DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)

CERTIFIED RETURN-RECEIPT REQUESTED

Colonel Tom D. Miller
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB NM 87117

FEB 13 2014

RECEIVED
FEB 14 2014
NM Environment Department
Office of the Secretary

The Honorable Ryan Flynn
Secretary, New Mexico Environment Department
1190 St. Francis Drive
P.O Box 5469, Santa Fe, New Mexico 87502

Dear Secretary Flynn

On 15 July 2010, your Department issued *Hazardous Waste Treatment Facility Operating Permit, EPA Id. No. NM9570024423,* with an effective date of 16 August 2010, to the United States Air Force for the treatment of hazardous waste at the Open Detonation (OD) Unit. As per the terms of the permit, §1.10 established a fixed term of three (3) years and a corresponding expiration date of 16 August 2013. Additionally, §1.14 requires the permit renewal application to be submitted at least 180 calendar days before expiration or no later than 17 February 2013. Your Department's subsequent approval of two permit renewal application extension requests established a new submission date of 14 February 2014.

Accordingly, I have enclosed the Kirtland Air Force Base (AFB) renewal permit application for your approval. Please take note that this renewal permit application incorporates five prioritized permit items/issues discussed and agreed to at the 4 November 2011 New Mexico Environment Department - Kirtland AFB Hazardous Waste Permit meeting. Those five issues dealt with active, inactive and closed ranges; Open Burn and OD treatment unit closures; solid waste management units and areas of concerns; perchlorate; and the inordinate financial costs associated with the 2010 permit requirements.

If you have any questions or concerns about this renewal permit application, please contact Mr. L. Wayne Bitner at (505) 853-3484 (ludie.bitner@kirtland .af.mil) or Mr. Cole Crosgrove at (505) 853-3098 (cole.crosgrove@kirtland.af.mil).

Sincerely

TOM D. MILLER, Colonel, USAF
Commander, 377th Air Base Wing

KAFB4127

Attachment:
Draft Renewal App Rev6 (30 Jan 2014)

cc:
NMED-HWB (Kieling, Moats, McDonald, Brandwein)
NMED-OGC
EPA Region 6 (L. King)
AFCEE/CMSE (Mr. Oyelowo)
Public Info Repository (Central New Mexico)
Administrative Record/Information Repository (AR/IR) File

Form Approved, OMB No. 2050-0034 Expires XX/XX/02
GSA No. 0248-EPA-OT

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For EPA Regional Use Only

Date Received
Month Day Year

United States Environmental Protection Agency
Washington, DC 20460

Hazardous Waste Permit Application
Part A

(Read the Instructions before starting)

I. Facility's EPA ID Number ***(Mark 'X' in the appropriate box)***

☐ **A. First Part A Submission**

[X] **B. Part A Amendment #** July 2010 Renewal

C. Facility's EPA ID Number: NM9570024423

D. Secondary ID Number ***(if applicable)***:

II. Name of Facility: KIRTLAND AIR FORCE BASE

III. Facility Location ***(Physical address not P.O. Box or Route Number)***

A. Street: 2000 WYOMING BOULEVARD SE

Street ***(Continued)***:

City or Town: KIRTLAND AFB

State: NM

Zip Code: 87117-5000

County Code *(If known)*:

County Name: BERNALILLO

B. Land Type (Enter code): F

C. Geographic Location
LATITUDE (Degrees, minutes, & seconds): 35 01 220
LONGITUDE (Degrees, minutes & seconds): 106 32 350

D. Facility Existence Date
Month Day Year: 07 14 1972

IV. Facility Mailing Address

Street or P.O. Box: 2000 WYOMING BOULEVARD SE

City or Town: KIRTLAND AFB

State: NM

Zip Code: 87117-5000

V. Facility Contact ***(Person to be contacted regarding waste activities at facility)***

Name ***(Last)***: PIKE

(First): JOHN

Job Title: CHIEF EM BRANCH

Phone Number ***(Area Code and Number)***: 505-846-8546

VI. Facility Contact Address ***(See Instructions)***

A. Contact Address
Location: X
Mailing:
Other:

B. Street or P.O. Box:

City or Town:

State:

Zip Code: -

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

EPA ID Number ***(Enter from page 1)***: NM9570024423

Secondary ID Number ***(Enter from page 1)***:

VII. Operator Information *(See Instructions)*

A. Name of Operator: KIRTLAND AIR FORCE BASE

Street or P.O. Box: 2000 WYOMING BOULEVARD SE

City or Town: KIRTLAND AFB

State: NM

Zip Code: 87117-5000

Phone Number ***(Area Code and Number)***: 505-846-8546

B. Operator Type: F

C. Change of Operator Indicator: Yes [ ] No [X]

Date Changed Month Day Year:

VIII. Facility Owner *(See Instructions)*

A. Name of Facility's Legal Owner: US AIR FORCE

Street or P.O. Box: 2000 WYOMING BOULEVARD SE

City or Town: KIRTLAND AFB

State: NM

Zip Code: 87117-5000

Phone Number ***(Area Code and Number)***: 505-846-8546

B. Owner Type: F

C. Change of Owner Indicator: Yes [ ] No [X]

Date Changed Month Day Year:

IX. NAICS Codes *(in order of significance; start in left box)*

First	928110	**Third**	
(Description) National Security		*(Description)*	
Second		**Fourth**	
(Description)		*(Description)*	

X. Other Environmental Permits *(See instructions)*

A. Permit Type *(Enter code)*	B. Permit Number	C. Description
		See Attachment 1

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

EPA ID Number (*Enter from page 1*)	Secondary ID Number (*Enter from page 1*)
N M 9 5 7 0 0 2 4 4 2 3	

XI. Nature of Business (*Provide a brief description*)

The 377 Air Base Wing (ABW), Kirtland Air Force Base, NM, as the host organization, supports more than 200 tenant organizations. These include nuclear weapons effects (simulation), high-energy laser systems, and nuclear safety. Flying operations are conducted by the 58 SOW (aircraft and helicopters); Naval Weapons Evaluation Facility; New Mexico Air National Guard (attack aircraft); Ross Aviation (DOE); and transit/training military aircraft. Hazardous wastes generated at KAFB and off-site facilities are managed under the 377 ABW's EPA ID number. Explosive Ordnance Disposal (EOD) personnel managed (no longer active) hazardous waste treatment activity and operations at the EOD Range.

XII. Process Codes and Design Capacities

A. PROCESS CODE - ***Enter the code from the list of process codes below that best describes each process to be used at the facility. Thirteen lines are provided for entering codes. If more lines are needed, attach a separate sheet of paper with the additional information. For "other" processes (i.e., D99, S99, T04 and X99), describe the process (including its design capacity) in the space provided in item XIII.***

B. PROCESS DESIGN CAPACITY - ***for each code entered in column A, enter the capacity of the process.***
1. AMOUNT - ***Enter the amount. In a case where design capacity is not applicable (such as in a closure/post-closure or enforcement action) enter the total amount of waste for that process.***
2. UNIT OF MEASURE – ***For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.***

C. PROCESS TOTAL NUMBER OF UNITS - ***Enter the total number of units used in the corresponding process code.***

PROCESS CODE	PROCESS	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
	Disposal:	
D79	Underground Injection Well Disposal	Gallons; Liters; Gallons Per Day; or Liters Per Day
D80	Landfill	Acre-feet; Hectare-meter; Acres; Cubic Meters; Hectares; Cubic Yards
D81	Land Application	Acres or Hectares
D82	Ocean Disposal	Gallons Per Day or Liters Per Day
D83	Surface Impoundment Disposal	Gallons; Liters; Cubic Meters; or Cubic Yards
D99	Other Storage	Any Unit of Measure Listed Below
	Storage:	
S01	Container	Gallons; Liters; Cubic Meters; or Cubic Yards
S02	Tank Storage	Gallons; Liters; Cubic Meters; or Cubic Yards
S03	Waste Pile	Cubic Yards or Cubic Meters
S04	Surface Impoundment Storage	Gallons; Liters; Cubic Meters; or Cubic Yards
S05	Drip Pad	Gallons; Liters; Acres; Cubic Meters; Hectares; or Cubic Yards
S06	Containment Building Storage	Cubic Yards or Cubic Meters
S99	Other Disposal	Any Unit Measure Listed Below
	Treatment:	
T01	Tank Treatment	Gallons Per Day; Liters Per Day; Short Tons Per Hour; Gallons Per Hour; Liters Per Hour Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Metric Tons Per Day; or Metric Tons Per Hour
T02	Surface Impoundment Treatment	Gallons Per Day; Liters Per Day; Short Tons Per Hour; Gallons Per Hour; Liters Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Metric Tons Per Day; or Metric Tons Per Hour
T03	Incinerator	Short Tons Per Hour Metric Tons Per Hour; Gallons Per Hour; Liters Per Hour; Btu Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Gallons Per Day; Liters Per Day; Metric Tons Per Hour; or Million Btu Per Hour
T04	Other Treatment	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; Btu Per Hour; Gallons Per Day; Liters Per Hour; or Million Btu Per Hour
T80	Boiler	Gallons; Liters; Gallons Per Hour; Liters Per Hour; Btu Per Hour; or Million Btu Per Hour
T81	Cement Kiln	Gallons Per Day; Liters Per Day;
T82	Lime Kiln	Pounds Per Hour; Short Tons Per
T83	Aggregate Kiln	Hour; Kilograms Per Hour; Metric
T84	Phosphate Kiln	Tons Per \Day; Metric Tons Per Hour;
T85	Coke Oven	Short Tons Per Day; Btu Per Hour;
T86	Blast Furnace	Liters Per Hour; Kilograms Per Hour; or Million Btu Per Hour
T87	Smelting, Melting, Or Refining Furnace	
T88	Titanium Dioxide Chloride Oxidation Reactor	
T89	Methane Reforming Furnace	Gallons Per Day; Liters Per Day, Pounds Per Hour; Short Tons
T90	Pulping Liquor Recovery Furnace	Per Hour; Kilograms Per Hour; Metric Tons Per Day, Metric Tons
T91	Combustion Device Used In The Recovery Of Sulfur Values From Spent Sulfuric Acid	Per Hour; Short Tons Per Day; Btu Per Hour, Gallons Per Hour; Liters Per Hour; or Million Btu Per Hour
T92	Halogen Acid Furnaces	
T93	Other Industrial Furnaces Listed in 40 CFR §260.10	
T94	Containment Building - Treatment	Cubic Yards; Cubic Meters; Short Tons Per Hour; Gallons Per Hour; Liters Per Hour; Btu Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Metric Tons Per Day; Gallons Per Day; Liters Per Day, Metric Tons Per Hour, or Million Btu Per Hour
	Miscellaneous (Subpart X):	
X01	Open Burning/Open Detonation	Any Unit of Measure Listed Below
X02	Mechanical Processing	Short Tons Per Hour; Metric Tons Per Hour; Short Tons Per Day; Metric Tons Per Day; Pounds Per Hour; Kilograms Per Hour; Gallons Per Hour; Liters Per Hour; or Gallons Per Day
X03	Thermal Unit	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; Btu Per Hour; or Million Btu Per Hour
X04	Geologic Repository	Cubic Yards; Cubic Meters; Acre-feet; Hectare-meter; Gallons; or Liters
X99	Other Subpart X	Any Unit Measure Listed Below

UNIT OF MEASURE	UNIT OF MEASURE CODE
Gallons	G
Gallons Per Hour	E
Gallons Per Day	U
Liters	L
Liters Per Hour	H
Liters Per Day	V
Short Tons Per Hour	D
Metric Tons Per Hour	W
Short Tons Per Day	N
Metric Tons Per Day	S
Pounds Per Hour	J
Kilograms Per Hour	R
Million Btu Per Hour	X
Cubic Yards	Y
Cubic Meters	C
Acres	B
Acre-feet	A
Hectares	Q
Hectare-meter	F
Btu Per Hour	I

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

EPA ID Number (*Enter from page 1*)	Secondary ID Number (*Enter from page 1*)
N M 9 5 7 0 0 2 4 4 2 3	

XII. Process Codes and Design Capacities ***(Continued)***

EXAMPLE FOR COMPLETING ITEM XII (shown in line number X-1 below): A facility has a storage tank, which can hold 533,788 gallons

Line Number		A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY 1. Amount (Specify)	B. 2. Unit Of Measure (Enter code)	C. Process Total Number Of Units	For Official Use Only					
EXPLOSIVE ORDNANCE DISPOSAL RANGE													
	1	X	0	1	Open Burning 1,500	See XIX	001						
	2	X	0	1	Open Detonation 1,500	See XIX	001						
	3				.								
	4				.								
	5				.								
	6				.								
	7				.								
	8				.								
	9				.								
1	0				.								
1	1				.								

NOTE: If you need to list more than 13 process codes, attach an additional sheet(s) with the information in the same format as above. Number the lines sequentially, tanking into account any lines that will be used for "other" processes (i.e., D99, S99, T04 and X99) in item XIII.

XIII. Other Processes ***(Follow instructions from item XII for D99, S99, T04 and X99 process codes)***

Line Number (Enter #s in seq w/XII)		A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY 1. Amount (Specify)	B. 2. Unit Of Measure (Enter code)	C. Process Total Number Of Units	D. Description Of Process
X	1	T	0	4	.			In-situ Vitrification
	1				.			
	2				.			
	3				.			
	4				.			

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

EPA ID Number (*Enter from page 1*)	Secondary ID Number (*Enter from page 1*)
N M 9 5 7 0 0 2 4 4 2 3	

XIV. Description of Hazardous Wastes

A. EPA HAZARDOUS WASTE NUMBER - ***Enter the four-digit number from 40 CFR, Part 261 Subpart D of each listed hazardous waste you will handle. For hazardous wastes which are not listed in 40 CFR, Part 261 Subpart D, enter the four-digit number(s) from 40 CFR, Part 261 Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.***

B. ESTIMATED ANNUAL QUANTITY - ***For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. for each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.***

C. UNIT OF MEASURE - ***For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:***

ENGLISH UNIT OF MEASURE	*CODE*	*METRIC UNIT OF MEASURE*	*CODE*
POUNDS	*P*	*KILOGRAMS*	*K*
TONS	*T*	*METRIC TONS*	*M*

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed hazardous waste: for each listed hazardous waste entered in column A select the code(s) from the list of process codes contained in item XII A. on page 3 to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed hazardous waste: For each characteristic or toxic contaminant entered in column A, select the code(s) from the list of process codes contained in item XII A. on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

NOTE: THREE SPACES ARE PROVIDED FOR ENTERING PROCESS CODES. IF MORE ARE NEEDED:

1. ***Enter the first two as described above.***
2. ***Enter "000" in the extreme right box of item XIV-D(1).***
3. ***Use additional sheet, enter line number from previous sheet, and enter additional code(s) in item XIV-E.***

2. PROCESS DESCRIPTION: ***If a code is not listed for a process that will be used, describe the process in the space provided on the form (D.(2)).***

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER - Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. ***Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B, C and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.***

2. ***In column A of the next line enter the other EPA Hazardous Waste Number that can be sued to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.***

3. ***Repeat step 2 for each EPA Hazardous Waste Number that can be used to describe the hazardous waste.***

EXAMPLE FOR COMPLETING ITEM XIV (shown in line numbers X-1, X-2, X-3, and X-4 below) - A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

Line Number	*A. EPA HAZARD WASTE NO. (Enter code)*	*B. ESTIMATED ANNUAL QUANTITY OF WASTE*	*C. UNIT OF MEASURE (Enter code)*	*D. PROCESS*	
				(1) PROCESS CODES (Enter)	*(2) PROCESS DESCRIPTION (If a code is not entered in D(1))*
X 1	*K 0 5 4*	*	*p*		***-No Longer Active**
X 2	*D 0 0 2*	*	*P*		"
X 3	*D 0 0 1*	*	*P*		"
X 4	*D 0 0 2*	*	*P*		"

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

EPA ID Number (*Enter from page 1*)	Secondary ID Number (*Enter from page 1*)
N M 9 5 7 0 0 2 4 4 2 3	

