WSB02	7.0 - 24.0	660 μg/kg
Semivolatile Organic Compounds:			
2-Methylnaphthalene	23WSB02	7.0 - 24.0	6,200 μg/kg
N-nitrosodiphenylamine	23WSB02	7.0 - 24.0	28,000 μg/kg
Pentachlorophenol	23WSB02	7.0 - 24.0	6,400 μg/kg
Phenanthrene	23WSB02	7.0 - 24.0	14,000 μg/kg

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Pesticides and Polychlorinated Biphenyls (PCBs)

One sample from each of five borings was analyzed for pesticides and PCBs using U.S. EPA Method 8080. Table A-3 (Appendix A) presents detailed the sampling information and analytical results from these samples. No pesticides or PCBs were detected in any of the samples.

Metals

One sample from each of five borings was analyzed for total and extractable concentrations of the metals listed in California Code of Regulations, Title 22. Table A-4 (Appendix A) presents detailed sampling information and analytical results from these samples.

Whereas the presence of any detectable amount of priority pollutant organic compound indicates contamination from a manufactured source, most soils have some natural concentrations of metals present. Because no other criteria have been established for evaluating metal contamination at McClellan Air Force Base (AFB), California hazardous waste criteria were used as a basis of comparison (California Code of Regulations, Title 22, Section 66699). All total metal concentrations were below the applicable Total Threshold Limit Concentrations (TTLCs), and all extractable concentrations were below the applicable Soluble Threshold Limit Concentrations (STLCs).

Oil and Grease

A total of seven samples from McLaren's five borings were analyzed for oil and grease using U.S. EPA Method 413.1. Sampling information and analytical results for oil and grease are included in Table A-4 (Appendix A). Although oil and grease were detected at concentrations ranging from 50 to 2800 mg/kg, regulatory limits with which to compare these concentrations have not been established.

Quality Assurance/Quality Control (QA/QC)

The quality assurance/quality control (QA/QC) information available for these analyses was limited to sample detection limits and some duplicate results (McLaren, 1986a; McLaren, 1986b). For a complete evaluation of the data, additional information, including results from method blanks, laboratory blanks, field blanks, laboratory replicates, laboratory spikes, and performance audit samples is required. Without this information, it is difficult to estimate the precision of analyses or determine if any systematic bias or artificial contamination was present in the analyses. However, some general considerations can be discussed regarding the quality of these analyses. For organic compounds, U.S. EPA Methods 8080, 8240, and 8270 are appropriate analytical methods for this type of investigation. Each analytical method has specific recommendations for QA/QC as part of the method procedure. Although no indications of analytical accuracy or precision were provided in the reports, these parameters may be within acceptable limits if the specified QA/QC recommendations were followed.

One unusual characteristic of the entire McLaren data set is the uniformity of detection limits between samples having different composition. The uniformity of detection limits may indicate that samples were not properly diluted before quantitation, or that dilutions were made, but not reported. Either of these omissions would result in detection limits that were higher than those indicated in the results.

Duplicate results were available for some samples; however, McLaren did not indicate in their reports whether duplicate results were from laboratory or field duplicate samples. Radian believed these duplicate results were from duplicate samples obtained in the field because unique identification numbers had been assigned to the samples by McLaren.

Although McLaren reported detecting N-nitrosodiphenylamine (Boring 23WSB02), the analytical method that was used (U.S. EPA Method 8270) does not distinguish between N-nitrosodiphenylamine and diphenylamine. For this reason, the result McLaren specified for N-nitrosodiphenylamine may have been either N-nitrosodiphenylamine, diphenylamine, or a combination of the two compounds.

Analytical methods for metals were not specified; instead, methods were referenced to the Waste Extraction Test in the California Assessment Manual (CAM), a former reference of California-approved methods for waste classification. The CAM allowed several analytical methods for each metal, but it is unknown which ones were actually used in the McLaren analyses. Although CAM has been discontinued, the methods referenced are still applicable under present standards.

4.1.3 Adequacy of Soil Characterization

The following criteria were used by Radian to determine the adequacy of a soil characterization (U.S. EPA, 1986, p. 9-5):

- Enough samples be collected to define both the lateral and vertical extent of contamination;

- Samples be handled and analyzed using appropriate methodology for the suspected contaminants; and

- Representative samples of soil be collected.

To determine the adequacy of McLaren's soil investigation at Site 23, these three criteria must be evaluated with respect to the contaminants possibly present and the physical characteristics of the site.

The number of samples collected is considered sufficient to assess the spacial distribution of contaminants. Boring logs and analytical results indicate the presence and degree of contamination is highly variable at Site 23, both laterally and vertically. This is especially apparent in the three borings drilled in the area of the former spoil pit (Borings 23WSB02, 23SSB03, and 23SSB04). In Boring 23WSB02, debris, discolored soil, and odors were present. In Boring 23SSB03, discolored soil and odors were present, but no debris were found. In Boring 23SSB04, no physical evidence of contamination was apparent. The analytical results for these three borings are also quite dissimilar. A total of 10 VOCs were detected in these borings; however, the only VOC detected in more than one boring was acetone (in Borings 23SSB04 and 23SSB03). Although additional sampling is needed to define the variability of contamination at Site 23, McLaren's investigation confirmed the presence of contamination at the site.

The sampling and analytical methods used to characterize samples for organic compounds, pesticides, and metals are appropriate for the types of materials suspected at this site. Data from metal analyses are probably adequate to identify areas of contamination above background levels. Although specific analytical methods were not indicated, a California-approved method was most likely used. Data from organic analyses are probably of adequate quality to identify areas of source material or high levels of contamination. Insufficient information is available to ascertain if the data are adequate for low-level determinations.

Samples are considered representative if they are collected from locations appropriate for the specified sampling strategy. At Site 23, McLaren used an authoritative sampling strategy to collect soil samples from locations and depths where field methods (visual inspection, odor, soil gas measurements) indicated the greatest potential for contamination. Previous experience has shown this to be an effective method of site characterization in cases where the approximate location of contamination is known and the contaminants of concern are detectable using field methods. As mentioned previously, the results from McLaren's soil investigation indicate the contamination at Site 23 is highly variable. Because of this variability, it is uncertain whether McLaren's samples actually represent the worst-case contamination at the site.

4.2 Soil Gas Results

This section summarizes the results of soil gas measurements taken during the 1985 McLaren investigation (McLaren, 1986a). While drilling each of the DAPs, WSBs, and SSBs at Site 23, McLaren recorded PID readings from soil gases emitted from cuttings every 5 feet. Headspace readings from soil samples collected every 5 feet from each boring were also recorded. The maximum soil gas readings from headspace jars and cuttings are presented in Table 4-2.

A PID is a screening instrument and does not speciate or accurately quantify the soil gas. Quality assurance measures included calibrating the PID daily with standardized isobutylene, keeping a calibration logbook, and prior to drilling, recording the ambient air reading from the PID. McLaren also indicated that the PID was periodically checked in the field to ensure proper functioning (McLaren, 1986b, p. 19).

McLaren measured relatively high soil gas readings in three borings; Boring 23SSB02 had the highest reading of 300 ppmv at a depth of 30 feet BGS. Borings 23WSB02 and 23SSB03 had the next highest headspace readings of 30 ppmv and 15 ppmv, respectively. Odors were noted at these same three borings.

McLaren's investigation is an adequate screening-level characterization of the soil gas concentration at Site 23; the relatively high soil gas readings indicate that some concentrations of VOCs are present in the soil at Site 23.

4.3 Groundwater Results

The discussion of groundwater results as part of the assessment of Site 23 will be limited in scope for several reasons. Factors involved in the migration of contaminants to groundwater at McClellan AFB are complex and include the following:

TABLE 4-2. MAXIMUM PHOTOIONIZATION DETECTOR READINGS FROM SOIL CUTTINGS/HEADSPACE JARS AT SITE 23 (UNITS IN PPMV)

Approximate Depth	BORING NUMBER									
	23DAP01		23DAP03		23DAP03		23DAP04		23WSB01	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	1	2	0	2	1	2	0	--	2	0
10	0	--	0	1	2	4	1	1	5	1
15	1	1	0	--	1	--	0	--	5	1
20	0	--	1	1	3	2	1	1		
25	1	--	0	--	1	--	0	--		
30	1	2	0	2	1	3	0	1		
35	0	--	0	--	0	--	1	--		
40	1	1	0	2	0	3	1	1		
45	0	--	1	--	1	--	1	--		
50	0	1	0	3	1	1	1	1		
55	1	--	0	--	0	--	1	--		
60	1	2	0	2	1	1	1	1		
65										
70										

(Continued)

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TABLE 4-2. (Continued)

Approximate Depth	BORING NUMBER 23WSB01 Cuttings	23WSB01 Headspace	23SSB01 Cuttings	23SSB01 Headspace	23SSB02 Cuttings	23SSB02 Headspace	23SSB03 Cuttings	23SSB03 Headspace	23SSB04 Cuttings	23SSB04 Headspace
5	0	30	0	0	0	1	1	1	1	1
10	0	25	0	0	0	0	7	40	1	2
15	1	4	0	0	0	0	1	7	2	15
20	0	15	0	0	0	0	15	20	4	1
25	0	9	0	0	0	0	10	40	0	1
30	0	0	0	0	0	0	10	300	0	1
35			0	0	0	0	40	7	0	0
40			0	0	0	0	2	10	0	0
45			0	0	0	0	1	2	0	0
50			0	0	--	0	25	4	0	0
55			0	0	0	0	50	15	0	0
60			0	0	0	0	1	3	0	0
65			0	0	0	0	2	5		
70			0	0	0	0	2	4		

* McLaren noted high readings may be due to "water artifact" affecting the photoionization detector.

-- = No readings taken.

Blanks indicate borings were terminated.

SOURCE: McLaren, 1986a.

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- Multiple potential contaminant sources in many areas;
- Long history of waste-generating activities;
- Changes in historical groundwater flow directions; and
- Heterogeneous soils.

An evaluation of the groundwater pathway or the extent of groundwater contamination associated with Site 23 was not included in the scope of this effort. A more detailed evaluation will be provided during individual site investigations or during investigations of groundwater operable units in future remedial investigation/feasibility study (RI/FS) tasks at McClellan AFB. The discussion of groundwater results for this Technical Memorandum is limited to water quality data from downgradient wells in the vicinity of the site that have detectable amounts of the same constituents found in the soils of Site 23; otherwise, water quality data will not be presented.

In the immediate area of Site 23, the groundwater flows south/southeast. Three monitoring wells (MWs), MW 48S, MW 3 and MW 116, are located immediately south of Site 23. Monitoring well 48S is dry and water samples have never been analyzed from this well (McLaren, 1986a, p. 22). Monitoring Well 3 is now abandoned, but water samples were collected prior to its abandonment. Water samples from MW 116 have been analysed approximately four times a year since November 1985.

Tables B-1 to B-7 (Appendix B) summarize the available sampling data and analytical results for MW 116. A complete discussion of sampling and analytical methods for these results are in Radian's "Quarterly Sampling and Analysis Program" reports (Radian, 1985-1988e). The compounds detected in the soil of Site 23 and also in the groundwater of MW 116 are ethyl benzene and tetrachloroethene.

4.4 Surface Water Results

Although no surface water samples that can be specifically related to Site 23 have been collected for analysis, surface water at McClellan AFB is regularly monitored under two National Pollutant Discharge Elimination System (NPDES) permits. The first requires that surface water from Arcade Creek, Second Creek, and Magpie Creek be sampled monthly where it enters the base, and again where it exits; these samples are analyzed for volatile organic compounds (VOCs) and heavy metals. The second permit outlines waste discharge regulations for the base groundwater treatment plant (located in Operable Unit (OU) C of McClellan AFB), including effluent analyses of VOCs, semivolatile organic compounds, and heavy metals. The NPDES permits establish limits on concentrations of VOCs, semivolatile organic compounds, and heavy metals in surface water discharged from McClellan AFB. Under the permit requirements, concentrations of these compounds must not exceed the established limits.

4.5 Air Monitoring Results

No air monitoring results have been specifically associated with Site 23.

5.0 POTENTIAL HAZARDS

The following sections discuss the potential contaminants of concern, immediate hazards, and potential for migration resulting from any on-site contamination at Site 23.

5.1 Potential Contaminants of Concern

The contaminants of concern at Site 23 are the volatile organic compounds (VOCs), semivolatile organic compounds, and metals that were detected in the soil. Section 4, Extent of Contamination, provides a detailed description of the previous investigation at Site 23, and is summarized below:

- A total of 10 borings were drilled at Site 23.
- Eleven soil samples collected from the borings were analyzed for VOCs. Ten VOCs were detected in these samples.
- Six soil samples collected from the borings were analyzed for semivolatile organic compounds. Four compounds were detected in these samples.
- Five soil samples collected from the borings were analyzed for pesticides and polychlorinated biphenyls (PCBs). No pesticides or PCBs were detected in these samples.
- Ten soil samples collected from the borings were analyzed for total and extractable concentrations of metals. All results were below threshold limit concentrations.
- Soil discoloration, odors, or burial debris indicating possible soil contamination were noted in seven of the borings from the ground surface to 38 feet below ground surface (BGS).
- The maximum soil gas reading was 300 parts per million per volume (ppmv) at a depth of 30 feet BGS.

- Additional sampling is needed to define the variability of contamination at Site 23.

Table 5-1 lists the organic chemicals detected at this site along with certain physical characteristic values that influence their mobility. Inorganic compounds and oil and grease are not listed in the table because the specific compounds present in the soil are unknown.

5.2 Immediate Hazards

This section describes any potential hazards including the potential for fire and explosion and the possible hazards to worker health and safety that require immediate action due to contaminants present at Site 23. Because the soil gas concentrations measured in the borings are far below the lower explosive limit, the potential for fire and explosion is very low.

Potential hazards to worker health and safety are limited to inhalation, ingestion, or dermal contact of any contaminated near-surface soil. Because the soil at Site 23 appears to be contaminated, exposure to soils may be hazardous. However, although surface soil samples have not been collected, immediate hazards are not believed to exist because most of Site 23 is covered by asphalt. The only uncovered soil at Site 23 is located along the outer perimeter of the site, outside of the areas believed to have been used for disposal. Exposure risk from potentially contaminated near-surface soil may be present to workers involved in any future construction or excavation activities at this site.

5.3 Potential for Contaminant Migration

This section describes the potential for wastes to migrate from Site 23 to the groundwater, surface water, and air. The potential for contaminant migration is dependent on the characteristics of the site, and the nature of the contaminants. Although site-specific information is limited, it is possible to discuss general considerations of contaminant migration at this site.

TABLE 5-1. PHYSICAL CHARACTERISTIC VALUES FOR ORGANIC COMPOUNDS DETECTED AT SITE 23

Compound	Water Solubility[a] (mg/L)	Vapor Pressure[a] (mm Hg)	Log K_{ow}[b]
Volatile Organic Compounds			
Acetone	1,000,000	270	-0.24
2-Butanone	268,000	77.5	0.26
Chloroform	8,200	151	1.97
trans-1,2-Dichloroethene	6,300	324	0.48
Methylene chloride	20,000	362	1.30
Ethylbenzene	152	7.0	3.15
Tetrachloroethene	150	7.8	2.6
Toluene	535	28.1	2.73
1,1,1-Trichloroethane	1,500	123	2.5
Xylenes	198	10.0	3.26
Semivolatile Organic Compounds			
2-Methylnaphthalene	NA	NA	NA
N-nitrosodiphenylamine	NA	NA	3.13[c]
Pentachlorophenol	1.40	1.10×10^{-4}	5
Phenanthrene	1.00	6.8×10^{-5}	4.46

[a] Neutral pH at 20-30 °C.
[b] Log of octanol/water partition coefficient.
[c] Source: U.S. EPA Database, 1988. Water Engineering Research Laboratory.

NA = Information not available.

SOURCE: U.S. Environmental Protection Agency, 1986. Superfund Public Health Evaluation Manual OSWER Directive 9285.4-1.

5.3.1 *Potential for Migration to Groundwater*

The most important factors that influence migration to groundwater are the amount of infiltrating surface water, other sources of percolating water, the percolation rate of the soil, and contaminant characteristics.

The amount of infiltration at Site 23 is primarily related to surface characteristics of the area and permeability of the soil. Most of Site 23 is covered with pavement which would minimize the amount of infiltrating surface water.

The percolation rate of contaminants depends on the soil permeability, structure, stratification, and characteristics of the contaminants. Although permeability data on the soil at Site 23 are not available, boring logs indicate that soils generally range from clay loams to sandy loams. The relative permeabilities for these soils range from very low to moderate. Basewide boring information indicates that relatively impermeable layers are not continuous and not effective barriers to percolation. Therefore, the percolation rate for this site is probably low to moderate.

The contaminants of concern at Site 23 are VOCs, semivolatile organic compounds, and metals. The detected VOCs have relative high water solubilities and moderate to low octanol/water coefficients (K_{ow}) (see Table 5-1), which indicates that these contaminants have a relatively high potential for dissolving into water and being carried with the flow of percolating water.

The semivolatile organic compounds detected at Site 23 are much less soluble in water and have much higher K_{ow} values, indicating these compounds tend to remain near their source and not migrate with percolating water. However, as other organic compounds dissolve in water, any semivolatile compounds high K_{ow} values may dissolve more readily due to the solvent properties of other organics.

The mobility of metals is limited by the least soluble compound of the metal in the percolating groundwater. Because hazardous metals generally form practically insoluble precipitates in soil at neutral pH or alkaline pH, these metals tend to remain in surface soils and not migrate with percolating water (Lindsay, 1979). However, dissolved acids may significantly increase the solubility of metal compounds and some semivolatile compounds (e.g., phenols and other acid-extractable organic compounds). If acidic materials are present at Site 23, metals and acid-extractable compounds may have migrated in the acidic soil solution. However, the natural buffer capacity of clay and silty soils is able to partially neutralize moderate amounts of acid or alkaline wastes and any migrating acid-extractable contaminants would quickly precipitate out of solution as the pH was neutralized.

Contaminants were detected in soils at Site 23 up to 70 feet BGS, which was also the greatest depth sampled. The approximate depth to groundwater in the area is 100 feet BGS. Two of the VOCs detected in the soil at Site 23 were also detected in groundwater samples from an on-site monitoring well. Therefore, migration of contaminants to groundwater at Site 23 needs to be investigated. Although groundwater contamination is also present upgradient of the site, additional soil sampling is needed before a relationship between soil and groundwater contamination at Site 23 can be made.

5.3.2 Potential for Migration to Surface Water

The primary site characteristics affecting the potential for contaminant migration to surface water are the topography and surface characteristics of the location. The same contaminant characteristics affecting migration to groundwater also affect migration of dissolved contaminants to surface water. Most of the ground surface at Site 23 is paved; therefore, the potential for any contaminants that may be present in surface soils to migrate to surface water is very low. Surface water runoff from Site 23 flows into a drainage ditch located east of the site along Lang Avenue (see Figure 3-2) and eventually into Magpie Creek (McClellan AFB, 1987).

5.3.3 Potential for Migration to Air

Surface characteristics of the site and contaminant characteristics also influence the potential for migration to air. Vapor pressure is a relative measure of the volatility of a chemical in its pure state and is an important determinant of the rate of vaporization from soils. Table 5-1 lists the available vapor pressures for the organic chemicals detected at Site 23. The relatively high vapor pressures for VOCs indicate that these compounds, if present in exposed surface and near-surface soils, are likely to migrate to the air.

The surface flux (concentration of organic compounds entering the air from soil in a unit time) is dependent upon soil permeability, soil moisture, depth of contaminants, concentration of contaminants in the soil gas, and other physical soil properties that have not been quantified. Because most of the site is covered with pavement or building foundation, the surface flux of volatile contaminants is probably low.

6.0 EVALUATION OF PREVIOUS CONTRACTORS' RECOMMENDATIONS

McLaren Environmental Engineering proposed a complete remediation plan for Site 23 (McLaren, 1986c, pp. 69-71). McLaren's recommendations are presented below in quotations followed by Radian's evaluation of each:

1. "The integrity of the asphalt surface should be evaluated prior to further action at the site" (McLaren, 1986c, p. 69).

   "Should the asphalt surface around Building 781 prove to be inadequate as a cap, it is recommended that Alternative 3 be implemented." (Alternative 3 includes construction of an impermeable asphalt or concrete cap covering Site 23 [McLaren, 1986c, p. 70]).

   "Runoff generated from the impermeable cap cover should be drained by a concrete diversion ditch surrounding the cap" (McLaren, 1986c, p. 70).

Although these recommendations may be appropriate steps in the remediation of Site 23, Radian believes a complete remedial investigation for Site 23 is needed to fully evaluate a remedial approach. Capping the site may not be the most appropriate remediation for Site 23. The remedial investigation will determine contaminant action levels and will aid in the screening of remedial measures for the site. After completing the remedial investigation, a feasibility study will be required to evaluate remedial action alternatives.

2. "As part of the site evaluation it is recommended that all water delivery systems be repaired in, and in the vicinity of, Building 781 to stop leaking water which may be causing spreading of chemicals beneath the site vertically and/or horizontally across perching layers" (McLaren, 1986c, p. 69).

This recommendation implies that the water delivery systems at Site 23 are leaking; however, McLaren did not provide evidence supporting this conclusion. Radian concurs that water delivery systems be checked and the leaks repaired to minimize the transport of contaminants through the unsaturated soil zone.

3. "A monitor well system should be employed in conjunction with the proposed cap-cover to determine flow directions and the groundwater

quality in the upgradient direction of Site 23, to assess the effectiveness of the proposed system" (McLaren, 1986c, p. 70).

Subsequent to McLaren's recommendation, monitoring well (MW) 116 was constructed near the southwest corner of Site 23. One or more additional monitoring well may need to be constructed near Site 23, depending on the results of the remedial investigation. Radian believes it is premature to recommend any additional monitoring wells until after a remedial investigation of the site has been completed.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Aerial photographs and construction drawings indicate that waste material has been buried at Site 23. Aerial photographs show evidence of disturbed soil throughout Site 23. The area north of Building 781 is a known burial location based on construction diagrams of Building 781 show a "spoil pit" filled with waste material.

Results from McLaren's soil investigations at Site 23 confirm waste is present in soils beneath the site. In total, nine different volatile organic compounds (VOCs) and four semivolatile organic compounds were detected in soil samples collected at depths ranging from 7 to 70 feet below ground surface (BGS). Priority pollutant metals were detected in the soil from Site 23; however, none of the results exceeded Total Threshold Limit Concentration (TTLC) or Soluble Threshold Limit Concentration (STLC) values.

McLaren's investigation determined the presence of contaminants at the site. However, the extent of contaminants in soils and the potential migration of contaminants to groundwater have not been sufficiently characterized to complete the remedial investigation for Site 23. In order to complete the remedial investigation for Site 23 the following actions should be performed:

- Inspect the water lines in the vicinity of Site 23;
- Sample and analyze additional soil samples from Site 23 to completely characterize the lateral and vertical extent of contamination; and
- Investigate the potential for groundwater contamination.

8.0 REFERENCES

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APPENDIX A

Analytical Results for Soil Samples

TABLE A-1. VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 23 (UNITS IN UG/KG)

Boring Number	23WSB02	23WSB02	23SSB01	23SSB01	23SSB02	23SSB02	23SSB03	23SSB03	23SSB03	23SSB04
Depth (feet BGS)	7.0-24.0	26.0-26.5	24.0-24.5	69.0-69.5	4.5-5.0	69.5-70.0	29.0-29.5	69.5-70.0	69.5-70.0	19.0-19.5
Date Sampled	01/03/86	01/03/86	07/26/85	07/29/85	07/29/85	07/30/85	07/30/85	07/30/85	07/30/85	07/31/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240
Date Analyzed	--	--	--	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC									FDA	
Laboratory QC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Acetone	<100	<100	<100	<100	190	<100	<100	<100	220	<100
Acrolein	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
2-Butanone	<100	<100	<100	<100	<100	<100	<100	740	850	<100
Carbon disulfide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	61	18	<10	<10
Chlorodibromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Dichlorobromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	59	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dichloromethane	<10	<10	<10	<10	<10	<10	13	<10	<10	<10

(Continued)

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TABLE A-1. (Continued)

Boring Number Depth (feet BGS)	23WSB02 7.0-24.0	23WSB02 26.0-26.5	23SSB01 24.0-24.5	23SSB01 69.0-69.5	23SSB02 4.5-5.0	23SSB02 69.5-70.0	23SSB03 29.0-29.5	23SSB03 69.5-70.0	23SSB03 69.5-70.0	23SSB04 19.0-19.5
1,2-Dichloropropane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	110	<10	<10	<10	<10	<10	<10	<10	<10	<10
Freon 113	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2-Hexanone	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
4-Methyl-2-pentanone	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Styrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	24	<10	<10	35	<10	<10	<10	<10	<10	<10
Toluene	400	<10	<10	<10	29	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	11	27	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl acetate	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Vinyl chloride	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Xylenes (total)	660	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Continued)

TABLE A-1. (Continued)

Boring Number	23SSB04
Depth (feet BGS)	59.5-60.0
Date Sampled	07/31/85
Sampled By	MCR
Analytical Method	EPA 8240
Date Analyzed	--
Laboratory	ITL
Field QC	
Laboratory QC	NS
Acetone	120
Acrolein	<100
Acrylonitrile	<100
Benzene	<10
Bromoform	<10
Bromomethane	<100
2-Butanone	<100
Carbon disulfide	<10
Carbon tetrachloride	<10
Chlorobenzene	<10
Chloroform	<10
Chlorodibromomethane	<10
Chloroethane	<10
2-Chloroethylvinyl ether	<10
Chloromethane	<100
Dichlorobromomethane	<10
1,1-Dichloroethane	<10
1,2-Dichloroethane	<10
1,1-Dichloroethene	<10
trans-1,2-Dichloroethene	<10
Dichloromethane	<10

(Continued)

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TABLE A-1. (Continued)

Boring Number	23SSB04
Depth (feet BGS)	59.5-60.0
1,2-Dichloropropane	<10
1,3-Dichloropropylene	<10
cis-1,3-Dichloropropylene	NS
trans-1,3-Dichloropropylene	NS
Ethylbenzene	<10
2-Hexanone	<100
4-Methyl-2-pentanone	<100
Styrene	<10
1,1,2,2-Tetrachloroethane	<10
Tetrachloroethene	<10
Toluene	<10
1,1,1-Trichloroethane	<10
1,1,2-Trichloroethane	<10
Trichloroethene	<10
Trichlorofluoromethane	<10
Vinyl acetate	<100
Vinyl chloride	<100
Xylenes (total)	<10

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

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TABLE A-2. SEMIVOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 23 (UNITS IN UG/KG)

Boring Number	23WSB02	23SSB01	23SSB01	23SSB02	23SSB03	23SSB04
Depth (feet BGS)	7.0-24.0	24.0-24.5	24.0-24.5	4.5-5.0	29.0-29.5	19.0-19.5
Date Sampled	01/03/86	07/26/85	07/26/85	07/29/85	07/30/85	07/31/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270
Date Analyzed	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL
Field QC						
Laboratory QC	NS	NS	FDA	NS	NS	NS
Acenaphthene	<100	<100	<100	<100	<100	<100
Acenaphthylene	<100	<100	<100	<100	<100	<100
Aniline	<100	<100	<100	<100	<100	<100
Anthracene	<100	<100	<100	<100	<100	<100
Benzidine	<400	<400	<400	<400	<400	<400
Benzo(a)anthracene	<100	<100	<100	<100	<100	<100
Benzo(a)pyrene	<100	<100	<100	<100	<100	<100
3,4-Benzo(b)fluoranthene	<100	<100	<100	<100	<100	<100
Benzo(g,h,i)perylene	<100	<100	<100	<100	<100	<100
Benzoic acid	<100	<100	<100	<100	<100	<100
Benzo(k)fluoranthene	<100	<100	<100	<100	<100	<100
Benzyl alcohol	<100	<100	<100	<100	<100	<100
4-Bromophenylphenyl ether	<100	<100	<100	<100	<100	<100
Butyl benzyl phthalate	<100	<100	<100	<100	<100	<100
4-Chloroaniline	<100	<100	<100	<100	<100	<100
bis(2-Chloroethoxy)methane	<100	<100	<100	<100	<100	<100
bis(2-Chloroethyl)ether	<100	<100	<100	<100	<100	<100
bis(2-Chloroisopropyl)ether	<100	<100	<100	<100	<100	<100
p-Chloro-m-cresol	<100	<100	<100	<100	<100	<100
bis(Chloromethyl)ether	<400	<400	<400	<400	<400	<400
2-Chloronaphthalene	<100	<100	<100	<100	<100	<100
2-Chlorophenol	<100	<100	<100	<100	<100	<100
4-Chlorophenylphenyl ether	<100	<100	<100	<100	<100	<100
Chrysene	<100	<100	<100	<100	<100	<100

(Continued)

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TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	23WSB02 7.0-24.0	23SSB01 24.0-24.5	23SSB01 24.0-24.5	23SSB02 4.5-5.0	23SSB03 29.0-29.5	23SSB04 19.0-19.5
Dibenzo(a,h)anthracene	<100	<100	<100	<100	<100	<100
Dibenzofuran	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	<100	<100	<100	<100	<100	<100
1,3-Dichlorobenzene	<100	<100	<100	<100	<100	<100
1,4-Dichlorobenzene	<100	<100	<100	<100	<100	<100
3,3'-Dichlorobenzidine	<100	<100	<100	<100	<100	<100
2,4-Dichlorophenol	<100	<100	<100	<100	<100	<100
Diethylphthalate	<100	<100	<100	<100	<100	<100
2,4-Dimethylphenol	<100	<100	<100	<100	<100	<100
Dimethylphthalate	<100	<100	<100	<100	<100	<100
Di-n-butylphthalate	<100	<100	<100	<100	<100	<100
4,6-Dinitro-2-methylphenol	NS	NS	NS	NS	NS	NS
4,6-Dinitro-o-cresol	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
2,4-Dinitrophenol	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
2,4-Dinitrotoluene	<100	<100	<100	<100	<100	<100
2,6-Dinitrotoluene	<100	<100	<100	<100	<100	<100
Di-n-octylphthalate	<100	<100	<100	<100	<100	<100
1,2-Diphenylhydrazine	<100	<100	<100	<100	<100	<100
bis(2-Ethylhexyl)phthalate	<100	<100	<100	<100	<100	<100
Fluoranthene	<100	<100	<100	<100	<100	<100
Fluorene	<100	<100	<100	<100	<100	<100
Hexachlorobenzene	<100	<100	<100	<100	<100	<100
Hexachlorobutadiene	<100	<100	<100	<100	<100	<100
Hexachlorocyclopentadiene	<100	<100	<100	<100	<100	<100
Hexachloroethane	<100	<100	<100	<100	<100	<100
Indeno(1,2,3-cd)pyrene	<100	<100	<100	<100	<100	<100
Isophorone	<400	<400	<400	<400	<400	<400
2-Methylnaphthalene	6,200	<100	<100	<100	<100	<100
2-Methylphenol	<100	<100	<100	<100	<100	<100
4-Methylphenol	<100	<100	<100	<100	<100	<100
Naphthalene	<100	<100	<100	<100	<100	<100

(Continued)

CS23/121489/JKS

TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	23WSB02 7.0-24.0	23SSB01 24.0-24.5	23SSB01 24.0-24.5	23SSB02 4.5-5.0	23SSB03 29.0-29.5	23SSB04 19.0-19.5
2-Nitroaniline	<100	<100	<100	<100	<100	<100
3-Nitroaniline	<100	<100	<100	<100	<100	<100
4-Nitroaniline	<100	<100	<100	<100	<100	<100
Nitrobenzene	<100	<100	<100	<100	<100	<100
N-Nitrosodimethylamine	<100	<100	<100	<100	<100	<100
N-Nitroso-di-n-propylamine	<100	<100	<100	<100	<100	<100
2-Nitrophenol	<100	<100	<100	<100	<100	<100
4-Nitrophenol	<100	<100	<100	<100	<100	<100
N-Nitrosodiphenylamine	28,000	<100	<100	<100	<100	<100
Pentachlorophenol	6,400	<100	<100	<100	<100	<100
Phenanthrene	14,000	<100	<100	<100	<100	<100
Phenol	<100	<100	<100	<100	<100	<100
Pyrene	<100	<100	<100	<100	<100	<100
2,3,7,8-Tetrachlorodibenzo-p-dioxin	<100	<100	<100	<100	<100	<100
1,2,4-Trichlorobenzene	<100	<100	<100	<100	<100	<100
2,4,5-Trichlorophenol	<100	<100	<100	<100	<100	<100
2,4,6-Trichlorophenol	<100	<100	<100	<100	<100	<100

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

CS23/121489/JKS

TABLE A-3. PESTICIDES/PCB ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 23 (UNITS IN UG/KG)

Boring Number	23WSB02	23SSB01	23SSB02	23SSB03	23SSB04
Depth (feet BGS)	7.0-24.0	24.0-24.5	4.5-5.0	29.0-29.5	19.0-19.5
Date Sampled	01/03/86	07/26/85	07/29/85	07/30/85	07/31/85
Sampled By	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080
Date Analyzed	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL
Field QC					
Laboratory QC	NS	NS	NS	NS	NS
Aldrin	<10	<10	<10	<10	<10
alpha-BHC	<10	<10	<10	<10	<10
beta-BHC	<10	<10	<10	<10	<10
delta-BHC	<10	<10	<10	<10	<10
gamma-BHC (Lindane)	<10	<10	<10	<10	<10
Chlordane	<100	<100	<100	<100	<100
4,4'-DDD	<10	<10	<10	<10	<10
4,4'-DDE	<10	<10	<10	<10	<10
4,4'-DDT	<10	<10	<10	<10	<10
Dieldrin	<10	<10	<10	<10	<10
Endosulfan I	<10	<10	<10	<10	<10
Endosulfan II	<10	<10	<10	<10	<10
Endosulfan sulphate	<10	<10	<10	<10	<10
Endrin	<10	<10	<10	<10	<10
Endrin aldehyde	<10	<10	<10	<10	<10
Heptachlor	<10	<10	<10	<10	<10
Heptachlor epoxide	<10	<10	<10	<10	<10
Methoxychlor	<100	<100	<100	<100	<100
Toxaphene	<200	<200	<200	<200	<200
PCB-1016	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1221	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1232	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1242	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1248	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1254	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1260	<1,000	<1,000	<1,000	<1,000	<1,000

(Continued)

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TABLE A-3. (Continued)

FOOTNOTES:

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NS = Not specified.
NA = Not analyzed.

SOURCE: McLaren, 1986a.

CS23/121489/JKS

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TABLE A-4. INORGANIC COMPOUND AND MISCELLANEOUS ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED FROM SITE 23

Boring Number		23WSB02	23WSB02	23WSB02	23SSB01	23SSB01	23SSB02	23SSB03	23SSB03	23SSB04
Depth (feet BGS)		7.0-24.0	7.0-24.0	26.0-26.5	24.0-24.5	24.0-24.5	4.5-5.0	29.0-29.5	29.0-29.5	19.0-19.5
Date Sampled		01/03/86	01/03/86	01/03/86	07/26/85	07/26/85	07/29/85	07/30/85	07/30/85	07/31/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC			FDA			FDA			FDA	
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	0.1	NA	NA	<0.1	NA	<0.1	<0.1	NA	<0.1
Arsenic	NS	7.6	8.6	NA	5.4	NA	7.2	30	NA	36
Barium	NS	120	NA	NA	91	NA	71	170	NA	150
Berylium	NS	0.5	NA	NA	<0.1	<0.1	0.3	0.7	NA	0.3
Cadmium	NS	5.8	5.8	NA	0.1	NA	1.4	0.2	NA	0.2
Chromium	NS	160	160	NA	11	NA	26	22	NA	34
Cobalt	NS	15	16	NA	7.1	NA	11	17	NA	19
Copper	NS	62	63	NA	16	NA	28	40	NA	37
Lead	NS	73	80	NA	3.9	NA	20	7.8	NA	6.8
Mercury	NS	0.19	NA	NA	0.11	NA	0.21	0.14	NA	0.11
Molybdenum	NS	<1	<1	NA	3.1	NA	3.1	1.1	NA	2.1
Nickel	NS	39	39	NA	19	NA	15	36	NA	41
Selenium	NS	<1	NA	NA	<1	NA	<1	<1	NA	<1
Silver	NS	14	14	NA	0.1	NA	1.1	0.1	NA	0.1
Thallium	NS	<0.1	<0.1	NA	0.23	NA	0.23	0.42	NA	0.42
Vanadium	NS	37	NA	NA	43	NA	27	59	NA	46
Zinc	NS	110	NA	NA	34	NA	43	78	NA	66
Oil & Grease	413.1	2,800	NA	130	75	72	200	50	NA	120
Total Hydrocarbons		NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		23WSB02 7.0-24.0	23WSB02 7.0-24.0	23WSB02 26.0-26.5	23SSB01 24.0-24.5	23SSB01 24.0-24.5	23SSB02 4.5-5.0	23SSB03 29.0-29.5	23SSB03 29.0-29.5	23SSB04 19.0-19.5
Parameter	Method	Results (Units in mg/kg)								
Extractable Antimony	WET/NS	0.04	0.04	NA	<0.1	NA	<0.1	<0.1	NA	<0.1
Extractable Arsenic	WET/NS	0.16	0.18	NA	<0.01	NA	0.06	0.06	NA	0.02
Extractable Barium	WET/NS	11	11	NA	7.1	7.2	7.6	9.7	NA	0.5
Extractable Berylium	WET/NS	0.022	0.024	NA	<0.1	NA	<0.1	<0.1	NA	0.1
Extractable Cadmium	WET/NS	0.13	0.13	NA	<0.01	NA	0.07	<0.01	NA	0.01
Extractable Chromium	WET/NS	10	12	NA	<0.1	NA	0.93	0.2	NA	0.25
Extractable Cobalt	WET/NS	1	1	NA	0.21	NA	0.27	0.26	NA	0.38
Extractable Copper	WET/NS	0.06	0.06	NA	0.46	NA	0.9	0.99	NA	0.43
Extractable Lead	WET/NS	2.1	2.1	NA	<0.1	NA	0.62	0.12	NA	<0.1
Extractable Mercury	WET/NS	<0.0002	<0.0002	NA	0.005	NA	0.009	0.01	NA	0.007
Extractable Molybdenum	WET/NS	0.13	0.13	NA	0.11	NA	0.23	0.1	0.12	<0.1
Extractable Nickel	WET/NS	1.9	2.2	NA	0.68	NA	0.64	0.47	NA	0.61
Extractable Selenium	WET/NS	<0.01	<0.01	NA	<0.01	NA	<0.01	<0.01	NA	<0.01
Extractable Silver	WET/NS	0.05	0.05	NA	<0.01	NA	<0.01	<0.01	NA	<0.01
Extractable Thallium	WET/NS	0.001	0.001	NA	<0.01	NA	<0.01	<0.01	NA	<0.01
Extractable Vanadium	WET/NS	0.8	0.73	NA	0.34	NA	0.14	0.44	NA	0.36
Extractable Zinc	WET/NS	4.6	NA	NA	0.3	NA	0.21	0.44	NA	0.56

(Continued)

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TABLE A-4. (Continued)

Boring Number		23SSB04
Depth (feet BGS)		19.0-19.5
Date Sampled		07/31/85
Sampled By		MCR
Date Analyzed		--
Laboratory		ITL
Field QC		FDA
Laboratory QC		NS
Parameter	**Method**	**Results (Units in mg/kg)**
Antimony	NS	NA
Arsenic	NS	NA
Barium	NS	NA
Berylium	NS	NA
Cadmium	NS	NA
Chromium	NS	NA
Cobalt	NS	NA
Copper	NS	NA
Lead	NS	NA
Mercury	NS	NA
Molybdenum	NS	NA
Nickel	NS	NA
Selenium	NS	NA
Silver	NS	NA
Thallium	NS	NA
Vanadium	NS	NA
Zinc	NS	NA
Oil & Grease	413.1	NA
Total Hydrocarbons		NA

(Continued)

CS23/121489/JKS

TABLE A-4. (Continued)

Boring Number		23SSB04
Depth (feet BGS)		19.0-19.5
Parameter	**Method**	**Results (Units in mg/kg)**
Extractable Antimony	WET/NS	NA
Extractable Arsenic	WET/NS	NA
Extractable Barium	WET/NS	NA
Extractable Berylium	WET/NS	NA
Extractable Cadmium	WET/NS	NA
Extractable Chromium	WET/NS	0.24
Extractable Cobalt	WET/NS	NA
Extractable Copper	WET/NS	NA
Extractable Lead	WET/NS	NA
Extractable Mercury	WET/NS	NA
Extractable Molybdenum	WET/NS	NA
Extractable Nickel	WET/NS	NA
Extractable Selenium	WET/NS	NA
Extractable Silver	WET/NS	NA
Extractable Thallium	WET/NS	NA
Extractable Vanadium	WET/NS	NA
Extractable Zinc	WET/NS	NA

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NA = Not analyzed.
NS = Not specified.
WET/NS = California Assessment Manual, Waste Extraction Test; analytical method not specified.

SOURCE: McLaren, 1986a.

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APPENDIX B

Soil Gas Results

RADIAN CORPORATION

TABLE B-1. U.S. EPA METHOD 8010 FOR GROUNDWATER SAMPLES FROM MW-116 (METHOD 601 PRIOR TO OCTOBER 1988)

Parameter	DHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116
Date Sampled			11/11/85	11/11/85	11/11/85	02/28/86	02/28/86	09/26/86	01/14/87	04/27/87	08/03/87	10/09/87	01/13/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/15/85	11/15/85	11/15/85	03/11/86	03/11/86	09/29/86	01/19/87	04/30/87	08/06/87	10/12/87	01/14/88
Lab			SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC
Field Analysis			FDA	FDB	FDB								
Lab Analysis				LDA	LDB	LDA	LDB						
Chloromethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	ND	ND	ND	ND	ND	0.82C(1.32)	ND	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND	0.36	ND	ND	ND	ND	ND
1,1-Dichloroethane	6	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	0.3	0.2	0.48	0.39C	ND	1.1C	0.32C	0.29PC
Total 1,2-Dichloroethene	16	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	ND	ND	ND	0.2	0.3	0.23	ND	0.47C	0.25C	ND	0.12PC
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
C = Analysis confirmed in second column analysis
LOQ = Limit of quantitation
P or PC = Identity previously confirmed
( ) = Data decision criterion (DDC). Indicates result below DDC.
NE = Not established

TABLE B-1. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-116	MW-116	MW-116
			WELL NUMBER		
Date Sampled			04/11/88	07/06/88	10/10/88
Sampled By			RADIAN	RADIAN	RADIAN
Date Analyzed			04/12/88	07/07/88	10/11/88
Lab			SAC	SAC	SAC
Field Analysis					
Lab Analysis					
Chloromethane	NE	NE	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND
1,1-Dichloroethane	20	NE	0.35PC	ND	ND
Total 1,2-Dichloroethene	16	NE	ND	ND	ND
Chloroform	100	100	ND	ND	ND
1,2-Dichloroethane	1	5	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND
Trichloroethene	5	5	ND	ND	ND
Dibromochloromethane	100	100	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND
Bromoform	100	100	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND
Tetrachloroethene	4	NE	0.17PC	ND	ND
Chlorobenzene	30	NE	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	ND

ALL UNITS ARE ug/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
P or PC = Identity previously confirmed
NE = Not established

SOURCES: Radian, 1988a, Appendix B, pp. 71-72; Radian, 1988b, p.1-137.

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TABLE B-2. U.S. EPA METHOD 8020 FOR GROUNDWATER SAMPLES FROM MW-116 (METHOD 602 PRIOR TO OCTOBER 1988)

Parameter	DHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116
Date Sampled			11/11/85	11/11/85	11/11/85	02/28/86	02/28/86	09/26/86	01/14/87	04/27/87	08/03/87	10/09/87	01/13/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/15/85	11/15/85	11/15/85	03/11/86	03/11/86	09/29/86	01/19/87	04/30/87	08/06/87	10/12/87	01/14/88
Lab			SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC
Field Analysis			FDA	FDA	FDB								
Lab Analysis			LDA	LDB		LDA	LDB						
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	0.1	0.1	0.22	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l

MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

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TABLE B-2. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-116	MW-116
Date Sampled			04/11/88	07/06/88
Sampled By			RADIAN	RADIAN
Date Analyzed			04/12/88	07/07/88
Lab			SAC	SAC
Field Analysis				
Lab Analysis				
Chlorobenzene	30	NE	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND
Benzene	.7	5	ND	ND
Ethylbenzene	680	NE	ND	ND
Toluene	100	NE	ND	ND
Total Xylenes	NE	NE	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCES: Radian, 1988a, Appendix B, pp. 322, 323; Radian, 1988b, p. 1-138.

RADIAN CORPORATION

TABLE B-3. U.S. EPA METHOD 8240 FOR GROUNDWATER SAMPLES FROM MW-116 (METHOD 624 PRIOR TO OCTOBER 1988)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-116	MW-116	MW-116
			WELL NUMBER		
Date Sampled			01/13/88	01/13/88	07/06/88
Sampled By			RADIAN	RADIAN	RADIAN
Date Analyzed			01/21/88	01/21/88	07/16/88
Lab			SAC	SAC	SAC
Field Analysis					
Lab Analysis			LDA	LDB	
Chloromethane	NE	NE	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	ND	ND	ND
Chloroform	100	100	ND	ND	ND
1,2-Dichloroethane	1	5	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND
Trichloroethene	5	5	ND	ND	ND
Dibromochloromethane	100	100	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND
Bromoform	100	100	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND
Tetrachloroethene	4	NE	ND	ND	ND
Chlorobenzene	30	NE	ND	ND	ND
Benzene	.7	5	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND
Toluene	100	NE	ND	ND	ND
Acetone	NE	NE	ND	ND	ND
Carbon disulfide	NE	NE	ND	ND	ND
2-Butanone	NE	NE	ND	ND	ND
Vinyl acetate	NE	NE	ND	ND	ND
2-Hexanone	NE	NE	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NE = Not established

TABLE B-3. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-116	MW-116	MW-116
			WELL NUMBER		
Date Sampled			01/13/88	01/13/88	07/06/88
Sampled By			RADIAN	RADIAN	RADIAN
Date Analyzed			01/21/88	01/21/88	07/16/88
Lab			SAC	SAC	SAC
Field Analysis					
Lab Analysis			LDA	LDB	
4-Methyl-2-pentanone	NE	NE	ND	ND	ND
Styrene	NE	NE	ND	ND	ND
Total Xylenes	NE	NE	ND	ND	NR

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NR = Not reported
NE = Not established

SOURCES: Radian, 1988a, Appendix B, p. 450; Radian, 1988b, pp. 1-139, 1-140

TABLE B-4. U.S. EPA METHOD 625 FOR GROUNDWATER SAMPLES FROM MW-116

Parameter	IHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-116	MW-116	MW-116	MW-116
Date Sampled			09/26/86	09/26/86	01/13/88	07/06/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/09/86	10/09/86	01/26/88	07/21/88
Lab			SAC	SAC	SAC	SAC
Field Analysis						
Lab Analysis			LDA	LDB		
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND
1,4-Dichlorobenzene	NE	750	ND	ND	ND	ND
Acenaphthene	NE	NE	ND	ND	ND	ND
1,2,4-Trichlorobenzene	NE	NE	ND	ND	ND	ND
Hexachlorobenzene	NE	NE	ND	ND	ND	ND
Hexachloroethane	NE	NE	ND	ND	ND	ND
Bis(2-chloroethyl)ether	NE	NE	ND	ND	ND	ND
2-Chloronaphthalene	NE	NE	ND	ND	ND	ND
3,3'-Dichlorobenzidine	NE	NE	ND	ND	ND	ND
2,4-Dinitrotoluene	NE	NE	ND	ND	ND	ND
2,6-Dinitrotoluene	NE	NE	ND	ND	ND	ND
Fluoranthene	NE	NE	ND	ND	ND	ND
4-Chlorophenyl phenylether	NE	NE	ND	ND	ND	ND
N-nitrosodimethylamine	NE	NE	ND	ND	ND	NA
N-nitrosodi-n-propylamine	NE	NE	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	NE	NE	ND	ND	ND	ND
Butylbenzyl phthalate	NE	NE	ND	ND	ND	ND
Di-n-butyl phthalate	NE	NE	ND	ND	ND	ND
Di-n-octyl phthalate	NE	NE	ND	ND	ND	ND
Diethyl phthalate	NE	NE	ND	ND	ND	ND
Dimethyl phthalate	NE	NE	ND	ND	ND	ND
Benzo(a)anthracene	NS	NE	ND	ND	ND	ND
Benzo(a)pyrene	NE	NE	ND	ND	ND	ND
Benzo(k)fluoranthene	NE	NE	ND	ND	ND	ND
Chrysene	NE	NE	ND	ND	ND	ND
Acenaphthylene	NE	NE	ND	ND	ND	ND
Anthracene	(LOQ)0.7	NE	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	NE	NE	ND	ND	ND	ND
Hexachlorobutadiene	NE	NE	ND	ND	ND	ND
Hexachlorocyclopentadiene	NE	NE	ND	ND	ND	ND
Isophorone	NE	NE	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

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TABLE B-4. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-116	MW-116	MW-116	MW-116
			WELL NUMBER			
Date Sampled			[illegible]/86	09/26/86	01/13/88	07/[illegible]/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/09/86	10/09/86	01/26/88	07/21/88
Lab			SAC	SAC	SAC	SAC
Field Analysis						
Lab Analysis			LDA	LDB		
Naphthalene	NE	NE	ND	ND	ND	ND
Nitrobenzene	NE	NE	ND	ND	ND	ND
Phenanthrene	NE	NE	ND	ND	ND	ND
Dibenzo(a,h)anthracene	NE	NE	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	NE	NE	ND	ND	ND	ND
Pyrene	NE	NE	ND	ND	ND	ND
2,4,6-Trichlorophenol	NE	NE	ND	ND	ND	ND
2-Chlorophenol	NE	NE	ND	ND	ND	ND
2,4-Dichlorophenol	NE	NE	ND	ND	ND	ND
2,4-Dimethylphenol	400	NE	ND	ND	ND	ND
2-Nitrophenol	NE	NE	ND	ND	ND	ND
4-Nitrophenol	NE	NE	ND	ND	ND	ND
2,4-Dinitrophenol	NE	NE	ND	ND	ND	ND
Pentachlorophenol	30	NE	ND	ND	ND	ND
Phenol	NE	NE	2.1B	ND	ND	ND
N-nitrosodiphenylamine	NE	NE	ND	ND	ND	ND
Benzidine	NE	NE	ND	ND	ND	NA
4-Bromophenyl phenylether	NE	NE	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	NE	NE	ND	ND	ND	ND
Benzo(g,h,i)perylene	NE	NE	ND	ND	ND	ND
Fluorene	NE	NE	ND	ND	ND	ND
4-Chloro-3-methylphenol	NE	NE	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	NE	NE	ND	ND	ND	ND
Aniline	NE	NE	ND	ND	ND	NA
Benzyl alcohol	NE	NE	ND	ND	ND	ND
2-Methylphenol	NE	NE	ND	ND	ND	ND
4-Methylphenol	NE	NE	ND	ND	ND	ND
Benzoic acid	NE	NE	ND	ND	ND	ND
4-Chloroaniline	NE	NE	ND	ND	ND	ND
2-Methylnaphthalene	NE	NE	ND	ND	ND	ND
2,4,5-Trichlorophenol	NE	NE	ND	ND	ND	ND
2-Nitroaniline	NE	NE	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
B = Compound detected in laboratory blank - not edited
NE = Not established

TABLE B-4. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-116	MW-116	MW-116	MW-116
			WELL NUMBER			
Date Sampled			09/26/86	09/26/86	01/13/88	07/06/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/09/86	10/09/86	01/26/88	07/21/88
Lab			SAC	SAC	SAC	SAC
Field Analysis						
Lab Analysis			LDA	LDB		
3-Nitroaniline	NE	NE	ND	ND	ND	ND
Dibenzofuran	NE	NE	ND	ND	ND	ND
4-Nitroaniline	NE	NE	ND	ND	ND	ND
Benzo(b)fluoranthene	NE	NE	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NE = Not established

SOURCES: Radian, 1988a, Appendix B, p. 564; Radian, 1988b, pp. 1-141, 1-142, 1-143.

TABLE B-5. U.S. EPA METHOD 6010 FOR GROUNDWATER SAMPLES FROM MW-116

Parameter	DHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116
Date Sampled			11/11/85	11/11/85	02/28/86	01/13/88	04/11/88	07/06/88	10/10/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/19/85	11/19/85	03/12/86				10/25/88
Lab			AUS	AUS	AUS	SAC	SAC	SAC	SAC
Field Analysis			FDA	FDB					
Lab Analysis									
Antimony	NE	NE	NA	NA	NA	ND	ND	ND	ND
Arsenic	NE	0.050	0.008	0.007	0.006	ND	0.004	ND	ND
Beryllium	NE	NE	NA	NA	NA	ND	ND	ND	ND
Cadmium	NE	0.010	0.002	ND	ND	ND	ND	ND	ND
Chromium	NE	0.050	0.039	0.040	ND	ND	0.01	0.012	0.014
Copper	NE	NE	NA	NA	NA	ND	ND	ND	ND
Lead	NE	0.050	ND	0.024	0.004	ND	ND	ND	ND
Mercury	NE	0.002	0.0003	0.0002	ND	ND	ND	ND	NA
Nickel	NE	NE	NA	NA	NA	ND	ND	ND	ND
Selenium	NE	0.010	ND	ND	ND	ND	ND	ND	ND
Silver	NE	0.050	0.003	ND	ND	ND	ND	ND	ND
Thallium	NE	NE	NA	NA	NA	ND	ND	ND	ND
Zinc	NE	NE	NA	NA	NA	ND	0.72	ND	0.006
Fluorene	NE	NE	NA	NA	NA	NA	NA	NA	NA
Calcium	NE	NE	18	19	19	NA	NA	NA	16B
Chloride	NE	NE	17	16	18	NA	NA	NA	NA
Carbonate	NE	NE	NA	NA	NA	NA	NA	NA	NA
Iron	NE	NE	NA	NA	NA	NA	NA	NA	0.016
Bicarbonate	NE	NE	NA	NA	NA	NA	NA	NA	NA
Magnesium	NE	NE	12	12	12	NA	NA	NA	10B
Sodium	NE	NE	17	18	17	NA	NA	NA	14B
Sulfate	NE	NE	18	16	37	NA	NA	NA	NA
Aluminum	NE	NE	NA	NA	NA	NA	NA	NA	0.080
Boron	NE	NE	NA	NA	NA	NA	NA	NA	0.032
Barium	NE	1.0	0.041	0.058	0.049	NA	NA	NA	0.034
Cobalt	NE	NE	NA	NA	NA	NA	NA	NA	ND
Potassium	NE	NE	NA	NA	NA	NA	NA	NA	ND
Manganese	NE	NE	NA	NA	NA	NA	NA	NA	ND
Molybdenum	NE	NE	NA	NA	NA	NA	NA	NA	ND
Silicon	NE	NE	NA	NA	NA	NA	NA	NA	35
Vanadium	NE	NE	NA	NA	NA	NA	NA	NA	0.026
Total Alkalinity	NE	NE	110	110	120	NA	NA	NA	NA

ALL UNITS ARE mg/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
AUS = Radian Analytical Services, Austin
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
B = Compound detected in laboratory blank - not edited
NE = Not established

TABLE B-5. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116
			WELL NUMBER						
Date Sampled			11/11/85	11/11/85	02/28/86	01/13/88	04/11/88	07/06/88	10/10/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/19/85	11/19/85	03/12/86				10/25/88
Lab			AUS	AUS	AUS	SAC	SAC	SAC	SAC
Field Analysis			FDA	FDB					
Lab Analysis									
Nitrate	NE	45	2.0	2.0	2.0	NA	NA	NA	NA
Total Dissolved Solids	NE	NE	230	240	240	NA	NA	NA	NA

ALL UNITS ARE mg/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
AUS = Radian Analytical Services, Austin
SAC = Radian Analytical Services, Sacramento

NA = Not analyzed
NE = Not established

SOURCES: Radian, 1988a, Appendix B, p. 702; Radian, 1988b, pp. 1-144, 1-145.

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TABLE B-6. U.S. EPA METHOD 9010 FOR GROUNDWATER SAMPLES FROM MW-116

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-116	MW-116	MW-116	MW-116
			WELL NUMBER			
Date Sampled			10/09/87	01/13/88	04/11/88	07/06/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed					04/18/88	07/13/88
Lab			SAC	SAC	SAC	SAC
Field Analysis						
Lab Analysis						
Total cyanide	0.200	0.200	ND	ND	ND	ND
Amenable cyanide	0.200	0.200	ND	NA	ND	ND

ALL UNITS ARE mg/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed

SOURCES: Radian, 1988a, Appendix B, p. 726; Radian, 1988b, p. 1-145.

TABLE B-7. PESTICIDE ANALYSIS FOR GROUNDWATER SAMPLES FROM MW-116

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-116	MW-116	MW-116	MW-116	MW-116	MW-116
Date Sampled			11/11/85	11/11/85	02/28/86	02/28/86	09/26/86	09/26/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/15/85	11/19/85	03/14/86	03/13/86	10/09/86	10/09/86
Lab			SAC	SAC	SAC	SAC	SAC	SAC
Field Analysis			FDA	FDB				
Lab Analysis					LDA	LDB	LDA	LDB
Aldrin	(LOQ).05	NE	ND	ND	ND	ND	ND	ND
Dieldrin	(LOQ).05	NE	ND	ND	ND	ND	ND	ND
Alpha chlordane	0.055	NE	ND	ND	ND	ND	ND	ND
4,4'-DDT	NE	NE	ND	ND	ND	ND	ND	ND
4,4'-DDE	NE	NE	ND	ND	ND	ND	ND	ND
4,4'-DDD	NE	NE	ND	ND	ND	ND	ND	ND
Alpha endosulfan	NE	NE	ND	ND	ND	ND	ND	ND
Beta endosulfan	NE	NE	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	NE	NE	ND	ND	ND	ND	ND	ND
Endrin	0.200	0.200	ND	ND	ND	ND	ND	ND
Endrin aldehyde	NE	NE	ND	ND	ND	ND	ND	ND
Heptachlor	0.020	NE	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	0.10	NE	ND	ND	ND	ND	ND	ND
Alpha-BHC	0.700	NE	ND	ND	ND	ND	ND	ND
Beta-BHC	0.300	NE	ND	ND	ND	ND	ND	ND
Gamma-BHC	4	4.0	ND	ND	ND	ND	ND	ND
Delta-BHC	NE	NE	ND	ND	ND	ND	ND	ND
PCB-1242	NE	NE	ND	ND	ND	ND	ND	ND
PCB-1254	NE	NE	ND	ND	ND	ND	ND	ND
PCB-1221	NE	NE	ND	ND	ND	ND	ND	ND
PCB-1232	NE	NE	ND	ND	ND	ND	ND	ND
PCB-1248	NE	NE	ND	ND	ND	ND	ND	ND
PCB-1260	NE	NE	ND	ND	ND	ND	ND	ND
PCB-1016	NE	NE	ND	ND	ND	ND	ND	ND
Toxaphene	5	5	ND	ND	ND	ND	ND	ND
Methoxychlor	100	100	NA	NA	NA	NA	ND	ND
Gamma chlordane	0.055	NE	NA	NA	NA	NA	ND	ND
Endrin ketone	NE	NE	NA	NA	NA	NA	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: Radian, 1988a, Appendix B, p. 630.

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INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

TECHNICAL MEMORANDUM FOR PRL 29
FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

Radian Corporation
10395 Old Placerville Road
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USAF CONTRACT NO. F33615-87-D-4023, DELIVERY ORDER NO. 0012
CONTRACTOR CONTRACT NO. 227-005, DELIVERY ORDER NO. 0012

United States Air Force Center for Environmental Excellence
Mr. Patrick Haas (Technical Project Manager)
Environmental Services Office/Environmental Restoration Division (AFCEE/ESR)
Brooks Air Force Base, Texas 78235-5501

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1.0 INTRODUCTION

This Technical Memorandum presents a summary of data compiled for Potential Release Location (PRL) 29 at McClellan Air Force Base (AFB), California. The location of PRL 29 is shown in Figure 1-1. Potential Release Location 29 was reported to be the location of a scrap material burn pit west of Operable Unit (OU) B of McClellan AFB. The task of compiling data for Technical Memorandums is part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan for any locations that pose a threat to human health and welfare or the environment. This site assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund sites.

The purpose of this Technical Memorandum is to:

- Identify any immediate response needs as required by CERCLA/ SARA;
- Determine whether further action is needed at the location;
- Provide qualified data to support operable unit prioritization and grouping;
- Evaluate previous contractors' recommendations; and
- Provide recommendations for further investigation or remedial actions.

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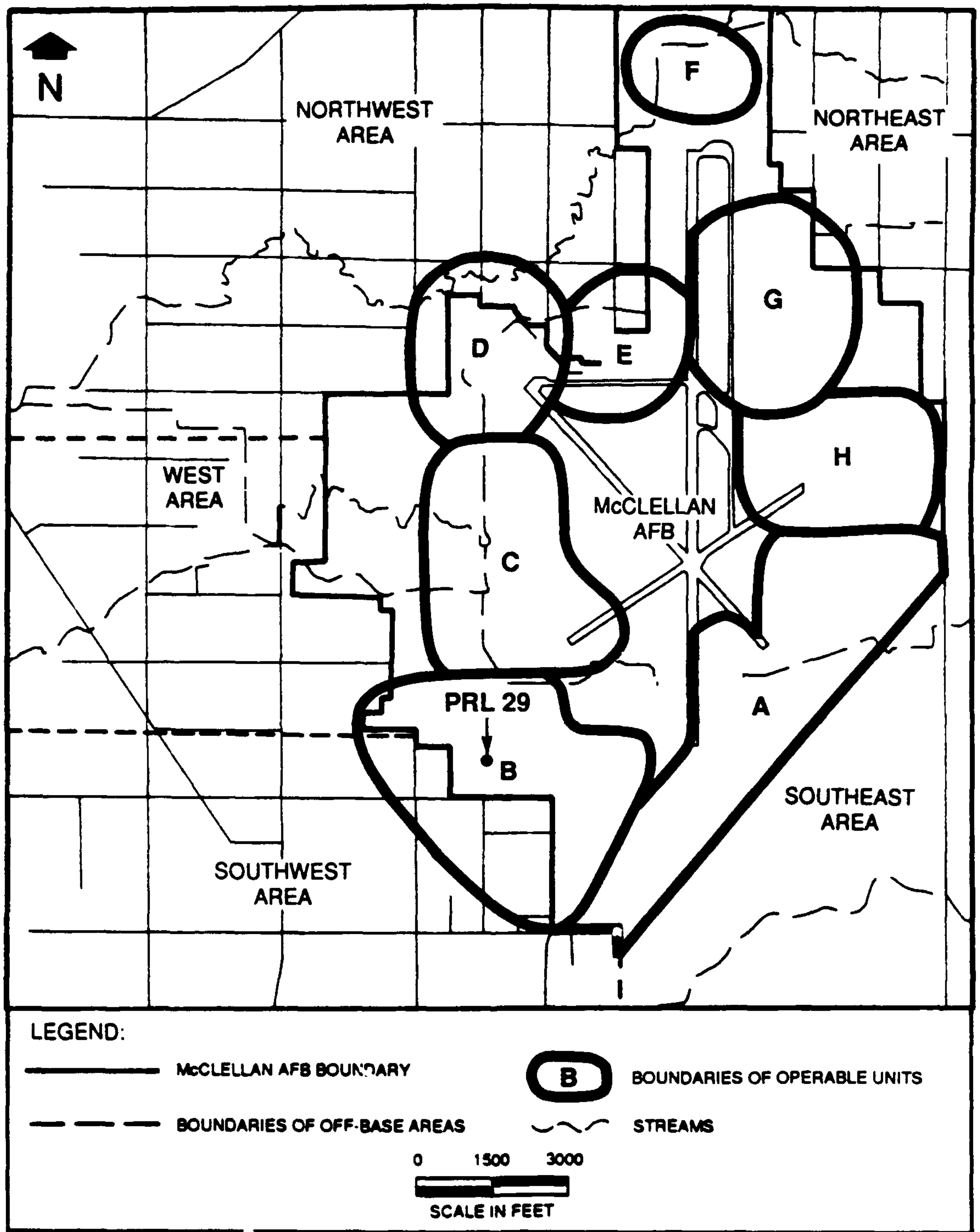

Figure 1-1. Map of PRL 29 Within the McClellan AFB Facility.

The scope of this Technical Memorandum includes site-specific data regarding the following categories of information:

- Operations and waste management practices;
- Waste characteristics;
- Contaminant migration pathways; and
- Target populations and environments.

Data on all four categories are necessary to develop an understanding of the location, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Site operations, waste management practices and waste characteristics, and migration pathways are discussed in this document. A separate General Information document addresses target populations and environments. Background information regarding the overall facility description of McClellan AFB is presented in the General Information document, which includes environmental setting, land use, hydrogeologic conditions, facility history, and a discussion of potential receptors.

This Technical Memorandum document includes the following:

- Information sources used to prepare the document;
- Location description, including historical activities;
- Extent of on-site soil contamination;
- Potential hazards;
- An evaluation of previous contractors' recommendations; and
- Conclusions and recommendations.

2.0 SOURCES OF INFORMATION

The following sections describe the sources of information used to develop this Technical Memorandum.

2.1 Previous Investigations

The first report to identify the area now designated as Potential Release Location (PRL) 29 was prepared by McClellan Air Force Base (AFB) personnel in 1981 (McClellan AFB, 1981). During the preparation of that report, McClellan AFB personnel investigated past disposal activities, reviewed base records, maps, and photographs, and interviewed other employees familiar with base disposal practices. The information obtained during the investigation led to the identification of 30 disposal sites at McClellan AFB, including PRL 29.

In 1981, CH2M Hill reviewed McClellan AFB files to determine the potential for hazardous materials to migrate off base. Interviews with past and present McClellan AFB employees and the review of base records resulted in the identification of 45 waste disposal sites at McClellan AFB, including PRL 29 (CH2M Hill, 1981).

In 1983, Engineering Science, Inc., ranked 46 disposal locations according to their relative potential hazards. As part of this report, the volume of wastes and volume of affected soils at PRL 29 were estimated (Engineering Science, Inc., 1983).

McLaren Environmental Engineering, Inc., investigated PRL 29 in 1985. The investigation included a ground penetrating radar (GPR) survey, physical characterization of the soil, and a qualitative characterization of the soil gas (McLaren, 1986a).

In 1988, McClellan AFB Environmental Management conducted a soil investigation in the vicinity of PRL 29 in preparation for the proposed construction of a Conforming Storage Facility (McClellan AFB, 1988).

2.2 Personnel Interviews

McClellan AFB personnel were interviewed by Radian regarding historical operations at PRL 29. Documentation for the interview information is in the PRL 29 Location File. Although personnel interviews were apparently conducted as part of the

CH2M Hill and McLaren investigations, written documentation of those interviews was not available for this report.

2.3 Location Visit

Radian personnel visited PRL 29 on 6 January 1989 to document current features and activities at the location.

2.4 Aerial Photographs

Aerial photographs of PRL 29, from the years listed in Table 2-1, were reviewed for physical features and evidence of contamination. Interpretation of aerial photographs is discussed in more detail in Section 3, Location Description.

2.5 Review of Base Files

McClellan AFB Civil and Bioenvironmental Engineering files were reviewed for historical information during the preparation of this Technical Memorandum; no information was available for PRL 29.

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TABLE 2-1. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1988) REVIEWED FOR PRL 29

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 400'
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 370'
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 400'
1949	Whittier College	1" = 400'
1951	Whittier College	1" = 770'
1953	U.S. Department of Agriculture, ASCS[1]	1" = 400'
1955	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1690'
1957	U.S. Department of Agriculture, ASCS	1" = 400'
1962	McClellan AFB, History Office	1" = 150'
1963	Cartwright Aerial Surveys	1" = 1667'
1965	McClellan AFB, History Office	1" = 150'
1968	Cartwright Aerial Surveys	1" = 1000'
1971	Cartwright Aerial Surveys	1" = 400'
1972	Cartwright Aerial Surveys	1" = 1000'
1974	Cartwright Aerial Surveys	1" = 1200'
1976	Cartwright Aerial Surveys	1" = 400'
1978	Cartwright Aerial Surveys	1" = 2000'
1981	Cartwright Aerial Surveys	1" = 1000'
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000'
1987	Cartwright Aerial Surveys	1" = 1000'
1988	Cartwright Aerial Surveys	1" = 400'

[1] United States Department of Agriculture, Agricultural Stabilization and Conservation Service.

3.0 LOCATION DESCRIPTION

Potential Release Location (PRL) 29 is located in the west-central part of Operable Unit (OU) B of McClellan Air Force Base (AFB), as shown in Figure 3-1. It consists of the reported location of a scrap material burn pit. Potential Release Locations (PRLs) B-1, B-9, and P-2 are adjacent to PRL 29. A location map showing PRL 29 and the surrounding area is presented in Figure 3-2.

3.1 Location Delineation

The first report to identify PRL 29 was prepared by McClellan AFB personnel in 1981 (McClellan AFB, 1981). Potential Release Location 29 is described as the Civil Engineering (CE) Reclamation Yard/Scrap Material Burner. A map included in the report shows PRL 29 located at the northeast corner of Dean Street and Patrol Road (north of the area shown in Figure 3-2), but the report states that the sites shown on the map are not precisely located.

In 1981, CH2M Hill identified PRL 29 as one of 45 locations possibly contributing to contamination at McClellan AFB (CH2M Hill, 1981). CH2M Hill's report describes PRL 29 in two lists of sites:

- One of 37 waste disposal sites; and
- One of nine sites where waste handling practices could result in spread of contamination.

It is unknown why PRL 29 was included in both site categorizations; it is the only location described in both lists. CH2M Hill described the location of PRL 29 as north of the Civil Engineering (CE) storage yard (CH2M Hill, 1981). The source of this information is not referenced.

In 1982, Engineering Science, Inc., estimated the size of PRL 29 as 250 by 160 feet (Engineering Science, Inc., 1983). It is not known how these dimensions were determined.

McLaren Environmental Engineering, Inc., reviewed aerial photographs and conducted a field investigation of PRL 29 in 1985 (McLaren, 1986a). McLaren

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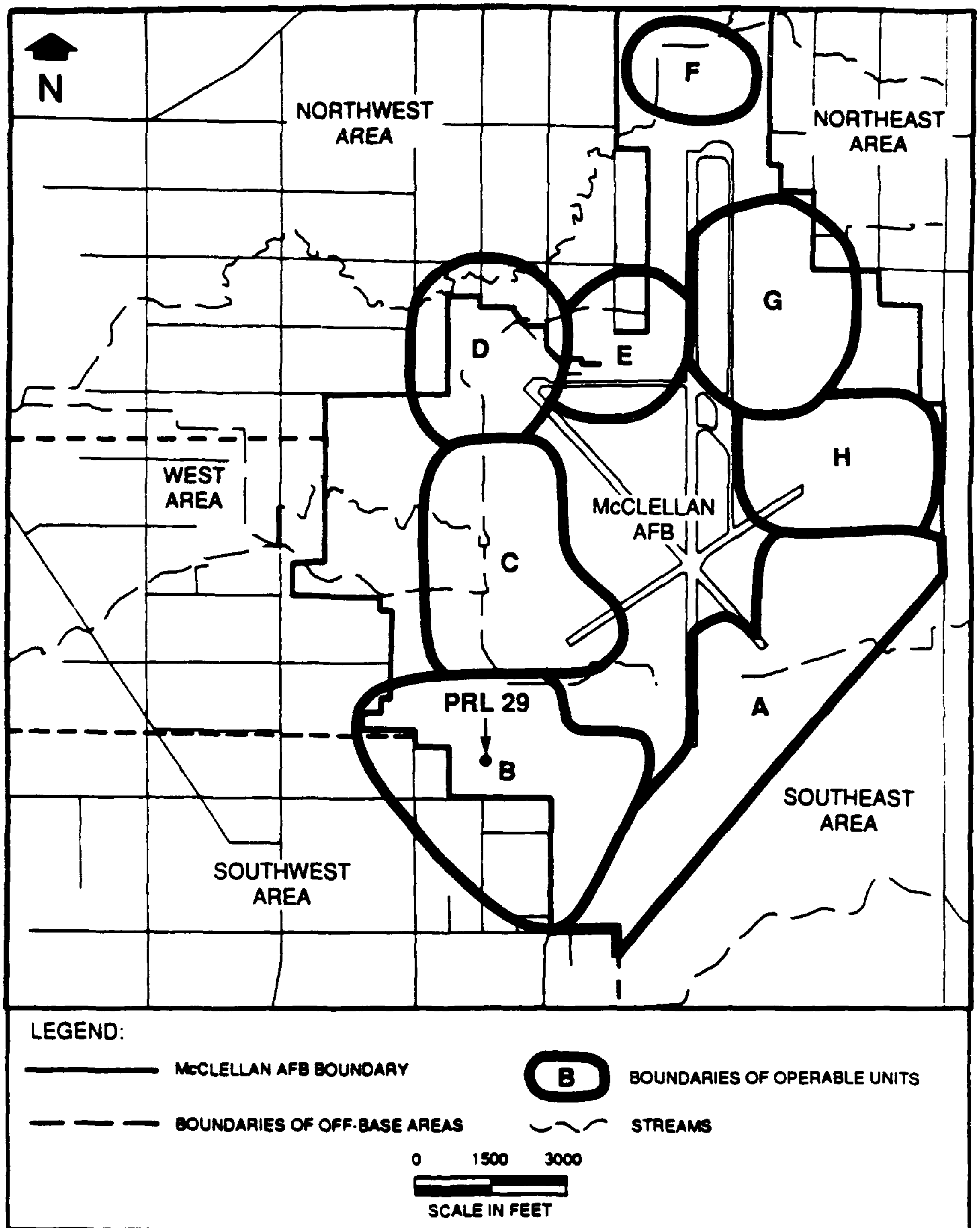

Figure 3-1. Map of PRL 29 Within the McClellan AFB Facility.

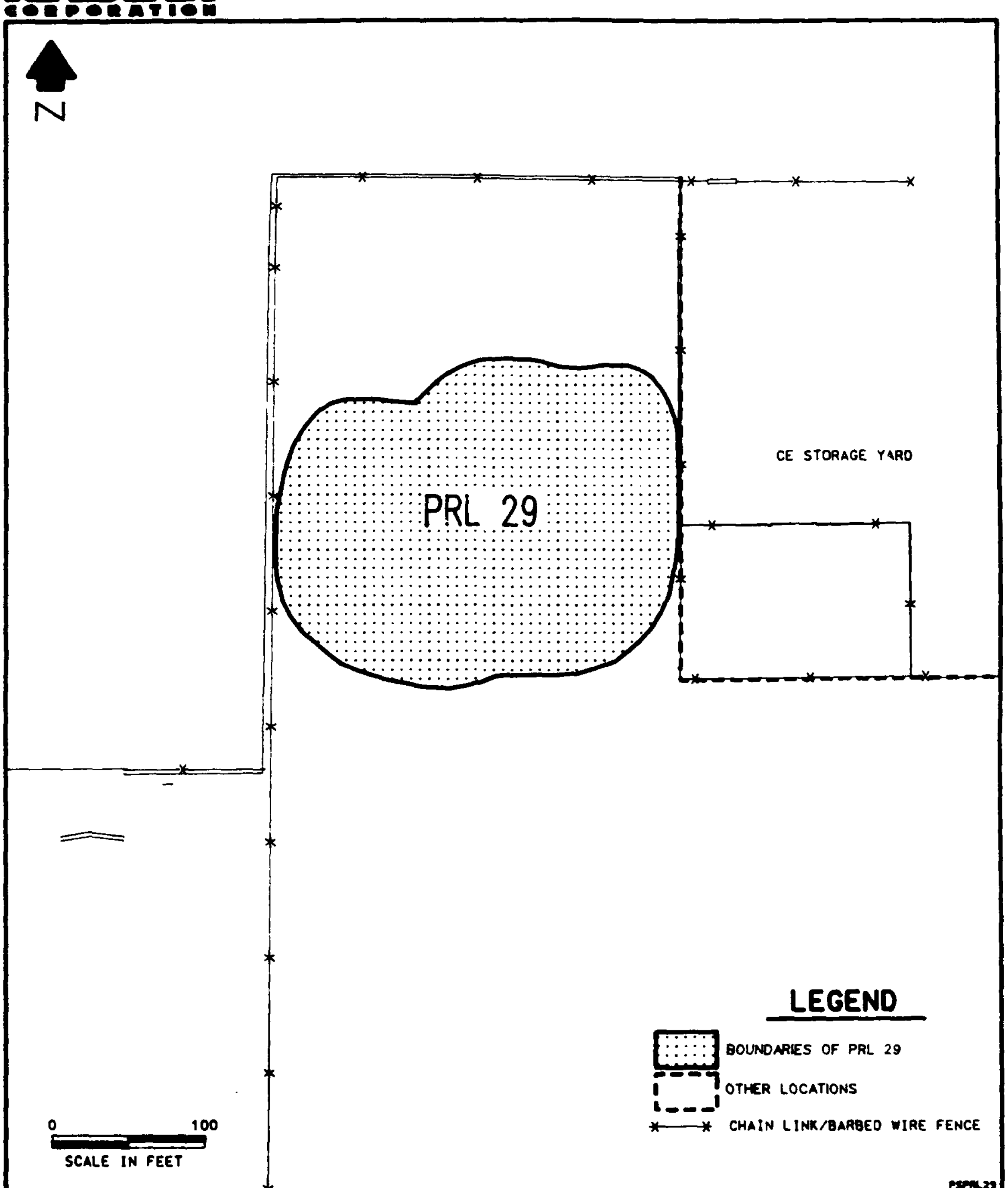

Figure 3-2. Map of PRL 29 and Vicinity.

reported they reviewed a 1974 aerial photograph and found no evidence of a burial pit north of the CE storage yard. McLaren's report describing their field investigation does not include any information about the area north of the CE storage yard. Because they found uneven terrain and disturbed soil west of the storage yard, McLaren decided to conduct their investigation there. To determine the extent of the disturbed soil, McLaren conducted a ground penetrating radar (GPR) survey of this area. McLaren used these results to establish the boundaries of PRL 29 shown in Figure 3-2.

Although the boundaries established by McLaren conflict with the information reported by CH2M Hill, McLaren's boundaries were used for the preparation of this Technical Memorandum because CH2M Hill did not delineate specific site boundaries.

3.2 Historical Activities

CH2M Hill reported that PRL 29 was used as a "scrap material burner pit" during the 1950s and 1960s. The hazardous rating worksheet for PRL 29 in CH2M Hill's report states:

> Used transformers were stored at this site, some of which may have contained PCBs--small spills may have occurred. The site was also reportedly used to bury 50-60 aircraft generators in 1974--no indication that hazardous materials were involved. (CH2M Hill, 1981)

The source of this information was not documented by CH2M Hill.

The aerial photographs of PRL 29 that were reviewed (Table 2-1) do not show any evidence of a burial pit or materials in storage at PRL 29. The photographs show PRL 29 as undeveloped grassland. Photographs taken in 1971 and 1976 show an eliptically shaped discolored area in the western section of PRL 29. Although it is not clear what caused this discoloration, many similarily discolored areas are visible nearby.

An employee of McClellan AFB, who has worked at the base since the 1950s and who is familiar with the area of PRL 29, was interviewed by Radian for historical information about the location (Jeffrey, personal communication, 1989). He did not recall any burn pits at PRL 29.

3.3 Current Activities

Currently, PRL 29 is undeveloped grassland enclosed by fencing. The surface of PRL 29 is uneven, possibly indicating past excavation.

3.4 Reported Releases

Releases of specific contaminants, if any, have not been documented at PRL 29.

3.5 Remedial Actions

No known remedial actions have been documented for PRL 29.

4.0 EXTENT OF CONTAMINATION

The following sections present the results of previous investigations at Potential Release Location (PRL) 29. Results of soil, soil gas, groundwater, surface water, and air monitoring investigations are presented under separate subsections.

4.1 Soil Results

McLaren Investigation

This section summarizes the physical characterization of the soil at PRL 29 and evaluates the adequacy of that soil characterization. Results presented in this section are from data obtained from the 1985 McLaren Environmental Engineering, Inc., investigation (McLaren, 1986a).

McLaren performed a ground penetrating radar (GPR) survey to delineate the boundaries of PRL 29. Data from the GPR survey were interpreted by McLaren to indicate an area of soil disturbance approximately 275 feet long by 225 feet wide west of the Civil Engineering (CE) Storage Yard. This area was investigated with two types of soil borings: deep auger profile borings (DAPs) and grid survey borings (GSBs). Figure 4-1 shows the boring locations and the GPR traverses.

Four DAPs were drilled to contact any lateral migration of contamination from the PRL (McLaren, 1986b). These borings were drilled using either 4-inch diameter solid stem augers or 8-inch diameter hollow-stem augers. No evidence of soil contamination was detected.

Three GSBs were drilled to verify the absence or presence of buried waste (McLaren, 1986b). The borings were drilled with a 4-inch diameter solid-stem auger to a depth of 20 feet. Soil columns from these locations were reportedly undisturbed with no evidence of fill material or wastes. Although the report on the investigation indicated that the soil columns were undisturbed (McLaren, 1986a), it is not clear how this determination was made. No soil samples were collected because no wastes were found.

