

**EXPLANATION OF SIGNIFICANT DIFFERENCES  
TO THE RECORD OF DECISION FOR  
OPERABLE UNIT 11**

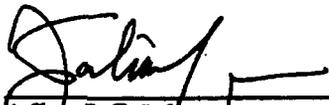
For Remedial Action at:

Ellsworth Air Force Base, South Dakota

Prepared by:

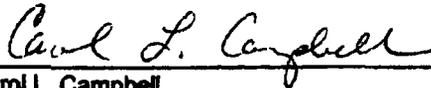
United States Air Force  
Ellsworth Air Force Base, South Dakota

April 11, 2011



Jeffrey B. Taliaferro  
Colonel, United States Air Force  
Commander, 28<sup>th</sup> Bomb Wing

25 Apr 11  
Date



Carol L. Campbell  
Assistant Regional Administrator  
Office of Ecosystems Protection and Remediation  
U.S. Environmental Protection Agency Region VIII

4/15/11  
Date



Steven M. Pimer  
Secretary, South Dakota Department of  
Environment and Natural Resources

4/20/11  
Date

**EXPLANATION OF SIGNIFICANT DIFFERENCES  
TO THE RECORD OF DECISION FOR  
OPERABLE UNIT 11**

For Remedial Action at:

Ellsworth Air Force Base, South Dakota

Prepared by:

United States Air Force  
Ellsworth Air Force Base, South Dakota

April 11, 2011

---

Jeffrey B. Taliaferro  
Colonel, United States Air Force  
Commander, 28<sup>th</sup> Bomb Wing

---

Date

---

Carol L. Campbell  
Assistant Regional Administrator  
Office of Ecosystems Protection and Remediation  
U.S. Environmental Protection Agency Region VIII

---

Date

---

Steven M. Pirner  
Secretary, South Dakota Department of  
Environment and Natural Resources

---

Date

*AB Smith*  
*SEPP-F*  
*4/13/11*

*8 ENF-L*  
*don m. Ross*  
*4/14/11*

*EPR-FF*  
*Ric*  
*Mundell*  
*4/14/11*

## TABLE OF CONTENTS

| <b>Section</b> |   | <b>Page</b> |
|----------------|---|-------------|
| 1.0            | INTRODUCTION .....  | 2           |
| 1.1            | Statement of Purpose .....  | 2           |
| 1.2            | Site Location .....   | 2           |
| 1.3            | Lead and Support Agencies .....                                       | 2           |
| 1.4            | Statutory Citation for An Explanation of Significant Difference ..... | 2           |
| 1.5            | Date of Record of Decision .....                                      | 2           |
| 1.6            | Administrative Record.....  | 3           |
| 2.0            | SITE HISTORY AND SELECTED REMEDY .....                                | 4           |
| 2.1            | Site History and Contamination .....                                  | 4           |
| 2.2            | OU-11 Selected Remedy.....  | 5           |
| 3.0            | BASIS FOR SIGNIFICANT DIFFERENCE.....                                 | 6           |
| 4.0            | DESCRIPTION OF SIGNIFICANT DIFFERENCES .....                          | 7           |
| 4.1            | Modification of Remedial Action objective .....                       | 7           |
| 4.2            | Modification of Institutional Control .....                           | 7           |
| 4.3            | Expected Outcomes .....   | 7           |
| 5.0            | SUPPORT AGENCY COMMENTS ON ESD.....                                   | 9           |
| 6.0            | STATUTORY DETERMINATIONS.....   | 10          |
| 7.0            | PUBLIC PARTICIPATION COMPLIANCE.....                                  | 11          |
| 8.0            | REFERENCES .....  | 12          |
| 9.0            | ACRONYMS AND ABBREVIATIONS .....                                      | 13          |

## LIST OF TABLES

Table 1 Comparative Cost Analysis

## LIST OF FIGURES

Figure 1 Ellsworth Air Force Base Location Map

Figure 2 Off-Base Plume Site Location Map

## **1.0 INTRODUCTION**

### **1.1 STATEMENT OF PURPOSE**

This Explanation of Significant Differences (ESD) addresses the Off-Base Groundwater Plume at Ellsworth Air Force Base (AFB). The Off-Base Groundwater Plume is part of Operable Unit (OU) 11, Basewide Groundwater. This ESD will allow the United States Air Force (USAF) to modify the Institutional Controls (ICs) to allow limited non-potable beneficial use of groundwater by off-Base residents. The ICs are enforced through Memoranda of Agreement (MOA) with current landowners.