XIV. Description of Hazardous Wastes ***(Continued; use additional sheets as necessary)***

Line Number	A. EPA Hazard Waste No. (Enter code)	B. Estimated Annual Quantity of Waste	C. Unit of Measure (Enter code)	D. PROCESS (1) PROCESS CODES (Enter code)	D. PROCESS (2) PROCESS DESCRIPTION (If a code is not entered in D(1))
1	**OPEN BURN UNIT**				
2	D001	*	P		*-No Longer Active
3	D002	*	P		*-No Longer Active
4	D003	*	P		*-No Longer Active
5	D004	*	P		*-No Longer Active
6	D005	*	P		*-No Longer Active
7	D006	*	P		*-No Longer Active
8	D007	*	P		*-No Longer Active
9	D008	*	P		*-No Longer Active
10	D009	*	P		*-No Longer Active
11	D010	*	P		*-No Longer Active
12	D011	*	P		*-No Longer Active
13	D018	*	P		*-No Longer Active
14	D022	*	P		*-No Longer Active
15	D028	*	P		*-No Longer Active
16	D029	*	P		*-No Longer Active
17	D030	*	P		*-No Longer Active
18	D034	*	P		*-No Longer Active
19	D035	*	P		*-No Longer Active
20	D036	*	P		*-No Longer Active
21	D038	*	P		*-No Longer Active
22	D040	*	P		*-No Longer Active

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

EPA ID Number (*Enter from page 1*)	Secondary ID Number (*Enter from page 1*)
N M 9 5 7 0 0 2 4 4 2 3	

XIV. Description of Hazardous Wastes ***(Continued; use additional sheets as necessary)***

Line Number	A. EPA Hazard Waste No. (Enter code)	B. Estimated Annual Quantity of Waste	C. Unit of Measure (Enter code)	D. PROCESS (1) PROCESS CODES (Enter code)	D. PROCESS (2) PROCESS DESCRIPTION (If a code is not entered in D(1))
23	**OPEN DETONATION UNIT**				
24	D001	*	P		*-No Longer Active
25	D002	*	P		*-No Longer Active
26	D003	*	P		*-No Longer Active
27	D004	*	P		*-No Longer Active
28	D005	*	P		*-No Longer Active
29	D006	*	P		*-No Longer Active
30	D007	*	P		*-No Longer Active
31	D008	*	P		*-No Longer Active
32	D009	*	P		*-No Longer Active
33	D010	*	P		*-No Longer Active
34	D011	*	P		*-No Longer Active
35	D018	*	P		*-No Longer Active
36	D022	*	P		*-No Longer Active
37	D028	*	P		*-No Longer Active
38	D029	*	P		*-No Longer Active
39	D030	*	P		*-No Longer Active
40	D034	*	P		*-No Longer Active
41	D035	*	P		*-No Longer Active
42	D036	*	P		*-No Longer Active
43	D038	*	P		*-No Longer Active
44	D040	*	P		*-No Longer Active

EPA ID Number (*Enter from page 1*)	Secondary ID Number (*Enter from page 1*)
N M 9 5 7 0 0 2 4 4 2 3	

XV. Map

Attach to this application a topographic map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in this map area. See instructions for precise requirements.

XVI. Facility Drawing

All existing facilities must include a scale drawing of the facility (See instructions for more detail).

XVII. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

XVIII. Certification(s)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner Signature: Tom D. Miller	Date Signed: 13 Feb 14
Name and Official Title (Type or print): TOM D. MILLER, Colonel, USAF, Commander	
Owner Signature	Date Signed
Name and Official Title (Type or print)	
Operator Signature	Date Signed
Name and Official Title (Type or print)	
Operator Signature	Date Signed
Name and Official Title (Type or print)	

XIX. Comments

The unit of measure for Section XII was pounds of net explosive weight (NEW) per burn or detonation treatment event. However, all treatment activity was terminated at these locations over 3 years ago (not later than August 2010.)

Note: Mail completed form to the appropriate EPA Regional or State Office. (Refer to instructions for more information)

February 2014

KIRTLAND AIR FORCE BASE

OPEN DETONATION UNIT HAZARDOUS WASTE TREATMENT OPERATING PERMIT EPA ID No. NM9570024423

Part B
Permit Renewal Application

Revision 1.0

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LIST OF ABBREVIATIONS/ACRONYMS

%	percent
20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ABC/AQCB	Albuquerque/Bernalillo County Air Quality Control Board
ADR	Ammunition Disposition Request
AEHA	U.S. Army Environmental Hygiene Agency
AK	acceptable knowledge
Al_2O_3	aluminum oxide
AQI	Air Quality Index
ARPA	Archaeological Resources Protection Act
ºC	degrees Celsius
Ca^{2+}	calcium ions
CO	carbon monoxide
COE	U.S. Army Corps of Engineers
DOT	U.S. Department of Transportation
EHD	City of Albuquerque Environmental Health Department
EM	Environmental Management
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ERDA	Energy Research and Development Administration
ºF	degrees Fahrenheit
ft	feet
ft/day	feet per day
ft/ft	feet per feet
ft/mi	feet per mile
ft/yr	feet per year
FEMA	Federal Emergency Management Administration

FR	*Federal Register*
HR	Hydrogeologic Region
in.	inch(es)
IDW	investigation-derived waste
KAFB	Kirtland Air Force Base
KCP	KAFB Command Post
KOP	knowledge of process
lbs.	pounds
LDR	land disposal restrictions
M	moles per liter
Ma	million years ago
MCL	maximum contaminant level
Mg^{2+}	magnesium ions
mi	mile(s)
MIDAS	Munitions Items Disposition Action System
mph	miles per hour
MSDS	material safety data sheet
NEW	net explosive weight
NMED	New Mexico Environment Department
NOAA	National Oceanographic and Atmospheric Administration
NO_x	oxides of nitrogen
OB	open burn
OD	open detonation
PM	particulate matter
PPE	personal protective equipment
ppm	parts per million
POP	Period of Performance

PBC	Performance Based Contract
QA	quality assurance
QAPP	Quality Assurance Program Plan
QC	Quality Control
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RSO	Range Safety Officer
SAP	sampling and analysis plan
SC	Site Closure
SiO_2	silica dioxide
SNL/NM	Sandia National Laboratories/New Mexico
SSL	soil screening level
SW-846	"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
SWMU	solid waste management unit
TCLP	Toxicity Characteristic Leaching Procedure
TNT	trinitrotoluene
TSDF	treatment, storage, or disposal facility
UHC	underlying hazardous constituents
U.S.	United States
USAF	United States Air Force
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTS	Universal Treatment Standards
WAP	Waste Analysis Plan

PERMIT PART 1: GENERAL PERMIT REQUIREMENTS

1.1 INTRODUCTION

This Permit Application Part 1 contains general requirements pertaining to hazardous waste management and corrective action and closure activities at the Open Detonation (OD) Treatment Unit, identified Solid Waste Management Units (SWMU's) and Areas of Concern (AOC's) at Kirtland Air Force Base (KAFB) (see Figures 1-1 and 1-2 and Table 1-1, of this Permit Application Part B, for a map view of the Installation, an aerial view of the OD unit and a listing of regulatory references with corresponding Permit Application locations, respectively), as permitted under the New Mexico Hazardous Waste Act (HWA), New Mexico Statutes Annotated (NMSA) 1978, §§74-4-1 to 74-4-14.

1.2 LEGAL AUTHORITY

This KAFB OD Part B Permit Renewal Application is submitted to address the Part B permit application requirements in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), incorporating 40 Code of Federal Regulations (CFR) Parts 270, 264, and 268. KAFB officially terminated all hazardous material/hazardous waste acceptance and treatment activities at the Open Burn (OB) and OD Treatment Units on the Explosive Ordnance Disposal (EOD) Range in 2009 and 2010, respectively.

Submission of this Permit Renewal Application is a formality to cover statutory requirements until such time as KAFB's OB and OD Treatment Unit Closure Plans are accepted and KAFB is advised this Operating Permit is no longer required. The KAFB OB Hazardous Waste Treatment Operating Permit was first issued in July 1995 (Permit Number NM9570024423-OB; NMED, 1995), and the OD Hazardous Waste Facility Permit was originally issued in December 1994 (Permit Number NM9570024423-OD; NMED, 1994). Per the 25 September 2009 Settlement Agreement between KAFB and NMED, the OB Treatment Unit was closed to the receipt and treatment of hazardous waste on 25 September 2009, with closure and restoration deferred until the OD Treatment Unit closure process was initiated. Subsequently, in July 2010, NMED re-issued KAFB's Hazardous Waste Treatment Facility Operating Permit, EPA ID No. NM9570024423.

1.3. ENFORCEMENT

KAFB violations of any terms and conditions of the current Hazardous Waste Treatment Facility Operating Permit, EPA ID No. NM9570024423, during the Permit renewal process may subject the Permittee, and its officers, employees, successors, and assigns, to a compliance order

under §74-4-10 of the HWA or §3008(a) of RCRA, 42 U.S.C. §6928(a); to an injunction under §74-4-10 of the HWA, §3008(a) of RCRA, 42 U.S.C. §6928(a), or §7002(a) of RCRA, 42 U.S.C. §6972(a); to civil penalties under §74-4-10 of the HWA, §3008(a) and (g) of RCRA, 42 U.S.C. §6928(a) and (g), or §7002(a) of RCRA, 42 U.S.C. §6972(a); to criminal penalties under §74-4-11 of the HWA or §3008(d), (e), and (f) of RCRA, 42 U.S.C. §6928(d), (e), and (f); or to some combination of the foregoing.

1.4. PERMITTED ACTIVITY

The current Permit authorizes the Permittee to treat hazardous wastes at the OD Treatment Unit, and establishes the general and specific standards for these activities, as required by the HWA and the Hazardous Waste Management Regulations (HWMR) 20.4.1 New Mexico Administrative Code (NMAC). The OD Treatment Unit is classified as a miscellaneous unit under 40 CFR §264, Subpart X. This Permit establishes standards for the closure and sets forth the requirements for corrective action to address releases of hazardous waste and hazardous constituents into the environment from the OD Treatment Unit, Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) pursuant to the HWA and the HWMR. The Permittee shall not treat, without a permit, hazardous wastes at any other location at this Facility, except as provided in 40 CFR §270.1(c)(2). The Permittee shall not store for more than 90 days any hazardous waste at any location at this Facility except as provided in 40 CFR §262.34(b). This Permit does not authorize the treatment of firearms or contraband that are not reactive or ignitable hazardous waste.

Until 2009, the EOD Range included two (2) treatment units, otherwise known as the OB and OD Treatment Units, that were used to treat (i.e., burn or detonate) explosive and explosive-contaminated waste. The waste was typically in the form of explosive substances or items contaminated with explosive substances that were deemed to be waste. Under a settlement agreement with NMED, KAFB closed the OB Treatment Unit to the receipt and treatment of waste on 25 September 2009. Subsequently, on 13 August 2010, KAFB closed the OD range to the receipt and/or treatment of any hazardous waste.

Due to severe funding shortfalls during FY 2013, significant resource reductions across the Air Force, and the fact that all treatment activity ceased at the KAFB OB and OD units in 2009 and 2010, respectively, complete updates to all sections of this permit application will not be possible. Where applicable, annotations have been inserted indicating that previous data is

being used, or that termination of all treatment operations invalidates the applicability of the specific data element. Table 1-1 provides a comprehensive list of regulatory references and the corresponding location where the applicable requirement is addressed in this permit renewal application. Where appropriate, the regulatory citations in this document reference 20.4.1 NMAC, which adopts, with few exceptions, all requirements of 40 CFR §260 to §266, §268, and §270.

This Part B permit renewal application is submitted along with the "Kirtland Air Force Base OD Part A, Permit Renewal Application." Together, they comprise the "Kirtland Air Force Base Comprehensive OD Permit Renewal Application.

1.5 PERMIT COMPLIANCE

Compliance with this Permit during its term constitutes compliance, for purposes of enforcement, with 40 CFR §260 to §273, for those management practices specifically authorized by this Permit.

1.6 EFFECT OF INACCURACIES IN PERMIT APPLICATION

The information and data submitted in this Part B Permit application dated February 2014 and any subsequent information submitted in support of this application is, to the best of our knowledge and belief, true, accurate and complete. Where and when the Permittee becomes aware that it failed to submit any relevant facts in the Application, or submitted incorrect information in the Application, it shall promptly submit such facts or corrected information pursuant to 40 CFR §270.30(l)(11).

1.7 PERMIT CITATIONS

Whenever this Application cites a provision of 20.4.1 NMAC or 40 CFR or Part or Section of this Permit Application, the Application shall be deemed to incorporate the citation by reference, as amended. All references to provisions of Federal regulations that have been incorporated into the State regulations shall be deemed to include the State incorporation of those provisions.

1.8 SEVERABILITY

The provisions of this Permit are severable. If any provision of this Permit, or any application of any provision of this Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this Permit shall not be affected thereby.

1.9 DEFINITIONS

For purposes of this Permit, terms used herein shall have the same meanings as those in the HWA, RCRA, and their implementing regulations, unless this Permit specifically provides otherwise. Where a term is not defined in HWA, RCRA, pursuant regulations, or this Permit, the meaning associated with such a term shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term.

"Area of Concern" (AOC) means any area of the Facility under the control or ownership of the Permittee, which is not a solid waste management unit where a release of a hazardous waste or hazardous constituent has occurred, or is suspected to have occurred regardless of the frequency or duration of the release, which pose an unacceptable risk or imminent threat to human health or the environment. An area of concern includes areas and structures at which releases of hazardous waste or hazardous constituents were not fully remediated, including one time and accidental events.

"Corrective Measures" means all corrective action necessary to protect human health and the environment from all releases of hazardous waste or hazardous constituents from any Solid Waste Management Unit or AOC at the Facility, regardless of the time at which waste was placed in the unit, as required under § 74-4-4.2(B) of the HWA and 40 C.F.R. § 264.101. Corrective Measures may address releases to air, soil, sediment, surface water, or groundwater.

"Days" refers to calendar days unless specified otherwise in this Permit.

"Department" means the New Mexico Environment Department and any successor agencies.

"EOD" means Explosives Ordnance Disposal

"**EPA**" means the United States Environmental Protection Agency and any successor agencies.

Impact Extent means the horizontal and vertical area in which the concentrations of waste or hazardous constituents in the environmental media being investigated are above detection limits or background concentrations indicative of the region, whichever is appropriate, as determined by the Department.

"Facility" means Kirtland Air Force Base, including all contiguous land, structures, other appurtenances, and improvements on the land. For the purpose of implementing corrective action under 40 C.F.R. § 264.101, RCRA § 3008(h), or the HWA, NMSA 1978, § 74-4-10(E), the Facility includes all contiguous property under the control of the owner or operator seeking a permit under the HWA.

"Hazardous constituent" means any constituent identified in Appendix VIII of 40 C.F.R. Part 261, or any constituent identified in Appendix IX of 40 C.F.R. Part 264, incorporated by 20.4.1 NMAC.

"Hazardous waste" means a solid waste that is not excluded from regulation under 40 C.F.R. § 261.4(b), and that either is listed in 40 C.F.R. Part 261, Subpart D, exhibits any of the characteristics identified in 40 C.F.R. Part 261, Subpart C, or is a mixture of solid waste and one or more wastes listed in 40 C.F.R. Part 261, Subpart D. However, for purposes of corrective action, "hazardous waste" shall have the meaning set forth in the HWA, § 74-4-3(K).

"**Hazardous waste regulations**" or "**Hazardous Waste Management Regulations**" means the New Mexico Hazardous Waste Management Regulations, 20.4.1 NMAC and all provisions of 40 C.F.R. Parts 260 through 273 incorporated therein.

"Interim measures" means actions necessary to minimize or prevent the further migration of contaminants and limit actual or potential human and environmental exposure to contaminants while long-term corrective action remedies are evaluated and, if necessary, implemented.

"KAFB" means Kirtland Air Force Base, including all contiguous land, structures, other appurtenances, and improvements on the land. For the purpose of implementing corrective action under 40 C.F.R. § 264.101, RCRA § 3008(h), or the HWA, NMSA 1978, § 74-4-10(E), the Facility includes all contiguous property under the control of the owner or operator seeking a permit under the HWA.

"NMED" means New Mexico Environmental Department.

"Off-site source" means a generator of Hazardous Waste located within the United States but outside the Permittee's Facility.

"**Open Detonation**" means the treatment of ignitable or reactive hazardous waste in accordance with the requirements of this Permit. Treatment by open detonation is accomplished by the detonation of hazardous waste in open pits using a counter charge to initiate the explosion.

"Open Detonation Unit" means solid waste management unit OT-29, otherwise known as the open detonation unit within the explosive ordnance disposal range, which is an area circular in shape with a diameter of approximately 1500 feet.

"**Permit**" means this Permit, issued to the Permittee for the Facility, pursuant to the HWA and the New Mexico Hazardous Waste Management Regulations to conduct corrective action and to operate the OD Unit at the Facility, EPA ID No. NM9570024423, as it may be modified or amended.

"**Permittee**" means U.S. Air Force, a part of the U.S. Department of Defense, which is a Department in the U.S. Government, and any successor.

