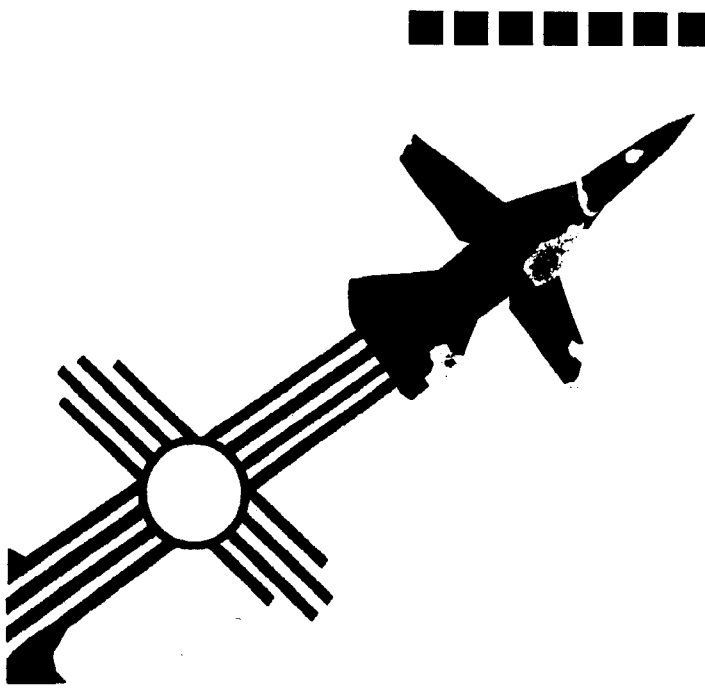


CAF B 94



CONCENTRATIONS OF  
SELECTED NATURALLY  
OCCURRING CHEMICAL  
CONSTITUENTS IN SOIL  
AND GROUNDWATER AT  
CANNON AIR FORCE BASE  
CLOVIS, NEW MEXICO

Command 27 FW  
Cannon Air Force Base  
100 South D.L. Ingram Blvd., Suite 100  
Cannon AFB, New Mexico 88103-5214

March 1994

3-1-1994

# **LIBRARY COPY**

## **CONCENTRATIONS OF SELECTED NATURALLY OCCURRING CHEMICAL CONSTITUENTS IN SOIL AND GROUNDWATER AT CANNON AIR FORCE BASE CLOVIS, NEW MEXICO**

**MARCH 1994**

**Prepared For**

**UNITED STATES AIR FORCE  
COMMAND 27 FW  
CANNON AIR FORCE BASE  
100 South D.L. Ingram Blvd.  
Suite 100  
Cannon AFB, New Mexico 88103-5214**

**and**

**U.S. DEPARTMENT OF THE ARMY  
CORPS OF ENGINEERS, OMAHA DISTRICT  
215 North 17th Street  
Omaha, Nebraska 68102-4978**

**Prepared By**

**WOODWARD-CLYDE CONSULTANTS  
101 South 108th Avenue  
Omaha, Nebraska 68154**

**89MC114W (T15)**

## TABLE OF CONTENTS

---

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1-1
2.0 BACKGROUND SOILS DATA	2-1
2.1 REGIONAL SOILS	2-1
2.2 BASE-WIDE SOILS	2-2
3.0 BACKGROUND GROUNDWATER DATA	3-1
3.1 REGIONAL AQUIFER	3-1
3.2 BASE PRODUCTION WELLS	3-2
3.3 UPGRADIENT MONITORING WELLS	3-3
4.0 SUMMARY	4-1
5.0 REFERENCES	5-1

**TABLE OF CONTENTS (Continued)**

---

**LIST OF TABLES**

- TABLE 2-1 ELEMENTAL CONCENTRATIONS IN SOILS AND OTHER SURFICIAL MATERIALS IN THE CONTERMINOUS UNITED STATES
- TABLE 2-2 BACKGROUND ELEMENTAL CONCENTRATIONS FROM SURFACE AND SUBSURFACE SOIL SAMPLES COLLECTED AT OFFSITE AREAS AND ALONG THE SANITARY SEWER LINE BY WCC DURING THE 1991 RI FOR 18 SWMUs
- TABLE 2-3 BACKGROUND ELEMENTAL CONCENTRATIONS FROM SURFACE AND SUBSURFACE SOIL SAMPLES COLLECTED NEAR LANDFILL NO. 2 (SWMU NO. 82/IRP NO. LF-2) BY WCC DURING THE 1992 RFI FOR LANDFILL NOS. 1 AND 2
- TABLE 2-4 BACKGROUND ELEMENTAL CONCENTRATIONS FROM SURFACE SOIL SAMPLES COLLECTED FROM PERIMETER AREAS BY WALK, HAYDEL AND ASSOCIATES DURING THE 1988 IRP/RI
- TABLE 2-5 BACKGROUND ELEMENTAL CONCENTRATIONS FROM SURFACE AND SUBSURFACE SOIL SAMPLES COLLECTED NEAR LANDFILL NO. 25 (SWMU NO. 97/IRP NO. LF-25) BY RADIAN CORPORATION DURING THE 1992 RI FOR LANDFILL NO. 25
- TABLE 2-6 STATISTICAL SUMMARY OF BACKGROUND ELEMENTAL CONCENTRATIONS FROM SURFACE AND SUBSURFACE SOIL SAMPLES COLLECTED BY WCC, RADIAN CORPORATION, AND WALK, HAYDEL AND ASSOCIATES
- TABLE 3-1 INORGANIC, ION, AND GENERAL MINERAL CONCENTRATIONS OF SELECTED WATER SAMPLES FROM THE REGIONAL OGALLALA AQUIFER
- TABLE 3-2 INORGANIC, ION, AND GENERAL MINERAL CONCENTRATIONS OF GROUNDWATER SAMPLES FROM PRODUCTION WELL NO. 1
- TABLE 3-3 INORGANIC, ION, AND GENERAL MINERAL CONCENTRATIONS OF GROUNDWATER SAMPLES FROM PRODUCTION WELL NO. 2
- TABLE 3-4 INORGANIC, ION, AND GENERAL MINERAL CONCENTRATIONS OF GROUNDWATER SAMPLES FROM PRODUCTION WELL NO. 3