### **1.2 SITE LOCATION**

Ellsworth AFB is a USAF Air Combat Command installation located 12 miles east of Rapid City, South Dakota and adjacent to the City of Box Elder (see Figure 1). The Base is situated on approximately 4,858 acres in Meade and Pennington Counties, and includes runways, airfield operations, industrial areas, housing, and recreational facilities. Open land containing individual residences lies to the north, south, and west of Ellsworth AFB, while residential and commercial areas lie to the east. The location of the Off-Base Groundwater Plume is shown on Figure 2. A site description is provided in Section 2 of this ESD.

### **1.3 LEAD AND SUPPORT AGENCIES**

The USAF is the lead agency. The United States Environmental Protection Agency (USEPA) Region 8 and the South Dakota Department of Environment and Natural Resources (SDDENR) are the support agencies.

### **1.4 STATUTORY CITATION FOR AN EXPLANATION OF SIGNIFICANT DIFFERENCE**

Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code (USC) §9617(c), and the National Contingency Plan (NCP) at Title 40 Code of Federal Regulations (40 CFR) §300.435(c)(2)(i), require that an ESD be prepared when differences in the remedial action significantly change but do not fundamentally alter the remedy selected in the Record of Decision (ROD) with respect to scope, performance, or cost.

### **1.5 DATE OF RECORD OF DECISION**

The ROD for OU-11 was issued in April 1997 (USAF 1997). The OU-11 ROD was signed by the USAF on April 23, 1997; by the USEPA on April 28, 1997; and by the SDDENR on April 29, 1997.

## **1.6 ADMINISTRATIVE RECORD**

This ESD is supported by and, when issued, will become part of the Administrative Record file for the Base, in accordance with the NCP at 40 CFR §300.825(a)(2). Documents referenced in this ESD are part of the Administrative Record or will become part of the Administrative Record. Two referenced documents supporting this ESD which will be (or have been) added to the Administrative Record in support of this ESD are the June 2009 "Final Off-Base Groundwater Plume Investigation Work Plan" and the October 2010 "Exit Strategy Report, OT-20 Off-Base Groundwater Plume".

The Administrative Record is available to the public Monday through Friday from 7 a.m. to 4 p.m. at:

South Dakota Air & Space Museum  
2890 Davis Drive, Bldg 5208  
Ellsworth AFB, SD 57706  
605-385-5188

The Administrative Record and the documents which will be added to the Administrative Record are available by appointment at the Base environmental office:

Ellsworth AFB Environmental Restoration Program  
28th Civil Engineer Squadron Office  
2125 Scott Drive, Building 8225  
Ellsworth AFB, SD 57706  
605-385-2677

## 2.0 SITE HISTORY AND SELECTED REMEDY

The USAF initiated environmental investigations at Ellsworth AFB in 1985. On August 30, 1990 (55 FR 35509), Ellsworth AFB was listed on the USEPA's National Priority List. A Federal Facilities Agreement (FFA) was signed in January 1992 and went into effect on April 1, 1992 (USEPA 1992). Parties to the FFA include the USAF, USEPA Region 8, and the State of South Dakota. A total of 12 OUs were identified at Ellsworth AFB. The Off-Base Groundwater Plume is part of OU-11, Basewide Groundwater. The following discussions present the site history, nature and extent of contamination, as well as the selected remedy from the OU-11 ROD.