"**RCRA**" means the Resource Conservation and Recovery Act of 1980, as amended, 42 U.S.C. §§ 6901 to 6992k.

"Release" means any spilling, leaking, pouring, emitting, emptying, discharging, injecting, pumping, escaping, leaching, dumping, or disposing of any hazardous waste or hazardous

constituents into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing hazardous waste or hazardous constituents).

"Remediation waste" means all solid and hazardous wastes, and all media (including groundwater, surface water, soil, and sediment) and debris, which contain listed hazardous wastes or which exhibit a hazardous waste characteristic, that are managed for the purpose of implementing corrective action requirements. Remediation wastes may originate from releases that extend beyond the Facility boundaries.

"Secretary" means the Secretary of the New Mexico Environment Department or his designee.

"**Solid waste**" means a solid waste as defined in the HWA, § 74-4-3(O).

"Solid Waste Management Unit" (**SWMU**) means any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at the Facility at which solid wastes have been routinely and systematically released.

1.10 PERMIT TERM

The Permit shall be for effective for a period of ten (10) years in accordance with 40 CFR §270.50(a).

1.11 PERMIT RENEWAL

If the Permittee continues the activities authorized by this Permit after the expiration date of the Permit, in accordance with 40 C.F.R. § 270.30(b), the Permittee shall apply for and obtain a new permit. The Permittee may request a Permit renewal by submitting an application for a new permit at least one hundred eighty (180) calendar days before the expiration date of the Permit as required by 40 CFR §270.10(h).

1.12 CONTINUATION OF EXPIRING PERMIT

Pursuant to 40 C.F.R. § 270.51, if the Permittee submits a timely and complete application for renewal of this Permit ,as specified in 40 CFR §§270.10, 270.11, 270.12 (as applicable) and §§270.13 through 270.29 (as applicable), the Permit shall remain in effect until the effective date of the new permit if, through no fault of the Permittee, the Department has not issued a new permit on or before the expiration date of this Permit. [40 CFR §270.51].

1.13 DUTY TO MITIGATE

In the event of noncompliance with the terms and conditions of this Permit, the Permittee shall take all reasonable steps to minimize releases to the environment, and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment. [40 C.F.R. § 270.30(d)].

1.14 OPERATION AND MAINTENANCE

The Permittee shall at all times properly operate and maintain all treatment units, SWMUs, AOCs, facilities and treatment and control systems which are installed or used by the Permittee to achieve compliance with the requirements of this Permit. Proper operation and maintenance includes performance, funding, operator staffing and training, and reasonable laboratory and process controls, including appropriate quality assurance/quality control procedures.

1.15 DUTY TO PROVIDE INFORMATION

The Permittee shall furnish to the Department, within a reasonable time mutually agreeable to the Department and the Permittee, any relevant information which the Department requests to determine whether cause exists for modifying, revoking, reissuing, or terminating the Permit, or to determine compliance with the Permit. The Permittee shall also furnish to the Department, upon request, copies of records required to be kept pursuant to the Permit. [40 C.F.R. § 264.74(a), and 40 C.F.R. § 270.30(h)].

1.16 INSPECTION AND ENTRY

In accordance with 40 C.F.R. § 270.30(i), the Permittee shall allow the Department, or authorized representatives, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter at reasonable times into the Permittee's premises where the regulated facility or activity is located or conducted, or where records must be kept under the requirements of this Permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the requirements of this Permit;

3. Inspect at reasonable times the treatment units, SWMUs, AOCs, facility, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and

4. Sample or monitor at reasonable times, for the purposes of assuring Permit compliance or as otherwise authorized by RCRA or HWA, any substances or parameters at the treatment units, including waste, air, soil, sediment, surface water, and groundwater at the Facility.

The Permit requirements of this Section (1.15) shall not be construed to limit, in any manner, the Department's authority under the HWA, NMSA 1978, § 74-4-4.3, or RCRA, § 3007(a), 40 C.F.R. § 270.30(i), or any other applicable law or regulation.

1.17 MONITORING AND RECORDS

1.17.1. Representative Sampling

The Permittee shall take representative samples and measurements in accordance with the procedures in this Permit and 40 C.F.R. Part 270. This includes, but is not limited to, sampling and analysis of waste, treatment residue, soil, groundwater, and spills. Representative samples of a waste stream shall be obtained from a sampling method compliant with 40 C.F.R. Part 261, Appendix I or an equivalent method approved by the Department (See Permit Application Attachment C, Waste Analysis Plan). Analyses for the treatment, storage or disposal of wastes shall comply with 40 C.F.R § 264.73(b).

1.17.2. Operating Record

The Permittee shall maintain a written Operating Record at the EM Branch Office as required by 40 C.F.R. §§ 264.73 and 264.74. The Permittee shall maintain all records in the Operating Record until completion of closure and, if necessary, post closure care, as provided in the Permit. The Permittee shall make the Operating Record available at all reasonable times for inspection by any officer, employee, or authorized representative of the Department or EPA, upon request, or shall furnish copies of documents within the record, as required by 40 C.F.R. § 264.74.

1.18 REPORTING PLANNED CHANGES

The Permittee shall give advance notice to the Department as soon as possible, but no less than one week in advance of any planned physical alterations or additions to the OD Unit. [40 C.F.R. § 270.30(l)(1)].

1.19 REPORTING ANTICIPATED NONCOMPLIANCE

The Permittee shall give advance notice to the Department as soon as possible, but no less than one (1) week in advance of any planned physical alterations or additions to the OD Unit or of any activities, which may result in noncompliance with the requirements of this Permit. [40 C.F.R. § 270.30(l)(2)].

1.20 TWENTY-FOUR HOUR AND SUBSEQUENT REPORTING

1.20.1 Oral Report

The Permittee shall report to the Department any noncompliance which may endanger human health or the environment. Any such information shall be reported orally within twenty-four (24) hours from the time the Permittee becomes aware of the circumstances.

The oral report shall include:

a. Information concerning release of any hazardous waste or constituents that may cause an endangerment to public drinking water supplies; and

b. Any information about a release or discharge of hazardous waste or hazardous constituent or of a fire or explosion which could threaten the environment or human health including:

i. A description of the noncompliance and its cause;

ii. The name, address, and telephone number of the owner, operator, and name of the responsible official;

iii. The name, address, and telephone number of the Facility;

iv. The period of the occurrence including exact date and time and, if the noncompliance has not been corrected, the anticipated time it is expected to continue;

v. The name and quantity of materials involved;

vi. The extent of injuries, if any;

vii. An assessment of actual or potential hazards to the environment and human health at and outside the Facility, where this is applicable;

viii. The estimated quantity and disposition of recovered material that resulted from the incident; and

ix. The steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. [40 C.F.R. § 270.30(l)(6)(i and ii)].

1.20.2. Non-Compliance Written Report

The Permittee shall also submit a written report within five (5) calendar days from the time the Permittee becomes aware of any noncompliance. The written report shall contain the

information required for an oral report under this Permit Section (1.19). The Department may extend the time for submitting the written report up to fifteen (15) calendar days upon written request by the Permittee prior to the end of the five (5) calendar days allowed under Permit Section 1.19.2. [40 C.F.R. § 270.30(l)(6)(iii)].

1.21. CORRECTIVE ACTION

Corrective action required pursuant to 40 C.F.R. § 264.101, shall continue under this Permit as required to comply with the requirements specified in Part 6 of this Permit.

1.22. ADMISSIBILITY OF DATA

The Permittee waives any objection to the admissibility as evidence of any data required by this Permit in any administrative or judicial action to enforce a condition of this Permit.

1.23 OTHER NONCOMPLIANCE

The Permittee shall report all instances of noncompliance not otherwise required to be reported under this Permit at the time monitoring reports are submitted. The reports shall contain the information listed in Permit Section 1.18 [40 C.F.R. § 270.30(l)(10)].

1.24 SIGNATORY AND CERTIFICATION REQUIREMENTS

The Permittee shall sign and certify all applications, reports, or other information submitted to the Department or required by this Permit, in accordance with 40 C.F.R. § 270.11(a)(3).
The Permittee shall provide, upon request by the Department, notification and certification statements associated with the treatment of hazardous wastes in compliance with 40 C.F.R. § 268.7 and § 268.9.

1.25 MONITORING REPORTS

The Permittee shall submit Monitoring Reports to the Department as specified in the requirements of Permit Sections 1.15 and 1.26. [40 C.F.R. § 270.30(l)(4)].

1.26 COMPLIANCE SCHEDULES

Reports of compliance or noncompliance with this Permit, any progress reports on activities conducted under this Permit, and interim and final requirements contained in any compliance schedule of this Permit shall be submitted to the Department no later than fourteen (14) calendar days following each schedule date set forth in this Permit. [40 C.F.R. § 270.30(l)(5)].

1.27 INFORMATION REPOSITORY

Upon written notification, the Department may require the Permittee to establish and maintain an information repository at any time, based on the factors set forth in 40 C.F.R. § 124.33(b) and 40 C.F.R. § 270.30(m). The information repository shall be governed by the provisions in 40 C.F.R. § 124.33(c).

1.28 REPORTS, NOTIFICATIONS, AND INFORMATION SUBMITTALS

The Permittee shall submit to the Department by certified mail or hand delivery all reports, notifications, or other submittals that are required by this Permit to be sent or given to the Department, at the following address:

Hazardous Waste Bureau Chief
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone Number: (505) 476-6000
Facsimile Number: (505) 476-6030

Two (2) hard (paper) copies and one (1) electronic copy of these plans, reports, notifications, or other submissions shall be submitted to the Department.

1.29 POINTS OF CONTACT FOR THE FACILITY

Points of contact for the Facility during the term of the Permit are identified below:

Base Commander
377 ABW/CC
2000 Wyoming Blvd. SE
Kirtland AFB, NM 87117-5606

and

Environmental Management Chief
377 MSG/CEI
2050 Wyoming Blvd. SE
Kirtland AFB, NM 87117-5270

All reports required by this permit shall be signed by a principal executive officer or their duly authorized representatives in accordance with 40 C.F.R. § 270.11(b). The Permittee shall inform the Department in writing of changes in its principal executive officers (or their duly authorized representatives) within thirty (30) days of the changes, and Emergency Coordinators and their telephone numbers and addresses within fifteen (15) calendar days of the changes.

Changes to the principal executive officers (or their duly authorized representatives) are not permit modifications. Changes in name, address, or phone number for Emergency Coordinators are Class 1 permit modifications under 40 C.F.R § 270.42.

1.30 WORK PLANS AND OTHER DELIVERABLE DOCUMENTS

All documents that the Permittee prepares under the terms of this Permit and submits to the Department that are subject to the requirements of 20.4.2 NMAC shall be subject to the procedures set forth therein. Documents requiring Department approval that are not subject to the requirements of 20.4.2 NMAC may be reviewed and approved, approved with modifications or directions, disapproved, denied, or rejected by the Department. Upon the Department's written approval, all submittals and associated schedules shall become enforceable under this Permit in accordance with the terms of the Department's written approval, and such documents as approved, shall control over any contrary or conflicting requirements of this Permit.

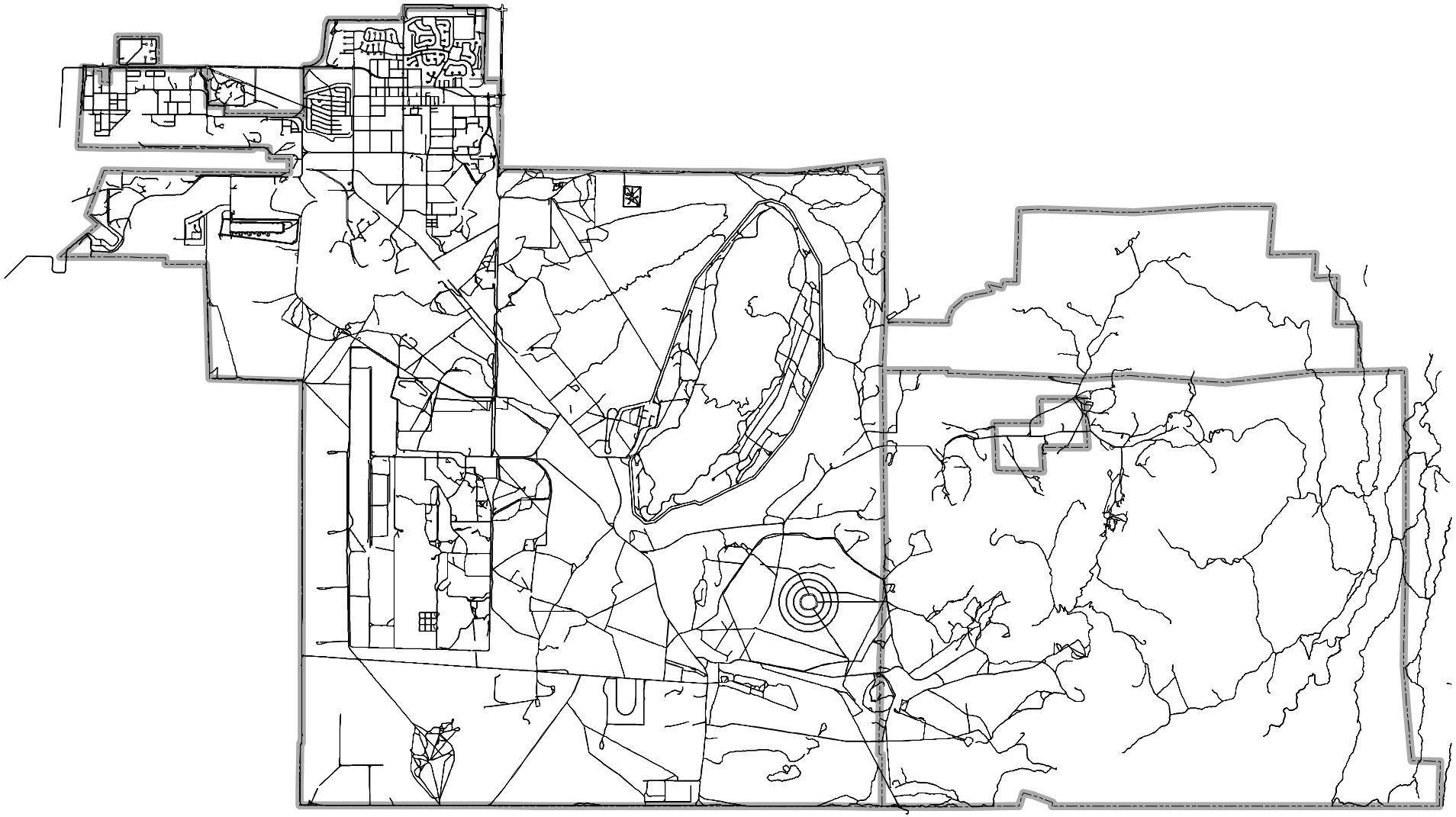
This provision does not affect any public process that is otherwise required by this Permit, the HWA, or its implementing regulations. Failure to submit any of the work plans, schedules, reports, and other deliverable documents that the Permittee is required to prepare under this Permit in substantial compliance with this Permit, and according to the schedules or deadlines in this Permit, may subject the Permittee to enforcement action under § 74-4-10 of the HWA, or other applicable provisions of law, which may include fines, civil penalties, or suspension or revocation of the Permit. Any noncompliance with approved plans and schedules shall be noncompliant with this Permit.

The Department may grant extensions of written requests for due dates for submittals of reports and other deliverables, provided that the Permittee includes a written justification showing good cause and a proposed schedule for submittal.

1.31 CONFIDENTIAL INFORMATION

The Permittee may claim that any information required by this Permit or otherwise submitted to the Department is confidential pursuant to the provisions of §§ 74-4-4.3(D) and (F) of the HWA and 40 CFR §§ 260.2 and 270.12.