McClellan AFB Investigation

In 1988 McClellan Air Force Base (AFB) Environmental Management (EM) conducted an investigation in prepartation for the proposed construction of a

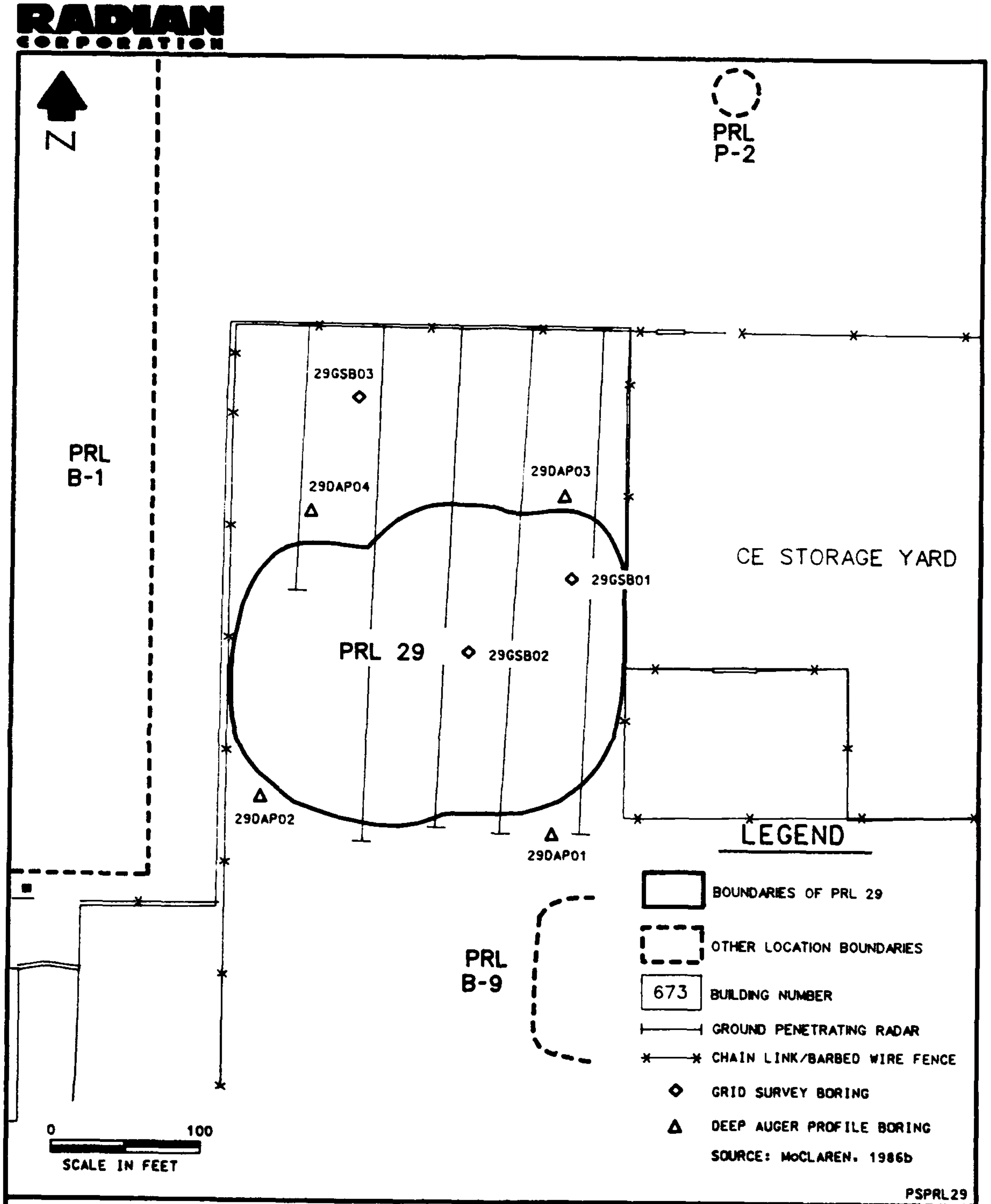

Figure 4-1. Boring Locations for PRL 29.

Conforming Storage Facility in the vicinity of PRL 29. Sixteen soil samples were collected from nine boring locations. Exact sampling loctions could not be determined with available information; however, based on EM reports, the samples were collected in the vicinity of PRL 29 (Hoda, personal communication, 1990). Samples were collected from the borings at depths of from 5 to 15 feet below groundsurface (BGS) and analyzed for halogenated volatile organic compounds (VOCs), aromatic VOCs, semi-volatile organic compounds, and metals using U.S. Environmental Protection Agency (EPA) Methods 8010, 8020, 8270, and 6010, respectively. Table 4-1 presents a summary of the volatile and semivolatile compounds detected in soil samples collected during the investigation. Analytical results are not presented in this report because detected contamination cannot be definitively related to PRL 29 and can only be used as an indication of potential contaminants of concern in the area. It should be noted however that all of the compounds listed in Table 4-1 were detected at low levels (below 130 micrograms per kilogram).

4.1.1 Physical Characteristics

The physical characterization of the soil is based on McLaren's lithologic logs. The soils at PRL 29 range from dry to very moist sandy loams, silt loams, and clay loams. Strong cementation was encountered in Boring 29DAP02 at 40 feet BGS. The color of surface soils range from yellowish brown to dark brown and varies with depth, with light olive brown predominating. No evidence of soil discoloration, solvent odors, or wastes were noted in any of the borings.

4.1.2 Analytical Results

No samples were collected by McClaren because no wastes or evidence of contamination were found.

4.1.3 Adequacy of Soil Characterization

To determine the adequacy of a soil investigation, the characteristics of the suspected contaminants must be considered. Previous reports have identified three separate activities at PRL 29 that may have contributed to contamination:

- The location was used as a scrap material burner;
- 50 to 60 aircraft generators were buried at the location; and
- Drums and transformers were stored at the location.

TABLE 4-1 COMPOUNDS DETECTED DURING THE EM INVESTIGATION NEAR PRL 29

Volatile Organic Compounds	Semivolatile Organic Compounds
Benzene	Benzo(a)anthracene
Ethyl benzene	Chrysene
1,1-Dichloroethene	Diethylphthalate
Trichlorofluoromethane	Fluoranthene
Toluene	Phenanthrene
Xylenes	Pyrene

No hazardous materials have been specifically associated with the scrap material burner or the generators. None of the available information indicates what the drums contained. Because transformers were reportedly stored at PRL 29 and transformers may contain polychlorinated biphenyls (PCBs), it is possible that PCBs may have been spilled at PRL 29.

The seven McLaren borings at PRL 29 were drilled in the following locations: four borings at the edges of the delineated boundaries to determine the lateral extent of contamination and two borings in the center of the suspected location to detect the highest concentrations of constituents. Boring 29GSB03, performed last, was drilled approximately 100 feet north of PRL 29.

Although no visual or soil gas (see Section 4.2, Soil Gas Results) contamination was found in any of the borings, additional borings are needed to verify the absence of wastes at PRL 29. Furthermore, it is possible that the GPR survey did not detect the actual location of the former scrap material burner and generator disposal pit. Although GPR indicated an area of reduced soil density, the soil borings drilled in the area did not indicate evidence of waste disposal activities. Data from GPR surveys cannot distinguish waste disposal activities from natural changes in soil layering, differences in soil composition, or soil disturbances due to other causes.

Additional soil investigation is needed to determine if PCB contamination is present at PRL 29, because visual evidence is not necessarily a good indicator of PCB contamination. If PCBs were spilled at PRL 29, soil sampling in the specific area of the spill is necessary to determine the extent of any contamination. Because no samples were analyzed, additional soil sampling and analysis is needed.

4.2 Soil Gas Results

McLaren Investigation

This section presents the results of soil gas measurements taken during the 1985 McLaren investigation (McLaren, 1986a). Soil gas measurements were obtained with a portable photoionization detector (PID). A PID is a screening instrument and does not speciate or accurately quantify the soil gas. Quality assurance measures included calibrating the PID daily with standardized isobutylene, keeping a calibration logbook and, prior to drilling, recording the ambient air reading from the PID. McLaren also indicated that the PID was periodically checked in the field to ensure proper functioning (McLaren, 1986b, p. 19).

While drilling each of the seven borings at PRL 29, McLaren recorded soil gas readings from soil cuttings approximately every 5 feet and from headspace containers approximately every 10 feet. All PID readings were less than 1 part per million by volume (ppmv).

Although no wastes were found and all PID measurements were low, it is not possible to conclude that volatile constituents are not present at PRL 29. Because the exact location where the drums and transformers were stored is unknown, additional subsurface soil gas measurements are necessary to determine whether or not volatile organic constituents are present. Furthermore, PIDs do not necessarily detect the contaminants most likely to be present, PCBs.

Radian Preliminary Pathways Assessment

In 1989, Radian performed a ground surface soil gas screening of PRL 29 as part of the Preliminary Pathways Assessment (Radian, 1988, 1989). As part of this screening, Radian personnel traversed the location in a grid pattern, taking PID and organic vapor analyzer (OVA) readings measured from the ground surface and from ambient air 5 feet above the ground surface. The PID reading of ambient air at PRL 29 was 1 ppmv; the maximum PID reading measured from the ground surface was 1.1 ppmv. The OVA reading of ambient air was 1 ppmv; the maximum OVA reading measured from the ground surface was 1.1 ppmv. These PID and OVA measurements are adequate as a preliminary screening of the amount of soil gas that is migrating to the air at PRL 29.

4.3 Groundwater Results

Because this Technical Memorandum is concerned only with site-specific data, only groundwater results from downgradient wells that have detectable amounts of the same constituents associated with PRL 29 are relevant. Because no specific contaminants have been identified with PRL 29, no groundwater results have been included here.

4.4 Surface Water Results

Although no surface water samples that can be specifically related to PRL 29 have been collected for analysis, surface water at McClellan AFB is regularly monitored under two National Pollutant Discharge Elimination System (NPDES) permits. The first requires that surface water from Arcade Creek, Second Creek, and Magpie Creek be sampled monthly where it enters the base, and again where it exits; these samples are analyzed for volatile organic compounds (VOCs) and heavy metals. The second permit outlines waste discharge regulations for the base groundwater treatment plant (located in Operable Unit (OU) C of McClellan AFB), including effluent analyses of VOCs, semivolatile organic compounds, and heavy metals. The NPDES permits establish limits on concentrations of VOCs, semivolatile organic compounds, and heavy metals in surface water discharged from McClellan AFB. Under the permit requirements, concentrations of these compounds must not exceed the established limits.

4.5 Air Monitoring Results

No air monitoring results have been specifically associated with PRL 29.

5.0 POTENTIAL HAZARDS

The following sections discuss the potential contaminants of concern, immediate hazards, and the potential for migration resulting from any on-site contamination at Potential Release Location (PRL) 29.

5.1 Potential Contaminants of Concern

The following activities have reportedly taken place at PRL 29:

- Scrap material was burned;
- Generators were buried; and
- Drums and transformers were stored.

Specific contaminants have not been associated with the burnt scrap material, the buried generators, or the drums that were reportedly stored at PRL 29. Polychlorinated biphenyls (PCBs) have been identified as suspected contaminants at PRL 29 because any transformers stored at the location may have leaked oils containing PCBs.

No visible evidence of contamination was found at PRL 29 during McLaren's investigation of the location. Soil samples from PRL 29 were not analyzed as part of the McLaren investigation. Further investigation is needed to determine whether contamination is present or absent at the location.

The volatile and semivolatile organic contaminants detected during the McClellan Air Force Base Environmental Management investigation (see Section 4.1) can only be considered an indication of the potential contaminants of concern in the area because it could not be confirmed whether the contaminated soil is within the location boundaries of PRL 29.

5.2 Immediate Hazards

This section describes potential immediate hazards caused by contamination at PRL 29, including the potential for fire and explosion and the possible hazards to worker health and safety. Because all soil gas readings were less than 1 part per million volume (ppmv), the risk of fire or explosion at the location is very low.

Potential hazards to worker health and safety are limited to inhalation. ingestion, or dermal contact of any contaminated near-surface soils. Because further investigation is needed to determine if contamination is present or absent at PRL 29, the potential health risks should be reevaluated prior to any construction or excavation at the location.

5.3 Potential for Contaminant Migration

This section describes the potential for wastes to migrate from PRL 29 to groundwater, surface water, and air. Although site-specific information is limited, it is possible to discuss general considerations of contamination at this location.

5.3.1 Potential for Migration to Groundwater

The most important factors that influence migration to groundwater are the surface water infiltration rate, the percolation rate, and the contaminant characteristics.

The potential infiltration rate for soil is primarily related to the surface characteristics of the area and the permeability of the soil. The surface of PRL 29 is exposed soil with vegetation. Boring logs indicate the soil at PRL 29 ranges from sandy loams to clay loams. Although permeability data for the soil at PRL 29 is not available, sandy loams and clay loams generally have very low to low permeabilities. The combination of these surface characteristics and soil types indicates the infiltration rate at PRL 29 is low to very low.

The percolation rate of contaminants dissolved in infiltrating water depends on the soil permeability, structure, and stratification. As indicated above, the permeability of the soil at PRL 29 is believed to be very low to low. Although cementation was noted in the boring logs, the depth of cementation was not consistent, and basewide boring date indicate that relatively impermeable layers are not continuous and are not effective barriers to percolation. Therefore, the percolation rate is believed to be low to moderate.

Polychlorinated biphenyls have been identifed as a suspected contaminant at PRL 29. Polychlorinated biphenyls are relatively insoluble. In the soil environment, PCBs behave similarly to thick oils, which adhere to soil grains. Therefore, PCBs are unlikely to be transported by infiltrating water to the level of groundwater.

Other contaminants of concern at PRL 29 are VOCs and semivolatile organic compounds. In general, VOCs are the most soluble of these contaminants and have the highest potential for dissolving into water and being carried with the flow of percolating water. Semivolatile organic compounds and metals are generally much more likely to remain in near-surface soils and not migrate with percolating water. However, as other organic compounds dissolve in water, any semivolatile organic compounds may also dissolve more readily due to the solvent properties of other organics.

5.3.2 Potential for Migration to Surface Water

The primary characteristics affecting the potential for contaminant migration to surface water are the topography and surface characteristics of the location. The topography at PRL 29 is relatively uneven, unpaved grassland. Given the slope at PRL 29, runoff from the location apparently drains south into a drainage ditch, which eventually flows into Magpie Creek. If the surface at PRL 29 is contaminated, contaminanted soil particles could be carried via runoff to surface water. For this reason, the potential for migration to surface water at the location is considered to be moderate.

5.3.3 Potential for Migration to Air

Both location surface characteristics and contaminant characteristics influence the potential for migration to air. PCBs have relatively low volatility. For this reason, and because all soil gas measurements were less than 1 ppmv, the potential for migration to air is considered very low.

6.0 EVALUATION OF PREVIOUS CONTRACTORS' RECOMMENDATIONS

McLaren made the following recommendation for PRL 29:

> Because neither buried debris or fill material were encountered, the recommended alternative for Site 29 is no additional action. (McLaren, 1986a)

Because soil investigation is needed to verify that contaminants are not present at PRL 29, Radian believes this recommendation was premature.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The boundaries of Potential Release Location (PRL) 29 vary considerably in previous reports:

- Brunner and Zipfel showed the location of PRL 29 as being at the north-east corner of Dean Street and Patrol Road;
- CH2M Hill described the location of PRL 29 as being north of the Civil Engineering (CE) storage yard; and
- McLaren identified the location of PRL 29 as being west of the CE storage yard.

In order to verify the boundaries of PRL 29 and better determine the presence and extent of any contamination, Radian recommends conducting additional interviews with past or present base personnel who may be aware of activities at PRL 29 to determine:

- The former location of the scrap material burner;
- The location of the buried generators;
- The former location of stored transformers; and
- The former location of drum storage area and a description of the contents.

Investigation of subsurface soils and aerial photographs have shown no evidence of waste handling activities within the presently defined boundaries of PRL 29. However, because hazardous materials were reportedly stored at PRL 29, Radian recommends that soil samples from the potentially affected areas be collected and analyzed for polychlorinated biphenyls. In addition, soil samples should be analyzed for volatile and semivolatile organic compounds because soil sampling and analytical data from a McClellan Air Force Base Environmental Management investigation showed low levels of a number of volatile and semivolatile compounds in soil samples collected in the vicinity of PRL 29. The source of this contamination is unknown.

8.0 REFERENCES

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INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

TECHNICAL MEMORANDUM FOR SITE 30
FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

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CONTRACTOR CONTRACT NO. 227-005, DELIVERY ORDER NO. 0012

United States Air Force Center for Environmental Excellence
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1.0 INTRODUCTION

This Technical Memorandum presents a summary of data compiled for Site 30 at McClellan Air Force Base (AFB), California. The location of Site 30 is shown in Figure 1-1. Site 30 was reportedly the location of a surface disposal site east of Building 628. The task of compiling data for Technical Memorandums is part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan for any sites that pose a threat to human health and welfare or the environment. This site assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund sites.

The purpose of this Technical Memorandum is to:

- Identify any immediate response needs as required by CERCLA/SARA;
- Determine whether further action is needed at the site;
- Provide qualified data to support operable unit prioritization and grouping; and
- Provide recommendations for further investigation or remedial actions.

The scope of this Technical Memorandum includes site-specific data regarding the following categories of information:

- Operations use and waste management practices;
- Waste characteristics;
- Contaminant migration pathways; and
- Target populations and environments.

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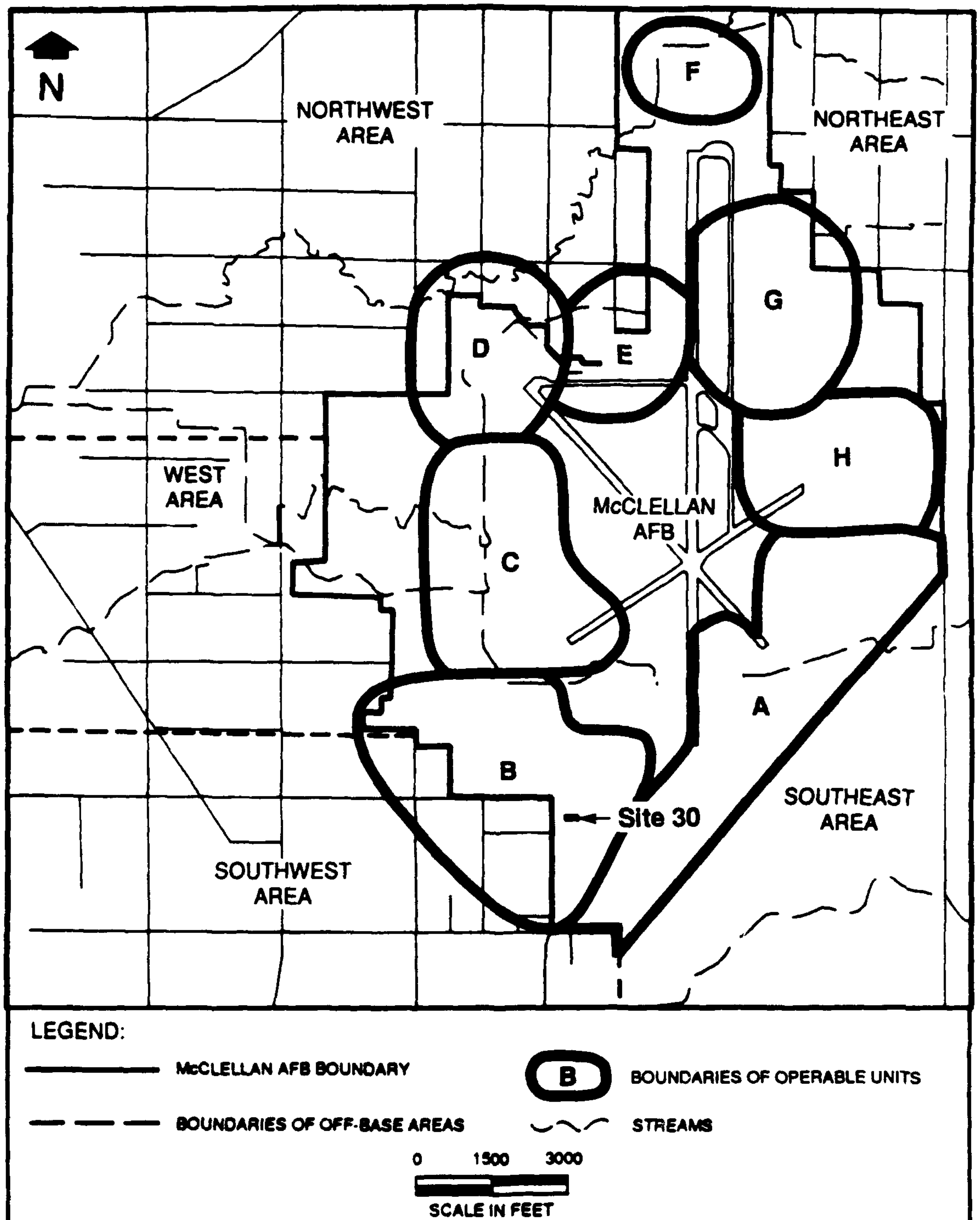

Figure 1-1. Map of Site 30 Within the McClellan AFB Facility.

Data on all four categories are necessary to develop an understanding of the site, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Past and present use of the site, characteristics of the waste disposed, and migration pathways are discussed in this document. A separate General Information document addresses target populations and environments. Background information regarding the overall facility description of McClellan AFB is presented in the General Information document that includes environmental setting, land use, hydrogeologic conditions, facility history, and a discussion of potential receptors.

This Technical Memorandum document includes the following:

- Informational sources used to prepare the document;
- Site description, including historical and current activities;
- Extent of on-site soil contamination with a presentation of previous analytical data;
- Potential hazards as provided by CERCLA/SARA;
- An evaluation of previous contractors' recommendations; and
- Conclusions and recommendations.

2.0 SOURCES OF INFORMATION

The following sections describe the sources of information used to develop this Technical Memorandum.

2.1 Previous Investigations

In 1981, CH2M Hill reviewed McClellan Air Force Base (AFB) files to determine the potential for hazardous materials to migrate off the Base. Interviews with past and present employees and the review of base records resulted in the identification of 45 waste disposal sites at McClellan AFB (CH2M Hill, 1981). One of the identified disposal sites, now designated as Site 30, was reportedly used by the 1155th Technical Squadron Central Laboratory (located in Building 628) for the surface disposal of small quantities of solvents and radioactive washwater.

In 1983, Engineering Science prioritized 46 disposal locations according to their relative potential hazards. As part of that report, the volume of affected soils at Site 30 were estimated (Engineering Science, 1983).

In 1985, McLaren Environmental Engineering, Inc., performed a soil investigation of PSPRL 30. The investigation included chemical and physical characterization of the soil as well as qualitative characterization of the soil gas (McLaren, 1986a).

2.2 Personnel Interviews

Personnel interviews regarding waste generating activities and disposal practices associated with Building 628 were conducted by Radian in January, 1989. Information obtained from personnel interviews is contained in Section 3, Site Description. Written documentation of these interviews can be found in the Site 30 Site File.

2.3 Site Visit

Radian personnel visited Site 30 on 31 January 1989 for the purpose of investigating current features and activities at the site.

2.4 Interpretation of Aerial Photographs

Historical aerial photographs were reviewed for physical features and evidence of contamination. The year, scale, and source of each aerial photograph reviewed for this Technical Memorandum are listed in Table 2-1. Interpretation of aerial photographs is discussed in detail in Section 3, Site Description.

2.5 Review of Base Files

McClellan AFB Civil and Bioenvironmental Engineering files were reviewed for historical information on Site 30 and the vicinity during the preparation of this Technical Memorandum. Civil Engineering files contained construction, utility, and storm drainage diagrams for Building 628 which is located west of Site 30. Bioenvironmental Engineering files did not contain any pertinent information regarding Building 628.

TABLE 2-1. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1988) REVIEWED FOR SITE 30

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 400'
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 370'
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 400'
1949	Whittier College	1" = 400'
1951	Whittier College	1" = 400'
1953	U.S. Department of Agriculture, ASCS[1]	1" = 400'
1955	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1690
1957	U.S. Department of Agriculture, ASCS	1" = 400'
1962	McClellan AFB, History Office	1" = 150'
1965	McClellan AFB, History Office	1" = 180'
1968	Cartwright Aerial Surveys	1" = 1000'
1971	Cartwright Aerial Surveys	1" = 400'
1972	Cartwright Aerial Surveys	1" = 1000'
1974	Cartwright Aerial Surveys	1" = 1200'
1976	Cartwright Aerial Surveys	1" = 400'
1978	Cartwright Aerial Surveys	1" = 2000'
1981	Cartwright Aerial Surveys	1" = 1000'
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000'
1987	Cartwright Aerial Surveys	1" = 1000'
1988	Cartwright Aerial Surveys	1" = 400'

[1] United States Department of Agriculture, Agricultural Stabilization and Conservation Service.

3.0 SITE DESCRIPTION

Site 30 (shown in Figure 3-1) is located in Operable Unit (OU) B of McClellan Air Force Base (AFB). Site 30 was reportedly a surface disposal site located east of Building 628. A location map showing Site 30 and the surrounding area is presented in Figure 3-2.

The following sections discuss site delineation, historical and current activities, reported releases, and remedial actions at Site 30.

3.1 Site Delineation

In 1981, CH2M Hill identified Site 30 as one of 45 locations possibly contributing to soil and groundwater contamination at McClellan AFB (CH2M Hill, 1981). CH2M Hill described Site 30 as a surface disposal site located near the railroad tracks east of Building 628 and on the paved area near Building 629 (see Figure 3-2). CH2M Hill's information was reportedly obtained from interviews with base personnel. However, documentation of those interviews was not kept.

In 1983, Engineering Science estimated the size of Site 30 as 200 feet by 220 feet (Engineering Science, 1983). It is not known how these dimensions were determined.

McLaren Environmental Engineering, Inc., reviewed aerial photographs and conducted a field investigation of Site 30 in 1985 (McLaren, 1986a). Two of the figures presented in McLaren's report show differing site boundaries. Documen-tation supporting McLaren's determination of the Site 30 site boundaries or the discrepancy between the two different site boundaries was not available. In lieu of contradictory or supporting information, the larger of McLaren's delineations was used in the preparation of this Technical Memorandum.

3.2 Historical Activities

The 1155th Technical Squadron operated a classified research laboratory in Building 628 from 1957 until late 1988 (CH2M Hill, 1981; Paisley, personal communication, 1989). Laboratory analyses performed in this building included gas analyses, applied physics-related analyses, and radiation analyses. The laboratory was a classified research facility; therefore, documentation describing specific historical

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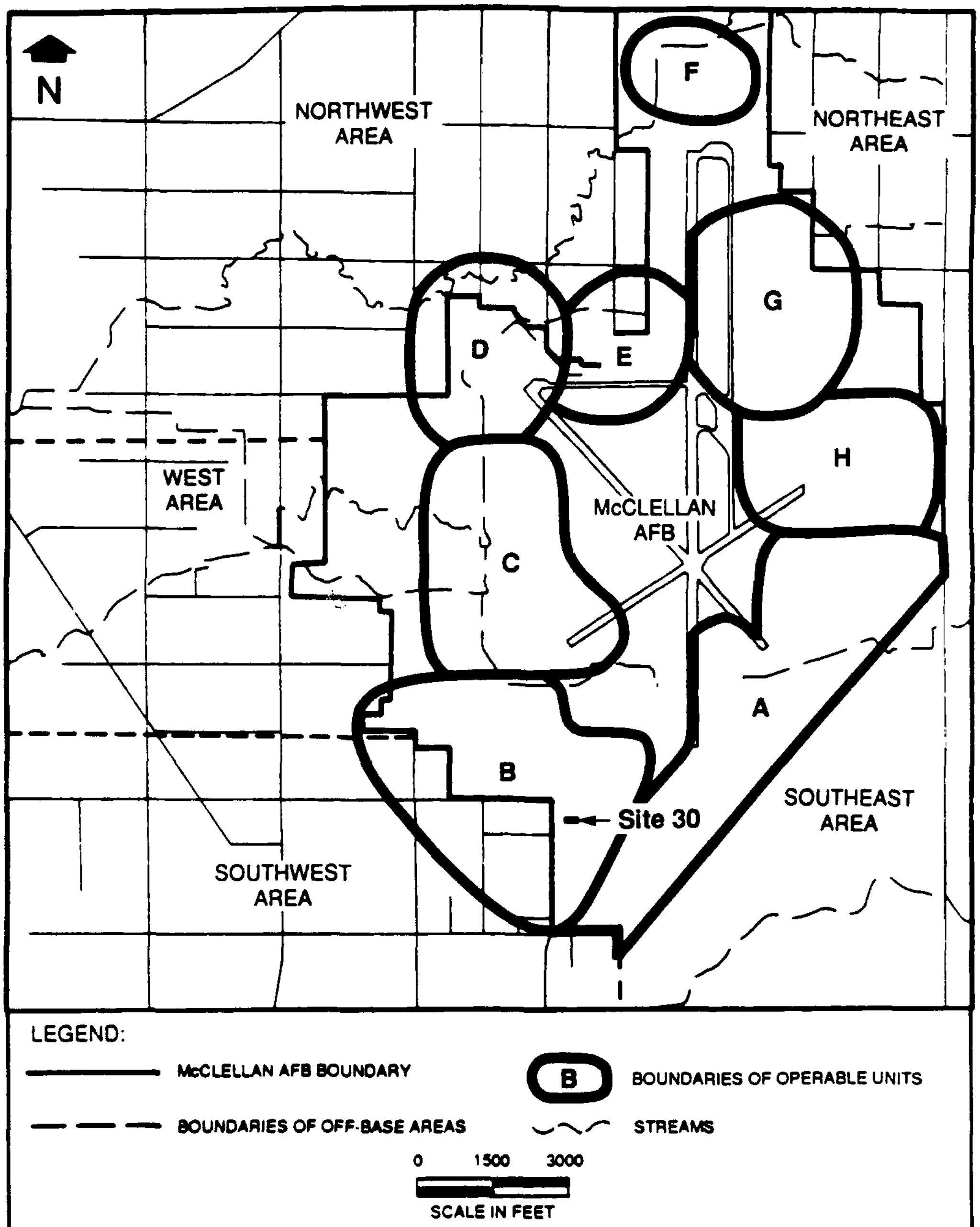

Figure 3-1. Map of Site 30 Within the McClellan AFB Facility.

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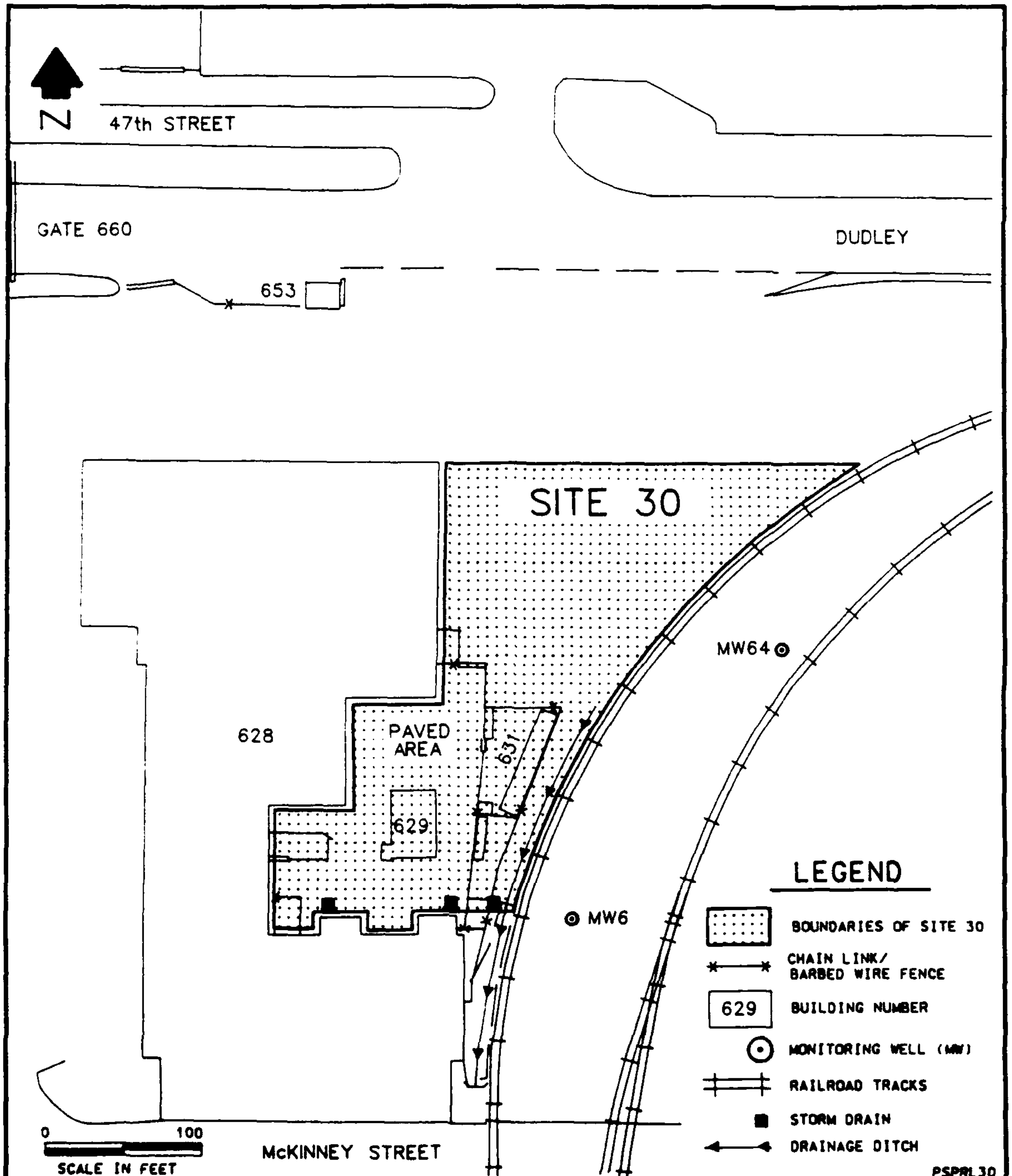

Figure 3-2. Map of Site 30 and Vicinity.

activities within Building 628 was not available for review in the preparation of this Technical Memorandum. However, the following list of hazardous substances used in the laboratory was included in the "1980 Hazardous Waste System Evaluation" contained in CH2M Hill's Phase I Report (CH2M Hill, 1981):

- Methyl ethyl ketone (MEK);
- Ortho-xylene;
- Phenol;
- Carbon tetrachloride;
- High purity benzene;
- Trichloroethene (TCE);
- Ethyl acetate;
- Methyl isobutyl ketone; and
- Heavy metals including molybdenum, lanthinides, lead, and nickel.

No information was available regarding the quantities of chemicals that were used in the laboratory.

Site 30 was reportedly used by the 1155th Squadron for the surface disposal of small amounts of TCE, freon®, diethyl ether, and low-level radioactive washwater (CH2M Hill, 1981). From interviews with McClellan AFB personnel, CH2M Hill identified two specific surface disposal areas within Site 30 boundaries. Each of these areas and the types of chemicals reportedly disposed there are discussed below.

CH2M Hill (1981) reported that approximately 100 gallons per year of freon® and 2 quarts per year of ethyl ether were disposed of on the ground near the railroad tracks east of Building 628. Disposal of these chemicals reportedly occurred between the years 1960 to 1980 and 1976 to 1979, respectively. Documentation supporting CH2M Hill's estimations was not available. However, recent interviews conducted by Radian indicate it is highly probable that ethyl ether was disposed of in this area. Base employees had no recollection of freon® being used in the laboratory (Paisley, personal communication, 1989).

An unspecified location in the paved area between Buildings 628 and 629 was reportedly used as a cleaning area from 1960 to 1975. Between 1960 and 1961, approximately 100 gallons of TCE per year were used for cleaning. In addition, between 1961 and 1975 approximately 2 gallons of TCE per year were used as a degreaser. Spent TCE was reportedly disposed of by spilling it onto the pavement and allowing it to evaporate. In the past, small amounts of radioactive washwater were reportedly used to wash sample containers. Approximately 5 gallons of this washwater per year was allowed to spill onto the paved area between Buildings 628 and 629 (CH2M Hill, 1981). Documentation of CH2M Hill estimations was not available. However, information obtained from recent interviews conducted by Radian concurs with the types and quantities of chemicals disposed of on the paved area near Building 629 (Paisley, personal communication, 1989).

Additional interview information obtained by Radian indicates the area descibed as Site 30 was used primarily as a radioactive waste storage area, with waste storage in Building 629 (see Figure 3-2) (McAlister, personal communication, 1989).

Aerial photographs were examined to determine historical operations at Site 30. No evidence of waste disposal activities was apparent in any of the photographs reviewed (see Table 2-1).

3.3 Current Activities

Laboratory research within Building 628 was terminated in August 1988. The building is currently all but unused with one room used for equipment storage (Paisley, personal communication, 1989). The building is currently being decommissioned; as part of the decommissioning process, a separate investigation will include drilling of 25 soil borings within Building 628 and 15 adjacent to the building.

The paved area between Buildings 628 and 629 is surrounded on all sides by a chain link/barbed wire fence which limits access into the paved area (see Figure 3-2). Building 629 continues to be used for the storage of hazardous materials (McAlister, personal communication, 1989).

The railroad tracks border the eastern perimeter of Site 30 to the east of Building 628 and are situated 4 feet below ground surface elevation in surface depressions. A cement-lined drainage canal runs along the western-most railroad track. Surface water runoff from the paved area enters the canal via storm drain inlets located in the paved area between Building 628 and 629. The drainage canal is connected to the basewide storm system at McKinney Street (see Figure 3-2). The surface water flow in the drainage canal flows from the northeast to the southwest. Although the drainage canal does not traverse a reported disposal area, surface water runoff from the paved area between Buildings 628 and 629 does enter the drainage canal via storm drains.

Most of Site 30 is paved with asphalt or cement. Open ground with little vegetative cover is present east of the chain link fence except where the cement-lined drainage canal is located. The area between and east of the railroad tracks is also unpaved. Rust-colored stains are visible on the paved area between Buildings 628 and 629.

3.4 Reported Releases

The following releases were reported by CH2M Hill in 1981 and verified by recent interviews with McClellan AFB employees:

- Surface disposal of approximately 2 quarts per year of ethyl ether between 1960 and 1961 at the railroad tracks east of Building 628;
- Surface disposal of approximately 100 gallons per year of TCE between 1960 and 1961 and approximately 2 gallons per year of TCE between 1961 and 1975 onto the paved area between Buildings 628 and 629; and
- Surface disposal of approximately 5 gallons per year of radioactive washwater onto the paved area between Buildings 628 and 629.

3.5 Remedial Actions

No remedial actions are known to have occurred at Site 30.

4.0 EXTENT OF CONTAMINATION

The following sections present the results of previous investigations at Site 30. Results of soil, soil gas, groundwater, surface water, and air monitoring investigations are presented under separate sections.

4.1 Soil Results

This section presents the physical characteristics of the soil, analytical results, and an evaluation of the adequacy of the soil characterization performed at Site 30. Results presented in this section are based on data from the 1985 McLaren investigation (McLaren, 1986a).

Twenty-two shallow auger profile (SAP) borings, drilled in a 50-foot grid pattern, were used to identify any areas of contaminated soil east of Building 628. In addition, two waste sample borings (WSBs) and one soil sample boring (SSB) were drilled to collect soil samples for analysis. Figure 4-1 shows boring locations for Site 30.

Seventeen of the 22 SAP borings were located near Buildings 628 and 629 in the paved area. The other five SAP borings were drilled in the railroad track cut east of the paved area. All but one of the 22 SAP borings were located within the area delineated by McLaren.

The shallow auger profile borings were drilled to an average depth of 10 feet below ground surface (BGS) using a 4-inch diameter solid stem auger. Boring 30SAP03 was only drilled to a depth of 1.5 feet BGS. At this depth, a lens of clean sand was encountered, indicating a possible utility line, and drilling was stopped to avoid penetrating the line. Although the report from McLaren's investigation indicated that soils from SAP borings were undisturbed, it is unknown how this determination was made.

Two WSBs were drilled to sample any buried waste that may present at Site 30. One WSB (30WSB01) was located next to a storm drain inlet near Building 628 (see Figure 4-1). The other WSB (30WSB02) was located near the two SAP borings (30SAP01 and 30SAP02) that showed the highest soil gas readings (1 ppmv and 2 ppmv, respectively). The waste sample borings were drilled using an 8-inch diameter hollow

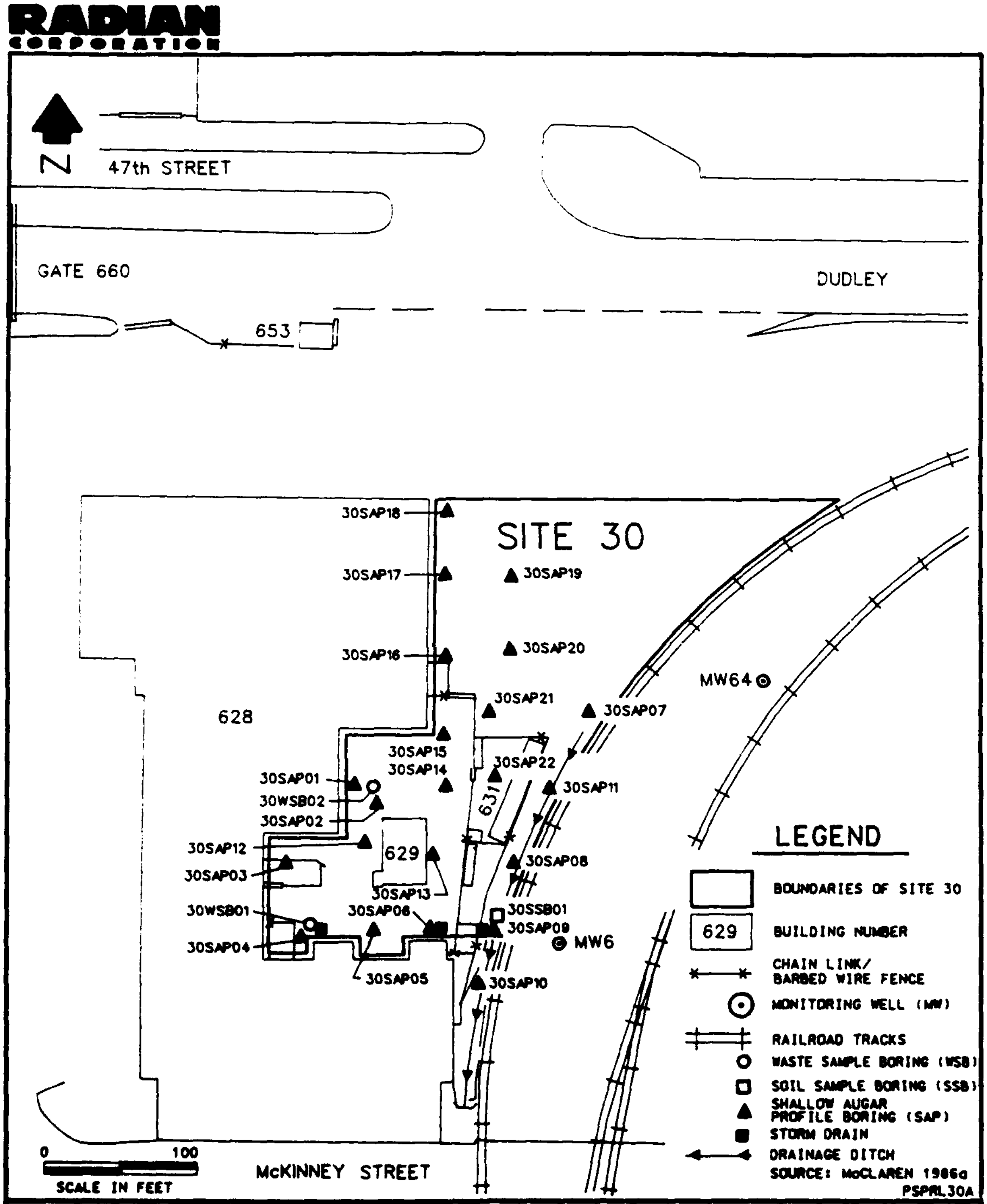

Figure 4-1. Boring Locations for Site 30.

stem auger to a depth of approximately 60 feet BGS. Soil samples were collected at depths of 49 and 60 feet BGS from 30WSB01, and at depths of 40 and 60 feet BGS from 30WSB02.

The soil sample boring (SSB) was located next to a storm drain outlet approximately 40 feet northwest of Monitoring Well 6 (MW-6). The boring was drilled and sampled to a depth of approximately 60 feet using an 8-inch diameter hollow stem auger.

4.1.1 Physical Characteristics

McLaren's boring logs were used to determine the physical characteristics of soils. Soils at Site 30 are generally moist cemented loams, sandy loams, clay loams, silt loams, and sand. Surface soils range in color from dark yellowish brown to yellowish brown. No evidence of soil discoloration, solvent odors, or wastes were noted in McLaren's boring logs.

4.1.2 Analytical Results

Soil samples were collected from three borings at Site 30 and analyzed for volatile and semivolatile organic compounds, pesticides and polychlorinated biphenyls (PCBs), metals, and oil and grease. Table 4-1 presents a summary of positive analytical results for soil samples from Site 30.

Samples were collected through the auger stem using "a split-spoon sampler/drop hammer system." The brass tubes of the sampler were separated, the ends covered with aluminum foil, capped with a 1-inch deep plastic cap, and then sealed with plastic tape. Analytical samples were refrigerated until analysis. Chain-of-custody procedures were apparently followed, although specific procedures were not documented (McLaren, 1986b).

Volatile Organic Compounds

Six soil samples and one duplicate sample from Site 30 were analyzed for U.S. Environmental Protection Agency (U.S. EPA) priority pollutant volatile organic compounds (VOCs) using U.S. EPA Method 8240. Table A-1 (Appendix A) presents detailed sampling information and analytical results for these samples. Acetone,

TABLE 4-1. SUMMARY OF POSITIVE ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 30

Compound Detected	Boring Number	Depth (feet BGS)	Concentration
Volatile Organic Compounds			
Acetone	30SSB01	24.0 - 24.5	170 μg/kg
	30WSB01	59.5 - 60.0	140 μg/kg
Chloroform	30WSB01	59.5 - 60.0	34 μg/kg
	30WSB02	59.5 - 60.0	13 μg/kg
Dichloromethane	30WSB01	49.0 - 49.5	63 μg/kg
4-Methyl-2-pentanone	30WSB02	39.5 - 40.0	220 μg/kg
1,1,2,2-Tetrachloroethane	30WSB02	39.5 - 40.0	11 μg/kg
Toluene	30WSB01	49.0 - 49.5	27 μg/kg
		59.5 - 60.0	30 μg/kg
	30WSB02	39.5 - 40.0	23 μg/kg
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	30WSB01	49.0 - 49.5	2,900 μg/kg

BGS = Below ground surface.
μg/kg = Micrograms per kilograms.

SOURCE: McLaren, 1986a.

chloroform, dichloromethane, toluene, 4-methyl-2-pentanone, and 1,1,2,2-tetrachloroethane were each detected in the SSB or the WSBs, at depths ranging from 24 to 60 feet BGS. (See Table 4-1.) No other VOCs were detected in soil and waste samples collected from Site 30 at levels above method detection limits.

Semivolatile Organic Compounds

Three soil samples were analyzed for U.S. EPA priority pollutant semi-volatile organic compounds using U.S. EPA Method 8270. Table A-2 (Appendix A) presents detailed sampling information and analytic results for these samples. As shown, the only compound detected was bis(2-ethylhexyl)phthalate at a concentration of 2,900 μg/kg in a sample from boring 30WSB01 (at 49 feet BGS). However, this compound is known to be a common laboratory contaminant.

Pesticides and PCBs

Three samples from two borings were analyzed for U.S. EPA priority pollutant pesticides and polychlorinated biphenyls (PCBs) using U.S. EPA Method 8080. Table A-3 (Appendix A) presents detailed the sampling information and analytical results from these samples. As the table indicates, no pesticides nor PCBs were detected at levels above method detection limits in soil samples collected from Site 30.

Inorganic Compounds

Three soil samples were analyzed for both total and extractable concentrations of the metals listed in the California Code of Regulations; Title 22. In addition, three duplicate samples were analyzed for selected metals. Table A-4 (Appendix A) presents detailed sampling information and analytical results for these samples. Analytical methods for total and extractable metals were not specified.

All total metal concentrations except for antimony and selenium were found at levels above method detection limits. The highest concentrations identified were for barium which ranged from 110 μg/kg to 220 μg/kg. Extractable metal concentrations of all metals except antimony, silver, and thallium, were detected above method detection limits in at least one sample.

Whereas the presence of any detectable amount of a priority pollutant organic compound indicates contamination from a manufactured source, most soils have some natural level of metals present. Because no other criteria have been established for evaluating metal contamination at McClellan AFB, California hazardous waste criteria have been used as a basis of comparison for analytical results for metals (California Code of Regulations, Title 22, Section 66699). All total metal concentrations were below the applicable Total Threshold Limit Concentrations (TTLCs), and all extractable concentrations were below the applicable Soluble Threshold Limit Concentrations (STLCs).

Oil and Grease

Three soil samples and one duplicate sample were analyzed for oil and grease using U.S. EPA Method 413.1. Table A-4 (Appendix A) presents detailed sampling information and analytical results for these samples. Oil and grease was detected at concentrations ranging from 140 milligrams per kilogram (mg/kg) to 930 mg/kg, although regulatory limits have not been established for these compounds.

Quality Assurance/Quality Control

McLaren's soil sampling efforts included the collection of duplicate samples from the two waste sample borings (WSBs) and the soil sample boring (SSB) locations. One duplicate sample was analyzed for VOCs and one was analyzed for oil and grease. Three duplicate samples were analyzed for inorganic compounds.

Limited laboratory quality assurance/quality control (QA/QC) data were available for samples collected from Site 30 (McLaren, 1986a; McLaren 1986b). However, general considerations can be discussed regarding the quality of the analyses. For organic compounds, U.S. EPA Methods 8080, 8240, and 8270 are appropriate analytical methods; for oil and grease, U.S. EPA Method 413.1 is the appropriate analytical method. Each method has specific QA/QC recommendations included in the method procedure. Although no indications of analytical accuracy or precision were provided in McLaren's documentation, these parameters may be within acceptable limits, as long as specified QA/QC recommendations were followed by experienced technicians.

Analytical methods for inorganics (total and extractable metals) were not specified. Methods were referenced to the Waste Extraction Test in the California Assessment Manual (CAM-WET), a former reference of California-approved methods for waste classification. The California Assessment Manual allows for several analytical methods for each metal. However, it is unknown which analytical methods were employed by McLaren to analyze soil samples collected from Site 30. Although CAM-

WET testing has since been discontinued, the methods referenced are still applicable under current standards.

One unusual characteristic of the entire McLaren data set is that each compound has the same detection limit between samples having difference composition. The uniformity of detection limits may indicate that samples were not properly diluted before quantitation or that dilutions were made, but not reported. Either of these omissions would result in true detection limits that were higher than th ›se indicated in the results.

4.1.3 Adequacy of Soil Characterization

Radian used the following criteria to determine the adequacy of a soil characterization (U.S. EPA, 1986, pp. 9-5):

- Representative samples of soil be collected;
- Enough samples be collected to define both the lateral and vertical extent of contamination; and
- Samples are handled and analyzed using appropriate methodology for the suspected contaminants.

The number and location of SAP borings at Site 30 were adequate to locate potential areas of soil contamination. Twenty-one borings were located within the boundaries delineated by McLaren. One SAP was located outside the boundaries.

Additional sampling is needed to fully characterize the extent of contamination at Site 30. Only two WSBs and one SSB were drilled and sampled. One WSB was located near a storm drain inlet and the other was located in the area where the highest soil gas readings (from SAP borings) were recorded. The SSB was located near the storm drain outlet. (See Figure 4-1.) Additional borings are needed to define the lateral extent of contamination.

Soil samples were collected from depths ranging from 25 to 60 feet BGS. No surface (from unpaved areas) or near-surface soil samples were collected. Additional soil investigation, therefore, is needed to define the vertical extent of contamination.

The sampling and analytical methods used to characterize soil samples are appropriate based on the disposal activities reported for this site. However, only one chlorofluorocarbon (trichlorofluoromethane) was included in the analysis of organic compounds. Both freon® 113 and dichlorodifluoromethane were excluded from the analysis of soil samples collected from Site 30. Although the analytical methods employed were appropriate, the complete set of analytes should have been included in the analyses because freon® was reportedly released at Site 30 (CH2M Hill, 1981).

4.2 Soil Gas Results

This section summarizes the results of the soil gas measurements taken during the 1985 McLaren investigation (McLaren, 1986a). Results from the soil gas investigation are presented in Table B-1 (Appendix B). Throughout drilling operations, photoionization detector (PID) readings from soil cuttings were recorded at intervals of 2.5 feet to depths of 10 feet BGS. Thereafter, PID readings were recorded at intervals of 10 feet. Headspace container readings were recorded approximately every 5 feet. Background readings were recorded as zero parts per million by volume (ppmv).

A PID is a screening instrument and does not speciate or accurately quantify the soil gas. Quality assurance measures included calibrating the PID daily with standardized isobutylene, keeping a calibration logbook and, prior to drilling, recording the ambient air reading from the PID. McLaren also indicated that the PID was periodically checked in the field to ensure proper functioning (McLaren, 1986b, p. 19).

The only borings where soil gas readings were recorded above 2 ppmv were borings 30SAP01, 30SAP02, 30SAP04, 30WSB01, 30WSB02, and 30SSB01. The highest soil gas reading recorded (7 ppmv) was from soil cuttings from boring 30SSB01 at a depth of 25 feet BGS. All other soil gas readings were below 7 ppmv.

McLaren's soil gas investigation an adequate characterization of the total soil gas concentration in the area studied.

4.3 Groundwater Results

The scope of this discussion is limited because of the complexity of the factors involved in the contaminant source areas and the migration of these contaminants to the groundwater. Some of the complicating factors include multiple potential sources in some areas, a long history of waste-generating activities, historical changes in groundwater flow direction, and heterogeneous soils beneath McClellan AFB. However, these factors will be addressed for this location on an operable unit basis in a future Remedial Investigation/Feasibility Study (RI/FS) task at McClellan AFB.

4.4 Surface Water

Although no surface water samples that can be specifically related to Site 30 have been collected for analysis, surface water at McClellan AFB is regularly monitored under two National Pollutant Discharge Elimination System (NPDES) permits. The first requires that surface water from Arcade Creek, Second Creek, and Magpie Creek be sampled monthly where it enters the base, and again where it exits; these samples are analyzed for volatile organic compounds (VOCs) and heavy metals. The second permit outlines waste discharge regulations for the base groundwater treatment plant (located in Operable Unit (OU) of McClellan AFB), including effluent analyses of VOCs, semivolatile organic compounds, and heavy metals. The NPDES permits establish limits on concentrations of VOCs, semivolatile organic compounds, and heavy metals in surface water discharged from McClellan AFB. Under the permit requirements, concentrations of these compounds must not exceed the established limits.

4.5 Air Monitoring Results

No air monitoring results have been specifically associated with Site 30.

5.0 POTENTIAL HAZARDS

The following sections discuss potential immediate hazards and the potential for contamination migration associated with any on-site contamination at Site 30.

5.1 Potential Contaminants of Concern

The contaminants of concern at Site 30 are volatile organic compounds (VOCs) and radioactive isotopes. Section 4, Extent of Contamination, provides a detailed description of previous investigations at Site 30, and is summarized below:

- A total of 25 borings were drilled within or adjacent to Site 30.

- No evidence of soil discoloration, solvent ordors, or wastes were noted.

- Soil gas readings for all borings ranged from 0 parts per million by volume (ppmv) to 7 ppmv.

- Seven samples collected from three borings were analyzed for VOCs. Six VOCs were detected in these samples, and at least one VOC was detected in each of the borings.

- One sample from each of three borings was analyzed for semi-volatile organic compounds, pesticides, and polychlorinated biphenyls. The only compound detected is a common laboratory contaminant.

- Two samples from each of three borings were analyzed for California Title 22 hazardous metals. One sample from each of the borings was also analyzed for eactractable metals. All metal results were less than California Title 22 threshold limit concentrations.

- One sample from each of three borings was analyzed for oil and grease. Oil and grease were detected at concentrations ranging from 140 to 930 mg/kg.

- Additional samples are needed to define the lateral and vertical extent of contamination.

Table 5-1 lists the organic chemicals detected at this site, along with certain physical characteristic values that influence their mobility. Inorganic compounds and oil and grease are not listed in the table because the specific compounds present in the soil are unknown. The significance of these characteristics is discussed below.

5.2 Immediate Hazards

This section describes any potential hazards including the potential for fire and explosion and the possible hazards to worker health and safety that require immediate action due to contaminants present at Site 30. Because the soil gas concentrations measured in the two borings are far below the lower explosive limit, the potential for fire and explosion is believed to be low.

Potential hazards to worker health and safety are limited to inhalation, ingestion, or dermal contact of any contaminated near-surface soil. Most of Site 30 is covered with asphalt or concrete and access to the site is restricted by a chain-link fence. Although surface soil samples have not been collected, the potential for hazards to worker health and safety are low. However, potential hazards should be reevaluated if construction or excavation activities are planned in the future.

5.3 Potential for Contaminant Migration

This section describes the potential for wastes to migrate from Site 30 to the groundwater, surface water, and air. The potential for contaminant migration is dependent on the characteristics of the site, and the nature of the contaminants. Although site-specific information is limited, it is possible to discuss general considerations of contaminant migration at this site.

5.3.1 Potential for Migration to Groundwater

The most important factors that influence migration to groundwater are the amount of infiltrating surface water, other sources of percolating water, the percolation rate of the soil, and contaminant characteristics.

TABLE 5-1. PHYSICAL CHARACTERISTIC VALUES FOR ORGANIC COMPOUNDS DETECTED AT SITE 30

Compound	Water Solubility[a] (mg/L)	Vapor Pressure[b] (mm Hg)	Log K_{ow}[b]
Volatile Organic Compounds			
Acetone	Miscible	270	-0.24
Chloroform	8,200	151	1.97
Dichloromethane	20,000	362	1.30
4-Methyl-2-pentanone	NA	NA	NA
1,1,2,2-Tetrachloroethane	2,900	5.0	2.39
Toluene	535	28.1	2.73
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	5.3[c]	1.3[c]	NA

[a] At neutral pH at 20 to 30°C.
[b] Log of octanol/water partition coefficient.
[c] Source: U.S. EPA Database, 1988. Water Engineering Research Laboratory.

NA = Information not available.

SOURCE: U.S. Environmental Protection Agency, 1986. Superfund Public Health Evaluation Manual. OSWER Directive 9285.4-1.

Most of the surface of Site 30 is covered with asphalt or concrete, which minimizes the amount of infiltrating surface water at the site. No other sources of percolating water are known.

The percolation rate of contaminants depends on the soil permeability, structure, stratification, and characteristics of the contaminants. Although permeability data on the soil at Site 30 are not available, boring logs reveal that soils range from sand to clay loams. The relative permeabilities for these soils range from very low to moderate. Basewide boring information indicates that relatively impermeable layers are not continuous and not effective barriers to percolation. Therefore, the percolation rate for this site is probably low to moderate.

The contaminants of concern at Site 30 are VOCs. The detected VOCs have relatively high water solubilities and moderate to low octanol/water coefficients (K_{ow}) (shown in Table 5-1), which indicate that these contaminants have a relatively high potential for dissolving into water and being carried with the flow of percolating water.

5.3.2 Potential for Migration to Surface Water

The primary characteristics affecting the potential for contaminant migration to surface water are the topography and surface characteristics of the site. Since the surface of Site 30 is covered with asphalt and concrete, the potential for migration of contaminants to surface water is very low.

5.3.3 Potential for Migration to Air

Surface characteristics of the site and contaminant characteristics influence the potential for migration to air. Vapor Pressure is a relative measure of the volatility of a chemical in its pure state and is important in determining the chemical's vaporization rate from soils and solid waste sites. The relatively high vapor pressures for VOCs indicate that VOCs present in exposed surface and near-surface soils are likely to migrate to the air. (See Table 5-1.)

The surface flux (concentration of organic compounds entering the air from the soil in a unit time) is dependent upon soil permeability, soil moisture, depth of contaminants, concentration of contaminants in the soil gas, and other physical soil properties that have not been quantified. Because most of the site is covered with asphalt and concrete, the surface flux of volatile contaminants is probably low.

6.0 EVALUATION OF PREVIOUS CONTRACTORS' RECOMMENDATIONS

The following recommendations for further investigation at Site 30 have been recommended by previous contractors:

- In 1981, CH2M Hill recommended that McClellan Air Force Base (AFB) implement a groundwater monitoring program to determine the extent and sources of trichloroethene contamination. Specific areas to be addressed in Operable Unit B included the 1155th Central Laboratory area (CH2M Hill, 1981); and

- In 1983, Engineering Science recommended that the surface conditions of Site 30 be evaluated. In an effort to prevent precipitation from contacting affected materials, if the site was found to impact groundwater quality, the site should be covered with an impermeable cap designed to divert surface water from the site (Engineering Science, 1983).

Radian concurs with CH2M Hill's recommendation. A groundwater monitoring program is currently being implemented at McClellan AFB. An impermeable cap to divert surface water from Site 30 would only be applicable to the unpaved areas of the location. Because additional soil investigation is needed to verify near-surface soil contamination at Site 30, Radian concurs with Engineering Science's recommendation to evaluate surface conditions at the site.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on reviews of previous reports, it appears that the boundaries of Site 30 were determined from undocumented interviews with McClellan Air Force Base (AFB) personnel. A surface disposal site was not evident at this location in the review of aerial photographs conducted for the preparation of this Technical Memorandum. Soil borings drilled within delineated site boundaries did not reveal visual evidence of waste or debris. Organic soil gas measurements from borings were consistently low (less than 7 parts per million by volume [ppmv]). However, analytical results for subsurface soil samples collected from depths ranging from 24 to 60 feet below ground surface (BGS) indicate detectable levels of volatile and semivolatile organic compounds and metals.

Limited site characterization data are available for Site 30. Although much of the site is paved with asphalt or cement, there is a small portion of the site that is unpaved (beneath and east of the railroad tracks located to the east of Building 628). Additional soil investigation is needed to determine the full extent of contamination present at Site 30. Potential hazards posed by contaminants cannot be evaluated until the site is fully characterized. To adequately characterize the site, the following activities are recommended:

- A soil gas investigation shall be conducted at Site 30 prior to initiating the Remedial Investigation of this area;
- Near-surface soil samples should be collected from the unpaved areas within the boundaries of Site 30 and analyzed for volatile and semivolatile organic compounds, metals, and radionuclides; and
- Additional soil borings should be drilled and soils sampled to characterize the lateral extent of contamination within Site boundaries.

However, before any additional sampling is performed, Radian recommends conducting additional interviews to obtain any additional information regarding disposal practices at Site 30, because the location was originally identified by a previous contractor from McClellan AFB interviews.

8.0 REFERENCES

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APPENDIX A

Analytical Results for Soil Samples

TABLE A-1. VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 30 (UNITS IN UG/KG)

Boring Number	30SSB01	30SSB01	30WSB01	30WSB01	30WSB01	30WSB02	30WSB02
Depth (feet BGS)	24.0-24.5	59.5-60.0	49.0-49.5	49.0-49.5[a]	59.5-60.0	39.5-40.0	59.5-60.0
Date Sampled	08/01/85	08/02/85	06/20/85	06/20/85	06/20/85	06/21/85	06/21/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240
Date Analyzed	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC							
Laboratory QC	NS	NS	NS	NS	NS	NS	NS
Acetone	170	<100	<100	<100	140	<100	<100
Acrolein	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<100	<100	<100	<100	<100	<100	<100
2-Butanone	<100	<100	<100	<100	<100	<100	<100
Carbon disulfide	<10	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	34	<10	13
Chlorodibromomethane	<10	<10	NA	NA	NA	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<100	<100	<100	<100	<100	<100	<100
Dichlorobromomethane	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10
Dichloromethane	<10	<10	<10	63	<10	<10	<10
1,2-Dichloropropane	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropylene	<10	<10	<10	<10	<10	<10	<10
Diethyl ether	NA	NA	<10	NA	NA	<10	NA
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	<100	<100	<100	<100	<100	<100	<100
4-Methyl-2-pentanone	<100	<100	<100	<100	<100	220	<100

(Continued)

PSPRL30/0800789/DJD

TABLE A-1. (Continued)

Boring Number Depth (feet BGS)	30SSB01 24.0-24.5	30SSB01 59.5-60.0	30WSB01 49.0-49.5	30WSB01 49.0-49.5[a]	30WSB01 59.5-60.0	30WSB02 39.5-40.0	30WSB02 59.5-60.0
Styrene	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	11	<10
Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	27	30	23	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10	<10	<10
Vinyl acetate	<100	<100	<100	<100	<100	<100	<100
Vinyl chloride	<100	<100	<100	<100	<100	<100	<100
Xylenes (total)	<10	<10	<10	<10	<10	<10	<10

[a] Duplicate sample.

BGS = Below ground surface.
NCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

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TABLE A-2. SEMIVOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 30 (UNITS IN UG/KG)

Boring Number	30SSB01	30WSB02	30WSB01
Depth (feet BGS)	24.0-24.5	39.5-40.0	49.0-49.5
Date Sampled	08/01/85	06/21/85	06/20/85
Sampled By	MCR	MCR	MCR
Analytical Method	EPA 8270	EPA 8270	EPA 8270
Date Analyzed	--	--	--
Laboratory	ITL	ITL	ITL
Field QC			
Laboratory QC	NS	NS	NS
Acenaphthene	<100	<100	<100
Acenaphthylene	<100	<100	<100
Aniline	<100	<100	<100
Anthracene	<100	<100	<100
Benzidine	<400	<400	<400
Benzo(a)anthracene	<100	<100	<100
Benzo(a)pyrene	<100	<100	<100
3,4-Benzo(b)fluoranthene	<100	<100	<100
Benzo(g,h,i)perylene	<100	<100	<100
Benzoic acid	<100	<100	<10U
Benzo(k)fluoranthene	<100	<100	<100
Benzyl alcohol	<100	<100	<100
4-Bromophenylphenyl ether	<100	<100	<100
Butyl benzyl phthalate	<100	<100	<100
4-Chloroaniline	<100	<100	<100
bis(2-Chloroethoxy)methane	<100	<100	<100
bis(2-Chloroethyl)ether	<100	<100	<100
bis(2-Chloroisopropyl)ether	<100	<100	<100
p-Chloro-m-cresol	<100	<100	<100
bis(Chloromethyl)ether	<400	<400	<400
2-Chloronaphthalene	<100	<100	<100
2-Chlorophenol	<100	<100	<100
4-Chlorophenylphenyl ether	<100	<100	<100
Chrysene	<100	<100	<100

(Continued)

PSPRL30/020989/JKS

TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	30SSB01 24.0-24.5	30WSB02 39.5-40.0	30WSB01 49.0-49.5
Dibenzo(a,h)anthracene	<100	<100	<100
Dibenzofuran	<100	<100	<100
1,2-Dichlorobenzene	<100	<100	<100
1,3-Dichlorobenzene	<100	<100	<100
1,4-Dichlorobenzene	<100	<100	<100
3,3'-Dichlorobenzidine	<100	<100	<100
2,4-Dichlorophenol	<100	<100	<100
Diethylphthalate	<100	<100	<100
2,4-Dimethylphenol	<100	<100	<100
Dimethylphthalate	<100	<100	<100
Di-n-butylphthalate	<100	<100	<100
4,6-Dinitro-o-cresol	<1,000	<1,000	<1,000
2,4-Dinitrophenol	<1,000	<1,000	<1,000
2,4-Dinitrotoluene	<100	<100	<100
2,6-Dinitrotoluene	<100	<100	<100
Di-n-octylphthalate	<100	<100	<100
1,2-Diphenylhydrazine	<100	<100	<100
bis(2-Ethylhexyl)phthalate	<100	<100	2,900
Fluoranthene	<100	<100	<100
Fluorene	<100	<100	<100
Hexachlorobenzene	<100	<100	<100
Hexachlorobutadiene	<100	<100	<100
Hexachlorocyclopentadiene	<100	<100	<100
Hexachloroethane	<100	<100	<100
Indeno(1,2,3-cd)pyrene	<100	<100	<100
Isophorone	<400	<400	<400
2-Methylnaphthalene	<100	<100	<100
2-Methylphenol	<100	<100	<100
4-Methylphenol	<100	<100	<100
Naphthalene	<100	<100	<100

(Continued)

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TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	30SSB01 24.0-24.5	30WSB02 39.5-40.0	30WSB01 49.0-49.5
2-Nitroaniline	<100	<100	<100
3-Nitroaniline	<100	<100	<100
4-Nitroaniline	<100	<100	<100
Nitrobenzene	<100	<100	<100
N-Nitrosodimethylamine	<100	<100	<100
N-Nitroso-di-n-propylamine	<100	<100	<100
2-Nitrophenol	<100	<100	<100
4-Nitrophenol	<100	<100	<100
N-Nitrosodiphenylamine	<100	<100	<100
Pentachlorophenol	<100	<100	<100
Phenanthrene	<100	<100	<100
Phenol	<100	<100	<100
Pyrene	<100	<100	<100
2,3,7,8-Tetrachlorodibenzo-p dioxin	<100	<100	<100
1,2,4-Trichlorobenzene	<100	<100	<100
2,4,5-Trichlorophenol	<100	<100	<100
2,4,6-Trichlorophenol	<100	<100	<100

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

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TABLE A-3. PESTICIDES/PCB ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 30 (UNITS IN UG/KG)

Boring Number	30SSB01	30WSB01	30WSB02
Depth (feet BGS)	24.0-24.5	49.0-49.5	39.5-40.0
Date Sampled	08/01/85	06/20/85	06/21/85
Sampled By	MCR	MCR	MCR
Analytical Method	EPA 8080	EPA 8080	EPA 8080
Date Analyzed	--	--	--
Laboratory	ITL	ITL	ITL
Field QC			
Laboratory QC	NS	NS	NS
Aldrin	<10	<10	<10
alpha-BHC	<10	<10	<10
beta-BHC	<10	<10	<10
delta-BHC	<10	<10	<10
gamma-BHC (Lindane)	<10	<10	<10
Chlordane	<100	<100	<100
4,4'-DDD	<10	<10	<10
4,4'-DDE	<10	<10	<10
4,4'-DDT	<10	<10	<10
Dieldrin	<10	<10	<10
Endosulfan I	<10	<10	<10
Endosulfan II	<10	<10	<10
Endrin	<10	<10	<10
Endrin aldehyde	<10	<10	<10
Heptachlor	<10	<10	<10
Heptachlor epoxide	<10	<10	<10
Methoxychlor	<100	<100	<100
Toxaphene	<200	<200	<200
PCB-1016	<1,000	<1,000	<1,000
PCB-1221	<1,000	<1,000	<1,000
PCB-1232	<1,000	<1,000	<1,000
PCB-1242	<1,000	<1,000	<1,000
PCB-1248	<1,000	<1,000	<1,000
PCB-1254	<1,000	<1,000	<1,000
PCB-1260	<1,000	<1,000	<1,000

(Continued)

TABLE A-3. (Continued)

FOOTNOTES:

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
NS = Not specified.
NA = Not analyzed.

SOURCE: McLaren, 1986a.

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TABLE A-4. INORGANIC COMPOUND AND MISCELLANEOUS ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED FROM SITE 30

Boring Number		30SSB01	30SSB01	30WSB01	30WSB01	30WSB02	30WSB02
Depth (feet BGS)		24.0-24.5	24.0-24.5[a]	49.0-49.5	49.0-49.5[a]	39.5-40.0	39.5-40.0[a]
Date Sampled		08/01/85	08/01/85	06/20/85	06/20/85	06/21/85	06/21/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL
Field QC							
Laboratory QC		NS	NS	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/kg)					
Antimony	NS	<0.1	NA	<0.1	<0.1	<0.1	NA
Arsenic	NS	36	NA	4	4	15	NA
Barium	NS	110	NA	120	NA	220	210
Berylium	NS	0.6	NA	0.21	0.21	0.38	NA
Cadmium	NS	0.1	NA	0.13	0.13	0.58	NA
Chromium	NS	21	NA	13	NA	20	NA
Cobalt	NS	12	NA	5.7	NA	18	18
Copper	NS	24	NA	11	NA	64	NA
Lead	NS	5.8	NA	2.9	NA	9.5	9.5
Mercury	NS	0.12	NA	0.49	0.59	<0.5	NA
Molybdenum	NS	<1.0	NA	<0.1	NA	1.7	1.7
Nickel	NS	250	NA	18	NA	40	NA
Selenium	NS	<1.0	<1.0	<1.0	NA	<1.0	NA
Silver	NS	0.1	NA	<0.1	NA	<0.1	NA
Thallium	NS	0.33	NA	<0.1	<0.1	<0.1	NA
Vanadium	NS	65	NA	26	36	76	NA
Zinc	NS	41	NA	47	NA	100	NA
Oil & Grease	413.1	140	NA	930	NA	140	220

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		30SSB01 24.0-24.5	30SSB01 24.0-24.5[a]	30WSB01 49.0-49.5	30WSB01 49.0-49.5[a]	30WSB02 39.5-40.0	30WSB02 39.5-40.0[a]
Parameter	Method	Results (Units in mg/L)					
Extractable Antimony	WET/NS	<0.1	NA	<0.001	NA	<0.001	NA
Extractable Arsenic	WET/NS	0.02	NA	0.011	NA	0.043	NA
Extractable Barium	WET/NS	12	NA	3.2	NA	20	NA
Extractable Berylium	WET/NS	<0.1	NA	<0.001	NA	0.003	NA
Extractable Cadmium	WET/NS	<0.01	NA	0.002	NA	0.011	0.01
Extractable Chromium	WET/NS	<0.1	NA	0.094	NA	0.063	NA
Extractable Cobalt	WET/NS	0.33	NA	0.14	NA	0.91	NA
Extractable Copper	WET/NS	0.33	NA	0.31	NA	0.89	NA
Extractable Lead	WET/NS	<0.1	NA	<0.01	NA	0.018	NA
Extractable Mercury	WET/NS	0.004	NA	<0.001	NA	0.003	NA
Extractable Molybdenum	WET/NS	0.1	NA	<0.1	<0.1	<0.1	NA
Extractable Nickel	WET/NS	0.3	NA	0.39	NA	0.72	NA
Extractable Selenium	WET/NS	<0.01	NA	0.018	NA	<0.01	NA
Extractable Silver	WET/NS	<0.01	NA	<0.001	NA	<0.001	NA
Extractable Thallium	WET/NS	<0.01	NA	<0.001	NA	<0.001	NA
Extractable Vanadium	WET/NS	0.13	0.13	0.26	NA	0.76	NA
Extractable Zinc	WET/NS	0.35	NA	0.3	NA	0.59	NA

[a] Duplicate sample.

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
NA = Not analyzed.
NS = Not specified.
WET/NS = California Assessment Manual, Waste Extraction Test; analytical method not specified.

SOURCE: McLaren, 1986a.

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APPENDIX B

Soil Gas Results

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TABLE B-1. MAXIMUM PID READINGS FROM SOIL CUTTINGS AND HEADSPACE JARS AT SITE 30 (UNITS IN PPMV)

Approximate	30WSB01		30WSB02		30SSB01		30SAP01		30SAP02	
Depth	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	0	0	1	0	0	1	0	-	0	-
10	0	0	0	1	1	1	1	5	0	3
15	0	1	0	3	-	1				
20	0	0	0	0	5	1				
25	1	3	0	0	7	1				
30	0	2	0	2	4	1				
35	0	1	0	2	6	0				
40	0	1	0	2	0	1				
45	0	2	0	2	0	1				
50	0	4	0	1	0	0				
55	1	1	0	0	0	0				
60	0	1	0	0	0	0				

Continued

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TABLE B-1. (Continued)

Approximate	30SAP03		30SAP04		30SAP05		30SAP06		30SAP07	
Depth	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	0	-	0	-	0	-	1	-	0	-
10			0	5	0	0	0	1	0	0
15										
20										

Continued

TABLE B-1. (Continued)

Approximate	30SAP09		30SAP10			30SAP11			30SAP12		30SAP14	
Depth	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	0	-	0	-	1	-	0	-	0	-	0	-
10	0	1	0	1	1	1	0	2	1	1	0	1
15												
20												

Continued

TABLE B-1. (Continued)

Approximate	30SAP15		30SAP16		30SAP17		30SAP18		30SAP19		30SAP20	
Depth	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	0	-	0	-	0	-	0	-	0	-	0	-
10	0	1	0	1	0	0	0	1	0	0	0	1
15												
20												

Continued

TABLE B-1. (Continued)

Approximate Depth	30SAP21 Cuttings	30SAP21 Headspace	30SAP22 Cuttings	30SAP22 Headspace
5	0	-	0	-
10	0	1	0	1
15				
20				

ppmv = parts per million by volume.

-- = No readings taken.

Blanks indicate borings were terminated.

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INSTALLATION RESTORATION PROGRAM (IRP) STAGE 3

TECHNICAL MEMORANDUM FOR SITE 31 FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

Radian Corporation
10395 Old Placerville Road
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USAF CONTRACT NO. F33615-87-D-4023, DELIVERY ORDER NO. 0012
CONTRACTOR CONTRACT NO. 227-005, DELIVERY ORDER NO. 0012

United States Air Force Center for Environmental Excellence
Mr. Patrick Haas (Technical Project Manager)
Environmental Services Office/Environmental Restoration Division (AFCEE/ESR)
Brooks Air Force Base, Texas 78235-5501

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1.0 INTRODUCTION

This Technical Memorandum presents a summary of data compiled for Site 31 at McClellan Air Force Base (AFB), California. The location of Site 31 is shown in Figure 1-1. Site 31 was reportedly the location of a refuse incinerator in Operable Unit (OU) B of McClellan AFB. The task of compiling data for Technical Memorandums is part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan for any locations that pose a threat to human health and welfare or the environment. This site assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund sites.

The purpose of this Technical Memorandum is to:

- Identify any immediate response needs as required by CERCLA/SARA;
- Determine whether further action is needed at the site;
- Evaluate previous contractors' recommendations;
- Provide qualified data to support operable unit prioritization and grouping; and
- Provide recommendations for further investigation or remedial actions.

The scope of this Technical Memorandum includes site-specific data regarding the following categories of information:

- Operations and waste management practices;
- Waste characteristics;

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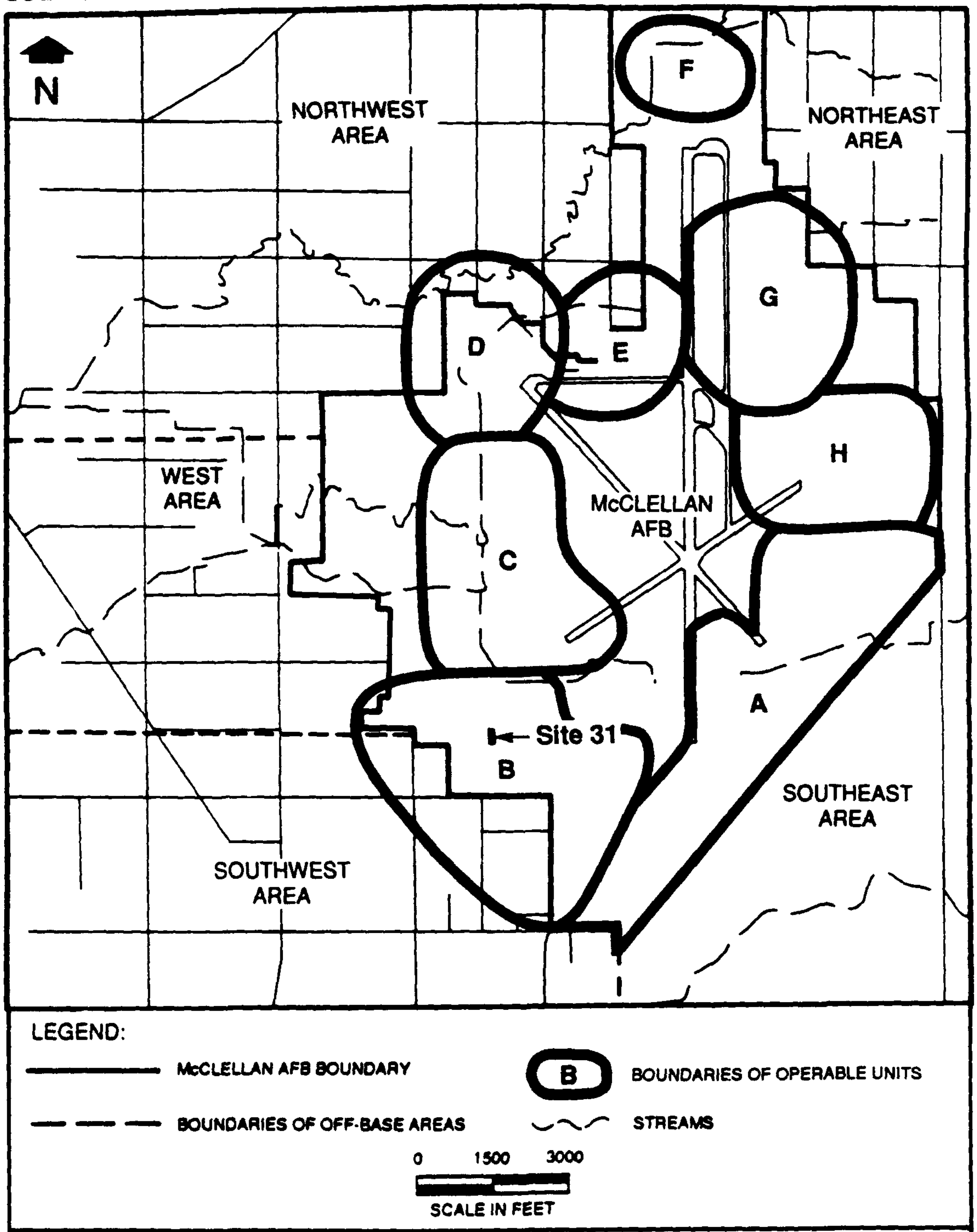

Figure 1-1. Map of Site 31 Within the McClellan AFB Facility.

- Contaminant migration pathways; and
- Target populations and environments.