TABLE OF CONTENTS (Continued)

---

- TABLE 3-5 INORGANIC, ION, AND GENERAL MINERAL  
CONCENTRATIONS OF GROUNDWATER SAMPLES FROM  
PRODUCTION WELL NO. 4
- TABLE 3-6 INORGANIC, ION, AND GENERAL MINERAL  
CONCENTRATIONS OF GROUNDWATER SAMPLES FROM  
PRODUCTION WELL NO. 7
- TABLE 3-7 INORGANIC, ION, AND GENERAL MINERAL  
CONCENTRATIONS OF GROUNDWATER SAMPLES FROM  
PRODUCTION WELL NO. 8
- TABLE 3-8 INORGANIC CONCENTRATIONS OF GROUNDWATER  
SAMPLES FROM MONITORING WELL 113A, NORTHWEST OF  
LANDFILL NO. 5
- TABLE 3-9 INORGANIC CONCENTRATIONS OF GROUNDWATER  
SAMPLES FROM MONITORING WELL 101E, NORTHWEST OF  
WASTEWATER LAGOONS
- TABLE 3-10 INORGANIC, ION, AND GENERAL MINERAL MINIMUM,  
MAXIMUM AND MEAN CONCENTRATIONS OF  
GROUNDWATER SAMPLES FROM PRODUCTION WELLS NOS.  
1, 2, 3, 4, 7, 8 AND MONITORING WELLS 113A, 101E

## TABLE OF CONTENTS (Concluded)

---

### LIST OF FIGURES

FIGURE 1-1	GENERAL VICINITY MAP
FIGURE 2-1	LOCATION OF WCC 1991 BACKGROUND SURFACE SOIL SAMPLES AT THE OFFSITE BACKGROUND SITES
FIGURE 2-2	LOCATION OF WCC 1991 BACKGROUND SOIL BORING SAMPLES AT SANITARY SEWER LINE, SOUTH TORCH BLVD
FIGURE 2-3	LOCATION OF WCC 1991 BACKGROUND SOIL BORING SAMPLES AT SANITARY SEWER LINE, TAXIWAY B
FIGURE 2-4	LOCATION OF WCC 1991 BACKGROUND SOIL BORING SAMPLES AT SANITARY SEWER LINE, EAST OF MAIN RUNWAY
FIGURE 2-5	LOCATION OF WCC 1992 BACKGROUND SOIL BORING SAMPLES AT LANDFILL NO. 2
FIGURE 2-6	LOCATION OF WALK, HAYDEL AND ASSOCIATES 1988 BACKGROUND SURFACE SOIL SAMPLES AT PERIMETER AREAS
FIGURE 2-7	LOCATION OF RADIAN 1992 BACKGROUND SOIL BORING SAMPLES AT LANDFILL NO. 25
FIGURE 3-1	LOCATIONS OF WATER WELLS AND MONITORING WELLS

**INTRODUCTION**

---

The purpose of this report is to supplement the Remedial Investigation (RI) at the 18 Solid Waste Management Units (SWMUs) by describing the background chemical conditions on or near Cannon Air Force Base (Cannon AFB), Clovis, New Mexico. Woodward-Clyde Consultants (WCC) was contracted by the U.S. Army Corps of Engineers - Omaha District (USACE) to prepare the report described herein.

The focus of this report is on available data for soils and groundwater both regionally and at Cannon AFB. This report refers to background as meaning naturally occurring inorganic constituents and their concentrations in soil and groundwater. The data search has included a review of the pertinent Installation Restoration Program (IRP)/RI documents currently in the possession of WCC, the background data collected by Walk, Haydel & Associates during the 1998 IRP/RI, data collected by WCC during the 1991 RI of the 18 SWMUs and 1992 RFI for Landfills No. 1 and No. 2 at Cannon AFB, data collected by Radian Corporation during the 1992 RI for Landfill No. 25, and regional United States Geological Survey (USGS) soils data. The vicinity map of Cannon AFB is shown on Figure 1-1.

Section 2.0 of this background report presents the background soils data, including a discussion on chemical concentrations across the U.S., in the western U.S., and concentrations observed in the vicinity of Clovis, New Mexico. Background soils data specifically collected during IRP/RI and RFI investigations are also discussed. Section 3.0 presents the background groundwater data, starting with a regional discussion of groundwater data for the Ogallala aquifer, followed by a presentation of groundwater data from six production wells and two upgradient monitoring wells.