### 2.1 SITE HISTORY AND CONTAMINATION

OU-11, Basewide Groundwater, originally provided for a study of the overall Base groundwater quality and characteristics. Investigations and remedial action decisions for groundwater contamination at several sites not specifically included in other OUs were included in OU-11. During the Remedial Investigation (RI) for OU-6, several monitoring wells were installed in areas believed to be uncontaminated. These wells were intended to be background wells, but groundwater was discovered to be contaminated. The areas around two of these wells were identified in the RI for OU-11 as the "MW93BG04 Study Area" and the "MW93BG05 Study Area" (EA, 1996). Groundwater contaminant plumes were identified in both areas. The two plumes became known as the "BG04 Plume" and the "BG05 Plume". It was also recognized that off-Base groundwater impacts were likely because trichloroethene (TCE) was detected in groundwater at the Base boundary at a concentration of 25 micrograms per liter ( $\mu\text{g/L}$ ). The maximum contaminant level (MCL) for TCE is 5  $\mu\text{g/L}$ .

One of the requirements of the ROD for OU-11 (USAF, 1997) was additional investigation to determine the eastern extent of the Off-Base Groundwater Plume. The Off-Base Groundwater Plume was investigated in 1997 (Rust, 1997) and 1998 (Rust 1998a). These investigations revealed the BG04 and BG05 plumes commingled just east of the Base boundary to form a contaminant plume that extended 4.5 miles southeast from the Base boundary to the vicinity of Custer Springs. In 1999, additional investigation in the Custer Springs area defined the extent of TCE exceeding MCLs at the terminus of the off-Base plume (Rust, 1999b).

In 1996, Ellsworth AFB began providing water to off-Base residents affected by contamination coming from the Base. This originally consisted of providing bottled water to 18 residences and extending a Base waterline to nine residences (Rust, 1998b). By 1999, the waterline had been extended east of the Base to provide a permanent alternative water supply to affected off-Base residents (Rust, 1999a). Each resident connected to the waterline entered into an MOA with Ellsworth AFB, which restricts groundwater use in the contaminant plume and the surrounding buffer area (URS, 2010). Ellsworth AFB supplied water to the off-Base residents until March 2007, when the City of Box Elder was licensed to maintain and operate the water supply line.

As specified in the OU-11 ROD, two groundwater pump-and-treat systems were installed at the Base boundary to treat the BG04 and BG05 contaminant plumes. Treated water is reinjected into the aquifer. The OU-11 ROD also specified natural attenuation for low contamination concentration areas, including the off-Base plume. At that time, concentrations of TCE in the off-Base plume were as high as 31  $\mu\text{g/L}$ . Long term monitoring (LTM) of the Off-Base

Groundwater Plume has been on-going since 1997. This LTM shows operation of the pump-and-treat systems has resulted in a separation of the on-Base plumes from the off-Base plume. The most recent investigation of the Off-Base Groundwater Plume was completed in 2009 and 2010 (URS, 2010). The maximum TCE concentrations detected in the off-Base plume were 9.5 µg/L for screening level data analyzed at the on-site laboratory, and 6.0 µg/L for monitoring well samples analyzed at a fixed laboratory (URS, 2010).

## 2.2 OU-11 SELECTED REMEDY

The selected remedy for OU-11 is described in the OU-11 ROD (USAF 1997). The remedial action objectives for OU-11, per the OU-11 ROD, are:

- Prevent future human exposures to on-Base ground water with contaminants exceeding State of South Dakota Ground-Water Quality Standards and Federal MCLs.
- Prevent additional ground water containing contaminants above State of South Dakota Ground-Water Quality Standards and Federal MCLs from moving off-Base.
- Prevent human exposure to off-Base ground water with contaminants exceeding State of South Dakota Ground-Water Quality Standards and Federal MCLs.