Data on all four categories are necessary to develop an understanding of the site, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Site operations, waste management practices and waste characteristics, and migration pathways are discussed in this document. A separate General Information document addresses target populations and environments. Background information regarding the overall facility description of McClellan AFB presented in the General Information document that includes environmental setting, land use, hydrogeologic conditions, facility history, and a discussion of potential receptors.

This Technical Memorandum document includes the following:

- Information sources used to prepare the document;
- Site description, including historical activities;
- Extent of on-site soil contamination with a presentation of previous analytical data;
- Potential hazards;
- An evaluation of previous contractors' recommendations; and
- Conclusions and recommendations.

2.0 SOURCES OF INFORMATION

The following sections describe the sources of information used to develop this Technical Memorandum.

2.1 Previous Investigations

In 1981, CH2M Hill reviewed McClellan Air Force Base (AFB) files to determine the potential for hazardous materials to migrate off base. Interviews with past and present employees and the review of base records resulted in the identification of 45 waste disposal sites at McClellans AFB, including Site 31 (CH2M Hill, 1981).

In 1982, Engineering Science, Inc., ranked 46 disposal locations based on their relative potential hazards. As part of this report, the volume of wastes, and volume of affected soils at Site 31 were estimated (Engineering Science, 1983).

McLaren Environmental Engineering investigated Site 31 in 1985. The investigation included physical and chemical characterization of the soil, as well as qualitative characterization of the soil gas (McLaren, 1986a).

2.2 Personnel Interviews

Personnel interviews regarding waste disposal at Site 31 have not been conducted by Radian because base personnel who may be able to provide pertinent site-specific information have not been identified. Although personnel interviews were apparently conducted as part of the CH2M Hill and McLaren investigations, written documentation for those interviews was not kept.

2.3 Site Visit

Radian personnel visited Site 31 on 6 January 1989 to document current features and activities at the site.

2.4 Aerial Photographs

Historical aerial photographs were reviewed for physical features and evidence of contamination. Table 2-1 lists the photographs that were reviewed.

TABLE 2-1. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1988) REVIEWED FOR SITE 31

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 400'
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 370'
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 400'
1949	Whittier College	1" = 400'
1951	Whittier College	1" = 770'
1953	U.S. Department of Agriculture, ASCS[1]	1" = 400'
1955	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1690'
1957	U.S. Department of Agriculture, ASCS	1" = 400'
1962	McClellan AFB, History Office	1" = 150'
1963	Cartwright Aerial Surveys	1" = 1667'
1965	McClellan AFB, History Office	1" = 150'
1968	Cartwright Aerial Surveys	1" = 1000'
1971	Cartwright Aerial Surveys	1" = 400'
1972	Cartwright Aerial Surveys	1" = 1000'
1974	Cartwright Aerial Surveys	1" = 1200'
1976	Cartwright Aerial Surveys	1" = 400'
1978	Cartwright Aerial Surveys	1" = 2000'
1981	Cartwright Aerial Surveys	1" = 1000'
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000'
1987	Cartwright Aerial Surveys	1" = 1000'
1988	Cartwright Aerial Surveys	1" = 400'

[1] United States Department of Agriculture, Agricultural Stabilization and Conservation Service.

Interpretation of aerial photographs is discussed in more detail in Section 3, Site Description.

2.5 Review of Base Files

McClellan AFB Civil and Bioenvironmental Engineering files were reviewed for historical information during the preparation of this Technical Memorandum. Nothing directly relating to Site 31 was found in either of the files.

3.0 SITE DESCRIPTION

Site 31, the reported site of a refuse incinerator, is situated in Operable Unit (OU) B on McClellan Air Force Base (AFB) (Figure 3-1). Potential Release Location (PRL) B-1, PRL P-2, and PRL 29 are adjacent to Site 31. Building 680 is located within the boundaries of Site 31. A location map showing Site 31 and the surrounding area is presented in Figure 3-2.

3.1 Site Delineation

The first report identifying Site 31 was written in 1981 by CH2M Hill (CH2M Hill, 1981). Site 31 is described in this report as a "full-scale refuse incinerator" used from 1963 to 1968.

McLaren reviewed aerial photographs and conducted a field investigation of Site 31 in 1985 (McLaren, 1986a). McLaren used a 1965 aerial photograph showing the refuse incinerator to determine the boundaries of Site 31. The boundaries of Site 31 established by McLaren, and confirmed by Radian, were used for the preparation of this Technical Memorandum.

3.2 Historical Activities

CH2M Hill reported Site 31 was used as a "full-scale refuse incinerator" from 1963-1968. The facility was closed in 1968 due to difficulty in meeting air emission requirements. Ash from the incinerator was reportedly buried in on-site disposal pits (CH2M Hill, 1981). The location of these pits is not known.

A review of aerial photographs by Radian supports the information provided by CH2M Hill. An aerial photograph taken in 1962 shows the area of Site 31 as undeveloped land. The next available photograph, taken in 1965, shows the incinerator constructed and in use. The absence of the incinerator in subsequent aerial photographs indicates the incinerator was dismantled between 1971-1976. Figure 3-3 shows a 1962 Base Civil Engineering construction drawing of the incinerator at Site 31.

McLaren discovered additional information about the historical operations of the incinerator (McLaren, 1986a). McLaren reported the following undocumented information for Site 31:

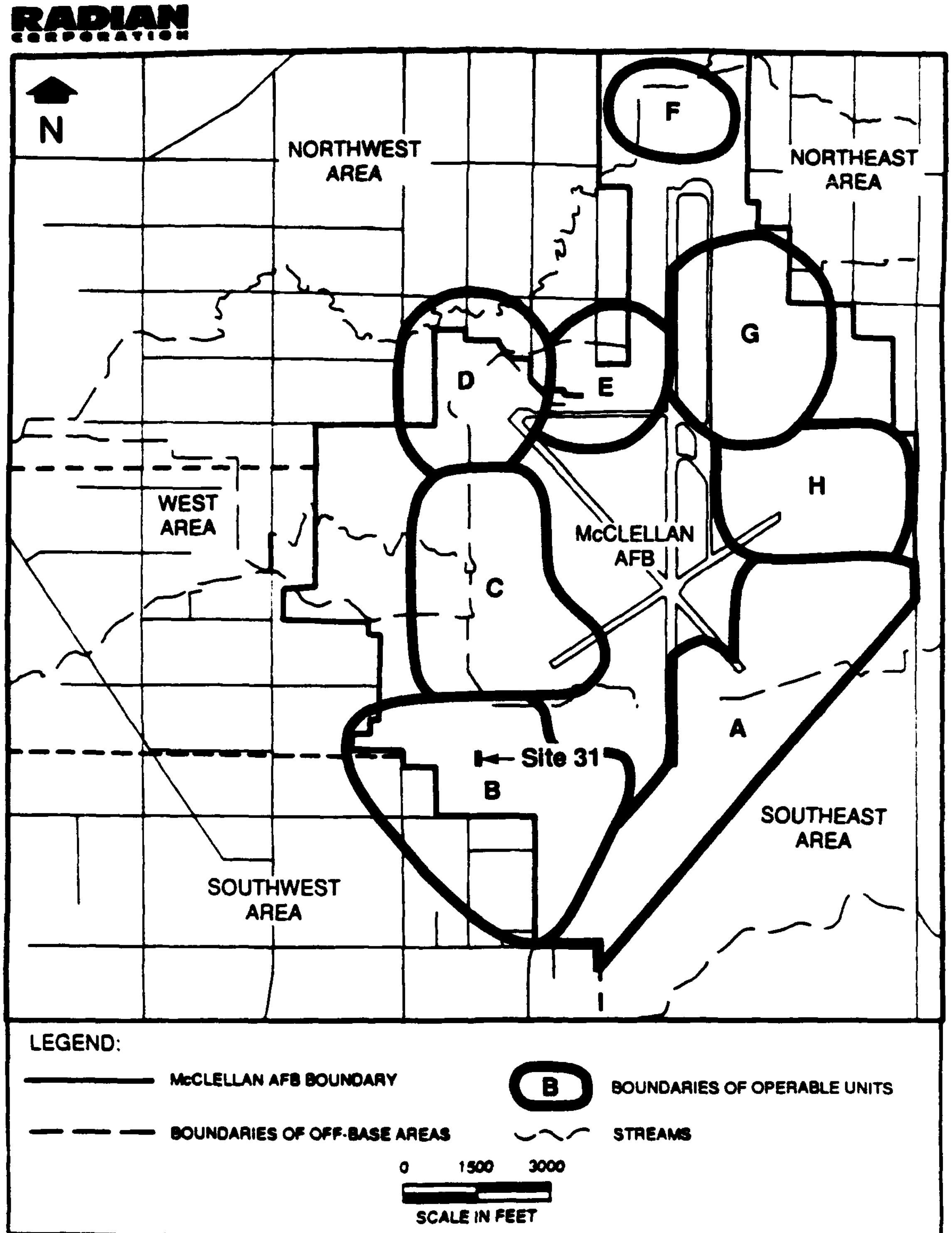

Figure 3-1. Map of Site 31 Within the McClellan AFB Facility.

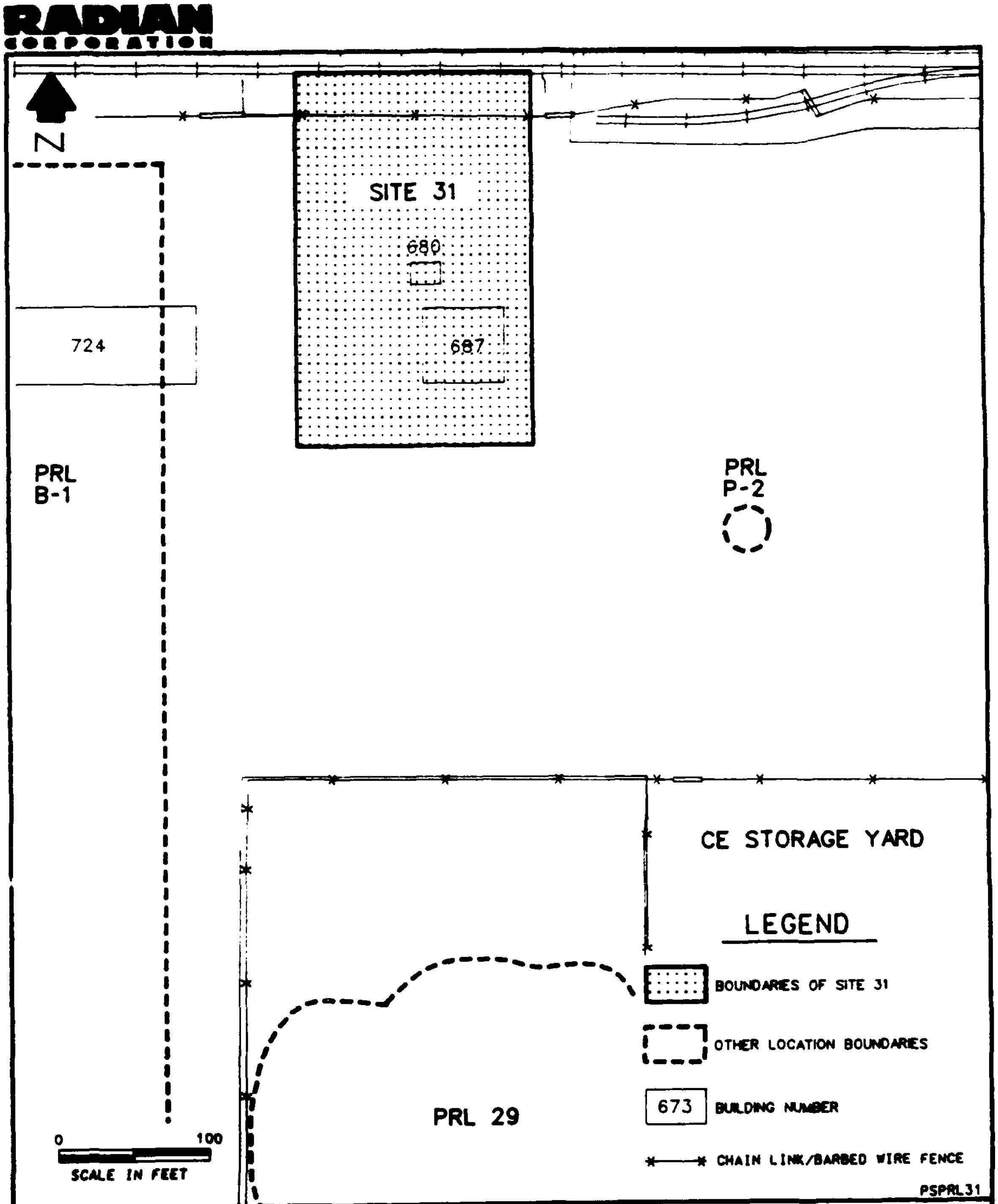

Figure 3-2. Map of Site 31 and Vicinity.

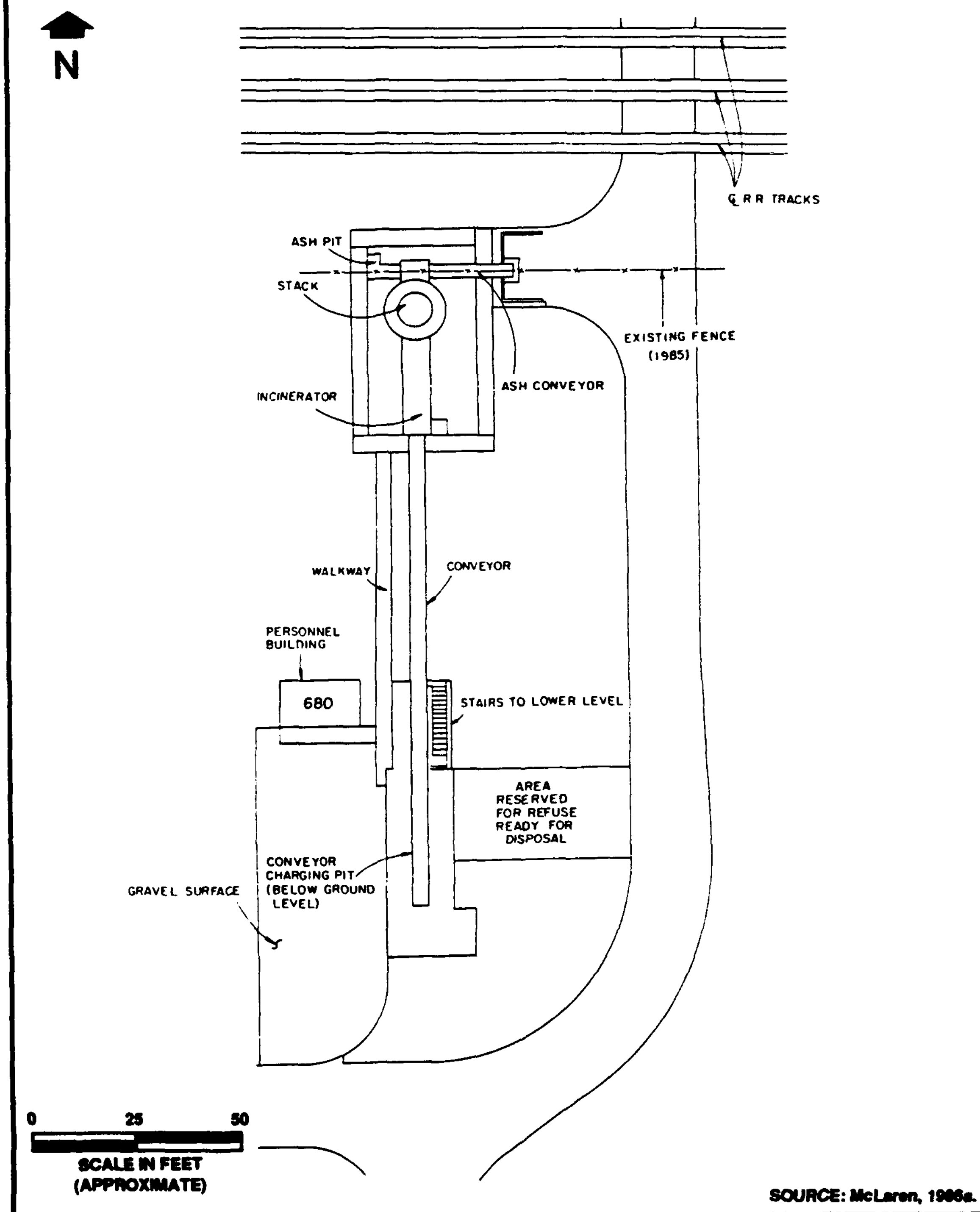

Figure 3-3. Plan Map of Refuse Incinerator at Site 31.

Trucks would drive into the area reserved for 'refuse ready for disposal' and the contents would be unloaded. The refuse would then be emptied into the below ground conveyor charging pit. Once on the conveyor, the refuse would be transferred to the incinerator, ignited, and the ashes subsequently cleaned out and disposed of. The plans show one ash pit to the northwest of the stack. It appears that this ash pit was for the temporary storage of ash prior to loading the ash into the ash conveyor. A historical photograph indicated that some ash was present on the ground along the railroad tracks north of the site. The quantity and type of materials that were handled at this site are not known. (McLaren, 1986a)

3.3 Current Activities

Currently, Site 31 is covered by concrete and asphaltic cement and is being used to store miscellaneous materials.

3.4 Reported Releases

Releases of specific contaminants, if any, have not been documented at Site 31.

3.5 Remedial Actions

No remedial actions are known to have been performed at Site 31.

4.0 EXTENT OF CONTAMINATION

The following sections present the results of previous investigations at Site 31. Results of soil, soil gas, groundwater, surface water, and air monitoring investigations are presented under separate subsections.

4.1 Soil Results

This section summarizes the physical characterization of the soil and the analytical results of soil samples, and evaluates the adequacy of the soil characterization. Results presented in this section are from data obtained from the 1985 McLaren investigation (McLaren, 1986a). Two types of borings were drilled at Site 31: shallow auger profile borings (SAPs), and waste sample borings (WSBs). Figure 4-1 shows the location of 20 borings drilled at Site 31.

Eighteen SAPs were used to determine the placement of the WSBs within the site. The SAPs were drilled with 4-inch-diameter solid-stem augers. The procedure used for SAPs was to: drill to 10 or 20 feet below ground surface (BGS), monitor the cuttings with a photoionization detector (PID), and log the cuttings for soil properties (McLaren, 1986b).

Two WSBs were used to characterize the soil and to take soil samples. These WSBs were drilled with an 8-inch-diameter hollow-stem auger. Although McLaren encountered no waste at Site 31 during their investigation, they apparently identified their soil sample borings as waste sample borings because that was the boring procedure they followed. Soil samples were taken approximately every 5 feet with a "down the hole split-spoon sampler/drop-hammer system." Analytical samples were placed in freezer storage until analysis. Chain-of-custody procedures were apparently followed, although specific procedures were not documented (McLaren, 1986b).

4.1.1 Physical Characteristics

McLaren's logs were used to determine the physical characteristics of the soil. The soils at Site 31 range from dry sandy loams to wet clay loams, sandy loams, silt loams, and fine sand. The surface soils consist of gravelly sand loams and gravelly course sandy loams. Boring 31WSB01 shows strong cementation at a depth of 5 feet BGS and Boring 31WSB02 shows moderate cementation at 8 feet BGS. The color

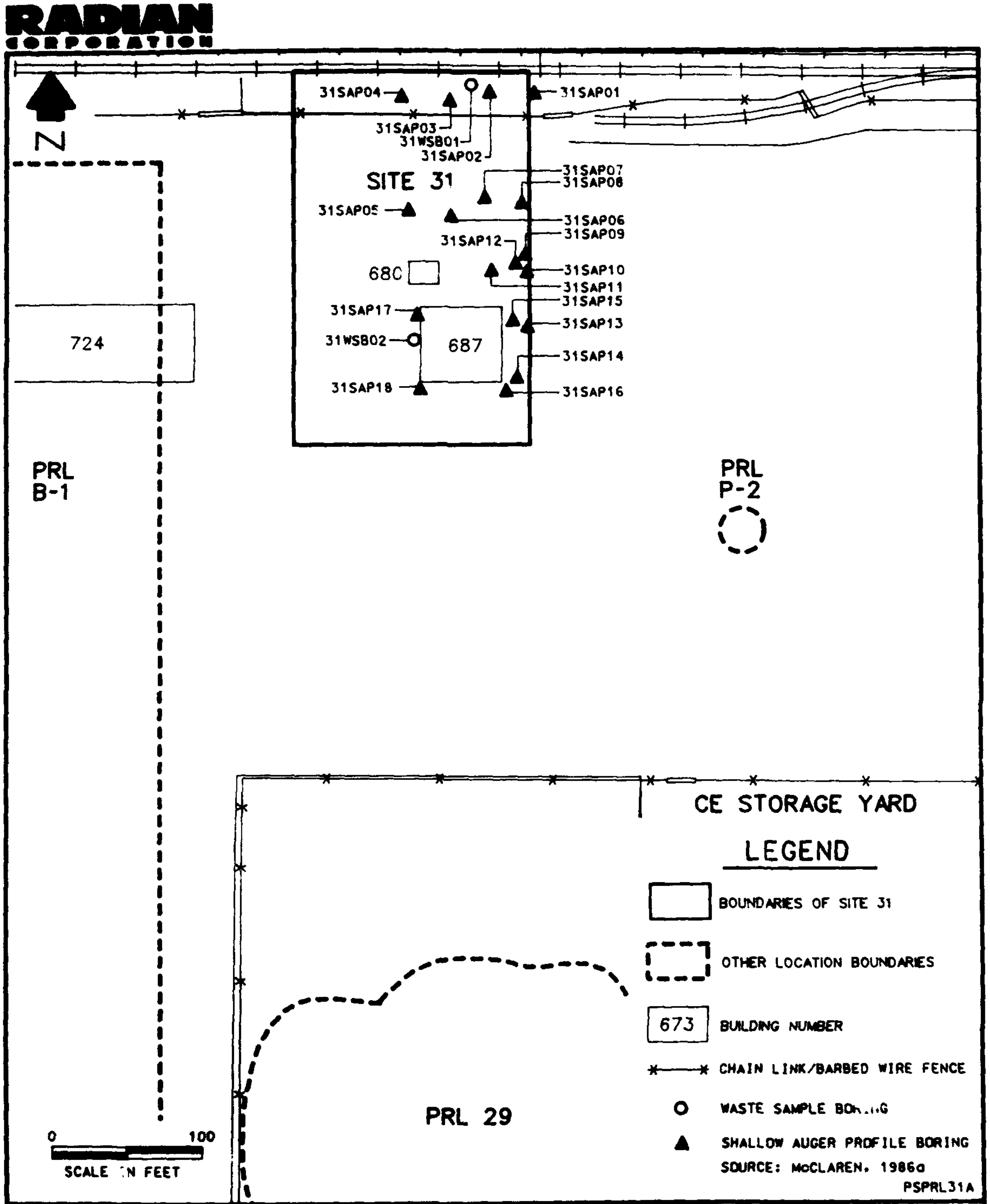

Figure 4-1. Boring Locations for Site 31.

of surface soils range from dark brown to dark grayish brown. At greater depths, soil colors range from dark reddish gray to light olive brown, with yellowish brown predominating.

Several of the boring logs show indications of possible contamination. Discolored soil was noted in Borings 31WSB02, 31SAP15 and 31SAP18 at 2 to 3 feet BGS. In each boring log, the discolored soil was described as being a dark grayish brown color. The cause of this discoloration is unknown. McLaren reported that ash was not found in any of the borings. Odors were noted in Borings 31SSAP17 and 31SAP18 at 2 to 3 feet BGS, but no descriptions were given to characterize the odors.

Several of the borings encountered obstacles. Borings 31SAP03, 31SAP12, 31SAP13, and 31SAP16 encountered concrete or asphalt at depths ranging from 0.5 to 2.0 feet. Four borings (Borings 31SAP09, 31SAP10, 31SAP11, and 31SAP13), located along a straight northerly line, encountered a pipe or some other hard object at 2 feet BGS.

Most of the borings showed the soil to be moist or very moist. Boring 31SAP14 was terminated at 7.5 feet BGS due to saturated conditions. Because the borings were drilled in August, it is unusual that perched water was found. The cause of this moisture is unknown, but the piping encountered in Borings 31SAP09, 31SAP10, 31SAP11, and 31SAP13, suggest that a leaky water line may have been the source of the water.

4.1.2 Analytical Results

Two soil samples were collected from each of the two WSBs at Site 31 and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), and metals. The analyzed samples were collected from depths of 14 and 49.5 feet, and 8.5 and 49.5 feet BGS, respectively. Table 4-1 presents a summary of positive analytical results for soil samples from Site 31.

Volatile Organic Compounds

Four samples were analyzed for U.S Environmental Protection Agency (U.S. EPA) Priority Pollutant VOCs. Table A-1 (Appendix A) presents detailed sampling information and analytical results from these samples. None of the VOCs in the Priority Pollutant list were detected.

Semivolatile Organic Compounds

One sample from each of the two borings was analyzed for U.S. EPA Priority Pollutant semivolatile organic compounds. Table A-2 (Appendix A) presents detailed sampling information and analytical results from these samples. None of the semivolatile organic compounds included in the Priority Pollutant list were detected.

Pesticides and Polychlorinated Biphenyls

One sample from each of the two borings was analyzed for U.S. EPA priority pollutant pesticides and PCBs. Table A-3 (Appendix A) presents detailed the sampling information and analytical results from these samples. No pesticides or PCBs were detected in any of the samples.

Inorganic Compounds

One sample from each of the two borings was analyzed for both total and extractable concentrations of the metals listed in California Code of Regulations, Title 22. Table A-4 (Appendix A) presents detailed sampling information and analytical results from these samples. Whereas the presence of any detectable amount of priority pollutant organic compound indicates contamination from a manufactured source, most soils have some natural concentrations of metals present. Because no other criteria have been established for evaluating metal contamination at McClellan AFB, California hazardous waste criteria were used as a basis of comparison for these results (California Code of Regulations, Title 22, Section 66699). All total metal concentrations were below the applicable Total Threshold Limit Concentrations (TTLCs), and all extractable concentrations were below the applicable Soluble Threshold Limit Concentrations (STLCs).

Oil and Grease

One sample from each of the two borings was analyzed for oil and grease. Table A-4 (Appendix A) shows that the concentrations of oil and grease were 190 mg/kg (ppm) for Boring 31WSB01 and 200 mg/kg (ppm) for Boring 31WSB02.

Quality Assurance/Quality Control

The quality assurance/quality control (QA/QC) information available for these analyses was limited to sample detection limits and occasional duplicate results (McLaren, 1986a; McLaren, 1986b). For a complete evaluation of the data, additional

TABLE 4-1. SUMMARY OF POSITIVE ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 31

Compound Detected	Boring Number	Depth (feet BGS)	Concentration
Miscellaneous Compounds:			
Oil and Grease	31WSB01	14.0-14.5	190 mg/kg
	31WSB02	8.5-9.0	200 mg/kg

SOURCE: McLaren, 1986a.

information is required, including results from method blanks, laboratory blanks, field blanks, laboratory replicates, laboratory spikes, and performance audit samples. Without this information, it is impossible to estimate the precision of analyses or determine if any systematic bias or artificial contamination was present in the results.

However, some general considerations can be discussed regarding the quality of these analyses. For organic compounds, U.S. EPA Methods 8080, 8240, and 8270 are appropriate analytical methods for this type of investigation. Each has specific recommendations for QA/QC as part of the method procedure. Although no indications of analytical accuracy or precision were provided in the reports, these parameters may be within acceptable limits as long as the specified QA/QC recommendations were followed by experienced technicians.

One unusual characteristic of the entire McLaren data set is the uniformity of detection limits between samples having different composition. The uniformity of detection limits may indicate that samples were not properly diluted before quantitation or that dilutions were made, but not reported. Either of these omissions would result in true detection limits that were higher than those indicated in the results.

Analytical methods for metals were not specified; instead, methods were referenced to the Waste Extraction Test in the California Assessment Manual (CAM-WET), a former reference of California-approved methods for waste classification. The California Assessment Manual allowed several analytical methods for each metal, but it is unknown which ones were actually used in the McLaren analyses. Although CAM itself has since been discontinued, the methods referenced are still applicable under present standards.

4.1.3 Adequacy of Soil Characterization

The following criteria were used by Radian to determine the adequacy of a soil characterization (U.S. EPA, 1986, p. 9-5):

- Representative samples of soil be collected;
- Samples are handled and analyzed using appropriate methodology for the suspected contaminants; and
- Enough samples be collected to define both the lateral and vertical extent of contamination.

Both WSBs were drilled in appropriate locations. Boring 31WSB01 was drilled near the railroad tracks because McLaren's review of historical photographs showed evidence of ash being stored in this location. Boring 31WSB02 was placed between 31SAP17 and 31SAP18 because discolored soil and odors were noted in these borings.

Additional samples are needed where field evidence has indicated that contamination may be present. Specifically, samples are needed from areas where high soil gas readings were recorded or where discolored soil was noted. Furthermore, near-surface soil samples are needed because this is the likely interval in which relatively immobile semivolatile and metallic source material would remain.

The sampling and analytical methods used to characterize samples for organic are probably of adequate quality to identify areas of source material or high levels of contamination. Insufficient information is available to determine if the data are adequate for low-level determinations.

The presence of some types of contamination at Site 31 is still uncertain because the soil samples that were analyzed were not taken from appropriate depths to detect contaminants which may have been present. The most likely source of contamination at Site 31 was the ash that was stored on site. Although the type of refuse burned in the incinerator at Site 31 is unknown, the ash from the incinerator potentially contained metallic source material. If the refuse was not completely burned, polynuclear aromatic hydrocarbons (PNAs) might also have been present in the ash. Because these contaminants are relatively immobile and would not migrate readily to depth, the samples that were analyzed were collected from depths too great to adequately determine the presence of certain types of contamination at Site 31.

4.2 Soil Gas Results

This section presents the results of soil gas measurements taken during the 1985 McLaren investigation (McLaren, 1986a). A PID is a screening instrument and does not speciate or accurately quantify the soil gas. Quality assurance measures included calibrating the PID daily with standardized isobutylene, keeping a calibration logbook, and prior to drilling, recording the ambient air reading from the PID. McLaren also indicated that the PID was periodically checked in the field to ensure proper functioning (McLaren, 1986b, p. 19).

Throughout the drilling operations, PID readings were taken approximately every 5 feet from soil cuttings. In addition, while drilling the two WSBs, and three of the SAPs, PID readings from headspace containers were recorded approximately every 5 feet. Results from the soil gas investigation are presented in Table 4-2. McLaren recorded the background PID reading as zero parts per million by volume (ppmv). The only borings where soil gas readings above 2 ppmv were recorded were Borings 31WBS02, 31SAP17, and 31SAP18. These three borings were all located adjacent to the west side of Building 687. The highest recorded readings from the cuttings at Borings 31SAP17 and 31SAP18 were 50 to 100 ppmv at depths of 7 to 5 feet BGS, respectively. The highest reading from 31WSB02 was 60 ppmv at 3.5 feet BGS. In the two SAPs, McLaren noted that the high PID readings may be due to moisture. However, the odors and discolored soil also noted in these boring logs support the elevated soil gas readings. No analytical samples were taken from depths that had high PID readings.

McLaren noted that the PID was sensitive to excessive moisture, and excessive moisture may cause the PID to show higher readings than the actual levels. This response can be identified by a very slow meter response; "thus, when slow responses occurred and ultimate readings were high in the absence of odors or other indications of contamination, the PID readings were assumed to be moisture artifacts" (McLaren, 1986b, p. 19).

4.3 Groundwater Results

Because this Technical Memorandum is concerned only with site-specific data, only groundwater results from downgradient wells that have detectable amounts of the constituents associated with Site 31 are relevant. No specific contaminants have been identified with Site 31; therefore, no groundwater results have been included here.

4.4 Surface Water Results

Although no surface water samples that can be specifically related to Site 31 have been collected for analysis, surface water at McClellan AFB is regularly monitored under two National Pollutant Discharge Elimination System (NPDES) permits. The first requires that surface water from Arcade Creek, Second Creek, and Magpie Creek be sampled monthly where it enters the base, and again where it exits; these samples are analyzed for volatile organic compounds (VOCs) and heavy metals.

TABLE 4-2. MAXIMUM PID READINGS FROM SOIL CUTTINGS AND HEADSPACE JARS AT SITE 31 (UNITS IN PPMV)

Approximate Depth (ft)	BORING NUMBER									
	31SAP01		31SAP02		31SAP03		31SAP04		31SAP05	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	0	--	1	--	1	--	1	--	1	--
10	0	--	0	--	1	--	0	--	0	--
15										
20										
25										
30										
35										
40										
45										
50										
55										

(Continued)

PRL31/040290/jks

TABLE 4-2. (Continued)

Approximate Depth (ft)	BORING NUMBER 31SAP06 Cuttings	31SAP06 Headspace	31SAP07 Cuttings	31SAP07 Headspace	31SAP08 Cuttings	31SAP08 Headspace	31WSB01 Cuttings	31WSB01 Headspace	31WSB02 Cuttings	31WSB02 Headspace
5	1	--	1	--	1	--	0	0	2[b]	25
10	0	--					0	0	3	1.5
15							0	0	3	2
20							0	0	0	1
25							0	0	1	5
30							0	0	0	20
35							0	0	1	60
40							0	0	0	1
45							0	0	0	0
50							0	0	0	0
55										

(Continued)

TABLE 4-2. (Continued)

Approximate Depth (ft)	BORING NUMBER 31SAP09 Cuttings	Headspace	31SAP10 Cuttings	Headspace	31SAP11 Cuttings	Headspace	31SAP12 Cuttings	Headspace	31SAP13 Cuttings	Headspace
5	1	--	1	--	1	--	1	1	1	--
10							1	0		
15										
20										
25										
30										
35										
40										
45										
50										
55										

(Continued)

PRL31/040290/jks

TABLE 4-2. (Continued)

Approximate Depth (ft)	31SAP14 Cuttings	31SAP14 Headspace	31SAP15 Cuttings	31SAP15 Headspace	31SAP16 Cuttings	31SAP16 Headspace	31SAP17 Cuttings	31SAP17 Headspace	31SAP18 Cuttings	31SAP18 Headspace
5	2	--	1	3	1	1	50[a,c]	50[c]	100[a,b,c]	90[c]
10			0	1	0	0	100[c]	10[c]	70[c]	--
15			0	1	0	0	30[c]	--	10[c]	150[c]
20			0	0	0	0	10[c]	10[c]	10[c]	70c
25										
30										
35										
40										
45										
50										
55										

[a] Odor noted in soil.
[b] Discoloration noted in soil.
[c] McLaren noted high readings may be due to "moisture artifact" affecting the photoionization detector.

-- = No readings taken.
Blanks indicate borings were terminated.

SOURCE: McLaren, 1986a.

PRL31/040290/jks

The second permit outlines waste discharge regulations for the base groundwater treatment plant (located in Operable Unit [OU] C of McClellan AFB), including effluent analyses of VOCs, semivolatile organic compounds, and heavy metals. The NPDES permits establish limits on concentrations of VOCs, semivolatile organic compounds, and heavy metals in surface water discharged from McClellan AFB. Under the permit requirements, concentrations of these compounds must not exceed the established limits.

4.5 Air Monitoring Results

No air quality data have been specifically associated with Site 31.

5.0 POTENTIAL HAZARDS

The following sections discuss the potential contaminants of concern, immediate hazards, and potential for migration resulting from any on-site contamination at Site 31.

5.1 Potential Contaminants of Concern

Ash and wastes from refuse are suspected of being released at Site 31. Section 4, Extent of Contamination, provides a detailed description of previous investigations at Site 31 and is summarized below:

- Eighteen shallow auger profile borings and two waste sample borings were drilled at the site;
- The only organic contaminant detected in analysis of two samples was oil and grease at 190 and 200 mg/kg; and
- The maximum soil gas reading where interferance from water vapor was not suspected was 60 ppmv.

The contaminants of concern at Site 31 are metal and semivolatile organic compounds from the ash and wastes. Additional samples are needed to determine the presence or absence of these types of compounds in near-surface soils.

5.2 Immediate Hazards

This section describes potential immediate hazards caused by contamination at Site 31, including the potential for fire and explosion and the possible hazards to worker health and safety. Because only low levels of volatile organic compounds (VOCs) are believed to exist at the site, the potential for fire and explosion is very low. Because further investigation is needed to determine the extent of any contamination present at Site 31, the potential health risks should be reevaluated prior to any construction or excavation at the site.

Potential hazards to worker health and safety are limited to inhalation, ingestion, or dermal contact of any surface soil contaminated with semivolatile organic or metal compounds. Because the entire surface of Site 31 is covered with concrete or asphaltic cement, the risks to workers is very low.

5.3 Potential for Contaminant Migration

This section describes the potential for wastes to migrate from Site 31 to the groundwater, surface water, and air. Although site-specific information is limited, it is possible to discuss general considerations of contaminant migration at this site.

5.3.1 Potential for Migration to Groundwater

The most important factors that influence migration to groundwater are surface water infiltration rate, percolation rate, and contaminant characteristics.

The potential infiltration rate for soil is primarily related to surface characteristics of the area and permeability of the soil. Because the surface at Site 31 is covered with concrete or asphaltic cement, surface infiltration is limited to cracks in the pavement or leaks of underground pipes.

The percolation rate of contaminants depends on the soil permeability, structure and stratification. Boring logs indicate that soil ranges from sandy loams to clay loams. Although cementation was noted in two borings, base-wide boring information indicates that relatively impermeable layers are not continuous and are not effective barriers to percolation.

The contaminants of concern at Site 31 are semivolatile organic and metal compounds which are relatively insoluble in water and tend to adsorb onto fine soil particles. Unless large volumes of semivolatile organic or metal compounds have been discharged to the ditch, migration of contaminants is limited by their solubility in infiltrating surface water. Therefore, any contaminants at Site 31 have a low potential for migrating to groundwater.

5.3.2 Potential for Migration to Surface Water

The primary characteristics affecting the potential for contaminant migration to surface water are the topography and surface characteristics of the site. The same contaminant characteristics affecting migration to groundwater also affect migration to surface water. Because the entire surface of Site 31 is covered with cement or asphaltic concrete, the potential for wastes to migrate to surface water are very low.

5.3.3 Potential for Migration to Air

Surface characteristics and contaminant characteristics influence the potential for migration to air. Because all soil gas measurements were relatively low (see Section 4.2, Soil Gas Results) and the site is paved with concrete, the potential for migration to air is also low.

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6.0 EVALUATION OF PREVIOUS CONTRACTORS' RECOMMENDATIONS

McLaren made the following recommendation for Site 31:

> Because no appreciable soil contamination was detected, the recommended alternative for Site 31 is no additional action. (McLaren, 1986a)

Because additional investigation of shallow soils is needed to verify that contaminants are not present at Site 31, Radian believes this recommendation was premature.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Shallow groundwater was observed in drilling during a dry season at Site 31. The water may have been the result of leakage from wastewater lines, potable water lines, or other artificial sources. If the potential leakage is ongoing, the sources of shallow groundwater may be providing artificial groundwater recharge and inducing contaminant migration through the vadose zone to the groundwater.

Radian recommends the following immediate actions:

- Determine location of any water supply lines in the vicinity of Site 31;
- Evaluate consequences of leakage from the lines or other sources in the vicinity of Site 31; and
- Repair, replace, or discontinue flow through the lines.

The soil investigation at Site 31 did not reveal any contamination; however, additional samples are needed to determine the presence of contamination or waste material at the site in order to fully characterize the site. Existing information will be used to propose additional borings in the Remedial Investigation Sampling and Analysis Plan.

The following activities are recommended for Site 31:

- Interviews with base personnel familiar with the operation of the incinerator at Site 31 should be conducted to determine what type of refuse was burned and where the ash was stored and disposed; and
- Near-surface soil samples should be taken from the areas where ash was stored or buried and where higher soil gas readings were detected, and analyzed to determine if metals, polynuclear aromatic hydrocarbons (PNAs), polychlorinated dibenzofurans, polychlorinated quarterphenyls, or dioxins, which may have been generated during refuse incineration as a result of incomplete combustion of chlorinated organics, are present.

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8.0 REFERENCES

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APPENDIX A

Analytical Results for Soil Samples

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TABLE A-1. VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM PSPRL 31 (UNITS IN UG/KG)

Depth (feet BGS)	14.0-14.5	49.5-50.0	8.5-9.0	49.5-50.0
Date Sampled	07/22/85	07/23/85	07/19/85	07/19/85
Sampled By	MCR	MCR	MCR	MCR
Analytical Method	EPA 8240	EPA 8240	EPA 8240	EPA 8240
Date Analyzed	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL
Field QC				
Laboratory QC	NS	NS	NS	NS
Acetone	<100	<100	<100	<100
Acrolein	<100	<100	<100	<100
Acrylonitrile	<100	<100	<100	<100
Benzene	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10
Bromomethane	<100	<100	<100	<100
2-Butanone	<100	<100	<100	<100
Carbon disulfide	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10
Chlorodibromomethane	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10
Chloromethane	<100	<100	<100	<100
Dichlorobromomethane	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10
Dichloromethane	<10	<10	<10	<10
1,2-Dichloropropane	<10	<10	<10	<10
1,3-Dichloropropylene	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10

(Continued)

TABLE A-1. (Continued)

Boring Number Depth (feet BGS)	31WSB01 14.0-14.5	31WSB01 49.5-50.0	31WSB02 8.5-9.0	31WSB02 49.5-50.0
2-Hexanone	<100	<100	<100	<100
4-Methyl-2-pentanone	<100	<100	<100	<100
Styrene	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10
Toluene	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10
Vinyl acetate	<100	<100	<100	<100
Vinyl chloride	<100	<100	<100	<100
Xylenes (total)	<10	<10	<10	<10

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
NA = Not analysed.
NS = Not specified.

SOURCE: McLaren, 1986a.

PSPRL31/112989/JKS

TABLE A-2. SEMIVOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM PSPRL 31 (UNITS IN UG/KG)

Boring Number	31WSB01	31WSB02
Depth (feet BGS)	14.0-14.5	8.5-9.0
Date Sampled	07/22/85	07/19/85
Sampled By	MCR	MCR
Analytical Method	EPA 8270	EPA 8270
Date Analyzed	--	--
Laboratory	ITL	ITL
Field QC		
Laboratory QC	NS	NS
Acenaphthene	<100	<100
Acenaphthylene	<100	<100
Aniline	<100	<100
Anthracene	<100	<100
Benzidine	<400	<400
Benzo(a)anthracene	<100	<100
Benzo(a)pyrene	<100	<100
3,4-Benzo(b)fluoranthene	<100	<100
Benzo(g,h,i)perylene	<100	<100
Benzoic acid	<100	<100
Benzo(k)fluoranthene	<100	<100
Benzyl alcohol	<100	<100
4-Bromophenylphenyl ether	<100	<100
Butyl benzyl phthalate	<100	<100
4-Chloroaniline	<100	<100
bis(2-Chloroethoxy)methane	<100	<100
bis(2-Chloroethyl)ether	<100	<100
bis(2-Chloroisopropyl)ether	<100	<100
p-Chloro-m-cresol	<100	<100
bis(Chloromethyl)ether	<400	<400
2-Chloronaphthalene	<100	<100
2-Chlorophenol	<100	<100
4-Chlorophenylphenyl ether	<100	<100
Chrysene	<100	<100

(Continued)

PSPRL31/112989/JKS

TABLE A-2. (Continued)

Boring Number	31WSB01	31WSB02
Depth (feet BGS)	14.0-14.5	8.5-9.0
Dibenzo(a,h)anthracene	<100	<100
Dibenzofuran	<100	<100
1,2-Dichlorobenzene	<100	<100
1,3-Dichlorobenzene	<100	<100
1,4-Dichlorobenzene	<100	<100
3,3'-Dichlorobenzidine	<100	<100
2,4-Dichlorophenol	<100	<100
Diethylphthalate	<100	<100
2,4-Dimethylphenol	<100	<100
Dimethylphthalate	<100	<100
Di-n-butylphthalate	<100	<100
4,6-Dinitro-o-cresol	<1,000	<1,000
2,4-Dinitrophenol	<1,000	<1,000
2,4-Dinitrotoluene	<100	<100
2,6-Dinitrotoluene	<100	<100
Di-n-octylphthalate	<100	<100
1,2-Diphenylhydrazine	<100	<100
bis(2-Ethylhexyl)phthalate	<100	<100
Fluoranthene	<100	<100
Fluorene	<100	<100
Hexachlorobenzene	<100	<100
Hexachlorobutadiene	<100	<100
Hexachlorocyclopentadiene	<100	<100
Hexachloroethane	<100	<100
Indeno(1,2,3-cd)pyrene	<100	<100
Isophorone	<400	<400
2-Methylnaphthalene	<100	<100
2-Methylphenol	<100	<100
4-Methylphenol	<100	<100
Naphthalene	<100	<100

(Continued)

TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	31WSB01 14.0-14.5	31WSB02 8.5-9.0
2-Nitroaniline	<100	<100
3-Nitroaniline	<100	<100
4-Nitroaniline	<100	<100
Nitrobenzene	<100	<100
N-Nitrosodimethylamine	<100	<100
N-Nitroso-di-n-propylamine	<100	<100
2-Nitrophenol	<100	<100
4-Nitrophenol	<100	<100
N-Nitrosodiphenylamine	<100	<100
Pentachlorophenol	<100	<100
Phenanthrene	<100	<100
Phenol	<100	<100
Pyrene	<100	<100
2,3,7,8-Tetrachlorodibenzo-p-dioxin	<100	<100
1,2,4-Trichlorobenzene	<100	<100
2,4,5-Trichlorophenol	<100	<100
2,4,6-Trichlorophenol	<100	<100

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

PSPRL31/112989/JKS

TABLE A-3. PESTICIDES/PCB ANALYTICAL RESULTS FOR SOIL SAMPLES FROM PSPRL 31

(UNITS IN UG/KG)

Boring Number	31WSB01	31WSB02
Depth (feet BGS)	14.0-14.5	8.5-9.0
Date Sampled	07/22/85	07/19/85
Sampled By	MCR	MCR
Analytical Method	EPA 8080	EPA 8080
Date Analyzed	--	--
Laboratory	ITL	ITL
Field QC		
Laboratory QC	NS	NS
Aldrin	<10	<10
alpha-BHC	<10	<10
beta-BHC	<10	<10
delta-BHC	<10	<10
gamma-BHC (Lindane)	<10	<10
Chlordane	<100	<100
4,4'-DDD	<10	<10
4,4'-DDE	<10	<10
4,4'-DDT	<10	<10
Dieldrin	<10	<10
Endosulfan I	<10	<10
Endosulfan II	<10	<10
Endosulfan I/II	NS	NS
Endosulfan sulphate	<10	<10
Endrin	<10	<10
Endrin aldehyde	<10	<10
Endrin ketone	NS	NS
Heptachlor	<10	<10
Heptachlor epoxide	<10	<10
Methoxychlor	<100	<100
Toxaphene	<200	<200
PCB-1016	<1,000	<1,000
PCB-1221	<1,000	<1,000
PCB-1232	<1,000	<1,000
PCB-1242	<1,000	<1,000
PCB-1248	<1,000	<1,000
PCB-1254	<1,000	<1,000
PCB-1260	<1,000	<1,000

(Continued)

PSPRL31/112989/JKS

TABLE A-3. (Continued)

FOOTNOTES:

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
NS = Not specified.
NA = Not analyzed.

SOURCE: McLaren, 1986a.

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TABLE A-4. INORGANIC COMPOUND AND MISCELLANEOUS ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED FROM PSPRL 31

Boring Number		31WSB01	31WSB01	31WSB02	31WSB02
Depth (feet BGS)		14.0-14.5	14.0-14.5	8.5-9.0	8.5-9.0
Date Sampled		07/22/85	07/22/85	07/19/85	07/19/85
Sampled By		MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--
Laboratory		ITL	ITL	ITL	ITL
Field QC		FDA	FDB	FDA	FDB
Laboratory QC		NS	NS	NS	NS
Parameter	Method	Results (Units in mg/kg)			
Antimony	NS	<0.1	<0.1	<0.1	NA
Arsenic	NS	14	12	35	NA
Barium	NS	120	120	140	140
Berylium	NS	<0.1	NA	<0.1	NA
Cadmium	NS	0.1	NA	<0.1	NA
Chromium	NS	15	14	23	NA
Cobalt	NS	10	11	9.3	NA
Copper	NS	22	NA	22	22
Lead	NS	6.8	5.8	8.7	NA
Mercury	NS	0.17	0.14	<0.1	NA
Molybdenum	NS	3.1	3.1	3.1	NA
Nickel	NS	25	23	33	33
Selenium	NS	<1	<1	<1	NA
Silver	NS	0.1	0.1	0.1	NA
Thallium	NS	0.33	0.33	0.33	NA
Vanadium	NS	40	NA	53	NA
Zinc	NS	52	NA	45	45
Oil & Grease	413.1	190	NA	200	NA

(Continued)

PSPRL31/112989/JKS

TABLE A-4. (Continued)

Boring Number		31WSB01	31WSB01	31WSB02	31WSB02
Depth (feet BGS)		14.0-14.5	14.0-14.5	8.5-9.0	8.5-9.0
Parameter	Method	Results (Units in mg/L)			
Extractable Antimony	WET/NS	<0.1	NA	<0.1	NA
Extractable Arsenic	WET/NS	0.02	NA	0.02	NA
Extractable Barium	WET/NS	8.4	NA	12	NA
Extractable Berylium	WET/NS	<0.1	NA	<0.1	NA
Extractable Cadmium	WET/NS	<0.01	NA	<0.01	NA
Extractable Chromium	WET/NS	0.1	NA	0.16	NA
Extractable Cobalt	WET/NS	0.27	NA	<0.1	NA
Extractable Copper	WET/NS	0.24	0.23	0.28	NA
Extractable Lead	WET/NS	<0.1	NA	<0.1	NA
Extractable Mercury	WET/NS	0.006	0.006	0.005	NA
Extractable Molybdenum	WET/NS	<0.1	NA	<0.1	NA
Extractable Nickel	WET/NS	0.32	0.33	0.29	NA
Extractable Selenium	WET/NS	<0.01	NA	<0.01	NA
Extractable Silver	WET/NS	<0.01	NA	<0.01	NA
Extractable Thallium	WET/NS	<0.01	NA	<0.01	NA
Extractable Vanadium	WET/NS	0.24	NA	0.45	NA
Extractable Zinc	WET/NS	0.32	NA	0.31	NA

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NA = Not analyzed.
NS = Not specified.
WET/NS = California Assessment Manual, Waste Extraction Test; analytical method not specified.

SOURCE: McLaren, 1986a.

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INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

TECHNICAL MEMORANDUM FOR PRL 35
FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

Radian Corporation
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USAF CONTRACT NO. F33615-87-D-4023, DELIVERY ORDER NO. 0012
CONTRACTOR CONTRACT NO. 227-005, DELIVERY ORDER NO. 0012

United States Air Force Center for Environmental Excellence
Mr. Patrick Haas (Technical Project Manager)
Environmental Services Office/Environmental Restoration Division (AFCEE/ESR)
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1.0 INTRODUCTION

This Technical Memorandum presents a summary of data compiled for Potential Release Location (PRL) 35 at McClellan Air Force Base (AFB), California. The location of PRL 35 is shown in Figure 1-1. Potential Release Location 35 was reportedly the location of a scrap metal burial pit within B of McClellan AFB. The task of compiling data for Technical Memorandums is part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan for any locations that pose a threat to human health and welfare or the environment. This site assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund sites.

The purpose of this Technical Memorandum is to:

- Identify any immediate response needs as required by CERCLA/ SARA;
- Determine whether further action is needed at the location;
- Provide qualified data to support operable unit prioritization and grouping; and
- Provide recommendations for further investigation or remedial actions.

The scope of this Technical Memorandum includes site-specific data regarding the following categories of information:

- Operations and waste management practices;
- Waste characteristics;
- Contaminant migration pathways; and
- Target populations and environments.

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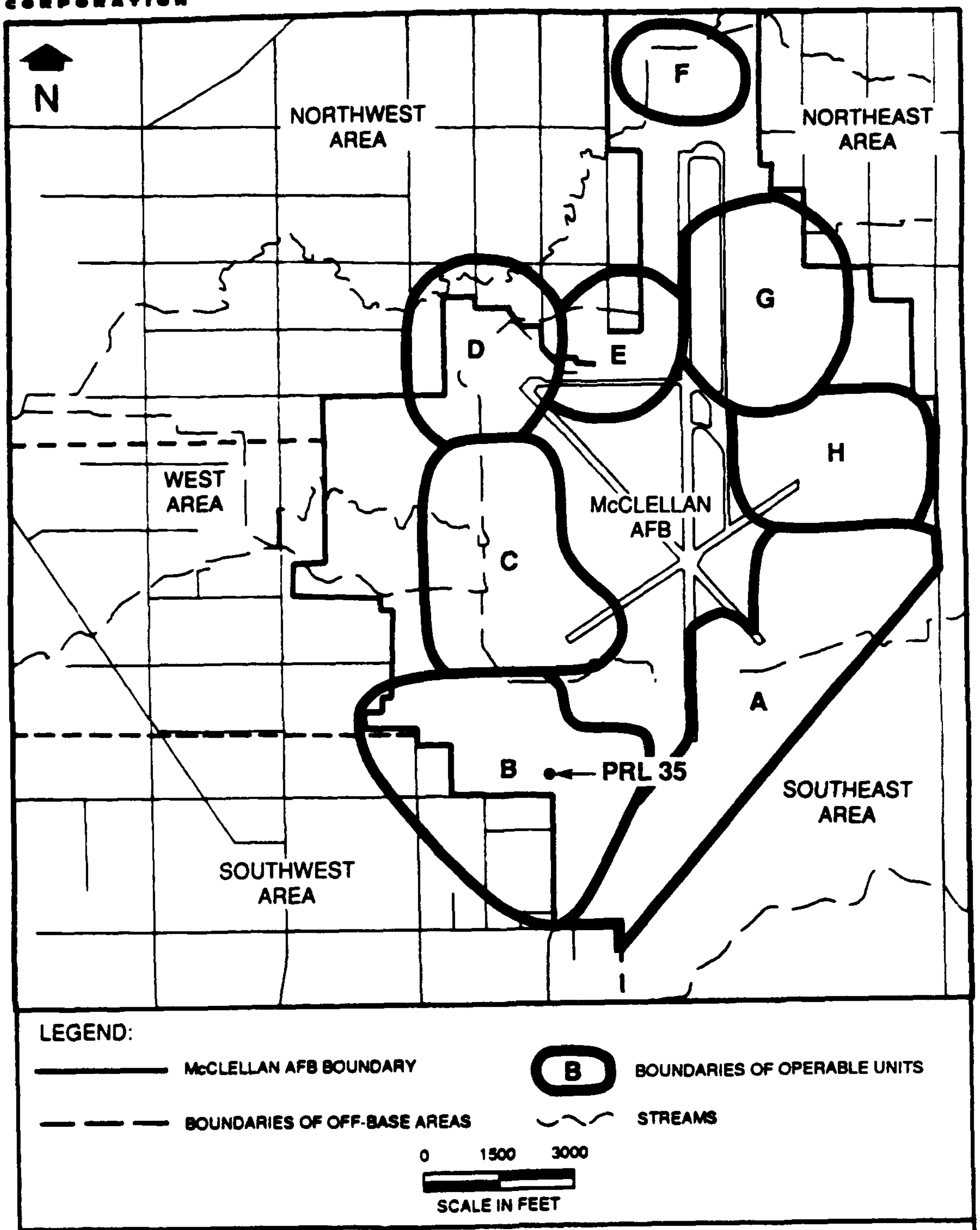

Figure 1-1. Map of PRL 35 Within the McClellan AFB Facility.

Data on all four categories are necessary to develop an understanding of the location, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Site operations, waste management practices and waste characteristics, and migration pathways are discussed in this document. A separate General Information document addresses target populations and environments. Background information regarding the overall facility description of McClellan AFB is presented in the General Information document which includes environmental setting, land use, hydrogeologic conditions, facility history, and a discussion of potential receptors.

This Technical Memorandum document includes the following:

- Information sources used to prepare the document;
- Location description, including historical activities;
- Extent of on-site soil contamination;
- Potential hazards; and
- Conclusions and recommendations.

2.0 SOURCES OF INFORMATION

The following sections describe the sources of information used to develop this Technical Memorandum.

2.1 Previous Investigations

In 1981, CH2M Hill reviewed McClellan Air Force Base (AFB) files to determine the potential for hazardous materials to migrate off base. Interviews with past and present employees and the review of base records resulted in the identification of 45 waste disposal sites at McClellan AFB, including Potential Release Location (PRL) 35 (CH2M Hill, 1981).

McLaren Environmental Engineering, Inc., investigated PRL 35 in 1985. The investigation included a ground penetrating radar (GPR) survey, physical characterization of the soil, and a qualitative characterization of the soil gas (McLaren, 1986a).

2.2 Personnel Interviews

Personnel interviews regarding waste disposal at PRL 35 were not conducted by Radian because base personnel who had information about the site could not be identified. Although personnel interviews were apparently conducted as part of the CH2M Hill and McLaren investigations, written documentation of those interviews was not kept.

2.3 Location Visit

Radian personnel visited PRL 35 on 6 January 1989 to document current features and activities at the location.

2.4 Aerial Photographs

Historical aerial photographs were reviewed for physical features and evidence of contamination. Table 2-1 lists the photographs that were reviewed. Interpretation of aerial photographs is discussed in more detail in Section 3, Location Description.

TABLE 2-1. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1988) REVIEWED FOR PRL 35

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 400'
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 370'
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 400'
1949	Whittier College	1" = 400'
1951	Whittier College	1" = 770'
1955	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1690'
1957	U.S. Department of Agriculture, ASCS	1" = 400'
1962	McClellan AFB, History Office	1" = 150'
1963	Cartwright Aerial Surveys	1" = 1667'
1965	McClellan AFB, History Office	1" = 150'
1968	Cartwright Aerial Surveys	1" = 1000'
1971	Cartwright Aerial Surveys	1" = 400'
1972	Cartwright Aerial Surveys	1" = 1000'
1974	Cartwright Aerial Surveys	1" = 1200'
1976	Cartwright Aerial Surveys	1" = 400'
1978	Cartwright Aerial Surveys	1" = 2000'
1981	Cartwright Aerial Surveys	1" = 1000'
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000'
1987	Cartwright Aerial Surveys	1" = 1000'
1988	Cartwright Aerial Surveys	1" = 400'

2.5 Review of Base Files

McClellan AFB Civil and Bioenvironmental Engineering files were reviewed for historical information during the preparation of this Technical Memorandum. No information was available for PRL 35.

3.0 LOCATION DESCRIPTION

Potential Release Location (PRL) 35, the reported site of a scrap metal burial pit, is located in Operable Unit (OU) B of McClellan Air Force Base (AFB), west of Building 652, as shown in Figure 3-1. Building 652 is being evaluated separately as Potential Release Location (PRL) S-34. A location map showing PRL 35 and the surrounding area is presented in Figure 3-2.

3.1 Location Delineation

The first report to identify PRL 35 was written in 1981, by CH2M Hill (CH2M Hill, 1981). Potential Release Location 35 is described as a scrap metal burial pit near Building 652.

McLaren Environmental Engineering, Inc., reviewed aerial photographs and conducted a field investigation of PRL 35 in 1985 (McLaren, 1986a). Because McLaren did not find any evidence of excavation in aerial photographs, ground penetrating radar (GPR) was used to delineate the boundaries of PRL 35. McLaren concluded that GPR results indicated an area of disturbed soil west of Building 652. McLaren used the boundaries of the disturbed soil to delineate the boundaries of PRL 35. McLaren's boundaries were used for the preparation of this Technical Memorandum.

3.2 Historical Activities

CH2M Hill reported PRL 35 was used as a scrap metal burial pit during World War II. The buried metal was reported to have been removed in 1950, when Building 652 was constructed (CH2M Hill, 1981). CH2M Hill did not find any information indicating that hazardous materials have been buried at PRL 35.

The aerial photographs Radian reviewed do not show any evidence of an excavation in the area of PRL 35. The only photograph of the area available for the World War II period was taken in 1943. There is no indication of the presence of a burial pit in the 1943 photograph. All of the reviewed photographs taken prior to 1946 show the area as undeveloped land.

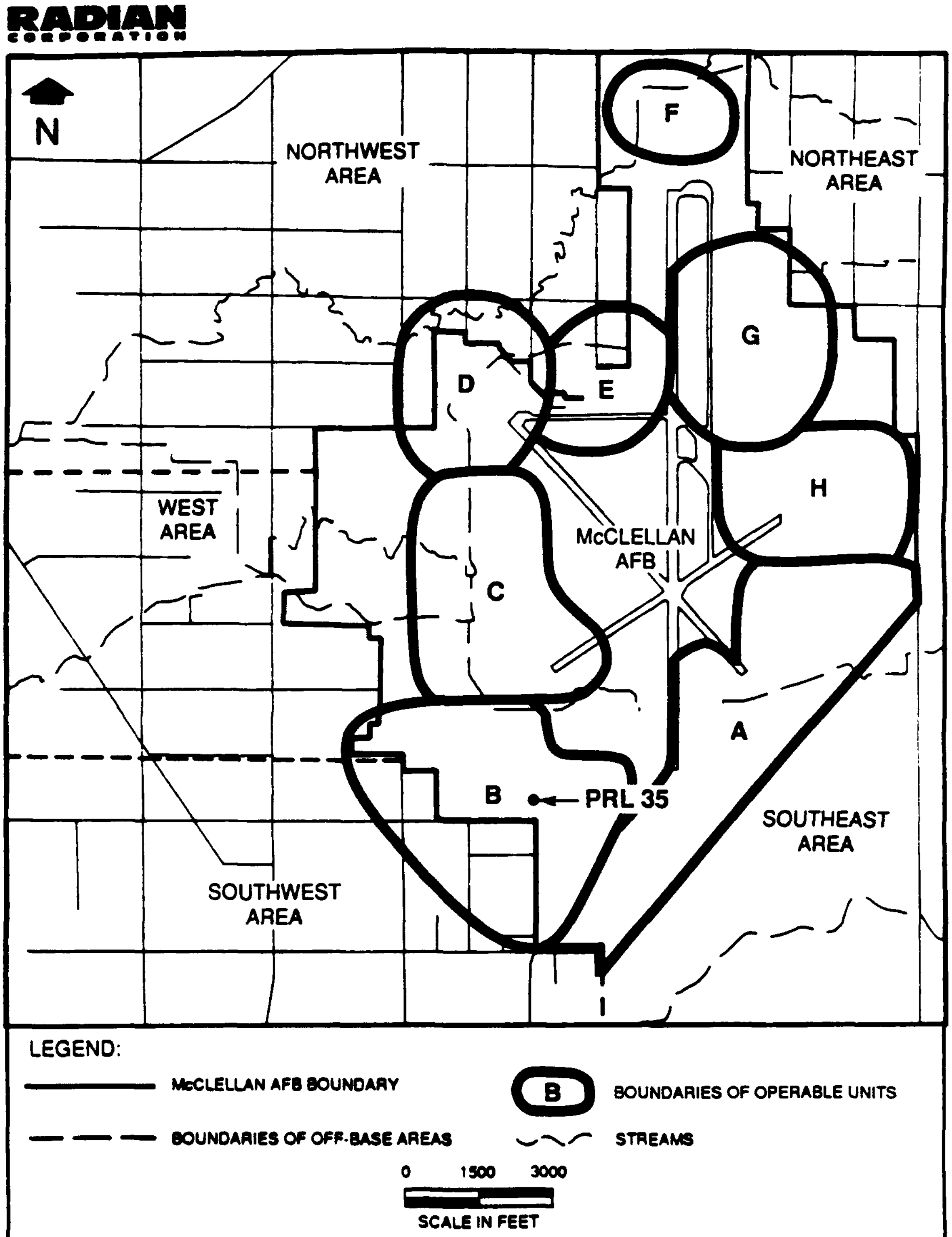

Figure 3-1. Map of PRL 35 Within the McClellan AFB Facility.

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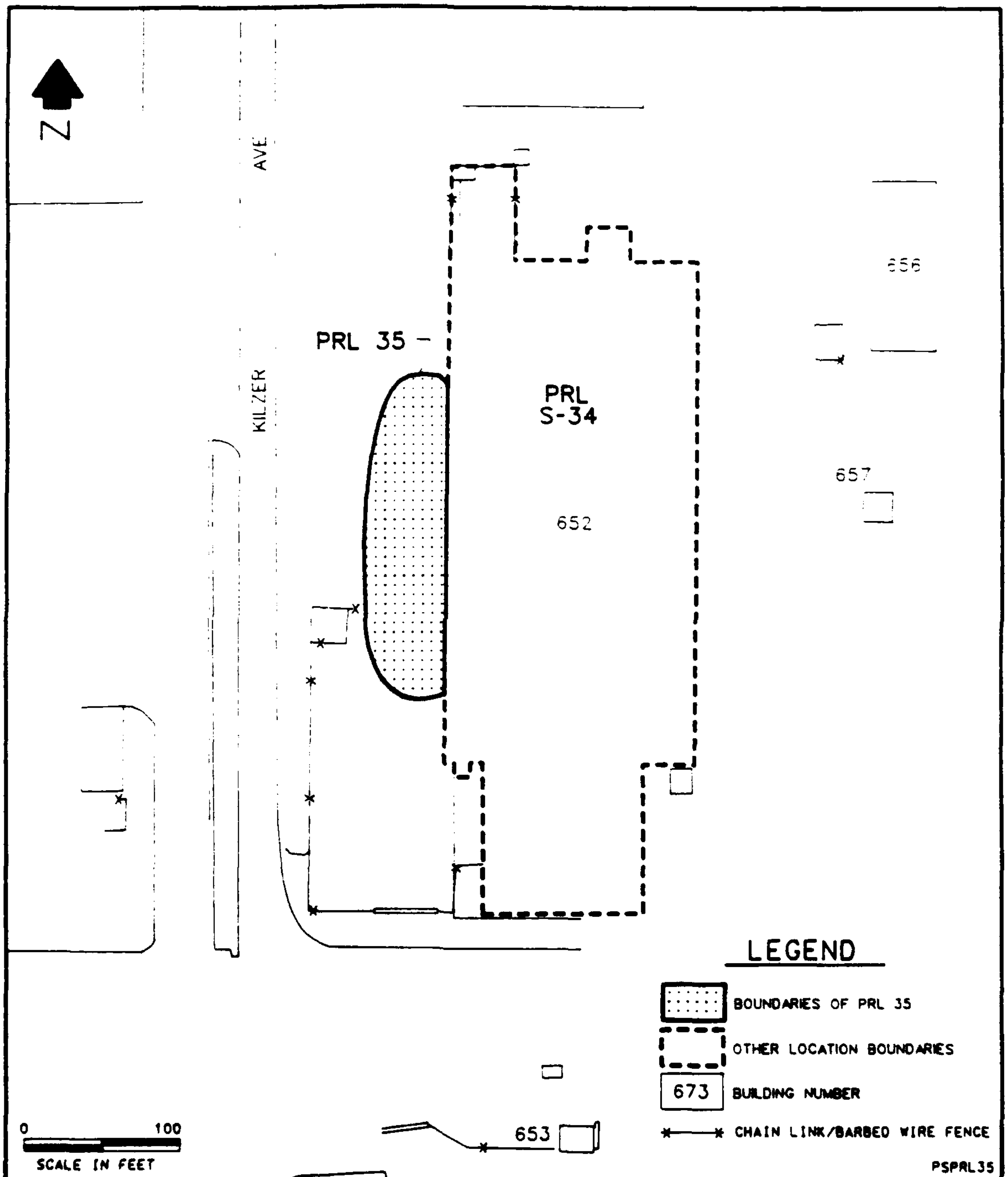

Figure 3-2. Map of PRL 35 and Vicinity.

Although CH2M Hill reported Building 652 was constructed in 1950, a photograph taken in 1946 shows Building 652 partially constructed. McLaren reviewed a 1947 photograph showing the building and concluded that if the buried metal was removed when Building 652 was constructed, the removal occurred prior to 1947 (McLaren, 1986a). However, aerial photographs show that the southern section of Building 652, outlined in Figure 3-3, was not constructed until later--between 1949 and 1951. The aerial photographic evidence may explain the apparent discrepancy in CH2M Hill's report. It is possible that the southern section of Building 652 was constructed in 1950, and the buried metal was removed during this construction and not the earlier one.

3.3 Current Activities

The area of PRL 35 is now covered by asphaltic cement. Currently, the area is used to store lumber.

3.4 Reported Releases

Releases of specific contaminants, if any, have not been documented at PRL 35.

3.5 Remedial Actions

No known remedial actions have been documented for PRL 35.

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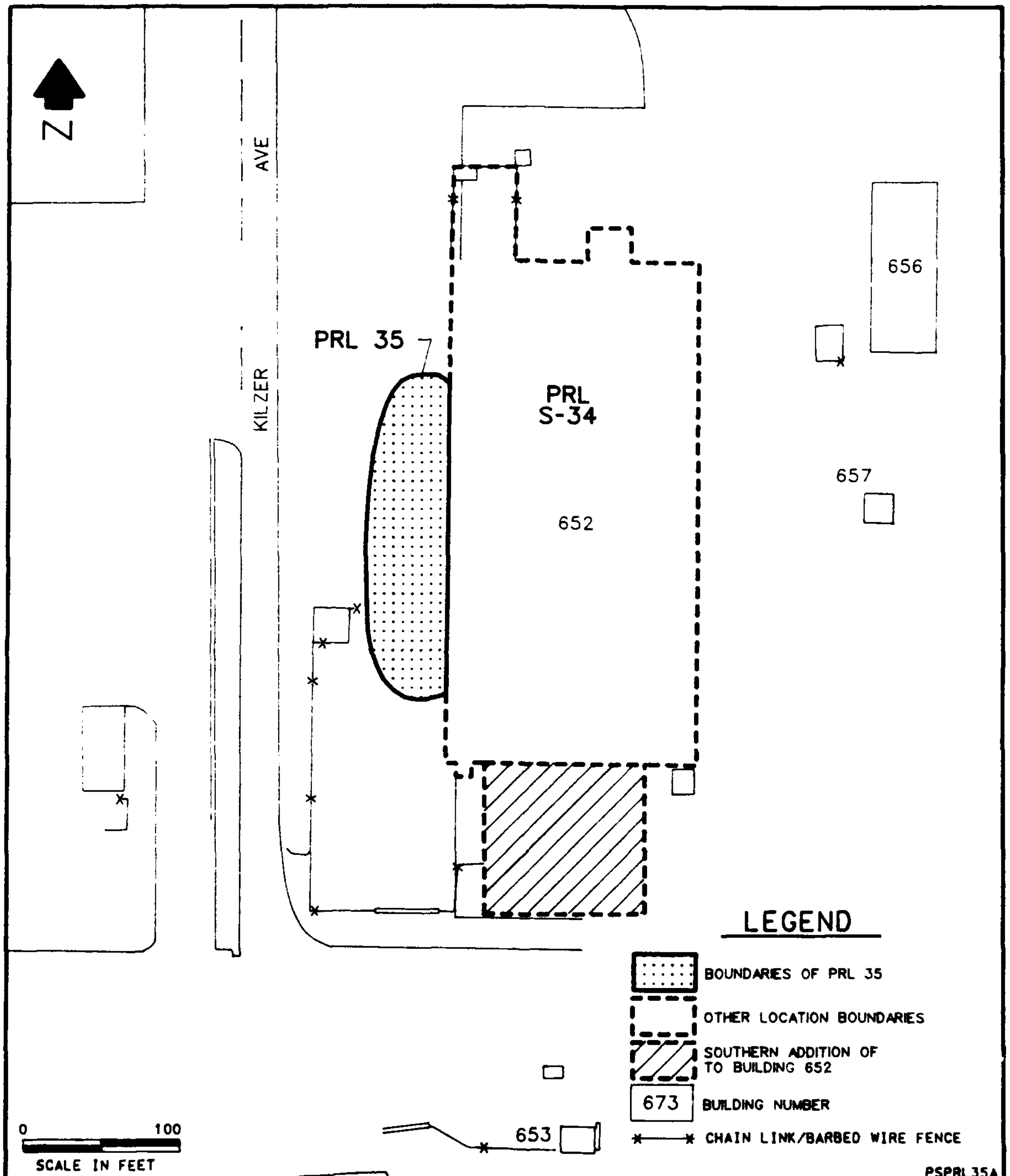

Figure 3-3. Map of PRL 35 and Vicinity Showing Southern Addition to Building 652.

4.0 EXTENT OF CONTAMINATION

The following sections present the results of previous investigations at Potential Release Location (PRL) 35. Discussions related to soil, soil gas, groundwater, surface water, and air monitoring are presented under separate subsections.

4.1 Soil Results

This section summarizes the physical characterization of the soil at PRL 35 and evaluates of the adequacy of that soil characterization performed there. Results presented in this section are from data obtained from the 1985 McLaren Environmental Engineering, Inc., investigation (McLaren, 1986a).

McLaren used ground penetrating radar (GPR) to delineate the boundaries of PRL 35. Three GPR traverses were made across the parking lot west of Building 652. McLaren's interpretation of data from the GPR survey indicated an area of soil disturbance approximately 200 feet long by 50 feet wide, adjacent to Building 652. This area was investigated with two types of borings: grid survey borings (GSBs), and deep auger profile borings (DAPs). Figure 4-1 shows the GPR traverses and the boring locations.

One GSB was drilled in the center of PRL 35 to verify the presence or absence of buried waste (McLaren, 1986a). This boring was drilled with a 4-inch diameter solid-stem auger to a depth of 20 feet below ground surface (BGS). The soil cuttings that came to the surface during drilling were monitored with a photoionization detector (PID), and logged for soil classification. The soil column from this location was described as being undisturbed with no evidence of fill material. No waste was found.

In addition, four DAPs were drilled to contact any lateral migration of contamination from the PRL (McLaren, 1986b). These borings were drilled using either 4-inch diameter solid stem augers or 8-inch diameter hollow-stem augers. The cuttings were monitored with a PID and logged for soil classification. No evidence of soil contamination or disturbed soil was detected. No soil samples were collected because no wastes were found.

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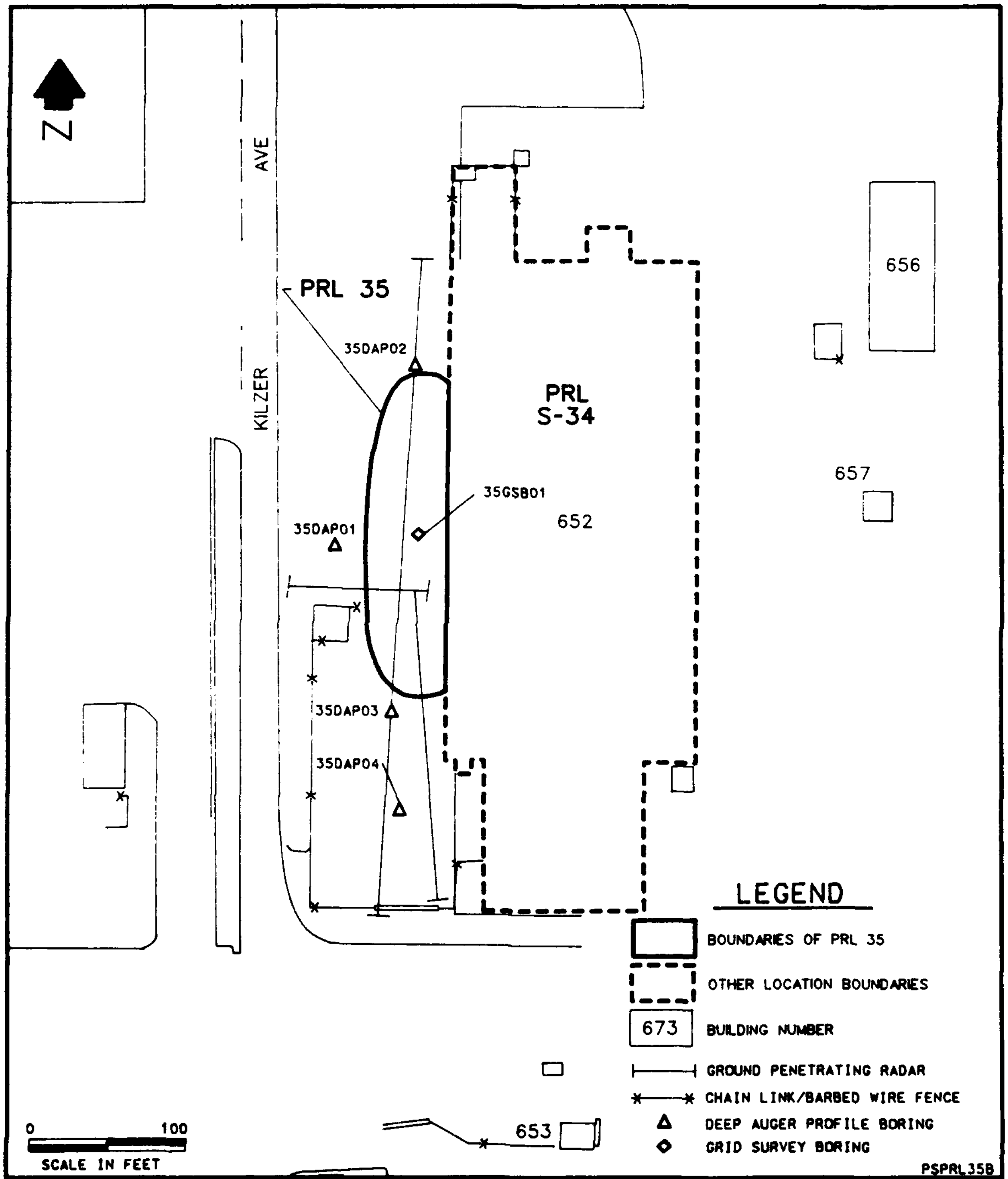

Figure 4-1. Boring Locations for PRL 35.

4.1.1 Physical Characteristics

McLaren's boring logs were used to characterize the soil at PRL 35. The soils at PRL 35 ranged from slightly moist to moist sands, sandy loams, silt loams, and clay loams. The surface soils consisted of gravelly fine sandy loams, and very gravelly loams. Borings 35DAP01, 35DAP02, and 35DAP03 showed moderate cementation at depths near 20 feet BGS. The color of surface soils was dark yellowish brown or dark brown. At greater depths, soil colors ranged from dark reddish brown to olive, with light olive brown predominating.

4.1.2 Analytical Results

No soil samples were collected for analysis because no wastes or evidence of contamination were found.

4.1.3 Adequacy of Soil Characterization

The five borings at PRL 35 were drilled in the following locations: three DAPs were drilled at the edges of the delineated boundaries to determine the lateral extent of contamination, and one GSB was drilled in the center of the location to detect the highest concentrations of any constituents. Boring 35DAP04, performed last, was drilled approximately 80 feet south of the PRL 35 boundary. Radian believes that an additional soil investigation is not needed at PRL 35.

Although GPR indicated an area of reduced soil density, the soil borings drilled in the area did not encounter evidence of waste disposal activities. Data from GPR surveys are not intended to distinguish waste disposal activities from natural changes in soil layering, differences in soil layering, differences in soil composition, or soil disturbances due to other causes.

4.2 Soil Gas Results

This section presents the results of soil gas measurements taken during the 1985 McLaren investigation (McLaren, 1986a). Throughout the drilling operations, soil gas readings from soil cuttings and headspace containers were recorded approximately every 2 feet. All soil gas readings were less than 20 parts per million by volume (ppmv). Results from the soil gas investigation are presented in Table 4-1.

TABLE 4-1. MAXIMUM PID READINGS FROM SOIL CUTTINGS AND HEADSPACE JARS AT PRL 35 (UNITS IN PPMV)

Approximate Depth (ft)	BORING NUMBER 35DAP01 Cuttings	35DAP01 Headspace	35DAP02 Cuttings	35DAP02 Headspace	35DAP03 Cuttings	35DAP03 Headspace	35DAP04 Cuttings	35DAP04 Headspace	35GSB01 Cuttings	35GSB01 Headspace
5	1	--	0	--	0	--	2	--	0	1
10	2	--	1	--	0	--	1	--	0	--
15	0	--	2	5	1	--	0	--	0	--
20	2	--	1	--	1	3	1	1	0	--
25	0	0	1[a]	--	1	--	1	--		
30	2	--	4	10	2	--	1	--		
35	1	--	5	--	2	4	0	--		
40	1	--	5	--	1	--	0	--		
45	1	--	20	15	2	--	1	--		
50	2	--	10	--	0	--	0	--		
55	1	--	5	--	3	--	0	0		
60	1	1	10	--	0	--	0	--		

[a] Discoloration noted in soil.

-- = No readings taken.

Blanks indicate borings were terminated.

SOURCE: McLaren, 1986a.

PRL35/032790/lms

A PID is a screening instrument and does not speciate or accurately quantify the soil gas. Quality assurance measures included calibrating the PID daily with standardized isobutylene, keeping a calibration logbook, and prior to drilling, recording the ambient air reading from the PID. McLaren also indicated that the PID was periodically checked in the field to ensure proper functioning (McLaren, 1986b, p. 19).

McLaren's investigation is an adequate characterization of the soil gas concentration in the area studied. Because no wastes were encountered and all soil gas measurements were less than 20 ppmv, it is reasonable to conclude that only low concentrations of volatile organic contaminants could be present in the soil.

4.3 Groundwater Results

Because this Technical Memorandum is concerned only with site-specific data, only groundwater results from downgradient wells that have detectable amounts of the same constituents associated with PRL 35 are relevant. Because no specific contaminants have been identified with PRL 35, no groundwater results have been included here.

4.4 Surface Water Results

Although no surface water samples that can be specifically related to PRL 35 have been collected for analysis, surface water at McClellan AFB is regularly monitored under two National Pollutant Discharge Elimination System (NPDES) permits. The first requires that surface water from Arcade Creek, Second Creek, and Magpie Creek be sampled monthly where it enters the base, and again where it exits; these samples are analyzed for volatile organic compounds (VOCs) and heavy metals. The second permit outlines waste discharge regulations for the base groundwater treatment plant (located in Operable Unit (OU) C of McClellan AFB), including effluent analyses of VOCs, semivolatile organic compounds, and heavy metals. The NPDES permits establish limits on concentrations of VOCs, semivolatile organic compounds, and heavy metals in surface water discharged from McClellan AFB. Under the permit requirements, concentrations of these compounds must not exceed the established limits.