Figure 1-1 Map view of the Installation



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U.S. AIR FORCE

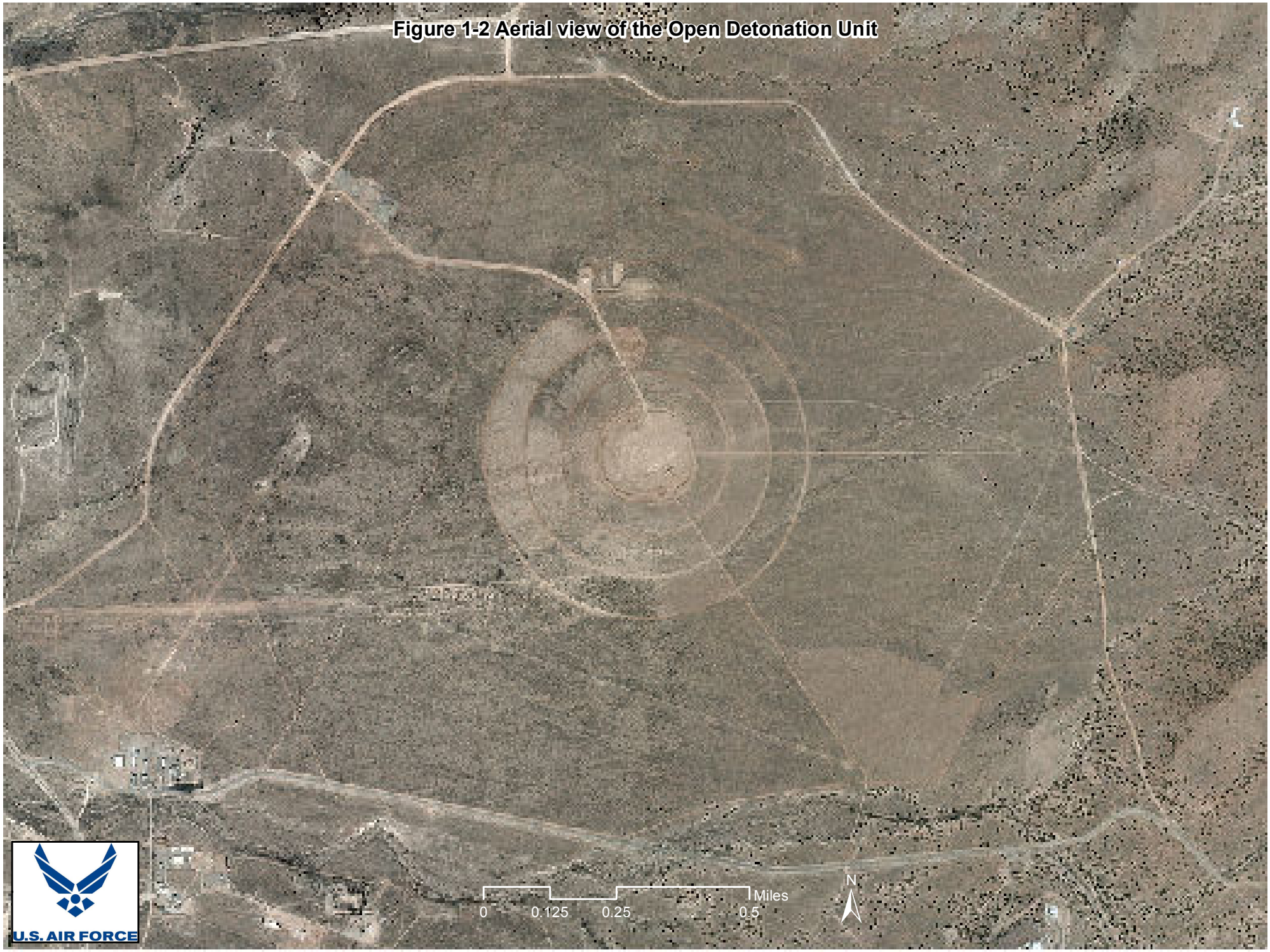


Figure 1-2 Aerial view of the Open Detonation Unit

Table 1-1
Regulatory References and Corresponding Part B Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(1)	General facility description	Appendix A
§270.14(b)(2)	Chemical and physical analyses	Appendix B (B.2, B.3)
§270.14(b)(3)	Waste analysis plan	Appendix B
§264.13(b)	Implementation of a written waste analysis plan	Appendix B
§264.13(c)	Off-site waste analysis requirements	Appendix B (B.2, B.3, B.6.1)
§270.14(b)(4)	Security procedures and equipment	Appendix G (G.2.6)
§264.14	Security	Appendix G (G.2.6)
§270.14(b)(5)	General inspection requirements	Appendix C
§264.15(b)	General inspection requirements	2.4, Appendix C
§264.33	Testing and Maintenance of Equipment	Appendix G (G.2.7.2)
§264.174	Container inspections	NA[a]
§264.193(i)	Tank inspections	NA
§264.195	Overfill control inspections	NA
§264.226	Surface impoundments monitoring and inspection	NA
§264.254	Waste pile monitoring and inspection	NA
§264.273	Land treatment design and operating requirements	NA
§264.303	Landfill monitoring and inspection	NA
§264.347	Incinerator monitoring and inspection	NA
§264.602	Miscellaneous units (monitoring, analysis, inspection, response, reporting, corrective action)	2.0 (2.3, 2.4, 2.8), 4.0, Appendix B (B.2, B.3), Appendix C, Appendix F (F.2.3), Appendix G (G.2.7.2), Appendix H (H.3.4), Appendix I
§264.1033	Process vent standards	NA
§264.1052	Pumps in light liquid service standards	NA
§264.1053	Compressor standards	NA
§264.1054	Pressure relief devices in gas/vapor service standards	NA
§264.1055	Sampling connection system standards	NA
§264.1056	Open-ended valves or lines standards	NA
§264.1057	Valves in light liquid service standards	NA
§264.1058	Pumps, valves, pressure relief devices, flanges and other connectors standards	NA
§264.1088	Subpart CC inspection and monitoring requirements	NA
§270.14(b)(6)	Request for waiver from preparedness and prevention requirements of 264 Subpart C	NA
§270.14(b)(7)	Contingency plan requirements under 264 Subpart D	Appendix E
§264, Subpart D	Contingency plan and emergency procedures	Appendix E
§264.227	Surface impoundment emergency repairs	NA
§264, Subpart C	Preparedness and prevention	Appendix G
§270.14(b)(8)	Preparedness and prevention	Appendix G (G.2.7.6)

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(8)(i)	Prevention of hazards in unloading operations (ramps and special forklifts)	Appendix G (G.2.7.6)
§270.14(b)(8)(ii)	Runoff prevention with berms, trenches, and dikes	2.0, Appendix G (G.2.7.6)
§270.14(b)(8)(iii)	Prevention of contamination of water supplies	Appendix G (G.2.7.6)
§270.14(b)(8)(iv)	Mitigation effects of equipment failure and outages	Appendix E (E.3.3), Appendix G (G.2.7.6)
§270.14(b)(8)(v)	Prevention of undue exposure of personnel by use of personal protective equipment	Appendix G (G.2.7.6)
§270.14(b)(8)(vi)	Prevention of release to the atmosphere	Appendix G (G.2.7.6), Appendix H (H.3.3)
§270.14(b)(9)	Prevention of accidental ignition or reaction	2.5, Appendix G (G.2.5, G.2.7.7)
§264.17	General requirements for ignitable, reactive, or incompatible wastes	2.5, Appendix G (G.2.5, G.2.7.7)
§264.17(c)	Documentation of compliance with 264.17 (general requirements for ignitable, reactive, or incompatible wastes)	2.5, Appendix G (G.2.5, G.2.7.7)
§270.14(b)(10)	Traffic pattern, volume, and controls	NA
§270.14(b)(11)	Facility/unit location information	Appendix A (A.3)
§264.18	Location standards	Appendix A (A.3)
§270.14(b)(11)(i)	Seismic standard applicability [264.18(a)]	Appendix A (A.3.1)
§270.14(b)(11)(ii)	Seismic standard requirements	Appendix A (A.3.1)
§270.14(b)(11)(ii)(A)	No fault within 3,000 feet (ft) with displacement in Holocene time	NA
§270.14(b)(11)(ii)(A)(1)	Published geological studies	NA
§270.14(b)(11)(ii)(A)(2)	Aerial reconnaissance of a 5-mile radius from facility	NA
§270.14(b)(11)(ii)(A)(3)	Analysis of aerial covering 3,000-ft radius of unit	NA

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(11)(ii)(A)(4)	Reconnaissance based on walking portions of the area within 3,000 ft of the facility	NA
§270.14(b)(11)(ii)(B)	If faults which have displacement in Holocene time are present within 3,000 ft, no faults pass within 200 ft of portions of the facility where treatment, storage, or disposal will be conducted	NA
§270.14(b)(11)(iii)	100-year floodplain standard	Appendix A (A.3.2)
§270.14(b)(11)(iv)	If facility is within 100-year floodplain	NA
§270.14(b)(11)(iv)(A)	Engineering analyses of hydrostatic forces expected in a 100-year flood	NA
§270.14(b)(11)(iv)(B)	Structural engineering studies for flood protection to prevent washout	NA
§270.14(b)(11)(iv)(C)	Detailed description of procedures to remove hazardous waste to safety before flooding	NA
§270.14(b)(11)(iv)(C)(1)	Timing of removal	NA
§270.14(b)(11)(iv)(C)(2)	Location to be moved to	NA
§270.14(b)(11)(iv)(C)(3)	Dedicated equipment and personnel to ensure removal	NA
§270.14(b)(11)(iv)(C)(4)	Potential for accidental discharge during movement	NA
§270.14(b)(11)(v)	Plan to show how the facility will be brought into compliance with 264.18(b)	NA
§270.14(b)(12)	Personnel training program	Appendix D
§270.14(b)(13)	Closure and post-closure plans	2.6, Appendix F
§264.112	Amendment of closure plan	Appendix F (F.1.5)
§264.118	Post-closure plan; amendment of plan	Appendix F (F.1.9)
§264.178	Closure/containers	NA
§264.197	Closure/tanks	NA
§264.228	Closure/post-closure/surface impoundments	NA
§264.258	Closure/post-closure/waste piles	NA
§264.280	Closure/post-closure/land treatment	NA
§264.310	Closure/post-closure/landfills	NA
§264.351	Closure/incinerators	NA
§264.601	Environmental performance standards/miscellaneous units	Appendix F (F.1), Appendix H (H.3)
§264.601(a)	Prevention of release of contaminants to groundwater	2.0 (2.3, 2.7), Appendix G (G.1, G.2.7.6), Appendix H (H.3.1)
§264.601(a)(1)	Volume and characteristics of waste considering potential for migration through containing structures	2.0 (2.1, 2.3, 2.7), Appendix G (G.1.1, G.1.2, G.2.1)

Regulatory Citation(s)	Description of Requirement	Location in this Document
§264.601(a)(2)	Hydrologic/geologic characteristics	Appendix H (H.1)
§264.601(a)(3)	Quality of groundwater including other sources of contamination and cumulative impact	Appendix H (H.1.2, H.3.1)
§264.601(a)(4)	Quantity and direction of groundwater flow	Appendix H (H.1.2, H.1.2.3)
§264.601(a)(5)	Proximity to and withdrawal rates of potential groundwater users	Appendix H (H.1.2.3)
§264.601(a)(6)	Regional patterns of land use	Appendix A (A.4)
§264.601(a)(7)	Potential for deposition and migration of waste constituents	Appendix H (H.2)
§264.601(a)(8)	Potential for health risks caused by human exposure to waste constituents	Appendix H (H.2.1)
§264.601(a)(9)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	Appendix H (H.2.1)
§264.601(b)	Prevention of release of contaminants to surface water	Appendix G (G.1, G.2.7.6), Appendix H (H.3.2)
§264.601(b)(1)	Volume and characteristics of the waste	2.0 (2.1, 2.3, 2.7), Appendix G (G.1.1, G.1.2, G.2.1)
§264.601(b)(2)	Effectiveness and reliability of containment, confinement, and collection systems and structures	2.0 (2.3), Appendix G (G.1.1, G.1.2, G.2.1, G.2.7.6)
§264.601(b)(3)	Hydrologic characteristics of the unit and local area	Appendix H (H.1.2)
§264.601(b)(4)	Regional precipitation patterns	Appendix H (H.1.3.1)
§264.601(b)(5)	Quantity, quality, and direction of groundwater flow	Appendix H (H.1.2, H.1.2.3)
§264.601(b)(6)	Proximity of the unit to surface water	Appendix A (A.4), Appendix H (H.1.2.1)
§264.601(b)(7)	Current and potential uses of nearby surface waters and water quality standards for those waters	Appendix H (H.1.2.1, H.3.2)
§264.601(b)(8)	Quality of surface waters and soils including other sources of contamination and their cumulative impact on surface waters and soils	Appendix H (H.1.1.3, H.1.2.1, H.2.1, H.3)
§264.601(b)(9)	Regional patterns of land use	Appendix A (A.4)
§264.601(b)(10)	Potential for health risks caused by human exposure to waste constituents	Appendix H (H.2.1)
§264.601(b)(11)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	Appendix H (H.2.1)
§264.601(c)	Prevention of release of contaminants to air	2.0 (2.3), Appendix G (G.2.7.6), Appendix H (H.3.3)
§264.601(c)(1)	Volume and characteristics of waste including its potential for emission	2.0 (2.1, 2.3, 2.7), Appendix G (G.2.7.6)
§264.601(c)(2)	Effectiveness and reliability of systems/structures to reduce/prevent emissions of hazardous constituents to the air	2.0 (2.1, 2.3, 2.7), Appendix G (G.2.7.6)
§264.601(c)(3)	Operating characteristics of the unit	2.0 (2.1), Appendix G (G.2)

Regulatory Citation(s)	Description of Requirement	Location in this Document
§264.601(c)(4)	Characteristics of the unit and the surrounding area	2.0, Appendix A (Map A-1), Appendix H (H.1)
§264.601(c)(5)	Existing quality of the air including other sources of contaminants and their cumulative impact on the air	Appendix H (H.1.4, H.3.3)
§264.601(c)(6)	Potential health risks caused by human exposure to waste constituents	Appendix H (H.2.1) Appendix
§264.601(c)(7)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	H (H.2.1)
§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	2.0 (2.3, 2.4, 2.8), 4.0, Appendix C, Appendix F (F.2.3), Appendix G (G.2.7.2), Appendix H (H.3.4), Appendix I
§264.603	Post-closure care/miscellaneous units	Appendix F (F.1.1)
§270.14(b)(14)	Post-closure notices (264.119)	Appendix F (F.1.9)
§270.14(b)(15)	Closure cost estimate (264.142)	Appendix F (F.1.6)
	Financial assurance (264.143)	Appendix F (F.1.6)
§264.75	Biennial report	2.0 (2.8), Appendix H (3.4.3)
§264.76	Unmanifested waste report	2.0 (2.8), Appendix H (3.4.3)
§264.77	Additional reports	2.0 (2.8), Appendix H (3.4.3)
§270.14(b)(16)	Post-closure care cost estimate (264.144)	Appendix F (F.1.6)
	Post-closure care financial assurance (264.145)	Appendix F (F.1.6)
§270.14(b)(17)	Liability insurance (264.147)	Appendix F (F.1.6)
§270.14(b)(18)	Proof of financial coverage (264.149-150)	Appendix F (F.1.6)
§270.14(b)(19)	Topographic map requirements	Appendix A (A.4)
§270.14(b)(19)(i)	Map scale and date	Appendix A (A.4)
§270.14(b)(19)(ii)	100-year floodplain	Appendix A (A.4)
§270.14(b)(19)(iii)	Surface waters	Appendix A (A.4)
§270.14(b)(19)(iv)	Land use	Appendix A (A.4)
§270.14(b)(19)(v)	Wind rose	Appendix A (A.4)
§270.14(b)(19)(vi)	Map orientation	Appendix A (A.4)
§270.14(b)(19)(vii)	Legal boundaries	Appendix A (A.4)
§270.14(b)(19)(viii)	Access controls	Appendix A (A.4)
§270.14(b)(19)(ix)	Wells	Appendix A (A.4)