The selected remedy for OU-11 Area 2 is ground water containment/extraction and treatment, and includes the following major components:

- Ground water removal and treatment along the northeast Base boundary and at areas of high contaminant concentrations on Base.
- Natural attenuation of low contaminant concentration areas, primarily off Base.
- Alternative water supply to residents affected by contamination coming from the Base.
- Additional investigation to determine the eastern extent of off-Base ground water contamination.
- Institutional controls and long-term monitoring.

### 3.0 BASIS FOR SIGNIFICANT DIFFERENCE

An off-Base groundwater investigation and risk assessment was completed in 2009 in accordance with the Final Off-Base Groundwater Plume Investigation Work Plan (URS 2009) and reported in the Final Exit Strategy Report, OT-20 Off-Base Groundwater Plume (URS 2010). The Final Exit Strategy provides the basis for the significant difference.

A total of 307 groundwater samples were collected from 335 direct push borings throughout the off-Base plume. The goal of this sampling was to delineate the current extent of TCE contamination exceeding its MCL (5 µg/L). A total of 19 monitoring wells were installed within the off-Base plume to enhance the long-term data inputs for natural attenuation of the plume and to track contaminants in the areas of the plume with a higher potential for use of restricted groundwater in the near term. Soil samples were collected from 28 direct push borings and from each monitoring well boring to obtain near surface soils data that could support evaluation of the indoor air pathway during risk evaluation (URS 2010).

A risk assessment for probable and realistic residential non-potable groundwater uses for the off-Base plume was completed as part of the Final Exit Strategy Report. Preliminary remediation goals (PRGs) for non-potable groundwater use (irrigation, swimming, or recreational use of a sprinkler) and for vapor intrusion into indoor air are presented in the Final Exit Strategy Report (URS 2010). The PRGs for the individual scenarios range from 23 µg/L to 12,000 µg/L. The lowest PRG is based on the carcinogenic properties of TCE for the potential vapor intrusion to indoor air pathway. The PRGs for the adult and child receptors based on the cumulative scenarios (irrigation, swimming, recreational use of a sprinkler, and vapor intrusion) range from 18 µg/L to 141 µg/L. The lowest PRG is based on the cumulative scenarios for the adult and is predominantly due to the potential for vapor intrusion to indoor air using a target risk of 1E-06 and a target hazard quotient of 1. Based on sampling during the off-Base groundwater investigation, concentrations of TCE in groundwater are less than 10 µg/L, approximately 2 times below the lowest calculated PRG of 18 µg/L.

Based on the risk assessment, groundwater use in the off-Base plume for residential non-potable purposes will still be protective of human health even though the groundwater TCE concentration remains above the groundwater cleanup goal of 5 µg/L.

## 4.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES

### 4.1 MODIFICATION OF REMEDIAL ACTION OBJECTIVE

The third remedial action objective per the OU-11 ROD,

- Prevent human exposure to off-Base ground water with contaminants exceeding State of South Dakota Ground-Water Quality Standards and Federal MCLs.

will be modified in accordance with the Final Exit Strategy Report (URS 2010) to read:

- Prevent human exposure to off-Base groundwater with contaminants at concentrations that pose an unacceptable risk to human health.

Another remedial action objective applicable to the off-Base plume is being added to OU-11 Basewide Groundwater through an OU-11 ROD amendment: Attain South Dakota Groundwater Quality Standards and Federal MCLs for contaminants of concern throughout the plume.

### 4.2 MODIFICATION OF INSTITUTIONAL CONTROL

This ESD allows modification of the current ICs enforced through MOAs with private landowners. The USAF may allow landowners to install new wells or use existing wells within the off-Base plume, and pump the groundwater for non-potable purposes such as landscape irrigation, garden irrigation, and swimming.

### 4.3 EXPECTED OUTCOMES

Allowing landowners to install new wells or use existing wells within the off-Base plume and pump groundwater for non-potable use enhances the current site remedy because it allows for beneficial use of the groundwater resource while remaining protective of human health.

Although use of groundwater would essentially treat (through aeration and volatilization) groundwater in the off-Base plume, the relatively low pumped volumes are not expected to significantly enhance plume attenuation rates; therefore the remediation time is expected to be the same as that for the current remedy (19 years).