4.5 Air Monitoring Results

No air monitoring results have been specifically associated with PRL 35.

5.0 POTENTIAL HAZARDS

The following sections discuss the potential contaminants of concern, immediate hazards, and potential for migration resulting from any contamination at Potential Release Location (PRL) 35.

5.1 Potential Contaminants of Concern

No hazardous contaminants are suspected of being released at PRL 35. Section 4, Extent of Contamination, provides a detailed description of previous investigations at PRL 35 and is summarized below:

- Five borings were drilled at PRL 35 and no wastes, debris or other evidence of contamination was discovered; and

- All soil gas readings were less than 20 ppmv.

5.2 Immediate Hazards

This section describes potential immediate hazards caused by contamination at PRL 35, including the potential for fire and explosion and the possible hazards to worker health and safety. Because no hazardous chemicals are believed to exist at the site, the potential for immediate hazards is very low.

5.3 Potential for Contaminant Migration

This section describes the potential for wastes to migrate from PRL 35 to the groundwater, surface water, and air. The potential for contaminant migration is dependent on the characteristics of the site and the nature of the contaminants. Site-specific information is limited, and no contaminants have been identified at PRL 35; however, it is possible to discuss general considerations of contaminant migration at this location.

5.3.1 Potential for Migration to Groundwater

The most important factors that influence migration to groundwater are surface water infiltration rate, percolation rate, and contaminant characteristics. The infiltration rate for soil is primarily determined by surface characteristics of the area and permeability of the surface soils. The ground surface of PRL 35 is paved, which reduces infiltration by intercepting rainfall and promoting runoff before it reaches the soil. Borings drilled at PRL 35 indicate the soils range from moist sands to clay loams. Although permeability data for the soils at PRL 35 are not available, the infiltration rate for this location is potentially very low because of the paved surface and soil characteristics.

The percolation rate of contaminants depends on the soil permeability, structure, stratification, and characteristics of the contaminants. As previously mentioned, soil permeability is expected to be low, and no contaminants have been identified. Although cementation was noted in the boring logs, basewide data indicate that relatively impermeable layers are not continuous and not effective barriers to percolation. Although no contaminant specific data is available, generally the percolation rate at PRL 35 is potentially low. During its 20 years of operation, the IWTP No. 2 may have allowed deep migration of contaminants toward groundwater if discharges from any tanks or pipelines occurred. Volatile organic compounds, phenols, and cyanide compounds have a higher potential to migrate to the groundwater in areas of infiltration. Semivolatile organic compounds and metals have a low potential to migrate at neutral pH; however, metals have a high potential to migrate at low pH.

5.3.2 Potential for Migration to Surface Water

The primary characteristics affecting the potential for contaminant migration to surface water are the topography and surface characteristics of the location. The same contaminant characteristics affecting migration to groundwater also affect migration to surface water. The topography at PRL 35 is essentially flat. Surface runoff from the location enters the base storm drainage system via nearby storm drains. Water entering the drainage system in this area of the base eventually drains into Magpie Creek to the north.

The surface of PRL 35 is paved, which reduces the potential for surface water contacting any contaminated surface soils which may exist. Therefore, the potential for transport of contaminants dissolved in surface runoff is considered very low. Similarly, the potential for erosion and transport of particulate-borne contaminants is also very low.

5.3.3 Potential for Migration to Air

Surface characteristics of the location and contaminant characteristics also influence the potential for migration to air. The surface at PRL 35 is paved, limiting the ability of volatile contaminants in soils to migrate to air. No contaminants have been detected at PRL 35. The potential for migration to air is unknown, but it is potentially very low because of the paved surface.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the investigation of subsurface soils and aerial photographs, there is no evidence of a burial site within the defined boundaries of Potential Release Location (PRL) 35. Although ground penetrating radar (GPR) indicated the soil at PRL 35 was disturbed, the soil investigation did not find any waste, fill material, or evidence of disturbed soil in any of the borings. Soil gas concentrations measured during previous investigations may have resulted from contamination originating at Building 652 (PRL S-34). The inconsistency of results between McLaren's GPR survey and their soil boring investigation indicates one of the following:

- No material was ever buried at PRL 35; or
- Material was buried, but the boundaries of PRL 35 do not include the former burial pit.

In any case, it is unlikely that disposal of significant quantities of hazardous wastes occurred at PRL 35 because:

- All of the available information indicates that only nonhazardous materials (scrap metal) were buried at this location; and
- The scrap metal was reportedly removed.

Therefore, Radian recommends that PRL 35 be removed from the list of potential release locations. Due to the inconsistency in McLaren's results, Radian recommends that additional investigation of this area be conducted as part of the investigation of PRL S-34, including a boring west of the southern portion of Building 652 to attempt to locate the reported disposal area.

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7.0 REFERENCES

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INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

TECHNICAL MEMORANDUM FOR SITE 36
FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

Radian Corporation
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USAF CONTRACT NO. F33615-87-D-4023, DELIVERY ORDER NO. 0012
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1.0 INTRODUCTION

This Technical Memorandum presents a summary of data compiled for Site 36 at McClellan Air Force Base (AFB), California. The location of Site 36 is shown in Figure 1-1. Site 36 was the chemical storage area for the Building 666 plating shop. The task of compiling data for Technical Memorandums is part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan for any sites that pose a threat to human health and welfare or the environment. This site assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund sites.

The purpose of this Technical Memorandum is to:

- Identify any immediate response needs as required by CERCLA/SARA;
- Determine whether further action is needed at the site;
- Provide qualified data to support operable unit prioritization and grouping; and
- Provide recommendations for further investigation or remedial actions.

The scope of this Technical Memorandum includes site-specific data regarding the following categories of information:

- Facility use and waste management practices;
- Waste characteristics;
- Contaminant migration pathways; and
- Target populations and environments.

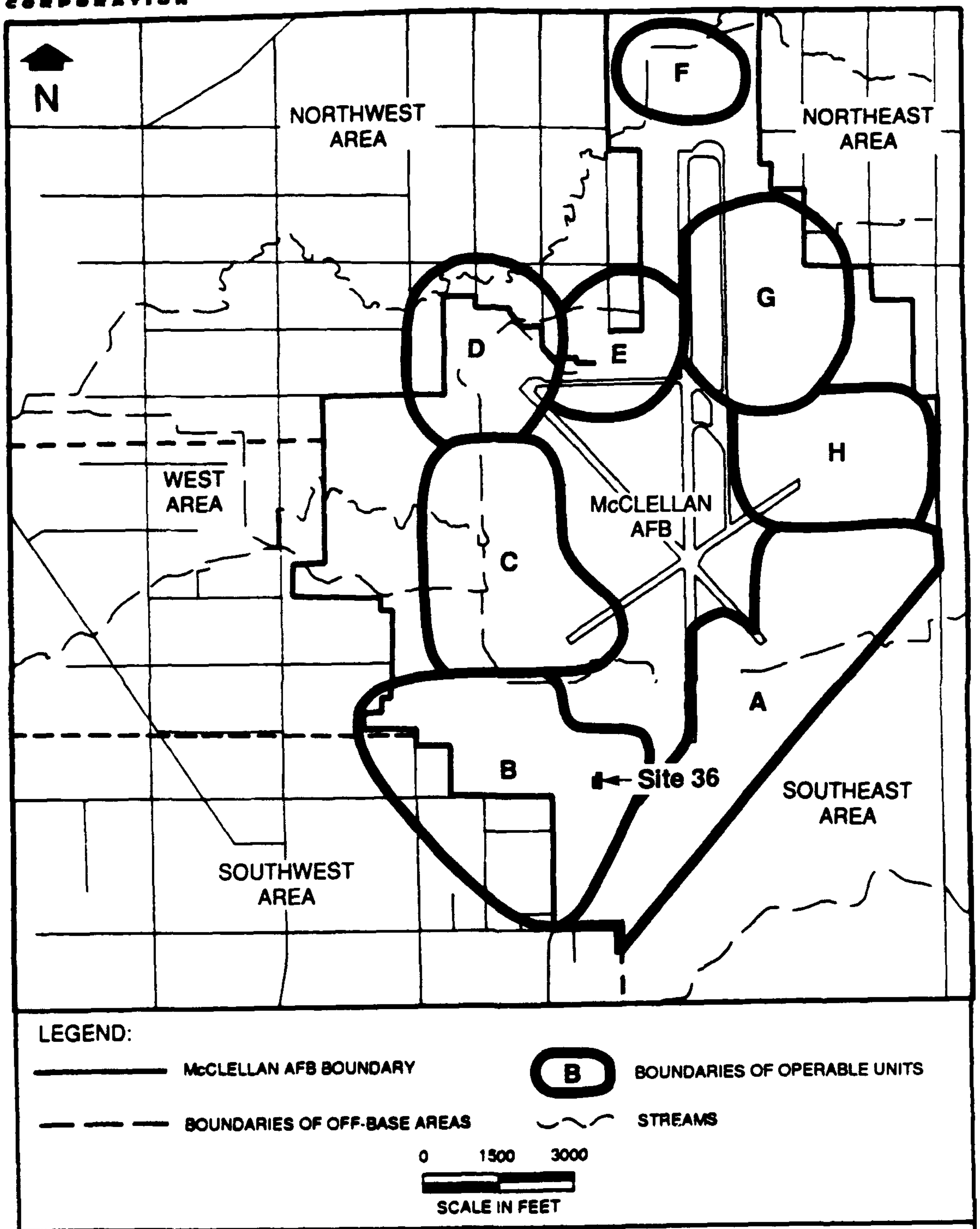

Figure 1-1. Map of Site 36 Within the McClellan AFB Facility.

Data on all four categories are necessary to develop an understanding of the site, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Site operations, waste management practices, waste characteristics, and migration pathways are discussed in this document. A separate General Information document addresses target populations and environments. Background information regarding the overall facility description of McClellan AFB is presented in the General Information document, which includes environmental setting, land use, hydrogeologic conditions, facility history, and a discussion of potential receptors.

This Technical Memorandum includes the following:

- Information sources used to prepare the document;
- Site description, including historical activities;
- Extent of on-site soil contamination with a presentation of previous analytical data;
- Potential hazards;
- An evaluation of previous contractors' recommendations; and
- Conclusions and recommendations.

2.0 SOURCES OF INFORMATION

The following sections describe the sources of information used to develop this Technical Memorandum.

2.1 Previous Investigations

In 1981, CH2M Hill reviewed McClellan Air Force Base (AFB) files to determine the potential for migration of hazardous materials off the base (CH2M Hill, 1981). Interviews with past and present employees and the review of base records resulted in the identificatio·. of 45 disposal sites at McClellan AFB. The area now designated as Site 36 was identified as the open area north of Building 666 used for the storage of plating shop materials from 1958 to 1980.

In 1982, Engineering Science, Inc., ranked 46 disposal locations by their relative potential hazards. As part of this report, the size of Site 36 was estimated to be 125 feet wide by 190 feet long (Engineering Science, 1983).

Harding Lawson Associates performed a geophysical investigation of a neighboring site, Building 666 (Confirmed Site 47), in 1982 (Walker, 1983). As part of the 1982 investigation, a soil boring was drilled on the southeast corner of Site 36.

McLaren Environmental Engineering, Inc., performed a soil investigation of Site 36 in 1985 (McLaren, 1986a) that included chemical and physical characterization of the soil, as well as qualitative characterization of the soil gas.

2.2 Personnel Interviews

Interviews were conducted by Radian on 30 January 1989 and 15 February 1989 with personnel who had worked in the Building 666 plating shop. Information from these interviews is included in the Technical Memorandum. Documentation of the interviews can be found in the Site 36 Site File.

2.3 Site Visit

Site 36 was visited by Radian personnel on 6 February 1989 to document current site features and activities.

2.4 Aerial Photographs

Historical aerial photographs were reviewed for physical features and evidence of contamination. The year, scale, and source of each aerial photograph reviewed for this Technical Memorandum are contained in Table 2-1. Aerial photographs are discussed in detail in Section 3, Site Description.

2.5 Review of Base Files

McClellan AFB Civil and Bioenvironmental Engineering files were reviewed for historical information during the preparation of this Technical Memorandum. A 1967 storm drainage drawing was found in the Civil Engineering files; this drawing identified the discharge point of the drains located at Site 36 (McClellan AFB, 1967). A 1974 Civil Engineering drawing of McClellan AFB identified the surface drainage patterns in the vicinity of Site 36 (McClellan AFB, 1974). No site-specific information was available from Bioenvironmental Engineering files.

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TABLE 2-1. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1988) REVIEWED FOR SITE 36

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 400'
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 370'
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 400'
1949	Whittier College	1" = 400'
1951	Whittier College	1" = 400'
1953	U.S. Department of Agriculture, ASCS[1]	1" = 400'
1955	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1690'
1957	U.S. Department of Agriculture, ASCS	1" = 400'
1962	McClellan AFB, History Office	1" = 150'
1965	McClellan AFB, History Office	1" = 180'
1968	Cartwright Aerial Surveys	1" = 1000'
1971	Cartwright Aerial Surveys	1" = 400'
1972	Cartwright Aerial Surveys	1" = 1000'
1974	Cartwright Aerial Surveys	1" = 1200'
1976	Cartwright Aerial Surveys	1" = 400'
1978	Cartwright Aerial Surveys	1" = 2000'
1981	Cartwright Aerial Surveys	1" = 1000'
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000'
1987	Cartwright Aerial Surveys	1" = 1000'
1988	Cartwright Aerial Surveys	1" = 400'

[1] United States Department of Agriculture, Agricultural Stabilization and Conservation Service.

3.0 SITE DESCRIPTION

Site 36, located within Operable Unit (OU) B of McClellan Air Force Base (AFB) (Figure 3-1), was used to store plating shop chemicals from 1958 to 1980. The location of Site 36 relative to other Sites and surrounding facilities is shown in Figure 3-2. Building 666 (Site 47), a plating shop from 1958 to 1986, lies adjacent to the southern boundary of Site 36. Site 48, Industrial Wastewater Treatment Plant (IWTP) No. 4, lies southwest of Site 36. Both Building 666 and IWTP No. 4 were dismantled in 1988 and are discussed in separate Technical Memorandums.

The following sections describe site delineation, historical and current activities, reported releases, and remedial actions at Site 36.

3.1 Site Delineation

In 1981, CH2M Hill identified the area used for the storage of Building 666 plating shop chemicals and designated it Site 36. The dimensions of the site were not specified. Engineering Science estimated the dimensions of Site 36 to be 125 feet wide by 190 feet long; the basis for this estimate was not specified (Engineering Science, 1983).

McLaren Environmental Engineering, Inc., first delineated the boundaries of Site 36 from a 1962 aerial photograph (McLaren, 1986a). However, subsequent figures in the same report do not consistently show the same boundaries of Site 36. These inconsistencies include the following:

- The southern boundary;
- The northern boundary; and
- The boundary enclosing the northwest corner of the site. It is included in one figure and omitted in others.

Radian's delineation of the Site 36 boundaries is shown in Figure 3-2. This delineation represents a composite of the most conservative boundaries identified by McLaren. The southern boundary is considered accurate because interviews with base personnel have indicated that plating shop materials were stored directly against Building 666 (Cruz, personal communication, 1989). Less is known about the northern

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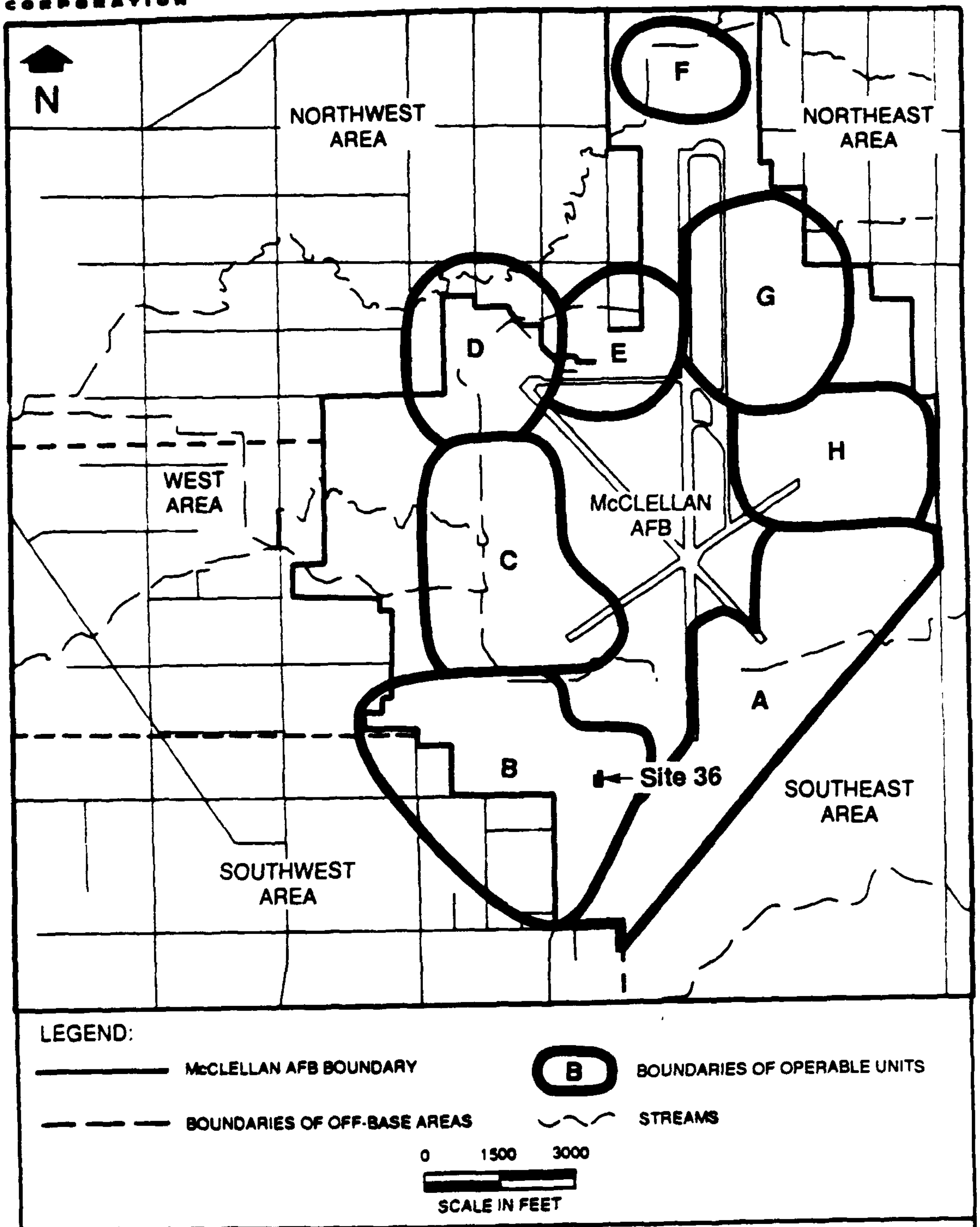

Figure 3-1. Map of Site 36 Within the McClellan AFB Facility.

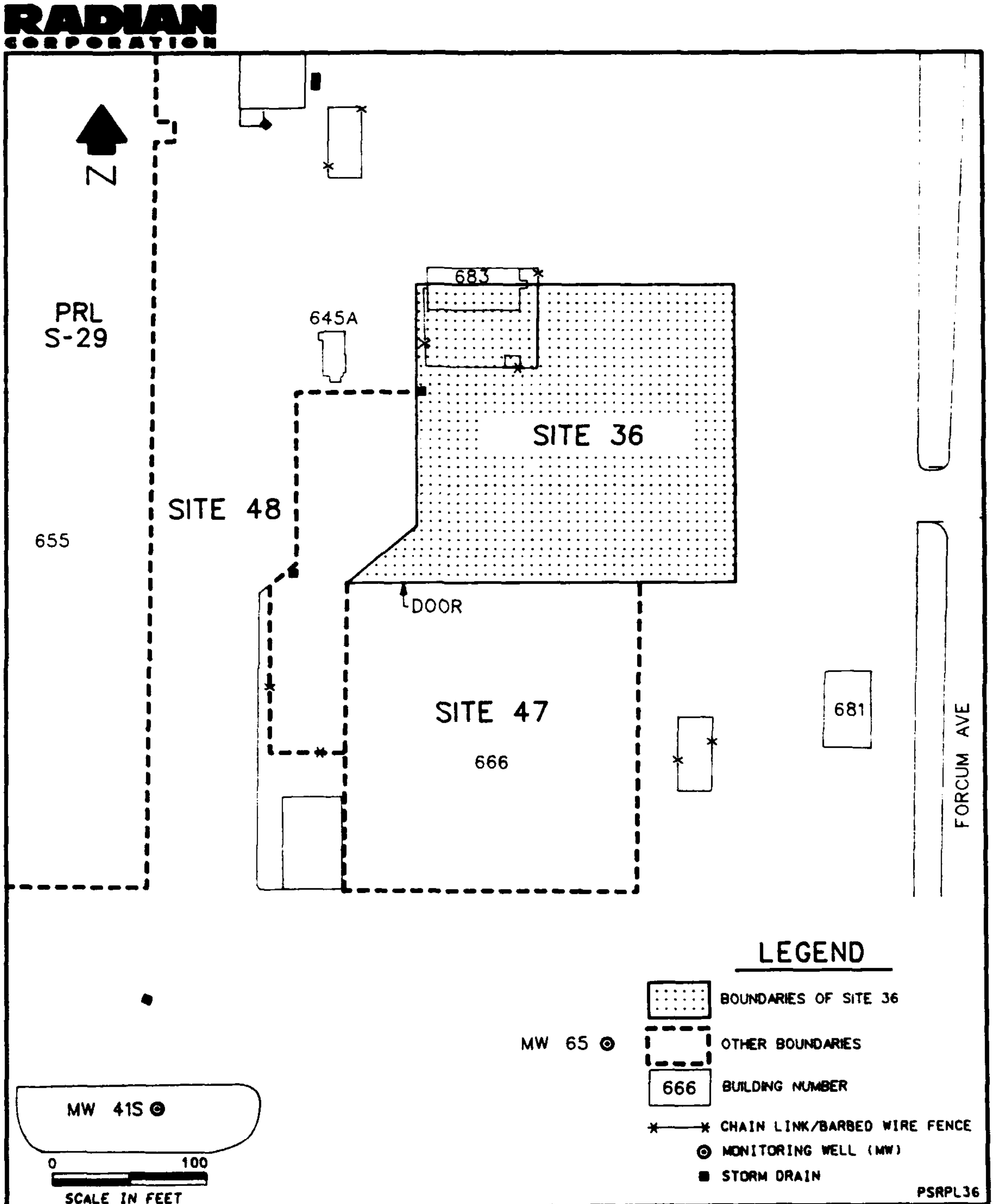

Figure 3-2. Map of Site 36 and Vicinity.

boundary and the inclusion of the northwest corner within the site boundaries. Further interviews with base personnel knowledgeable of historical operations at Site 36 may provide information that clarifies these boundaries.

3.2 Historical Activities

Aerial photographs reveal no activity occurred at Site 36 until 1946. Between approximately 1946 and 1949, aerial photographs indicate that airplanes and what appear to be tractor-trailer trucks parked across the site. In a 1951 photograph, the planes and trucks are no longer present, and no other activity can be seen in aerial photographs prior to the construction of Building 666.

Aerial photographs confirm that after the construction of Building 666 in 1957, Site 36 was used as a storage area. The most extensive storage activity appears to have occurred between approximately 1962 and 1971. During these years, storage containers were distributed from the pavement strip that borders Building 666, across the unpaved area which constitutes the remainder of Site 36, and beyond its boundary on the north. Aerial photographs reveal that a 30-foot wide paved strip has bordered Building 666 since its construction. The remainder of Site 36 was not paved until sometime after 1971. Portions of this unpaved area (approximately 50 to 80 feet north of Building 666) are discolored on the 1962 and 1965 aerial photographs.

Personnel interviews were conducted by Radian to determine the type, quantity, and containment methods for chemicals stored at Site 36 (Cruz, personal communication, 1989; Burns, personal communication, 1989). Table 3-1 summarizes the historical information obtained. The most common type of chemicals stored at Site 36 were acids used in the plating processes of Building 666. The acids were contained in 13-gallon glass bottles which were stored in styrofoam inserts inside wooden crates on the upaved portion of Site 36. Both empty and full acid bottles were stored at Site 36. Other chemicals stored on site included trichloroethene and sodium hydroxide that were stored in 55-gallon drums and 50- to 100-pound drums, respectively. Personnel interviewed for this investigation indicated that other plating shop chemicals may have been stored at Site 36, but specific chemicals could not be identified.

Sometime between 1965 and 1970, a lean-to with an asphalt floor was constructed adjacent to the north side of Building 666. Dry sodium dichromate and ammonium nitrate were stored in this lean-to along with other chemicals that could not be identified by personnel interviewed for this site. In 1971, a rectangular storage bin

TABLE 3-1. SUMMARY OF COMPOUNDS STORED ON SITE 36

Compound	Physical State	Containment Method
Ammonium nitrate	Dry flakes	Bags stored inside lean-to
Chromic acid	Dry flakes	NA
Hydrochloric acid	Liquid	13-gallon glass bottles
Nitric acid	Liquid	13-gallon glass bottles
Sodium dichromate	Dry flakes	Bags stored inside lean-to
Sodium hydroxide	Dry flakes	50- to 100-pound drums
Sulfuric acid	Liquid	13-gallon glass bottles
Trichloroethylene	Liquid	55-gallon drums

NA = Not available.

SOURCE: Cruz, personal communication, 1989; Burns, personal communication, 1989.

was constructed approximately 50 feet north of Building 666. This bin was built on a platform above ground and was used to store plating shop chemicals. Personnel interviewed regarding the site could not recall the specific chemicals stored in the bin. An office trailer was located east of Building 683 sometime after 1972. This trailer housed the Plant Services Maintenance Office and was not used for chemical storage.

Chemicals stored at Site 36 were normally transferred to Building 666 by pouring the chemical from the storage container (i.e., drum or glass bottle) into a smaller container for transport to the plating shop. Any spills which occured during this process would have fallen on the bare dirt of Site 36. Any spills of liquid or powdered chemicals that fell to the pavement strip surrounding Building 666 were washed into the dirt of Site 36 with high pressure hoses. Spills that occurred inside Building 666 were periodically washed from the interior floor and directed out through the door on the north side of the building toward Site 36 (Cruz, personal commuication, 1989).

3.3 Current Activities

Site 36 was visited by Radian personnel on 6 February 1989 to determine the current status of the site. The only current use of Site 36 appears to be automobile parking on the northeast portion of the site. A map showing the present features of Site 36 is presented in Figure 3-3. All storage containers have been removed from Site 36 except for one tank located on the northeast corner of the site. This tank is mounted on a platform and labeled "Diesel Fuel."

Approximately half of the site is enclosed by the fence surrounding Building 666. Both Building 666 to the south and IWTP No. 4 to the west of Site 36 have been dismantled. The concrete foundation of Building 666 and the 30-foot wide pavement strip which borders it remain. Only concrete pads are left from the IWTP (see Figure 3-3).

Site 36 is currently covered by a combination of gravel, broken concrete, and intact concrete. The approximate locations of each of these groundcovers are shown in Figure 3-3. No vegetation or discolored soil was evident during the site visit.

The surface of Site 36 generally slopes gently to the west. During the site visit, small pools of water were noted on the north and east sides of the site. Two storm drains, which discharge to Arcade Creek, are located at Site 36 (McClellan AFB, 1967). The locations of these features are shown in Figure 3-3.

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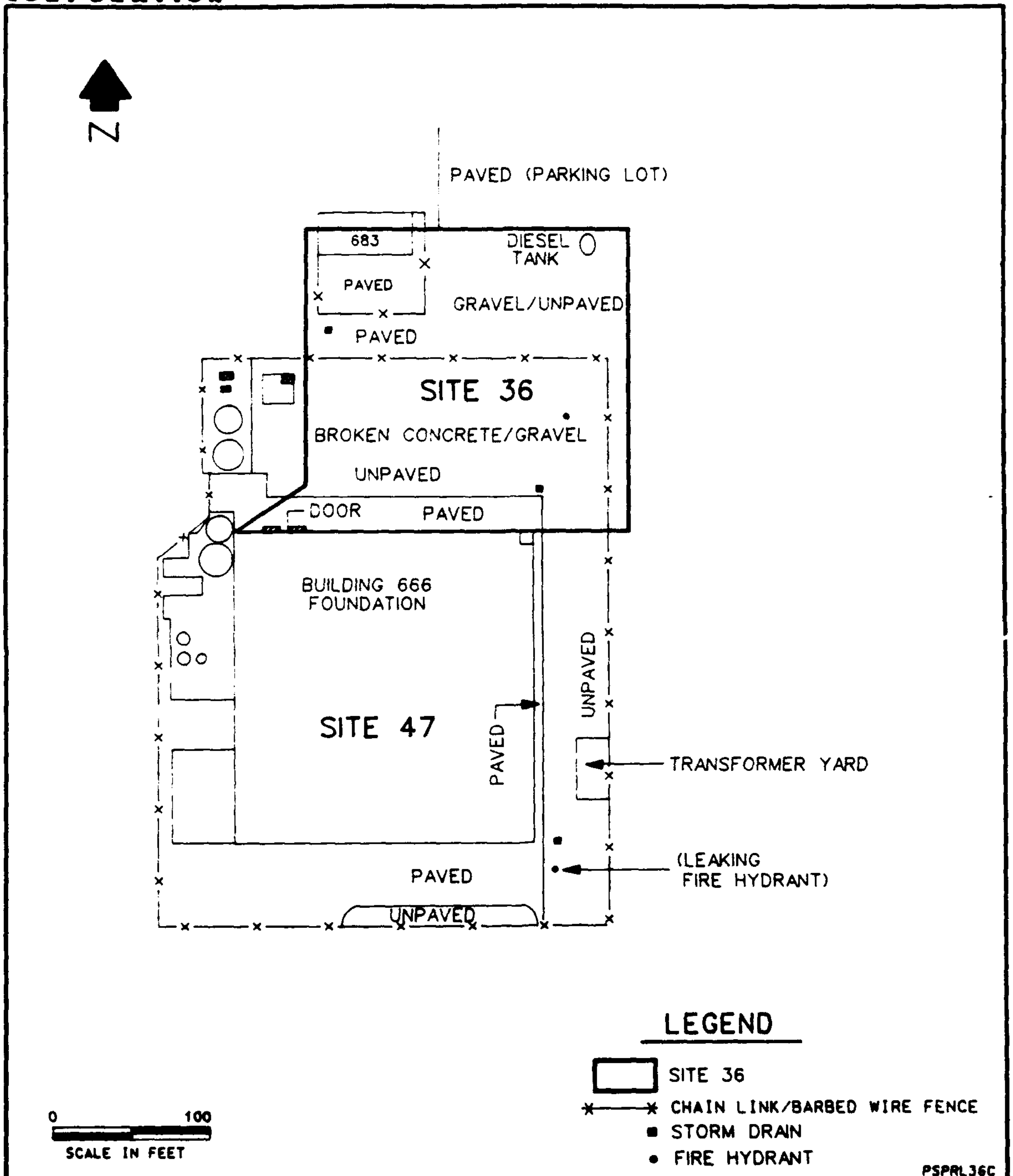

Figure 3-3. Current Conditions at Site 36 and Vicinity.

3.4 Reported Releases

Releases of specific contaminants, if any, have not been documented at Site 36.

3.5 Remedial Actions

By approximately 1981, the storage containers located at Site 36 had been removed. Aerial photographs reveal that most of the structures located at Site 36 were removed by 1982. The fence that encloses the southern half of Site 36 was constructed in 1987. No other remedial actions have been documented.

4.0 EXTENT OF CONTAMINATION

The following sections present the results of previous investigations at Site 36. Results of soil, soil gas, groundwater, surface water, and air monitoring investigations are presented under separate subsections.

4.1 Soil Results

This section presents the physical characterization of the soil, analytical results of soil samples, and an evaluation of the adequacy of the soil characterization. The results discussed in this section are from data obtained during the 1985 McLaren Environmental Engineering, Inc., investigation (McLaren, 1986a) of Site 36. Results are also presented from soil samples collected along the perimeter of Site 36 as part of the McLaren and Harding Lawson investigations of neighboring sites, Site 47 and Site 48 (McLaren, 1986a; Walker, 1983).

McLaren Investigation of Site 36

McLaren drilled three types of borings during their investigation of Site 36: shallow auger profile borings (SAPs), waste sample borings (WSBs) and soil sample borings (SSBs). Boring locations for Site 36 are shown in Figure 4-1. Eighteen SAPs were drilled in a 50-foot grid pattern across Site 36. These borings were drilled to an average depth of 10 feet below ground surface (BGS) using a 4-inch solid stem auger. Two WSBs were drilled between the SAPs that had the highest soil gas readings (i.e., between borings 36SAP16 and 36SAP17; between borings 36SAP10 and 36SAP14). One of the WSBs was drilled to a depth of 60 feet BGS at the western edge of Site 36 and the other was drilled to a depth of 70 feet BGS in the center of the site. To characterize any lateral migration of contaminants, two SSBs were each drilled to a depth of 60 feet BGS, one on the north boundary and one on the east boundary of the location. The WSBs and the SSBs were drilled using an 8-inch solid stem auger.

Investigation of Neighboring Sites

As part of McLaren's soil investigation of neighboring sites Site 47 and Site 48, nine borings were drilled along the south and west boundaries of Site 36 (see Figure 4-1). During McLaren's investigation of Site 47, five SAPs were drilled to a depth of 10 feet BGS along the south edge of Site 36. During the Harding Lawson investigation of Site 47, one boring (No. 4) was drilled in the southeast corner of Site 36; this boring was drilled to a depth of 95 feet BGS with an 8-inch hollow stem auger.

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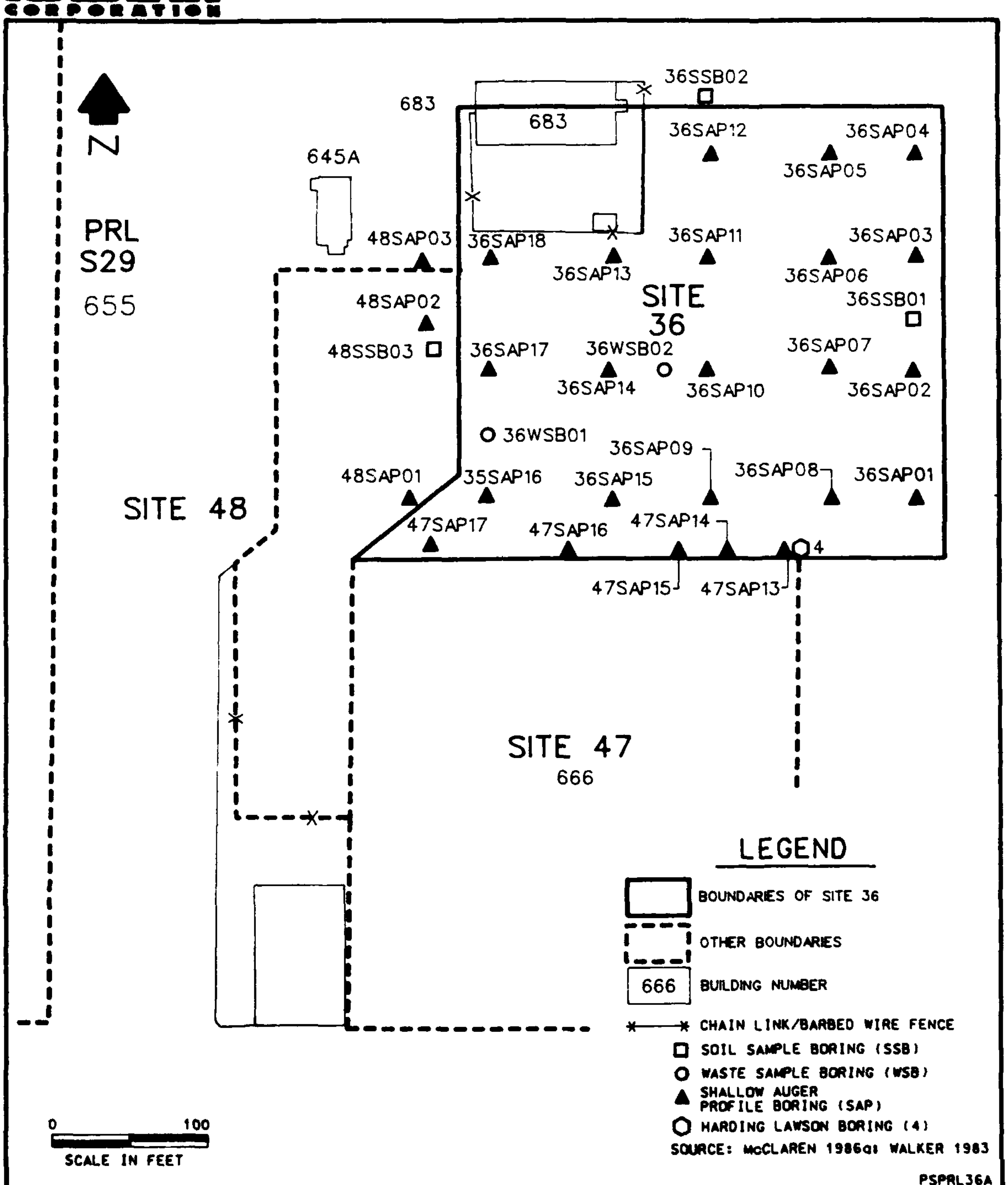

Figure 4-1. Boring Locations for Site 36.

In addition, three SAPs and one SSB were drilled between Site 48 and the west edge of Site 36 as part of McLaren's investigation of Site 48. The information from these borings is included in this Technical Memorandum because aerial photographs and personnel interviews indicate that plating shop materials were stored in the areas penetrated by these borings.

4.1.1 Physical Characteristics

Soil boring logs from 26 SAPs, 3 SSBs and 2 WSBs were used to identify the physical characteristics of the soil in the vicinity of Site 36. The soil characteristic data from the 27 SAPs generally support the SSB and WSB log data. The soils of Site 36 range from slightly moist to very moist loams, gravelly loams, and sandy clay loams. Grain size distributions were measured by McLaren from samples collected from borings 36SSB01, 36SSB02, 36WSB01, and 36WSB02. The results confirm the original classification of the soils in the boring logs.

Soil color ranges from dark yellowish brown to dark reddish brown. No unusual odors were noted in any of the borings. Discolored soil was noted between 3 and 7 feet BGS in boring 48SAP03.

4.1.2 Analytical Results

At least one sample from each WSB and SSB was analyzed for volatile organic compounds (VOCs), semivolatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), and inorganic compounds. Table 4-1 summarizes the positive analytical results for soil samples from Site 36. Detailed sampling and analytical results are presented in Tables A-1 through A-4 (Appendix A). Samples were collected through the auger stem using a modified California split-spoon sampler. The brass tubes of the sampler were separated, the ends covered with aluminum foil, capped with a 1-inch deep plastic cap, and then sealed with plastic tape. Chain-of-custody procedures were apparently followed, although specific procedures were not documented (McLaren, 1986b).

Composite samples were also collected between 0 and 10 feet BGS from the Site 47 and Site 48 SAPs drilled along the south and west edges of Site 36. The composite samples were placed inside headspace jars and analyzed for total metals.

TABLE 4-1. SUMMARY OF POSITIVE ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 36

Compound Detected	Boring Number	Depth (feet BGS)	Concentration
Volatile Organic Compounds			
Acetone	48SSB03	14.5 - 15.0	200 μg/kg
		79.0 - 79.5	110 μg/kg
2-Butanone	36SSB01	14.5 - 15.0	130 μg/kg
	36SSB02	14.5 - 15.0	350 μg/kg
Chloroform	48SSB03	79.0 - 79.5	13 μg/kg
Toluene	36WSB01	59.5 - 60.0	11 μg/kg
	36WSB02	34.5 - 35.0	23 μg/kg
1,1,1-Trichloroethane	48SSB03	79.0 - 79.5	16 μg/kg
Trichloroethene	36WSB01	59.5 - 60.0	16 μg/kg
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	36SSB01	14.5 - 15.0	110 μg/kg
	48SSB03	14.5 - 15.0	100 μg/kg
Inorganic Compounds			
Cyanide	36WSB02	34.5 - 35.0	3.7 μg/kg

μg/kg = Micrograms per kilogram.
BGS = Below ground surface.

SOURCE: McLaren 1986a.

Samples collected from the Harding Lawson boring drilled in the southeast corner of Site 36 were analyzed for anions. Analytical results are presented in Table A-5 (Appendix A). Five soil samples were collected between 1 and 92.5 feet BGS with a split-barrel sampler using hollow-stem auger equipment.

Volatile Organic Compounds

Eleven samples from five borings at depths of from 15 to 79 feet BGS were analyzed for U.S. Environmental Protection Agency (U.S. EPA) priority pollutant VOCs (Table A-1 [Appendix A]). Six different VOCs were detected: 2-butanone, toluene, trichloroethene, acetone, chloroform, and 1,1,1-trichloroethane. Figure 4-2 shows the maximum levels of organic compounds detected in borings in and around Site 36. The maximum detected concentration of any compound was 350 micrograms per kilogram (μg/kg) (parts per billion [ppb]) of 2-butanone, in boring 36SSB02. The most frequently detected compounds were 2-butanone and toluene, which were each detected in two borings.

Semivolatile Organic Compounds

Six samples from four borings at depths of from 15 to 35 feet BGS were analyzed for U.S. EPA priority pollutant semivolatile organics (Table A-2 [Appendix A]). The only compound detected was bis(2-ethylhexyl)phthalate at a concentration of 110 μg/kg in boring 36SSB01; however, this compound is a known laboratory contaminant.

Pesticides and PCBs

Seven samples from five borings at depths of from 15 to 35 feet BGS were analyzed for U.S. EPA priority pollutant pesticides and PCBs (Table A-3 [Appendix A]). No pesticides or PCBs were detected in any of the samples.

Metals

Soil samples from the SSBs, WSBs, and SAPs drilled in and around Site 36 were analyzed for total and/or extractable concentrations of the metals listed in California Code of Regulations, Title 22; seven duplicate samples were also analyzed for selected metals (Table 4-4 A-4 [Appendix A]). All samples collected from the SSBs and WSBs and analyzed for metals were collected from depths greater than 14.5 feet BGS. Composite samples were collected from the SAPs drilled along the perimeter of Site 36

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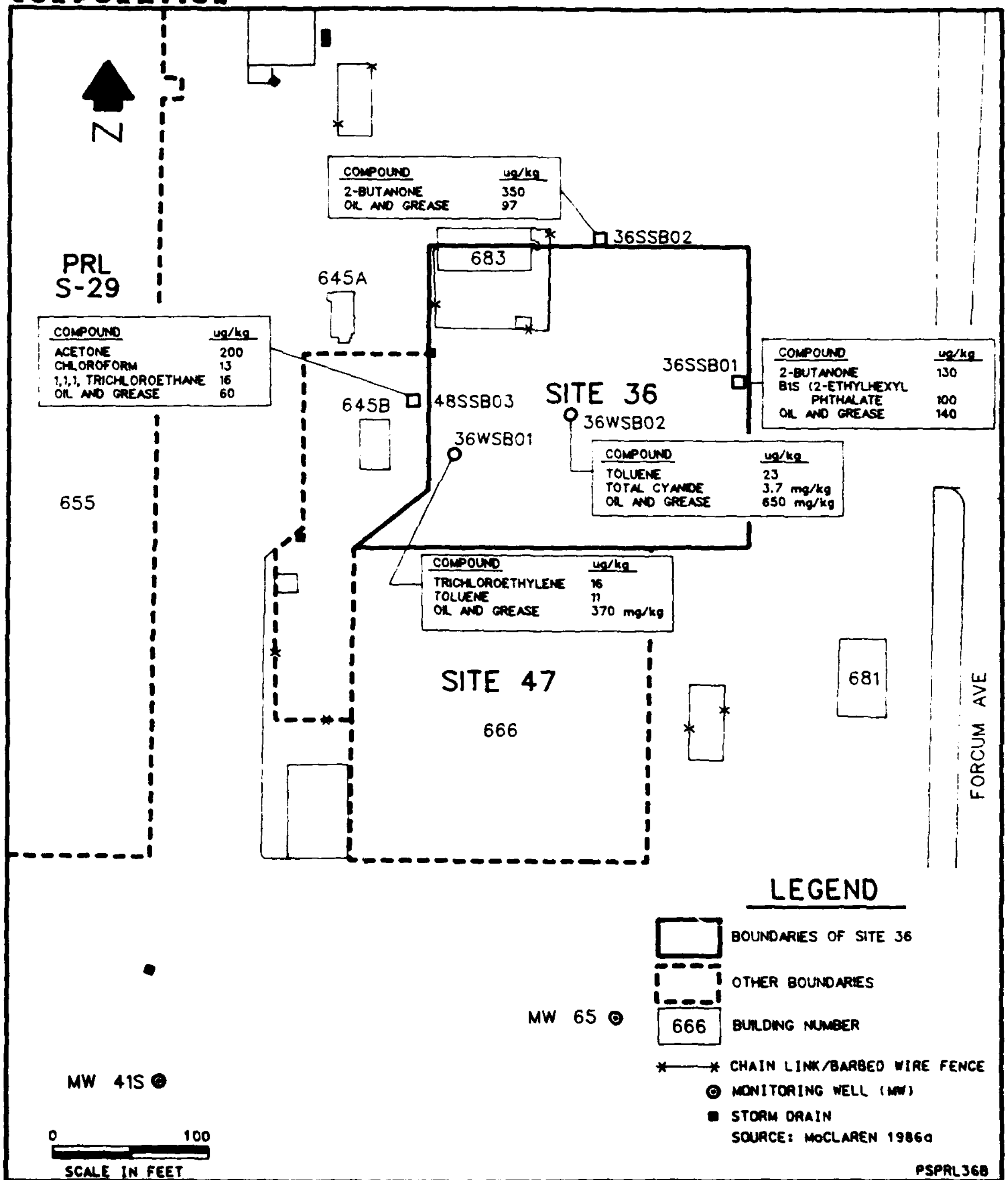

Figure 4-2. Maximum Level of Compounds Detected in and around Site 36.

as part of the soil investigation of Site 47 and Site 48; these samples were collected between 0 and 10 feet BGS and analyzed for total metals.

Whereas the presence of any detectable amount of priority pollutant organic indicates contamination from a manufactured source, most soils have some natural concentrations of metals present. Because no other criteria have been established for evaluating metal contamination at McClellan AFB, California hazardous waste criteria were used as a basis of comparison (California Code of Regulations, Title 22, Section 6699). All total metal concentrations were below the applicable Total Threshold Limit Concentrations (TTLCs). All extractable metal concentrations were below the applicable Soluble Threshold Limit Concentrations (STLCs).

Cyanide

Fourteen samples from 10 borings were analyzed for cyanide; the analytical method was not specified by either McLaren or Harding Lawson (Table A-5 [Appendix A]). Cyanide was detected only in boring 36WSB02, at a concentration of 3.7 mg/kg at a depth of 34.5 to 35 feet BGS.

Oil and Grease

One sample from each WSB and SSB drilled in and around Site 36 was analyzed for oil and grease. Four duplicate samples were also analyzed, but whether the samples analyzed were field duplicates or laboratory duplicates was not specified (Table A-5 [Appendix A]). Although oil and grease was detected in all the SSBs and WSBs at concentrations ranging from 60 mg/kg to 650 mg/kg, regulatory limits with which to compare the concentrations have not been established.

Quality Assurance/Quality Control (QA/QC)

The quality assurance/quality control (QA/QC) information available for these analyses was limited to sample detection limits and occasional duplicate results (McLaren, 1986a; McLaren, 1986b). For a complete evaluation of the data, additional information is required, including results from method blanks, laboratory blanks, field blanks, laboratory replicates, laboratory spikes, and performance audit samples. Without this information, it is impossible to estimate the precision of analyses or determine if any systematic bias or artificial contamination was present in the results. However, some general considerations can be discussed regarding the quality of these analyses. For organic compounds, U.S. EPA Methods 8080, 8240 and 8270 are appropriate analytical methods for this type of investigation. Each has specific recommendations for QA/QC as part of the method procedure. Although no indications of analytical accuracy or precision were provided in the reports, these parameters may be within acceptable limits, as long as the specified QA/QC recommendations were followed by experienced technicians.

Analytical methods for inorganic compounds were not specified; instead, methods were referenced to the Waste Extraction Test in the California Assessment Manual (CAM-WET), a former reference of California-approved methods for waste classification. The California Assessment Manual allows several analytical methods for each metal, but it is unknown which ones were actually used. Although CAM has been discontinued, the methods referenced are still applicable under present standards.

The analytical method for cyanide was not specified. Assuming U.S. EPA Method 335.2 was used (the method was specified by another laboratory used by McLaren), this distillation method is intended for water and wastewater samples and is unreliable for soil samples. However, the laboratory cyanide analyses most likely would have detected some level of cyanide had it been present in the soil. At the time of the analyses, no other U.S. EPA-approved cyanide method was available.

One unusual characteristic of the entire McLaren data set is that each compound has the same detection limit between samples having different composition. The uniformity of detection limits may indicate that samples were not properly diluted before quantitation or that dilutions were made, but not reported. Either of these omissions would result in true detection limits that were higher than those indicated in the results.

Duplicate results were available for some samples. McLaren did not indicate in their reports whether duplicate results were from laboratory or field duplicate samples. Radian assumed these duplicate results were from duplicate samples obtained in the field because unique identification numbers had been assigned to the samples by McLaren.

4.1.3 Adequacy of Soil Characterization

The following criteria were used by Radian to determine the adequacy of a soil characterization (U.S. EPA, 1986, p. 9-5):

- The number and placement of soil borings are adequate to define both the lateral and vertical extent of contamination;

- Representative samples of soil be collected; and

- Samples are analyzed using appropriate methodology for the suspected contaminants.

Lateral Extent of Contamination

The SAPs drilled during the Site 36 investigation were adequate to determine the presence of any contaminants detectable by field methods (i.e., visual inspection and soil gas measurements). The eighteen SAPs, spaced approximately 50 feet apart, that were drilled across Site 36 adequately covered the area that aerial photographs reveal was used for storage. As part of the soil investigations of Site 47 and Site 48, eight additional SAPs were drilled along the south and west perimeter of Site 36 (see Figure 4-1). At least one SAP was drilled in each area that aerial photographs and personnel interviews indicate were once used for storing materials. However, no samples were collected from the Site 36 SAPs and the samples collected from the Site 47 and Site 48 SAPs were analyzed for total metals only. Additional borings are needed to determine the lateral extent of contamination.

Two WSBs were drilled between the SAPs which had the highest soil gas readings; this strategy is appropriate for determining boring locations. However, no WSBs were drilled in the area directly outside the door on the north side of Building 666 (See Figure 3-2). Personnel interviews indicated that spills of plating shop materials inside Building 666 were periodically washed through the outside door of the building onto Site 36. Samples collected from WSBs drilled in this area would determine the presence of any soil contamination that occurred there.

The SSBs were drilled in three locations to determine the potential for contaminants to migrate off site. An SSB was drilled along each of the north, east, and west sides of Site 36. Without characterization of the presence or extent of on-site contamination, the adequacy of the three SSBs cannot be evaluated. Samples from two SSBs had detectable concentrations of 2-butanone, toluene, bis(2-ethylhexyl)phthalate, and oil and grease. The third (48SSB03) contained concentrations of chloroform and 1,1,1-trichloroethane.

Vertical Extent of Contamination

The depths from which samples were analyzed from the WSBs and the SSBs of Site 36 may be adequate to determine the greatest vertical extent of contamination, if the WSBs and SSBs were drilled in areas where contaminants had potential to migrate vertically. Samples were generally collected from the SSBs and WSBs at intervals between 15 and 30 feet BGS and between 60 and 70 feet BGS. Although chemicals from the plating shop were reportedly spilled on the surface soil, no samples were collected from the SSBs and WSBs at a depth less than 14.5 feet BGS. Above 15 feet BGS is the likely interval in which relatively immobile semivolatile and metallic source materials would remain. Shallower samples were collected from the Site 47 and Site 48 SAPs and from Boring 4, but these samples were analyzed only for metals and anions, respectively. Also, these borings are located along the southern and western border of Site 36 and characterize only a limited portion of Site 36. Therefore, additional surface and shallow subsurface soil samples are needed at Site 36 to adequately characterize the site.

The soil samples collected from the WSBs and SSBs were analyzed for VOCs, semivolatile organic compounds, PCBs, pesticides, inorganics, miscellaneous anions and other compounds. The information gathered from personnel interviews indicate that the analyses performed were adequate with one exception. The pH of the soil should have been measured because acids for the plating shop were reportedly stored and spilled on site, and low pH values in the soils would have indicated the presence and extent of acid contamination. The presence of acid is particularly important for surface and near-surface soils.

4.2 Soil Gas Results

McLaren Investigation

This section summarizes the results of soil gas measurements taken during the 1985 McLaren investigation (McLaren, 1986a). While drilling each of the SAPs in and around Site 36, McLaren recorded photoionization detector (PID) readings of soil gases emitted from cuttings every 5 feet. Samples were also collected from 1, 3, 5 and 10 feet BGS and composited. These composite samples were placed in a headspace jar and the soil gases emitted were recorded with a PID. For each WSB and SSB, both cutting and headspace soil gas readings were taken every 5 feet.

The maximum soil gas readings from soil cuttings and from the headspace jars taken from soil samples collected from at the SAPs, WSBs, and SSBs are presented in Table B-1 (Appendix B). Boring 36SAP17 had the highest PID, reading with a composite headspace reading of 350 parts per million by volume (ppmv). Borings 36SAP16, 36SAP17, and 36SAP12 all had headspace readings from composite samples in excess of 300 ppmv. McLaren noted that the high soil gas readings may be water artifacts caused by moisture buildup within their PID instruments.

Prior to drilling, the PID reading of ambient air was recorded. All subsequent cutting and headspace readings were reported relative to this background reading. Quality assurance measures included calibrating the PID instruments daily with standardized isobutylene and keeping a calibration logbook. It is unknown if the PID was calibrated to zero with ambient air or a source of uncontaminated air.

McLaren's investigation qualitatively characterized the soil gas concentrations at Site 36. However, because of the uncertainties related to the high readings measured during the investigation, the soil gas data should be considered unreliable.

Radian Investigation

In 1989, Radian performed a ground surface soil gas screening of Site 36 as part of the Preliminary Pathways Assessment for McClellan AFB (Radian, 1988d). As part of this screening, PID and organic vapor analyzer (OVA) readings were measured 3 inches above the ground surface of Site 36 while the location was traversed in 20-foot intervals. Only the northern half of the location was screened because the southern half was fenced and inaccessible. Ambient air was measured 5 feet above the ground surface upwind of Site 36. The PID measurement for ambient air at Site 36 was 1.2 ppmv; the maximum PID measurement during the traverses was 1.5 ppmv. The OVA measurement for ambient air at Site 36 was 1.2 ppmv; the maximum OVA measurement during the traverses was 1.4 ppmv (Radian, 1989). The PID and OVA were factory calibrated prior to field activities and were checked daily before and after field activities using trichloroethane and benzene, respectively. Refer to the McClellan AFB Quality Assurance Project Plan (QAPP) for details on Radian field procedures (Radian, 1988e). These PID and OVA measurements are adequate as a preliminary screening of the amount of soil gas that is migrating to the air at Site 36.

4.3 Groundwater Results

Because this Technical Memorandum is concerned only with site-specific data, only groundwater results from downgradient wells that have detectable amounts of the same constituents associated with Site 36 are relevant. Historically, the groundwater of McClellan AFB has flowed south and southwest. Monitoring Well (MW) 41S and MW-65 are the only monitoring wells in the vicinity of Site 36 which are located south or southwest of Site 36.

Tables C-1 through C-7 (Appendix C) summarize the available sampling data and analytical results for MW-41S and MW-65. The compounds detected in the soil of Site 36 and also in the groundwater of MW 41S are chloroform and trichloroethene. The compounds detected in the soil of Site 36 and also in the groundwater of MW-65 are toluene and trichloroethene. A complete discussion of the sampling and analytical methods for these results is presented in Radian's "Quarterly Sampling and Analysis Program" reports (Radian, 1984-1988e).

4.4 Surface Water Results

Although no surface water samples that can be specifically related to Site 36 have been collected for analysis, surface water at McClellan AFB is regularly monitored under two National Pollutant Discharge Elimination System (NPDES) permits. The first requires that surface water from Arcade Creek, Second Creek, and Magpie Creek be sampled monthly where it enters the base, and again where it exits; these samples are analyzed for volatile organic compounds (VOCs) and heavy metals. The second permit outlines waste discharge regulations for the base groundwater treatment plant (located in Operable Unit (OU) C of McClellan AFB), including effluent analyses of VOCs, semivolatile organic compounds, and heavy metals. The NPDES permits establish limits on concentrations of VOCs, semivolatile organic compounds, and heavy metals in surface water discharged from McClellan AFB. Under the permit requirements, concentrations of these compounds must not exceed the established limits.

4.5 Air Monitoring Results

No air monitoring results have been specifically associated with Site 36.

5.0 POTENTIAL HAZARDS

The following sections discuss the potential contaminants of concern, immediate hazards, and potential for migration resulting from any on-site contamination at Site 36.

5.1 Potential Contaminants of Concern

The contaminants of concern at Site 36 are the volatile organic compounds (VOCs), metals, acids, and bases known to have been used at the site and detected during previous investigations (see Sections 3 and 4). Section 4, Extent of Contamination, provides a detailed description of previous investigations at Site 36, and is summarized below:

- A total of 22 borings were drilled, 4 of which were drilled to depths greater than 10 feet below ground surface (BGS);
- Visual evidence of contamination was encountered in one boring;
- Samples were collected and analyzed for VOCs, semivolatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), metals, cyanide, and oil and grease;
- Six VOCs were detected in five borings and cyanide was detected in one boring; bis(2-ethylhexyl)phthalate was also detected, but it is a common laboratory contaminant and is not considered a contaminant of concern;
- Three borings had maximum soil gas readings above 300 parts per million by volume (ppmv), although these readings are believed to be greater than actual values; and
- Additional borings are needed to determine the lateral and vertical extent of contamination.

Table 5-1 lists the organic chemicals detected at this site along with certain physical characteristic values that influence their mobility. Inorganic compounds

TABLE 5-1. PHYSICAL CHARACTERISTIC VALUES FOR ORGANIC COMPOUNDS DETECTED AT SITE 36

Compound	Log K_{ow}[a]	Water Solubility[b] (mg/L)	Vapor Pressure[b] (mm Hg)
Volatile Organic Compounds			
Dichloromethane	1.3	20,000	3.6
1,1,2,2-Tetrachloroethane	2.4	2,900	5.0
1,1,1-Trichloroethane	2.4	1,500	123
Trichloroethene	2.4	1,100	57.9
Semivolatile Organic Compounds			
Benzo(a)anthracene	5.6	0.006	2.2×10^{-8}
Benzo(k)fluoranthene	6.8	0.004	5.1×10^{-7}
Chrysene	5.6	0.002	6.3×10^{-9}
bis(2-Ethylhexyl)phthalate	5.3[c]	1.3[c]	NA
Fluoranthene	4.9	0.206	5.0×10^{-6}
Phenanthrene	4.5	1.00	6.8×10^{-4}
Pyrene	5.18	0.16	2.5×10^{-6}

[a] Log of octanol/water partition coefficient.
[b] At neutral pH at 20 - 30°C.
[c] Source: U.S. EPA Database, 1988. Water Engineering Research Laboratory.

NA = Information not available.
mg/L = Milligrams per liter.
mm Hg = Millimeters of mercury.

SOURCE: U.S. Environmental Protection Agency, 1986. Superfund Public Health Evaluation Manual. OSWER Directive 9285.4-1.

are not listed in the table because the specific compounds present in the soil are unknown.

5.2 Immediate Hazards

This section describes any potential hazards, including the potential for fire and explosion and the possible worker health and safety hazards that require immediate action due to contaminants present at Site 36. Because the concentration of soil VOCs and soil gas are far below the lower explosive limit, the potential for fire and explosion is expected to be low.

Potential hazards to worker health and safety are limited to inhalation, ingestion, or dermal contact of any contaminated near-surface soil. Approximately 70 percent of Site 36 is covered with broken concrete or gravel; the remaining 30 percent is asphalt, intact concrete, or buildings. These surface characteristics minimize the amount of dust and particulates released from the site, and no immediate hazards to worker health and safety are believed to exist. However, potential exposures should be reevaluated if construction or excavation activities are planned for the site.

5.3 Potential for Contaminant Migration

This section describes the potential for wastes to migrate from Site 36 to the groundwater, surface water, and air. The potential for contaminant migration is dependent on the characteristics of the site, and the nature of the contaminants. Although site-specific information is limited, it is possible to discuss general considerations of contaminant migration from this site.

5.3.1 Potential for Migration to Groundwater

The most important factors that influence migration to groundwater are surface water infiltration rate, other sources of percolating water, percolation rate, and contaminant characteristics.

The infiltration rate for soil is primarily determined by surface characteristics of the area and permeability of the soil. Although permeability data on the soil at Site 36 are not available, boring logs reveal that soils range from gravelly loams to sandy clay loams. The relative permeabilities for these soils range from very low to moderate. However, the gravel and broken concrete which comprise approximately 70 percent of the site increase the infiltration rate for the soil. Therefore, the infiltration rate for this site is potentially low to moderate.

The percolation rate of contaminants depends on the soil permeability, structure, stratification, and characteristics of the contaminants. As stated above, the soil types at Site 36 have very low to moderate permeabilities associated with them and boring logs do not indicate any impermeable layers that could be effective barriers to percolation.

The contaminants of concern at Site 36 are VOCs, metals, cyanide, semivolatile organic compounds, acids, and bases. Five of the six VOCs detected have relatively high water solubilities and moderate to low octanol/water partition coefficients (K_{ow}) (Table 5-1), which indicate that these contaminants have a relatively high potential for dissolving in infiltrating surface water and being carried with the flow of percolating water. Although data on these specific physical characteristics were not found for 2-butanone, based on its chemical similarity to acetone, it is also likely to be very soluble in water and have a moderate K_{ow} value.

No specific inorganic compounds are suspected at Site 36. However, cyanide compounds were used at this location, and cyanide was detected in soils samples from previous investigations. Generally, cyanide compounds oxidize rapidly in aerobic alkaline conditions, and evolve hydrogen cyanide gas in acidic conditions. However, soluble cyanide is stable in low concentrations in neutral or slightly acidic solutions and has potential to migrate to groundwater.

The mobility of metals is limited by the least soluble compound of the metal in the percolating ground water (Lindsay, 1979). Because hazardous metals generally form practically insoluble precipitates in soil at neutral or alkaline pH, these metals tend to remain in surface soils and do not migrate with percolating water.

It is worthwhile noting, however, that dissolved acids may significantly increase the solubility of metal compounds. If acidic compounds have been released to the soil at Site 36, metals may have migrated in the acidic soil solution. However, the natural buffer capacity of clay and loamy soils is able to partially neutralize moderate amounts of acid wastes and metals would quickly precipitate out of solution as the pH was neutralized.

5.3.2 Potential for Migration to Surface Water

The primary characteristics affecting the potential for contaminant migration to surface water are the topography and surface characteristics of the site. The same contaminant characteristics affecting migration to groundwater also affect migration to surface water. Site 36 is relatively flat, and according to McClellan AFB surface drainage maps, surface drainage from the site flows into two storm drains which discharge to Arcade Creek.

The surface of Site 36 is primarily concrete, broken concrete, and gravel, thus allowing little opportunity for any contaminants to dissolve into runoff or for sediment to be transported with runoff. However, the surface concentrations of any contaminants have not been determined and the actual risk of dissolved or suspended contaminants in the runoff is unknown.

5.3.3 Potential for Migration to Air

Surface characteristics of the site and contaminant characteristics also influence the potential for migration to air. Because approximately 70 percent of the site is uncovered (i.e., broken concrete or gravel), any near-surface contaminants in these areas are able to volatilize and enter the gaseous phase. Vapor pressure is a measure of the volatility of a chemical in its pure state and is a relative indicator of the rate of vaporization from soils and solid waste sites. Table 5-1 lists the available vapor pressures for the organic chemicals detected at Site 36. The vapor pressures for the VOCs are relatively high, which indicate that any VOCs present in surface and near-surface soils are likely to migrate to the air.

The surface flux (concentration of organic compounds entering the air from the soil in a unit time) is dependent upon soil permeability, soil moisture, depth of contaminants, concentration of contaminants in the soil gas, and other physical soil properties that have not been quantified. Because some soil gas measurements were as high as 350 ppmv, the surface flux of VOCs to the air could be significant.

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6.0 EVALUATION OF PREVIOUS CONTRACTORS' RECOMMENDATIONS

Previous contractors have not made specific recommendations for remedial actions or futher investigations at Site 36.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Aerial photographs from the 1950s, 1960s, and 1970s confirm that materials were stored at Site 36 from 1957 to approximately 1980. Personnel interviews indicate that materials from the adjacent plating shop (Building 666) were stored and occasionally spilled onto the soil surface of Site 36. In addition, spills which occurred inside of Building 666 were periodically washed outside through the north door of the building onto the soils of Site 36.

Although McLaren's soil investigation identified volatile organic contamination of the soil of Site 36, the investigations performed to date on Site 36 are incomplete. The pH of the soil of Site 36 was never measured even though acids were reportedly spilled on Site 36. Low pH soils at surface or shallow depths may present a hazard to employees or construction workers. The depths at which samples were collected from the WSBs and SSBs were not shallow enough to detect the presence of near-surface semivolatile organic compounds or metals. In addition, no samples were collected from the potentially contaminated soils outside of the door leading from Building 666 to Site 36.

The following activities are recommended to fully characterize the soil contamination of Site 36 and to determine the immediate hazards, if any, presented by Site 36:

- Further confirmation of the site boundaries;
- Near-surface samples should be collected from Site 36. These samples should be analyzed for volatile organic compounds (VOCs), semivolatile organic compounds, and priority pollutant metals using appropriate analytical methods;
- Additional soil samples should be collected from the soil outside of the door leading from the north side of Building 666;
- The pH of all soil samples collected should be measured; and
- Soil borings and monitoring wells will be completed as necessary during the Remedial Investigation to determine the extent of contamination.

Any further investigation of Site 36 should be integrated with the investigations of the adjoining sites--Building 666 (Site 47) and Industrial Waste Treatment Plant (IWTP) No. 4 (Site 48). Each of these sites was associated with the operations in Building 666. Materials stored on Site 36 were used in the plating processes of Building 666 and wastewater produced from these processes were ultimately sent to the IWTP.

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APPENDIX A

Analytical Results for Soil Samples

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TABLE A-1. VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 36 (UNITS IN UG/KG)

Boring Number	36WSB01	36WSB01	36WSB01	36WSB02	36WSB02	36SSB01	36SSB01	36SSB02	36SSB02
Depth (feet BGS)	19.5-20.0	19.5-20.0	59.5-60.0	34.5-35.0	69.5-70.0	14.5-15.0	59.5-60.0	14.5-15.0	59.5-60.0
Date Sampled	06/25/85	06/25/85	06/25/85	06/26/85	06/26/85	07/23/85	07/24/85	07/24/85	07/25/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240
Date Analyzed	--	--	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC									
Laboratory QC	NS	FDA*	NS	NS	NS	NS	NS	NS	NS
Acetone	<100	<100	<100	<100	<100	<100	<100	<100	<100
Acrolein	<100	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<100	<100	<100	<100	<100	<100	<100	<100	<100
2-Butanone	<100	<100	<100	<100	<100	130	<100	350	<100
Carbon disulfide	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorodibromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<100	<100	<100	<100	<100	<100	<100	<100	<100
Dichlorobromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropylene	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Continued)

TABLE A-1. (Continued)

Boring Number Depth (feet BGS)	36WSB01 19.5-20.0	36WSB01 19.5-20.0	36WSB01 59.5-60.0	36WSB02 34.5-35.0	36WSB02 69.5-70.0	36SSB01 14.5-15.0	36SSB01 59.5-60.0	36SSB02 14.5-15.0	36SSB02 59.5-60.0
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	<100	<100	<100	<100	<100	<100	<100	<100	<100
4-Methyl-2-pentanone	<100	<100	<100	<100	<100	<100	<100	<100	<100
Styrene	<10	<10	<10	<10	<1C	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	11	23	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	16	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl acetate	<100	<100	<100	<100	<100	<100	<100	<100	<100
Vinyl chloride	<100	<100	<100	<100	<100	<100	<100	<100	<100
Xylenes (total)	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Continued)

TABLE A-1. (Continued)

Boring Number	48SSB03	48SSB03
Depth (feet BGS)	14.5-15.0	79.0-79.5
Date Sampled	07/01/85	07/02/85
Sampled By	MCR	MCR
Analytical Method	EPA 8240	EPA 8240
Date Analyzed	--	--
Laboratory	ITL	ITL
Field QC		
Laboratory QC	NS	FDA*
Acetone	200	110
Acrolein	<100	<100
Acrylonitrile	<100	<100
Benzene	<10	<10
Bromoform	<10	<10
Bromomethane	<100	<100
2-Butanone	<100	<100
Carbon disulfide	<10	<10
Carbon tetrachloride	<10	<10
Chlorobenzene	<10	<10
Chloroform	<10	13
Chlorodibromomethane	<10	<10
Chloroethane	<10	<10
2-Chloroethylvinyl ether	<10	<10
Chloromethane	<100	<100
Dichlorobromomethane	<10	<10
1,1-Dichloroethane	<10	<10
1,2-Dichloroethane	<10	<10
1,1-Dichloroethene	<10	<10
trans-1,2-Dichloroethene	<10	<10
Dichloromethane	<10	<10

(Continued)

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TABLE A-1. (Continued)

Boring Number	48SSB03	48SSB03
Depth (feet BGS)	14.5-15.0	79.0-79.5
Ethylbenzene	<10	<10
2-Hexanone	<100	<100
4-Methyl-2-pentanone	<100	<100
Styrene	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10
Tetrachloroethene	<10	<10
Toluene	<10	<10
1,1,1-Trichloroethane	<10	16
1,1,2-Trichloroethane	<10	<10
Trichloroethene	<10	<10
Trichlorofluoromethane	<10	<10
Vinyl acetate	<100	<100
Vinyl chloride	<100	<100
Xylenes (total)	<10	<10

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
FDA = Field duplicate analysis.
NS = Not specified.
* = Not confirmed.

SOURCE: McLaren, 1986a.

PSPRL36/080189/JKS

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TABLE A-2. SEMIVOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 36 (UNITS IN UG/KG)

Boring Number	36WSB01	36WSB02	36SSB01	36SSB01	36SSB02	48SSB03
Depth (feet BGS)	19.5-20.0	34.5-35.0	14.5-15.0	14.5-15.0	14.5-15.0	14.5-15.0
Date Sampled	06/25/85	06/26/85	07/23/85	07/23/85	07/24/85	07/01/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270
Date Analyzed	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL
Field QC						
Laboratory QC	NS	NS	NS	FDA*	NS	NS
Acenaphthene	<100	<100	<100	<100	<100	<100
Acenaphthylene	<100	<100	<100	<100	<100	<100
Aniline	<100	<100	<100	<100	<100	<100
Anthracene	<100	<100	<100	<100	<100	<100
Benzidine	<400	<400	<400	<400	<400	<400
Benzo(a)anthracene	<100	<100	<100	<100	<100	<100
Benzo(a)pyrene	<100	<100	<100	<100	<100	<100
3,4-Benzo(b)fluoranthene	<100	<100	<100	<100	<100	<100
Benzo(g,h,i)perylene	<100	<100	<100	<100	<100	<100
Benzoic acid	<100	<100	<100	<100	<100	<100
Benzo(k)fluoranthene	<100	<100	<100	<100	<100	<100
Benzyl alcohol	<100	<100	<100	<100	<100	<100
4-Bromophenylphenyl ether	<100	<100	<100	<100	<100	<100
Butyl benzyl phthalate	<100	<100	<100	<100	<100	<100
4-Chloroaniline	<100	<100	<100	<100	<100	<100
bis(2-Chloroethoxy)methane	<100	<100	<100	<100	<100	<100
bis(2-Chloroethyl)ether	<100	<100	<100	<100	<100	<100
bis(2-Chloroisopropyl)ether	<100	<100	<100	<100	<100	<100
p-Chloro-m-cresol	<100	<100	<100	<100	<100	<100
bis(Chloromethyl)ether	<400	<400	<400	<400	<400	<400
2-Chloronaphthalene	<100	<100	<100	<100	<100	<100
2-Chlorophenol	<100	<100	<100	<100	<100	<100
4-Chlorophenylphenyl ether	<100	<100	<100	<100	<100	<100
Chrysene	<100	<100	<100	<100	<100	<100

(Continued)

TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	36WSB01 19.5-20.0	36WSB02 34.5-35.0	36SSB01 14.5-15.0	36SSB01 14.5-15.0	36SSB02 14.5-15.0	48SSB03 14.5-15.0
Dibenzo(a,h)anthracene	<100	<100	<100	<100	<100	<100
Dibenzofuran	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	<100	<100	<100	<100	<100	<100
1,3-Dichlorobenzene	<100	<100	<100	<100	<100	<100
1,4-Dichlorobenzene	<100	<100	<100	<100	<100	<100
3,3'-Dichlorobenzidine	<100	<100	<100	<100	<100	<100
2,4-Dichlorophenol	<100	<100	<100	<100	<100	<100
Diethylphthalate	<100	<100	<100	<100	<100	<100
2,4-Dimethylphenol	<100	<100	<100	<100	<100	<100
Dimethylphthalate	<100	<100	<100	<100	<100	<100
Di-n-butylphthalate	<100	<100	<100	<100	<100	<100
4,6-Dinitro-o-cresol	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
2,4-Dinitrophenol	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
2,4-Dinitrotoluene	<100	<100	<100	<100	<100	<100
2,6-Dinitrotoluene	<100	<100	<100	<100	<100	<100
Di-n-octylphthalate	<100	<100	<100	<100	<100	<100
1,2-Diphenylhydrazine	<100	<100	<100	<100	<100	<100
bis(2-Ethylhexyl)phthalate	<100	<100	110	110	<100	100
Fluoranthene	<100	<100	<100	<100	<100	<100
Fluorene	<100	<100	<100	<100	<100	<100
Hexachlorobenzene	<100	<100	<100	<100	<100	<100
Hexachlorobutadiene	<100	<100	<100	<100	<100	<100
Hexachlorocyclopentadiene	<100	<100	<100	<100	<100	<100
Hexachloroethane	<100	<100	<100	<100	<100	<100
Indeno(1,2,3-cd)pyrene	<100	<100	<100	<100	<100	<100
Isophorone	<400	<400	<400	<400	<400	<400
2-Methylnaphthalene	<100	<100	<100	<100	<100	<100
2-Methylphenol	<100	<100	<100	<100	<100	<100
4-Methylphenol	<100	<100	<100	<100	<100	<100
Naphthalene	<100	<100	<100	<100	<100	<100

(Continued)

TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	36WSB01 19.5-20.0	36WSB02 34.5-35.0	36SSB01 14.5-15.0	36SSB01 14.5-15.0	36SSB02 14.5-15.0	48SSB03 14.5-15.0
2-Nitroaniline	<100	<100	<100	<100	<100	<100
3-Nitroaniline	<100	<100	<100	<100	<100	<100
4-Nitroaniline	<100	<100	<100	<100	<100	<100
Nitrobenzene	<100	<100	<100	<100	<100	<100
N-Nitrosodimethylamine	<100	<100	<100	<100	<100	<100
N-Nitroso-di-n-propylamine	<100	<100	<100	<100	<100	<100
2-Nitrophenol	<100	<100	<100	<100	<100	<100
4-Nitrophenol	<100	<100	<100	<100	<100	<100
N-Nitrosodiphenylamine	<100	<100	<100	<100	<100	<100
Pentachlorophenol	<100	<100	<100	<100	<100	<100
Phenanthrene	<100	<100	<100	<100	<100	<100
Phenol	<100	<100	<100	<100	<100	<100
Pyrene	<100	<100	<100	<100	<100	<100
2,3,7,8-Tetrachlorodibenzo-p-dioxin	<100	<100	<100	<100	<100	<100
1,2,4-Trichlorobenzene	<100	<100	<100	<100	<100	<100
2,4,5-Trichlorophenol	<100	<100	<100	<100	<100	<100
2,4,6-Trichlorophenol	<100	<100	<100	<100	<100	<100

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
FDA = Field duplicate analysis.
NA = Not analyzed.
NS = Not specified.
* = Not confirmed.

SOURCE: McLaren, 1986a.

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TABLE A-3. PESTICIDES/PCB ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 36 (UNITS IN UG/KG)

Boring Number	36WSB01	36WSB01	36WSB02	36SSB01	36SSB01	36SSB02	48SSB03
Depth (feet BGS)	19.5-20.0	19.5-20.0	34.5-35.0	14.5-15.0	14.5-15.0	14.5-15.0	14.5-15.0
Date Sampled	06/25/85	06/25/85	06/26/85	07/23/85	07/23/85	07/24/85	07/01/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080
Date Analyzed	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC							
Laboratory QC	NS	FDA*	NS	NS	FDA*	NS	NS
Aldrin	<10	<10	<10	<10	<10	<10	<10
alpha-BHC	<10	<10	<10	<10	<10	<10	<10
beta-BHC	<10	<10	<10	<10	<10	<10	<10
delta-BHC	<10	<10	<10	<10	<10	<10	<10
gamma-BHC (Lindane)	<10	<10	<10	<10	<10	<10	<10
Chlordane	<100	<100	<100	<100	<100	<100	<100
4,4'-DDD	<10	<10	<10	<10	<10	<10	<10
4,4'-DDE	<10	<10	<10	<10	<10	<10	<10
4,4'-DDT	<10	<10	<10	<10	<10	<10	<10
Dieldrin	<10	<10	<10	<10	<10	<10	<10
Endosulfan I	<10	<10	<10	<10	<10	<10	<10
Endosulfan II	<10	<10	<10	<10	<10	<10	<10
Endosulfan sulphate	<10	<10	<10	<10	<10	<10	<10
Endrin	<10	<10	<10	<10	<10	<10	<10
Endrin aldehyde	<10	<10	<10	<10	<10	<10	<10
Heptachlor	<10	<10	<10	<10	<10	<10	<10
Heptachlor epoxide	<10	<10	<10	<10	<10	<10	<10
Methoxychlor	<100	<100	<100	<100	<100	<100	<100
Toxaphene	<200	<200	<200	<200	<200	<200	<200
PCB-1016	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1221	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1232	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1242	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1248	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1254	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1260	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000

(Continued)

TABLE A-3. (Continued)

FOOTNOTES:

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
FDA = Field duplicate analysis.
NS = Not specified.
NA = Not analyzed.
* = Not confirmed.

SOURCE: McLaren, 1986a.