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(19)(x)	Buildings	Appendix A (A.4)
	Treatment, storage, and disposal operations	Appendix A (A.4)
	Run-on/run-off control systems	2.7, Appendix A (A.4), Appendix G (G.1.1, G.2.7.6)
	Storm sewer systems	Appendix A (A.4)
	Sanitary sewer systems	Appendix A (A.4)
	Process sewer systems	Appendix A (A.4)
	Loading/unloading areas	Appendix A (A.4)
	Fire control facilities	Appendix A (A.4)
§270.14(b)(19)(xi)	Drainage barriers	Appendix A (A.4)
§270.14(b)(19)(xii)	Location of operational units	Appendix A (A.4)
§270.14(b)(20)	Other federal laws	3.0
§270.3(a)	Wild and Scenic Rivers Act	3.1
§270.3(b)	National Historic Preservation Act	3.2
§270.3(c)	Endangered Species Act	3.3
§270.3(d)	Coastal Zone Management	3.4
§270.3(e)	Fish and Wildlife Coordination Act	3.5
§270.3(f)	Executive Orders	3.6
§270.14(b)(21)	Notice of extension approval for land disposal facilities	NA
§270.14(c)	Groundwater monitoring requirements	Appendix A (A.5)
§270.14(c)(1)	Groundwater monitoring under 265.90 through 265.94	NA
§270.14(c)(2)	Identification of uppermost aquifer, groundwater flow rate and direction	NA
§270.14(c)(3)	A topographic map required under 270.14(b)(19) that identifies proposed point of compliance	NA
	Proposed location of groundwater monitoring wells under 264.97	NA
§270.14(c)(4)	Description of plume of contamination that has entered groundwater	NA
§270.14(c)(4)(i)	Extent of plume indicated on topographic map	NA
§270.14(c)(4)(ii)	Identification of constituents and concentration for Appendix IX of 264	NA
§270.14(c)(5)	Detailed plan and an engineering report describing proposed groundwater monitoring program under 264.97	NA
§270.14(c)(6)	No releases detected in groundwater (264.98)	NA
§270.14(c)(6)(i)	List of proposed indicator parameters	NA
§270.14(c)(6)(ii)	Proposed groundwater monitoring system	NA
§270.14(c)(6)(iii)	Background values for each proposed monitoring parameter	NA
§270.14(c)(6)(iv)	Description of proposed sampling, analyses and statistical comparisons to be used	NA
§270.14(c)(7)	Release detected at point of compliance requires corrective action under 264.100	NA
§270.14(d)	Information requirements for solid waste management units (SWMU)	4.0

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(d)(1)(i)	Location of SWMUs on topographic map	4.0, Appendix A (Map A-1)
§270.14(d)(1)(ii)	Types of SWMUs	4.0
§270.14(d)(1)(iii)	Dimensions and descriptions of SWMUs	4.0
§270.14(d)(1)(iv)	Dates of operation	4.0
§270.14(d)(1)(v)	Waste types managed at SWMU	4.0
§270.14(d)(2)	Information on releases from SWMUs	4.0
§264.101	Corrective action for solid waste management units	4.0
§270.15	Containers	NA
§270.16	Tank systems	NA
§270.16(a)	Written assessment and certification	NA
§270.16(b)	Capacity/dimensions	NA
§270.16(c)	Systems and controls	NA
§270.16(d)	Piping and process flow	NA
§270.16(e)	External corrosion protection	NA
§270.16(f)	Installation	NA
§270.16(g)	Secondary containment system	NA
§270.16(h)	Request for variance from secondary containment	NA
§270.16(i)	Spill prevention	NA
§270.16(j)	Ignitable, reactive, or incompatible wastes	NA
§270.16(k)	Air emission control equipment	NA
§270.23(a)	Detailed description of unit being used	Appendix G (G.1)
§270.23(a)(1)	Physical characteristics, materials of construction, and dimensions of unit	Appendix G (G.1)
§270.23(a)(2)	Detailed plans/reports describing unit location, design, construction, operation, maintenance, monitoring, inspection, and closure	Appendix C, Appendix F, Appendix G, Appendix I
§270.23(b)	Detailed hydrologic, geologic, and meteorologic assessments and land use maps for region surrounding site to ensure compliance with environmental performance standards in §264.601	Appendix A (Figures A-4 and A-5), Appendix H (H.1, H.2)
§270.23(c)	Information on potential pathways of exposure and magnitude/nature of exposure to humans or environmental receptors to hazardous waste or hazardous constituents	Appendix H (H.2)
§270.23(d)	Demonstration of treatment effectiveness based on laboratory or field data	Appendix G (G.2.4)

[a] NA = not applicable

PERMIT PART 2: GENERAL OD TREATMENT UNIT REQUIREMENTS

2.1 INTRODUCTION

This Part presents a general description of the OD treatment units that were in use at the Kirtland Air Force Base (KAFB) Explosive Ordnance Disposal (EOD) Range. It also presents the general waste management practices previously used to treat wastes at both the OB and OD Treatment Units. The information provided in this Permit Renewal Application Part 2 is submitted to address the applicable Part B permit application miscellaneous unit requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), incorporating 40 CFR §270.23, and 20.4.1 NMAC, Subpart V, incorporating 40 CFR §264, Subpart X. Appendix G of this permit renewal application contains more detailed information on and figures of the OB and OD Treatment Units and the waste management practices associated with them prior to their closure to the receipt and treatment of waste.

2.2 TREATMENT UNITS

The OB and OD Treatment Units are located on KAFB at the EOD Range, which is southeast of the former Manzano Base and approximately two miles north of the southern boundary of KAFB (Figure A-2). The OB and OD Treatment Units at the EOD Range were previously used to treat (i.e., burn or detonate) explosive and explosive-contaminated waste to remove the hazardous characteristics of reactivity (D003) and/or ignitability (D001). The EOD Range was also used for training (e.g., demolition and explosives-handling methods).

The OB and OD treatment units were previously used to treat explosives, unexploded ordinance, propellants, and pyrotechnics in the form of pure substances, and explosive-contaminated waste items. The explosives that were treated included bulk explosives and explosives from research and development activities. Munitions that were expired or unserviceable were also treated at these units. The hazardous wastes previously treated at the OB and OD Treatment Units were mostly in solid form; however, on occasion, wastes in liquid form (e.g., picric acid) were treated at these units. Examples of potential hazardous waste previously treated at the OB and OD units are presented in Appendix B, Tables B-2 and B-3. Nonhazardous items (e.g., contraband, firearms) received from off-site were treated at the OB and OD units as a service in support of the various agencies listed in Appendix B, Table B-1.

The maximum hazardous waste treatment capacity of each treatment unit per treatment event was 1,500 Pounds, net explosive weight (NEW). At the OB Treatment Unit, hazardous waste

and nonhazardous waste could be treated together during a single OB event. The maximum total quantity of combined waste during such treatments was 5,000 pounds per treatment event. Open burning was facilitated by using a flammable liquid, such as diesel fuel, to initiate and sustain the burn and effectively remove the characteristics of reactivity and/or ignitability. Most explosive and explosive-contaminated waste burned well enough that no additional source of heat was required. If any reactive waste remained after burning, it was re-burned to ensure that the characteristic of reactivity was removed. OD was performed using bulk explosives to countercharge the hazardous waste and effectively remove the characteristics of reactivity and/or ignitability.

Prior to the issuance of the July 2010 Permit, the Permittee was allowed to treat a maximum of 80,000 pounds NEW of hazardous wastes per year at the OB Treatment Unit. Similarly, the Permittee was allowed to treat a maximum of 100,000 pounds NEW of hazardous wastes per year at the OD Treatment Unit. KAFB minimized the impact to the environment by conducting treatment operations in a strictly controlled, remote area within the KAFB facility boundary. Treatment operations were not conducted during adverse atmospheric conditions. The operational and waste management practices previously used at the EOD Range (OB and OD units) are more fully described in Appendix G.

The July 2010 Permit significantly reduced allowable NEW treatment amounts at the OD Treatment Unit to fifteen hundred (1,500) lbs. of waste per treatment, eighteen thousand (18,000) lbs. per calendar year and one hundred eighty thousand (180,000) lbs. per the term of the permit.

2.3 SECURITY

The Permittee shall prevent unknowing entry to the EOD range to minimize the possibility of unauthorized entry of persons into the OB and OD Treatment Units, pursuant to 40 CFR § 264.14. Access is controlled via locked gates and barbed-wire fencing. Warning signs have also been placed at the entrance gate, as well as along the EOD range perimeter boundary. EOD personnel continue to perform access control for anyone needing access to the area. Monthly inspections are performed by the EOD Shop and Environmental Branch to verify site security features are intact, review site conditions and ensure no unauthorized access or activity is taking place within the EOD Range perimeter boundary.

2.4 AUTHORIZED WASTE IDENTIFICATION

The OB and OD Treatment Units were previously used to treat hazardous wastes bearing a variety of U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers. The EPA Hazardous Waste Numbers for wastes that could have been treated at the OB and OD units are listed in the Part A permit renewal application.

2.5 PREPAREDNESS AND PREVENTION

2.5.1 CONTAINMENT

Containment at the OB Treatment Unit was used to prevent releases during material staging, burning, and residue management. The OB Treatment Unit is located on a concrete pad with walls at the back and on both sides. A heavy-duty steel container is located on the concrete pad and surrounded on three sides by the concrete walls; the steel container provided primary containment. The OB Treatment Unit's retractable cover was used between treatment events to prevent precipitation from entering the unit. The cover also acted as containment to reduce the potential of wind-blown residues from the unit. A concrete berm located near the front of the pad prevented runoff in the event that precipitation collected on the concrete pad before the retractable cover could be pulled back over the steel container.

The OD Treatment Unit is surrounded by an earthen berm. Wastes were only staged at the OD Treatment unit immediately prior to detonation to prevent releases before treatment.

2.5.2 REQUIRED EQUIPMENT

As required by 40 CFR §264.32, the OB and OD Treatment Units (while active) were equipped with or operations personnel had access to adequate emergency equipment, including telephone or two-way radio, fire extinguishers, and fire control, spill control, and decontamination equipment. Emergency equipment available for use at the OB and OD Treatment Units during its operation is summarized in Tables F-2 and F-3 in the Contingency Plan (see Attachment F).

Other mandatory equipment required for OB and OD treatment activity, (including fire extinguishers, shovels, personal protective equipment, emergency eye-wash and first aid kits) was either carried in EOD vehicles or staged at the EOD personnel bunker for emergency response to fires, spills or other incidents.

2.5.3 TESTING AND MAINTENANCE OF EQUIPMENT

The Permittee shall test and maintain the equipment specified in Permit Part 2.4.2, as necessary, to assure its proper operation in time of emergency, as required by 40 CFR §264.33. All fire protection equipment, and decontamination equipment associated with the Treatment Units shall be inspected monthly. Damaged or defective emergency equipment, fire protection equipment, and decontamination equipment shall be repaired or replaced immediately upon discovery. Since all treatment activity was terminated, some of the site's emergency equipment has been removed and reutilized. Portable equipment resources will be utilized by emergency response forces to any potential future incident at the site.

2.5.4 Emergency Coordinator

Since the OB and OD Treatment Units are no longer active, the Base Fire Department and Wing Command Post serve as the Primary and Alternate Coordinators for this facility, respectively. The 377 ABW Command Post maintains authority to commit resources needed to address an emergency in accordance with 40 CFR §264.55.

2.6. WASTE CHARACTERIZATION

2.6.1 WASTES TO BE SHIPPED OFF-SITE

Since all OB and OD waste treatment activity was terminated, any applicable residuals found on the site will be handled as follows: Prior to shipping any hazardous waste off-site, the Permittee shall characterize the waste as necessary for treatment and disposal and to ensure proper packaging, labeling , marking, and placarding in accordance with the Department of Transportation regulations at 49 CFR §172, 173, 178, and 179.

2.6.2. Remediation Waste

The Permittee shall characterize remediation waste (as defined at 40 CFR §260.10) in compliance with all waste characterization requirements in this Permit. The characterization information shall be included in the Operating Record, shall be maintained as required under Permit Section 1.16.2, and include at a minimum: a hazardous waste determination, an identification of all applicable hazardous waste numbers, a LDR status determination, the origin of the waste and how it was subsequently managed, the time and circumstances of the release that created the waste, and any investigation or other reports describing the release.

2.6.3. Additional Characterization Requirements for Containerized Waste

The Permittee shall characterize hazardous wastes placed inside containers, including over

packed drums, to ensure that the wastes do not react dangerously with, decompose, or ignite sorbent material in the container, in compliance with 40 CFR §264.316(c), and to ensure that the wastes are not incompatible or reactive with one another, in compliance with 40 CFR §264.316(d) and §264.316(e). The Permittee shall characterize laboratory packs, if they are intended to undergo the alternative treatment standards at 40 CFR §268.42(c), to determine whether they contain any prohibited hazardous wastes.

2.6.4. Records of Waste Characterization

The Permittee shall record and maintain in the Facility EM Branch Office the results of waste analyses and waste determinations performed by acceptable knowledge, and sampling and analysis, as specified in this Permit Part (2) in compliance with 40 CFR §264.73(b)(3), (b)(7), (b)(10), (b)(15), and (b)(16), and copies of notices and certifications required in Permit Sections 2.6.2 and 2.6.3. The requirement to record and maintain in the Facility EM Branch Office the results of waste analyses, waste determinations, and copies of notices and certifications applies to solid wastes even when the hazardous characteristic is removed prior to disposal, or when waste is excluded from the definition of hazardous or solid waste under 40 CFR §261.2 through §261.6, or exempted from Subtitle C regulation, subsequent to the point of generation. [40 CFR §268.7(a)(8)].

2.7. WASTE MANAGEMENT

2.7.1. Provisions for Complying with Land Disposal Restriction Requirements

The Permittee shall comply with the restrictions for land disposal at 40 CFR §268.

The Permittee shall not arrange for the disposal at an off-site land disposal facility any hazardous waste restricted from land disposal under 40 CFR §268, unless:

1. The waste meets treatment standards specified in 40 CFR §268.40, §268.41, §268.42, or §268.43; or
2. A variance from the treatment standards has been granted pursuant to 40 CFR §268.44.

This Permit does not authorize land disposal of hazardous waste at any location at the Facility.

2.7.2. Generator Requirements

Generators of hazardous waste must determine, based on the characteristics of the waste at the point of generation, if the waste must be treated before it can be land disposed. This includes the Permittee as a “generator” of waste. Generators are required to send a one-time written notice to the Facility for the treatment of hazardous waste or each exact type of waste stream. A copy of the one-time notice shall be maintained at the EM Branch Office. The notice shall include:

1. The applicable EPA Hazardous Waste Numbers and manifest number of the shipment;
2. A statement that the waste is subject to LDRs;
3. The UHCs and their concentrations in the wastes, if any;
4. The applicable treatability group category (normally as a non-wastewater);
5. Waste code subdivisions based on waste-specific criteria, if appropriate; and
6. Waste analysis data, if appropriate.

For wastes that do not meet treatment standards, the one-time written notice shall include the generator paperwork requirements information referenced in 40 CFR §268.7(a)(2). For wastes that meet treatment standards at the original point of generation, the one-time notice shall include the generator paperwork regulatory requirements information and the certification statement referenced in 40 CFR §268.7(a)(3).

2.7.3. OD Treatment Unit Requirements

Residues previously generated at the OD Treatment Unit are subject to LDR requirements, as well as other applicable requirements in 40 CFR §261, §262, §263 and this Permit. If an analysis indicates that a treatment residue does not fully meet the treatment standards for hazardous waste in 40 CFR §268.40 and universal treatment standards of 40 CFR §268.48, the residue shall be sent to an offsite facility for additional treatment, including any necessary treatment of UHCs to meet the applicable standards, and disposal. The Permittee must comply with the notice and certification requirements in accordance with 40 CFR §268.7(b)(5), as well as Permit Section 2.5.1, and any other applicable requirements of this Permit.

If analysis indicates that a treatment residue meets the treatment standards, it shall be sent offsite for disposal. In accordance with 40 CFR §268.7(b)(3) and (4), a notification and certification signed by an authorized representative shall be submitted to the offsite treatment facility with the initial shipment of treatment residue. If a waste is determined to be no longer hazardous, a one-time notification and certification shall be placed in the files at the EM Branch Office, as required by 40 CFR §268.9(d). The notification and certification shall be updated if the process or operation generating the waste changes and/or if the Subtitle D facility receiving the waste changes. The notification shall include:

1. The name and address of the Subtitle D facility receiving the waste shipment; and
2. A description of the waste (e.g., the treatment residue) as initially generated, including EPA Hazardous Waste Number(s), treatability group(s), and UHCs.
3. An authorized Facility representative shall sign the certification.

2.8. WASTE MINIMIZATION

In accordance with 40 CFR §264.73(b)(9), the Permittee shall certify annually that the Permittee has a program in place to reduce the volume and toxicity of hazardous waste. This annual certification shall be maintained in the Environmental Management files and the Operating Record for the facility.

2.9. IMPERMISSIBLE DILUTION

The Permittee shall not dilute a restricted waste as a substitute for treatment. [40 CFR §268.3]. Impermissible dilution to avoid an applicable treatment standard includes, but is not limited to, the addition of solid waste to reduce a hazardous constituent's concentration, or an ineffective treatment method that does not destroy, remove, or permanently immobilize hazardous constituents. Aggregating or mixing wastes as part of a legitimate treatment process are not considered impermissible dilution for purposes of this Permit requirement.

2.10. DUST SUPPRESSION

The Permittee shall not use waste or used oil or any other material which is contaminated with dioxin, polychlorinated biphenyls (PCBs), or any other hazardous waste, other than a waste identified solely on the basis of ignitability, for dust suppression or road treatment. [40 CFR §266.23(b)].