Costs for the current remedy and the proposed non-potable use were developed in the Exit Strategy Report (URS 2010). The cost of non-potable use is essentially the same as the cost of the current site remedy, with the added cost of preparing this ESD as noted in the comparative cost analysis (Table 1). Approximately eighty five MOAs apply use restrictions to groundwater within the plume and in a buffer zone around the plume. It is not known how many landowners will elect to have their MOAs modified. Administrative costs associated with preparing new MOAs are not included in the comparative cost analysis. The costs associated with drilling new wells, installation of pumps/hydrants, and/or operation of existing wells are borne by the landowner.

**TABLE 1 Comparative Cost Analysis**

| Type of Cost                                      | Current Site Remedy | Non-Potable Groundwater Use |
|---|---------------------|-----------------------------|
| Capital   | \$0                 | \$32,500                    |
| O&M and Monitoring                                |                     |                             |
| Annual Cost                                       | \$25,000            | \$25,000                    |
| Number of Years                                   | 19                  | 19                          |
| Present Worth                                     | \$302,133           | \$302,133                   |
| Verification Monitoring                           |                     |                             |
| Annual Cost                                       | \$25,000            | \$25,000                    |
| Number of Years                                   | 3                   | 3                           |
| Present Worth                                     | \$26,942            | \$26,942                    |
| Decommissioning/Abandonment                       |                     |                             |
| Cost  | \$15,000            | \$15,000                    |
| Years Cost Incurred from Start                    | 23                  | 23                          |
| Present Worth                                     | \$4,884             | \$4,884                     |
| 5-Year Reviews                                    |                     |                             |
| Annual Cost                                       | \$20,000            | \$20,000                    |
| Number of Reviews                                 | 4                   | 4                           |
| Present Worth                                     | \$49,849            | \$49,849                    |
| <b>Total Present Worth Cost (Life Cycle Cost)</b> | <b>\$383,807</b>    | <b>\$416,307</b>            |

(URS 2010)

## **5.0 SUPPORT AGENCY COMMENTS ON ESD**

The USAF consulted with USEPA Region 8 and the SDDENR during the preparation of this ESD. This ESD was drafted with their cooperation and support. All regulatory agency comments have been addressed and incorporated into this document.

## 6.0 STATUTORY DETERMINATIONS

This ESD revises one of the Remedial Action Objectives and the Institutional Controls for the off-Base groundwater, which is addressed in the ROD as OU-11 Area 2. It also specifies another RAO for the same area, which was provided for but not specified in the original ROD. It is consistent with CERCLA §121 (42 USC §9621) and the NCP (40 CFR §300). The proposed remedial action objective revision is protective of human health and the environment, complies with Federal and State Applicable or Relevant and Appropriate Requirements (ARARs) identified in the ROD, and is cost-effective.

An ARARs evaluation of the Administrative Rules of South Dakota (ARSD) was completed and presented in the Final Exit Strategy Report for the off-Base plume (URS 2010). Contaminated groundwater runoff entering the waters of the State would be considered a point discharge and the requirements of ARSD 74:52 would be applicable. Landowners would need to obtain a Surface Water Discharge permit prior to such discharge. Under ARSD 74:54:02:02, land application of contaminated groundwater would not require a groundwater discharge permit if the land application is entirely within the groundwater plume and buffer zone. Land application outside the buffer zone would not be allowed unless the applied water has been demonstrated to conform to the groundwater quality standards of ARSD 74:54:01 and does not contain any potentially toxic pollutant as specified in ARSD 74:54:01:05.

The Federal Clean Water Act and State statutes concerning surface water quality would be satisfied with proper monitoring to ensure that the groundwater contaminant concentrations remain below PRGs, and with MOAs that restrict use of groundwater to non-potable uses that do not impact surface water within the groundwater plume and buffer zone. Clean up standards are not being changed, and groundwater would be used only for non-potable purposes, therefore satisfying Safe Drinking Water Act MCLs.