RADIAN CORPORATION

TABLE A-4. INORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED FROM SITE 36

Boring Number		36WSB01	36WSB01	36WSB02	36WSB02	36WSB02	36SSB01	36SSB01	36SSB02
Depth (feet BGS)		19.5-20.0	59.5-60.0	34.5-35.0	69.5-70.0	69.5-70.0	14.5-15.0	14.5-15.0	14.5-15.0
Date Sampled		06/25/85	06/25/85	06/26/85	06/26/85	06/26/85	07/23/85	07/23/85	07/24/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC									
Laboratory QC		NS	NS	NS	NS	FDA*	NS	FDA*	NS
Parameter	**Method**	Results (Units in mg/kg)							
Antimony	NS	<0.1	<0.01	<0.1	<0.1	NA	<0.1	NA	<0.1
Arsenic	NS	2.9	20	14	9.1	NA	12	NA	13
Barium	NS	130	130	140	120	NA	150	NA	140
Berylium	NS	0.13	0.47	0.3	0.38	0.38	<0.1	NA	<0.1
Cadmium	NS	0.13	0.49	0.13	0.22	NA	0.1	NA	0.1
Chromium	NS	14	42	20	33	NA	14	NA	13
Cobalt	NS	8.6	18	13	12	11	12	NA	11
Copper	NS	22	49	39	33	NA	27	27	21
Lead	NS	2.9	7.6	10	4.8	5.7	4.8	NA	4.8
Mercury	NS	<0.05	<0.5	0.46	<0.05	NA	0.15	NA	0.18
Molybdenum	NS	0.48	1.3	0.78	0.88	NA	3.1	NA	<1
Nickel	NS	18	62	29	37	NA	25	NA	23
Selenium	NS	<1	<1	<1	<1	NA	<1	NA	<1
Silver	NS	<0.1	<0.01	<0.1	<0.1	NA	0.1	NA	0.1
Thallium	NS	<0.1	<0.1	<0.1	<0.1	NA	0.33	NA	0.33
Vanadium	NS	26	66	46	36	NA	48	NA	41
Zinc	NS	43	80	59	67	NA	56	NA	47

(Continued)

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RADIAN CORPORATION

TABLE A-4. (Continued)

Boring Number		36WSB01	36WSB01	36WSB02	36WSB02	36WSB02	36SSB01	36SSB01	36SSB02
Depth (feet BGS)		19.5-20.0	59.5-60.0	34.5-35.0	69.5-70.0	69.5-70.0	14.5-15.0	14.5-15.0	14.5-15.0
Parameter	Method	Results (Units in mg/L)							
Extractable Antimony	WET/NS	<0.001	NA	<0.001	NA	NA	<0.1	NA	<0.1
Extractable Arsenic	WET/NS	0.011	NA	0.011	NA	NA	0.02	NA	<0.01
Extractable Barium	WET/NS	4.2	NA	8.7	NA	NA	9.7	NA	10
Extractable Berylium	WET/NS	<0.001	NA	0.002	NA	NA	<0.1	NA	<0.1
Extractable Cadmium	WET/NS	0.003	NA	0.004	NA	NA	<0.01	NA	<0.01
Extractable Chromium	WET/NS	0.063	NA	0.063	NA	NA	0.08	NA	0.14
Extractable Cobalt	WET/NS	0.24	NA	0.36	NA	NA	0.27	NA	0.3
Extractable Copper	WET/NS	0.85	NA	0.63	NA	NA	0.34	NA	0.36
Extractable Lead	WET/NS	<0.01	NA	0.044	NA	NA	<0.1	NA	0.93
Extractable Mercury	WET/NS	0.001	NA	<0.001	NA	NA	0.002	NA	0.01
Extractable Molybdenum	WET/NS	<0.1	NA	<0.1	NA	NA	<0.1	NA	0.13
Extractable Nickel	WET/NS	0.5	NA	0.44	NA	NA	0.36	NA	0.4
Extractable Selenium	WET/NS	0.018	NA	<0.01	NA	NA	<0.01	NA	<0.01
Extractable Silver	WET/NS	<0.001	NA	<0.001	NA	NA	<0.01	NA	<0.01
Extractable Thallium	WET/NS	<0.001	NA	<0.001	NA	NA	<0.01	NA	<0.01
Extractable Vanadium	WET/NS	0.26	NA	0.36	NA	NA	0.2	NA	0.27
Extractable Zinc	WET/NS	0.54	NA	0.47	NA	NA	0.67	0.67	0.75

(Continued)

TABLE A-4. (Continued)

Boring Number		47SAP13	47SAP14	47SAP15	47SAP16	47SAP16	47SAP17	47SAP17	48SAP01	48SAP01
Depth (feet BGS)		0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
Date Sampled		06/17/85	06/17/85	06/17/85	06/17/85	06/17/85	06/17/85	06/17/85	06/20/85	06/20/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC										
Laboratory QC		NS	NS	NS	NS	FDA*	NS	FDA*	NS	FDA*
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	<0.1	<0.1	<0.1	<0.1	NA	<0.1	NA	<0.1	<0.1
Arsenic	NS	11	9.7	7.6	6.6	NA	7.6	7.6	9.5	NA
Barium	NS	99	110	130	120	NA	78	68	82	93
Berylium	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	NS	0.2	0.1	0.1	0.1	NA	0.1	<0.1	<0.1	<0.1
Chromium	NS	32	29	28	31	NA	23	23	19	NA
Cobalt	NS	8.1	8.9	8.9	9.6	NA	9.7	9.9	9.8	NA
Copper	NS	14	15	18	19	NA	18	NA	15	NA
Lead	NS	6.4	5.6	6.7	35	NA	9	7.8	3.8	NA
Mercury	NS	<0.1	<0.1	0.18	0.39	NA	<0.1	NA	<0.1	<0.1
Molybdenum	NS	0.9	0.6	0.9	0.6	NA	0.6	NA	0.8	0.8
Nickel	NS	26	26	24	31	NA	23	NA	15	NA
Selenium	NS	<0.1	1.1	<0.1	0.13	NA	<0.1	0.13	<0.1	NA
Silver	NS	0.14	<0.1	<0.1	0.14	NA	<0.1	<0.1	<0.1	<0.1
Thallium	NS	<0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Vanadium	NS	36	<10	<10	27	17	27	NA	17	NA
Zinc	NS	31	29	40	36	NA	35	NA	29	NA

(Continued)

TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47SAP13 0-10	47SAP14 0-10	47SAP15 0-10	47SAP16 0-10	47SAP16 0-10	47SAP17 0-10	47SAP17 0-10	48SAP01 0-10	48SAP01 0-10
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

TABLE A-4. (Continued)

Boring Number		48SAP02	48SAP02	48SAP03	48SSB03	48SSB03	48SSB03
Depth (feet BGS)		0-10	0-10	0-10	14.5-15.0	14.5-15.0	79.0-79.5
Date Sampled		06/17/85	06/17/85	06/21/85	07/01/85	07/01/85	07/02/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL
Field QC							
Laboratory QC		NS	FDA*	NS	NS	FDA*	NS
Parameter	Method	Results (Units in mg/kg)					
Antimony	NS	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Arsenic	NS	<1	NA	<1	2.3	2.3	1.3
Barium	NS	260	NA	160	90	NA	100
Berylium	NS	<0.1	NA	<0.1	0.48	NA	0.18
Cadmium	NS	<0.1	NA	<0.1	<0.1	NA	<0.1
Chromium	NS	<1	NA	2.1	10	NA	4.2
Cobalt	NS	0.71	NA	3.7	5.7	5.8	5.9
Copper	NS	3	NA	3	14	NA	9.6
Lead	NS	<1	NA	<1	6.4	NA	8.5
Mercury	NS	<0.1	NA	<0.1	0.11	NA	<0.1
Molybdenum	NS	<0.1	NA	<0.1	<1	NA	<1
Nickel	NS	5.2	NA	4.2	14	NA	13
Selenium	NS	<0.1	NA	<0.1	<1	NA	<1
Silver	NS	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Thallium	NS	<0.1	NA	<0.1	<0.1	NA	<0.1
Vanadium	NS	<10	NA	<10	7.9	NA	5.9
Zinc	NS	14	NA	11	38	NA	36

(Continued)

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TABLE A-4. (Continued)

Boring Number		48SAP02	48SAP02	48SAP03	48SSB03	48SSB03	48SSB03
Depth (feet BGS)		0-10	0-10	0-10	14.5-15.0	14.5-15.0	79.0-79.5
Parameter	Method	Results (Units in mg/L)					
Extractable Antimony	WET/NS	NA	NA	NA	<0.001	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	<0.01	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	11	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	0.004	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	0.008	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	0.079	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	0.35	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	0.53	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	0.15	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	0.003	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	0.1	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	0.59	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	0.01	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	0.001	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	0.001	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	0.45	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	0.38	NA	NA

BGS = Below ground surface.
HLA = Harding Lawson Associates.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
PEL = Pacific Environmental Laboratory.
FDA = Field duplicate analysis.
NA = Not analyzed.
NS = Not specified.
* = Not confirmed.
WET/NS = California Assessment Manual, Waste Extraction Test; analytical method not specified.

SOURCE: McLaren, 1986a.

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TABLE A-5. MISCELLANEOUS ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED FROM SITE 36 AND VICINITY

Boring Number		4	4	4	4	4	36WSB01	36WSB01	36WSB01	36WSB02
Depth (feet BGS)		0.5-1.0	10.5-11.0	25.5-26.0	45.5-46.0	91.5-92.5	19.5-20.0	19.5-20.0	59.5-60.0	34.5-35.0
Date Sampled		11/12/82	11/12/82	11/12/82	11/12/82	11/12/82	06/25/85	06/25/85	06/25/85	06/26/85
Sampled By		HLA	HLA	HLA	HLA	HLA	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	ITL	ITL	ITL	ITL
Field QC										
Laboratory QC		NS	NS	NS	NS	NS	NS	FDA*	NS	NS
Parameter	**Method**	Results (Units in mg/kg)								
Chloride	NS	<10	<10	<10	<10	<10	NA	NA	NA	NA
Cyanide	NS	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	NA	<0.5	3.7
Fluoride	NS	2.7	2.6	2.9	2.7	3.5	NA	NA	NA	NA
Nitrate	NS	14	3	12	<5	12	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	NA	370	180	NA	650
Phosphate (total)	NS	842	1,070	1,450	918	842	NA	NA	NA	NA
Sulfate	NS	65	36	<10	18	<10	NA	NA	NA	NA

(Continued)

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TABLE A-5. (Continued)

Boring Number		36WSB02	36WSB02	36WSB02	36SSB01	36SSB01	36SSB02	47SAP13	47SAP14	47SAP15
Depth (feet BGS)		34.5-35.0	69.5-70.0	69.5-70.0	14.5-15.0	14.5-15.0	14.5-15.0	0-10	0-10	0-10
Date Sampled		06/26/85	06/26/85	06/26/85	07/23/85	07/23/85	07/24/85	06/17/85	06/17/85	06/17/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC		FDA*	NS	FDA*	NS	FDA*	NS	NS	NS	NS
Laboratory QC										
Parameter	Method	Results (Units in mg/kg)								
Chloride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	NA	<0.5	<0.5	NA	NA	NA	<0.5	<0.5	<0.5
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	530	NA	NA	140	120	97	NA	NA	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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TABLE A-5. (Continued)

Boring Number		47SAP16	48SAP01	48SAP02	48SAP03	48SSB03	48SSB03	48SSB03
Depth (feet BGS)		0-10	0-10	0-10	0-10	14.5-15.0	14.5-15.0	79.0-79.5
Date Sampled		06/17/85	06/20/85	06/27/85	06/21/85	07/01/85	07/01/85	07/02/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC								
Laboratory QC		NS	NS	NS	NS	NS	FDA*	NS
Parameter	Method	Results (Units in mg/kg)						
Chloride	NS	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	60	59	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA
Sulfate		NA	NA	NA	NA	NA	NA	NA

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
PEL = Pacific Environmental Laboratory.
ITL = IT Laboratories
HLA = Harding Lawson Associates.
-- = Not available.
FDA = First field duplicate analysis.
NA = Not analyzed.
NS = Not specified.
* = Not confirmed.

SOURCE: McLaren, 1986a.

PSPRL36/080189/JKS

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APPENDIX B

Soil Gas Results

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TABLE B-1. MAXIMUM PHOTOIONIZATION DETECTOR READINGS FROM SOIL CUTTINGS/HEADSPACE JARS AT SITE 36 (UNITS IN PPMV)

Approximate Depth	BORING NUMBER									
	36WSB01		36WSB02		36SSB01		36SSB02		36SAP02	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	0	1	0	2	0	1	1	2	0	--
10	1	6	0	5	1	1	1	4	0	30*
15	2	3	0	10	0	3	0	7		
20	1	10	1	5	0	2	1	6		
25	1	3	1	10	1	1	1	1		
30	0	2	0	5	1	2	1	3		
35	0	15	0	10	1	2	1	1		
40	0	--	0	1	3	2	1	1		
45	0	1	0	6	1	2	2	1		
50	1	6	1	11	2	3	1	1		
55	0	3	0	10	1	2	1	1		
60	0	3	0	3	1	1	0	1		
65										

* Headspace reading composited from samples collected at 1, 3, 5, and 10 feet below ground surface.

(Continued)

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TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	36SAP03		36SAP04		36SAP05		36SAP06		36SAP07	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	0	--	0	--	0	--	5	--	1	--
10	0	25*	0	40*	3	30*	2	30*	0	24*
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										

* Headspace reading composited from samples collected at 1, 3, 5, and 10 feet below ground surface.

(Continued)

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TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	36SAP08		36SAP09		36SAP10		36SAP11		36SAP12	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	20	--	20	--	20	--	10	--	20	--
10	1	40*	3	20*	4	140*	15	50*	20	320*
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										

* Headspace reading composited from samples collected at 1, 3, 5, and 10 feet below ground surface.

(Continued)

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TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	36SAP13		36SAP14		36SAP15		36SAP16		36SAP17	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	30	--	20	--	18	--	250	--	160	--
10	3	50*	180	250*	30	50*	4	320*	--	350*
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										

* Headspace reading composited from samples collected at 1, 3, 5, and 10 feet below ground surface.

(Continued)

PSPRL36/080189/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	36SAP18		47SAP13		47SAP14		47SAP15		47SAP16	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	20	--	8	--	8	--	10	--	180	--
10	0	160	10	30	--	55	2	35	10	20
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										

* Headspace reading composited from samples collected at 1, 3, 5, and 10 feet below ground surface.

(Continued)

PSPRL36/080189/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	47SAP17		47SAP18		48SAP01		48SAP02		48SAP03	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	8	--	250	10	5	30	15	--	5	2
10	5	10	50	5	2	3	5	15	1	1
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										

* Headspace reading composited from samples collected at 1, 3, 5, and 10 feet below ground surface.

(Continued)

PSPRL36/080189/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER 48SSB03 Cuttings	Headspace
5	7	6
10	1	8
15	1	15
20	1	4
25	1	3
30	10	4
35	1	5
40	1	2
45	0	3
50	1	4
55	0	4
60	0	6
65	1	5
70	1	4
75	1	2
80	1	2

Headspace reading composited from samples collected at 1, 3, 5, and 10 feet below ground surface.
-- = No readings taken.
Blanks indicate borings were terminated.
Source: McLaren, 1986a

PSPRL36/080189/JKS

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APPENDIX C

Analytical Results for Groundwater Samples

TABLE C-1. U.S. EPA METHOD 8010 ANALYTICAL RESULTS (METHOD 601 PRIOR TO OCTOBER 1988) FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S
Date Sampled			06/10/85	03/13/86	11/18/86	11/18/86	01/15/87	01/15/87	04/24/87	04/24/87	08/05/87	10/20/87	10/20/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			06/12/85	03/19/86	11/21/86	11/21/86	01/22/87	01/22/87	04/28/87	04/28/87	08/07/87	10/27/87	10/22/87
Lab			RAS	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC
Field Analysis					FDA	FDB	FDA	FDB				FDA	FDB
Lab Analysis									LDA	LDB			
Chloromethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.9C	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	ND	ND	ND	ND	ND	ND	24C	24C	20C	17C	15C
Chloroform	100	100	ND	1.4	1.1DL	ND	1.0C	1.0C	1.8DL	1.4DL	1.0C	1.0C	1.4C
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND	ND	0.99DL	0.28DL	ND	2.1C	ND
1,1,1-Trichloroethane	200	200	2.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	0.25DL	ND	ND	0.71DL	0.55DL	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND	ND	0.19DL	0.10DL	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	5	23.2	20	44C	43C	37C	37C	91C	80C	130C	81C	100C
Dibromochloromethane	[illegible]	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	3.3	0.6	0.18DL	ND	ND	ND	0.75DL	0.74DL	ND	3.2C	ND
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
C = Analysis confirmed in second column analysis
LOQ = Limit of quantitation
DL = Diluted out of the confirmation run
NE = Not established

SOURCE: Radian, 1984-1988c.

TABLE C-1. (Continued)

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
			WELL NUMBER								
Date Sampled			10/20/87	01/26/88	01/26/88	04/18/88	07/13/88	07/13/88	07/13/88	07/13/88	10/07/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/24/87	01/28/88		04/21/88	08/09/88	07/14/88	07/14/88	07/14/88	10/17/88
Lab			CES	SAC	CES	SAC	CES	SAC	SAC	SAC	SAC
Field Analysis								FDA	FDA	FDB	
Lab Analysis								LDA	LDB		
Chloromethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	ND	17C	ND	22PC	ND	23P	25P	23P	11P
Chloroform	100	100	ND	0.92PC	1.4	0.48PC	ND	1.7P	1.7P	1.7P	ND
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	5	110	140PC	190.	220PC	1100C	980P	920P	870P	2900P
Dibromochloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	ND	6.2PC	4.9	10PC	ND	52P	57P	42P	370P
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Camme Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
C = Analysis confirmed in second column analysis
LOQ = Limit of quantitation
P or PC = Identity previously confirmed
NE = Not established

SOURCE: Radian, 1984-1988c.

TABLE C-2. U.S. EPA METHOD 602 FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
Date Sampled			09/24/84	03/13/86	11/18/86	11/18/86	01/15/87	01/15/87	04/24/87	04/24/87	08/05/87	10/20/87	10/20/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			09/26/84	03/19/86	11/21/86	11/21/86	01/22/87	01/22/87	04/28/87	04/28/87	08/07/87	10/22/87	11/24/87
Lab			RAS	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	CES
Field Analysis					FDA	FDB	FDA	FDB				FDA	FDA
Lab Analysis									LDA	LDB			
Chlorobenzene	30	NE	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: Radian, 1984-1987.

TABLE C-2. (Continued)

Parameter	DHS Action Level	U S EPA Primary MCL	WELL NUMBER MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S	MW 41S
Date Sampled			10/20/87	01/26/88	01/26/88	04/18/88	07/13/88	07/13/88	07/13/88	07/13/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/22/87	01/28/88		04/21/88	08/09/88	07/14/88	07/14/88	07/14/88
Lab			SAC	SAC	CES	SAC	CES	SAC	SAC	SAC
Field Analysis			FDB					FDA	FDA	FDB
Lab Analysis								LDA	LDB	
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: Radian, 1984-1987.

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TABLE C-3. U.S. EPA METHOD 604 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S
Date Sampled			04/18/88
Sampled By			RADIAN
Date Analyzed			05/04/88
Lab			SAC
Field Analysis			
Lab Analysis			
2,4,6-Trichlorophenol	NE	NE	ND
2-Chlorophenol	NE	NE	ND
2,4-Dichlorophenol	NE	NE	ND
2,4-Dimethylphenol	400	NE	ND
2-Nitrophenol	NE	NE	ND
4-Nitrophenol	NE	NE	ND
2,4-Dinitrophenol	NE	NE	ND
Pentachlorophenol	30	NE	ND
Phenol	NE	NE	ND
4-Chloro-3-methylphenol	NE	NE	ND
4,6-Dinitro-2-methylphenol	NE	NE	ND

ALL UNITS ARE ug/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NE = Not established

SOURCE: Radian, 1988b.

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TABLE C-4. U.S. EPA METHOD 9010 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
Date Sampled			10/20/87	10/20/87	10/20/87	01/20/88	01/26/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed							
Lab			SAC	CES	SAC	CES	SAC
Field Analysis			FDA	FDA	FDB		
Lab Analysis							
Total cyanide	0.200	0.200	ND	ND	ND	ND	ND
Amenable cyanide	0.200	0.200	ND	NA	ND	ND	NA

ALL UNITS ARE mg/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed

SOURCE: Radian, 1987-1988c.

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TABLE C-5. U.S. EPA METHOD 624 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41	MW-41S	MW-41S	MW-65	MW-65
			WELL NUMBER				
Date Sampled			01/26/88	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			02/04/88	02/04/88	07/19/88		
Lab			SAC	SAC	SAC	IT	IT
Field Analysis							
Lab Analysis			LDA	LDB			
Chloromethane	NE	NE	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	NA	NA
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	18	20	13	ND	ND
Chloroform	100	100	1.8	2.1	ND	ND	ND
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	NA	NA
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	NA	NA
Trichloroethene	5	5	190	220	700	110	77
Dibromochloromethane	100	100	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	NA	NA
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	NA	NA
Bromoform	100	100	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	4.7	5.5	27	ND	ND
Chlorobenzene	30	NE	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	2.8
Acetone	NE	NE	ND	ND	ND	ND	ND
Carbon disulfide	NE	NE	ND	ND	ND	ND	ND
2 Butanone	NE	NE	ND	ND	ND	ND	ND
Vinyl acetate	NE	NE	ND	ND	ND	ND	ND
2 Hexanone	NE	NE	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First Laboratory duplicate analysis
LDB = Second Laboratory duplicate analysis

RADIAN - Radian Corporation, Sacramento
McLAREN - McLaren Environmental Engineering
SAC - Radian Analytical Services, Sacramento
IT - IT Laboratories

ND = Nothing detected
NE = Not established

SOURCE: McLaren, 1986c; Radian, 1988c.

TABLE C-5. (Continued)

Parameter	UHS Action Level	U.S EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-65	MW-65
			WELL NUMBER				
Date Sampled			01/26/88	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			02/04/88	02/04/88	07/19/88		
Lab			SAC	SAC	SAC	IT	IT
Field Analysis							
Lab Analysis			LDA	LDB			
4-Methyl-2-pentanone	NE	NE	ND	ND	ND	ND	ND
Styrene	NE	NE	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	ND	ND	NR	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established
NR = Not reported

SOURCE: McLaren, 1986c; Radian, 1988c.

TABLE C-6. U.S. EPA METHOD 625 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S AND MW-65

Parameter	DHS Action Level	U S EPA Primary MCL	WELL NUMBER MW 41S	MW 41S	MW 41S	MW 41S	MW 65	MW 65
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NE	750	ND	ND	ND	ND	ND	ND
Acenaphthene	NE	NE	ND	ND	ND	ND	NA	NA
1,2,4-Trichlorobenzene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachlorobenzene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachloroethane	NE	NE	ND	ND	ND	ND	NA	NA
Bis(2-chloroethyl)ether	NE	NE	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	NE	NE	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	NE	NE	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	NE	NE	ND	ND	ND	ND	ND	ND
Fluoranthene	NE	NE	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenylether	NE	NE	ND	ND	ND	ND	NA	NA
N-nitrosodimethylamine	NE	NE	ND	ND	ND	NA	ND	ND
N-nitrosodi-n-propylamine	NE	NE	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	NE	NE	ND	ND	ND	ND	NA	NA
Butylbenzyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Diethyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Dimethyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	NE	NE	ND	ND	ND	ND	ND	ND
Chrysene	NE	NE	ND	ND	ND	ND	ND	ND
Acenaphthylene	NE	NE	ND	ND	ND	ND	NA	NA
Anthracene	(LOQ)0.7	NE	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	NE	NE	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachlorocyclopentadiene	NE	NE	ND	ND	ND	ND	ND	ND
Isophorone	NE	NE	ND	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND - Nothing detected
NA - Not analyzed
LOQ - Limit of quantitation
NE - Not established

SOURCE: McLaren, 1986c; Radian, 1986-1988c

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TABLE C-6. (Continued)

Parameter	IHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
Naphthalene	NE	NE	ND	ND	ND	ND	ND	ND
Nitrobenzene	NE	NE	ND	ND	ND	ND	ND	ND
Phenanthrene	NE	NE	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	NE	NE	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	NE	NE	ND	ND	ND	ND	ND	ND
Pyrene	NE	NE	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2-Chlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	400	NE	ND	ND	ND	ND	ND	ND
2-Nitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
4-Nitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
Pentachlorophenol	30	NE	ND	ND	ND	ND	ND	ND
Phenol	NE	NE	ND	ND	ND	ND	ND	ND
N-nitrosodiphenylamine	NE	NE	ND	ND	ND	ND	ND	ND
Benzidine	NE	NE	ND	ND	ND	NA	ND	ND
4-Bromophenyl phenylether	NE	NE	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	NE	NE	ND	ND	ND	ND	ND	ND
Fluorene	NE	NE	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	NE	NE	ND	ND	ND	ND	NA	NA
4,6-Dinitro-2-methylphenol	NE	NE	ND	ND	ND	ND	NA	NA
Aniline	NE	NE	ND	ND	ND	NA	ND	ND
Benzyl alcohol	NE	NE	ND	ND	ND	ND	ND	ND
2-Methylphenol	NE	NE	ND	ND	ND	ND	ND	ND
4-Methylphenol	NE	NE	ND	ND	ND	ND	ND	ND
Benzoic acid	NE	NE	ND	ND	ND	ND	ND	ND
4-Chloroaniline	NE	NE	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	NE	NE	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND
3-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND - Nothing detected
NA = Not analyzed
NR - Not reported
NE - Not established

SOURCE: McLaren, 1986c; Radian, 1986-1988c.

TABLE C-6. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
Dibenzofuran	NE	NE	ND	ND	ND	ND	ND	ND
4-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	NE	NE	ND	ND	ND	ND	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established

SOURCE: McLaren, 1986c; Radian, 1986-1988c.

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TABLE C-7. U.S. EPA METHOD 6010 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S AND MW-65

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW 41S	MW-41S	MW-41S	MW-41S	MW-41S	MW 65	MW 65[a]	MW 65	MW 65[a]
Date Sampled				09/14/82	09/24/84	03/13/86	01/26/88	08/12/85	08/12/85	11/11/85	11/11/85
Sampled By			RADIAN	ES	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN	McLAREN	McLAREN
Date Analyzed						03/31/86					
Lab			CES	ES	RAS	AUS	SAC	IT	IT	IT	IT
Field Analysis											
Lab Analysis											
Antimony	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.001	NA
Arsenic	NE	0.050	ND	ND	0.0040	ND	ND	<0.01	NA	<0.01	NA
Beryllium	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.005	NA
Cadmium	NE	0.010	ND	ND	ND	ND	ND	0.012	NA	<0.005	0.008
Chromium	NE	0.050	0.010	ND	ND	ND	ND	0.024	NA	0.01	NA
Copper	NE	NE	ND	ND	ND	NA	ND	0.02	NA	0.2	NA
Lead	NE	0.050	ND	ND	0.020	ND	ND	<0.001	NA	0.02	NA
Mercury	NE	0.002	ND	ND	ND	0.0002	ND	0.0003	NA	<0.0002	NA
Nickel	NE	NE	ND	ND	NA	NA	ND	<0.01	NA	0.05	NA
Selenium	NE	0.010	ND	ND	ND	ND	ND	<0.01	NA	<0.01	NA
Silver	NE	0.050	ND	ND	ND	ND	ND	<0.001	NA	<0.001	NA
Thallium	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.001	NA
Zinc	NE	NE	ND	ND	0.035	NA	ND	0.14	NA	0.2	NA
Fluorene	NE	NE	ND	NA	NA	NA	NA	ND	NA	ND	NA
Calcium	NE	NE	ND	NA	NA	16	NA	18	91	97	100
Chloride	NE	NE	ND	NA	NA	18	NA	18	NA	22	NA
Carbonate	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NE	NE	ND	NA	0.63	NA	NA	NA	NA	NA	NA
Bicarbonate	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NE	NE	ND	NA	13	9.9	NA	NA	NA	NA	NA
Sodium	NE	NE	ND	NA	19	13	NA	16	16	15	NA
Sulfate	NE	NE	ND	NA	NA	6	NA	3	NA	2	NA
Aluminum	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NE	1.0	ND	NA	0.098	0.044	NA	NA	NA	0.17	0.17
Cobalt	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silicon	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE mg/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Services
ES = Engineering Science, Inc.
AUS = Radian Analytical Services, Austin
RAS = Radian Analytical Services
CES = Cannonie Environmental Services
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established
NA = Not analyzed

[a] Duplicate samples assumed to be field duplicates.

SOURCE. McLaren, 1986c; Radian, 1982-1988b.

TABLE C-7. (Continued)

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW 41S	MW 41S	MW 41S	MW 41S	MW-41S	MW 65	MW 65[a]	MW 65	MW 65[a]
			WELL NUMBER								
Date Sampled				09/14/82	09/24/84	03/13/86	01/26/88	08/12/85	08/12/85	11/11/85	11/11/85
Sampled By			RADIAN	ES	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN	McLAREN	McLAREN
Date Analyzed						03/31/86					
Lab			CES	ES	RAS	AUS	SAC	IT	IT	IT	IT
Field Analysis											
Lab Analysis											
Vanadium	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Alkalinity	NE	NE	ND	NA	NA	92	NA	92	91	97	100
Nitrate	NE	45	ND	NA	NA	1.5	NA	2.4	NA	2	NA
Total Dissolved Solids	NE	NE	ND	NA	NA	210	NA	NA	NA	NA	NA

ALL UNITS ARE mg/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Services
AUS = Radian Analytical Services, Austin
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established
NA = Not analyzed

[a] Duplicate samples assumed to be field duplicates.

SOURCE: McLaren, 1986c; Radian, 1982-1988b.

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INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

TECHNICAL MEMORANDUM FOR SITE 47
FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

Radian Corporation
10395 Old Placerville Road
Sacramento, California 95827

USAF CONTRACT NO. F33615-87-D-4023, DELIVERY ORDER NO. 0012
CONTRACTOR CONTRACT NO. 227-005, DELIVERY ORDER NO. 0012

IRP PROGRAM OFFICE (HSD/YAQ)
United States Air Force Center for Environmental Excellence
Mr. Patrick Haas (Technical Project Manager)
Environmental Services Office/Environmental Restoration Division (AFCEE/ESR)
Brooks Air Force Base, Texas 78235-5501

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1.0 INTRODUCTION

This Technical Memorandum presents a summary of data compiled for Site 47 at McClellan Air Force Base (AFB), California. The location of Site 47 is shown in Figure 1-1. Site 47 was the location of a plating shop at Building 666 within Area B of McClellan AFB. The task of compiling data for Technical Memorandum is part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan for any sites that pose a threat to human health and welfare or the environment. This site assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund sites.

The purpose of this Prelimianry Assessment is to:

- Identify any immediate response needs as required by CERCLA/SARA;
- Determine whether further action is needed at the location;
- Provide qualified data to support operable unit prioritization and grouping; and
- Provide recommendations for further investigation or remedial actions.

The scope of this assessment includes site-specific data regarding the following categories of information:

- Site operations and waste management practices;
- Waste characteristics;
- Contaminant migration pathways; and
- Target populations and environments.

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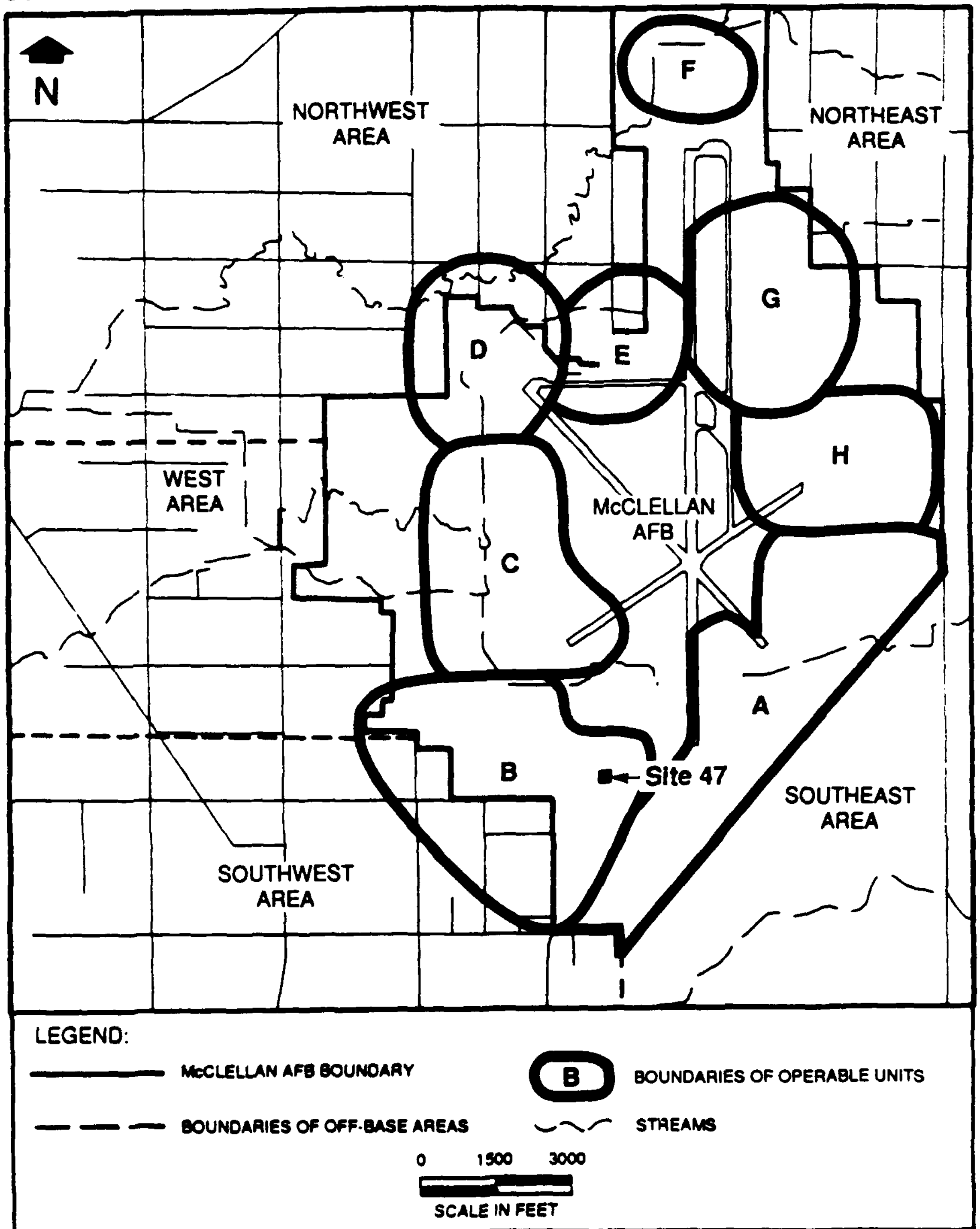

Figure 1-1. Map of Site 47 Within the McClellan AFB Facility.

Data on all four categories are necessary to develop an understanding of the site, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Site operations, waste management practices and waste characteristics, and migration pathways are discussed in this document. A separate General Information document addresses target populations and environments. Background information regarding the overall facility description of McClellan AFB is presented in the General Information document, which includes environmental setting, land use, hydrogeologic conditions, facility history, and a discussion of potential receptors.

This Technical Memorandum document includes the following:

- Information sources used to prepare the document;
- Site description, including historical activities;
- Extent of on-site soil contamination with a presentation of previous data;
- Potential hazards;
- An evaluation of previous contractors' recommendations; and
- Conclusions and recommendations.

2.0 SOURCES OF INFORMATION

The following sections describe the sources of information used to develop this Technical Memorandum.

2.1 Previous Investigations

In 1981, CH2M Hill conducted a records search of McClellan Air Force Base (AFB) files to identify hazardous waste disposal sites on the base in order to determine the potential for hazardous materials to migrate off the base (CH2M Hill, 1981). Interviews with past and present employees and the review of base records resulted in the identification of 45 waste disposal sites at McClellan AFB. CH2M Hill did not include the site now designated as Site 47 as one of the numbered potential release locations, but the 1981 report contains information about the chemicals used in some of the processes that were performed at Building 666, and estimates of the amount and type of wastes generated.

Thomas J. Walker, Inc., investigated Site 47 in 1983 in order to prepare a decontamination plan to close Building 666 (Walker, 1983). The report contains the following:

- Walker's decontamination plan to close Building 666;
- An earlier, preliminary closure plan for Building 666 that was prepared by base personnel;
- Results of a geophysical examination performed by Harding Lawson Associates, Inc.;
- Chemical analytical results from Pacific Environmental Laboratory for soil samples collected beneath Building 666 and samples of scrapings, brick, mortar, and concrete collected within Building 666; and
- An evaluation of the environmental fate of chemicals detected in soils by Kennedy/Jenks Engineers.

McLaren Environmental Engineering, Inc., investigated Site 47 in 1985. This investigation included physical and chemical characterization of the soil, and a qualitative characterization of the soil gas (McLaren, 1986a). Later in 1986, McLaren summarized the results of their soil investigation and made recommendations concerning Site 47 (McLaren, 1986b).

2.2 Personnel Interviews

McClellan AFB personnel were interviewed by Radian for information regarding historic waste handling and disposal practices at Site 47. Information from those interviews has been included in this Technical Memorandum. Documentation of the interviews can be found in the Site 47 Site File.

2.3 Site Visit

Radian personnel visited Site 47 on 6 February 1989 to document current site features.

2.4 Aerial Photographs

Historical aerial photographs were reviewed for site features and evidence of contamination. Table 2-1 lists the photographs that were reviewed. Interpretation of aerial photographs is discussed in more detail in Section 3, Site Description.

2.5 Review of Base Files

McClellan AFB Civil and Bioenvironmental Engineering files were reviewed for historical information during the preparation of this Technical Memorandum. Construction diagrams of Building 666 were found in the Civil Engineering files. Results of industrial hygiene reviews of Building 666 were found in the Bioenvironmental files.

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TABLE 2-1. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1988) REVIEWED FOR SITE 47

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 400'
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 370'
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 400'
1949	Whittier College	1" = 400'
1951	Whittier College	1" = 770'
1953	U.S. Department of Agriculture, ASCS[1]	1" = 400'
1955	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1690'
1957	U.S. Department of Agriculture, ASCS	1" = 400'
1962	McClellan AFB, History Office	1" = 150'
1963	Cartwright Aerial Surveys	1" = 1667'
1965	McClellan AFB, History Office	1" = 150'
1968	Cartwright Aerial Surveys	1" = 1000'
1971	Cartwright Aerial Surveys	1" = 400'
1972	Cartwright Aerial Surveys	1" = 1000'
1974	Cartwright Aerial Surveys	1" = 120[illegible]
1976	Cartwright Aerial Surveys	1" = 400'
1978	Cartwright Aerial Surveys	1" = 2000'
1981	Cartwright Aerial Surveys	1" = 1000'
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000'
1987	Cartwright Aerial Surveys	1" = 1000'
1988	Cartwright Aerial Surveys	1" = 400'

[1] United States Department of Agriculture, Agricultural Stabilization and Conservation Service.

3.0 SITE DESCRIPTION

Site 47 is located in Area B of McClellan Air Force Base (AFB), as shown in Figure 3-1. The boundaries of Site 47 are the former perimeter of Building 666, which was demolished in 1988. Site 48 is west of Site 47 in the area where Industrial Wastewater Treatment Plan (IWTP) No. 4 has been located. The area north of Site 47 was used to store chemicals for use at Building 666 and is being investigated as Site 36. Both Site 48 and Site 36 are discussed in separate Technical Memorandums. A map showing the current features in the vicinity of Site 47 is presented in Figure 3-2. The following sections discuss site delineation, historical and current activities, reported releases, and remedial actions at Site 47.

3.1 Site Delineation

In 1981, CH2M Hill reported that hazardous chemicals were used at Building 666; however, the building was not identified as a Potential Release Location (PRL) until McLaren's 1986 soil investigation (McLaren, 1986). The boundaries of Site 47 are the perimeter of the foundation of Building 666, an area approximately 200 feet long by 190 feet wide.

3.2 Historical Operations

The following subsections describe the historical operations at Site 47.

Overview

Building 666 was constructed in 1957 and was used as the base electroplating shop from 1957 to 1980 (Walker, 1983). During this time, Building 666 also contained a radiator repair shop in the northern portion of the building and a sandblasting shop in the southwestern corner of the building. Figure 3-3 shows a plan view of the interior of Building 666 and identifies areas of historical operations.

In 1980, the plating operations at Building 666 were discontinued and from 1980 to 1982 Building 666 was used to store hazardous waste (Walker, 1983).

In December of 1981, McClellan AFB prepared a preliminary Resource Conservation and Recovery Act (RCRA) closure plan for Building 666 (Walker, 1983).

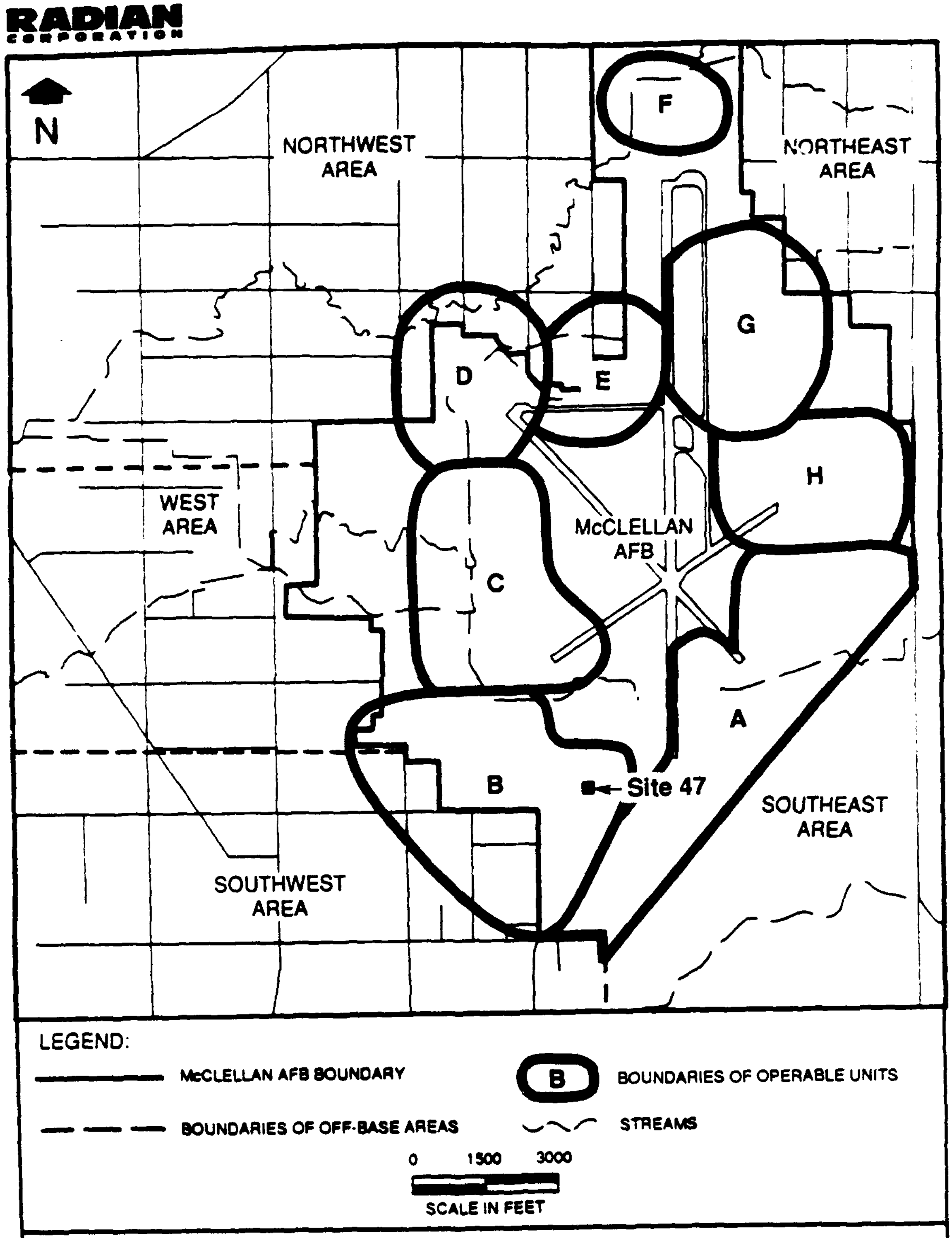

Figure 3-1. Map of Site 47 Within the McClellan AFB Facility.

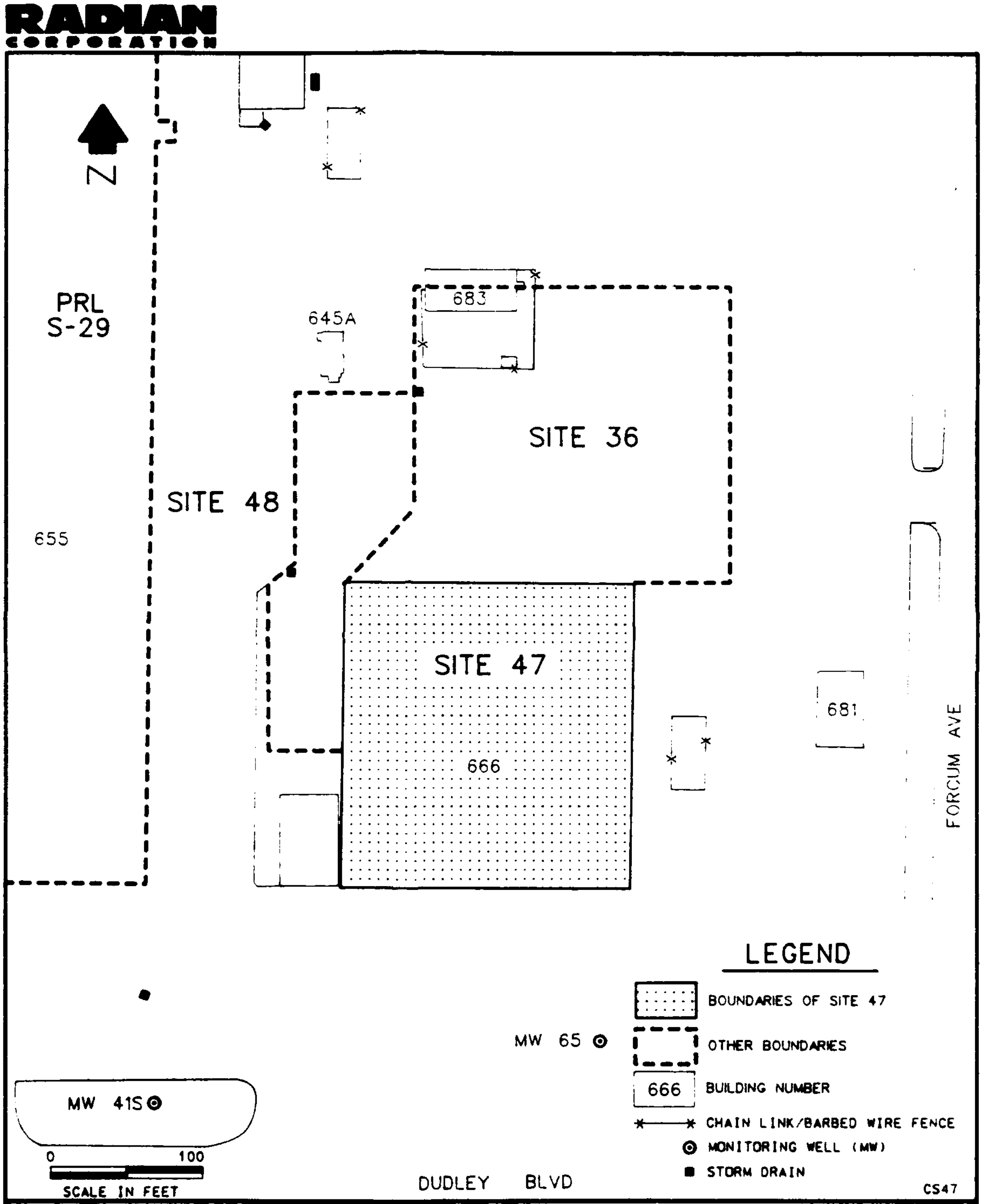

Figure 3-2. Map of Site 47 and Vicinity.

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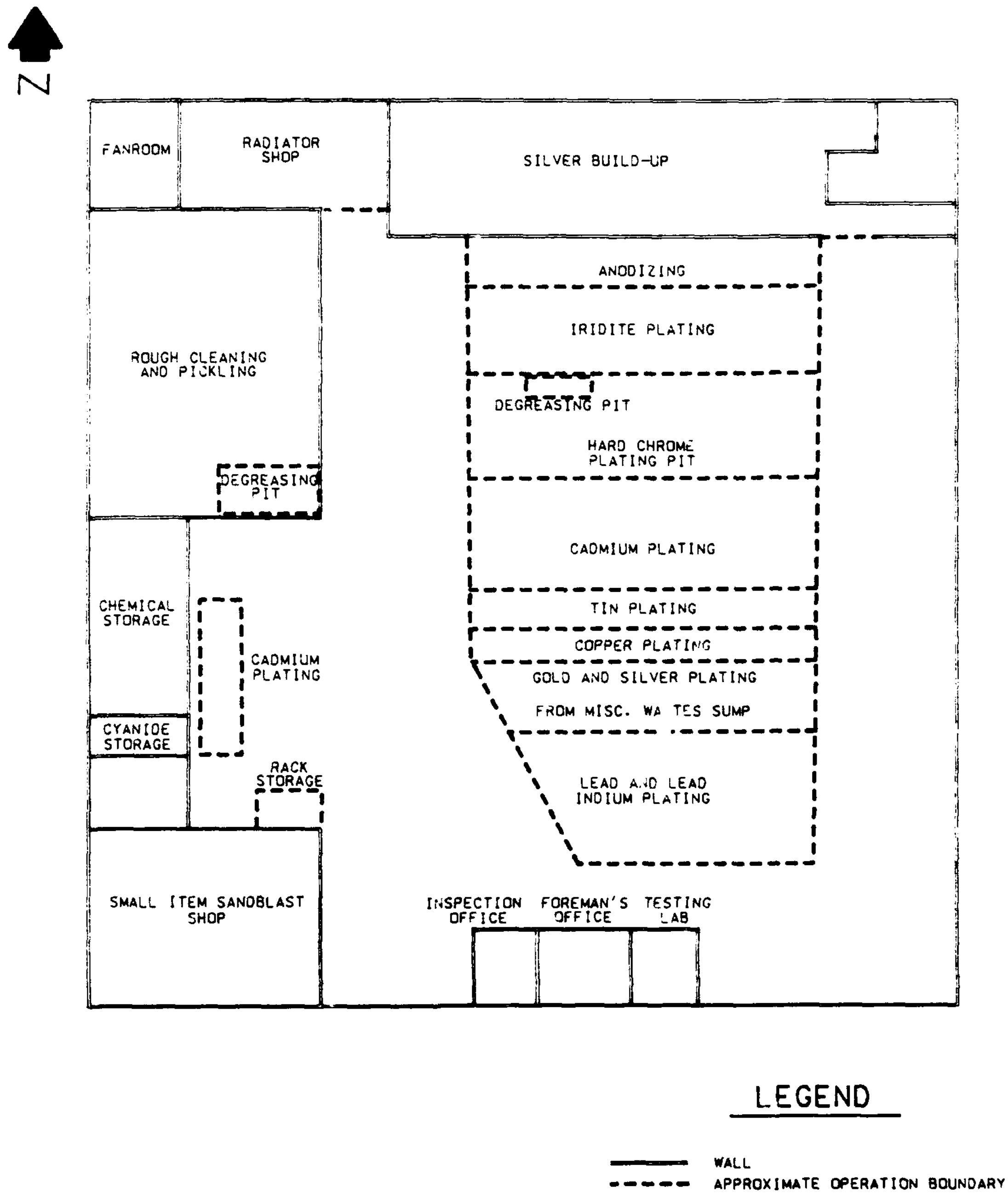

Figure 3-3. Historical Operations in Building 666.

McClellan AFB personnel planned to rehabilitate the building for other uses after RCRA closure was completed. However, after Walker completed a characterization of the facility, McClellan AFB contracted EG&G Idaho, Inc., to prepare a demolition plan for Building 666 and the Industrial Wastewater Treatment Plant (IWTP) No. 4 (EG&G Idaho, Inc., 1986). The demolition of Building 666 and the adjacent IWTP No. 4 was completed in 1988.

Table 3-1 describes the dates of operation, the materials used, and disposal information for each of the historical operations at Site 47.

Electroplating Operations

A wide range of plating-related processes were performed in Building 666 (McClellan AFB, 1967; Cruz, personal communication, 1989). These processes included the following:

- Alkaline and caustic cleaning;
- Cadmium, nickel, and silver stripping;
- Copper oxidizing;
- Chemical milling;
- Phosphate coating;
- Chromium, sulfuric, and phosphorus anodizing;
- Titanium and stainless steel passivating;
- Titanium activating;
- Electroless nickel plating; and
- Cadmium, chrome, gold, iridium, nickel, silver, tin, and zincate plating.

TABLE 3-1. CHEMICAL STORAGE AND DISPOSAL AT SITE 47

Operation	Dates of Operation	Materials Handled	Amount Stored (gal)	Quantity of Wastes Produced (gal/yr)	Disposal Method
Electroplating (includes rough cleaning and pickling)	1957-1980	Silver strike solution	650	7,800	IWTP #4
		Silver plating solution	1,290	2,580	IWTP #4
		Nickel plating solution	1,860	1,860	IWTP #4
		Chrome plating solution	8,040	8,040	IWTP #4
		Cadmium plating solution	648	324	IWTP #4
		Copper plating solution	1,430	2,860	IWTP #4
		Tin plating solution	350	175	IWTP #4
		Rhodium plating solution	65	None	None
		Gold plating solution	5	None	None
		Chromic acid anodizing solution	1,900	1,900	IWTP #4
		Sulfuric acid anodizing solution	1,900	1,900	IWTP #4
		Hard anodizing solution	300	3[illegible]	IWTP #4
		Electroless nickel solution	200	26,[illegible]	IWTP #4
		Chromic acid bright dip solution	300	300	IWTP #4
		Chrome stripping solution	220	440	IWTP #4
		Chromic acid pickel	1,900	1,900	IWTP #4
		Derust solution	220	640	IWTP #4
		Phosphate solution	381	640	IWTP #4
		Silver stripping solution	1,150	4,600	IWTP #4
		Nickel stripping solution	445	11,670	IWTP #4
		Hydrochloric acid	627	2,508	IWTP #4
		Passivate solution	2,180	4,360	IWTP #4
		Nitric etching solution	210	210	IWTP #4
		Nitric and muriatic bright dip solution	210	840	IWTP #4
		Nitric and sulfuric bright dip solution	110	440	IWTP #4
		Nitric and sulfuric etching solution	210	840	IWTP #4
		Iridite solution	1,780	890	IWTP #4
		Alkaline cleaner solution	3,640	43,680	IWTP #4
		Alkaline chrome stripping solution	1,020	4,080	IWTP #4
		Color anodize dye solution	900	1,800	IWTP #4
Vapor Degreasing	1957-1980	Acetone	NA	NA	DRMO
		Methylene chloride	NA	NA	DRMO
		Tetrachloroethylene	NA	NA	DRMO
		Trichloroethene	NA	NA	DRMO
		Toluene	NA	NA	DRMO
Chemical Storage	1957-1980	Silver cyanide	NA	None	None
		Nickel sulfate	NA	None	None
		Nitric acid	NA	None	None
		Sulfuric acid	NA	None	None
		Hydrochloric acid	NA	None	None
		Nickel chloride	NA	None	None
		Hydrogen peroxide	NA	None	None
		Floboric acid	NA	None	None
		Sodium hydroxide	NA	None	None

(Continued)

TABLE 3-1. (Continued)

Operation	Dates of Operation	Materials Handled	Amount Stored (gal)	Quantity of Wastes Produced (gal/yr)	Disposal Method
Chemical Storage (Continued)		Tri-sodium phosphate	NA	None	None
		Actane 70	NA	None	None
		Hydrofluoric acid	NA	None	None
		Zinc oxide	NA	None	None
		Copper cyanide	NA	None	None
		Trichloroethene	NA	None	None
Radiator Shop	NA	Sodium hydroxide	NA	NA	NA
		Stoddard solvent	NA	NA	NA
		Silver soldering flux compound	NA	NA	NA
		Regular soldering flux compound	NA	NA	NA
		Brazing flux compound	NA	NA	NA
Sandblasting Shop	NA	NA	NA	NA	NA
Hazardous Waste Storage	1980-1982	Tetrachloroethylene	1,650	None	Kettleman
		Hydrualic fluid	55	None	Kettleman
		Trichlorotrifluoroethane	2,640	None	Kettleman
		Chem mill maskant	825	None	Kettleman
		Sodium hdyroxide	1,100	None	Kettleman
		Used oils	220	None	Kettleman
		Organic dyes	1,350	None	Kettleman
		Ferric chloride solution	15	None	Kettleman
		Asbestos	660	None	Kettleman
		Hydrofluoric acid	55	None	Kettleman
		Lead fluoroborate	15	None	Kettleman
		Ammonium nitrate	495	None	Kettleman
		Nickel chloride	165	None	Kettleman
		Dichloromethane	660	None	Kettleman
		Nickel sulfate	1,065	None	Kettleman
		Copper cyanide	55	None	Kettleman
		Sodium ferric cyanide	55	None	Kettleman
		Paint remover solutions	220	None	Kettleman
		Nickel neutralizing solution	55	None	Kettleman

NA = Not available.
IWTP No. 4 = Material was transported to Industrial Waste Treatment Plant No. 4.
Kettleman = Material was taken to Kettleman Hills Class I disposal site.
DRMO = Material was disposed of by McClellan AFB Defense Reutilization and Marketing Office.
SOURCE: McClellan AFB Bioenvironmental Engineering Files.

The plating operations in Building 666 were divided into several plating lines. Figure 3-3 shows the primary operation that was performed in each plating line; however, several different operations were performed in each area. Each plating line consisted of a series of tanks containing chemical solutions and rinses. During the plating processes, the items to be plated were dipped into the tanks in a sequence that varied according to the plating specifications. The items were moved from tank to tank by means of cables and pulleys hung from monorails which were attached to the ceiling (Cruz, personel communication, 1989).

Most of the chemicals used for the plating operations in Building 666 were stored in two storage rooms located along the western wall of the building (see Figure 3-3). Construction diagrams show the southern room was used to store cyanide compounds. Apparently, the northern room was used to store all of the chemicals used in the building except cyanide compounds. None of the available information precisely describes how the chemicals were stored. Water applied through high pressure water hoses was used to periodically rinse the area. The rinse water drained out the west door or into open trenches. When the storage rooms were full, chemicals were stored outside of Building 666, along the north wall, in the area now designated as Site 36.

The trenches shown in Figure 3-4 were located beneath the plating line tanks to collect and transport spilled and discharged wastes. Each trench was designed to carry one of four waste classifications:

- Chromium wastes;
- Cyanide wastes;
- Silver cyanide wastes; or
- Miscellaneous wastes.

Construction diagrams show the trenches were built with a foundation of reinforced concrete lined with acid-resistant brick and mortar. When the solution in a tank was exhausted, a valve was opened and the solution drained into the trenches (Cruz, personal communication, 1989). After the solution had drained completely, the tank was rinsed with water to remove any remaining sludge. Water applied through high pressure hoses was used to clean the floors near the plating lines; this water also drained into the trenches.

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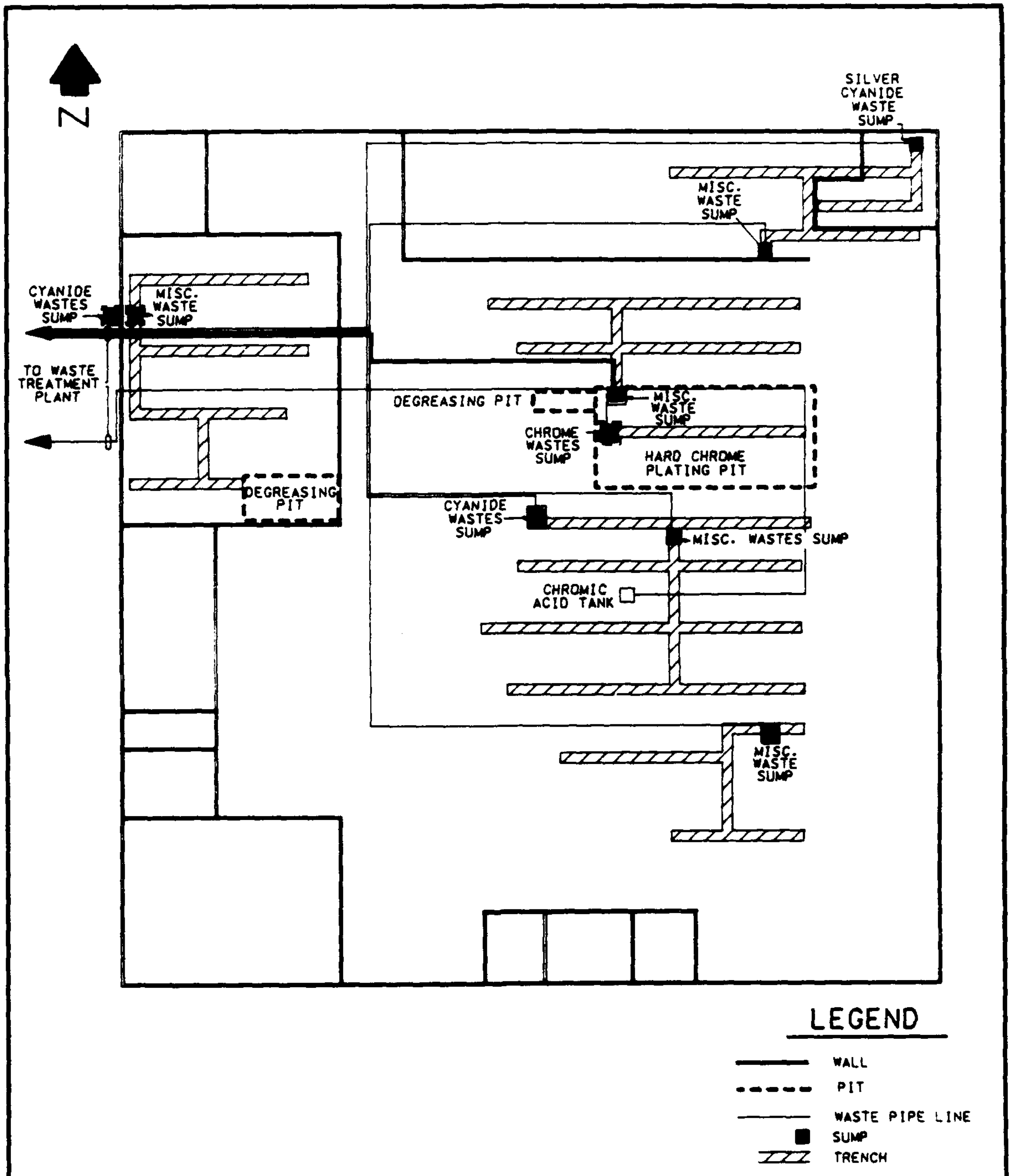

Figure 3-4. Waste Conveyance System in Building 666.

As shown in Figure 3-4, the trenches drained into nine different sumps. Sump pumps transported waste from the bottom of the sumps into wasteline pipes. The pipelines were located underground and discharged into the IWTP No. 4.

Degreasing and Dewaxing Operations

A variety of solvents were used for degreasing and dewaxing in the plating lines at Building 666 (McClellan AFB, 1967; Cruz, personal communication, 1989). Solutions containing the following solvents were used:

- Acetone;
- Methylene chloride;
- Trichloroethene (TCE);
- Tetrachoroethylene; and
- Toluene.

Although solvents were known to have been stored outside of Building 666, in the area designated as Site 36, it is unknown if solvents were also stored in the storage rooms within the building.

Construction diagrams for the degreaser pits (identified in Figure 3-4) show the the floor of the pits sloped downward toward the sumps. Wastes from these sumps were put in containers, and collected by Defense Reutilization and Marketing Office (DRMO).

Radiator Shop Operations

The radiator shop, located in the northern section of Building 666, repaired automobile radiators. The following operations were performed as part of the repair process:

- Cleaning using Stoddard solvent;
- Lead and silver soldering; and
- Acetylene welding.

A small storage area located within the radiator shop is identified on construction diagrams, but it is unknown if chemicals were stored there. None of the available information describes waste handling procedures within the radiator shop.

Sandblasting Operations

A "small item" sandblasting facility was operated in the southwestern corner of Building 666. No specific information about the Sandblasting Shop operations is available.

Hazardous Waste Storage Operations

From 1980 to 1982, Building 666 was used as a hazardous waste storage facility (Walker, 1983). The maximum inventory of stored wastes at the building was reported to be 736 55-gallon containers. The wastes stored in Building 666 during this time included petroleum products; chlorinated solvents; caustics; metal solutions; and "ORM A, B, C, D, and E materials" (Walker, 1983). It is unknown how the chemicals were organized within the building. Most of the materials were reportedly removed by the end of 1982 (Walker, 1983).

3.3 Current Operations

Except for the foundation, Building 666 has been demolished and removed. As shown in Figure 3-5, several areas of the foundation have been covered with caps. According to the statement of work for dismantlement, these caps were designed to cover the former pits and sumps in Building 666. The caps appear to be roof-like structures over the pits and sumps. The area surrounding Site 47 is completely enclosed by fencing.

3.4 Reported Releases

Releases of specific contaminants at Site 47, if any, have not been documented.

3.5 Remedial Actions

Building 666 was dismantled in 1988. The purpose of the dismantlement was described in the statement of work as follows:

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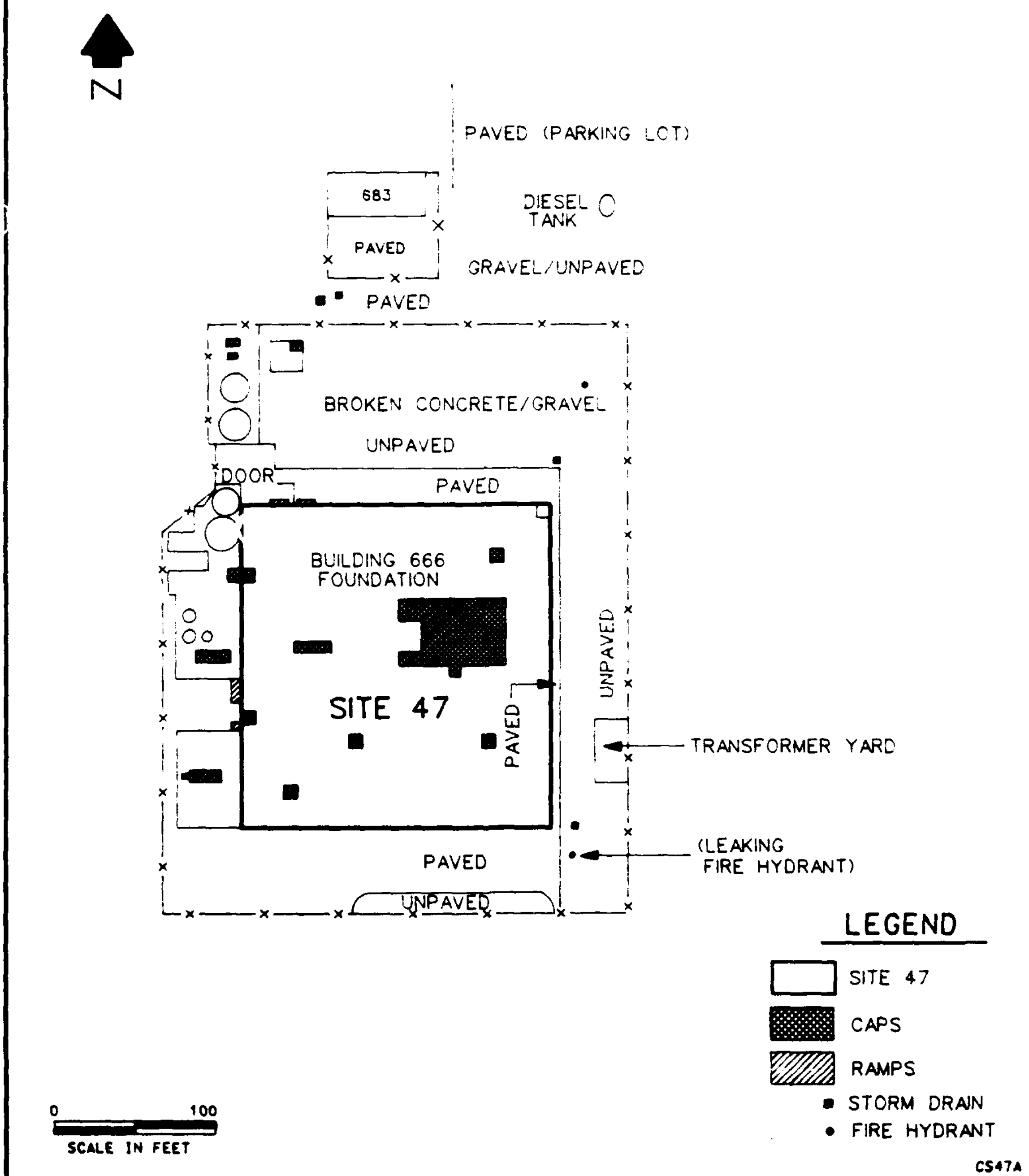

Figure 3-5. Current Conditions of Site 47 and Vicinity.

> The objectives of this project are to dismantle Building 666 and the IWTP down to floor level and leave the facility in a safe and stable condition until the foundations, floors, pits, sumps, and soil beneath and around the floor can be removed. (EG&G Idaho, Inc., 1986)

Although no specific information about the actual dismantlement is available, the following procedures were specified by EG&G Idaho, Inc., in the Statement of Work (EG&G Idaho, Inc., 1986):

- "A fence with lockable vehicle gates and appropriate warning signs must be installed so that it surrounds the facility.

- "All broken windows and other openings in the building will be covered to prevent intrusion of birds and spread of airborne contamination from the building during subsequent ripout of equipment...

- "All loose debris from both inside and outside the building will be removed and disposed of as hazardous waste.

- "A small sludge pile in the hard chrome pit will be removed and disposed of as extremely hazardous waste...

- "All floor areas and the pits and trenches will be vacuumed.

- "All waste will be disposed of as required by applicable state and federal codes and regulations...

- "The contents of the entire building will be removed and disposed of as hazardous waste.

- "Building 666 and its Sandblast Facility will be dismantled and everything, except the structural steel, will be disposed of as hazardous waste. The structural steel will be decontaminated, if possible; otherwise it will be disposed of as hazardous waste.

- "The remaining facility will be stabilized by filling all trenches, drains, and floor penetrations with concrete, constructing curbs around all sumps and pits, and constructing covers over sumps, pits and underground tank penetrations."

4.0 EXTENT OF CONTAMINATION

The following sections present the results of previous investigations at Site 47. Discussions related to the interior sampling of Building 666, soil, soil gas, groundwater, surface water, and air monitoring are presented under separate subsections.

4.1 Building 666 Interior Sampling Results

In 1982, as part of the Thomas J. Walker, Inc., decontamination plan to close Building 666, a total of 75 samples from the interior of the building were collected and analyzed (Walker, 1983). The samples consisted of brick, mortar, and concrete samples; wipings from ducts, walls and floors; and scrapings from ducts, walls and floors. The samples were analyzed for total metal concentrations of cadmium, chromium, copper, nickel, and silver. In addition, the samples were analyzed for fluoride, cyanide, chloride, sulfate, phosphate, and nitrate.

Results of the chemical analyses of Building 666 interior samples indicate detected levels of cadmium, chromium, copper, fluoride, nickel, and silver above Total Threshold Limit Concentrations (TTLC) values. Figures 4-1, 4-2, 4-3, 4-4, and 4-5 show the locations where samples were collected and the locations that exceeded the TTLC values for cadmium, chromium, copper, fluoride, and nickel, respectively.

Walker noted the possibility that Building 666 was contaminated with chlorinated hydrocarbons. Because a "waxy" material was observed on the side of the chrome pit near the degreasing tank, Walker reported that solvents had apparently been disposed of in the pit. In addition, odors identified as chlorinated hydrocarbons were noted in the hard chrome pit and in the pit in the sandblasting room. The Walker investigation did not address chlorinated hydrocarbons.

4.2 Soil Results

This section presents the physical characterization of the soil, analytical results of soil samples, and evaluates of the adequacy of the soil characterization. Two separate soil investigations have been performed at Site 47: Thomas J. Walker's investigation in 1982 and the McLaren Environmental Engineering, Inc., (McLaren) investigation in 1985 (Walker, 1983; McLaren, 1986a). Results presented in this section are from data obtained from these investigations. Figure 4-6 shows the location of all borings drilled at Site 47.

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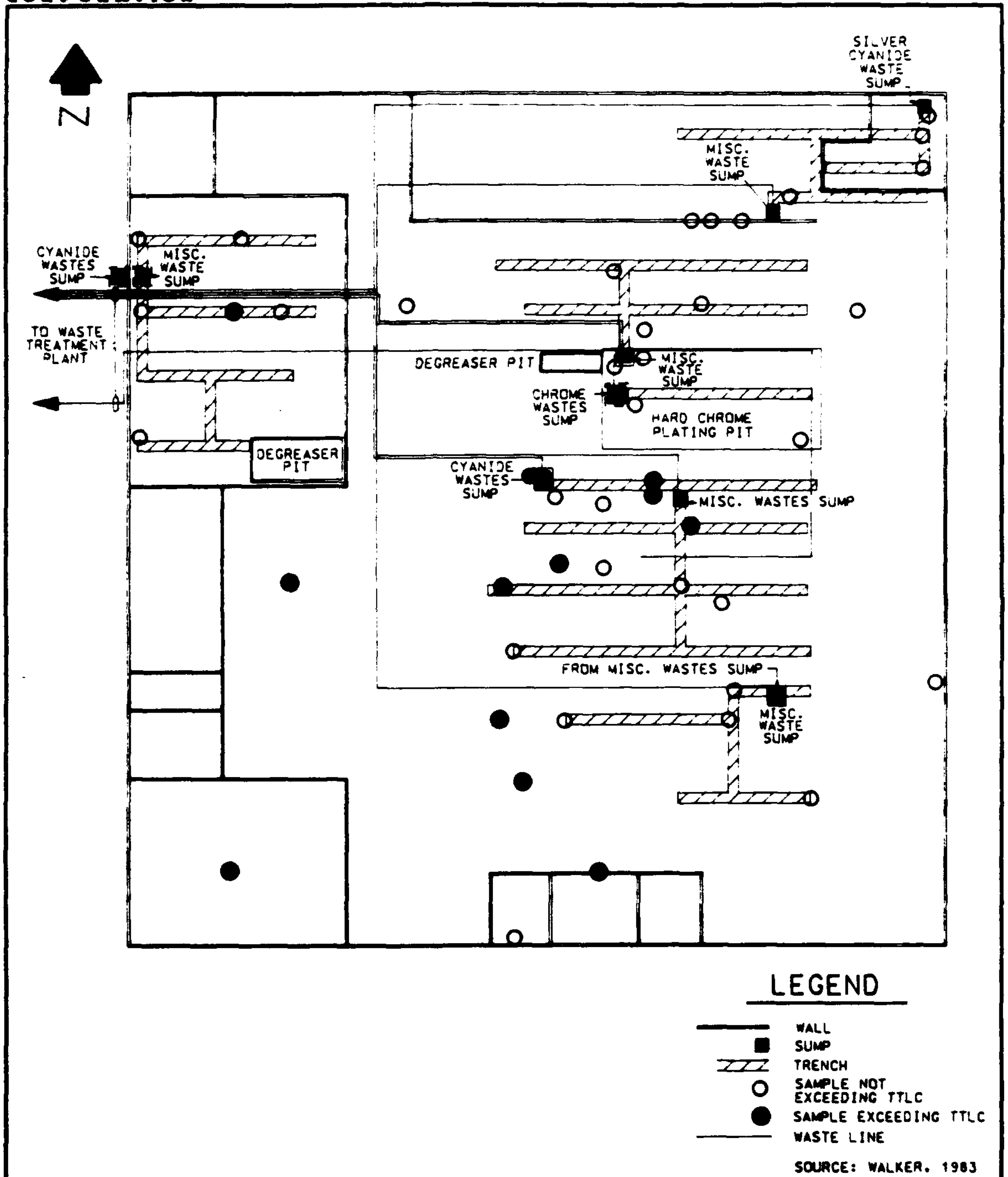

Figure 4-1. Building 666 Interior Results that Exceeded TTLC Value for Cadmium (100 ppm).

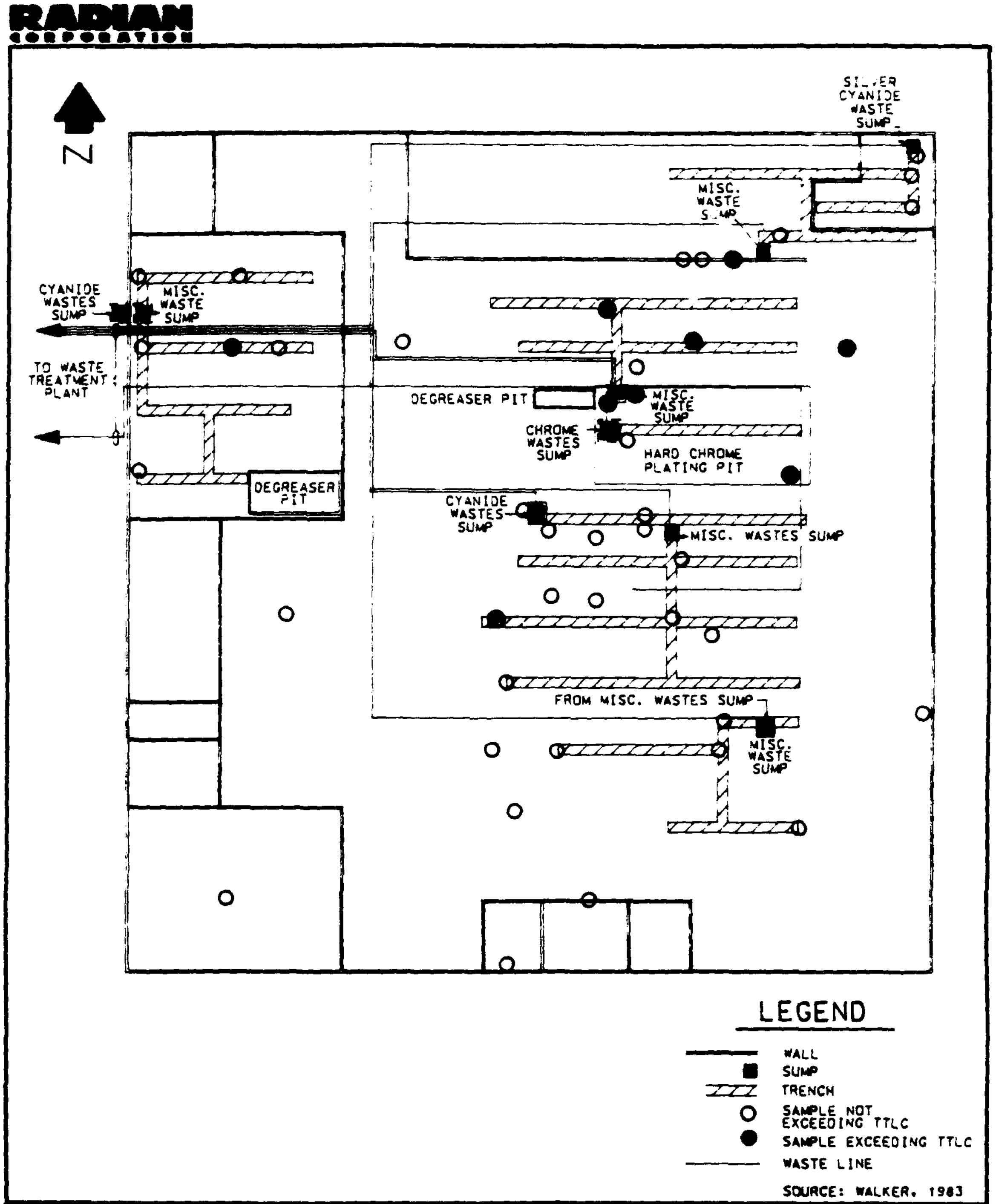

Figure 4-2. Building 666 Interior Results that Exceeded TTLC Value for Chromium (2500 ppm).

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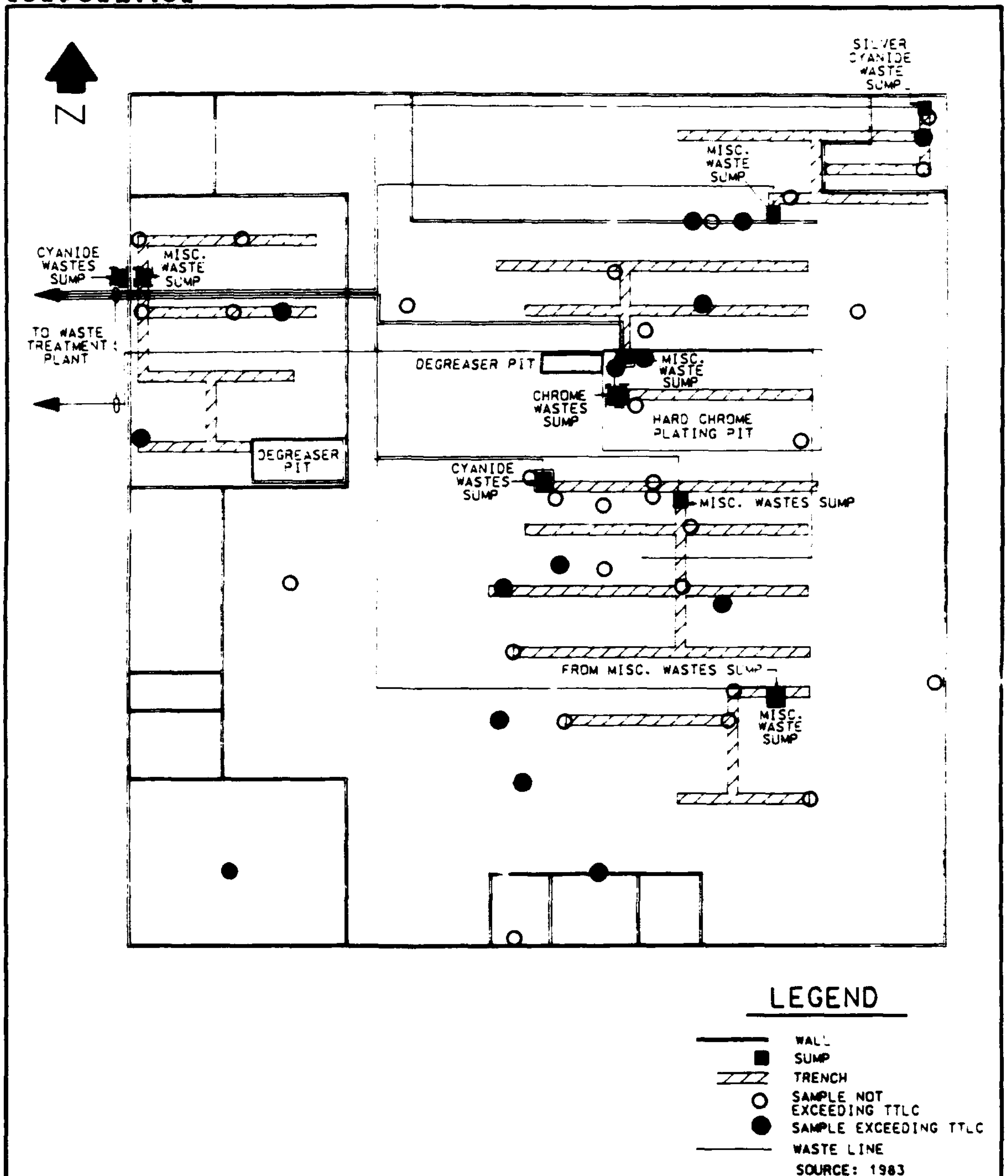

Figure 4-3. Building 666 Interior Results that Exceeded TTLC Value for Copper (250 ppm).