2.11 IGNITABLE AND REACTIVE WASTES

The Permittee shall take precautions to prevent accidental ignition or reaction of ignitable or reactive wastes, as required 40 CFR §264.17. Ignitable or reactive wastes shall be located at least 50 feet from the boundary of the OD Unit at all times and shall be protected from any sources of ignition, such as open flames, or reaction with other wastes or products, and shall be separated and protected from welding activities, hot surfaces, frictional heat, and sources of sparks. Only containers made of or lined with materials that will not react with and are otherwise compatible with the waste to be managed shall be used to contain waste.

2.12. AIR EMISSIONS FROM THE OD UNIT

During OD Treatment Unit closure, the Permittee shall comply with all air emission limitations and air monitoring requirements for the OD Unit set forth in air quality permits for the OD Unit issued by the City of Albuquerque Environmental Health Department and as required by Permit Section 3.3. The Permittee shall maintain all records relating to the air quality permit in the Operating Record for the Facility.

2.13. OFF-SITE SHIPMENTS

Prior to shipping any hazardous waste off-site, the Permittee shall comply with all applicable generator requirements at 40 CFR §262, as required by 40 CFR §262.10(h) and §264.71(c).

2.14. STORAGE OF RESTRICTED WASTE

The Permittee shall comply with 40 CFR §268, Subpart E for any storage of hazardous waste restricted from land disposal under 40 CFR §268, Subpart C.

2.15. MANIFEST SYSTEM

The Permittee shall comply with the manifest requirements of 40 CFR §264.71 and 40 CFR §264.72. With the exception of waste shipments from conditionally exempt small quantity generators, the Permittee shall not accept any hazardous waste from an off-site source without an accompanying manifest. If the Permittee accepts any hazardous wastes from an off-site facility without an accompanying manifest, if required, or without an accompanying shipping paper as described in 40 CFR §264.76, the Permittee shall prepare and submit an Unmanifested Waste Report to the Department within fifteen (15) calendar days after receiving the waste. The report shall include the following:

1. EPA identification number, name, and address of the off-site facility;
2. The date the Facility received the waste;
3. EPA identification number, name, and address of the generator and transporter;
4. A description and the quantity of each unmanifested hazardous waste received;
5. The certification signed by an authorized representative of the Facility; and
6. An explanation of why the waste was unmanifested, if known.

2.16. BIENNIAL REPORT

Since the OB and OD Treament Units were closed to the receipt and/or treatment of hazardous or nonhazardous waste in 2010, biennial reports are no longer required.

2.17. LIABILITY INSURANCE REQUIREMENTS

Pursuant to 40 CFR §264.140(c), as a Federal entity, the Permittee is exempt from the requirement to have and to maintain liability coverage for sudden and accidental occurrences as specified at 40 CFR §264.147(a).

2.18. INCAPACITY OF OWNERS OR OPERATORS, GUARANTORS, OR FINANCIAL INSTITUTIONS

Pursuant to 40 CFR §264.140(c), as a department of the federal government, the Permittee is exempt from the requirement to notify the Department of the commencement of bankruptcy as specified at 40 CFR §264.148.

2.19. DISCLOSURE STATEMENT

Pursuant to NMSA 1978, §74-4-4.7(F)(1), as a department of the federal government, the Permittee is not required to file a disclosure statement.

2.20. ADDITIONAL REPORTS

In accordance with the requirements of 40 CFR §264.77, the Permittee shall also report releases, fires and explosions to the Department.

2.21. CLOSURE

The OB and OD Treatment Units are closed to the receipt and treatment of hazardous wastes. Closure activities that have occurred at the OB and OD Treatment Units have included removal of waste and hazardous waste residues from the OB and OD Treatment Unit (See Appendix F for a Copy of the OB and OD Treatment Units Closure Plans currently under review by the Department). Soil contaminant concentrations will be compared to soil background levels and to Department and EPA soil screening levels to determine either that the soils will be excavated and removed, or a risk assessment will be conducted to demonstrate that any remaining hazardous constituents in the soil do not pose an unacceptable risk to human health or the environment. These activities will be conducted to meet the closure performance standards. Closure will minimize the need for further maintenance, preclude the release of hazardous waste or constituents to environmental media, and be protective of human health. Detailed closure procedures are addressed in Appendix F of this Part B permit renewal application (40 CFR §264.111).

PERMIT PART 3: OPEN DETONATION UNIT

3.1 INTRODUCTION

On 13 August 2010, the OD Treatment Unit was closed for the receipt and treatment of hazardous waste. This Permit Application Part 3 contains soil and groundwater monitoring requirements for the OD Treatment Unit.

3.2. AUTHORIZED WASTE AND MAXIMUM QUANTITY OF WASTE

The Permittee no longer treats hazardous waste at the the OD Treatment Unit, which was closed for the receipt and treatment of hazardous waste on 13 August 2010.

3.3. DESIGN, CONSTRUCTION, OPERATION, AND MAINTENANCE

3.3.1. General Requirements

The Permittee shall maintain the OD Treatment Unit in accordance with the requirements of this Permit to minimize noise and the possibility of accidental fire, explosion, or any sudden or non-sudden release of hazardous waste residue into the air, soil, sediment, surface water, or groundwater which could threaten human health or the environment, as required by 40 C.F.R. § 264.31 and § 264.601.

The Permittee shall mark the boundary of the EOD Range with signs or structures such that the boundary is clearly discernable.

3.3.2. Run-Off and Run-On Controls

The Permittee shall maintain the run-off control systems (protective berm) at the OD Treatment Unit to prevent precipitation run-off from leaving the Treatment Unit and the migration of hazardous waste residue off-unit, as required by 40 C.F.R. § 264.601(b). The Permittee shall maintain the run-on control systems (protective berm) at the OD Treatment Unit to prevent precipitation from entering the unit as overland run-on, as required by 40 C.F.R. § 264.601(b).

3.3.3. Restrictions on Operations

3.3.3.1. Hours of Operation

The Permittee shall conduct OD Treatment Unit maintenance and closure treatment operations only between sunrise and sunset.

3.3.3.2. Weather Conditions

The Permittee will discontinue OD Treatment Unit maintenance and closure activities when the Albuquerque Environmental Health Department (AEHD) issues high wind stop work advisories.

3.3.3.3. Range Fire

The Permittee no longer conducts treatment operations at the OD Treatment Unit. Maintenance and closure activities will be conducted in a manner to minimize the risk of fire danger.

3.3.4. Operation Safety

3.3.4.1. Personnel Safety

As of 13 August 2010, the Permittee no longer receives or treats hazardous waste at the OD Treatment Unit. A Health and Safety Plan will be developed as part of the OD Treatment Unit closure activities to ensure personnel safety.

3.3.4.2. Safety Precautions

The Permittee shall conduct all OD Treatment Unit maintenance and closure activities in accordance with all the safety precautions required by this Permit.

3.3.5. Maintenance

3.2.5.1. Accumulated Precipitation

To avoid accumulated precipitation, the Permittee will fill in all pits that may accumulate standing water.

3.3.5.2. Waste and Treatment Residues

The first phase of the OD Treatment Unit closure plan consisted of a hazards survey of the OD Treatment Unit conducted by qualified contractor health, physics and industrial hygiene personnel, which will include unexploded ordnance (UXO) safety personnel and KAFB EOD personnel. The purpose of the survey was to locate and remove any remaining “kick-out” untreated waste, waste fragments or UXO, and to identify potential contamination concerns that may present hazards to workers during closure activities and to specify control measures necessary to reduce worker risk. The survey provided the information necessary to identify worker qualifications, protective equipment (PPE), safety awareness, work permits, exposure control programs and emergency coordination required to complete closure. Any munitions and/or explosives of concern (MEC) identified during the hazard survey was handled by the UXO certified personnel in accordance with standard operating procedures.

3.4. AIR MONITORING

The Permittee shall conduct all OD Treatment Unit maintenance and closure activities in accordance with KAFB's Title V Operating Permit, Permit # 527, and all AEHD air program requirements.

3.5. SOIL MONITORING AND HUMAN RISK SCREENING

OD Treatment Unit closure soil sampling and human risk screening shall be performed in accordance with the Department approved OD Treatment Unit Closure Plan.

3.6. GROUNDWATER MONITORING

Installation of monitoring wells and subsequent groundwater sampling and analysis protocol will be accomplished as part of the OD Treatment Unit closure activities, in accordance with the Department approved OD Treatment Unit Closure Plan.

3.7. ORGANIC AIR EMISSIONS REQUIREMENTS

3.7.1. Additional Waste Characterization Requirements for Air Emissions

The Permittee shall characterize waste generated as a result of the OD Treatment Unit closure activities to ensure compliance with applicable emission requirements of 40 C.F.R. § 264.

3.7.2. Equipment Containing or Contacting Hazardous Waste

Each piece of equipment used during OD Treatment Unit closure activities that contains or contacts hazardous wastes with organic concentrations of at least 10 percent by weight shall be marked in such a manner that it can be distinguished readily from other pieces of equipment in accordance with 40 C.F.R. § 264.1050(d). Pursuant to 40 C.F.R. § 264.1050(f), equipment that contains or contacts hazardous waste with an organic concentration of at least 10 percent by weight for less than 300 hours per calendar year is excluded from the requirements of 40 C.F.R. § 264.1052 through § 264.1060 if it is identified, as required in 40 C.F.R. § 264.1064(g)(6). Such equipment shall be identified in writing in a log that shall be kept with the Operating Record in accordance with 40 C.F.R. § 264.1064(g)(6). The information required pursuant to 40 C.F.R. § 264.1064(k)(1), (2), (3) shall also be recorded in a log that is kept with the Operating Record. The Permittee shall comply with all applicable requirements of 40 C.F.R. §§ 264.1052 through 264.1060 for any equipment that contains or contacts hazardous waste with an organic concentration of at least 10 percent by weight for 300 or more hours per calendar year. The log shall note the total time elapsed that any equipment contains or contacts hazardous waste with an organic concentration of at least 10 percent by weight.

PERMIT PART 4: CLOSURE

4.1. GENERAL CLOSURE REQUIREMENTS

The Permittee shall close the OB and OD Treatment Units following the procedures set forth in the revised OB and OD Treatment Unit Closure Plans submitted to the Department on 19 and 20 March 2013, respectively, as required by 40 CFR § 264.111. Both plans are attached herein as Attachments F1 and F2.

4.2. SUBMITTAL OF REVISED CLOSURE PLANS

On 25 September 2009, the Permittee discontinued receipt and treatment of hazardous waste and operation of the OB Treatment Unit. Similarly, on 13 August 2010, the Permittee discontinued receipt and treatment of hazardous waste and operation of the OD Treatment Unit. On 19 and 20 March 2013, the Permittee submitted revised OB and OD closure plans for the OB and OD Treatment Units in accordance with this Permit and 40 C.F.R. § 264.112. The Permittee shall amend the Closure Plan whenever changes in circumstances necessitate a modification of the Closure Plan, as required by 40 C.F.R. § 264.112(c), for any other reasons set forth in 40 C.F.R. 264.112(c) or if there are changes in state law that affect the Closure Plan. The Permittee shall comply with all the requirements of 40 C.F.R. 264.112(c) in amending the Closure Plan.

When amending or revising the Closure Plan, the Permittee shall submit to the Department for approval detailed, and as necessary, updated procedures and methods describing the procedures and sampling methods to verify removal of all structures and equipment and removal of treatment residues and any hazardous or solid wastes. At a minimum, the Permittee shall include in the revised Closure Plan:

1. Unit history and description, identifying, at a minimum, the following:
    a. Constituents of concern, including all hazardous waste and hazardous constituents managed at the Unit, listed by category of constituent subject to the same sampling methods,
    b. Spills or other releases of hazardous waste and hazardous constituents during operation of the Unit, and
    c. Visible staining or other conditions indicating potential release locations;
2. Proposed procedures for removal of all structures and equipment;
3. Proposed sample locations;

4. Sample methods, equipment and procedures;
5. Analytes and analytical methods;
6. Detection limits;
7. QA/QC procedures; and
8. Sample management and preservation procedures.

4.3. CLEAN CLOSURE

The Permittee shall close the OB and OD Treatment Units by removing all hazardous waste residues and all structures and equipment from the OB and OD Treatment Units and demonstrating that no unacceptable risk to human health or the environment exists at the facility or in groundwater at the OB and OD Treatment Units (clean closure). However, if the OB and OD Treatment Units cannot be clean closed, post-closure care is required and the closure plans shall be amended. In the event that closure performance standards cannot be achieved for either the OB and OD Treatment Units, a post-closure plan will be submitted to the Department for review and approval.

4.4. NOTIFICATION OF CLOSURE

On 13 August 2010, the Permittee notified the Department that it had terminated the receipt and treatment of hazardous waste, as well as the intent to close the OD Treatment Unit. Similarly, on 25 September 2009, the Department received notice of the closure of the OB Treatment Unit when it signed the KAFB-NMED settlement agreement. In accordance with 40 CFR § 264.112, the Permittee has submitted revised OB and OD Treatment Unit closure plans.

4.5. TIME ALLOWED FOR CLOSURE

Within 90 calendar days after the approval of the OB and OD Treatment Unit Closure Plans, the Permittee shall remove all treatment residues and all other hazardous and solid waste from the Treatment Units. The waste shall be sent to an off-site permitted treatment or disposal facility, as applicable. The Permittee shall complete closure activities for the Treatment Units within 180 days of Closure Plan approval, as required by 40 C.F.R. § 264.113, following the schedule and requirements in the approved Closure Plans, Permit Attachment H, and as required by this Permit Part.

4.6. DISPOSAL/DECONTAMINATION OF EQUIPMENT, STRUCTURES, AND SOILS

The Permittee shall decontaminate soil as specified in the approved revised Closure Plans, Permit Attachment H.

4.7. MANAGEMENT OF REMEDIATION WASTE

By removing hazardous waste or hazardous constituents or contaminated media during closure activities, the Permittee becomes a generator of hazardous waste, and shall manage that waste in accordance with all applicable requirements of 40 C.F.R. Part 262.

4.8. CERTIFICATION OF CLOSURE

Within 60 calendar days from the date of completion of closure of the OD Unit, the Permittee shall submit to the Department a final closure report and written certification signed by the Permittee and an independent professional engineer registered in the State of New Mexico, that the OB and OD Treatment Units were closed as required by the procedures specified in the approved revised Closure Plans and this Permit, pursuant to 40 C.F.R. § 264.115.

4.9. FINANCIAL RESPONSIBILITY

4.9.1. Cost Estimate for Closure

Pursuant to 40 C.F.R. § 264.140(c), as a department of the federal government, the Permittee is exempt from the requirement to provide a cost estimate for closure as specified at 40 C.F.R. § 264.142.

4.9.2. Financial Assurance for Closure

Pursuant to 40 C.F.R. § 264.140(c), as a department of the federal government, the Permittee is exempt from the requirement to submit a signed duplicate original of the closure financial assurance instrument as specified at 40 C.F.R. § 264.143.

PERMIT PART 5: POST CLOSURE

5.1. POST CLOSURE CARE

As set forth in this Permit and the approved revised closure plans, clean closure is planned for both the OB and OD Treatment Unit.

PERMIT PART 6: CORRECTIVE ACTION

6.1. INTRODUCTION

Pursuant to § 3004(u) and (v) of RCRA, 42 U.S.C. § 6924(u) and (v); NMSA 1978, § 74-4-4.2(B) and 40 C.F.R. Part 264, Subparts F and G, the Permittee shall implement corrective action as necessary to protect human health and the environment from all releases of hazardous waste or hazardous constituents from the OB and OD Treatment Units, Solid Waste Management Units (SWMU's) or AOC's which pose an unacceptable risk or imminent threat to human health or the environment.

6.2. GENERAL PROVISIONS

6.2.1. Offsite Access

To the extent any requirement of this Permit, including any work plan approved under this Permit, requires access to property not owned or controlled by the Permittee, the Permittee shall use its best efforts to obtain access from the present owners of such property to conduct required activities. In the event that access is not obtained when necessary, the Permittee shall immediately notify the Department in writing regarding its best efforts and its failure to obtain such access.

6.2.2. Record Preservation

Until 10 years after the Permittee's receipt of the Department's written notice that corrective action has been completed for all SWMUs and AOCs listed on Table I-3 of Permit Attachment I, the Permittee shall maintain all records, documents, data, and other information that are required to be prepared under this Permit for corrective action in accordance with Air Force/Department of Defense guidelines that determine record keeping requirements for federal entities.