## **7.0 PUBLIC PARTICIPATION COMPLIANCE**

When this ESD is finalized, a Notice of Availability and a brief description of the ESD will be published in the Rapid City Journal, as required by the NCP at 40 CFR §300.435(c). Additionally, this ESD will be made available to the public and become part of the Administrative Record.

## **8.0 REFERENCES**

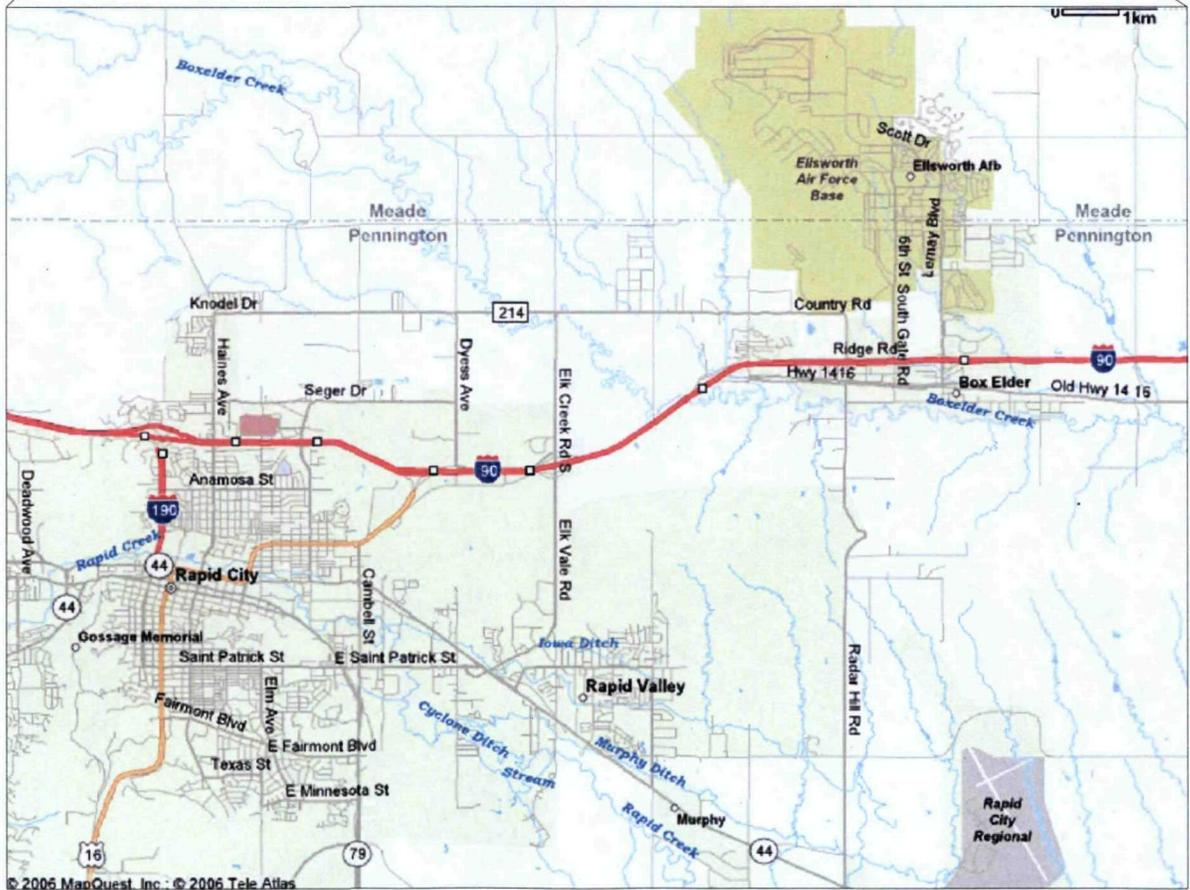
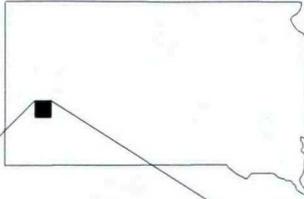
- EA Engineering, Science, and Technology (EA). 1996. Final Remedial Investigation, Operable Unit No. 11. Ellsworth Air Force Base, South Dakota. March.
- Earth Tech. 2000. Serial Letter 1-29-RA-356. New Monitor Wells, AOC-24. June 30.
- Rust. 1997. Memorandum. March/April Sampling Event, BG04/AOC-24 Investigation Results, EAFB, South Dakota. August 12.
- Rust. 1998a. Final Area of Concern - 24 Preliminary Assessment/Site Inspection Report, Ellsworth AFB, South Dakota. July.
- Rust. 1998b. Final Remedial Design/Work Plan, OU-11 Watermain, Ellsworth AFB, South Dakota. December.
- Rust. 1999a. Final Remedial Action Report, Operable Unit Eleven, Groundwater Extraction/Treatment, Alternate Water Supply, Ellsworth Air Force Base, South Dakota. August.
- Rust. 1999b. Technical Memorandum. Ellsworth AFB, South Dakota – AOC-24 (Custer Springs) TCE Plume Monitoring. July 19.
- URS. 2009. Final Off-Base Groundwater Plume Investigation Work Plan, ACC 4-Base PBC, Ellsworth Air Force Base, South Dakota. June.
- URS. 2010. Exit Strategy Report, OT-20 Off-Base Groundwater Plume, ACC 4-Base PBC, Ellsworth Air Force Base, South Dakota. October.
- USAF. 1997. Final Record of Decision for Remedial Action at Operable Unit 11, Ellsworth Air Force Base, South Dakota. April.
- USEPA. 1992. Federal Facilities Agreement Under CERCLA Section 120. In the Matter of: The U.S. Department of the Air Force, Ellsworth Air Force Base, South Dakota. EPA ID No. SD2572924644. January.