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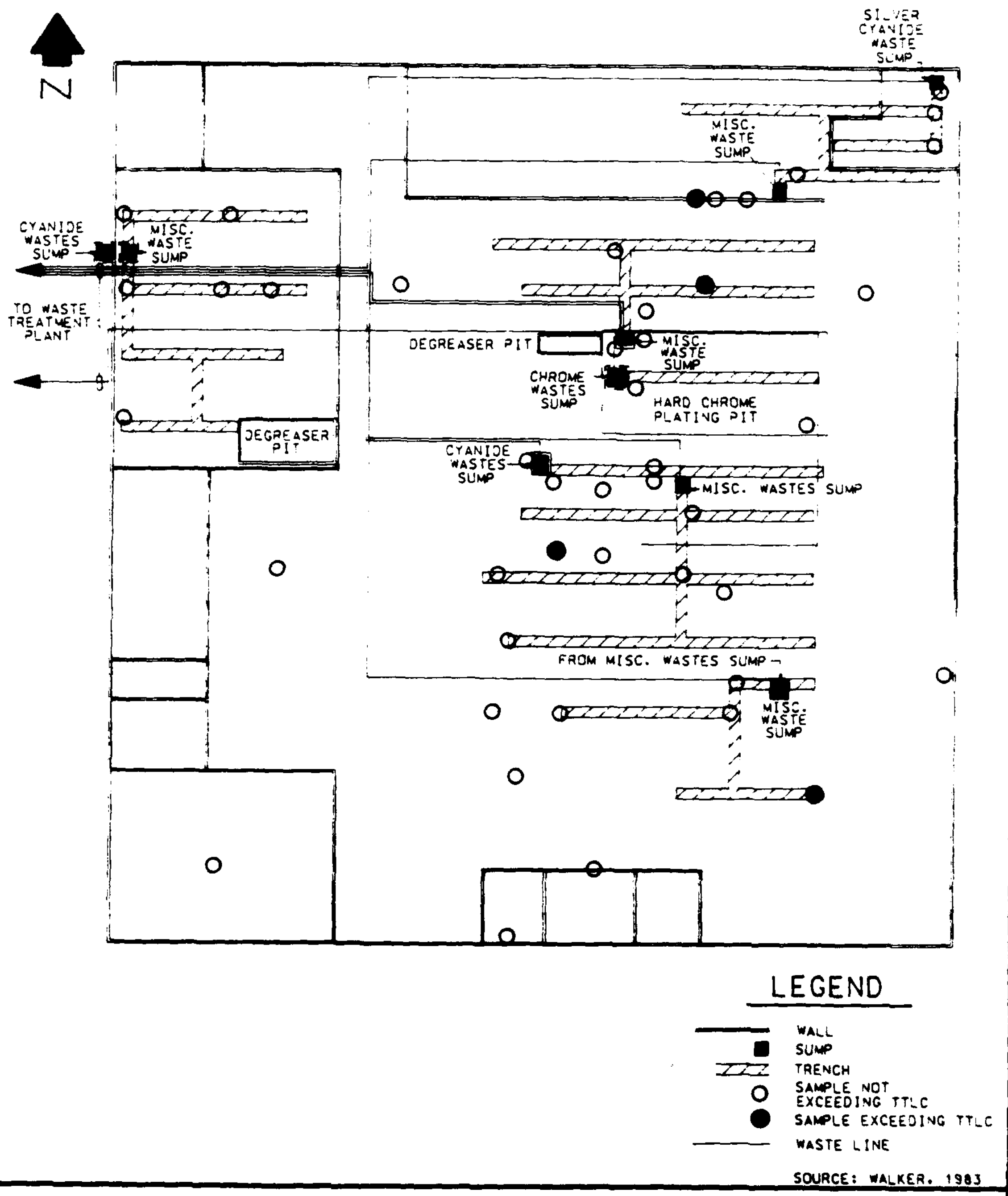

Figure 4-4. Building 666 Interior Results that Exceeded TTLC Value for Fluoride (1800 ppm).

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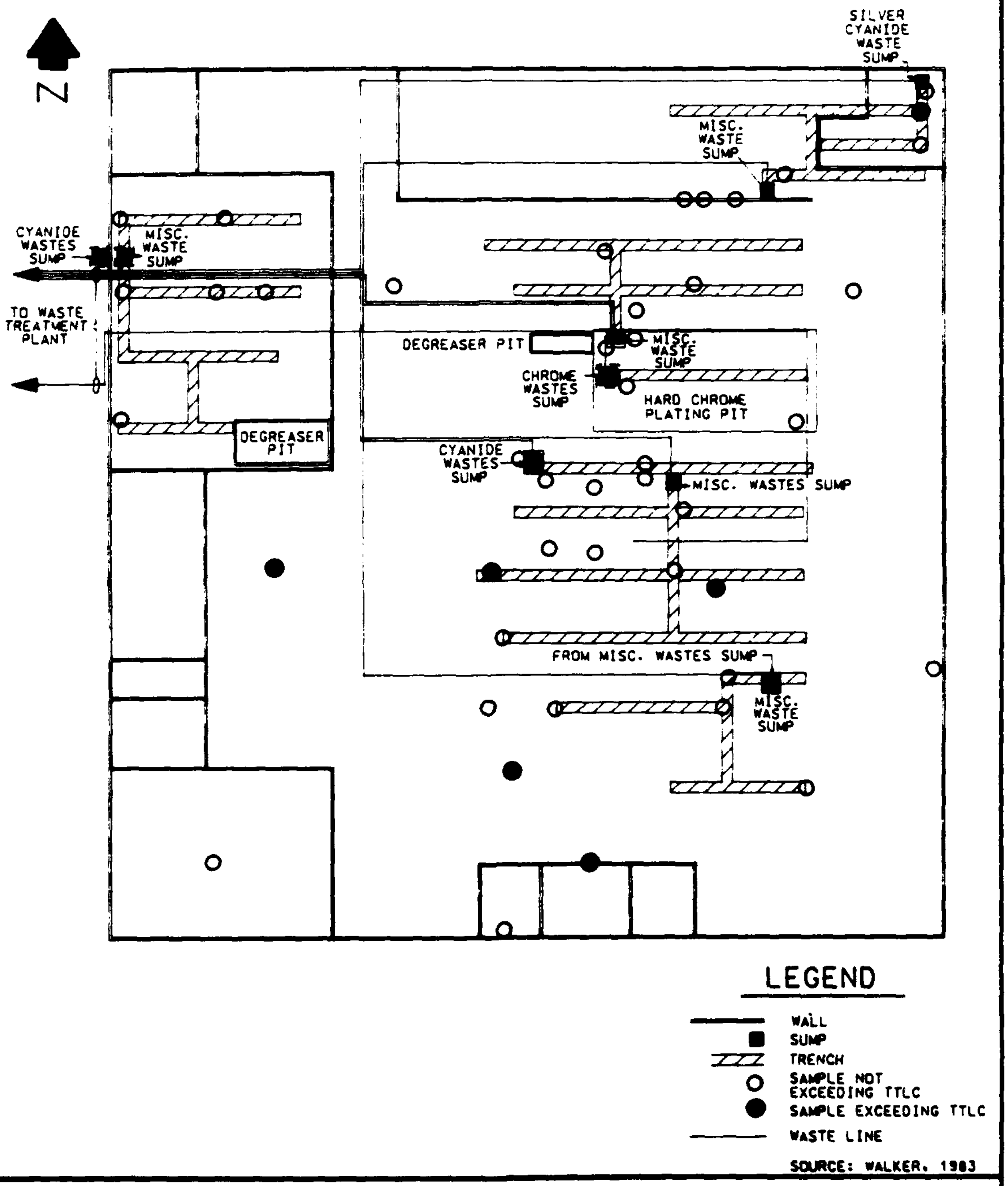

Figure 4-5. Building 666 Interior Results that Exceeded TTLC Value for Nickel (1200 ppm).

Walker's Sampling Procedures

Four soil borings were drilled as part of the Walker soil investigation. The boring locations were selected because these locations "exhibited the greatest probability for potential contamination" by cadmium, chromium, and cyanide (Walker, 1983). Soil samples were collected by split-barrel sampler with hollow-stem auger equipment.

McLaren's Sampling Procedures

A total of 38 borings were drilled as part of the McLaren soil investigation. Three types of borings were drilled: shallow auger profile borings (SAPs), waste sample borings (WSBs), and soil sample borings (SSBs).

Thirty-two SAPs were used to determine the placement of the WSBs within the site. Eighteen of the SAPs were drilled outside of Building 666 and 14 SAPs were drilled within the interior of the building. The SAPs were drilled with 4-inch-diameter solid-stem augers. The procedure for SAPs was to drill to 10 to 20 feet below ground surface (BGS), monitor the cuttings with a photoionization detector (PID), and log the cuttings for soil classification (McLaren, 1986c). The cuttings from all SAPs at Site 47 were composited from 1, 3, 5, and 10 feet BGS, and when applicable, 15 and 20 feet BGS. The samples were placed in headspace jars to be analyzed for metals and cyanide and to be measured for soil gases. The SAPs drilled within the building were periodically monitored for hydrocyanic acid with Draeger® tubes and for pH with pH paper (McLaren, 1986a).

Three WSBs were drilled within Building 666 to characterize the soil and to collect soil samples. The WSBs were drilled using an 8-inch-diameter hollow-stem auger. Soil samples were collected approximately every 5 feet with a "down the hole split-spoon sampler/drop-hammer system" (McLaren, 1986c).

Three SSBs were drilled around the perimeter of Building 666 to determine the lateral extent of contamination. The SSBs were drilled using an 8-inch-diameter hollow-stem auger. As with the WSBs, samples were collected approximately every 5 feet.

All of the samples collected for analysis during McLaren's soil investigation were placed in freezer storage until analysis. Chain-of-custody procedures were apparently followed, although specific procedures were not documented (McLaren, 1986c).

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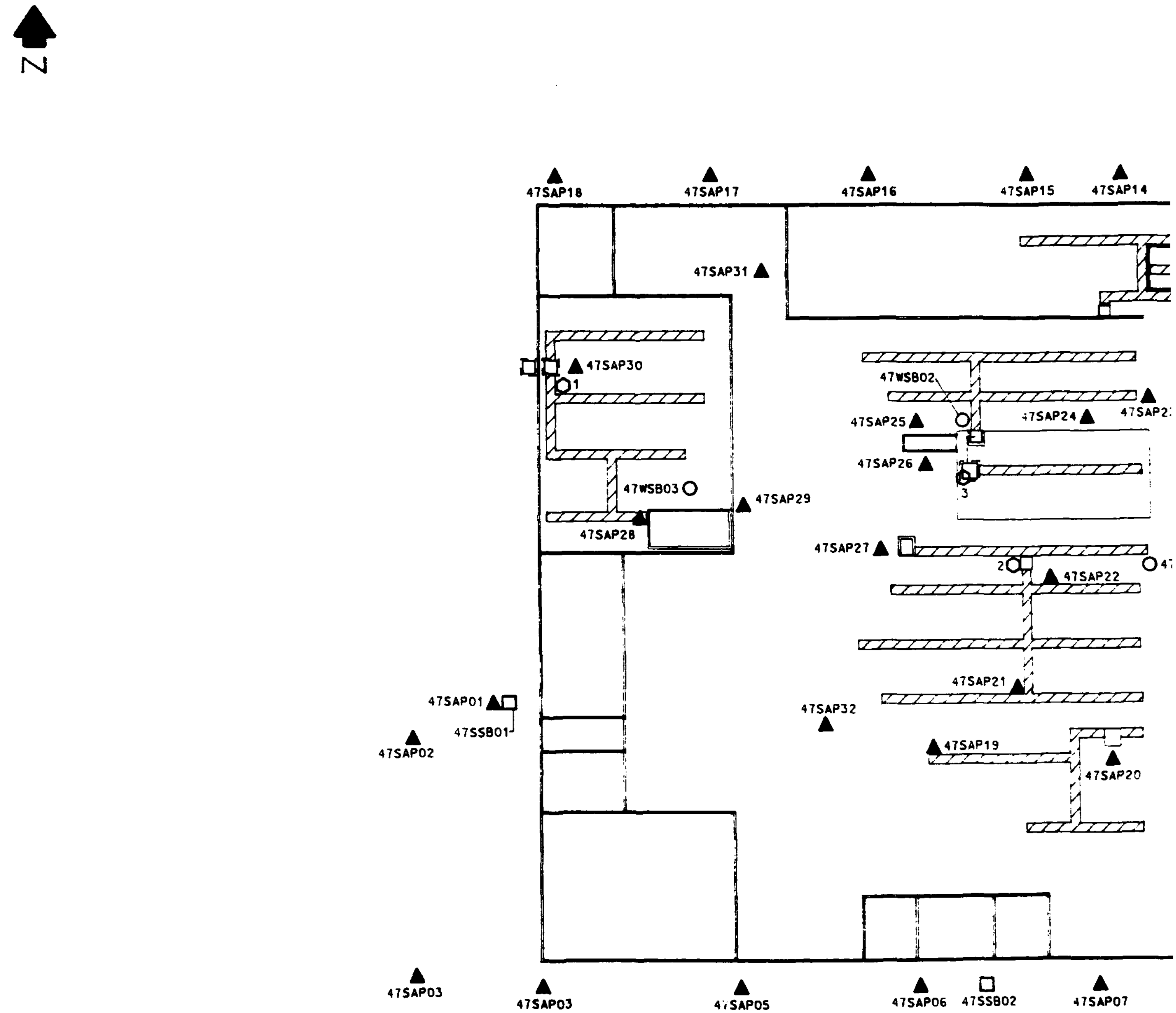

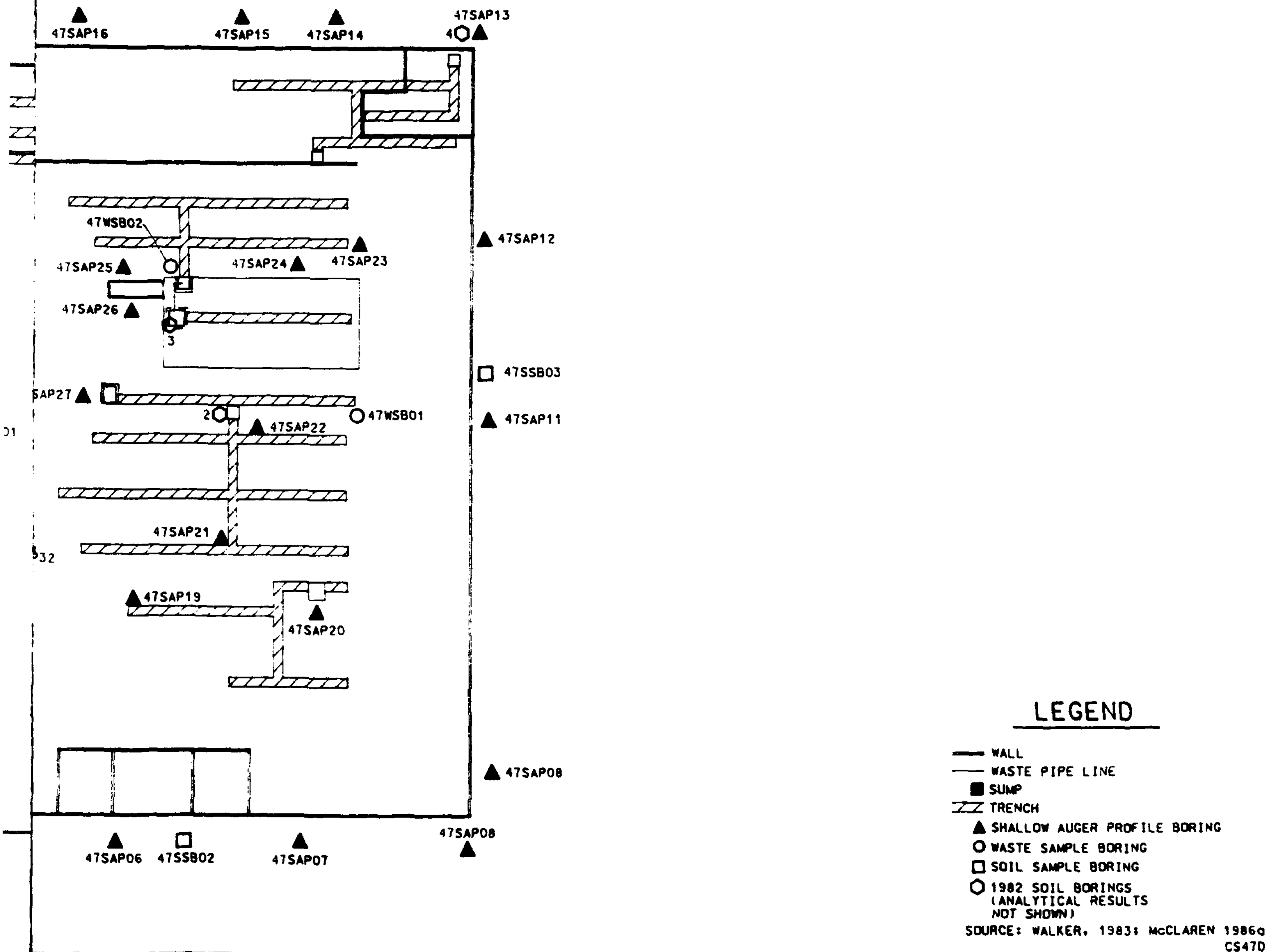

Figure 4-6. Boring Locations for Site 47.

4.2.1 Physical Characteristics

Lithologic logs from Walker's four borings and McLaren's 38 borings were used to determine the physical characteristics of the soil at Site 47. The soils at Site 47 range from slightly moist to very moist gravelly sandy loams, sands, sandy loams, loams, silt loams, and clay loams. The soil colors range from very dark grayish brown to light olive brown, with dark reddish brown predominating.

The surface soils around the perimeter of Building 666 consist of dry to slightly moist very gravelly sandy loams to gravelly loams. Directly beneath Building 666, the surface horizon consists of slightly moist to wet gravelly loams to fine sandy loams. The color of the surface soils range from dark brown to dark yellowish brown.

Solvent odors were noted in 12 borings: Walker's Boring 3; McLaren's 47SAP22, 47SAP23, 47SAP24, 47SAP25, 47SAP29, 47SAP32, 47WSB01, 47WSB02, 47WSB03, 47SSB01, and 47SSB03. Nine of these 12 borings are located in two general areas: near the hard chrome pit and eastern degreaser pit or near the western degreaser pit. Within the building, odors were first noted at depths ranging from 0 to 5 feet BGS; outside the building, the first odors were noted at depths of 14 to 70 feet BGS. In boring 47WSB02 (located near the eastern degreaser pit) odors were noted throughout the boring, from 0 to 80 feet BGS.

Boring logs from 47SAP22 and 47SAP26 indicate 4-inch and 6-inch voids, respectively, beneath the concrete foundation of Building 666. The cause of the voids is unknown. The surface soils in each boring were very moist.

Draeger® tubes were used to test soils from all the borings McLaren drilled within Building 666 for hydrocyanic acid. All results for hydrocyanic acid were negative, except for boring 47WSB03, where a value of 0 to 1 ppm was measured at a depth of 1 foot BGS.

The soil pH was recorded for eight of McLaren's borings: 47SAP22, 47SAP24, 47SAP25, 47SAP28, 47SAP30, 47WSB01, 47WSB02, and 47WSB03. The soil pH, measured using pH paper, varied from 5.5 to 6.8.

4.2.2 Analytical Results

Four samples from each of Walker's four borings were analyzed for total metal concentrations of cadmium, chromium, copper, nickel, and silver. Walker's samples were also analyzed to determine the concentrations of chloride, fluoride, sulfate, phosphate, and nitrate.

The extent of chemical analyses for McLaren's soil samples varied. For the most extensively analyzed samples, the following analyses for U.S. Environmental Protection Agency's (U.S. EPA) Priority Pollutant compounds were performed:

- Volatile organic compounds (VOCs);
- Semivolatile organic compounds;
- Pesticides and polychlorinated biphenyls (PCBs);
- Metals;
- Cyanide; and
- Oil and grease.

The least extensively analyzed samples were analyzed for total metal concentrations and cyanide only.

Table 4-1 summarizes the positive analytical results for soil samples from Site 47. The following subsections discuss the analytical results for the samples collected for the Walker and McLaren investigations.

Volatile Organic Compounds (VOCs)

A total of 12 samples from 6 borings were analyzed for VOCs using U.S. EPA Method 8240. In addition, field duplicates from borings 47SSB02 and 47SSB03 were analyzed. Table A-1 (Appendix A) presents detailed sampling information and analytical results from these samples.

In total, 10 different VOCs were detected in soil samples from the borings from Site 47 (see Table 4-1):

- Acetone;
- Benzene;
- 2-Butanone;
- Chloroform;
- 2-Hexanone;
- Tetrachloroethylene;
- Toluene;
- 1,1,1-Trichloroethane;

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TABLE 4-1. SUMMARY OF POSITIVE ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 47

Compound Detected	Boring Number	Depth (feet BGS)	Concentration
Volatile Organic Compounds:			
Acetone	47WSB02	59.5 - 60.0	430 μg/kg
		74.0 - 74.5	350 μg/kg
	47WSB03	24.5 - 25.0	110 μg/kg
Benzene	47WSB02	59.5 - 60.0	10 μg/kg
2-Butanone	47WSB01	44.5 - 45.0	160 μg/kg
		58.5 - 59.0	110 μg/kg
Chloroform	47SSB02	19.5 - 20.0	23 μg/kg
2-Hexanone	47WSB01	44.5 - 45.0	230 μg/kg
Tetrachloroethene	47WSB02	59.5 - 60.0	11 μg/kg
	47WSB03	24.5 - 25.0	15 μg/kg
Toluene	47WSB01	58.5 - 59.0	45 μg/kg
	47WSB03	24.5 - 25.0	11 μg/kg
		59.5 - 60.0	11 μg/kg
	47SSB03	73.5 - 74.0	13 μg/kg
			26 μg/kg
1,1,1-Trichloroethane	47SSB01	09.5 - 10.0	24 μg/kg
		79.5 - 80.0	20 μg/kg
	47SSB02	19.5 - 20.0	17 μg/kg
Trichloroethene	47WSB01	58.5 - 59.0	16 μg/kg
	47WSB02	59.5 - 60.0	10 μg/kg
	47WSB03	59.5 - 60.0	31 μg/kg
Total xylenes	47WSB02	59.5 - 60.0	18 μg/kg
	47SSB02	19.5 - 20.0	45 μg/kg
Semivolatile Organic Compounds:			
bis(2-Ethylhexyl)phthalate	47WSB01	44.5 - 45.0	150 μg/kg
	47WSB02	59.5 - 60.0	120 μg/kg
	47SSB01	9.5 - 10.0	140 μg/kg

- Trichloroethene; and
- Total xylenes.

The maximum levels of detected VOCs are shown in Figure 4-7.

Semivolatile Organic Compounds

One sample from each of six borings was analyzed for semivolatile organic compounds using U.S. EPA Method 8270. In addition, a duplicate sample from 47SSB03 was analyzed. Table A-2 (Appendix A) presents detailed summarizes sampling information and analytical results from these samples collected from 10 to 80 feet BGS. Only one compound was detected: bis(2-ethylhexyl)phthalate, in the samples from borings 47WSB01 (at 45 and 60 feet BGS) and 47SSB01 (at 10 feet BGS). However, this compound is a common laboratory contaminant.

Pesticides and Polychlorinated Biphenyls (PCBs)

Seven samples from six borings were analyzed for pesticides and PCBs using U.S. EPA Method 8080. Table A-3 (Appendix A) presents detailed sampling information and analytical results from these samples collected from 9 to 80 feet BGS. No pesticides or PCBs were detected in any of the samples.

Metals

Five samples from each of Walker's four borings were analyzed for cadmium, chromium, copper, nickel and silver. From McLaren's investigation, a total of 45 samples from 38 different borings were analyzed for total concentrations of the metals listed in California Code of Regulations, Title 22; and seven samples from six borings were analyzed for extractable concentrations of the metals listed in California Code of Regulations, Title 22. Table A-4 (Appendix A) presents detailed sampling information and analytical results from these samples collected from ground surface to 92 feet BGS.

Whereas the presence of any detectable amount of priority pollutant organic compound indicates contamination from a manufactured source, most soils have some natural concentrations of metals present. Because no other criteria have been established for evaluating metal contamination at McClellan AFB, California hazardous waste criteria were used as a basis of comparison (California Code of Regulations, Title 22, Section 66699). All total metal concentrations were below the applicable TTLCs,

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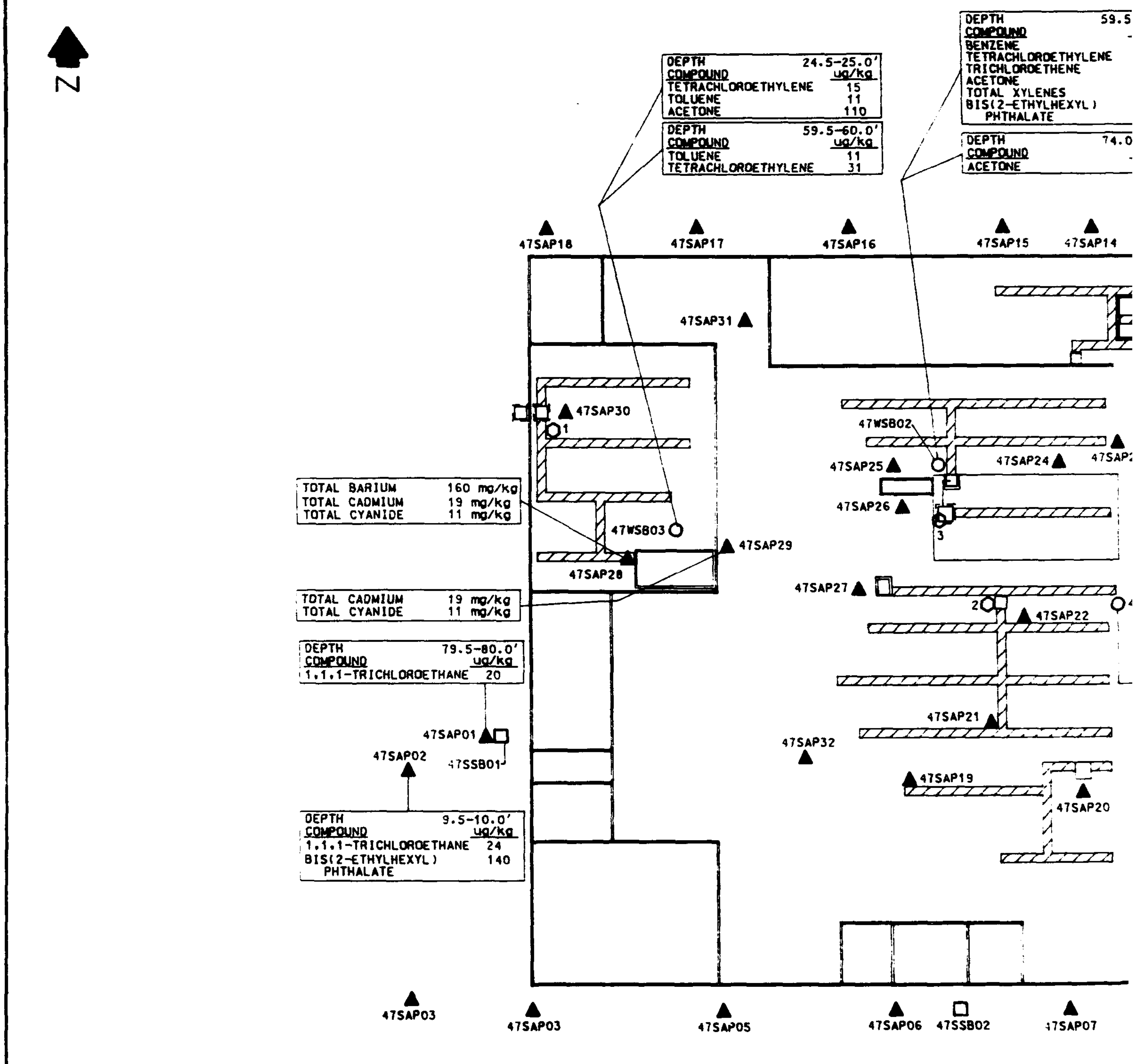

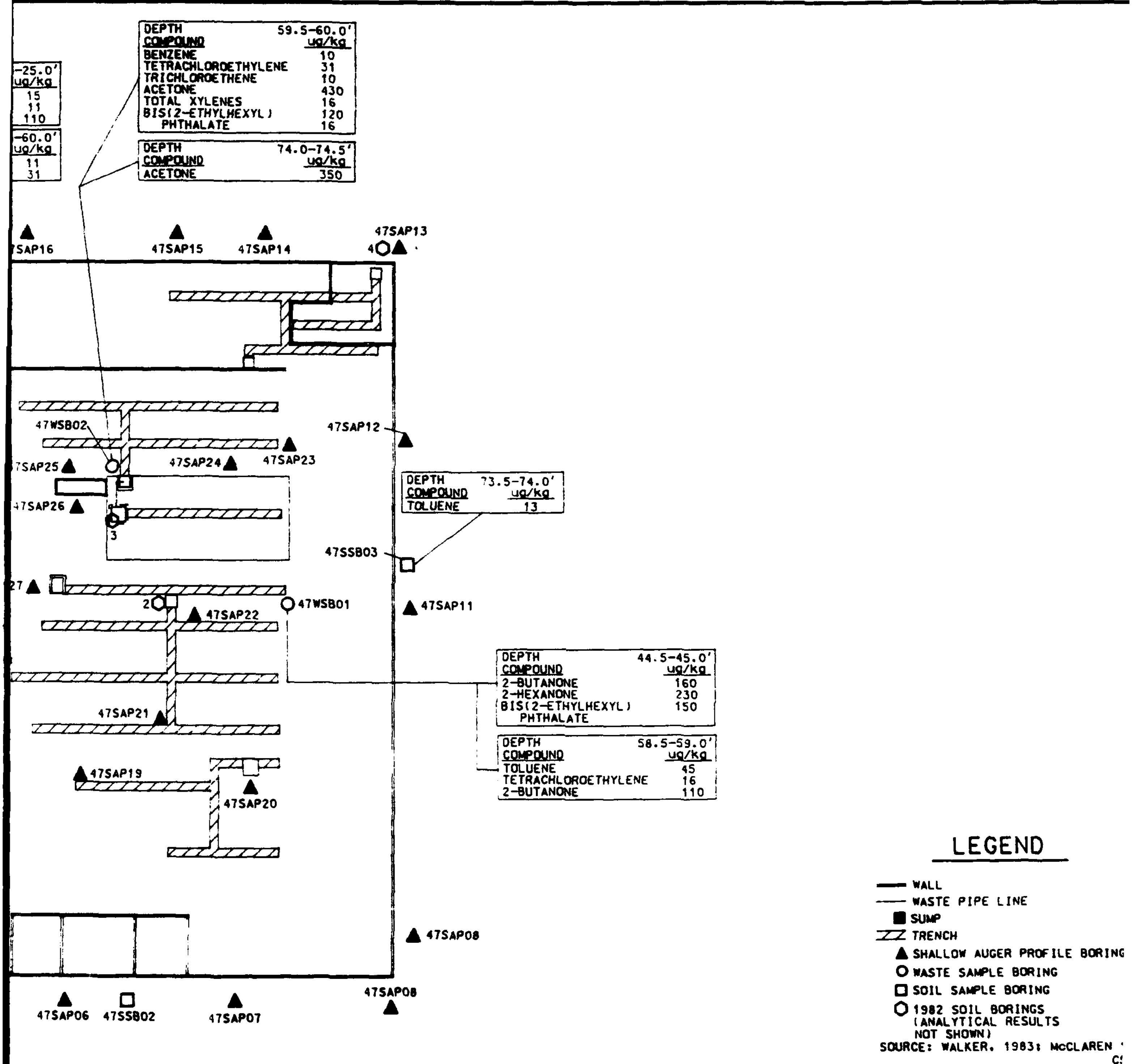

Figure 4-7. Maximum Levels of Organi
Compounds Detected for Site 47.

and all extractable concentrations were below the applicable Soluble Threshold Limit Concentrations (STLCs).

Miscellaneous Compounds

One sample from each of McLaren's three WSBs was analyzed for oil and grease using U.S. EPA Method 413.1. Sampling information and analytical results for oil and grease are included in Table A-5 (Appendix A). Although oil and grease was detected at concentrations ranging from 120 to 160 mg/kg, regulatory limits with which to compare these concentrations have not been established.

A total of 64 samples from 41 borings was analyzed for cyanide; the analytical method was not specified. Table A-5 (Appendix A) summarizes the available sampling information and analytical results for these samples. Cyanide was detected in the samples collected from borings 47SAP10 (composite sample from 1, 3, 5, 10, and 15 feet BGS); 47SAP28 (composite sample from 1, 3, 5, and 10 feet BGS); and 47SAP29 (composite sample from 1, 3, 5, 10, 15, and 20 feet BGS).

Five samples from each of Walker's four borings were analyzed for chloride, fluoride, nitrate, phosphate (total), and sulfate. The analytical results are presented in Table A-5 (Appendix A).

Quality Assurance/Quality Control (QA/QC)

The quality assurance/quality control (QA/QC) information available for these analyses was limited to sample detection limits and some duplicate results (McLaren, 1986a; McLaren, 1986d). For a complete evaluation of the data additional information is required, including results from method blanks, laboratory blanks, field blanks, laboratory replicates, laboratory spikes, and performance audit samples. Without this information it is difficult to estimate the precision of analyses, or determine if any systematic bias or artificial contamination was present in the results. However, some general considerations can be discussed regarding the quality of these analyses. For organic compounds, U.S. EPA Methods 8080, 8240, and 8270 are appropriate analytical methods for this type of investigation. Each analysis method has specific recommendations for QA/QC as part of the method procedure. Although no indications of analytical accuracy or precision were provided in the reports, these parameters may be within acceptable limits, if the specified QA/QC recommendations were followed by experienced technicians.

One unusual characteristic of the entire McLaren data set is the uniformity of detection limits between samples having different composition. The uniformity of detection limits may indicate that samples were not properly diluted before quantitation, or that dilutions were made, but not reported. Either of these omissions would result in detection limits that were higher than those indicated in the results.

Although duplicate results were available for some samples, McLaren did not indicate in their reports whether duplicate results were from laboratory or field duplicate samples. Radian assumed these duplicate results were from duplicate samples obtained in the field because unique identification numbers had been assigned to the samples by McLaren.

Analytical methods for metals were not specified; instead, methods were referenced to the Waste Extraction Test in the California Assessment Manual (CAM-WET), a former reference of California-approved methods for waste classification. The California Assessment Manual allowed several analytical methods for each metal, but it is unknown which ones were actually used in the McLaren and Walker analyses. Although CAM has been discontinued, the methods referenced are still applicable under present standards.

The analytical method for cyanide was not specified by either McLaren or Walker. Assuming U.S. EPA Method 335.2 was used (this method was specified for another laboratory used by McLaren), this distillation method was intended for water and wastewater samples and is unreliable for soil samples. At the time of the analyses, no other U.S. EPA-approved cyanide method was available. Whatever method was used, the three positive analytical results indicate that some level of cyanide is present in the soil at Site 47.

4.2.3 Adequacy of Soil Characterization

The following criteria were used by Radian to determine the adequacy of a soil characterization (U.S. EPA, 1986, p. 9-5):

- Representative samples of soil be collected;
- Enough samples be collected to define both the lateral and vertical extent of contamination; and

- Samples are handled and analyzed using appropriate methodology for the suspected contaminants.

The samples that were analyzed for the Walker and McLaren investigations were, at a minimum, adequate to detect the presence of high level contamination from metallic source material. The borings drilled during Walker's investigation were drilled in the areas of Site 47 that "exhibited the greatest probability for potential contamination" of cadmium, chromium, and cyanide (Walker, 1983). Three borings were drilled near sumps and one was drilled through the hard chrome pit. Samples were analyzed from depths approximately 2, 11, 26, 46, and 91 feet BGS. McLaren drilled 32 SAPs and analyzed composite samples collected from depths ranging from 1 to 20 feet BGS. Both investigations collected samples from the locations of Site 47 where metal contamination seems most likely. In addition, both investigations analyzed samples collected from relatively shallow depths, which is where metallic source material would most likely be found.

Additional sampling and analysis may be needed to detect the highest concentrations of non-metal contaminants. McLaren used observations from 32 SAPs to determine the placement of the WSBs. Generally, the analyzed samples from McLaren's WSBs and SSBs were collected from depths where relatively high soil gas readings were measured (see Section 4.3 for soil gas results). Although this is an appropriate strategy for selecting representative samples contaminated with volatile compounds, it may not identify source material containing semivolatile compounds, metals, or cyanide. Furthermore, only one sample was analyzed for volatile compounds and semivolatile compounds at a depth less than 10 feet BGS, which is the likely interval in which relatively immobile semivolatile compounds would remain.

The sampling and analytical methods used to characterize samples for organic compounds, pesticides, and metals are appropriate for the types of materials suspected at this site. Data from metal analyses are probably adequate to identify areas of contamination above background levels. Although specific analytical methods were not indicated, a California-approved method was most likely used. Data from organic analyses are probably of adequate quality to identify areas of source material or high levels of contamination. Insufficient information is available to determine if the data are adequate for low-level determinations.

4.3 Soil Gas Results

This section presents the results of soil gas measurements taken during the 1985 McLaren investigation (McLaren, 1986a). Throughout the drilling operations, McLaren used a PID to take soil gas readings from soil cuttings and headspace jars. For the SAPs, readings from soil cuttings were measured approximately at depths of 1, 3, 5, and 10 feet BGS, while readings from headspace jars were generally measured at 5 feet BGS and 10 feet BGS. For the WSBs and SSBs, cuttings and headspace readings were measured at 5-foot intervals.

A PID is a screening instrument and does not speciate or accurately quantify the soil gas. Quality assurance measures included calibrating the PID daily with standardized isobutylene, keeping a calibration log book, and prior to drilling, recording the ambient air reading from the PID. McLaren also indicated that the PID was periodically checked in the field to ensure proper functioning (McLaren, 1986d, p. 19).

McLaren measured relatively high soil gas readings in several of the borings, especially 47WSB02 and 47SAP02, where the maximum readings were over 400 parts per million by volume (ppmv). The maximum soil gas readings from soil cuttings and headspace jars are shown in Table B-1 (Appendix B). McLaren believed some of the high soil gas readings may have been due to "moisture artifacts" affecting the PID, as discussed in their report on procedures (McLaren, 1986c.)

McLaren noted that the PID was sensitive to excessive moisture, and excessive moisture may cause PID to show higher readings than the actual levels. This response can be identified by a very slow meter response; "Thus, when slow responses occurred and ultimate readings were high in the absence of odors or other indications of contamination, the PID readings were assumed to be moisture artifacts" (McLaren, 1986c, p. 19).

Generally, the depth where relatively high soil gas readings were recorded correlate to the depth where odors were noted. Reading of at least 30 ppmv were recorded for each of the 11 borings where solvent odors were noted.

McLaren's investigation is an adequate characterization of the soil gas concentration at Site 47. The relatively high soil gas readings indicate that some concentrations of VOCs are present in the soil at Site 47.

4.4 Groundwater Results

Because this Technical Memorandum is concerned only with site-specific data, only groundwater results from downgradient wells that have detectable amounts of the same constituents associated with Site 47 are relevant. Historically, the groundwater of McClellan AFB has flowed south/southwest. Monitoring Well (MW) 41S and MW-65 are the only monitoring wells in the vicinity of Site 47 that are located south or southwest of the site. Tables C-1 through C-7 (Appendix C) summarize the available sampling data and analytical results for MW-41S and MW-65 (McLaren, 1986d; Radian, 1984-1988c). The compounds detected in the soil of Site 47, and also in the groundwater of MW-41S, are chloroform, tetrachloroethylene, and trichloroethene. The compounds detected in soil of Site 47, and also in the groundwater of MW-65, are trichloroethylene and toluene. However, because of the complexity of factors involved in the migration of contaminants to groundwater (including multiple contaminant sources in this area), an on-site monitoring well is needed to confirm groundwater contamination originating from Site 47.

4.5 Surface Water

Although no surface water samples that can be specifically related to Site 47 have been collected for analysis, surface water at McClellan AFB is regularly monitored under two National Pollutant Discharge Elimination System (NPDES) permits. The first requires that surface water from Arcade Creek, Second Creek, and Magpie Creek be sampled monthly where it enters the base, and again where it exits; these samples are analyzed for volatile organic compounds (VOCs) and heavy metals. The second permit outlines waste discharge regulations for the base groundwater treatment plant (located in Operable Unit [OU] C of McClellan AFB), including effluent analyses of VOCs, semivolatile organic compounds, and heavy metals. The NPDES permits establish limits on concentrations of VOCs, semivolatile organic compounds, and heavy metals in surface water discharged from McClellan AFB. Under the permit requirements, concentrations of these compounds must not exceed the established limits.

4.6 Air Monitoring Results

No air monitoring results have been specifically associated with Site 47.

5.0 POTENTIAL HAZARDS

The following sections discuss the potential contaminants of concern, immediate hazards, and potential for migration resulting from any on-site contamination at Site 47.

5.1 Potential Contaminants of Concern

The contaminants of concern at Site 47 are the volatile organic compounds (VOCs), semivolatile organic compounds, metals, acids, bases, and cyanide known to have been used at the site and detected during previous investigations (see Sections 3 and 4). Section 4, Extent of Contamination, provides a detailed description of previous investigations at Site 47, and is summarized below:

- Interior samples taken from Building 666 had very high concentrations of metals.
- A total of 42 borings were drilled, 17 within Building 666 and 21 around the perimeter of the building.
- Solvent odors were noted in 12 borings.
- Soil gas readings ranged from 30 parts per million by volume (ppmv) to 400 ppmv.
- Five soil samples from each of four borings were analyzed for selected metals and anions. All results were less than California Title 22 threshold limit concentrations.
- Composite samples from either 1 to 10 feet or 1 to 20 feet were collected from each of 32 borings. Samples were analyzed for metals and cyanide; cyanide was detected in three samples, and metal results were less than California Title 22 threshold limit concentrations.
- Fourteen samples collected from six borings were analyzed for VOCs. Ten VOCs were detected in these samples. At least one VOC was detected in each of the borings.

- One sample from each of six borings were analyzed for semivolatile organic compounds and polychlorinated biphenyls (PCBs). The only compound detected is a common laboratory contaminant.

- Four VOCs found in the soils at Site 47 also have been detected in the groundwater near the site.

Table 5-1 lists the organic chemicals detected at this location along with certain physical characteristic values that influence their mobility. Inorganic compounds are not listed in the table because the specific compounds present in the soil are unknown.

5.2 Immediate Hazards

This section describes any potential hazards including the potential for fire and explosion, and the possible hazards to worker health and safety that require immediate action due to contaminants present at Site 47. Because the soil gas concentrations measured in the two borings are far below the lower explosive limit, the potential for fire and explosion is believed to be low.

Potential hazards to worker health and safety are limited to inhalation, ingestion, or dermal contact of any contaminated near-surface soil. Because all contaminated debris have been removed from Site 47, and the foundation of Building 666 remains at the site, the amount of contaminated dust and vapors released from the site is low. Furthermore, Site 47 is completely enclosed by a fence and locked gate, which also reduces the potential for worker exposure to contaminated material.

5.3 Potential for Contaminant Migration

This section describes the potential for wastes to migrate from Site 47 to the groundwater, surface water, and air. The potential for contaminant migration is dependent on the characteristics of the site, and the nature of the contaminants of concern. Although site-specific information is limited, it is possible to discuss general considerations of contaminant migration at this location.

TABLE 5-1. PHYSICAL CHARACTERISTIC VALUES FOR ORGANIC COMPOUNDS DETECTED AT SITE 47

Compound	Water Solubility[a] (mg/L)	Vapor Pressure[a] (mm Hg)	Log K_{ow}[b]
Volatile Organic Compounds			
Acetone	Miscible	270	-0.24
Benzene	1,750	95.2	2.12
2-Butanone	26,800	77.5	0.26
Chloroform	8,200	151	1.97
2-Hexanone	NA	NA	NA
Dichloromethane	20,000	362	1.30
Tetrachloroethene	150	17.8	2.6
Toluene	535	28.1	2.73
1,1,1-Trichloroethane	2.4	1,500	123
Trichloroethene	2.4	1,100	57.9
Xylenes	198	10	3.26
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	5.3[c]	1.3[c]	NA

[a] At neutral pH at 20 - 30°C
[b] Log of octanol/water partition coefficient.
[c] Source: U.S. EPA Database, 1988. Water Engineering Research Laboratory.

NA = Information not available.

SOURCE: U.S. Environmental Protection Agency, 1986. Superfund Public Health Evaluation Manual. OSWER Directive 9285.4-1.

5.3.1 Potential for Migration to Groundwater

The most important factors that influence migration to groundwater are the amount of infiltrating surface water, other sources of percolating water, the percolation rate of the soil, and contaminant characteristics.

Site 47 has been capped with roof-like structures to intercept rainfall, and the foundation of Building 666 remains at the site. Both of these features minimize the amount of infiltrating water. No other sources of subsurface water are suspected at the site.

The percolation rate of contaminants depends on the soil permeability, structure, stratification, and characteristics of the contaminants. Although permeability data on the soil at Site 47 are not available, boring logs reveal that soils range from gravelly sandy loams to clay loams. The relative permeabilities for these soils range from very low to moderate. Basewide boring information indicates that relatively impermeable layers are not continuous and not effective barriers to percolation. Therefore, the percolation rate for this location is potentially low to moderate.

The contaminants of concern at Site 47 are VOCs, semivolatile organic compounds, and metals, acids, bases, and cyanide. The detected VOCs have relatively high water solubilities and moderate to low octanol/water coefficients (K_{ow}) (shown in Table 5-1), which indicate that these contaminants have a relatively high potential for dissolving and being carried with the flow of percolating water.

Although semivolatile compounds were not detected in previous investigations, in general, these contaminants are much less soluble in water and have much higher K_{ow} values, indicating these compounds tend to remain in surface soil and not migrate with percolating water. However, as other organic compounds dissolve in water, any semivolatile compounds with high K_{ow} values may dissolve more readily, due to the solvent properties of other organics.

The mobility of metals is limited by the least soluble compound of the metal in the percolating groundwater. Because hazardous metals generally form practically insoluble precipitates in soil at neutral or alkaline pH, these metals tend to remain in surface soils and not migrate with percolating water (Lindsay, 1979). However, dissolved acids may significantly increase the solubility of metal compounds and some semivolatile compounds (e.g., phenols and other acid-extractable organic compounds). If acidic materials are present at Site 47, metals and acid-extractable compounds may have migrated in the acidic soil solution. However, the natural buffer capacity of clay and silty soils is able to partially neutralize moderate amounts of acid or alkaline wastes and any migrating acid-extractable contaminants would quickly precipitate out of solution as the pH was neutralized.

The behavior of cyanide compounds is extremely variable. The water solubility of these compounds range from practically insoluble to very soluble. However, cyanide compounds are reactive when in solution. Cyanide forms volatile hydrocyanic acid in low pH environments and oxidizes rapidly in aerobic, high pH environments. The soils at Site 47 have been measured as being slightly acidic; therefore, the cyanide probably is not volatile, and will not oxidize rapidly.

5.3.2 Potential for Migration to Surface Water

The primary site characteristics affecting the potential for contaminant migration to surface water are the topography and surface characteristics of the location. Since Site 47 is covered with a roof-like cap to intercept rainfall, and the foundation of Building 666 remains on the site, the potential for migration to surface water is very low.

5.3.3 Potential for Migration to Air

Surface characteristics of the site and contaminant characteristics also influence the potential for migration to air. Vapor Pressure is a relative measure of the volatility of a chemical in its pure state and is an important determinant of the rate of vaporization from soils and solid waste sites. Table 5-1 lists the available vapor pressures for the organic chemicals detected at Site 47. The relatively high vapor pressures for VOCs indicate that VOCs present in exposed surface and near-surface soils are likely to migrate to the air.

The surface flux (concentration of organic compounds entering the air from the soil in a unit time) is dependent upon soil permeability, soil moisture, depth of contaminants, concentration of contaminants in the soil gas, and other physical soil properties that have not been quantified. Because the entire site is covered with the foundation of Building 666, the surface flux of volatile contaminants is probably low.

6.0 EVALUATION OF PREVIOUS CONTRACTORS' RECOMMENDATIONS

McLaren Environmental Engineering proposed the following recommendations regarding remedial actions at Site 47 (McLaren, 1986b):

> Soil sampling should be completed beneath all portions of the building. Previous work completed in 1982 detected PCE [tetrachloroethylene] at 130 mb/kg [mg/kg] beneath the hard chrome pit. This area could be excavated with a backhoe or clamshell crane to a depth of about 15 feet below the bottom of the pit.
>
> Soil samples should be taken during excavation to determine the depth and extent of excavation necessary based on DHS Designated Levels for the Protection of Groundwater. This could potentially decrease the amount of soil that needs to be disposed of. Excavation and sampling should continue until the soil is determined to have concentrations less than regulatory standards. Additionally, samples should be taken beneath sumps and trenches to verify that soil contamination is below regulatory standards.

The McLaren recommendations are well taken, but may be premature. Characterization of Site 47 in a broader context should be made before excavating one pit or area. A complete remedial investigation for Site 47 and adjoining Sites is needed to fully evaluate a remedial approach. During the remedial investigation phase, all available data will be reviewed to determine the amount of additional soil sampling that is warranted. Excavation may not be the most appropriate remediation for Site 47. The remedial investigation will help determine clean up levels and will aid in the screening of remedial measures for the site. After completing the remedial investigation, a feasibility study should be done to evaluate remedial action alternatives.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Large amounts of hazardous materials were handled in Building 666 during its 25 years of operation. Results from previous soil investigations at Site 47 indicate contamination is present at the site. In total, 10 different volatile organic compounds were detected in soil samples collected at Site 47, at depths ranging from 15 to 80 feet BGS. Soil gas readings up to 400 parts per million by volume (ppmv) were measured at Site 47; readings exceeded 350 ppmv at depths of 80 feet BGS. Priority pollutant metals were detected in the soil from Site 47; however, none of the results exceeded Total Threshold Limit Concentration (TTLC) or Soluble Threshold Limit Concentration (STLC) values.

Previous investigations were adequate to characterize the presence of contaminants from ground surface to significant depths below ground surface (BGS). However, the extent of contaminants in soils and the migration of contaminants to groundwater have not been sufficiently characterized to determine remedial actions. As part of the recommended remedial investigation for Site 47 the following actions should be completed:

- Design additional remedial field investigations to include the adjoining Site 48 and Site 36;
- Collect concrete samples from the exposed foundation of Building 666 to confirm completion of stabilization procedures;
- At least one on-site groundwater monitoring well may be needed to help evaluate the extent of groundwater contamination from Site 47;
- Sample and analyze additional soil samples across Site 47, Site 48, and Site 36 to allow screening of remedial alternatives for soils;
- Evaluate the data to identify and compare alternatives for remediation;

- Determine cleanup levels for the contaminants detected at Site 47; and

- Conduct a feasibility study of alternatives for soil and groundwater remediation.

The Remedial Investigation Sampling and Analysis Plan for Site 47 should consider remedial alternatives in proposing the collection of information necessary to evaluate the performance of the possible alternatives for the site.

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APPENDIX A

Analytical Results for Soil Samples

RADIAN CORPORATION

TABLE A-1. VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 47 (UNITS IN UG/KG)

Boring Number	47WSB01	47WSB01	47WSB02	47WSB02	47WSB03	47WSB03	47SSB01	47SSB01	47SSB02	47SSB02
Depth (feet BGS)	44.5-45.0	58.5-59.0	59.5-60.0	74.0-74.5	24.5-25.0	59.5-60.0	9.5-10.0	79.5-80.0	19.5-20.0	19.5-20.0
Date Sampled	10/08/85	10/09/85	10/14/85	10/16/85	10/17/85	10/18/85	08/13/85	08/14/85	08/09/85	08/09/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240
Date Analyzed	--	--	--	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC										
Laboratory QC	NS	NS	NS	NS	NS	NS	NS	NS	FDA	FDB
Acetone	<100	<100	430	350	110	<100	<100	<100	<100	<100
Acrolein	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
2-Butanone	160	110	<100	<100	<100	<100	<100	<100	<100	<100
Carbon disulfide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10	23
Chlorodibromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Dichlorobenzene (total)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Dichlorobromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dichlorodifluoromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Continued)

CS47/080489/DJD

TABLE A-1. (Continued)

Boring Number Depth (feet BGS)	47WSB01 44.5-45.0	47WSB01 58.5-59.0	47WSB02 59.5-60.0	47WSB02 74.0-74.5	47WSB03 24.5-25.0	47WSB03 59.5-60.0	47SSB01 9.5-10.0	47SSB01 79.5-80.0	47SSB02 19.5-20.0	47SSB02 19.5-20.0
1,2-Dichloropropane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis-1,3-Dichloropropylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,3-Dichloropropylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Diethyl ether	NS	NS	NS	NS	NS	NS	NA	NA	NS	NS
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Freon 113	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2-Hexanone	230	<100	<100	<100	<100	<100	<100	<100	<100	<100
4-Methyl-2-pentanone	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Styrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<10	<10	11	<10	15	<10	<10	<10	<10	<10
Toluene	<10	45	<10	<10	11	11	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	24	20	<10	17
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	16	10	<10	<10	31	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl acetate	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Vinyl chloride	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Xylenes (total)	<10	<10	18	<10	<10	<10	<10	<10	<10	45

(Continued)

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TABLE A-1. (Continued)

Boring Number	47SSB02	47SSB03	47SSB03	47SSB03
Depth (feet BGS)	69.0-69.5	59.0-59.5	73.5-74.0	73.5-74.0
Date Sampled	08/12/85	11/21/85	11/21/85	11/21/85
Sampled By	MCR	MCR	MCR	MCR
Analytical Method	EPA 8240	EPA 8240	EPA 8240	EPA 8240
Date Analyzed	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL
Field QC				
Laboratory QC	NS	NS	FDA	FDB
Acetone	<100	<100	<100	<100
Acrolein	<100	<100	<100	<100
Acrylonitrile	<100	<100	<100	<100
Benzene	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10
Bromomethane	<100	<100	<100	<100
2-Butanone	<100	<100	<100	<100
Carbon disulfide	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10
Chlorodibromomethane	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10
Chloromethane	<100	<100	<100	<100
Dichlorobenzene (total)	NS	NS	NS	NS
Dichlorobromomethane	<10	<10	<10	<10
Dichlorodifluoromethane	NS	NS	NS	NS
1,1-Dichloroethane	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10
Dichloromethane	<10	<10	<10	<10

(Continued)

CS47/080489/DJD

TABLE A-1. (Continued)

Boring Number Depth (feet BGS)	47SSB02 69.0-69.5	47SSB03 59.0-59.5	47SSB03 73.5-74.0	47SSB03 73.5-74.0
1,2-Dichloropropane	<10	<10	<10	<10
1,3-Dichloropropylene	<10	<10	<10	<10
cis-1,3-Dichloropropylene	<10	<10	<10	<10
trans-1,3-Dichloropropylene	<10	<10	<10	<10
Diethyl ether	NA	NS	NS	NS
Ethylbenzene	<10	<10	<10	<10
Freon 113	NS	NS	NS	NS
2-Hexanone	<100	<100	<100	<100
4-Methyl-2-pentanone	<100	<100	<100	<100
Styrene	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10
Toluene	<10	<10	13	26
1,1,1-Trichloroethane	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10
Vinyl acetate	<100	<100	<100	<100
Vinyl chloride	<100	<100	<100	<100
Xylenes (total)	<10	<10	<10	<10

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
NA = Not analyzed.
NS = Not specified
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.

SOURCE: McLaren, 1986a.

CS47/080489/DJD

TABLE A-2. SEMIVOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 47 (UNITS IN UG/KG)

Boring Number	47WSB01	47WSB02	47WSB03	47SSB01	47SSB01	47SSB02	47SSB02	47SSB03
Depth (feet BGS)	44.5-45.0	59.5-60.0	24.5-25.0	9.5-10.0	79.5-80.0	19.5-20.0	19.5-20.0	59.0-59.5
Date Sampled	10/08/85	10/14/85	10/17/85	08/13/85	08/14/85	08/09.85	08/09/85	11/21/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270
Date Analyzed	--	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC								
Laboratory QC							FDA	FDB
Acenaphthene	<100	<100	<100	<100	<100	<100	<100	<100
Acenaphthylene	<100	<100	<100	<100	<100	<100	<100	<100
Aniline	<100	<100	<100	<100	<100	<100	<100	<100
Anthracene	<100	<100	<100	<100	<100	<100	<100	<100
Benzidine	<400	<400	<400	<400	<400	<400	<400	<400
Benzo(a)anthracene	<100	<100	<100	<100	<100	<100	<100	<100
Benzo(a)pyrene	<100	<100	<100	<100	<100	<100	<100	<100
3,4-Benzo(b)fluoranthene	<100	<100	<100	<100	<100	<100	<100	<100
Benzo(g,h,i)perylene	<100	<100	<100	<100	<100	<100	<100	<100
Benzoic acid	<100	<100	<100	<100	<100	<100	<100	<100
Benzo(k)fluoranthene	<100	<100	<100	<100	<100	<100	<100	<100
Benzyl alcohol	<100	<100	<100	<100	<100	<100	<100	<100
4-Bromophenylphenyl ether	<100	<100	<100	<100	<100	<100	<100	<100
Butyl benzyl phthalate	<100	<100	<100	<100	<100	<100	<100	<100
4-Chloroaniline	<100	<100	<100	<100	<100	<100	<100	<100
bis(2-Chloroethoxy)methane	<100	<100	<100	<100	<100	<100	<100	<100
bis(2-Chloroethyl)ether	<100	<100	<100	<100	<100	<100	<100	<100
bis(2-Chloroisopropyl)ether	<100	<100	<100	<100	<100	<100	<100	<100
p-Chloro-m-cresol	<100	<100	<100	<100	<100	<100	<100	<100
bis(Chloromethyl)ether	<400	<400	<400	<400	<400	<400	<400	<400
2-Chloronaphthalene	<100	<100	<100	<100	<100	<100	<100	<100
2-Chlorophenol	<100	<100	<100	<100	<100	<100	<100	<100
4-Chlorophenylphenyl ether	<100	<100	<100	<100	<100	<100	<100	<100
Chrysene	<100	<100	<100	<100	<100	<100	<100	<100

(Continued)

TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	47WSB01 44.5-45.0	47WSB02 59.5-60.0	47WSB03 24.5-25.0	47SSB01 9.5-10.0	47SSB01 79.5-80.0	47SSB02 19.5-20.0	47SSB02 19.5-20.0	47SSB03 59.0-59.5
Dibenzo(a,h)anthracene	<100	<100	<100	<100	<100	<100	<100	<100
Dibenzofuran	<100	<100	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	<100	<100	<100	<100	<100	<100	<100	<100
1,3-Dichlorobenzene	<100	<100	<100	<100	<100	<100	<100	<100
1,4-Dichlorobenzene	<100	<100	<100	<100	<100	<100	<100	<100
3,3'-Dichlorobenzidine	<100	<100	<100	<100	<100	<100	<100	<100
2,4-Dichlorophenol	<100	<100	<100	<100	<100	<100	<100	<100
Diethylphthalate	<100	<100	<100	<100	<100	<100	<100	<100
2,4-Dimethylphenol	<100	<100	<100	<100	<100	<100	<100	<100
Dimethylphthalate	<100	<100	<100	<100	<100	<100	<100	<100
Di-n-butylphthalate	<100	<100	<100	<100	<100	<100	<100	<100
4,6-Dinitro-2-methylphenol	NS	NS	NS	NS	NS	NS	NS	NS
4,6-Dinitro-o-cresol	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
2,4-Dinitrophenol	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
2,4-Dinitrotoluene	<100	<100	<100	<100	<100	<100	<100	<100
2,6-Dinitrotoluene	<100	<100	<100	<100	<100	<100	<100	<100
Di-n-octylphthalate	<100	<100	<100	<100	<100	<100	<100	<100
1,2-Diphenylhydrazine	<100	<100	<100	<100	<100	<100	<100	<100
bis(2-Ethylhexyl)phthalate	150	120	<100	140	<100	<100	<100	<100
Fluoranthene	<100	<100	<100	<100	<100	<100	<100	<100
Fluorene	<100	<100	<100	<100	<100	<100	<100	<100
Hexachlorobenzene	<100	<100	<100	<100	<100	<100	<100	<100
Hexachlorobutadiene	<100	<100	<100	<100	<100	<100	<100	<100
Hexachlorocyclopentadiene	<100	<100	<100	<100	<100	<100	<100	<100
Hexachloroethane	<100	<100	<100	<100	<100	<100	<100	<100
Indeno(1,2,3-cd)pyrene	<100	<100	<100	<100	<100	<100	<100	<100
Isophorone	<400	<400	<400	<400	<400	<400	<400	<400
2-Methylnaphthalene	<100	<100	<100	<100	<100	<100	<100	<100
2-Methylphenol	<100	<100	<100	<100	<100	<100	<100	<100
4-Methylphenol	<100	<100	<100	<100	<100	<100	<100	<100
Naphthalene	<100	<100	<100	<100	<100	<100	<100	<100

(Continued)

RADIAN CORPORATION

TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	47WSB01 44.5-45.0	47WSB02 59.5-60.0	47WSB03 24.5-25.0	47SSB01 9.5-10.0	47SSB01 79.5-80.0	47SSB02 19.5-20.0	47SSB02 19.5-20.0	47SSB03 59.0-59.5
2-Nitroaniline	<100	<100	<100	<100	<100	<100	<100	<100
3-Nitroaniline	<100	<100	<100	<100	<100	<100	<100	<100
4-Nitroaniline	<100	<100	<100	<100	<100	<100	<100	<100
Nitrobenzene	<100	<100	<100	<100	<100	<100	<100	<100
N-Nitrosodimethylamine	<100	<100	<100	<100	<100	<100	<100	<100
N-Nitroso-di-n-propylamine	<100	<100	<100	<100	<100	<100	<100	<100
2-Nitrophenol	<100	<100	<100	<100	<100	<100	<100	<100
4-Nitrophenol	<100	<100	<100	<100	<100	<100	<100	<100
N-Nitrosodiphenylamine	<100	<100	<100	<100	<100	<100	<100	<100
Pentachlorophenol	<100	<100	<100	<100	<100	<100	<100	<100
Phenanthrene	<100	<100	<100	<100	<100	<100	<100	<100
Phenol	<100	<100	<100	<100	<100	<100	<100	<100
Pyrene	<100	<100	<100	<100	<100	<100	<100	<100
2,3,7,8-Tetrachlorodibenzo-p-dioxin	<100	<100	<100	<100	<100	<100	<100	<100
1,2,4-Trichlorobenzene	<100	<100	<100	<100	<100	<100	<100	<100
2,4,5-Trichlorophenol	<100	<100	<100	<100	<100	<100	<100	<100
2,4,6-Trichlorophenol	<100	<100	<100	<100	<100	<100	<100	<100

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
NA = Not analyzed.
NS = Not specified.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.

SOURCE: McLaren, 1986a.

CS47/080489/DJD

TABLE A-3. PESTICIDES/PCB ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 47 (UNITS IN UG/KG)

RADIAN CORPORATION

Boring Number	47WSB01	47WSB02	47WSB03	47SSB01	47SSB01	47SSB02	47SSB02	47SSB03
Depth (feet BGS)	44.5-45.0	59.5-60.0	24.5-25.0	9.5-10.0	79.5-80.0	19.5-20.0	19.5-20.0	59.0-59.5
Date Sampled	10/08/85	10/14/85	10/17/85	08/13/85	08/14/85	08/09/85	08/09/85	11/21/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080
Date Analyzed	--	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC								
Laboratory QC	NS	NS	NS	NS	NS	FDA	FDB	NS
Aldrin	<10	<10	<10	<10	<10	<10	<10	<10
alpha-BHC	<10	<10	<10	<10	<10	<10	<10	<10
beta-BHC	<10	<10	<10	<10	<10	<10	<10	<10
delta-BHC	<10	<10	<10	<10	<10	<10	<10	<10
gamma-BHC (Lindane)	<10	<10	<10	<10	<10	<10	<10	<10
Chlordane	<100	<100	<100	<100	<100	<100	<100	<100
4,4'-DDD	<10	<10	<10	<10	<10	<10	<10	<10
4,4'-DDE	<10	<10	<10	<10	<10	<10	<10	<10
4,4'-DDT	<10	<10	<10	<10	<10	<10	<10	<10
Dieldrin	<10	<10	<10	<10	<10	<10	<10	<10
Endosulfan I	<10	<10	<10	<10	<10	<10	<10	<10
Endosulfan II	<10	<10	<10	<10	<10	<10	<10	<10
Endosulfan I/II	NS	NS	NS	NS	NS	NS	NS	NS
Endosulfan sulphate	<10	<10	<10	<10	<10	<10	<10	<10
Endrin	<10	<10	<10	<10	<10	<10	<10	<10
Endrin aldehyde	<10	<10	<10	<10	<10	<10	<10	<10
Endrin ketone	NS	NS	NS	NS	NS	NS	NS	NS
Heptachlor	<10	<10	<10	<10	<10	<10	<10	<10
Heptachlor epoxide	<10	<10	<10	<10	<10	<10	<10	<10
Methoxychlor	<100	<100	<100	<100	<100	<100	<100	<100
Toxaphene	<200	<200	<200	<200	<200	<200	<200	<200
PCB-1016	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1221	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1232	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1242	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1248	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1254	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1260	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000

(Continued)

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TABLE A-3. (Continued)

FOOTNOTES:

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NS = Not specified.
NA = Not analyzed.

SOURCE: McLaren, 1986a.

TABLE A-4. INORGANIC COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED FROM SITE 47

Boring Number		1	1	1	1	1	2	2	2	2
Depth (feet BGS)		1.5-2.5	10.5-11.5	26.0-26.5	46.0-46.5	91.0-91.5	0.5-1.5	10.0-11.0	25.0-26.0	46.0-46.5
Date Sampled		11/08/82	11/08/82	11/08/82	11/08/82	11/09/82	11/11/82	11/11/82	11/11/82	11/11/82
Sampled By		HLA	HLA	HLA	HLA	HLA	HLA	HLA	HLA	HLA
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Berylium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NS	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
Chromium	NS	18.5	17.8	19.5	18.7	20.6	22.8	20.9	20.7	12.8
Cobalt	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NS	5.16	8.67	11.4	15.5	17.7	9.07	9.76	17.7	12.3
Lead	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NS	11.7	9.4	9.0	12.3	9.6	15.6	9.8	13.8	10.6
Selenium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NS	<0.70	0.70	<0.70	<0.70	<0.70	0.78	<0.70	<0.70	<0.70
Thallium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

CS4?/022089/JKS

TABLE A-4. (Continued)

Boring Number		1	1	1	1	1	2	2	2	2
Depth (feet BGS)		1.5-2.5	10.5-11.5	26.0-26.5	46.0-46.5	91.0-91.5	0.5-1.5	10.0-11.0	25.0-26.0	46.0-46.5
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

CS47/022089/JKS

TABLE A-4. (Continued)

Boring Number		2	3	3	3	3	3	4	4	4
Depth (feet BGS)		91.0-91.5	0.0-1.5	10.5-11.0	25.5-26.0	46.0-46.5	90.5-91.5	0.5-1.0	10.5-11.0	25.5-26.0
Date Sampled		11/11/82	11/09/82	11/09/82	11/09/82	11/09/82	11/10/82	11/11/82	11/11/82	11/11/82
Sampled By		HLA	HLA	HLA	HLA	HLA	HLA	HLA	HLA	HLA
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/kg)								
Antimony	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Berylium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NS	<0.90	<0.90	28.5	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
Chromium	NS	24.1	26.7	61.7	20.7	21.7	25.0	21.8	16.3	7.84
Cobalt	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NS	16.5	9.50	10.8	17.6	20.6	14.1	5.57	9.67	8.08
Lead	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NS	16.5	27.8	28.0	11.8	18.7	17.0	9.7	11.5	<9.5
Selenium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NS	<0.70	0.70	<0.70	<0.70	<0.70	0.73	<0.70	<0.70	0.71
Thallium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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TABLE A-4. (Continued)

Boring Number		2	3	3	3	3	3	4	4	4
Depth (feet BGS)		91.0-91.5	0.0-1.5	10.5-11.0	25.5-26.0	46.0-46.5	90.5-91.5	0.5-1.0	10.5-11.0	25.5-26.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimc v	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

TABLE A-4. (Continued)

Boring Number		4	4	47SAP01	47SAP01	47SAP02	47SAP02	47SAP03	47SAP03	47SAP04
Depth (feet BGS)		45.5-46.0	91.5-92.5	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		11/11/85	11/11/85	06/14/85	06/14/85	06/20/85	06/20/85	06/20/85	06/20/85	06/20/85
Sampled By		HLA	HLA	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	NS	FDA	FDB	FDA	FDB	FDA	FDB	NS
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	NA	NA	<0.1	<0.1	<0.1	NA	<0.1	NA	<0.1
Arsenic	NS	NA	NA	10	<0.1	10	NA	9	NA	16
Barium	NS	NA	NA	68	NA	140	NA	140	NA	190
Beryllium	NS	NA	NA	<0.1	NA	<0.1	NA	<0.1	NA	0.18
Cadmium	NS	<0.90	<0.90	<0.1	<0.1	<0.1	NA	<0.1	NA	<0.1
Chromium	NS	12.5	19.6	20	NA	26	NA	32	NA	34
Cobalt	NS	NA	NA	10	NA	10	NA	11	NA	9.5
Copper	NS	8.04	8.91	15	15	15	NA	19	NA	19
Lead	NS	NA	NA	7.5	NA	4.3	NA	4.3	NA	5.4
Mercury	NS	NA	NA	0.39	NA	<0.1	NA	0.12	NA	0.25
Molybdenum	NS	NA	NA	0.7	0.6	0.6	NA	1.2	NA	1.1
Nickel	NS	<9.5	17.4	19	NA	25	NA	37	NA	64
Selenium	NS	NA	NA	<0.1	NA	<0.1	NA	<0.1	NA	<0.1
Silver	NS	<0.70	<0.70	0.14	NA	0.14	NA	0.14	NA	0.14
Thallium	NS	NA	NA	0.12	NA	<0.1	NA	<0.1	NA	<0.1
Vanadium	NS	NA	NA	46	NA	46	NA	56	56	56
Zinc	NS	NA	NA	71	73	46	NA	32	NA	36

(Continued)

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TABLE A-4. (Continued)

Boring Number		4	4	47SAP01	47SAP01	47SAP02	47SAP02	47SAP03	47SAP03	43SAP04
Depth (feet BGS)		45.5-46.0	91.5-92.5	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA		NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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TABLE A-4. (Continued)

Boring Number		47SAP05	47SAP06	47SAP06	47SAP07	47SAP08	47SAP09	47SAP10	47SAP10	47SAP11
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		06/20/85	06/20/85	06/20/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	FDA	FDB	NS	NS	NS	FDA	FDB	FDA
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	<0.1	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Arsenic	NS	1	6.9	NA	4.8	8	9	11	NA	13
Barium	NS	150	190	NA	68	130	130	99	NA	210
Berylium	NS	<0.1	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	0.18
Cadmium	NS	<0.1	<0.1	NA	<0.1	<0.1	<0.1	0.3	NA	0.1
Chromium	NS	6.6	19	NA	21	40	37	30	NA	31
Cobalt	NS	4.6	8.1	NA	7.7	13	11	11	NA	10
Copper	NS	7.4	17	NA	13	14	15	38	NA	19
Lead	NS	<1	4.3	NA	6.4	4.3	9.6	7.5	NA	4.3
Mercury	NS	0.16	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Molybdenum	NS	<0.1	0.7	NA	0.4	0.8	0.8	0.5	NA	0.7
Nickel	NS	13	23	25	22	64	67	34	NA	28
Selenium	NS	<0.1	<0.1	NA	0.1	<0.1	<0.1	0.1	NA	<0.1
Silver	NS	<0.1	<0.1	NA	0.14	<0.1	0.14	0.23	NA	<0.1
Thallium	NS	<0.1	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Vanadium	NS	17	46	NA	46	46	36	36	NA	46
Zinc	NS	36	36	NA	26	34	33	48	NA	38

(Continued)

TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47SAP05 0.0-10.0	47SAP06 0.0-10.0	47SAP06 0.0-10.0	47SAP07 0.0-10.0	47SAP08 0.0-10.0	47SAP09 0.0-10.0	47SAP10 0.0-10.0	47SAP10 0.0-10.0	47SAP11 0.0-10.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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TABLE A-4. (Continued)

Boring Number		47SAP11	47SAP12	47SAP12	47SAP13	47SAP14	47SAP15	47SAP16	47SAP16	47SAP17
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		06/19/85	06/19/85	06/19/85	06/17/85	06/17/85	06/17/85	06/17/85	06/17/85	06/17/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		FDB	FDA	FDB	NS	NS	NS	FDA	FDB	FDA
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	<0.1	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Arsenic	NS	NA	12	NA	11	9.7	7.6	6.6	NA	7.6
Barium	NS	NA	99	NA	99	110	130	120	NA	78
Berylium	NS	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	NS	0.1	0.2	NA	0.2	0.1	0.1	0.1	NA	0.1
Chromium	NS	NA	36	NA	32	29	28	31	NA	23
Cobalt	NS	NA	8.9	NA	8.1	8.9	8.9	9.6	NA	9.7
Copper	NS	NA	17	NA	14	15	18	19	NA	18
Lead	NS	NA	7.5	NA	6.4	5.6	6.7	35	NA	9
Mercury	NS	NA	0.13	0.2	<0.1	<0.1	0.18	0.39	NA	<0.1
Molybdenum	NS	0.6	0.5	NA	0.9	0.6	0.9	0.6	NA	0.6
Nickel	NS	NA	25	NA	26	26	24	31	NA	23
Selenium	NS	NA	0.1	NA	<0.1	1.1	<0.1	0.13	NA	<0.1
Silver	NS	NA	0.23	NA	0.14	<0.1	<0.1	0.14	NA	<0.1
Thallium	NS	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Vanadium	NS	NA	46	NA	36	<10	<10	27	17	27
Zinc	NS	NA	40	NA	31	29	40	36	NA	35

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47SAP11 0.0-10.0	47SAP12 0.0-10.0	47SAP12 0.0-10.0	47SAP13 0.0-10.0	47SAP14 0.0-10.0	47SAP15 0.0-10.0	47SAP16 0.0-10.0	47SAP16 0.0-10.0	47SAP17 0.0-10.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

TABLE A-4. (Continued)

Boring Number		47SAP17	47SAP18	47SAP18	47SAP19	47SAP19	47SAP20	47SAP20	47SAP21	47SAP22
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		06/17/85	06/21/85	06/21/85	09/27/85	09/27/85	09/27/85	09/27/85	09/27/85	10/03/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		FDB	FDA	FDB	FDA	FDB	FDA	FDB	NS	NS
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	NA	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Arsenic	NS	7.6	<0.1	<1	6.1	NA	4.2	3.2	10	3.2
Barium	NS	68	78	78	140	NA	82	82	92	72
Berylium	NS	<0.1	<0.1	NA	0.38	NA	0.38	0.18	0.58	0.58
Cadmium	NS	<0.1	0.1	<0.1	<0.5	NA	0.83	0.73	<0.5	<0.5
Chromium	NS	23	<1	<1	22	NA	25	25	25	18
Cobalt	NS	9.9	2.4	2.4	7.9	NA	12	8.9	11	5.9
Copper	NS	NA	5.4	5.4	12	NA	13	13	12	8.9
Lead	NS	7.8	<1	<1	11	NA	10	NA	10	5.5
Mercury	NS	NA	<0.1	NA	<0.1	<0.1	0.18	NA	0.3	<0.1
Molybdenum	NS	NA	<0.1	NA	<1	NA	4.8	NA	3.8	1.8
Nickel	NS	NA	6.1	5.1	24	NA	41	45	25	23
Selenium	NS	0.13	0.23	0.13	<1	NA	<1	<1	<1	<1
Silver	NS	<0.1	0.23	0.23	<0.1	<0.1	0.13	<0.1	0.13	<0.1
Thallium	NS	<0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Vanadium	NS	NA	<10	NA	23	23	36	NA	57	27
Zinc	NS	NA	8.9	8.9	27	NA	50	47	48	30

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47SAP17 0.0-10.0	47SAP18 0.0-10.0	47SAP18 0.0-10.0	47SAP19 0.0-10.0	47SAP19 0.0-10.0	47SAP20 0.0-10.0	47SAP20 0.0-10.0	47SAP21 0.0-10.0	47SAP22 0.0-10.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

TABLE A-4. (Continued)

Boring Number		47SAP23	47SAP24	47SAP24	47SAP25	47SAP25	47SAP26	47SAP26	47SAP27	47SAP28
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-15.0	0.0-15.0
Date Sampled		09/30/85	09/30/85	09/30/85	10/01/85	10/01/85	09/30/85	09/30/85	09/27/85	10/02/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	FDA	FDB	FDA	FDB	FDA	FDB	NS	NS
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	<0.1	<0.1	NA	<0.1	NA	<0.1	NA	<0.1	<0.1
Arsenic	NS	9.1	5.2	NA	6.8	NA	5.8	NA	5.8	9.6
Barium	NS	120	130	NA	110	NA	92	100	110	160
Berylium	NS	0.48	0.48	NA	0.68	NA	0.38	NA	0.58	0.58
Cadmium	NS	0.63	0.53	NA	0.53	NA	0.63	NA	0.63	19
Chromium	NS	29	25	NA	26	NA	25	NA	28	23
Cobalt	NS	8.9	9.9	NA	7.9	NA	7.9	NA	8.9	11
Copper	NS	14	15	NA	14	NA	12	NA	14	18
Lead	NS	15	11	NA	11	NA	10	NA	11	13
Mercury	NS	0.12	0.18	NA	0.47	NA	0.17	NA	0.19	0.22
Molybdenum	NS	2.8	<1	NA	2.8	1.8	2.8	NA	4.8	2.8
Nickel	NS	25	23	NA	26	NA	28	NA	25	31
Selenium	NS	<1	<1	NA	<1	NA	<1	NA	<1	<1
Silver	NS	0.13	<0.1	NA	<0.1	NA	<0.1	NA	<0.1	0.53
Thallium	NS	<0.1	<0.1	NA	<0.1	NA	<0.1	NA	<0.1	<0.1
Vanadium	NS	58	50	52	53	NA	48	NA	52	57
Zinc	NS	37	40	NA	36	NA	34	NA	46	46

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47SAP23 0.0-10.0	47SAP24 0.0-10.0	47SAP24 0.0-10.0	47SAP25 0.0-10.0	47SAP25 0.0-10.0	47SAP26 0.0-10.0	47SAP26 0.0-10.0	47SAP27 0.0-15.0	47SAP28 0.0-15.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

TABLE A-4. (Continued)

Boring Number		47SAP29	47SAP30	47SAP31	47SAP32	47SAP32	47WSB01	47WSB01	47WSB01	47WSB01
Depth (feet BGS)		0.0-20.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	19.5-20.0	19.5-20.0	44.5-45.0	58.5-59.0
Date Sampled		10/01/85	10/03/85	09/23/85	10/01/85	10/01/85	10/08/85	10/08/85	10/08/85	10/09/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	NS	NS	FDA	FDB	FDA	FDB	NS	NS
Parameter	**Method**	Results (Units in mg/kg)								
Antimony	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1
Arsenic	NS	11	8.7	8.7	6.8	6.8	6	NA	30	26
Barium	NS	200	82	110	100	120	130	NA	230	150
Berylium	NS	0.53	0.38	0.58	0.58	0.38	<0.5	NA	0.74	0.64
Cadmium	NS	0.73	0.73	0.63	0.63	0.83	0.57	NA	1.4	1.2
Chromium	NS	25	22	23	27	27	16	16	28	57
Cobalt	NS	11	6.9	4.9	5.9	8.9	12	NA	28	31
Copper	NS	25	12	19	15	15	29	NA	51	66
Lead	NS	14	15	16	15	14	9.1	NA	20	25
Mercury	NS	0.14	0.46	0.19	<0.1	0.13	0.44	NA	0.43	<0.1
Molybdenum	NS	2.3	1.8	<1	1.8	1.8	2.8	NA	1.8	1.8
Nickel	NS	30	24	26	26	26	18	NA	38	85
Selenium	NS	<1	<1	<1	<1	<1	<1	NA	<1	<1
Silver	NS	0.13	0.17	0.26	0.17	0.26	<0.1	NA	<0.1	<0.1
Thallium	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	0.24	<0.1
Vanadium	NS	60	52	57	55	56	44	NA	75	88
Zinc	NS	63	37	45	38	37	57	NA	98	87

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47SAP29 0.0-20.0	47SAP30 0.0-10.0	47SAP31 0.0-10.0	47SAP32 0.0-10.0	47SAP32 0.0-10.0	47WSB01 19.5-20.0	47WSB01 19.5-20.0	47WSB01 44.5-45.0	47WSB01 58.5-59.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	<0.001	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	<0.01	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	10	NA
Extractable Berylium	WE'/NS	NA	NA	NA	NA	NA	NA	NA	0.02	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.04	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.07	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.73	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.9	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.8	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	<0.002	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.14	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.56	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	<0.01	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	<0.001	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	<0.001	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.61	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	0.46	NA

(Continued)

TABLE A-4. (Continued)

Boring Number		47WSB02	47WSB02	47WSB02	47WSB02	47WSB03	47WSB03	47WSB03	47WSB03	47WSB03
Depth (feet BGS)		14.5-15.0	14.5-15.0	59.5-60.0	74.0-74.5	14.5-15.0	24.5-25.0	24.5-25.0	59.5-60.0	59.5-60.0
Date Sampled		10/14/85	10/14/85	10/14/85	10/16/85	10/17/85	10/17/85	10/17/85	10/18/85	10/18/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		FDA	FDB	NS	NS	NS	FDA	FDB	FDA	FDB
Parameter	**Method**	Results (Units in mg/kg)								
Antimony	NS	<0.1	<0.1	<0.1	1	<0.1	<0.1	NA	<0.1	NA
Arsenic	NS	11	8.8	13	5.2	2.5	17	NA	11	NA
Barium	NS	100	120	140	120	180	250	NA	120	NA
Berylium	NS	<0.5	<0.5	0.64	<0.5	<0.5	0.74	NA	0.64	NA
Cadmium	NS	0.77	NA	0.87	0.67	<0.5	0.97	NA	1.2	NA
Chromium	NS	23	NA	37	16	10	22	NA	38	NA
Cobalt	NS	14	13	24	16	10	23	NA	19	NA
Copper	NS	22	20	39	23	15	76	NA	43	44
Lead	NS	12	11	20	13	11	23	NA	32	NA
Mercury	NS	0.26	0.11	0.15	0.1	0.34	0.1	0.24	0.3	NA
Molybdenum	NS	<1	<1	1.8	1.8	<1	1.8	NA	1.8	NA
Nickel	NS	19	20	62	20	23	29	NA	61	NA
Selenium	NS	<1	<1	<1	<1	<1	<1	NA	<1	NA
Silver	NS	<0.1	<0.1	<0.1	<0.1	0.37	<0.1	NA	<0.1	NA
Thallium	NS	<0.1	<0.1	<0.1	<0.1	<0.1	0.18	NA	<0.1	NA
Vanadium	NS	36	37	64	58	34	61	NA	72	NA
Zinc	NS	42	46	87	56	35	1,200	NA	75	NA

(Continued)

TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47WSB02 14.5-15.0	47WSB02 14.5-15.0	47WSB02 59.5-60.0	47WSB02 74.0-74.5	47WSB03 14.5-15.0	47WSB03 24.5-25.0	47WSB03 24.5-25.0	47WSB03 59.5-60.0	47WSB03 59.5-60.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	0.004	NA	NA	0.001	0.001	NA	NA
Extractable Arsenic	WET/NS	NA	NA	<0.01	NA	NA	<0.01	<0.01	NA	NA
Extractable Barium	WET/NS	NA	NA	5.8	NA	NA	9.9	9.7	NA	NA
Extractable Berylium	WET/NS	NA	NA	0.03	NA	NA	0.02	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	0.04	NA	NA	0.05	0.05	NA	NA
Extractable Chromium	WET/NS	NA	NA	0.05	NA	NA	0.06	0.05	NA	NA
Extractable Cobalt	WET/NS	NA	NA	0.68	NA	NA	0.64	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	0.4	NA	NA	2.3	2.2	NA	NA
Extractable Lead	WET/NS	NA	NA	0.82	NA	NA	1.4	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	<0.002	NA	NA	0.002	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	0.11	NA	NA	0.11	0.1	NA	NA
Extractable Nickel	WET/NS	NA	NA	0.7	NA	NA	0.64	0.62	NA	NA
Extractable Selenium	WET/NS	NA	NA	<0.01	NA	NA	<0.01	<0.01	NA	NA
Extractable Silver	WET/NS	NA	NA	<0.001	NA	NA	<0.001	<0.001	NA	NA
Extractable Thallium	WET/NS	NA	NA	<0.001	NA	NA	0.005	0.005	NA	NA
Extractable Vanadium	WET/NS	NA	NA	0.87	NA	NA	0.41	0.44	NA	NA
Extractable Zinc	WET/NS	NA	NA	0.29	NA	NA	2.1	NA	NA	NA

(Continued)

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TABLE A-4. (Continued)

Boring Number		47SSB01	47SSB01	47SSB01	47SSB01	47SSB02	47SSB02	47SSB03
Depth (feet BGS)		9.5-10.0	9.5-10.0	79.5-80.0	79.5-80.0	19.5-20.0	19.5-20.0	59.0-59.5
Date Sampled		08/13/85	08/13/85	08/14/85	08/14/85	08/09/85	08/09/85	11/21/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC								
Laboratory QC		FDA	FDB	FDA	FDB	FDA	FDB	NS
Parameter	**Method**	Results (Units in mg/kg)						
Antimony	NS	<0.1	<0.1	<0.1	NA	<0.1	NA	<0.1
Arsenic	NS	3.7	3.7	3.7	NA	<1	NA	14
Barium	NS	91	NA	79	NA	210	NA	86
Berylium	NS	<0.1	NA	<0.1	NA	<0.1	NA	<0.5
Cadmium	NS	0.78	NA	0.87	NA	0.87	NA	<1
Chromium	NS	19	19	16	15	15	NA	22
Cobalt	NS	10	10	3.3	4.3	6.3	NA	15
Copper	NS	20	NA	30	30	24	NA	38
Lead	NS	2.9	2.9	2	NA	2	NA	8
Mercury	NS	<0.1	NA	<0.1	NA	<0.1	NA	<0.1
Molybdenum	NS	<1	<1	3.5	2.4	<1	NA	<1
Nickel	NS	26	NA	23	NA	20	19	60
Selenium	NS	<1	<1	<1	NA	<1	NA	<1
Silver	NS	1.3	NA	1.3	NA	2.3	NA	1.6
Thallium	NS	<0.1	<0.1	<0.1	NA	<0.1	NA	<0.1
Vanadium	NS	33	NA	33	NA	23	NA	54
Zinc	NS	39	NA	41	NA	39	NA	57

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47SSB01 9.5-10.0	47SSB01 9.5-10.0	47SSB01 79.5-80.0	47SSB01 79.5-80.0	47SSB02 19.5-20.0	47SSB02 19.5-20.0	47SSB03 59.0-59.5
Parameter	Method	Results (Units in mg/L)						
Extractable Antimony	WET/NS	<0.01	0.01	<0.01	NA	<0.01	NA	<0.001
Extractable Arsenic	WET/NS	<0.01	<0.01	<0.01	NA	<0.01	NA	0.94
Extractable Barium	WET/NS	6.6	NA	3.9	4	17	NA	5.5
Extractable Berylium	WET/NS	0.01	NA	0.01	0.01	0.01	NA	0.02
Extractable Cadmium	WET/NS	0.02	NA	0.03	NA	0.04	NA	0.03
Extractable Chromium	WET/NS	0.05	NA	0.05	NA	0.05	NA	0.24
Extractable Cobalt	WET/NS	0.31	NA	0.34	NA	0.44	NA	0.62
Extractable Copper	WET/NS	0.22	NA	0.6	NA	0.87	NA	0.44
Extractable Lead	WET/NS	0.04	0.04	0.01	NA	0.05	NA	0.16
Extractable Mercury	WET/NS	<0.002	NA	<0.002	NA	<0.002	NA	<0.002
Extractable Molybdenum	WET/NS	0.06	NA	0.09	NA	0.06	NA	0.04
Extractable Nickel	WET/NS	0.5	NA	0.32	NA	0.58	NA	0.5
Extractable Selenium	WET/NS	<0.01	<0.01	<0.01	NA	<0.01	NA	0.01
Extractable Silver	WET/NS	0.05	NA	0.05	NA	0.05	NA	0.06
Extractable Thallium	WET/NS	<0.01	<0.01	<0.01	NA	0.01	NA	<0.001
Extractable Vanadium	WET/NS	0.23	0.23	0.33	NA	0.33	NA	0.72
Extractable Zinc	WET/NS	0.4	NA	0.57	NA	0.58	NA	0.29

BGS = Below ground surface.
HLA = Harding Lawson Associates.
PEL = Pacific Environmental Laboratory.
MCR = McLaren Environmental Engineering.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
-- = Not available.
NA = Not analyzed.
NS = Not specified
WET/NS = California Assessment Manual, Waste Extraction Test; analytical method not specified.