6.2.3. Releases Beyond Treatment Unit, SWMU or AOC Boundaries

The Permittee shall notify the Department orally, within 24 hours of discovery, of any release of hazardous waste or hazardous constituent that has the potential to migrate beyond the OB and OD Treatment Units, SWMU or AOC boundaries, provided the migration beyond an AOC boundary poses an unacceptable risk or imminent threat to human health or the environment. In the event that a hazardous waste or a hazardous constituent migrates beyond the OB and OD Treatment Units, SWMU or AOC boundary, the Permittee shall implement corrective actions beyond the Facility property boundary, as necessary, to protect from unacceptable risks or

imminent threats to human health or the environment, unless the Permittee can demonstrate to the Department that, despite the Permittee's best efforts, the Permittee is unable to obtain the necessary permission to undertake such actions. The Permittee is not relieved of any responsibility to clean up a release that has migrated beyond said boundaries where offsite access has been denied. On-site measures to address such releases will be determined on a case by case basis and will be subject to the approval of the Department.

6.2.4. Work Plans and Other Deliverable Documents

All work plans, schedules, reports, and other deliverable documents that the Permittee is required to prepare under this Part (6) shall be submitted to the Department for review and approval as detailed in Permit Section 1.28.

6.2.5 Quarterly Progress Reports

The Permittee shall submit to the Department quarterly reports summarizing all clean closure corrective action activities for the OB and OD Treatment Units conducted pursuant to this Permit by January 31, April 30, July 31, and October 31 of each year. Each report shall summarize the corrective action activities for the quarter (i.e., 3 month time period) ending the month preceding the due date of the report. The content of these reports swhall include the information specified in Permit Section 6.2.4.1.

6.2.6 Lists of SWMUs and AOCs

Map A-10 shows the location of KAFB SWMU's and AOC's. Corrective action is required for all SWMUs and AOCs identified in Table I-3 of Permit Attachment I. Table K-1 of Permit Attachment K contains a listing of all SWMUs and AOCs for which the Department has determined that corrective action is complete without controls.

6.2.7 Newly discovered SWMUs, AOCs, and Releases

The Permittee shall notify the Department orally, within 24 hours of discovery, of any newly identified SWMU or AOC which pose an unacceptable risk or imminent threat to human health or the environment. Within fifteen (15) days after the discovery of any newly identified or suspected SWMU or AOC which pose an unacceptable risk or imminent threat to human health or the environment, the Permittee shall notify the Department in writing of such discovery. The notification shall include, at a minimum, the location of the SWMU or AOC and all available information pertaining to the nature of any release of contaminants from the SWMU

or AOC, including the contaminants that were released, the magnitude of the release, and the media affected by the release, provided the AOC poses an unacceptable risk or imminent threat to human health or the environment.

Within ninety (90) days after submitting such written notification, the Permittee shall submit to the Department for approval a SWMU Assessment Report (SAR) for each newly identified or suspected SWMU or AOC which poses an unacceptable risk or imminent threat to human health or the environment. At a minimum, the report shall provide the following information, to the extent available:

1. Location of each newly identified or suspected SWMU or AOC on a topographic map of appropriate scale mutually agreeable to the Department and the Permittee;
2. Designation of type and function of each newly identified or suspected SWMU or AOC;
3. General dimensions, capacities and structural description of each newly identified or suspected SWMU or AOC (including any available plans and drawings);
4. Dates of operation for each newly identified or suspected SWMU or AOC;
5. Identification of all wastes that have been managed at or in each newly identified or suspected SWMU or AOC, including any available data on hazardous constituents in the waste; and
6. All available information pertaining to any release of contaminants from each newly identified or suspected SWMU or AOC, including analytical data for groundwater, soil, sediment, rock, air, and surface water.

Based on the results of the report and any other relevant information, the Department will determine the need for further investigations at the SWMUs or AOCs covered in the report, including the need for an investigation report. The Department may also require corrective measures of the SWMU or AOC, based on a written finding that releases of contaminants have occurred, are occurring, or are likely to occur. Within fifteen (15) days after the discovery of any previously unknown release of a contaminant into soil, sediment, surface water, or groundwater, the Permittee shall notify the Department in writing of such discovery. Based on the results of the report and any other relevant information, the Department may determine that further investigation of the release of contaminants is needed, including the need for an Investigation Report. The Department may also require corrective measures, based on a finding that releases of contaminants have occurred, are occurring or are likely to occur from the SWMU or AOC Unit.

6.2.8 Land Transfer

In transferring land included in the OB and OD Treatment Units to another entity, the Permittee shall comply with the terms of § 120(h) of CERCLA, as amended, 42 U.S.C. § 9620(h), and as implemented in 40 C.F.R. Part 373. These provisions apply to any property owned by the Permittee on which any hazardous substance was stored for one year or more, known to have been released, or disposed of, subject to the limitations of 40 C.F.R. § 373.2. Consistent with CERCLA § 120(h)(3)(A), the Permittee shall include in any deed that transfers property, the information required by CERCLA § 120(h)(3)(A)(i), the covenant required by CERCLA § 120(h)(3)(A)(ii), and the access clause required by CERCLA § 120(h)(3)(A)(iii). The Permittee may defer the requirement of § 120(h)(3)(A)(ii)(I), consistent with the terms of CERCLA § 120(h)(3)(C). For any deed transferring title from the Permittee that contains a restriction on future land use, the Permittee shall, within ninety (90) days of transfer of the property, notify the Department of the transfer and identify for the Department the location of the property that is the subject of the transfer.

6.3. SPECIAL REQUIREMENTS

6.3.1. Information on Surface Water

The Permittee shall submit a map to the Department showing the locations of SWMUs and AOCs in relation to surface water bodies at KAFB (see Appendix A-4).

6.3.2. Cleanup Levels

The Permittee shall adhere to the requirements of this Permit Section (6.3.2) for implementing and completing cleanup of groundwater, surface water, and soil at the OB and OD Treatment Units. All proposed cleanup levels will comply with regulatory maximum contaminant levels (MCL's) or be determined by an appropriate risk assessment.

6.3.2.1. Cleanup Levels for Contaminants in Groundwater (other than Perchlorate)

Groundwater sampling results will be compared to the Federal Safe Drinking Water Act (MCL's). If the levels of hazardous constituents in the groundwater exceed the MCL's, a risk assessment will be prepared for each constituent showing a significant increase over samples collected from the area. If the risk assessment demonstrates that the level of contamination is unacceptable, the groundwater shall be subject to corrective action, and a corrective action work plan subject to Department review will be developed.

6.3.2.2. Cleanup Levels for Perchlorate in Groundwater

For groundwater perchlorate concentration greater than or equal to 15 ug/l (ppb), the Permittee shall initiate remediation through its CERCLA authority based on a risk assessment report. If the New Mexico WCCC adopts a perchlorate groundwater standard lower than 15 ug/L (ppb), the Permittee shall initiate remediation through its CERCLA authority based on a risk assessment report. The risk assessment shall identify appropriate groundwater screening levels for determining whether further evaluation is required before establishing site specific corrective action requirements to attain either residential or commercial/industrial cleanup standards or a No Further Action determination.

6.3.2.3. Cleanup Levels for Soil Contaminants (Other than PCBs and Lead)

Sampling will be conducted to characterize the nature and extent of contamination, establish background levels, and evaluate contaminants of potential concern (COPCs). The soil screening levels (SSLs) based on a 1E-05 target risk for detected carcinogens or a hazard quotient of 1 for noncarcinogens will be used as a tool to identify contaminants and areas that represent the greatest risks where further evaluation is appropriate. If analysis indicates soil contaminant concentrations exceed SSLs and background target levels, a Risk Assessment Report will be prepared in consultation with the Department to determine whether site-related contamination poses an unacceptable risk to human health or the environment. The risk assessment shall identify appropriate soil screening levels for determining whether further evaluation is required before establishing site specific corrective action requirements to attain either residential or commercial/industrial cleanup standards or a No Further Action determination.

6.3.2.4. Cleanup Levels for Lead in Soil

Pursuant to NMED Risk Assessment Guide for Site Investigations and Remediation dated June 2012, the lead concentration in soil shall not exceed 400 mg/kg.

6.3.2.5. Ecological Risk Evaluation and Cleanup Levels

Ecological risk shall be evaluated for the OB and OD Treatment Units if clean closure cannot be achieved.

6.3.2.6. Requests for Variance from Cleanup Levels

The Permittee may request a variance from a particular cleanup level. If the Permittee requests a variance from a cleanup level the Permittee may propose consideration of such factors as technical or physical infeasibility of the project, ineffectiveness of proposed solutions, cost of the

project, potential hazards to workers or to the public, and any other basis that may support a finding of project impracticability. In addition to demonstrating the basis for its impracticability request, the Permittee's written submittal shall propose the action to be taken by the Permittee if the Department approves the impracticability demonstration. Such action shall include, but is not limited to, completion of a site-specific risk assessment and identification of alternate clean-up levels. The proposed alternative cleanup level will be subject to the Department's review and approval.

6.3.3. Reporting Requirements

The purpose of this Permit Section (6.2.3) is to provide reporting requirements for corrective action activities required under this Permit. This Permit Section is not intended to provide reporting requirements for every potential type of activity conducted at the Facility; therefore, other formats or types of reports may be necessary or better suited for some activities. Described below are general reporting requirements and formats for Quarterly Reports, periodic monitoring reports and risk assessment reports. All Work Plans and Reports shall be prepared with technical and regulatory input from the Department. All Work Plans and Reports shall be submitted to the Department in the form of one (2) electronic copy in a format acceptable to the Department and two (1) paper copies.

6.3.3.1. Quarterly Reporting

Quarterly reports, as specified in Permit Section 6.1.6 shall include the following information:

1. A description of the work completed and an estimate of the percentage of total planned work completed;
2. Summaries of all findings, including summaries of laboratory data;
3. Summaries of all problems or potential problems encountered during the reporting period and actions taken to rectify problems;
4. Planned work for the next reporting period;
5. Summaries of contacts pertaining to corrective action with representatives of the local community, public interest groups, or State government during the reporting period;
6. Changes in key project personnel during the reporting period;
7. Summaries of any variances from approved investigation or remediation work plans; and
8. Brief summaries of any periodic monitoring reports prepared in accordance with the requirements in Permit Section 6.2.3.2

6.3.3.2. Quarterly Monitoring Reports

The Permittee shall prepare a Quarterly Monitoring Report using the format set forth below. The reports shall present the results of periodic or routine groundwater and remediation system monitoring at the OB and OD Treatment Units. All data collected during each monitoring and sampling event in the reporting period shall be included in a periodic monitoring report. In general, interpretation of data should be presented only in the background, conclusions, and recommendation sections of a report. The other text sections of a report should be reserved for presentation of facts and data without interpretation or qualifications. Requirements for a Periodic Monitoring Report are:

1. Title Page and Signature Block (for the name, title and organization of the preparer and the responsible Facility representative);
2. Executive Summary (Abstract);
3. Table of Contents;
4. Introduction;
5. Scope of Activities;
6. Regulatory Criteria;
7. Monitoring Results
8. Conclusions and Recommendations;
9. Tables - An explanation shall be provided on each table for all abbreviations, symbols, acronyms, and qualifiers;
10. Figures - All map figures shall include an accurate bar scale and a north arrow; other types of figures shall include a bar scale, if appropriate, and an explanation shall be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers; and,
11. Appendices - Including, as appropriate, field methods, boring/test pit logs and well construction diagrams, chemical analytical reports, and other appendices as required by the Department.

The Permittee may insert figures and tables within the text sections of a periodic monitoring report instead of in a separate section.

6.3.3.3. Risk Assessment Reports

The Permittee shall prepare a Risk Assessment Report using the format set forth below. Risk Assessment Reports may be appended to or combined with a CME Report or an Investigation Report to create a single document. Human health and ecological risk assessments should be presented in separate sections, but the general risk assessment outline applicable to both sections is provided below. The conceptual site model shall be discussed in all risk assessments. Requirements for a Risk Assessment Report are:

1. Title Page and Signature Block (for the name, title and organization of the preparer and the responsible Facility representative);

2. Executive Summary (Abstract);
3. Table of Contents;
4. Introduction;
5. Background Information -- Including site description and sampling results;
6. Conceptual Site and Risk Exposure Models;
7. Risk Screening Results;
8. Conclusions and Recommendations;
9. Tables;
10. Figures; and
11. Appendices.

A section in the risk assessment report shall summarize the analytical results of sampling. It shall include a description of the history of releases of contaminants, the known and possible sources of contamination, the vertical and lateral extent of contamination present in each medium, and a discussion of any uncertainties that are associated with contaminant characterization. Sources that are no longer considered to be ongoing but represent the point of origination for contaminants transported to other locations shall be included. This section shall reference any pertinent figures, data summary tables, and references in other reports. References made to other reports shall include page number, table numbers, and figure numbers for the referenced information. Page numbers for references made to other reports may be presented in a formal reference section of a risk assessment report. Summaries of data for each contaminant shall include the maximum value detected, the detection limit, and the upper confidence limit of the mean (UCL) based on a 95% confidence level (if applicable to the data set) with a notation for the statistical method used to calculate the UCL. Background values used for comparison to inorganic constituents and discussion of how “non-detect” analytical results were handled in the statistical analysis of data shall also be included.

Another section in the report shall present the conceptual site and risk exposure models. It shall include information on the expected fate and transport of contaminants detected. The discussion of fate and transport shall address potential migration of each contaminant in each medium, potential breakdown products and their migration, and anticipated pathways of exposure for human or ecological receptors. Diagrammatic representations of the conceptual site and risk exposure models shall appear in the figures section of the document. For human health risk assessments, the conceptual site and risk exposure models shall include the current and foreseeable future land use (such as industrial or recreational) for all risk assessments. Cleanup levels for the Facility shall be based on a residential land-use scenario, even if the

current use of the land is for other scenarios. All values for exposure parameters and the source of those values shall be included in table format and presented in the Tables section of the document. Conceptual site and risk exposure models presented for ecological risk assessments shall identify assessment endpoints and measurement receptors. The discussion of the models shall explain how the measurement receptors are protective of the ecological receptors. If risk screening is utilized, a section in the report shall present the actual screening values used for each contaminant for comparison to all applicable human health and ecological risk screening levels. Other regulatory levels that are applicable to screening the site, such as drinking water MCLs or WQCC standards shall also be included in this section. For risk assessments a section of the report shall present risk values, HQs, and hazard indexes (HI) for human health under projected future land use and residential scenarios and any site specific scenarios. A similar section shall also present for each contaminant the HQ for each ecological receptor.

Finally, a section shall also be included in the report that contains a discussion of qualitative, semi-quantitative, and quantitative uncertainty in the risk assessment and provides estimates of the potential impact of the various uncertainties. Appendices may include the results of statistical analyses of data sets and comparisons of data, full sets of results of all sampling investigations at the site, or other data as appropriate.

6.3.3.3. Certification

Pursuant to 40 C.F.R. § 270.11(d)(1), all corrective action documents shall include a certification, signed by a responsible official of the Facility, stating:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

6.4. TECHNICAL REQUIREMENTS

The methods used to conduct investigation, remediation, and monitoring activities shall be sufficient to fulfill the requirements of this Permit, and to provide accurate and representative data for the evaluation of site conditions, the nature, concentration, rate of migration, and extent of contamination, and for remedy selection and implementation, where necessary. The methods presented in this Permit are minimum requirements for environmental investigation and sampling, and are not intended to include all methods that may be necessary to fulfill the monitoring at the Facility must be determined based on the conditions and contaminants that exist at the OB and OD Treatment Units.

The Permittee shall provide a description of investigation, sampling or analytical methods and procedures in documents submitted to the Department that includes sufficient detail to evaluate the quality of the acquired data. The Department must approve any proposed combinations of SWMUs and AOCs that are grouped for the purpose of site investigation, remediation, and/or monitoring activities.

6.4.1. Standard Operating Procedures

The Permittee may reference relevant Facility Standard Operating Procedures, provided that copies of these procedures are also submitted to the Department for review. If any requirement or procedure in a Standard Operating Procedure is found by the Department to be unacceptable for reasons including, but not limited to, that the requirement or procedure will or could prevent the acquisition of representative and reliable sampling results, the requirement or procedure shall be replaced by the Permittee with a different requirement or procedure that is acceptable to the Department.

6.4.2. Documentation of Field Activities

Daily OB and OD Treatment Unit closure activities, including observations and field procedures, shall be recorded on appropriate forms. The daily record of field activities shall include, at a minimum:

1. OB or OD Treatment Unit designation;
2. Date;
3. Time of personnel arrival and departure;
4. Field investigation team members who are present, including subcontractors and visitors;
5. Weather conditions;

6. Daily activities conducted and times of performance;
7. Observations;
8. Record of samples collected with sample designations and locations specified;
9. Photographic log;
10. Field monitoring data, including health and safety monitoring if conditions arise that threaten worker or public safety, or the environment;
11. Equipment used and calibration records, if appropriate;
12. List of additional data sheets and maps completed;
13. An inventory of the waste generated and the method of storage and/or disposal; and
14. Signature of personnel completing the field record.