## 9.0 ACRONYMS AND ABBREVIATIONS

|        |  |
|--------|--|
| AFB    | Air Force Base   |
| ARARs  | Applicable or Relevant and Appropriate Requirements                  |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CFR    | Code of Federal Regulations  |
| ESD    | Explanation of Significant Differences                               |
| FFA    | Federal Facilities Agreement   |
| IC     | Institutional Control  |
| µg/L   | Micrograms per Liter   |
| MCL    | Maximum Contaminant Level  |
| MOA    | Memoranda of Agreement   |
| NCP    | National Contingency Plan  |
| OU     | Operable Unit  |
| PRG    | Preliminary Remediation Goal   |
| RI     | Remedial Investigation   |
| ROD    | Record of Decision   |
| SDDENR | South Dakota Department of Environment and Natural Resources         |
| TCE    | Trichloroethene  |
| USC    | United States Code   |
| USAF   | United States Air Force  |
| USEPA  | United States Environmental Protection Agency                        |

**FIGURES**

SOUTH DAKOTA



© 2006 MapQuest, Inc. © 2006 Tele Atlas

**BASE LOCATION MAP  
OU-11 EXPLANATION OF SIGNIFICANT DIFFERENCES  
ELLSWORTH AFB, SOUTH DAKOTA**

|                |                |                      |            |
|----------------|----------------|----------------------|------------|
| DRN. BY: LLS   | DATE: 01/13/11 | PROJECT NO. 16169962 | FIG. NO. 1 |
| CHK'D. BY: RDM | DATE: 01/13/11 |                      |            |

FILE: T:\jellsworth\16169962\12022\OU-11\FFS\Figure\_1.dgn  
 DATE: 1/13/2011 TIME: 1:27:17 PM BY: larry\_stiverson  
 MODEL: FIGURE 1-1

FILE: T:\Ellsworth\116169962\OU-11\FSS\Figure\_2.dgn  
DATE: 1/17/2011 TIME: 10:05:05 AM BY: TIM.SOS  
MODEL: FIGURE 2