SOURCE: McLaren, 1986a.

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TABLE A-5. MISCELLANEOUS ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED FROM SITE 47

Boring Number		1	1	1	1	1	2	2	2	2
Depth (feet BGS)		1.5-2.5	10.5-11.5	26.0-26.5	46.0-46.5	91.0-91.5	0.5-1.5	10.0-11.0	25.0-26.0	46.0-46.5
Date Sampled		11/08/82	11/08/82	11/08/82	11/08/82	11/09/82	11/11/82	11/11/82	11/11/82	11/11/82
Sampled By		HLA	HLA	HLA	HLA	HLA	HLA	HLA	HLA	HLA
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/kg)								
Chloride	NS	40	<10	40	40	<10	<10	<10	<10	<10
Cyanide	NS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	NS	5.6	1.8	1.8	1.5	1.7	3.4	3.2	2.8	3.0
Nitrate	NS	<5.0	7.1	66	19	<5.0	83	48	39	12
Oil & Grease	413.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate (total)	NS	498	995	612	1,600	612	765	612	1,380	1,450
Sulfate	NS	<10	<10	<10	<10	<10	29	32	29	<10

(Continued)

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TABLE A-5. (Continued)

Boring Number		2	3	3	3	3	3	4	4	4
Depth (feet BGS)		91.0-91.5	0.0-1.5	10.5-11.0	25.5-26.0	46.0-46.5	90.5-91.5	0.5-1.0	10.5-11.0	25.5-26.0
Date Sampled		11/11/82	11/09/82	11/09/82	11/09/82	11/09/82	11/10/82	11/11/82	11/11/82	11/11/82
Sampled By		HLA	HLA	HLA	HLA	HLA	HLA	HLA	HLA	HLA
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/kg)								
Chloride	NS	<1.0	16	<10	<10	<10	<10	<10	<10	<10
Cyanide	NS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	NS	3.6	2.8	5.1	3.3	2.8	3.4	2.7	2.6	2.9
Nitrate	NS	<5	92	<5.0	<5.0	70	<5.0	14	3.0	12
Oil & Grease	413.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate (total)	NS	1,150	459	1,071	1,380	1,760	994	842	1,070	1,450
Sulfate	NS	11	18	62	<10	15	15	65	36	<10

(Continued)

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TABLE A-5. (Continued)

Boring Number		4	4	47SAP01	47SAP01	47SAP02	47SAP02	47SAP03	47SAP03	47SAP04
Depth (feet BGS)		45.5-46.0	91.5-92.5	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		11/11/82	11/11/82	06/14/85	06/14/85	06/20/85	06/20/85	06/20/85	06/20/85	06/20/85
Sampled By		HLA	HLA	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	NS	FDA	FDB	FDA	FDB	FDA	FDB	NS
Parameter	Method	Results (Units in mg/kg)								
Chloride	NS	<10	<10	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	<1.0	<1.0	<0.5	NA	<0.5	<0.5	<0.5	NA	<0.5
Fluoride	NS	2.7	3.5	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	<5	12	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate (total)	NS	918	842	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	18	<10	NA	NA	NA	NA	NA	NA	NA

(Continued)

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TABLE A-5. (Continued)

Boring Number		47SAP05	47SAP06	47SAP06	47SAP07	47SAP08	47SAP09	47SAP10	47SAP10	47SAP11
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		06/20/85	06/20/85	06/20/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85	06/19/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	FDA	FDB	NS	NS	NS	FDA	FDB	FDA
Parameter	**Method**	Results (Units in mg/kg)								
Chloride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	0.7	<0.5
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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RADIAN CORPORATION

TABLE A-5. (Continued)

Boring Number		47SAP11	47SAP12	47SAP12	47SAP13	47SAP14	47SAP15	47SAP16	47SAP16	47SAP17
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		06/19/85	06/19/85	06/19/85	06/17/85	06/17/85	06/17/85	06/17/85	06/17/85	06/17/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		FDB	FDA	FDB	NS	NS	NS	FDA	FDB	FDA
Parameter	**Method**	Results (Units in mg/kg)								
Chloride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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RADIAN CORPORATION

TABLE A-5. (Continued)

Boring Number		47SAP17	47SAP18	47SAP18	47SAP19	47SAP19	47SAP20	47SAP20	47SAP21	47SAP22
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		06/17/85	06/21/85	06/21/85	09/27/85	09/27/85	09/27/85	09/27/85	09/27/85	10/03/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC		FDB	FDA	FDB	FDA	FDB	FDA	FDB	NS	NS
Laboratory QC										
		Results (Units in mg/kg)								
Parameter	Method									
Chloride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	NA	<0.5	NA	<0.5	<0.5	<0.5	NA	<0.5	<0.5
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

CS47/021689/JKS

TABLE A-5. (Continued)

Boring Number		47SAP23	47SAP24	47SAP24	47SAP25	47SAP25	47SAP26	47SAP26	47SAP27	47SAP28
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-15.0	0.0-15.0
Date Sampled		09/30/85	09/30/85	09/30/85	10/01/85	10/01/85	09/30/85	09/30/85	09/27/85	10/02/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	FDA	FDB	FDA	FDB	FDA	FDB	NS	NS
Parameter	Method	Results (Units in mg/kg)								
Chloride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	<0.5	<0.5	NA	<0.5	NA	<0.5	NA	<0.5	11
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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RADIAN CORPORATION

TABLE A-5. (Continued)

Boring Number		47SAP29	47SAP30	47SAP31	47SAP32	47SAP32	47WSB01	47WSB01	47WSB01	47WSB01
Depth (feet BGS)		0.0-20.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	19.5-20.0	19.5-20.0	44.5-45.0	58.5-59.0
Date Sampled		10/01/85	10/03/85	09/23/85	10/01/85	10/01/85	10/08/85	10/08/85	10/08/85	10/09/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		NS	NS	NS	FDA	FDB	FDA	FDB	NS	NS
Parameter	**Method**	Results (Units in mg/kg)								
Chloride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	1	<0.5	<0.5	<0.5	NA	<0.5	NA	<0.5	<0.5
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	NA	140	NA	NA	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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TABLE A-5. (Continued)

Boring Number		47WSB02	47WSB02	47WSB02	47WSB02	47WSB03	47WSB03	47WSB03	47WSB03	47WSB03
Depth (feet BGS)		14.5-15.0	14.5-15.0	59.5-60.0	74.0-74.5	14.5-15.0	24.5-25.0	24.5-25.0	59.5-60.0	59.5-60.0
Date Sampled		10/14/85	10/14/85	10/14/85	10/16/85	10/17/85	10/17/85	10/17/85	10/18/85	10/18/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC										
Laboratory QC		FDA	FDB	NS	NS	NS	FDA	FDB	FDA	FDB
Parameter	**Method**	Results (Units in mg/kg)								
Chloride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	160	NA	NA	140	120	NA	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

RADIAN CORPORATION

TABLE A-5. (Continued)

Boring Number		47SSB01	47SSB01	47SSB01	47SSB01	47SSB02	47SSB02	47SSB03
Depth (feet BGS)		9.5-10.0	9.5-10.0	79.5-80.0	79.5-80.0	19.5-20.0	19.5-20.0	59.0-59.5
Date Sampled		08/13/85	08/13/85	08/14/85	08/14/85	08/09/85	08/09/85	11/21/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--
Laboratory		PEL	PEL	PEL	PEL	PEL	PEL	PEL
Field QC								
Laboratory QC		FDA	FDB	FDA	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/kg)						
Chloride	NS	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	<0.5	<0.5	<0.5	NA	<0.5	NA	NA
Fluoride	NS	NA	NA	NA	NA	NA	NA	NA
Nitrate	NS	NA	NA	NA	NA	NA	NA	NA
Oil & Grease	413.1	NA	NA	NA	NA	NA	NA	NA
Phosphate (total)	NS	NA	NA	NA	NA	NA	NA	NA
Sulfate	NS	NA	NA	NA	NA	NA	NA	NA

BGS = Below ground surface.
HLA = Harding Lawson Associates.
MCR = McLaren Environmental Engineering.
PEL = Pacific Environmental Laboratory.
-- = Not available.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NA = Not analyzed.
NS = Not specified.
WET/NS = California Assessment Manual, Waste Extraction Test; analytical method not specified.

SOURCE: McLaren, 1986a.

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APPENDIX B

Soil Gas Results

RADIAN CORPORATION

TABLE B-1. MAXIMUM PHOTOIONIZATION DETECTOR READINGS FROM SOIL CUTTINGS/HEADSPACE JARS AT SITE 47

Approximate Depth	BORING NUMBER									
	47SAP01		47SAP02B*		47SAP03*		47SAP04*		47SAP05*	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	8	4	450	10	200	60	400	5	200	5
10	15	25	140	7	--	7	40	25	--	5
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										

(Continued)

CS47/022589/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	47SAP06*		47SAP07		47SAP08		47SAP09		47SAP10	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	40	25	80	--	5	3	4	--	10	--
10	30	7	4	15	2	3	0	7	1	25
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										

(Continued)

CS47/022589/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	47SAP11*		47SAP12		47SAP13		47SAP14		47SAP15	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	180	--	2	2	8	--	8	--	10	--
10	70	4	1	2	10	30	--	55	2	35
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										

(Continued)

CS47/022589/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	47SAP16*		47SAP17		47SAP18*		47SAP19*		47SAP20	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	180	--	8	--	250	10	5	20	8	2
10	10	20	5	10	50	5	8	150	1	8
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										

(Continued)

CS47/022589/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	47SAP21*		47SAP22		47SAP23		47SAP24		47SAP25	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	40	2	100	30	10	70	4	50	5	15
10	100	1	100	10	6	80	100	150	2	50
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										

(Continued)

CS47/022589/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	47SAP26*		47SAP27		47SAP28		47SAP29*		47SAP30	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	130	25	8	70	3	7	2	40	0	1
10	30	15	1	20	1	12	2	100	0	5
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										

(Continued)

CS47/022589/JKS

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	47SAP31*		47SAP32*		47WSB01		47WSB02		47WSB03	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	1	100	5	50	3	60	7	50	25	150
10	1	30	150	12	10	25	30	220	10	55
15					4	32	15	250	30	180
20					7	60	50	250	--	90
25					2	90	50	350	50	120
30					7	55	10	250	40	110
35					5	40	2	200	25	120
40					20	80	7	400	12	45
45					12	170	40	400	8	9
50					3	150	120	350	20	15
55					2	60	20	250	--	180
60					1	110	100	400	100	40
65							50	10		
70							400	250		
75							--	350		
80							350	--		

(Continued)

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER					
	47SSB01		47SSB02		47SSB03	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	3	1	0	4	1	2
10	4	15	0	5	0	1
15	7	6	0	2	0	12
20	5	8	0	30	0	5
25	1	7	0	2	1	14
30	3	14	0	10	1	12
35	4	18	1	8	2	--
40	4	3	0	10	1	30
45	2	25	1	10	3	10
50	1	2	4	12	2	30
55	0	20	8	9	5	25
60	1	6	18	12	3	100
65	0	6	1	30	3	50
70	3	40	2	11	30	80
75	3	60			15	--
80	1	60			100	130

* McLaren noted high readings may be due to "water artifact" affecting the photoionization detector.

-- = No readings taken.

Blanks indicate borings were terminated.

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APPENDIX C

Analytical Results for Groundwater Samples

TABLE C-1. U.S. EPA METHOD 8010 ANALYTICAL RESULTS (METHOD 601 PRIOR TO OCTOBER 1988) FOR GROUNDWATER SAMPLES FROM MW-41S

RADIAN CORPORATION

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
Date Sampled			06/10/85	03/13/86	11/18/86	11/18/86	01/15/87	01/15/87	04/24/87	04/24/87	08/05/87	10/20/87	10/20/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			06/12/85	03/19/86	11/21/86	11/21/86	01/22/87	01/22/87	04/28/87	04/28/87	08/07/87	10/27/87	10/22/87
Lab			RAS	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC
Field Analysis					FDA	FDB	FDA	FDB				FDA	FDB
Lab Analysis									LDA	LDB			
Chloromethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.9C	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	ND	ND	ND	ND	ND	ND	24C	24C	20C	17C	15C
Chloroform	100	100	ND	1.4	1.1DL	ND	1.0C	1.0C	1.8DL	1.4DL	1.0C	1.0C	1.4C
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND	ND	0.94DL	0.28DL	ND	2.1C	ND
1,1,1-Trichloroethane	200	200	2.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	0.25DL	ND	ND	0.71DL	0.55DL	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND	ND	0.19DL	0.10DL	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	5	23.2	20	44C	43C	37C	37C	91C	80C	130C	81C	100C
Dibromochloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	3.3	0.6	0.18DL	ND	ND	ND	0.75DL	0.74DL	ND	3.2C	ND
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
C = Analysis confirmed in second column analysis
LOQ = Limit of quantitation
DL = Diluted out of the confirmation run
NE = Not established

SOURCE: Radian, 1984-1988c.

TABLE C-1. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-41S	MW-41S	MW 41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
			WELL NUMBER								
Date Sampled			10/20/87	01/26/88	01/26/88	04/18/88	07/13/88	07/13/88	07/13/88	07/13/88	10/07/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/24/87	01/28/88		04/21/88	08/09/88	07/14/88	07/14/88	07/14/88	10/17/88
Lab			CES	SAC	CES	SAC	CES	SAC	SAC	SAC	SAC
Field Analysis								FDA	FDA	FDB	
Lab Analysis								LDA	LDB		
Chloromethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	ND	17C	ND	22PC	ND	23P	25P	23P	11P
Chloroform	100	100	ND	0.92PC	1.4	0.48PC	ND	1.7P	1.7P	1.7P	ND
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	5	110	140PC	190.	220PC	1100C	980P	920P	870P	2900P
Dibromochloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	ND	6.2PC	4.9	10PC	ND	52P	57P	42P	370P
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
C = Analysis confirmed in second column analysis
LOQ = Limit of quantitation
P or PC = Identity previously confirmed
NE = Not established

SOURCE: Radian, 1984-1988c.

TABLE C-2. U.S. EPA METHOD 602 FOR GROUNDWATER SAMPLES FROM MW-41S

			WELL NUMBER										
Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
Date Sampled			09/24/84	03/13/86	11/18/86	11/18/86	01/15/87	01/15/87	04/24/87	04/24/87	08/05/87	10/20/87	10/20/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			09/26/84	03/19/86	11/21/86	11/21/86	01/22/87	01/22/87	04/28/87	04/28/87	08/07/87	10/22/87	11/24/87
Lab			RAS	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	CES
Field Analysis					FDA	FDB	FDA	FDB				FDA	FDA
Lab Analysis									LDA	LDB			
Chlorobenzene	30	NE	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: Radian, 1984-1987.

TABLE C-2. (Continued)

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
Date Sampled			10/20/87	01/26/88	01/26/88	04/18/88	07/13/88	07/13/88	07/13/88	07/13/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/22/87	01/28/88		04/21/88	08/09/88	07/14/88	07/14/88	07/14/88
Lab			SAC	SAC	CES	SAC	CES	SAC	SAC	SAC
Field Analysis			FDB					FDA	FDA	FDB
Lab Analysis								LDA	LDB	
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l

MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: Radian, 1984-1987.

TABLE C-3. U.S. EPA METHOD 604 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-41S
Date Sampled			04/18/88
Sampled By			RADIAN
Date Analyzed			05/04/88
Lab			SAC
Field Analysis			
Lab Analysis			
2,4,6-Trichlorophenol	NE	NE	ND
2-Chlorophenol	NE	NE	ND
2,4-Dichlorophenol	NE	NE	ND
2,4-Dimethylphenol	400	NE	ND
2-Nitrophenol	NE	NE	ND
4-Nitrophenol	NE	NE	ND
2,4-Dinitrophenol	NE	NE	ND
Pentachlorophenol	30	NE	ND
Phenol	NE	NE	ND
4-Chloro-3-methylphenol	NE	NE	ND
4,6-Dinitro-2-methylphenol	NE	NE	ND

ALL UNITS ARE ug/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NE = Not established

SOURCE: Radian, 1988b.

TABLE C-4. U.S. EPA METHOD 9010 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	WELL NUMBER MW-41S
Date Sampled			10/20/87	10/20/87	10/20/87	01/20/88	01/26/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed							
Lab			SAC	CES	SAC	CES	SAC
Field Analysis			FDA	FDA	FDB		
Lab Analysis							
Total cyanide	0.200	0.200	ND	ND	ND	ND	ND
Amenable cyanide	0.200	0.200	ND	NA	ND	ND	NA

ALL UNITS ARE mg/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed

SOURCE: Radian, 1987-1988c.

TABLE C-5. U.S. EPA METHOD 624 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-65	MW-65
			WELL NUMBER				
Date Sampled			01/26/88	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			02/04/88	02/04/88	07/19/88		
Lab			SAC	SAC	SAC	IT	IT
Field Analysis							
Lab Analysis			LDA	LDB			
Chloromethane	NE	NE	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	NA	NA
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	18	20	13	ND	ND
Chloroform	100	100	1.8	2.1	ND	ND	ND
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	NA	NA
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	NA	NA
Trichloroethene	5	5	190	220	700	110	77
Dibromochloromethane	100	100	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	NA	NA
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	NA	NA
Bromoform	100	100	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	4.7	5.5	27	ND	ND
Chlorobenzene	30	NE	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	2.8
Acetone	NE	NE	ND	ND	ND	ND	ND
Carbon disulfide	NE	NE	ND	ND	ND	ND	ND
2-Butanone	NE	NE	ND	ND	ND	ND	ND
Vinyl acetate	NE	NE	ND	ND	ND	ND	ND
2-Hexanone	NE	NE	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First Laboratory duplicate analysis
LDB = Second Laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established

SOURCE: McLaren, 1986d; Radian, 1988c.

RADIAN CORPORATION

TABLE C-5. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-65	MW-65
			WELL NUMBER				
Date Sampled			01/26/88	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			02/04/88	02/04/88	07/19/88		
Lab			SAC	SAC	SAC	IT	IT
Field Analysis							
Lab Analysis			LDA	LDB			
4-Methyl-2-pentanone	NE	NE	ND	ND	ND	ND	ND
Styrene	NE	NE	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	ND	ND	NR	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established
NR = Not reported

SOURCE: McLaren, 1986d; Radian, 1988c.

RADIAN CORPORATION

TABLE C-6. U.S. EPA METHOD 625 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S AND MW-65

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NE	750	ND	ND	ND	ND	ND	ND
Acenaphthene	NE	NE	ND	ND	ND	ND	NA	NA
1,2,4-Trichlorobenzene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachlorobenzene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachloroethane	NE	NE	ND	ND	ND	ND	NA	NA
Bis(2-chloroethyl)ether	NE	NE	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	NE	NE	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	NE	NE	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	NE	NE	ND	ND	ND	ND	ND	ND
Fluoranthene	NE	NE	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenylether	NE	NE	ND	ND	ND	ND	NA	NA
N-nitrosodimethylamine	NE	NE	ND	ND	ND	NA	ND	[illegible]
N-nitrosodi-n-propylamine	NE	NE	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	NE	NE	ND	ND	ND	ND	NA	NA
Butylbenzyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Diethyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Dimethyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	NE	NE	ND	ND	ND	ND	ND	ND
Chrysene	NE	NE	ND	ND	ND	ND	ND	ND
Acenaphthylene	NE	NE	ND	ND	ND	ND	NA	NA
Anthracene	(LOQ)0.7	NE	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	NE	NE	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachlorocyclopentadiene	NE	NE	ND	ND	ND	ND	ND	ND
Isophorone	NE	NE	ND	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: McLaren, 1986d; Radian, 1986-1988c.

RADIAN CORPORATION

TABLE C-6. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65
			WELL NUMBER					
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
Naphthalene	NE	NE	ND	ND	ND	ND	ND	ND
Nitrobenzene	NE	NE	ND	ND	ND	ND	ND	ND
Phenanthrene	NE	NE	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	NE	NE	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	NE	NE	ND	ND	ND	ND	ND	ND
Pyrene	NE	NE	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2-Chlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	400	NE	ND	ND	ND	ND	ND	ND
2-Nitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
4-Nitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
Pentachlorophenol	30	NE	ND	ND	ND	ND	ND	ND
Phenol	NE	NE	ND	ND	ND	ND	ND	ND
N-nitrosodiphenylamine	NE	NE	ND	ND	ND	ND	ND	ND
Benzidine	NE	NE	ND	ND	ND	NA	ND	ND
4-Bromophenyl phenylether	NE	NE	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	NE	NE	ND	ND	ND	ND	ND	ND
Fluorene	NE	NE	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	NE	NE	ND	ND	ND	ND	NA	NA
4,6-Dinitro-2-methylphenol	NE	NE	ND	ND	ND	ND	NA	NA
Aniline	NE	NE	ND	ND	ND	NA	ND	ND
Benzyl alcohol	NE	NE	ND	ND	ND	ND	ND	ND
2-Methylphenol	NE	NE	ND	ND	ND	ND	ND	ND
4-Methylphenol	NE	NE	ND	ND	ND	ND	ND	ND
Benzoic acid	NE	NE	ND	ND	ND	ND	ND	ND
4-Chloroaniline	NE	NE	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	NE	NE	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND
3-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NA = Not analyzed
NR = Not reported
NE = Not established

SOURCE: McLaren, 1986d; Radian, 1986-1988c.

TABLE C-6. (Continued)

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65
			WELL NUMBER					
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
Dibenzofuran	NE	NE	ND	ND	ND	ND	ND	ND
4-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	NE	NE	ND	ND	ND	ND	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established

SOURCE: McLaren, 1986d; Radian, 1986-1988c.

TABLE C-7. U.S. EPA METHOD 6010 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S AND MW-65

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	WELL NUMBER MW-41S	MW-65	MW-65[a]	MW-65	MW-65[a]
Date Sampled				09,'4/8.	09/24/84	03/13/86	01/26/88	08/12/85	08/12/85	11/11/85	11/11/85
Sampled By			RADIAN	ES	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN	McLAREN	McLAREN
Date Analyzed						03/31/86					
Lab			CES	ES	RAS	AUS	SAC	IT	IT	IT	IT
Field Analysis											
Lab Analysis											
Antimony	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.001	NA
Arsenic	NE	0.050	ND	ND	0.0040	ND	ND	<0.01	NA	<0.01	NA
Beryllium	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.005	NA
Cadmium	NE	0.010	ND	ND	ND	ND	ND	0.012	NA	<0.005	0.008
Chromium	NE	0.050	0.010	ND	ND	ND	ND	0.024	NA	0.01	NA
Copper	NE	NE	ND	ND	ND	NA	ND	0.02	NA	0.2	NA
Lead	NE	0.050	ND	ND	0.020	ND	ND	<0.001	NA	0.02	NA
Mercury	NE	0.002	ND	ND	ND	0.0002	ND	0.0003	NA	<0.0002	NA
Nickel	NE	NE	ND	ND	NA	NA	ND	<0.01	NA	0.05	NA
Selenium	NE	0.010	ND	ND	ND	ND	ND	<0.01	NA	<0.01	NA
Silver	NE	0.050	ND	ND	ND	ND	ND	<0.001	NA	<0.001	NA
Thallium	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.001	NA
Zinc	NE	NE	ND	ND	0.035	NA	ND	0.14	NA	0.2	NA
Fluoride	NE	NE	ND	NA	NA	NA	NA	ND	NA	ND	NA
Calcium	NE	NE	ND	NA	NA	16	NA	18	91	97	100
Chloride	NE	NE	ND	NA	NA	18	NA	18	NA	22	NA
Carbonate	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NE	NE	ND	NA	0.63	NA	NA	NA	NA	NA	NA
Bicarbonate	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NE	NE	ND	NA	13	9.9	NA	NA	NA	NA	NA
Sodium	NE	NE	ND	NA	19	13	NA	16	16	15	NA
Sulfate	NE	NE	ND	NA	NA	6	NA	3	NA	2	NA
Aluminum	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NE	1.0	ND	NA	0.098	0.044	NA	NA	NA	0.17	0.17
Cobalt	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silicon	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE mg/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Services
ES = Engineering Science, Inc.
AUS = Radian Analytical Services, Austin
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND - Nothing detected
NE - Not established
NA - Not analyzed

[a] Duplicate samples assumed to be field duplicates

SOURCE. McLaren, 1986d; Radian, 1982-1988b.

RADIAN CORPORATION

TABLE C-7. (Continued)

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65[a]	MW-65	MW-65[a]
Date Sampled				09/14/82	09/24/84	03/13/86	01/26/88	08/12/85	08/12/85	11/11/85	11/11/85
Sampled By			RADIAN	ES	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN	McLAREN	McLAREN
Date Analyzed						03/31/86					
Lab			CES	ES	RAS	AUS	SAC	IT	IT	IT	IT
Field Analysis											
Lab Analysis											
Vanadium	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Alkalinity	NE	NE	ND	NA	NA	92	NA	92	91	97	100
Nitrate	NE	45	ND	NA	NA	1.5	NA	2.4	NA	2	NA
Total Dissolved Solids	NE	NE	ND	NA	NA	210	NA	NA	NA	NA	NA

ALL UNITS ARE mg/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Services
AUS = Radian Analytical Services, Austin
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established
NA = Not analyzed

[a] Duplicate samples assumed to be field duplicates.

SOURCE: McLaren, 1986d; Radian, 1982-1988b.

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INSTALLATION RESTORATION PROGRAM (IRP)
STAGE 3

TECHNICAL MEMORANDUM FOR SITE 48
FINAL

FOR

McCLELLAN AFB/EM
McCLELLAN AFB, CALIFORNIA 95652-5990

OCTOBER 1991

PREPARED BY:

Radian Corporation
10395 Old Placerville Road
Sacramento, California 95827

USAF CONTRACT NO. F33615-87-D-4023, DELIVERY ORDER NO. 0012
CONTRACTOR CONTRACT NO. 227-005, DELIVERY ORDER NO. 0012

United States Air Force Center for Environmental Excellence
Mr. Patrick Haas (Technical Project Manager)
Environmental Services Office/Environmental Restoration Division (AFCEE/ESR)
Brooks Air Force Base, Texas 78235-5501

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1.0 INTRODUCTION

This Technical Memorandum presents a summary of data compiled for Site 48 at McClellan Air Force Base (AFB), California. The location of Site 48 is shown in Figure 1-1. Site 48 was the location of Industrial Waste Treatment Plan No. 4, which operated from 1957 to 1980. The task of compiling data for Technical Memorandums is part of the Remedial Response process within the Air Force's Installation Restoration Program (IRP). The objective of the IRP is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan for any sites that pose a threat to human health and welfare or the environment. This site assessment work has been conducted in general accordance with guidelines set forth by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA provide guidance for conducting remedial investigations/feasibility studies at Superfund sites.

The purpose of this Technical Memorandum is to:

- Identify any immediate response needs as required by CERCLA/SARA;
- Determine whether further action is needed at the site;
- Provide qualified data to support operable unit prioritization and grouping and preliminary risk assessment; and
- Provide recommendations for further investigation or remedial actions.

The scope of this Technical Memorandum includes site-specific data regarding the following categories of information:

- Site operations and waste management practices;
- Waste characteristics;
- Contaminant migration pathways; and
- Target populations and environments.

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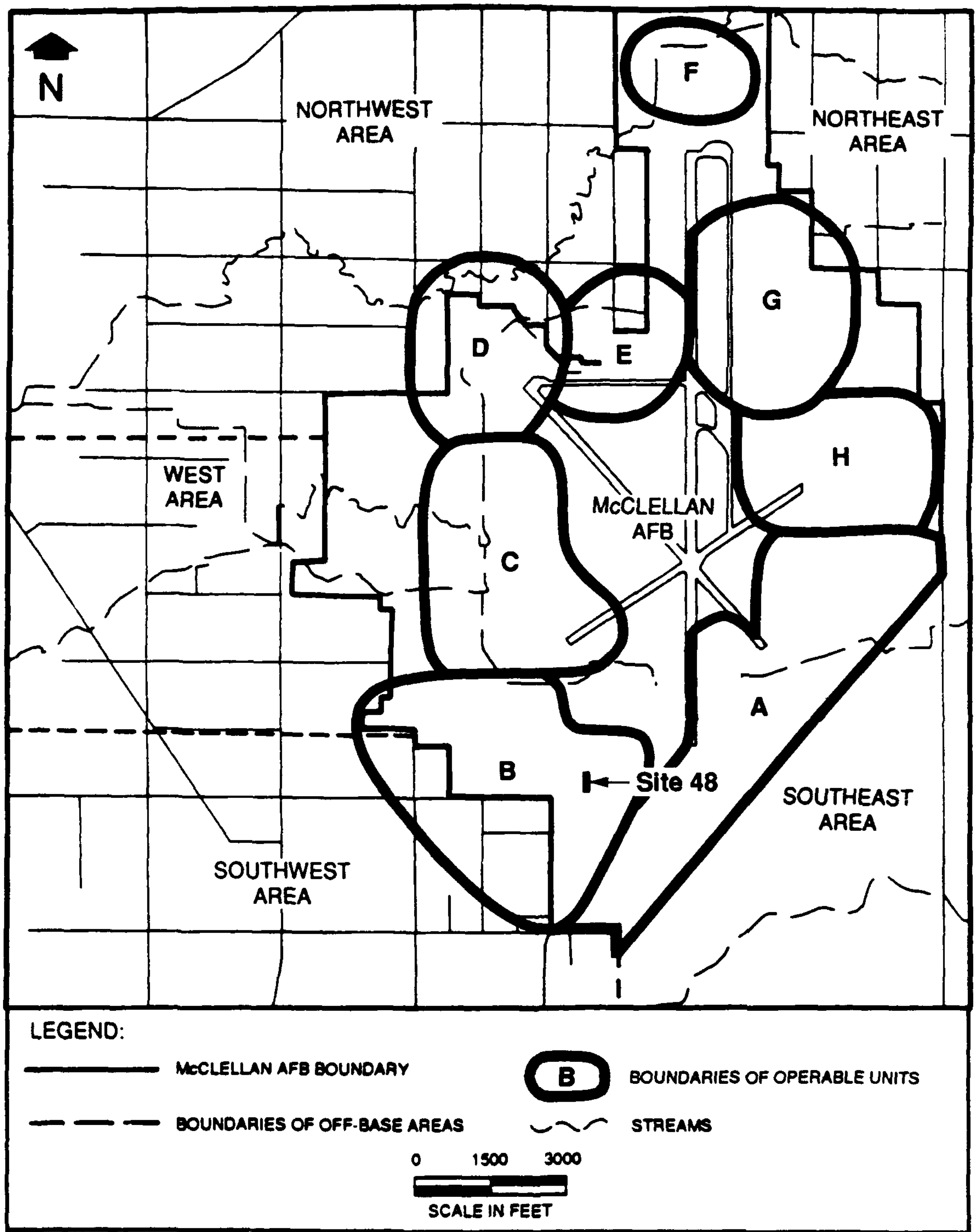

Figure 1-1. Map of Site 48 Within the McClellan AFB Facility.

Data on all four categories are necessary to develop an understanding of the site, the possible sources and routes for release of contaminants, and the probable affected populations and environments. Site operations, waste management practices and waste characteristics, and migration pathways are discussed in this document. A separate General Information document addresses target populations and environments. Background information regarding the overall facility description of McClellan AFB is presented in the General Information document that includes environmental setting, land use, hydrogeologic conditions, facility history, and a discussion of potential receptors.

This Technical Memorandum document includes the following:

- Information sources used to prepare the document;
- Site description, including historical activity;
- Extent of on-site soil contamination with a presentation of previous data;
- Potential hazards;
- An evaluation of previous contractors' recommendations; and
- Conclusions and recommendations.

2.0 SOURCES OF INFORMATION

The following sections describe the sources of information used to develop this Technical Memorandum.

2.1 Previous Investigations

In 1981, CH2M Hill conducted a records search of McClellan Air Force Base (AFB) files to identify hazardous waste disposal sites on base, in order to determine the potential for hazardous materials to migrate off the base (CH2M Hill, 1981). Interviews with past and present employees and the review of McClellan AFB records resulted in the identification of 45 waste disposal locations at McClellan AFB. CH2M Hill did not include the area now designated as Site 48 among the 45 locations; however, they did provide a brief description of some of the activities which occurred at the site.

McLaren Environmental Engineering, Inc., performed an investigation of Site 48 in 1985 (McLaren, 1985). The investigation included physical and chemical characterization of the soil, qualitative characterization of the soil gas, and a chemical characterization of solid and liquid residues from on-site facilities.

In 1988, EG&G Idaho, Inc., examined the Industrial Wastewater Collection System for leaks and analyzed wastewater passing through the wastewater line at the site (EG&G Idaho, Inc., 1988).

2.2 Personnel Interviews

Radian personnel interviewed staff from the McClellan AFB Civil Engineering Division (Wastewater Unit) to gather information regarding historical and current activities at Site 48. Results of the interviews, which were held on 1 February 1989, are discussed in Section 3, Site Description. Documentation of the interviews can be found in the Site 48 Site Files.

2.3 Site Visit

Radian personnel visited Site 48 on 2 February 1989 for the purpose of investigating current features and activities at the location.

2.4 Aerial Photographs

Historical aerial photographs were reviewed for site features and evidence of contamination. Table 2-1 lists the photographs that were reviewed. Interpretation of aerial photographs is discussed in more detail in Section 3, Site Description.

2.5 Review of Base Files

McClellan AFB Bioenvironmental Engineering files were reviewed for historical information during the preparation of this Technical Memorandum. Base Civil Engineering files were reviewed for construction drawings related to the location. The information gathered from both sources is included in Section 3, Site Description.

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TABLE 2-1. AERIAL PHOTOGRAPHS OF McCLELLAN AFB (1928 - 1988) REVIEWED FOR SITE 48

Year	Source	Scale
1928	Whittier College	1" = 400'
1940	Whittier College	1" = 400'
1941	U.S. Army Corps of Engineers, Sacramento District Office	1" = 370'
1943	McClellan AFB, History Office	1" = 560'
1946	Whittier College	1" = 400'
1949	Whittier College	1" = 400'
1951	Whittier College	1" = 770'
1953	U.S. Department of Agriculture, ASCS [1]	1" = 400'
1955	U.S. Army Corps of Engineers, Sacramento District Office	1" = 1690'
1957	U.S. Department of Agriculture, ASCS	1" = 400'
1962	McClellan AFB, History Office	1" = 150'
1963	Cartwright Aerial Surveys	1" = 1667'
1965	McClellan AFB, History Office	1" = 150'
1968	Cartwright Aerial Surveys	1" = 1000'
1971	Cartwright Aerial Surveys	1" = 400'
1972	Cartwright Aerial Surveys	1" = 1000'
1974	Cartwright Aerial Surveys	1" = 1200'
1976	Cartwright Aerial Surveys	1" = 400'
1978	Cartwright Aerial Surveys	1" = 2000'
1981	Cartwright Aerial Surveys	1" = 1000'
1982	McClellan AFB	1" = 400'
1984	Cartwright Aerial Surveys	1" = 4000'
1986	Cartwright Aerial Surveys	1" = 1000'
1987	Cartwright Aerial Surveys	1" = 1000'
1988	Cartwright Aerial Surveys	1" = 400'

1 United States Department of Agriculture, Agricultural Stabilization and Conservation Service.

3.0 SITE DESCRIPTION

Site 48 (Figure 3-1), located in Operable Unit (OU) B of McClellan Air Force Base (AFB), consists of the asphalt and concrete foundation of former Industrial Wastewater Treatment Plant (IWTP) No. 4. A location map showing details of the site and the surrounding area is presented in Figure 3-2. The site is approximately 250 feet long and 50 feet wide and is located about 100 feet east of Building 655. Site 48 is adjacent to Site 47 and Site 36 (Figure 3-2). These sites are discussed in separate reports. The following sections describe site delineation, historical and current activities, reported releases, and remedial actions at Site 48.

3.1 Site Delineation

The area now designated as Site 48 was first identified by CH2M Hill in the course of a records search of McClellan AFB files in 1981 (CH2M Hill, 1981). The report discussed various industrial operations on base and described Site 48 as an industrial waste treatment facility for plating shop operations at Building 666. The treatment facility was designated Site 48 by McLaren Environmental Engineering, Inc., in the course of an investigation of five disposal locations in Area B (McLaren, 1986a).

3.2 Historical Activities

The IWTP No. 4 was a pretreatment facility for wastes generated from Building 666 plating operations. Influent from the plating shop primarily consisted of metals, cyanide, acid, and caustic wastewaters. The IWTP No. 4 was not intended to treat wastewaters containing organic chemicals; however, some levels of organic compounds from plating shop operations probably entered the wastewater stream. Along with wastewater from the plating shop, IWTP No. 4 also treated wastes generated from other sources, including the McClellan AFB photo lab, x-ray shop, and various technical operations labs (Costa, personal communication, 1989). Industrial Wastewater Treatment Plant No. 4 operated from 1957 to 1980; however, one report indicates that wastes were stored in 20 tanks at the facility as late as 1985 (McLaren, 1985). The report did not indicate the quantity or types of wastes that were stored in the tanks.

The facilities at Site 48 included a total of 38 tanks and Building 645B (Figure 3-3). The treatment plant comprised two sections: one adjacent to the west side of Building 666 (30 tanks) and the other 35 feet northwest from Building 666 (four open-top tanks). The southern section was 60 feet wide and 102 feet long and the

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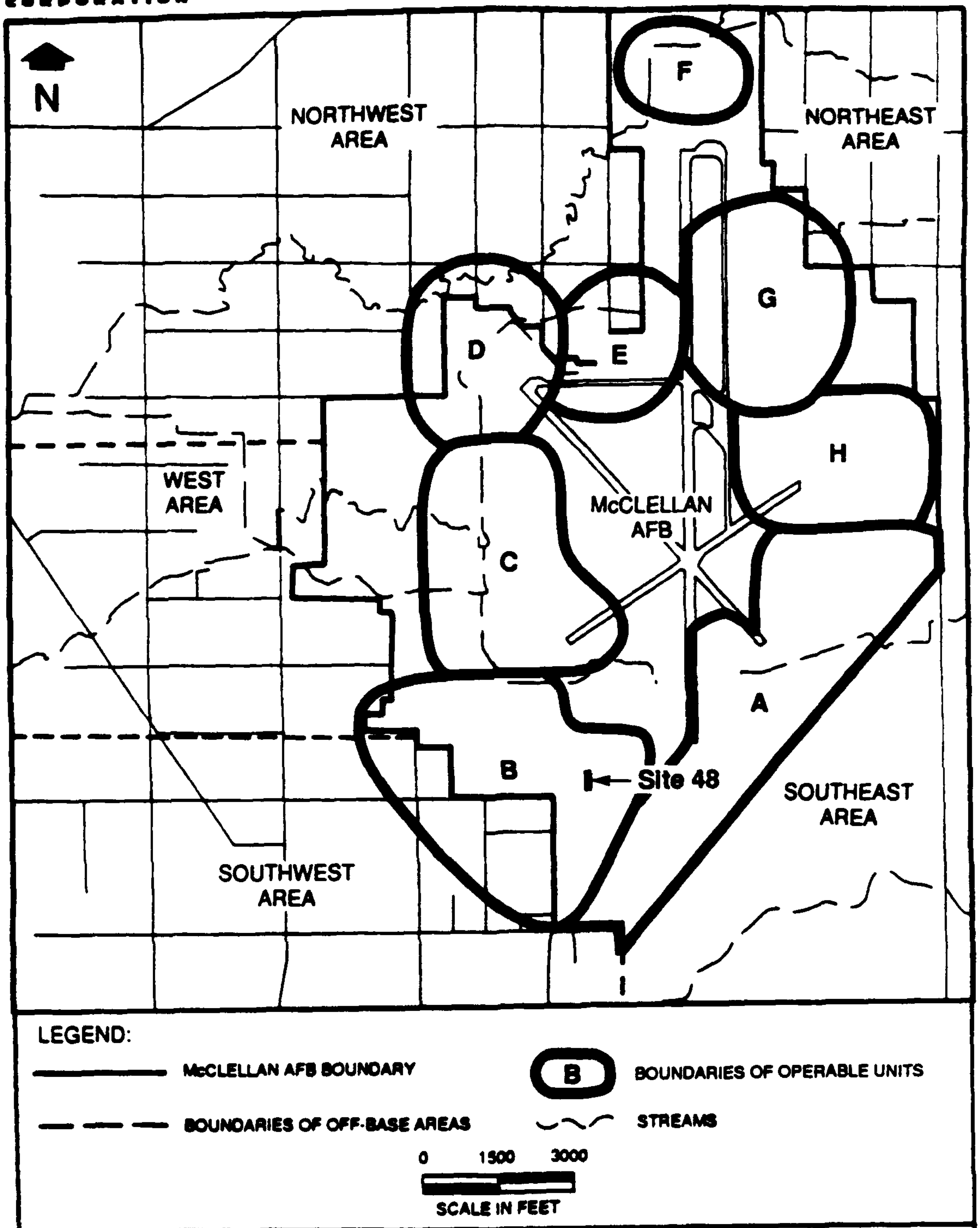

Figure 3-1. Map of Site 48 Within the McClellan AFB Facility.

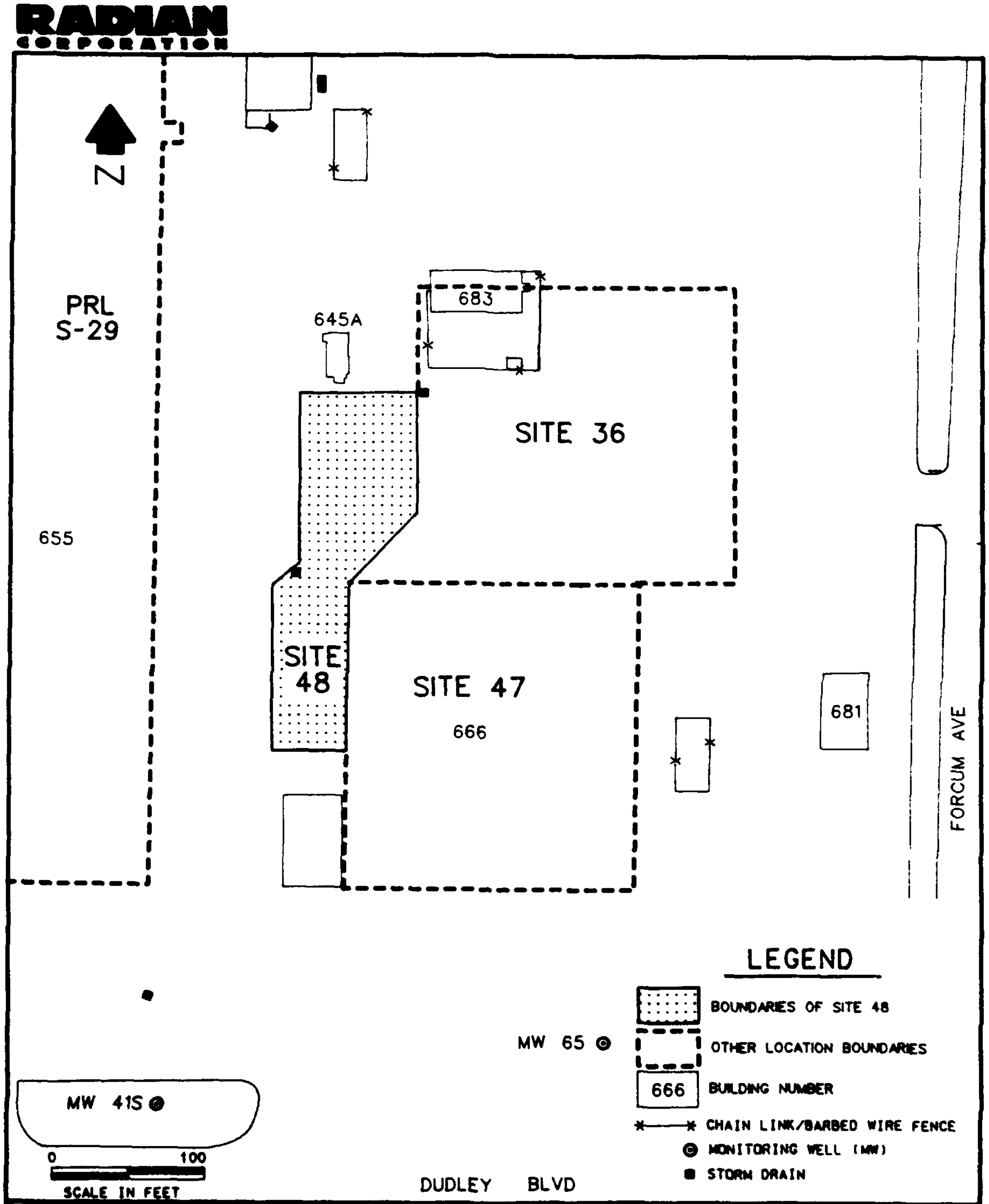

Figure 3-2. Map of Site 48 and Vicinity.

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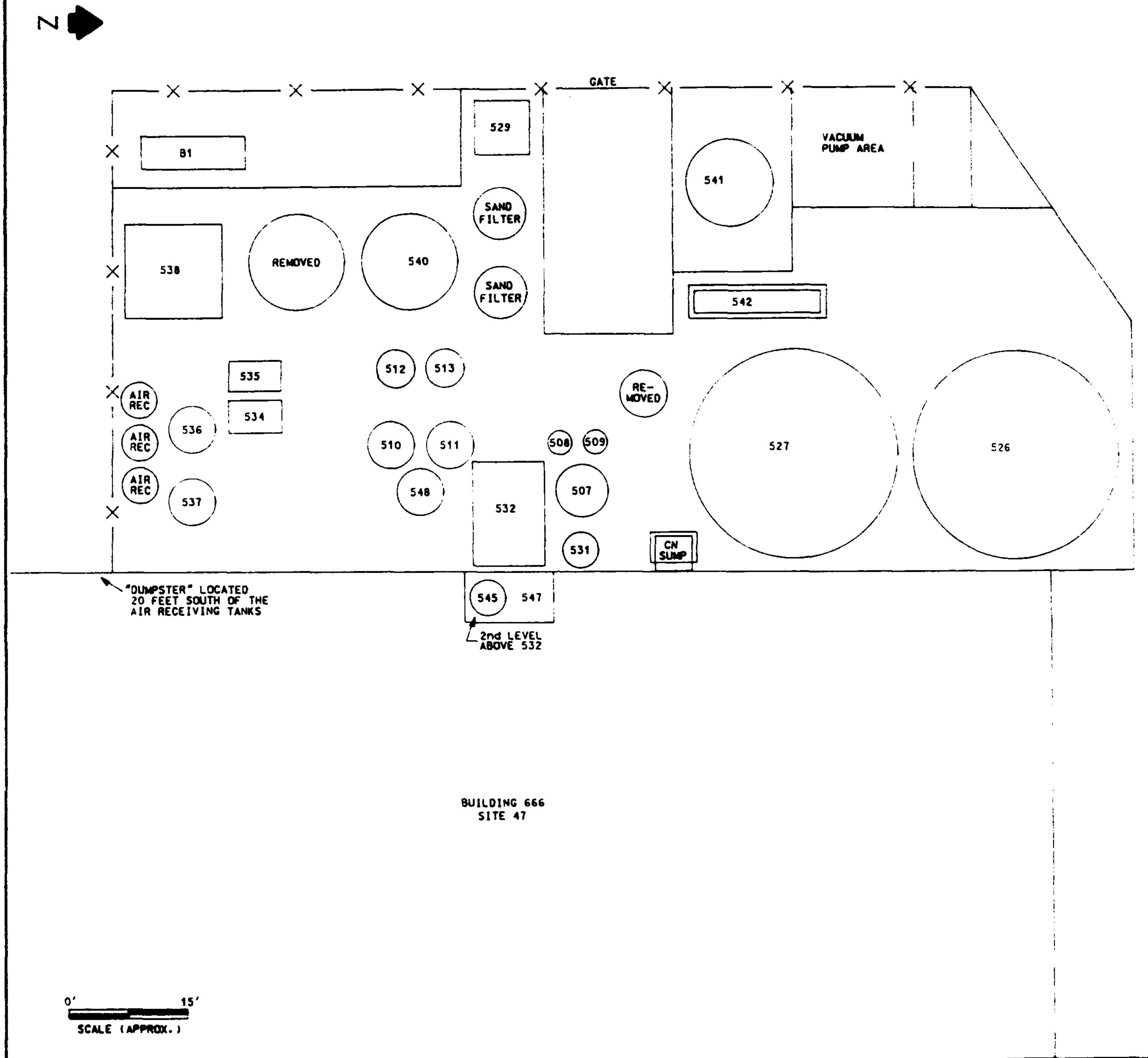

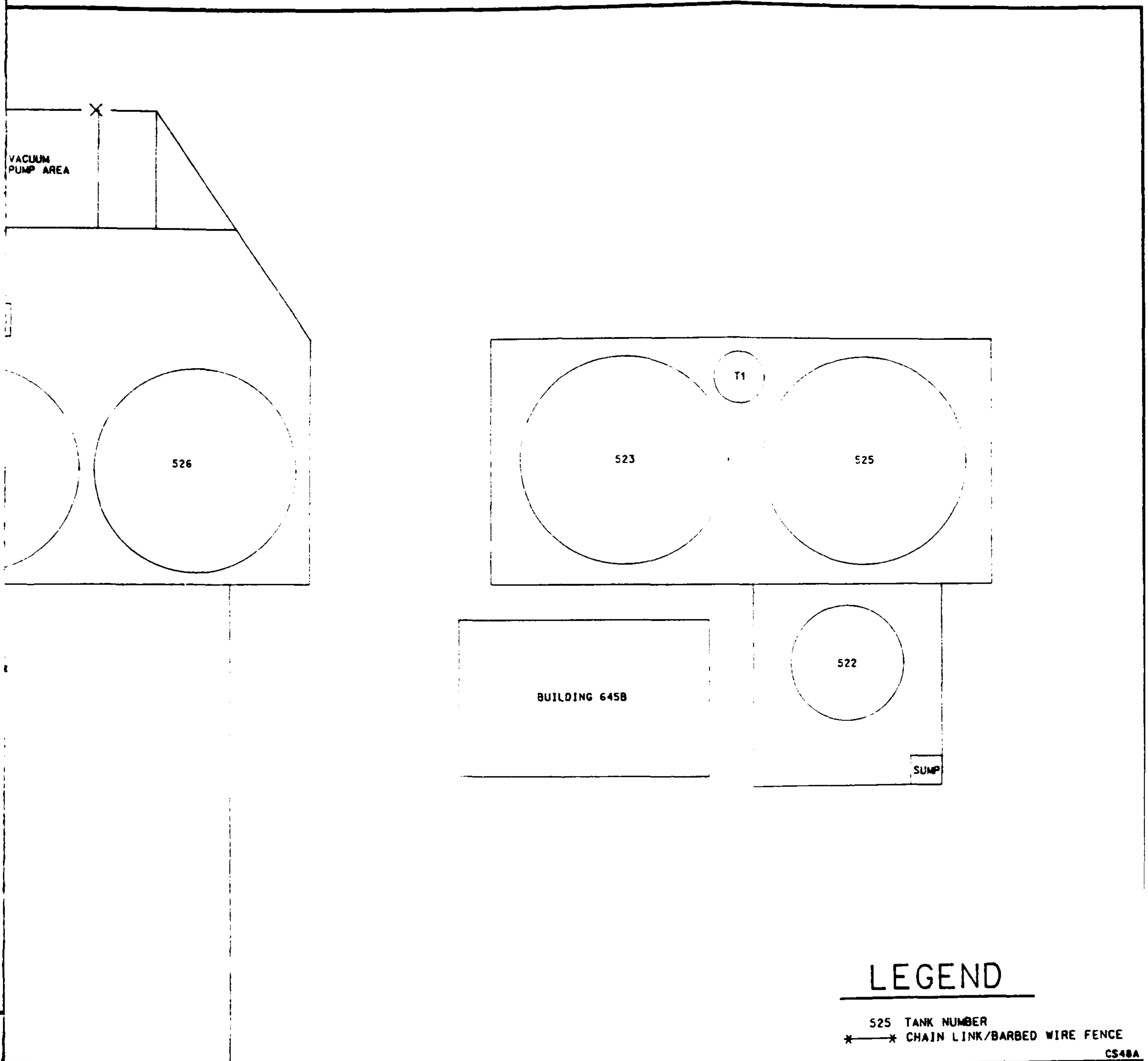

Figure 3-3. Locations of Tanks, Building 645B, and other Historical Features of Site 48

northern section was 28 feet wide and 72 feet long. Building 645B was located east of the four tanks in the northern section (EG&G Idaho, Inc., 1986). Most of the tanks were composed of carbon steel, and all tanks were set on a 12-inch thick concrete pad without secondary containment structures.

Included among the 38 tanks were the following: 23 process-related acid or caustic tanks, 6 ion exchangers, 3 air receivers, and 2 sand filters. Two plant water reservoirs were located below grade level at the southern end of the plant. A cyanide sump was located near the center and along the eastern edge of the plant, and a sludge sump was located at the northern end of the plant. The sumps were brick- and mortar-lined. According to construction drawings, all piping was aboveground.

The treatment chemicals used at IWTP No. 4 included various acids and caustics including lime, ferrous sulfate, soda ash, and sulfuric and hydrochloric acids. About 1963, plant operations changed from using dry caustics to liquid sodium hydroxide. The dry chemicals were stored in Building 645B, but the acids were stored in 13-gallon glass carboys adjacent to the eastern side of Building 645B. Liquid sodium hydroxide was stored in an 8,000-gallon tank located at the northwest corner of the plant. The dry chemicals were kept in quantities of 20,000 pounds lime, 15-20,000 ferrous sulfate, and 8-10,000 pounds soda ash. The acids were kept in approximate quantities of 1,200 gallons of sulfuric acid and 260 gallons of hydrochloric acid (Costa, personal communication, 1989).

All influent, except cyanide and concentrated chromium wastes, entered Tank 523, the Miscellaneous Holding Tank. Cyanide and chromium wastes were pretreated before entering Tank 523. Waste from Tank 523 entered Tank 525, the Coagulator Tank. In this tank, the pH was raised to 11-11.5 forming a sludge consisting of hydroxides of metals. The sludge was pumped into tanker trucks and disposed of in the Area D sludge pits. From 1957 to the mid-1960s, the remaining effluent was discharged to a drainage ditch located immediately north of the site (Potential Release Location P-9) (Gregory, personal communication, 1989). After the mid-1960s, the remaining effluent flowed to T1, the overflow tank, and was then transported via gravity pipe to the Industrial Wastewater Line (IWL) which led to IWTP No. 1 in the west area of the base. Other processes used at IWTP No. 4 included an ion exchange system for chrome rinse solutions, a chrome recovery system, and an ion exchange system for deionized water (Costa, personal communication, 1989). Table 3-1 summarizes of the treatment processes and their related tanks.

TABLE 3-1. SUMMARY OF TREATMENT PROCESSES AND RELATED TANKS AT SITE 48

Treatment Process	Influent	Related Tanks/ Description	Treatment Chemicals	*Effluent*	Quantity of *Effluent*	Disposal
Coagulation of miscellaneous wastes	Plating solutions containing common metals including nickel strip, lead, and anodizing strip solutions	523--Miscellaneous Waste Holding Tank (40,000 gallons) 525--Miscellaneous Waste Coagulator (45,000 gallons) *TI--Overflow Tank*	Lime (calcium hydroxide) Ferrous sulfate	Sludges (hydroxides of metals) pretreated wastewater	8,000 gal/day sludge	Sludge: Area D sludge pits via tanker trucks Pretreated wastewater: IWTP No. 1 via Industrial Wastewater Line
Chromium Reduction (Reduction from hexavalent to trivalent chromium)	Sodium chromate, concentrated acids and caustics, possibly mercury	522--Chrome Reduction Tank (13,000 gallons)	Ferrous sulfate, sodium metabisulfite, 50% sodium hydroxide, sulfuric acid	Acidic & caustic solutions containing common metals	NA	To 525 for coagulation
Cyanide Oxidation (Cyanide destruction)	Cyanide waste solutions	*526,527--Cyanide* Retention Tanks (40,000 gallons)	Chlorine, acids for pH control	Solutions containing common metals	8,000-40,000 gal/day	To 523/525 for coagulation
Ion Exchange	Chrome rinse solutions	510,511--Cationic Exchangers 512,513--Anionic Exchangers 532--Screen Tank (1,700 gallons) 540--Chrome Solution Holding Tank (8,000 gallons)	12% Sodium hydroxide, 12% sulfuric acid, 2% hydrochloric acid	Metals containing solutions produced after regeneration of ion exchangers	Anionic: 750 gal/regeneration Cationic: 1,400 gal/regeneration	Pumped to 522 the chrome reduction

(Continued)

CS48/030990/jks

TABLE 3-1. (Continued)

Treatment Process	Influent	Related Tanks/ Description	Treatment Chemicals	Effluent	Quantity of Effluent	Disposal
Ion Exchange (Continued)		529--Hydrochloric Acid Storage Tank (600 gallons)				
		534,535--Sulfuric Acid Storage Tanks (2,000 gallons)				
		548--Sodium Hydroxide Storage Tank (600 gallons)				
		545--Dilute Caustic Storage Tank (200 gallons)				
		"Removed" tank south of 540--Clean Water Tank				
Chrome Recovery	Chromic acid solutions	536--Chromic Acid Holding Tank (5,000 gallons)	12% Sodium hydroxide	Regenerated metals solutions	900 gal/regeneration	To 522 for chromium reduction
		542--Steam Evaporation (2,800 gallons)				
		512--Anionic Exchanger				
		537--Clean Chrome Tank (2,000 gallons)				
		541--Dilute Chromic Acid Holding Tank (6,000 gallons)				

NA = Not available.

CS48/122089/JKS

According to personnel interviews, only small operational spills occurred at Site 48 (Costa, personal communication, 1989). Photographs and reports indicate that most of the tanks were in good condition except for Tank 542 (steam evaporator for chrome recovery). Tank 542 leaked when in use. Because the concrete pad sloped towards the two underground plant water reservoirs, liquids that leaked from the tanks would have been carried by washwater toward the reservoirs where they could enter through each reservoir's access cover (Costa, personal communication, 1989).

The pretreated wastewater from Tank 525, the Coagulator Tank, entered the McClellan AFB Industrial Wastewater Line (IWL). The IWL lies below grade about 50 feet west of the western boundary of Site 48 and extends the entire length of the site. According to site interviews, the effluent was piped from Tank T1 to the IWL (Costa, personal communication, 1989). Reports describing inspections of this section of the IWL indicated areas of broken pipe and cracked joints (EG&G Idaho, 1988).

A review of historical aerial photographs of the area (see Table 2-1) showed that the area was undeveloped land until 1957. From 1957 to 1982, the major features of the site existed as described and illustrated in Figure 3-3 with one exception. In photos from 1971 to 1976, a tank is shown west of Tanks 526 and 527. No information was available describing the tank or its use. The tanks shown as "removed" on Figure 3-3 were observed in photographs taken before 1976. No information is available to determine the date when the tanks were removed. In the 1988 photo, the site appears completely dismantled, with only the concrete foundation remaining.

3.3 Current Activities

Radian personnel visited Site 48 on 2 February 1989 to observe the current conditions and activities at the site. The IWTP No. 4 has been dismantled down to the concrete foundation. The site is entirely fenced and completely paved except for a section in the northeast corner. Some of the pavement consists of asphalt; the remainder is the original concrete foundation. Impressions left by some of the larger tanks can still be seen in the foundation. The paved areas appeared in good condition with no significant cracking, spalling, or discoloration. The unpaved section consists of gravelled soil.

The topography of the site is essentially flat, with the asphalt sections sloping to the west. The site visit was conducted after a recent rain and standing water was observed on some portions of the foundation. Roof caps were in place over the former water reservoirs, the cyanide sump, and the sludge sump. Figure 3-4 shows the current features of Site 48. No other information was available regarding current site activities.

3.4 Reported Releases

Releases of specific contaminants, if any, have not been documented at Site 48.

3.5 Remedial Actions

Both IWTP No. 4 and Building 666 were dismantled in 1988. Dismantlement workplans indicate that the closure was a remedial action performed in response to documented contamination. The dismantlement plan was developed for Building 666 and IWTP No. 4 in June 1986, and outlined the dismantlement, decontamination, and stabilization procedures to be used for securing the area and for inhibiting the spread of contamination (EG&G, 1986).

The closure plan for IWTP No. 4 consisted of two phases--dismantlement then stabilization of the facility. Plans for dismantlement included: removal and disposal of all excess liquids and sludges in the tanks; removal and disposal of piping, valves, pumps, and structures; sectioning and/or crushing and disposal of all tanks; and dismantlement of Building 645B. The closure plan report indicated that Building 645B was used for storing insulation materials after IWTP No. 4 was decommissioned and may have been asbestos-contaminated. The report also indicated that several containers with hazardous materials labels were stored along the east wall of Building 645B; the report did not indicate the types of hazardous materials. All debris removed from the site was to be considered hazardous waste and disposed of accordingly.

Stabilization procedures were to include cleaning the foundations, sumps, and plant water reservoirs, removing loose material from spalled concrete and resurfacing those areas with concrete, installing perimeter curbs for the sumps, and installing roof caps over the sumps. The two water reservoirs were to have curbs and caps installed at the service and pump openings while pipe and float access openings were to be sealed with concrete.

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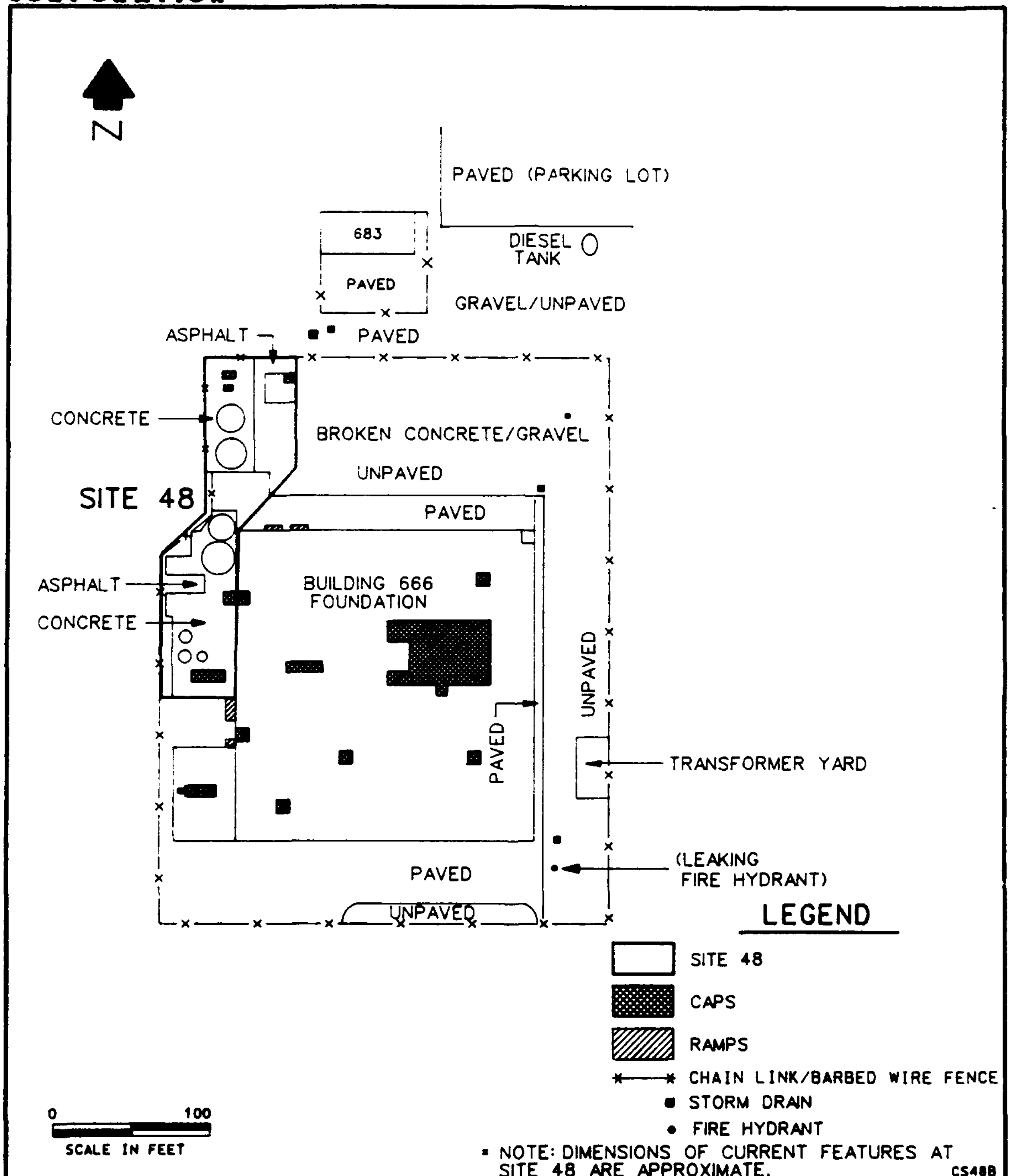

Figure 3-4. Current Conditions of Site 48 and Vicinity.

After dismantlement and stabilization procedures were completed, the entire area was to be cleaned (steam-cleaned and high-pressure wash) and enclosed by a fence with locked gates. No documentation was available confirming the closure procedures used; however, results of the Radian site visit indicate that stabilization procedures had been performed.

4.0 EXTENT OF CONTAMINATION

The following sections present the results of previous investigations at Site 48. Results of soil, soil gas, groundwater, tank sampling, surface water, and air monitoring investigations are presented under separate subsections.

4.1 Soil Results

This section summarizes the physical characterization of the soil, analytical results of soil samples, and evaluates the adequacy of the soil characterization. Results presented in this section are from data obtained from the 1985 McLaren investigation (McLaren, 1986a).

A total of 15 borings were drilled as part of that investigation. Because of their proximity to Site 48, three borings from the Site 47 investigation will also be included in the discussion of results. Because of inaccessibility to drilling locations, all borings were drilled outside the perimeter of the concrete pad. Two types of borings were drilled: shallow auger profile borings (SAPs) and soil sample borings (SSBs). Figure 4-1 shows the boring locations.

Twelve SAPs were drilled as an initial survey of site contamination. Included in the results are two SAPs from Site 47, borings 47SAP01 and 47SAP18. The SAPs were drilled to a depth of 10 feet below ground surface (BGS) using a 4-inch solid-stem auger. The soil cuttings that came to the surface during drilling were monitored with a photoionization detector (PID) and logged for soil classification. Composite samples from 1, 3, 5, and 10 feet BGS were collected, placed in clean headspace jars, and submitted to the laboratory for metals and cyanide analysis.

Three SSBs were drilled to define lateral contaminant migration from the site. One SSB from Site 47, boring 47SSB01, is included in the discussion of soil results for Site 48. The SSBs were drilled with an 8-inch hollow-stem auger. Samples were collected every 5 feet with a split-spoon sampler/drop- hammer system. Analytical samples were placed in freezer storage until analysis. Chain-of-custody procedures were apparently followed, although specific procedures were not documented (McLaren, 1986b).

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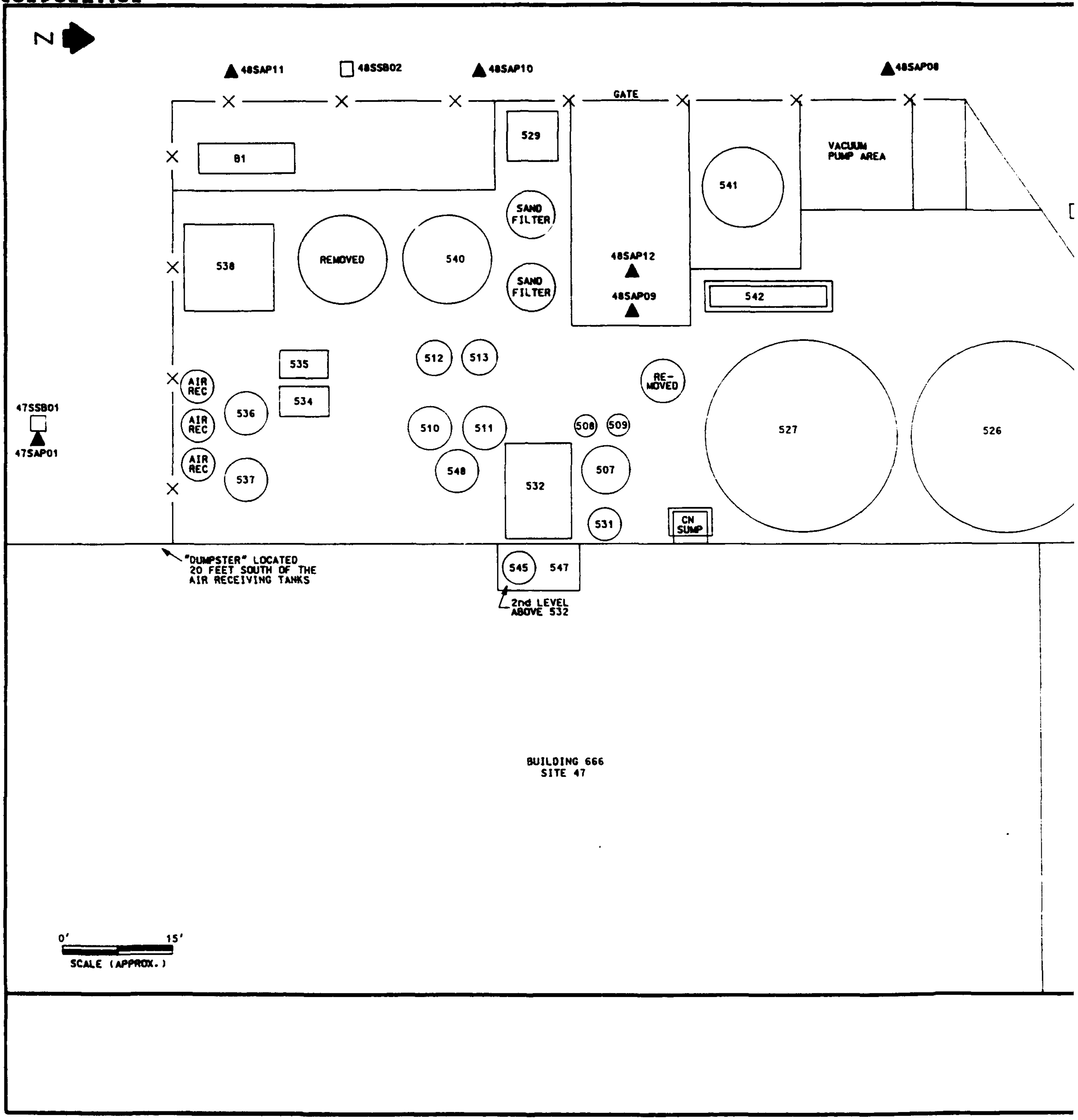

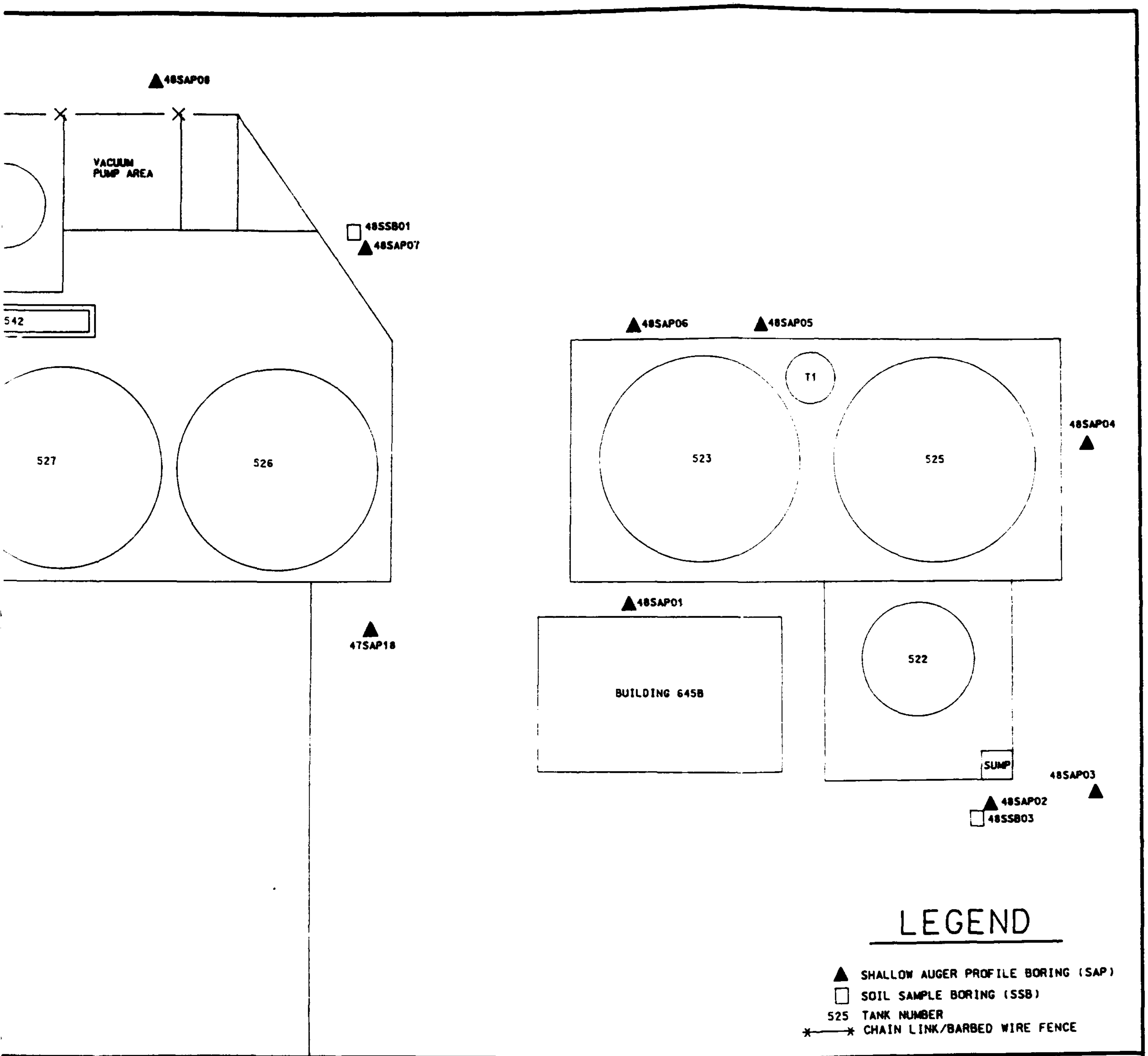

Figure 4-1. Boring Locations for Site 48.

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4.1.1 Physical Characteristics

McLaren's boring logs were used to determine the physical characteristics of the soil. The soils at Site 48 were described as predominantly slightly moist to moist clay loams and silt loams with some interspersed sand and clay layers. The surface soils consist of gravelly sandy loams. Grain size distribution analyses were prepared from samples collected at borings 48SSB01, 48SSB02, 48SSB03, and 47SSB01; results generally confirm the original classification of the soils in the soil sample boring logs. Cementation of soils ranges from slight to moderate; however, no direct correlation between cementation and depth is apparent.

The color of surface soils ranged from dark yellowish brown to dark brown and varied at depth between olive and brown with light olive brown predominating. Soil discoloration was found in borings 48SAP03 and 48SAP04. The discoloration occurred between the depths of 3 and 7 feet BGS and was described as dark grayish brown. No odors were detected in any of the SSBs or SAPs.

Boring 48SAP09 encountered an unknown hard obstruction at 2 feet BGS and drilling was discontinued. Boring 48SSB02 encountered a saturated zone at 47 feet BGS, also causing discontinuation of drilling. The saturated zone may be a layer of perched water, possibly from a leaking pipeline, because the water table surface beneath the site in 1985 was approximately 100 feet BGS.

4.1.2 Analytical Results

Soil samples collected from four SSBs at Site 48 and boring 47SSB01 were analyzed for the following: volatile organic compounds (VOCs), semivolatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), priority pollutant metals, cyanide, and oil and grease. Soil samples collected from 14 SAPs and borings 47SAP01 and 47SAP18 were analyzed for priority pollutant metals and cyanide. Detailed sampling and analytical data from analyses are presented in Tables A-1 through A-4 (Appendix A). A summary of positive analytical results for soil samples is presented in Table 4-1.

Volatile Organic Compounds (VOCs)

Four samples from boring 48SSB01 (including one duplicate) and two samples each from borings 48SSB02, 48SSB03, and 47SSB01 were analyzed for VOCs

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using United States Environmental Protection Agency (U.S. EPA) Method 8240 (Table A-1 [Appendix A]). Samples were collected at depths ranging from 10 to 80 feet BGS. Results showed five VOCs were detected: trichloroethene, toluene, acetone, chloroform, and 1,1,1-trichloroethane (Table 4-1). Figure 4-2 shows the maximum levels of organic compounds detected in each of the borings.

Semivolatile Organic Compounds

One sample each from borings 48SSB02 and 48SSB03 and two samples each from borings 48SSB01 (including one duplicate) and 47SSB01 were analyzed for semivolatile organic compounds using U.S. EPA Method 8270 (Table A-2 [Appendix A]). Samples were collected at depths ranging from 10 to 80 feet BGS. Results showed that bis(2-ethylhexyl)phthalate was detected at a depth of 15 feet BGS in boring 48SSB03 (Table 4-1). This compound was suspected of being a field sampling or laboratory contaminant (McLaren, 1986b).

Pesticides and PCBs

One sample from boring 48SSB01 and two samples each from borings 48SSB02, 48SSB03, and 47SSB01 were analyzed for pesticides and PCBs using U.S. EPA Method 8080 (Table A-3 [Appendix A]). Samples were collected at the following depths ranging from 10 to 80 feet BGS: 10 feet BGS in boring 48SSB01, 24 feet BGS in boring 48SSB02, 15 feet BGS in boring 48SSB03, and 10 feet and 80 feet BGS in boring 47SSB01. No pesticides or PCBs were detected in any of the samples.

Metals

Thirteen samples (including five duplicates) from the four SSBs and 22 samples (including 8 duplicates) from the 14 SAPs were analyzed for total concentrations of the metals listed in California Code of Regulations, Title 22. Seven samples (including 2 duplicates) from the four SSBs were analyzed for extractable concentrations of metals (Table A-4 [Appendix A]). Sampling depths for the SSBs were as follows: 10 feet and 35 feet BGS in boring 48SSB01; 24 feet and 44 feet BGS in boring 48SSB02; 15 feet and 79 feet BGS in boring 48SSB03; and 10 feet and 80 feet BGS in boring 47SSB01. For the SAPs, samples from the first 10 feet were composited for analysis.

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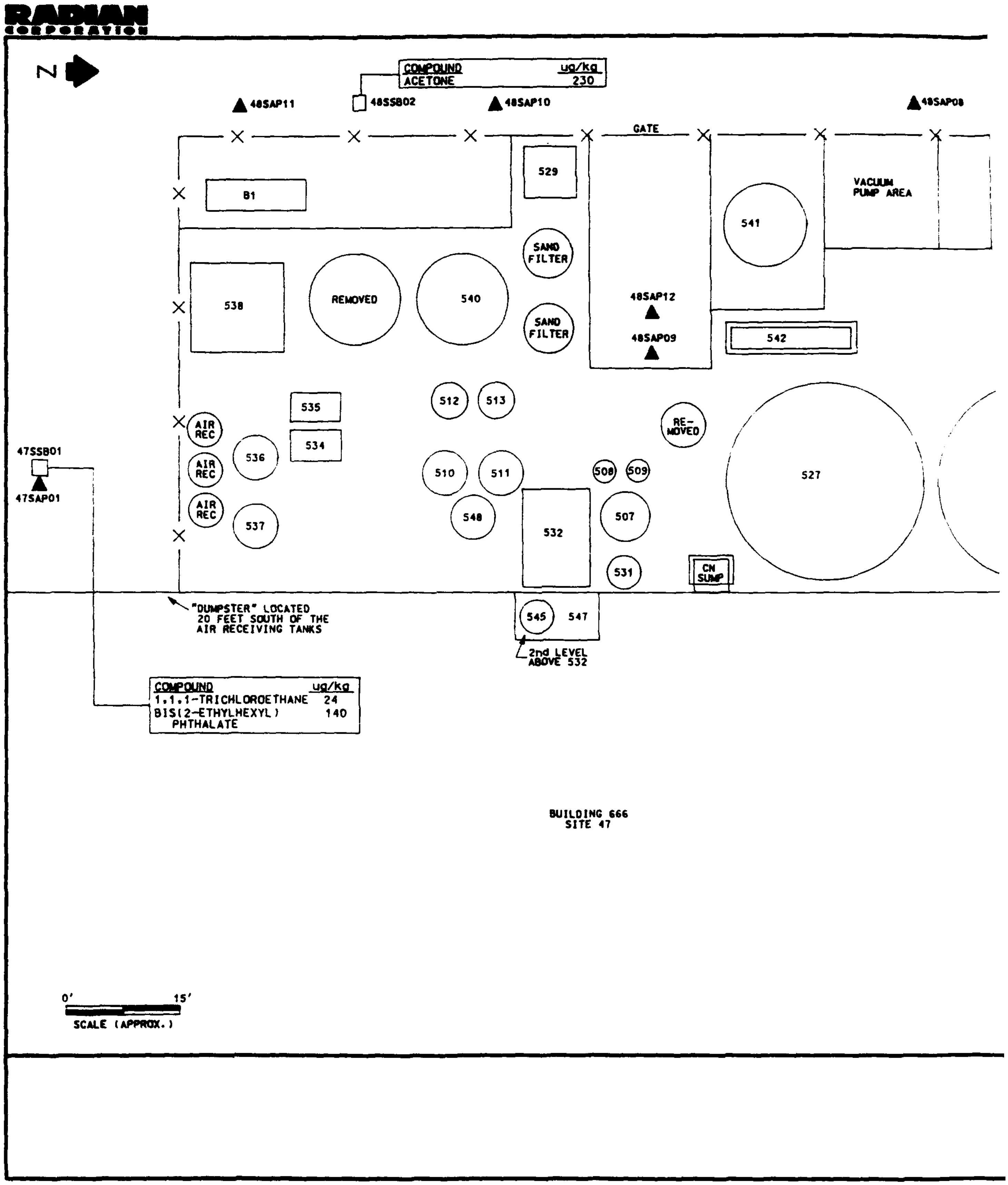
TABLE 4-1. SUMMARY OF POSITIVE ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 48

Compound Detected	Boring Number	Depth (feet BGS)	Concentration
Volatile Organic Compounds			
Acetone	48SSB02	44.0 - 44.5	230μg/kg
	48SSB03	14.5 - 15.0	200μg/kg
		79.0 - 79.5	110μg/kg
Chloroform	48SSB03	79.0 - 79.5	13μg/kg
Toluene	48SSB01	34.5 - 35.0	86μg/kg
			19μg/kg
		79.0 - 79.5	14μg/kg
1,1,1-Trichloroethane	48SSB03	79.0 - 79.5	16μg/kg
	47SSB01	9.5 - 10.0	24μg/kg
		79.5 - 80.0	20μg/kg
Trichloroethene	48SSB01	34.5 - 35.0	28μg/kg
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	48SSB03	14.5 - 15.0	100μg/kg
	47SSB01	9.5 - 10.0	140μg/kg

BGS = below ground surface

SOURCE: McLaren, 1986a.


RADIAN CORPORATION
N
COMPOUND ug/kg
ACETONE 230
48SAP11
48SSB02
48SAP10
48SAP08
GATE
529
B1
VACUUM PUMP AREA
541
SAND FILTER
538
REMOVED
540
SAND FILTER
48SAP12
48SAP09
542
535
512
513
RE-MOVED
AIR REC
534
47SSB01
536
AIR REC
510
511
508
509
527
47SAP01
AIR REC
548
507
537
532
531
CN SUMP
"DUMPSTER" LOCATED 20 FEET SOUTH OF THE AIR RECEIVING TANKS
545
547
2nd LEVEL ABOVE 532
COMPOUND ug/kg
1,1,1-TRICHLOROETHANE 24
BIS(2-ETHYLHEXYL) PHTHALATE 140
BUILDING 666
SITE 47
0'
15'
SCALE (APPROX.)

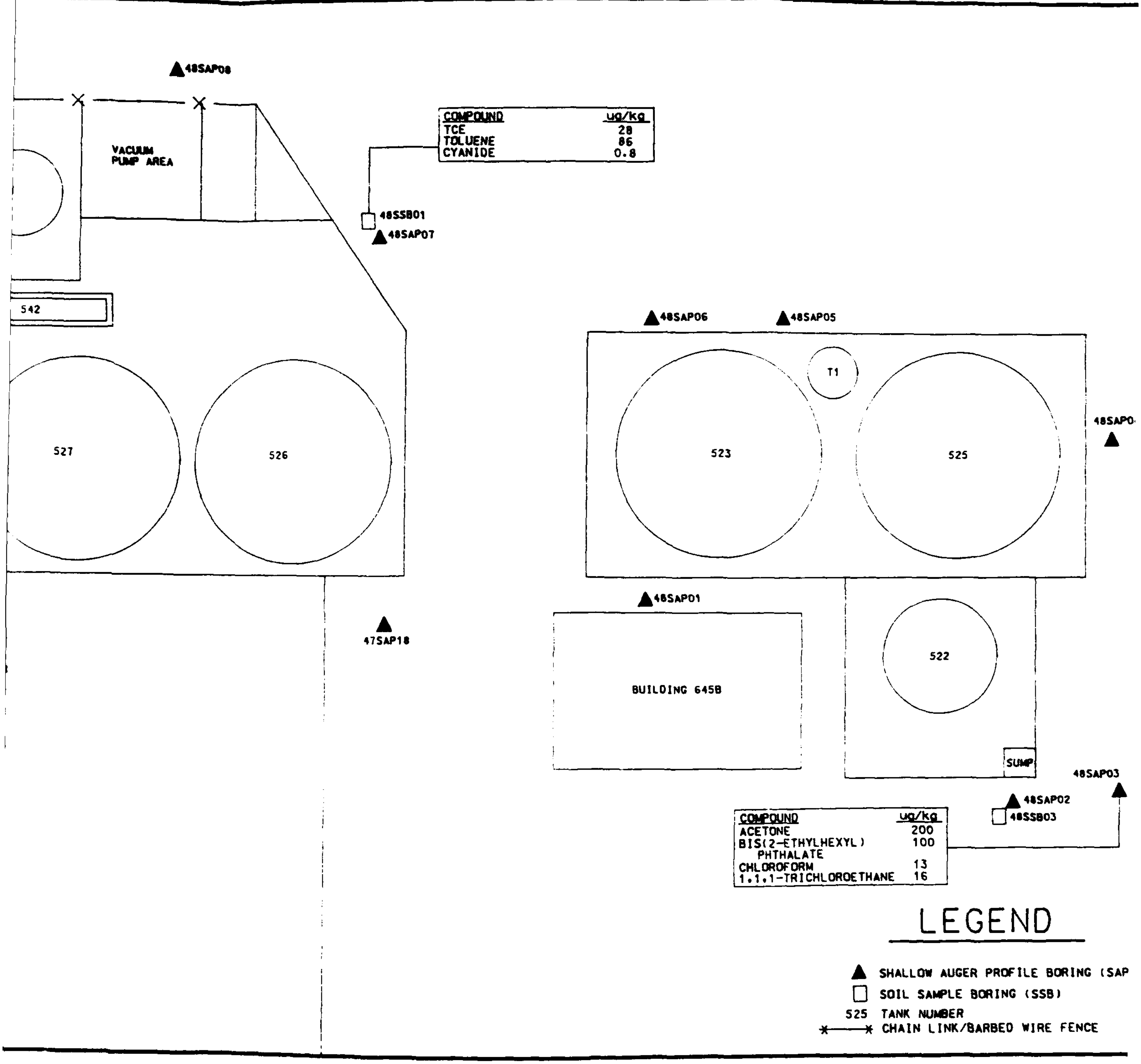


Figure 4-2. Maximum levels o
Organic Compounds in borings
in and around Site 48.

MCB2/CS480 GMH 9

Whereas the presence of any detectable amount of priority pollutant organic compound indicates contamination from a manufactured source, most soils have some natural concentrations of metals present. Because no other criteria have been established for evaluating metal contamination at McClellan AFB, California hazardous waste criteria were used as a basis of comparison (California Code of Regulations, Title 22, Section 66699). All total metal concentrations were below the applicable Total Threshold Limit Concentrations (TTLCs), and all extractable concentrations were below the applicable Soluble Threshold Limit Concentrations (STLCs).

Cyanide

Ten samples (including two duplicates) from the four SSBs and 14 samples (including two duplicates) from the 14 SAPs were analyzed for cyanide using U.S. EPA Method 335.2. Cyanide was detected in boring 48SSB01 (at 35 feet BGS) at a concentration of 0.8 mg/kg (Table A-4 [Appendix A]).

Oil and Grease

One sample each from borings 48SSB01 and 48SSB02 and two samples (including one duplicate) from boring 48SSB03 were analyzed for oil and grease using U.S. EPA Method 413.1. (See Table A-4 [Appendix A].) Although oil and grease was detected at concentrations ranging from 59 to 1,000 mg/kg, regulatory limits with which to compare the concentrations have not been established.

Quality Assurance/Quality Control

The quality assurance/quality control (QA/QC) information available for these analyses was limited to sample detection limits and occasional duplicate results (McLaren, 1986a; McLaren, 1986b). For a complete evaluation of the data additional information is required, including results from method blanks, laboratory blanks, field blanks, laboratory replicates, laboratory spikes, and performance audit samples. Without this information it is impossible to estimate the precision of analyses, or determine if any systematic bias or artificial contamination was present in the results. However, some general considerations can be discussed regarding the quality of these analyses. For organic compounds, U.S. EPA Methods 8080, 8240, and 8270 are appropriate analytical methods for this type of investigation. Each has specific recommendations for QA/QC as part of the method procedure. Although no indications of analytical accuracy or precision were provided in the reports, these parameters may be within acceptable limits as long as the specified QA/QC recommendations were followed by experienced technicians.

One unusual characteristic of the entire McLaren data set is that each compound has the same detection limit between samples having different composition. The uniformity of detection limits may indicate that samples were not properly diluted before quantitation, or that dilutions were made, but not reported. Either of these omissions would result in true detection limits that were higher than those indicated in the results.

Analytical methods for metals were not specified; instead, methods were referenced to the Waste Extraction Test in the California Assessment Manual (CAM-WET), a former reference of California-approved methods for waste classification. The California Assessment Manual allowed several analytical methods for each metal, but it is unknown which ones were actually used in the McLaren analyses. Although CAM has been discontinued, the methods referenced are still applicable under present standards.

United States Environmental Protection Agency Method 335.2, used in the analysis for cyanide, was intended for water and wastewater samples and is unreliable for soil samples. However, this method most likely would have detected some level of cyanide, had cyanide been present in the soil. At the time of the analyses, no other U.S. EPA-approved cyanide analytical method was available.

4.1.3 Adequacy of Soil Characterization

The following criteria were used by Radian to determine the adequacy of a soil characterization (U.S. EPA, 1986, p. 9-5):

- Representative samples of soil are collected;
- Enough samples are collected to define both the lateral and vertical extent of contamination; and
- Samples are handled and analyzed using appropriate methodology for the suspected contaminants.

Samples are considered representative if they are collected from appropriate areal and vertical locations based on the sampling strategy employed and the objectives of the data. In McLaren's investigation at Site 48, all borings were drilled outside the perimeter of the concrete pad. The twelve SAPs were placed at 50-foot intervals around the concrete foundation as an initial survey of "possible surface discharges or lateral migration from the site" (McLaren, 1986b). This is considered an appropriate strategy for a preliminary screening for the presence and lateral extent of contamination.

Utilizing a worst-case sampling strategy, McLaren then located the three SSBs where high soil gas readings occurred in the SAPs. For a remedial investigation, this is an appropriate strategy for selecting representative volatile samples, but it may not identify source material containing semivolatiles or metals. In these cases a more appropriate sampling strategy may have been to select samples where the soil was discolored or had other indications of source material. Furthermore, no samples from borings 48SSB02 and 48SSB03 were collected from depths less than 10 feet BGS which is the likely interval for detecting high levels of relatively immobile semivolatile and metallic source material. Nevertheless, the horizontal and vertical sampling locations selected are of adequate representativeness for at least a preliminary screening of lateral contaminant migration from the site.

The number of samples collected is sufficient when an estimate of the variability of contamination can be made with some degree of precision. The necessary degree of precision depends on the objectives and use of the data. In this investigation (including the three borings from the Site 47 investigation), McLaren collected and analyzed 10 soil samples for VOCs, 6 samples for semivolatile organic compounds, 7 samples for pesticides and PCBs, 40 samples for metals, 25 samples for cyanide, and 4 samples for oil and grease. Although none of the samples were collected within the perimeter of the foundation, the number of samples collected for each parameter was adequate for at least a preliminary screening of lateral contaminant migration from the site.

The sampling and analytical methods used to characterize samples for organic compounds, pesticides, cyanides and metals were appropriate for the types of materials suspected at this site. Because of the large amounts of acids and caustics handled at the site, measurements of pH should have been made. Data from metal analyses are probably adequate to identify areas of contamination above background levels. Although specific analytical methods were not indicated, a California-approved method was probably used. Data from cyanide and organic analyses are probably of adequate quality to identify areas of source material or high levels of contamination. Insufficient information is available to determine if the data are adequate for low level contaminant determinations.

4.2 Soil Gas Results

Throughout the drilling operations, McLaren used a PID to take soil gas readings from soil cuttings and headspace jars. A PID is a screening instrument and does not speciate or accurately quantify the soil gas. Quality assurance measures included calibrating the PID daily with standardized isobutylene, keeping a calibration logbook, and prior to drilling, recording the ambient air reading from the PID. McLaren also indicated that the PID was periodically checked in the field to ensure proper functioning (McLaren, 1986b, p. 19).

For the SAPs, readings from soil cuttings generally were measured at 0, 2.5. and 10 feet BGS, while readings from headspace jars were measured at 2.5 and 10 feet BGS. For the SSBs, cuttings and headspace readings were measured in 5-foot intervals. McLaren recorded relatively high concentrations in some of the borings, including borings 48SAP05 (maximum of 200 ppmv), 48SAP06 (maximum of 180 ppmv), and 48SAP11 (maximum of 190 ppmv). However, McLaren believed that the concentration values were due to moisture "artifacts" affecting the instrument, as discussed in their report on procedures (McLaren, 1986b). The maximum soil gas readings for all borings in the Site 48 investigation are presented in Table B-1 (Appendix B).

McLaren noted that the PID was sensitive to excessive moisture, and excessive moisture may cause the PID to show higher readings than the actual levels. This response can be identified by a very slow meter response:

> Thus, when slow responses occurred and ultimate readings were high in the absence of odors or other indications of contamination, the PID readings were assumed to be moisture artifacts. (McLaren, 1986b, p. 19)

McLaren's investigation is adequate for a preliminary screening of the total soil gas concentration in the studied area. However, because of the uncertainties related to the high readings thought to be the result of moisture "artifacts," the data should be considered suspect when evaluated for uses other than as a preliminary screening.

4.3 Groundwater Results

Because this Technical Memorandum is concerned only with site-specific data, only groundwater results from downgradient wells that have detectable amounts of the same constituents associated with Site 48 soil samples are relevant. Historically, the groundwater at McClellan AFB has flowed south/southwest, however, temporary fluctuations in flow direction may have occurred as a result of the Base production well 13's pumping influence from 1981 to 1985. Monitoring Well (MW) 41s and MW-65 are the only monitoring wells in the vicinity of Site 48 which are located south or southwest of Site 48. Tables C-1 through C-7 (Appendix C) summarize the available sampling data and analytical results for MW-41s and MW-65. The compounds detected in the soil of Site 48 and also in the groundwater of MW-41s are trichloroethene, 1,1,1-trichloroethane, and chloroform. The compounds detected in the soil of Site 48 and also in the groundwater of MW-65 are trichloroethene and toluene. Complete discussions of sampling and analytical methods can be found in "Quarterly Sampling and Analysis Program" reports (Radian, 1984-1988c) for MW-41s and in the "Area B Site Characterization Groundwater Report" (McLaren, 1986d) for MW-65.

4.4 Tank Sampling Results

McLaren collected residual water and solids samples from 20 tanks, the cyanide sump, and 2 bins at Site 48 on 27 November 1985 (McLaren, 1986a). Samples were analyzed for total heavy metals, cyanide, and pH. Solid residues were collected from Tank 525; all other tank samples collected were of residual water. Table D-1 (Appendix D) summarizes sampling information and analytical results for these samples.

Results showed pH levels ranging from 1.6 to 10.4, cyanide concentrations ranging from 0 to 29 mg/kg, and levels of cadmium, total chromium, lead, nickel, silver, and zinc that exceed TTLC and STLC values. Results of the tank sampling generally confirmed the presence of metals and cyanide suspected of contributing to contamination at the site.

4.5 Surface Water Results

Although no surface water samples that can be specifically related to Site 48 have been collected for analysis, surface water at McClellan AFB is regularly monitored under two National Pollutant Discharge Elimination System (NPDES) permits. The first requires that surface water from Arcade Creek, Second Creek, and

Magpie Creek be sampled monthly where it enters the base, and again where it exits; these samples are analyzed for volatile organic compounds (VOCs) and heavy metals. The second permit outlines waste discharge regulations for the base groundwater treatment plant (located in Operable Unit C of McClellan AFB), including effluent analyses of VOCs, semivolatile organic compounds, and heavy metals. The NPDES permits establish limits on concentrations of VOCs, semivolatile organic compounds, and heavy metals in surface water discharged from McClellan AFB. Under the permit requirements, concentrations of these compounds must not exceed the established limits.

4.6 Air Monitoring Results

No air monitoring results have been specifically associated with Site 48.

5.0 POTENTIAL HAZARDS

The following sections discuss the potential contaminants of concern, immediate hazards, and potential for migration resulting from any on-site contamination at Site 48.

5.1 Potential Contaminants of Concern

The contaminants of concern at Site 48 are the volatile organic compounds (VOCs), semivolatile organic compounds, metals, acids, bases, cyanide compounds, and asbestos known to have been used or stored at the site and detected during previous investigations (see Sections 3 and 4). Section 4, Extent of Contamination, provides a detailed description of previous investigations at Site 48, and is summarized below:

- A total of 18 borings were drilled near Site 48, all of which were drilled around the perimeter of the building.
- Soil discoloration was found from 3 to 7 feet below ground surface (BGS) in two borings.
- Soil gas readings ranged from 0 ppmv to 250 ppmv for all borings.
- Ten samples collected from four borings were analyzed for VOCs. Five VOCs were detected in these samples, and at least one VOC was detected in each of the borings.
- Five samples from four borings were analyzed for semivolatile organic compounds. The only compound detected is a common laboratory contaminant.
- One sample from each of four borings were analyzed for pesticides and polychlorinated biphenyls (PCBs). No PCBs were detected in the samples.
- Twenty-two samples from 18 borings were analyzed for California Title 22 hazardous metals and cyanides. Some of these samples were also analyzed for extractable metals. All metal results were less than California Title 22 threshold limit concentrations.

- One sample from each of three borings were analyzed for oil and grease. Oil and grease were detected at concentrations ranging from 59 to 1,000 mg/kg.

- Additional samples are needed to preclude the existence of other contaminants.

- Three VOCs found in the soils at Site 48 also have been detected in the groundwater near the site.

Table 5-1 lists the organic chemicals detected at this location, along with certain physical characteristic values that influence their mobility. Inorganic compounds and oil and grease are not listed in the table because the specific compounds present in the soil are unknown.

5.2 Immediate Hazards

This section describes any potential hazards, including the potential for fire and explosion and the possible hazards to worker health and safety that require immediate action due to contaminants present at Site 48. Because the soil gas concentrations measured in the two borings are far below the lower explosive limit, the potential for fire and explosion is believed to be low.

Potential hazards to worker health and safety are limited to inhalation, ingestion, or dermal contact of any contaminated near-surface soil. Most of the surface of Site 48 is covered with concrete, except for the asphalt-paved area in the northeast portion of the site. All contaminated debris have been removed from the site. Although surface soil samples have not been collected, the potential for hazards to worker health and safety are low. However, potentiǝl hazards should be reevaluated if construction or excavation activities are planned in the future.

5.3 Potential for Contaminant Migration

This section describes the potential for wastes to migrate from Site 48 to the groundwater, surface water, and air. The potential for contaminant migration is dependent on the characteristics of the site and the nature of the contaminants. Although site-specific information is limited, it is possible to discuss general considerations of contaminant migration from this location.

TABLE 5-1. PHYSICAL CHARACTERISTIC VALUES FOR ORGANIC COMPOUNDS DETECTED AT SITE 48

Compound	Water Solubility[a] (mg/L)	Vapor Pressure[a] (mm Hg)	Log K_{ow}[b]
Volatile Organic Compounds			
Acetone	Miscible	270	-0.24
Chloroform	8,200	151	1.97
Toluene	535	28.1	2.73
1,1,1-Trichloroethane	2.4	1,500	123
Trichloroethene	2.4	1,100	57.9
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	5.3[c]	1.3[c]	NA

[a] At neutral pH at 20 to 30°C.
[b] Log of octanol/water partition coefficient.
[c] Source: U.S. EPA Database, 1988. Water Engineering Research Laboratory.

NA = Information not available.

SOURCE: U.S. Environmental Protection Agency, 1986. Superfund Public Health Evaluation Manual. OSWER Directive 9285.4-1.

5.3.1 Potential for Migration to Groundwater

The most important factors that influence migration to groundwater are the amount of infiltrating surface water, other sources of percolating water, the percolation rate of the soil, and contaminant characteristics.

Most of the surface of Site 48 is covered with concrete, and the sumps have been capped with roof-like structures to intercept rainfall. These features minimize the amount of infiltrating surface water. However, Site 48 historically included several tanks, sumps, and water reservoirs which could have leaked substantial amounts of liquids into the soil over time.

The percolation rate of contaminants depends on the soil permeability, structure, stratification, and characteristics of the contaminants. Although permeability data on the soil at Site 48 are not available, boring logs reveal that soils range from gravelly sandy loams to clay loams. The relative permeabilities for these soils range from very low to moderate. Basewide boring information indicates that relatively impermeable layers are not continuous and not effective barriers to percolation. Therefore, the percolation rate for this location is potentially low to moderate.

The contaminants of concern at Site 48 are VOCs, semivolatile organic compounds, metals, acids, bases, cyanide compounds, and asbestos. Asbestos is insoluble and is not a threat to groundwater. The detected VOCs have relatively high water solubilities and moderate to low octanol/water coefficients (K_{ow}) (see Table 5-1), which indicate that these contaminants have a relatively high potential for dissolving into water and being carried with the flow of percolating water. Although no water is believed to be percolating through the soil at Site 48 now, VOCs could have migrated to deeper soil or groundwater if historic tanks, sumps, or reservoirs were leaking.

Although semivolatile compounds were not detected in the previous investigations, in general these contaminants are much less soluble in water than VOCs and have much higher K_{ow} values, indicating these compounds tend to remain in surface soil and not migrate with percolating water. However, as other organic compounds dissolve in water, any semivolatile compounds with high K_{ow} values may also dissolve more readily due to the solvent properties of other organics.

The mobility of metals is limited by the least soluble compound of the metal in the percolating groundwater. Because hazardous metals generally form practically insoluble precipitates in soil at neutral or alkaline pH, these metals tend to remain in surface soils and do not migrate with percolating water (Lindsay, 1979). However, dissolved acids may significantly increase the solubility of metal compounds and some semivolatile compounds (e.g., phenols and other acid-extractable organic compounds). If acidic materials are present at Site 48, metals and acid-extractable compounds may have migrated in the acidic soil solution. However, the natural buffer capacity of clay and silty soils is able to partially neutralize moderate amounts of acid or alkaline wastes and any migrating acid-extractable contaminants would quickly precipitate out of solution as the pH was neutralized.

The behavior of cyanide compounds is extremely variable, and no specific cyanide compounds are suspected. The water solubility of cyanide compounds range from practically insoluble to very soluble. However, cyanide compounds are reactive when in solution. Cyanide forms volatile hydrocyanic acid in low pH environments and oxidizes rapidly in aerobic, high pH environments.

5.3.2 Potential for Migration to Surface Water

The primary site characteristics affecting the potential for contaminant migration to surface water are the topography and surface characteristics of the site. Since Site 48 is covered with concrete, asphalt, and roof-like caps which prevent surface water from contacting any contaminated soil, the potential for migration of contaminants to surface water is very low.

5.3.3 Potential for Migration to Air

Surface characteristics of the site and contaminant characteristics also influence the potential for migration to air. Vapor pressure is a relative measure of the volatility of a chemical in its pure state and is an important determinant of the rate of vaporization from soils and solid waste sites. The relatively high vapor pressures for the VOCs detected at Site 48 indicate that VOCs present in exposed surface and near-surface soils are likely to migrate to the air (see Table 5-1).

The surface flux (concentration of organic compounds entering the air from the soil in a unit time) is dependent upon soil permeability, soil moisture, depth of contaminants, concentration of contaminants in the soil gas, and other physical soil properties that have not been quantified. Because most of the site is covered with asphalt and concrete, the surface flux of volatile contaminants is probably low.

6.0 EVALUATION OF PREVIOUS CONTRACTORS' RECOMMENDATIONS

Recommendations were suggested by McLaren previous to development of plans to dismantle the treatment plant (McLaren, 1986c). The recommendations included emptying and cleaning all tanks, sumps, and bins at the site. No other specific recommendations for remedial actions or further investigation have been made.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Industrial Waste Treatment Plant No. 4 handled a large volume of hazardous materials and hazardous waste during its 23 years of operation. Although it was specifically designed to treat metal and cyanide wastes, some levels of organic compounds from plating shop operations probably entered the wastewater stream. At least one tank was reported to have leaked and none of the tanks had secondary containment structures. Soil contamination by organic compounds has been confirmed in areas outside the perimeter of the concrete pad. Therefore, further investigations are recommended for Site 48. In addition, it is recommended that investigations for Site 48, Site 47, and Site 36 be combined because of their closely related historical activities and their close proximity.

The samples collected from outside the perimeter of the concrete pad were adequate for at least a preliminary screening of the lateral extent of contamination at the site. Furthermore, much of the data from the investigation is considered valid and may be integrated into future investigations. However, there is a lack of information from inside the perimeter of the concrete pad.

The following activities are recommended for Site 48:

- Design a soil and groundwater investigation that addresses Site 47, Site 48, and Site 36 together;

- Collect concrete samples from the concrete pad (to confirm completion of stabilization procedures) and analyze for volatile organic compounds (VOCs), semivolatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), metals and cyanide;

- Perform additional borings within the perimeter of the concrete pad, especially underneath former sump and tank locations;

- Screen soil samples from the borings using real-time analyzers (photoionization or flame ionization detectors);

- Collect near-surface samples and analyze for VOCs, semivolatile organic compounds, pesticides, PCBs, metals, and cyanide; and

- Drill, sample, and analyze one or more monitoring wells to determine contaminant migration from the three sites.

The exact extent of additional investigations will be presented in the Remedial Investigation Sampling and Analysis Plan for Site 48.

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APPENDIX A

Analytical Results for Soil Samples

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TABLE A-1. VOLATILE COMPOUND ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 48 (UNIT IN UG/KG)

Boring Number	48SSB01	48SSB01	48SSB01	48SSB01	48SSB02	48SSB02	48SSB03	48SSB03	47SSB01	47SSB01
Depth (feet BGS)	9.5-10.0	34.5-35.0	34.5-35.0	79.0-79.5	24.0-24.5	44.0-44.5	14.5-15.0	79.0-79.5	9.5-10.0	79.5-80.0
Date Sampled	06/27/85	06/27/85	06/27/85	06/28/85	06/28/85	07/01/85	07/01/85	07/02/85	08/13/85	08/14/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240
Date Analyzed	--	--	--	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC		FDA	FDB							
Laboratory QC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Acetone	<100	<100	<100	<100	<100	230	200	110	<100	<100
Acrolein	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
2-Butanone	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Carbon disulfide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	13	<10	<10
Chlorodibromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Dichlorobromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Continued)

CS48/073189/JKS

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TABLE A-1. (Continued)

Boring Number Depth (feet BGS)	48SSB01 9.5-10.0	48SSB01 34.5-35.0	48SSB01 34.5-35.0	48SSB01 79.0-79.5	48SSB02 24.0-24.5	48SSB02 44.0-44.5	48SSB03 14.5-15.0	48SSB03 79.0-79.5	47SSB01 9.5-10.0	47SSB01 79.5-80.0
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	<100	<100	<100	NA	<100	<100	<100	<100	<100	<100
4-Methyl-2-pentanone	<100	<100	<100	NA	<100	<100	<100	<100	<100	<100
Styrene	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	86	19	14	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	16	24	20
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	28	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl acetate	<100	<100	<100	NA	<100	<100	<100	<100	<100	<100
Vinyl chloride	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Xylenes (total)	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

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TABLE A-2. SEMIVOLATILE ORGANIC COMPOUND ANALYTIC L RESULTS FOR SOIL SAMPLES FROM SITE 48 (UNITS IN UG/KG)

Boring Number	48SSB01	48SSB01	48SSB02	48SSB03	47SSB01	47SSB01
Depth (feet BGS)	9.5-10.0	9.5-10.0	24.0-24.5	14.5-15.0	9.5-10.0	79.5-80.0
Date Sampled	06/27/85	06/27/85	06/28/85	07/01/85	08/13/85	08/14/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270	EPA 8270
Date Analyzed	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL
Field QC	FDA	FDB				
Laboratory QC	NS	NS	NS	NS	NS	NS
Acenaphthene	<100	<100	<100	<100	<100	<100
Acenaphthylene	<100	<100	<100	<100	<100	<100
Aniline	<100	<100	<100	<100	<100	<100
Anthracene	<100	<100	<100	<100	<100	<100
Benzidine	<400	<400	<400	<400	<400	<400
Benzo(a)anthracene	<100	<100	<100	<100	<100	<100
Benzo(a)pyrene	<100	<100	<100	<100	<100	<100
3,4-Benzo(b)fluoranthene	<100	<100	<100	<100	<100	<100
Benzo(g,h,i)perylene	<100	<100	<100	<100	<100	<100
Benzoic acid	<100	<100	<100	<100	<100	<100
Benzo(k)fluoranthene	<100	<100	<100	<100	<100	<100
Benzyl alcohol	<100	<100	<100	<100	<100	<100
4-Bromophenylphenyl ether	<100	<100	<100	<100	<100	<100
Butyl benzyl phthalate	<100	<100	<100	<100	<100	<100
4-Chloroaniline	<100	<100	<100	<100	<100	<100
bis(2-Chloroethoxy)methane	<100	<100	<100	<100	<100	<100
bis(2-Chloroethyl)ether	<100	<100	<100	<100	<100	<100
bis(2-Chloroisopropyl)ether	<100	<100	<100	<100	<100	<100
p-Chloro-m-cresol	<100	<100	<100	<100	<100	<100
bis(Chloromethyl)ether	<400	<400	<400	<400	<400	<400
2-Chloronaphthalene	<100	<100	<100	<100	<100	<100
2-Chlorophenol	<100	<100	<100	<100	<100	<100
4-Chlorophenylphenyl ether	<100	<100	<100	<100	<100	<100
Chrysene	<100	<100	<100	<100	<100	<100

(Continued)

TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	48SSB01 9.5-10.0	48SSB01 9.5-10.0	48SSB02 24.0-24.5	48SSB03 14.5-15.0	47SSB01 9.5-10.0	47SSB01 79.5-80.0
Dibenzo(a,h)anthracene	<100	<100	<100	<100	<100	<100
Dibenzofuran	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	<100	<100	<100	<100	<100	<100
1,3-Dichlorobenzene	<100	<100	<100	<100	<100	<100
1,4-Dichlorobenzene	<100	<100	<100	<100	<100	<100
3,3'-Dichlorobenzidine	<100	<100	<100	<100	<100	<100
2,4-Dichlorophenol	<100	<100	<100	<100	<100	<100
Diethylphthalate	<100	<100	<100	<100	<100	<100
2,4-Dimethylphenol	<100	<100	<100	<100	<100	<100
Dimethylphthalate	<100	<100	<100	<100	<100	<100
Di-n-butylphthalate	<100	<100	<100	<100	<100	<100
4,6-Dinitro-o-cresol	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
2,4-Dinitrophenol	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
2,4-Dinitrotoluene	<100	<100	<100	<100	<100	<100
2,6-Dinitrotoluene	<100	<100	<100	<100	<100	<100
Di-n-octylphthalate	<100	<100	<100	<100	<100	<100
1,2-Diphenylhydrazine	<100	<100	<100	<100	<100	<100
bis(2-Ethylhexyl)phthalate	<100	<100	<100	100	140	<100
Fluoranthene	<100	<100	<100	<100	<100	<100
Fluorene	<100	<100	<100	<100	<100	<100
Hexachlorobenzene	<100	<100	<100	<100	<100	<100
Hexachlorobutadiene	<100	<100	<100	<100	<100	<100
Hexachlorocyclopentadiene	<100	<100	<100	<100	<100	<100
Hexachloroethane	<100	<100	<100	<100	<100	<100
Indeno(1,2,3-cd)pyrene	<100	<100	<100	<100	<100	<100
Isophorone	<400	<400	<400	<400	<400	<400
2-Methylnaphthalene	<100	<100	<100	<100	<100	<100
2-Methylphenol	<100	<100	<100	<100	<100	<100
4-Methylphenol	<100	<100	<100	<100	<100	<100
Naphthalene	<100	<100	<100	<100	<100	<100

(Continued)

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TABLE A-2. (Continued)

Boring Number Depth (feet BGS)	48SSB01 9.5-10.0	48SSB01 9.5-10.0	48SSB02 24.0-24.5	48SSB03 14.5-15.0	47SSB01 9.5-10.0	47SSB01 79.5-80.0
2-Nitroaniline	<100	<100	<100	<100	<100	<100
3-Nitroaniline	<100	<100	<100	<100	<100	<100
4-Nitroaniline	<100	<100	<100	<100	<100	<100
Nitrobenzene	<100	<100	<100	<100	<100	<100
N-Nitrosodimethylamine	<100	<100	<100	<100	<100	<100
N-Nitroso-di-n-propylamine	<100	<100	<100	<100	<100	<100
2-Nitrophenol	<100	<100	<100	<100	<100	<100
4-Nitrophenol	<100	<100	<100	<100	<100	<100
N-Nitrosodiphenylamine	<100	<100	<100	<100	<100	<100
Pentachlorophenol	<100	<100	<100	<100	<100	<100
Phenanthrene	<100	<100	<100	<100	<100	<100
Phenol	<100	<100	<100	<100	<100	<100
Pyrene	<100	<100	<100	<100	<100	<100
2,3,7,8-Tetrachlorodibenzo-p-dioxin	<100	<100	<100	<100	<100	<100
1,2,4-Trichlorobenzene	<100	<100	<100	<100	<100	<100
2,4,5-Trichlorophenol	<100	<100	<100	<100	<100	<100
2,4,6-Trichlorophenol	<100	<100	<100	<100	<100	<100

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not Available
ITL = IT Analytical Laboratories.
FDA = First field duplicate analysis.
FDB = Second field duplicate anlaysis.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

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TABLE A-3. PESTICIDE/PCB ANALYTICAL RESULTS FOR SOIL SAMPLES FROM SITE 48 (UNITS IN UG/KG)

Boring Number	48SSB01	48SSB02	48SSB02	48SSB03	48SSB03	47SSB01	47SSB01
Depth (feet BGS)	9.5-10.0	24.0-24.5	24.0-24.5	14.5-15.0	14.5-15.0	9.5-10.0	79.5-80.0
Date Sampled	06/27/85	06/28/85	06/28/85	07/01/85	07/01/85	08/13/85	08/14/85
Sampled By	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Analytical Method	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080	EPA 8080
Date Analyzed	--	--	--	--	--	--	--
Laboratory	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC		FDA	FDB	FDA	FDB		
Laboratory QC	NS	NS	NS	NS	NS	NS	NS
Aldrin	<10	<10	<10	<10	<10	<10	<10
alpha-BHC	<10	<10	<10	<10	<10	<10	<10
beta-BHC	<10	<10	<10	<10	<10	<10	<10
delta-BHC	<10	<10	<10	<10	<10	<10	<10
gamma-BHC (Lindane)	<10	<10	<10	<10	<10	<10	<10
Chlordane	<100	<100	<100	<100	<100	<100	<100
4,4'-DDD	<10	<10	<10	<10	<10	<10	<10
4,4'-DDE	<10	<10	<10	<10	<10	<10	<10
4,4'-DDT	<10	<10	<10	<10	<10	<10	<10
Dieldrin	<10	<10	<10	<10	<10	<10	<10
Endosulfan I	<10	<10	<10	<10	<10	<10	<10
Endosulfan II	<10	<10	<10	<10	<10	<10	<10
Endosulfan sulphate	<10	<10	<10	<10	<10	<10	<10
Endrin	<10	<10	<10	<10	<10	<10	<10
Endrin aldehyde	<10	<10	<10	<10	<10	<10	<10
Heptachlor	<10	<10	<10	<10	<10	<10	<10
Heptachlor epoxide	<10	<10	<10	<10	<10	<10	<10
Methoxychlor	<100	<100	<100	<100	<100	<100	<100
Toxaphene	<200	<200	<200	<200	<200	<200	<200
PCB-1016	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1221	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1232	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1242	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1248	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1254	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
PCB-1260	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000

(Continued)

TABLE A-3. (Continued)

FOOTNOTES:

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NS = Not specified.
NA = Not analyzed.

SOURCE: McLaren, 1986a.

RADIAN CORPORATION

TABLE A-4. INORGANIC COMPOUND AND MISCELLANEOUS ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED FROM SITE 48

Boring Number		48SAP01	48SAP01	48SAP02	48SAP02	48SAP03	48SAP04	48SAP05	48SAP05	48SAP06
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		06/20/85	06/20/85	06/17/85	06/17/85	06/21/85	06/20/85	06/21/85	06/21/85	06/20/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC		FDA	FDB	FDA	FDB			FDA	FDB	
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/kg)								
Antimony	NS	<0.1	<0	<0.1	NA	<0.1	<0.1	<0.1	NA	<0.1
Arsenic	NS	9.5	NA	<1	NA	<1	13	12	NA	11
Barium	NS	82	93	260	NA	160	160	160	NA	130
Berylium	NS	<0.1	<0.1	<0.1	NA	<0.1	0.16	<0.1	NA	0.16
Cadmium	NS	<0.1	<0.1	<0.1	NA	<0.1	0.3	<0.1	NA	<0.1
Chromium	NS	19	NA	<1	NA	2.1	26	26	NA	19
Cobalt	NS	9.8	NA	0.71	NA	3.7	10	12	NA	11
Copper	NS	15	NA	3	NA	3	16	20	20	11
Lead	NS	3.8	NA	<1	NA	<1	3.8	4.7	NA	2.9
Mercury	NS	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	NA	<0.1
Molybdenum	NS	0.8	0.8	<0.1	NA	<0.1	0.9	0.9	NA	0.9
Nickel	NS	15	NA	5.2	NA	4.2	23	21	NA	15
Selenium	NS	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	NA	<0.1
Silver	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Thallium	NS	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	NA	<0.1
Vanadium	NS	17	NA	<10	NA	<10	36	27	NA	36
Zinc	NS	29	NA	14	NA	11	35	39	NA	23
Cyanide	335.2	<0.5	NA	<0.5	NA	<0.5	<0.5	<0.5	NA	<0.5

(Continued)

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TABLE A-4. (Continued)

Boring Number		48SAP01	48SAP01	48SAP02	48SAP02	48SAP03	48SAP04	48SAP05	48SAP05	48SAP06
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

TABLE A-4. (Continued)

Boring Number		48SAP07	48SAP07	48SAP08	48SAP09	48SAP10	48SAP11	48SAP11	48SAP12	48SAP12
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Date Sampled		06/14/85	06/14/85	06/20/85	06/14/85	06/21/85	06/21/85	06/21/85	06/21/85	06/21/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC		FDA	FDB				FDA	FDB	FDA	FDB
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/kg)								
Antimony	NS	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	<0.1	NA
Arsenic	NS	14	NA	13	7.6	12	13	12	12	NA
Barium	NS	130	NA	93	61	72	93	NA	82	NA
Berylium	NS	0.16	NA	0.16	<0.1	<0.1	0.16	NA	0.16	NA
Cadmium	NS	<0.1	NA	<0.1	0.3	0.2	<0.1	NA	0.91	NA
Chromium	NS	27	NA	28	28	23	32	NA	26	26
Cobalt	NS	8.1	NA	11	10	6.4	12	12	10	10
Copper	NS	16	NA	18	14	13	17	NA	18	NA
Lead	NS	3.8	NA	3.8	9.3	3.8	2.9	2.9	3.8	3.8
Mercury	NS	<0.1	NA	<0.1	<0.1	<0.1	0.26	0.1	0.13	NA
Molybdenum	NS	0.7	NA	0.8	0.5	0.5	0.8	NA	0.8	NA
Nickel	NS	25	NA	21	32	19	29	NA	37	36
Selenium	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1
Silver	NS	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	<0.1	NA
Thallium	NS	<0.1	NA	<0.1	<0.1	<0.1	<0.1	NA	<0.1	NA
Vanadium	NS	36	NA	27	17	10	<10	NA	27	27
Zinc	NS	35	NA	36	35	29	33	NA	39	39
Cyanide	335.2	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		48SAP07 0.0-10.0	48SAP07 0.0-10.0	48SAP08 0.0-10.0	48SAP09 0.0-10.0	48SAP10 0.0-10.0	48SAP11 0.0-10.0	48SAP11 0.0-10.0	48SAP12 0.0-10.0	48SAP12 0.0-10.0
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Berylium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cadmium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Continued)

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TABLE A-4. (Continued)

Boring Number		48SSB01	48SSB01	48SSB01	48SSB02	48SSB02	48SSB02	48SSB03	48SSB03	48SSB03
Depth (feet BGS)		9.5-10.0	34.5-35.0	34.5-35.0	24.0-24.5	44.0-44.5	44.0-44.5	14.5-15.0	14.5-15.0	79.0-79.5
Date Sampled		06/27/85	06/27/85	06/27/85	06/28/85	07/01/85	07/01/85	07/01/85	07/01/85	07/02/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC			FDA	FDB		FDA	FDB	FDA	FDB	
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	Method	Results (Units in mg/kg)								
Antimony	NS	<0.1	<0.1	NA	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Arsenic	NS	4	38	33	1.3	8.3	NA	2.3	2.3	1.3
Barium	NS	140	170	NA	80	99	NA	90	NA	100
Beryllium	NS	0.21	0.47	NA	0.28	0.68	NA	0.48	NA	0.18
Cadmium	NS	0.13	0.22	0.22	<0.1	0.1	NA	<0.1	NA	<0.1
Chromium	NS	12	24	NA	3.2	15	NA	10	NA	4.2
Cobalt	NS	5.7	16	NA	11	8.9	NA	5.7	5.8	5.9
Copper	NS	15	33	NA	15	26	NA	14	NA	9.6
Lead	NS	3.9	9.5	NA	6.4	10	NA	6.4	NA	8.5
Mercury	NS	<0.05	0.13	NA	<0.1	0.17	NA	0.11	NA	<0.1
Molybdenum	NS	0.17	1.3	NA	<1	1.3	NA	<1	NA	<1
Nickel	NS	20	41	NA	14	25	NA	14	NA	13
Selenium	NS	<1	<1	NA	<1	<1	NA	<1	NA	<1
Silver	NS	<0.1	<0.1	<0.1	<0.1	<0.1	NA	<0.1	NA	<0.1
Thallium	NS	<0.1	0.17	NA	<0.1	<0.1	NA	<0.1	NA	<0.1
Vanadium	NS	26	56	NA	2	40	NA	7.9	NA	5.9
Zinc	NS	36	83	NA	42	52	NA	38	NA	36
Cyanide	335.2	<0.5	0.8	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5
Oil & Grease	413.1	1,000	NA	NA	160	NA	NA	60	59	NA

(Continued)

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TABLE A-4. (Continued)

Boring Number		48SSB01	48SSB01	48SSB01	48SSB02	48SSB02	48SSB02	48SSB03	48SSB03	48SSB03
Depth (feet BGS)		9.5-10.0	34.5-35.0	34.5-35.0	24.0-24.5	44.0-44.5	44.0-44.5	14.5-15.0	14.5-15.0	79.0-79.5
Parameter	Method	Results (Units in mg/L)								
Extractable Antimony	WET/NS	<0.001	NA	NA	<0.001	NA	NA	<0.001	NA	NA
Extractable Arsenic	WET/NS	0.011	NA	NA	<0.01	NA	NA	<0.01	NA	NA
Extractable Barium	WET/NS	17	NA	NA	7.2	NA	NA	11	NA	NA
Extractable Berylium	WET/NS	0.006	NA	NA	0.003	NA	NA	0.004	NA	NA
Extractable Cadmium	WET/NS	0.008	NA	NA	0.004	NA	NA	0.008	NA	NA
Extractable Chromium	WET/NS	0.063	NA	NA	0.049	NA	NA	0.079	NA	NA
Extractable Cobalt	WET/NS	0.280	NA	NA	0.46	NA	NA	0.35	NA	NA
Extractable Copper	WET/NS	0.62	NA	NA	0.34	NA	NA	0.53	NA	NA
Extractable Lead	WET/NS	0.044	NA	NA	0.12	NA	NA	0.15	NA	NA
Extractable Mercury	WET/NS	0.001	NA	NA	<0.002	NA	NA	0.003	NA	NA
Extractable Molybdenum	WET/NS	<0.1	NA	NA	<0.1	NA	NA	<0.1	NA	NA
Extractable Nickel	WET/NS	0.73	NA	NA	0.48	NA	NA	0.59	NA	NA
Extractable Selenium	WET/NS	0.018	NA	NA	<0.01	NA	NA	<0.01	NA	NA
Extractable Silver	WET/NS	<0.001	NA	NA	<0.001	NA	NA	<0.001	NA	NA
Extractable Thallium	WET/NS	<0.001	NA	NA	<0.001	NA	NA	<0.001	NA	NA
Extractable Vanadium	WET/NS	0.56	NA	NA	0.45	NA	NA	0.45	NA	NA
Extractable Zinc	WET/NS	0.49	NA	NA	0.27	NA	NA	0.38	NA	NA

(Continued)

TABLE A-4. (Continued)

Boring Number		47SAP01	47SAP01	47SAP18	47SAP18	47SSB01	47SSB01	47SSB01	47SSB01
Depth (feet BGS)		0.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0	9.5-10.0	9.5-10.0	79.5-80.0	79.5-80.0
Date Sampled		06/14/85	06/14/85	06/21/85	06/21/85	08/13/85	08/13/85	08/14/85	08/14/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC		FDA	FDB	FDA	FDB	FDA	FDB	FDA	FDB
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS
Parameter	Method	Results (Units in mg/kg)							
Antimony	NS	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	NA
Arsenic	NS	10	<0.1	<0.1	<1	3.7	3.7	3.7	NA
Barium	NS	68	NA	78	78	91	NA	79	NA
Berylium	NS	<0.1	NA	<0.1	NA	<0.1	NA	<0.1	NA
Cadmium	NS	<0.1	<0.1	0.1	<0.1	0.78	NA	0.87	NA
Chromium	NS	20	NA	<1	<1	19	19	16	15
Cobalt	NS	10	NA	2.4	2.4	10	10	3.3	4.3
Copper	NS	15	15	5.4	5.4	20	NA	30	30
Lead	NS	7.5	NA	<1	<1	2.9	2.9	2	NA
Mercury	NS	0.39	NA	<0.1	NA	<0.1	NA	<0.1	NA
Molybdenum	NS	0.7	0.6	<0.1	NA	<1	<1	3.5	2.4
Nickel	NS	19	NA	6.1	5.1	26	NA	23	NA
Selenium	NS	<0.1	NA	0.23	0.13	<1	<1	<1	NA
Silver	NS	0.14	NA	0.23	0.23	1.3	NA	1.3	NA
Thallium	NS	0.12	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Vanadium	NS	46	NA	<10	NA	33	NA	33	NA
Zinc	NS	71	73	8.9	8.9	39	NA	41	NA
Cyanide	335.2	<0.5	NA	<0.5	NA	<0.5	<0.5	<0.5	NA

(Continued)

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TABLE A-4. (Continued)

Boring Number Depth (feet BGS)		47SAP01 0.0-10.0	47SAP01 0.0-10.0	47SAP18 0.0-10.0	47SAP18 0.0-10.0	47SSB01 9.5-10.0	47SSB01 9.5-10.0	47SSB01 79.5-80.0	47SSB01 79.5-80.0
Parameter	Method	Results (Units in mg/L)							
Extractable Antimony	WET/NS	NA	NA	NA	NA	<0.01	0.01	<0.01	NA
Extractable Arsenic	WET/NS	NA	NA	NA	NA	<0.01	<0.01	<0.01	NA
Extractable Barium	WET/NS	NA	NA	NA	NA	6.6	NA	3.9	4
Extractable Berylium	WET/NS	NA	NA	NA	NA	0.01	NA	0.01	0.01
Extractable Cadmium	WET/NS	NA	NA	NA	NA	0.02	NA	0.03	NA
Extractable Chromium	WET/NS	NA	NA	NA	NA	0.05	NA	0.05	NA
Extractable Cobalt	WET/NS	NA	NA	NA	NA	0.31	NA	0.34	NA
Extractable Copper	WET/NS	NA	NA	NA	NA	0.22	NA	0.6	NA
Extractable Lead	WET/NS	NA	NA	NA	NA	0.04	0.04	0.01	NA
Extractable Mercury	WET/NS	NA	NA	NA	NA	<0.002	NA	<0.002	NA
Extractable Molybdenum	WET/NS	NA	NA	NA	NA	0.06	NA	0.09	NA
Extractable Nickel	WET/NS	NA	NA	NA	NA	0.5	NA	0.32	NA
Extractable Selenium	WET/NS	NA	NA	NA	NA	<0.01	<0.01	<0.01	NA
Extractable Silver	WET/NS	NA	NA	NA	NA	0.05	NA	0.05	NA
Extractable Thallium	WET/NS	NA	NA	NA	NA	<0.01	<0.01	<0.01	NA
Extractable Vanadium	WET/NS	NA	NA	NA	NA	0.23	0.23	0.33	NA
Extractable Zinc	WET/NS	NA	NA	NA	NA	0.4	NA	0.57	NA

BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.
FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NA = Not analyzed.
NS = Not specified.
WET/NS = California Assessment Manual, Waste Extraction Test; analytical method not specified.

SOURCE: McLaren, 1986a.

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APPENDIX B

Soil Gas Results

TABLE B-1. MAXIMUM PHOTOIONIZATION READINGS FROM SOIL CUTTINGS AND HEADSPACE JARS AT SITE 48 (UNITS IN PPMV)

Approximate Depth	BORING NUMBER									
	48SAP01		48SAP02		48SAP03		48SAP04		48SAP05	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	5	30	15	--	5	2	1	--	165	5
10	2	3	5	15	1	1	0	2	200	1
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										

(Continued)

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TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	48SAP06		48SAP07		48SAP08		48SAP09		48SAP10	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	180	3	5	17	0	13	0	0	3	7
10	5	3	6	7	3	6			1	3
15										
20										
25										
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										

(Continued)

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TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER									
	48SAP11		48SAP12		48SSB01		48SSB02		48SSB03	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	190	4	5	2	5	15	0	1	7	6
10	25	8	5	2	7	70	0	2	1	9
15					2	40	0	1	1	15
20					--	8	0	2	1	
25					2	4	0	7	1	
30					2	1	0	4	10	
35					1	13	0	7	1	
40					1	4	10	7	1	
45					20	5	5	3	0	
50					10	5			1	
55					40	10			0	
60					5	13			0	
65					2	5			1	
70					10	6			1	
75					5	7			1	
80					4	5			1	

(Continued)

TABLE B-1. (Continued)

Approximate Depth	BORING NUMBER					
	47SAP01		47SAP18		47SSB01	
	Cuttings	Headspace	Cuttings	Headspace	Cuttings	Headspace
5	8	4	250	10	3	1
10	15	25	50	5	4	15
15					7	6
20					5	8
25					1	7
30					3	14
35					4	18
40					4	3
45					2	25
50					1	2
55					0	20
60					1	6
65					0	6
70					3	40
75					3	60
80					1	60

Blanks indicate borings were terminated.

-- = No readings taken.

SOURCE: McLaren, 1986a.

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APPENDIX C

Analytical Results for Groundwater Samples

TABLE C-1. U.S. EPA METHOD 8010 ANALYTICAL RESULTS (METHOD 601 PRIOR TO OCTOBER 1988) FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
Date Sampled			06/10/85	03/13/86	11/18/86	11/18/86	01/15/87	01/15/87	04/24/87	04/24/87	08/05/87	10/20/87	10/20/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			06/12/85	03/19/86	11/21/86	11/21/86	01/22/87	01/22/87	04/28/87	04/28/87	08/07/87	10/27/87	10/22/87
Lab			RAS	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC
Field Analysis					FDA	FDB	FDA	FDB				FDA	FDB
Lab Analysis									LDA	LDB			
Chloromethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.9C	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	ND	ND	ND	ND	ND	ND	24C	24C	20C	17C	15C
Chloroform	100	100	ND	1.4	1.1DL	ND	1.0C	1.0C	1.8DL	1.4DL	1.0C	1.0C	1.4C
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND	ND	0.99DL	0.28DL	ND	2.1C	ND
1,1,1-Trichloroethane	200	200	2.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	0.25DL	ND	ND	0.71DL	0.55DL	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND	ND	0.19DL	0.10DL	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	5	23.2	20	44C	43C	37C	37C	91C	80C	130C	81C	100C
Dibromochloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	3.3	0.6	0.18DL	ND	ND	ND	0.75DL	0.74DL	ND	3.2C	ND
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
C = Analysis confirmed in second column analysis
LOQ = Limit of quantitation
DL = Diluted out of the confirmation run
NE = Not established

SOURCE: Radian, 1984-1988c.

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TABLE C-1. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
			WELL NUMBER								
Date Sampled			10/20/87	01/26/88	01/26/88	04/18/88	07/13/88	07/13/88	07/13/88	07/13/88	10/07/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/24/87	01/28/88		04/21/88	08/09/88	07/14/88	07/14/88	07/14/88	10/17/88
Lab			CES	SAC	CES	SAC	CES	SAC	SAC	SAC	SAC
Field Analysis								FDA	FDA	FDB	
Lab Analysis								LDA	LDB		
Chloromethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	ND	17C	ND	22PC	ND	23P	25P	23P	11P
Chloroform	100	100	ND	0.92PC	1.4	0.48PC	ND	1.7P	1.7P	1.7P	ND
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	5	110	140PC	190.	220PC	1100C	980P	920P	870P	2900P
Dibromochloromethane	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	ND	6.2PC	4.9	10PC	ND	52P	57P	42P	370P
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
C = Analysis confirmed in second column analysis
LOQ = Limit of quantitation
P or PC = Identity previously confirmed
NE = Not established

SOURCE: Radian, 1984-1988c.

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TABLE C-2. U.S. EPA METHOD 602 FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
Date Sampled			09/24/84	03/13/86	11/18/86	11/18/86	01/15/87	01/15/87	04/24/87	04/24/87	08/05/87	10/20/87	10/20/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			09/26/84	03/19/86	11/21/86	11/21/86	01/22/87	01/22/87	04/28/87	04/28/87	08/07/87	10/22/87	11/24/87
Lab			RAS	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	SAC	CES
Field Analysis					FDA	FDB	FDA	FDB				FDA	FDA
Lab Analysis									LDA	LDB			
Chlorobenzene	30	NE	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: Radian, 1984-1987.

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TABLE C-2. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-41S
Date Sampled			10/20/87	01/26/88	01/26/88	04/18/88	07/13/88	07/13/88	07/13/88	07/13/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/22/87	01/28/88		04/21/88	08/09/88	07/14/88	07/14/88	07/14/88
Lab			SAC	SAC	CES	SAC	CES	SAC	SAC	SAC
Field Analysis			FDB					FDA	FDA	FDB
Lab Analysis								LDA	LDB	
Chlorobenzene	30	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	(LOQ)0.5	NE	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: Radian, 1984-1987.

RADIAN CORPORATION

TABLE C-3. U.S. EPA METHOD 604 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S
Date Sampled			04/18/88
Sampled By			RADIAN
Date Analyzed			05/04/88
Lab			SAC
Field Analysis			
Lab Analysis			
2,4,6-Trichlorophenol	NE	NE	ND
2-Chlorophenol	NE	NE	ND
2,4-Dichlorophenol	NE	NE	ND
2,4-Dimethylphenol	400	NE	ND
2-Nitrophenol	NE	NE	ND
4-Nitrophenol	NE	NE	ND
2,4-Dinitrophenol	NE	NE	ND
Pentachlorophenol	30	NE	ND
Phenol	NE	NE	ND
4-Chloro-3-methylphenol	NE	NE	ND
4,6-Dinitro-2-methylphenol	NE	NE	ND

ALL UNITS ARE ug/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NE = Not established

SOURCE: Radian, 1988b.

RADIAN CORPORATION

TABLE C-4. U.S. EPA METHOD 9010 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S

Parameter	DHS Action Level	U.S.EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	WELL NUMBER MW-41S
Date Sampled			10/20/87	10/20/87	10/20/87	01/20/88	01/26/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed							
Lab			SAC	CES	SAC	CES	SAC
Field Analysis			FDA	FDA	FDB		
Lab Analysis							
Total cyanide	0.200	0.200	ND	ND	ND	ND	ND
Amenable cyanide	0.200	0.200	ND	NA	ND	ND	NA

ALL UNITS ARE mg/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
NA = Not analyzed

SOURCE: Radian, 1987-1988c.

TABLE C-5. U.S. EPA METHOD 624 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES FROM MW-41S AND MW-65

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-65	WELL NUMBER MW-65
Date Sampled			01/26/88	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			02/04/88	02/04/88	07/19/88		
Lab			SAC	SAC	SAC	IT	IT
Field Analysis							
Lab Analysis			LDA	LDB			
Chloromethane	NE	NE	ND	ND	ND	ND	ND
Bromomethane	NE	NE	ND	ND	ND	ND	ND
Vinyl chloride	2	1	ND	ND	ND	ND	ND
Chloroethane	NE	NE	ND	ND	ND	ND	ND
Methylene chloride	40	NE	ND	ND	ND	NA	NA
Trichlorofluoromethane	3400	NE	ND	ND	ND	ND	ND
1,1-Dichloroethene	6	7	ND	ND	ND	ND	ND
1,1-Dichloroethane	20	NE	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	16	NE	18	20	13	ND	ND
Chloroform	100	100	1.8	2.1	ND	ND	ND
1,2-Dichloroethane	1	5	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	200	200	ND	ND	ND	ND	ND
Carbon tetrachloride	5	5	ND	ND	ND	ND	ND
Bromodichloromethane	100	100	ND	ND	ND	NA	NA
1,2-Dichloropropane	10	NE	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	NE	NE	ND	ND	ND	NA	NA
Trichloroethene	5	5	190	220	700	110	77
Dibromochloromethane	100	100	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	100	NE	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	87	NE	ND	ND	ND	NA	NA
2-Chloroethylvinyl ether	NE	NE	ND	ND	ND	NA	NA
Bromoform	100	100	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NE	NE	ND	ND	ND	ND	ND
Tetrachloroethene	4	NE	4.7	5.5	27	ND	ND
Chlorobenzene	30	NE	ND	ND	ND	ND	ND
Benzene	.7	5	ND	ND	ND	ND	ND
Ethylbenzene	680	NE	ND	ND	ND	ND	ND
Toluene	100	NE	ND	ND	ND	ND	2.8
Acetone	NE	NE	ND	ND	ND	ND	ND
Carbon disulfide	NE	NE	ND	ND	ND	ND	ND
2-Butanone	NE	NE	ND	ND	ND	ND	ND
Vinyl acetate	NE	NE	ND	ND	ND	ND	ND
2-Hexanone	NE	NE	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First Laboratory duplicate analysis
LDB = Second Laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = *Not established*

SOURCE: McLaren, 1986c; Radian, 1988c.

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TABLE C-5. (Continued)

Parameter	DHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-65	MW-65
Date Sampled			01/26/88	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			02/04/88	02/04/88	07/19/88		
Lab			SAC	SAC	SAC	IT	IT
Field Analysis							
Lab Analysis			LDA	LDB			
4-Methyl-2-pentanone	NE	NE	ND	ND	ND	ND	ND
Styrene	NE	NE	ND	ND	ND	ND	ND
Total Xylenes	NE	NE	ND	ND	NR	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
LDA = First laboratory duplicate analysis
LDB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established
NR = Not reported

SOURCE: McLaren, 1986c; Radian, 1988c.

RADIAN CORPORATION

TABLE C-6. U.S. EPA METHOD 625 ANALYTICAL RESULTS FOR GROUNDWATER FROM MW-41S AND MW-65

Parameter	IHS Action Level	U.S.EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
1,3-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	130	NE	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NE	750	ND	ND	ND	ND	ND	ND
Acenaphthene	NE	NE	ND	ND	ND	ND	NA	NA
1,2,4-Trichlorobenzene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachlorobenzene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachloroethane	NE	NE	ND	ND	ND	ND	NA	NA
Bis(2-chloroethyl)ether	NE	NE	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	NE	NE	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	NE	NE	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	NE	NE	ND	ND	ND	ND	ND	ND
Fluoranthene	NE	NE	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenylether	NE	NE	ND	ND	ND	ND	NA	NA
N-nitrosodimethylamine	NE	NE	ND	ND	ND	NA	ND	ND
N-nitrosodi-n-propylamine	NE	NE	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	NE	NE	ND	ND	ND	ND	NA	NA
Butylbenzyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Diethyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Dimethyl phthalate	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	NE	NE	ND	ND	ND	ND	ND	ND
Chrysene	NE	NE	ND	ND	ND	ND	ND	ND
Acenaphthylene	NE	NE	ND	ND	ND	ND	NA	NA
Anthracene	(LOQ)0.7	NE	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	NE	NE	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	NE	NE	ND	ND	ND	ND	NA	NA
Hexachlorocyclopentadiene	NE	NE	ND	ND	ND	ND	ND	ND
Isophorone	NE	NE	ND	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NA = Not analyzed
LOQ = Limit of quantitation
NE = Not established

SOURCE: McLaren, 1986c; Radian, 1986-1988c.

TABLE C-6. (Continued)

Parameter	DHS Action Level	U.S. EPA Primary MCL	MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65
			WELL NUMBER					
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
Naphthalene	NE	NE	ND	ND	ND	ND	ND	ND
Nitrobenzene	NE	NE	ND	ND	ND	ND	ND	ND
Phenanthrene	NE	NE	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	NE	NE	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	NE	NE	ND	ND	ND	ND	ND	ND
Pyrene	NE	NE	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2-Chlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	400	NE	ND	ND	ND	ND	ND	ND
2-Nitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
4-Nitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	NE	NE	ND	ND	ND	ND	ND	ND
Pentachlorophenol	30	NE	ND	ND	ND	ND	ND	ND
Phenol	NE	NE	ND	ND	ND	ND	ND	ND
N-nitrosodiphenylamine	NE	NE	ND	ND	ND	ND	ND	ND
Benzidine	NE	NE	ND	ND	ND	NA	ND	ND
4-Bromophenyl phenylether	NE	NE	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	NE	NE	ND	ND	ND	ND	ND	ND
Fluorene	NE	NE	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	NE	NE	ND	ND	ND	ND	NA	NA
4,6-Dinitro-2-methylphenol	NE	NE	ND	ND	ND	ND	NA	NA
Aniline	NE	NE	ND	ND	ND	NA	ND	ND
Benzyl alcohol	NE	NE	ND	ND	ND	ND	ND	ND
2-Methylphenol	NE	NE	ND	ND	ND	ND	ND	ND
4-Methylphenol	NE	NE	ND	ND	ND	ND	ND	ND
Benzoic acid	NE	NE	ND	ND	ND	ND	ND	ND
4-Chloroaniline	NE	NE	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	NE	NE	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	NE	NE	ND	ND	ND	ND	ND	ND
2-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND
3-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NA = Not analyzed
NR = Not reported
NE = Not established

SOURCE: McLaren, 1986c; Radian, 1986-1988c.

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TABLE C-6. (Continued)

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65
Date Sampled			11/18/86	11/18/86	01/26/88	07/13/88	08/12/85	11/11/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN
Date Analyzed			12/01/86	12/01/86	02/16/88	07/26/88		
Lab			SAC	SAC	SAC	SAC	IT	IT
Field Analysis			FDA	FDB				
Lab Analysis								
Dibenzofuran	NE	NE	ND	ND	ND	ND	ND	ND
4-Nitroaniline	NE	NE	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	NE	NE	ND	ND	ND	ND	NA	NA

ALL UNITS ARE ug/l
MW = Monitoring Well
FDA = First field duplicate analysis
FDB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Engineering
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established

SOURCE: McLaren, 1986c; Radian, 1986-1988c.

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TABLE C-7. U.S. EPA METHOD 6010 ANALYTICAL RESULTS FOR GROUNDWATER FROM MW-41S AND MW-65

Parameter	DHS Action Level	U.S. EPA Primary MCL	WELL NUMBER MW-41S	MW-41S	MW-41S	MW-41S	MW-41S	MW-65	MW-65[a]	MW-65	MW-65[a]
Date Sampled				09/14/82	09/24/84	03/13/86	01/26/88	08/12/85	08/12/85	11/11/85	11/11/85
Sampled By			RADIAN	ES	RADIAN	RADIAN	RADIAN	McLAREN	McLAREN	McLAREN	McLAREN
Date Analyzed						03/31/86					
Lab			CES	ES	RAS	AUS	SAC	IT	IT	IT	IT
Field Analysis											
Lab Analysis											
Antimony	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.001	NA
Arsenic	NE	0.050	ND	ND	0.0040	ND	ND	<0.01	NA	<0.01	NA
Beryllium	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.005	NA
Cadmium	NE	0.010	ND	ND	ND	ND	ND	0.012	NA	<0.005	0.008
Chromium	NE	0.050	0.010	ND	ND	ND	ND	0.024	NA	0.01	NA
Copper	NE	NE	ND	ND	ND	NA	ND	0.02	NA	0.2	NA
Lead	NE	0.050	ND	ND	0.020	ND	ND	<0.001	NA	0.02	NA
Mercury	NE	0.002	ND	ND	ND	0.0002	ND	0.0003	NA	<0.0002	NA
Nickel	NE	NE	ND	ND	NA	NA	ND	<0.01	NA	0.05	NA
Selenium	NE	0.010	ND	ND	ND	ND	ND	<0.01	NA	<0.01	NA
Silver	NE	0.050	ND	ND	ND	ND	ND	<0.001	NA	<0.001	NA
Thallium	NE	NE	ND	ND	NA	NA	ND	<0.001	NA	<0.001	NA
Zinc	NE	NE	ND	ND	0.035	NA	ND	0.14	NA	0.2	NA
Fluoride	NE	NE	ND	NA	NA	NA	NA	ND	NA	ND	NA
Calcium	NE	NE	ND	NA	NA	16	NA	18	91	97	100
Chloride	NE	NE	ND	NA	NA	18	NA	18	NA	22	NA
Carbonate	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NE	NE	ND	NA	0.63	NA	NA	NA	NA	NA	NA
Bicarbonate	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NE	NE	ND	NA	13	9.9	NA	NA	NA	NA	NA
Sodium	NE	NE	ND	NA	19	13	NA	16	16	15	NA
Sulfate	NE	NE	ND	NA	NA	6	NA	3	NA	2	NA
Aluminum	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NE	1.0	ND	NA	0.098	0.044	NA	NA	NA	0.17	0.17
Cobalt	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NE	NE	ND	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silicon	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA

ALL UNITS ARE mg/l
MW = Monitoring Well

RADIAN = Radian Corporation, Sacramento
McLAREN = McLaren Environmental Services
ES = Engineering Science, Inc.
AUS = Radian Analytical Services, Austin
RAS = Radian Analytical Services
CES = Canonie Environmental Services
SAC = Radian Analytical Services, Sacramento
IT = IT Laboratories

ND = Nothing detected
NE = Not established
NA = Not analyzed

[a] Duplicate samples assumed to be field duplicates.

SOURCE. McLaren, 1986c; Radian, 1982-1988b.

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TABLE D-1. (Continued)

Sample Location		TANK 525[a]	TANK 525[a]	TANK 526	TANK 527
Date Sampled		11/29/85	11/29/85	11/29/85	11/29/85
Sampled By		MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--
Laboratory		ITL	ITL	ITL	ITL
Field QC		FDA	FDB		
Laboratory QC		NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/L unless noted)			
Antimony	NS	3.4	3.5	0.035	0.71
Arsenic	NS	7.1	7.1	<0.01	<0.01
Barium	NS	280	280	0.1	<0.01
Berylium	NS	0.59	0.59	<0.005	0.005
Cadmium	NS	1,600	1,800	2	0.7
Chromium	NS	6,900	7,500	0.79	2.5
Cobalt	NS	64	63	0.03	0.03
Copper	NS	700	700	11	4.5
Lead	NS	4,400	4,600	0.2	0.3
Mercury	NS	1.4	1	0.004	<0.002
Molybdenum	NS	20	19	0.1	0.56
Nickel	NS	5,900	5,700	0.67	0.44
Selenium	NS	<1	<1	<0.01	<0.01
Silver	NS	670	760	0.017	0.039
Thallium	NS	0.13	0.13	0.001	0.002
Vanadium	NS	81	81	0.2	0.1
Zinc	NS	5,000	5,300	1.9	2.1
Cyanide	335.2	29	NA	4.96	1.98
pH		7.60	NA	8.90	8.50

[a] Results in mg/kg.
BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.

FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

CS48/073180/JKS

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APPENDIX D

Analytical Results for Tank Samples

TABLE D-1. TOTAL METALS, CYANIDE, AND pH RESULTS FOR TANK SAMPLING AT SITE 48

Sample Location		TANK 532	TANK 533	TANK 535	TANK 536	TANK 537	TANK 538	TANK 540	TANK 541	TANK 548
Date Sampled		11/29/85	11/29/85	11/29/85	11/27/85	11/27/85	11/29/85	11/27/85	11/27/85	11/29/85
Sampled By		MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--	--	--	--	--	--
Laboratory		ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL	ITL
Field QC										
Laboratory QC		NS	NS	NS	NS	NS	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/L unless noted)								
Antimony	NS	NA	NA	NA	NA	NA	NS	NA	NA	NA
Arsenic	NS	NA	NA	NA	NA	NA	NS	NA	NA	NA
Barium	NS	NA	NA	NA	NA	NA	<0.1	NA	NA	NA
Berylium	NS	NA	NA	NA	NA	NA	NS	NA	NA	NA
Cadmium	NS	NA	NA	NA	NA	NA	0.41	NA	NA	NA
Chromium	NS	NA	NA	NA	NA	NA	0.25	NA	NA	NA
Cobalt	NS	240	NA	NA	350	43	NS	56	78	NA
Copper	NS	NA	NA	NA	NA	NA	0.37	NA	NA	NA
Lead	NS	NA	NA	NA	NA	NA	1.6	NA	NA	NA
Mercury	NS	NA	NA	NA	NA	NA	NS	NA	NA	NA
Molybdenum	NS	NA	NA	NA	NA	NA	NS	NA	NA	NA
Nickel	NS	NA	NA	NA	NA	NA	1.2	NA	NA	NA
Selenium	NS	NA	NA	NA	NA	NA	NS	NA	NA	NA
Silver	NS	NA	NA	NA	NA	NA	0.004	NA	NA	NA
Thallium	NS	NA	NA	NA	NA	NA	NS	NA	NA	NA
Vanadium	NS	NA	NA	NA	NA	NA	NS	NA	NA	NA
Zinc	NS	NA	NA	NA	NA	NA	63	NA	NA	NA
Cyanide	335.2	NA	NA	NA	NA	NA	<0.05	NA	NA	NA
pH		8.60	5.45	4.50	1.80	3.50	1.60	7.10	6.30	10.40

(Continued)

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TABLE D-1. (Continued)

Sample Location		TANK 542	TANK 542	TANK T-1	TANK T-1	BIN B-1	CYANIDE SUMP	DUMPSTER	TANK 522	TANK 523
Date Sampled		11/27/85	11/27/85	11/29/85	MCR	11/29/85	11/29/85	11/29/85	11/29/85	11/29/85
Sampled By		MCR	MCR	MCR	--	MCR	MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	ITL	--	--	--	--	--
Laboratory		ITL	ITL	ITL	FDB	ITL	ITL	ITL	ITL	ITL
Field QC		FDA	FDB	FDA	NS					
Laboratory QC		NS	NS	NS		NS	NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/L unless noted)								
Antimony	NS	0.064	0.12	0.003	NA	0.025	NA	0.033	0.009	0.005
Arsenic	NS	<0.01	<0.01	<0.01	NA	0.35	NA	0.03	<0.01	<0.01
Barium	NS	1.1	1.3	<0.01	NA	<0.1	NA	<0.1	<0.1	<0.1
Berylium	NS	<0.005	NA	<0.005	NA	0.02	NA	<0.005	<0.005	<0.005
Cadmium	NS	<0.01	<0.01	0.02	NA	0.41	NA	<0.01	0.25	0.39
Chromium	NS	8.2	9.4	0.16	NA	0.25	NA	0.11	11	5.4
Cobalt	NS	0.02	0.02	<0.01	NA	1.3	NA	0.03	0.2	<0.01
Copper	NS	0.06	0.04	0.02	NA	0.37	NA	1.3	170	1.1
Lead	NS	33	36	<0.01	NA	1.6	NA	0.02	23	2.3
Mercury	NS	<0.002	NA	<0.002	NA	<0.001	NA	<0.001	0.002	0.003
Molybdenum	NS	<0.01	<0.01	0.03	NA	0.18	NA	1.8	0.04	0.04
Nickel	NS	0.1	NA	0.1	NA	1.2	NA	0.15	7.9	1.1
Selenium	NS	<0.01	<0.01	<0.01	NA	0.05	NA	<0.01	<0.01	<0.01
Silver	NS	0.054	NA	0.001	NA	0.004	NA	0.018	0.017	0.086
Thallium	NS	0.001	0.001	0.001	NA	0.009	NA	0.001	0.001	0.001
Vanadium	NS	0.1	0.1	0.1	NA	0.61	NA	0.1	0.2	0.2
Zinc	NS	0.5	0.55	0.18	NA	6.3	NA	0.5	4.2	0.85
Cyanide	335.2	NA	NA	<0.05	<0.05	<0.05	4.33	<0.05	<0.05	0.96
pH		6.10	NA	7.55	NA	5.80	NA	9.95	4.70	7.55

(Continued)

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TABLE D-1. (Continued)

Sample Location		TANK 525[a]	TANK 525[a]	TANK 526	TANK 527
Date Sampled		11/29/85	11/29/85	11/29/85	11/29/85
Sampled By		MCR	MCR	MCR	MCR
Date Analyzed		--	--	--	--
Laboratory		ITL	ITL	ITL	ITL
Field QC		FDA	FDB		
Laboratory QC		NS	NS	NS	NS
Parameter	**Method**	Results (Units in mg/L unless noted)			
Antimony	NS	3.4	3.5	0.035	0.71
Arsenic	NS	7.1	7.1	<0.01	<0.01
Barium	NS	280	280	0.1	<0.01
Beryllium	NS	0.59	0.59	<0.005	0.005
Cadmium	NS	1,600	1,800	2	0.7
Chromium	NS	6,900	7,500	0.79	2.5
Cobalt	NS	64	63	0.03	0.03
Copper	NS	700	700	11	4.5
Lead	NS	4,400	4,600	0.2	0.3
Mercury	NS	1.4	1	0.004	<0.002
Molybdenum	NS	20	19	0.1	0.56
Nickel	NS	5,900	5,700	0.67	0.44
Selenium	NS	<1	<1	<0.01	<0.01
Silver	NS	670	760	0.017	0.039
Thallium	NS	0.13	0.13	0.001	0.002
Vanadium	NS	81	81	0.2	0.1
Zinc	NS	5,000	5,300	1.9	2.1
Cyanide	335.2	29	NA	4.96	1.98
pH		7.60	NA	8.90	8.50

[a] Results in mg/kg.
BGS = Below ground surface.
MCR = McLaren Environmental Engineering.
-- = Not available.
ITL = IT Analytical Laboratories.

FDA = First field duplicate analysis.
FDB = Second field duplicate analysis.
NA = Not analyzed.
NS = Not specified.

SOURCE: McLaren, 1986a.

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