6.4.3. Decontamination Procedures

The objective of the decontamination procedures described below is to minimize the potential for cross-contamination. A designated area shall be established for decontamination of drilling equipment, reusable sampling equipment, and well materials. Drilling rigs and other equipment shall be decontaminated prior to entering the OB and OD Treatment Units. Drilling equipment or other exploration equipment that may come in contact with a borehole shall be decontaminated by steam cleaning, by hot-water pressure washing, or by another method approved by the Department prior to drilling each boring. Sampling or measurement equipment, including but not limited to, stainless steel sampling tools, split-barrel or core samplers, well development or purging equipment, groundwater quality measurement instruments, and water level measurement instruments, shall be decontaminated in accordance with the following procedures or other methods approved by the Department before each sampling event:

1. Brush equipment with a wire or other suitable brush, if necessary or practicable, to remove large particulate matter;
2. Rinse with potable tap water;
3. Wash with non-phosphate detergent or other detergent approved by the Department (e.g., Fantastik™ and Liqui-Nox®) followed by a tap water rinse;
4. Rinse with 0.1 M nitric acid to remove trace metals, if necessary, followed by a tap water rinse;
5. Rinse with methanol to remove organic compounds, if necessary;
6. Rinse with potable tap water; and
7. Double rinse with deionized water.

All decontamination solutions shall be collected and stored temporarily as Investigation Derived Waste (IDW) as described in Permit Section 6.3.7. Decontamination procedures and the cleaning agents used shall be documented in the daily field log.

6.4.4. Field Equipment Calibration Procedures

Field equipment requiring calibration shall be calibrated before use in the field to known standards, in accordance with the manufacturers' recommended schedules and procedures. Calibration measurements shall be recorded in the daily field logs. If field equipment becomes inoperable, its use shall be discontinued until the necessary repairs are made. In the interim, a properly calibrated replacement instrument shall be used.

6.4.5. Sample Handling, Shipping, and Custody Requirements

The Permittee shall follow all procedures for sampling activities that are detailed in this Permit.

6.4.5.1. Sample Handling

At a minimum, the following procedures shall be used at all times when collecting samples during investigation, corrective action, and monitoring activities:

1. Neoprene, nitrile, or other protective gloves shall be worn when collecting samples. New disposable gloves shall be used to collect samples. If any glove is contaminated by touching the sampled material, or other material that could contaminate or dilute the sample, the glove shall be replaced before taking another sample;
2. All samples collected of each medium shall be transferred into clean containers with the exception of soil, rock, and sediment samples obtained in brass sleeves or in Encore™ samplers. Sample container volumes and preservation methods shall be in accordance with EPA SW-846 and established industry practices; and
3. Sample labels and documentation shall be completed for each sample following procedures included in the site-specific work plans that are to be approved by the Department. Immediately after the samples are collected, they shall be stored either in a cooler with ice or by other appropriate storage method until they are delivered to the analytical laboratory. Chain-of-custody procedures, as described in this Permit Section (6.3.5.1) and Section 1.3.2.4 of Permit Attachment C shall be followed for all samples collected. All samples shall be submitted to the laboratory in an appropriate timeframe to allow the laboratory to conduct the specified analyses within the method holding times.

6.4.5.2. Sample Shipment Procedures

Shipment procedures shall include:

1. Individual sample containers shall be packed to prevent breakage, and transported in a sealed cooler with ice or other suitable coolant or as otherwise approved by the Department. Any drainage hole at the bottom of the cooler shall be sealed and secured to prevent leakage;
2. Each cooler or other container shall be delivered in a timely manner to the analytical laboratory;
3. Glass bottles shall be separated in the shipping container by cushioning material to prevent breakage;
4. Plastic containers shall be protected from possible puncture during shipping using cushioning material;
5. The chain-of-custody form and analytical request form shall be shipped inside the sealed storage container to be delivered to the laboratory; and
6. Chain-of-custody seals (signed and dated) shall be used to seal individual sample containers and the sample-shipping container in conformance with EPA guidance.

6.4.5.3. Sample Custody

All samples collected for analysis shall be recorded in the field report or data sheets. Chain-of custody forms shall be completed prior to the transfer of samples off-site, and shall accompany the samples during shipment to the laboratory. Upon receipt of the samples at the laboratory, the custody seals will be broken by laboratory personnel, the chain-of-custody form shall be signed as received by the laboratory, and the conditions of the samples shall be recorded on the form. The original chain-of-custody form shall remain with the laboratory and copies shall be returned to the relinquishing party. The Permittee shall maintain copies of all chain-of-custody forms generated as part of sampling activities. Copies of the chain-of-custody records (either paper copies or electronically scanned in PDF format) shall be included with final reports submitted to the Department.

A chain-of-custody form shall be used to track samples from collection through analysis to ensure the integrity of analytical results. A chain-of-custody form shall include:

1. Sample identification number;

2. Signature of sample collector;
3. Date and time of sample collection;
4. Location at which sample was collected;
5. Type of media sampled (e.g., soil);
6. Type of preservation;
7. Analysis required;
8. Signature of all persons that have had custody of the samples;
9. Dates and times of possession; and
10. Signature, date and time of breaking the custody seal.

An individual in custody of any sample must comply with the procedures identified in SW-846 Chapter Nine (EPA, 1986) and those included here.

6.4.5.4. Sample Labels

Sample labels or tags are necessary to prevent misidentification. Gummed paper labels or tags are adequate and shall include at a minimum:

1. Sample identification number;
2. Name or initial of collector;
3. Sample location;
4. Sample date and time;
5. Analytical method or parameter to be analyzed for (e.g., VOCs, SVOCs, metals);
6. Preservation method; and
7. Other remarks.

Labels shall be affixed to sample containers before sampling, and they shall be immediately completed with the above information after the samples are collected. The Permittee shall adhere to the following field custody procedures:

1. When collecting samples, as few people as possible should handle them;
2. Sampling personnel are responsible for the care and custody of samples until they are transferred or properly dispatched to the laboratory in accordance with the procedures described herein; and
3. Sample tags or labels shall be completed for each sample using waterproof ink, or covered by transparent waterproof tape.

6.4.6. In-Situ Testing and Other Tests

In-situ permeability tests, remediation system pilot tests, stream flow tests, and other tests

conducted to evaluate site, surface, and subsurface conditions shall be designated to accommodate specific site conditions and to achieve test objectives. The testing methods must be approved, in writing, by the Department prior to implementation. The tests shall be conducted in accordance with Department, EPA, United States Geological Survey, ASTM International (ASTM -http://www.astm.org/) or other methods generally accepted by industry that will allow information representative of site conditions to be obtained. Detailed logs of all relevant site conditions and measurements shall be made during the testing events. A summary of the general test results, including unexpected or unusual test results and equipment failures or testing limitations shall be reported to the Department. The summary shall be presented in a format acceptable to the Department and in general accordance with the report formats outlined in Permit Section 6.2.3.

6.4.7. Collection and Management of Investigation Derived Waste

IDW includes, but is not limited to, general refuse, drill cuttings, excess sample material, water (e.g., decontamination, development and purge), spent materials, and used disposable equipment generated during the course of investigation, corrective action, or monitoring activities. All IDW shall be properly characterized and disposed of in accordance with Permit Attachment C (Waste Analysis Plan) and all federal, state, and local laws and regulations for storage, labeling, handling, transport, and disposal of waste. The Permittee shall include a description of the anticipated IDW management process as part of any work plan submitted to the Department for approval. All waste generated during sampling and decontamination activities shall be temporarily stored in containers appropriate for the waste.

6.4.8. Surveying Sample, Well, and Site Feature Locations

The horizontal and vertical coordinates of the top of each monitoring well casing and the ground surface elevation at each monitoring well location shall be determined by a registered New Mexico professional land surveyor or licensed Professional Engineer. Horizontal coordinates shall be measured in accordance with the State Plane Coordinate System (NMSA 1978, 47-1-49-56 [Repl. Pamp. 1993]). The surveys shall be conducted in accordance with 12.8.2 NMAC -- *Minimum Standards for Surveying in New Mexico*. Horizontal positions shall be measured to the nearest 0.1 foot, and vertical elevations shall be measured to the nearest 0.01 foot. The Permittee shall prepare site map(s), certified by a registered New Mexico professional land surveyor or licensed Professional Engineer, presenting all surveyed locations and elevations of

wells and relevant site features and structures for submittal with all associated reports to the Department.

Site attributes (e.g., soil sample locations, sediment sample locations, springs, outfalls, pertinent structures, monitoring stations, as well as staked-out sampling grids), shall be located by using the global positioning system (GPS), an electronic total station with prism reflectors, transit with stadia rod or tape, or a combination of these surveying systems, or by a registered New Mexico Registered Land Surveyor or licensed Professional Engineer using the methods described in the paragraph above. Horizontal locations of site attributes shall be measured to the nearest 1.0-foot. The Permittee shall provide the Department with a statement of accuracy for survey data upon request.

6.4.9. Requirements for Exploratory and Well Installation Borings and Exploratory Excavations

Borings shall be completed at locations specified in this Permit or as approved by the Department in Investigation Work Plans. The Department may require additional exploratory or well borings as needed to ensure protection of human health and the environment. Any additional boring locations will be determined, and approved, by the Department. The anticipated depths and locations of exploratory and well borings shall be specified in work plans submitted to the Department for approval prior to the start of the field activities.

Borings that are not completed as permanent groundwater or soil-vapor monitoring wells shall be properly abandoned. Borings completed as either groundwater monitoring or soil-vapor wells shall be completed in accordance with the requirements described in this Permit Section (6.5.9). Exploratory and monitoring well borings shall be drilled using the most effective, proven, and practicable method for recovery of undisturbed samples and potential contaminants. The drilling method selected must be approved by the Department prior to the start of field activities. Based on the drilling conditions, the borings shall be completed using one of the following methods:

1. Hollow-stem auger;
2. Air rotary;
3. Mud rotary (generally will not be approved by the Department);
4. Percussion hammer;
5. Dual wall air rotary;
6. Direct Push Technology;
7. Cable tool;
8. Sonic; or

9. Air Rotary Casing Hammer (ARCH).

Hollow-stem auger or Direct Push Technology drilling methods are preferred if vapor-phase or volatile organic compound (VOC) contamination is known or suspected to be present. Air rotary, hollow stem auger, percussion hammer, dual wall air rotary, direct push technology, cable tool or sonic drilling are preferred for borings intersecting the saturated zone of any aquifer. The type of drilling fluids or additives used, if necessary, must be approved by the Department prior to the start of drilling activities. The use of drilling fluids, especially other than air and potable water, is discouraged.

All drilling equipment shall be in good working condition and capable of performing the assigned task. Drilling rigs and equipment shall be operated by properly trained, experienced, and responsible crews. The Permittee is responsible for ensuring that contaminants from another site or facility are not introduced into the SWMU or AOC under investigation due to equipment malfunction or poor equipment decontamination. Drilling equipment shall be properly decontaminated before initiation of drilling for each boring. Exploratory borings shall be advanced to the depths specified or approved by the Department. The Permittee shall propose drilling depths in the site-specific work plans submitted for each subject area where subsurface investigations are needed. Unless otherwise specified in this Permit or approved by the Department in work plans, the borings shall be advanced to the following minimum depths (see also Permit Section 6.5.11):

1. In all borings, 25 feet below the deepest detected contamination;
2. Twenty-five feet below the base of disposal units;
3. Five feet below the base of shallow structures such as piping or building sumps, or other building structures; and
4. Depths specified by the Department based on regional, or on SWMU or AOC specific data needs.

The Permittee shall notify the Department as early as practicable if conditions arise or are encountered that do not allow the advancement of borings to the depths specified or approved by the Department so that alternative actions may be approved. Precautions shall be taken to prevent the migration of contaminants between geologic, hydrologic, or other identifiable zones during drilling and well installation activities. Contaminant zones shall be isolated from other zones encountered in the borings. The drilling and sampling shall be conducted under the direction of a qualified engineer or geologist who shall maintain a detailed log of the materials and conditions encountered in each boring. Both sample information and visual observations of

the cuttings and core samples shall be recorded on a boring log. Known site features and/or site survey grid markers shall be used as references to locate each boring prior to surveying the location. The boring locations shall be located to the nearest foot of their planned location, and locations shall be recorded on a scaled site map upon completion of each boring.

Trenching and other exploratory excavation methods shall follow the applicable general procedures outlined in this Permit. Methods proposed by the Permittee for exploratory excavation and sampling at the OB and OD Treatment Units shall be included in a site-specific Investigation Work Plan submitted to the Department.

6.4.10. Requirements for Geophysical Surveys

Where necessary, the Permittee shall conduct geophysical surveys to locate underground utilities, pipelines, drums, debris, and other buried features, including buried waste, in the shallow subsurface. The methods used to conduct the surveys, such as magnetometer, ground penetrating radar, resistivity, or other methods, shall be selected based on the characteristics of the site and the possible or suspected underground features. Results of the surveys shall be included in Investigation Reports submitted to the Department.

6.4.11. Requirements for Deep Subsurface Soil, Rock, and Sediment Sampling

Deep subsurface samples are those collected at depths that generally require the use of power equipment. Relatively undisturbed discrete soil and rock samples shall be obtained, where possible, during the advancement of each boring for the purpose of logging, field screening, and analytical testing. Generally, samples shall be collected at the following intervals and depths:

1. At five-foot intervals, ten-foot intervals, continuously, or as approved by the Department;
2. At the depth immediately below the base of the disposal unit or facility structure;
3. At the maximum depth of each boring or excavation;
4. At the depths of contacts or first encounter with geologic units of different lithology, structural or textural characteristics, or of relatively higher or lower permeability that are observed during drilling or excavating;
5. At depths where soil or rock types are more likely to sorb or retain contaminants as compared to surrounding lithologic units;
6. At the depth of the first encounter of any saturated zones;
7. At intervals suspected of being source or contaminated zones; and
8. At other intervals approved or required by the Department.

Additional samples may be obtained from any depth based on field observations. A split-barrel sampler lined with brass sleeves, a coring device, or other method approved by the Department shall be used to obtain samples during the drilling of each boring.

A split barrel sampler lined with brass sleeves is the preferred sampling method for borehole soil and sediment; a coring device is the preferred sampling method for rock sampling. The following procedures should be followed if a split barrel sampler is used. Upon recovery of the sample, the brass sleeves shall be removed from the split barrel sampler, and the open ends of the sleeves covered with Teflon tape or foil and sealed with plastic caps fastened to the sleeves with tape for shipment to an analytical laboratory. If brass sleeves are not used, a portion of the sample shall be placed in clean containers for laboratory analysis. The remaining portions of the sample shall be used for field screening and logging, as described in Permit Sections 6.3.13 and 6.3.15, respectively. Discrete samples shall be collected for field screening and laboratory analyses. For analyses other than that for VOCs and semivolatile organic compounds (SVOCs), the Permittee may submit site-specific, alternative methods for homogenization of samples in the field to the Department for review and written approval. Samples to be submitted for laboratory analyses shall be selected based upon: 1) the results of the field screening or mobile laboratory analyses; 2) the position of the sample relative to groundwater, suspected releases, or site structures; 3) the sample location relative to former or altered site features or structures; 4) the stratigraphy encountered in the boring; and 5) the specific objectives and requirements of this Permit and the approved work plan for the OB and OD Treatment Units under investigation. The proposed number of samples and analytical parameters shall be included as part of the site-specific work plan submitted to the Department for approval prior to the start of field investigation activities.

6.4.12. Surface and Shallow Subsurface Soil and Sediment Sampling Procedures

Surface soil samples are those collected at depths of 0 to 6 inches. Shallow subsurface samples are those collected at depths that do not require the use of power equipment. Surface and shallow subsurface soil and sediment samples shall be collected in accordance with the procedures described below. Samples that are collected for analyses other than for VOCs or SVOCs shall be obtained using a hand-held stainless steel coring device, Shelby tube, thin-wall sampler, or other device approved by the Department. The samples shall be transferred to clean containers for submittal to the laboratory. Samples obtained for VOC or SVOC analysis shall be collected using Shelby tubes, thin-wall samplers, or other device approved by the

Department. The ends of the samplers shall be lined with Teflon tape or aluminum foil and sealed with plastic caps fastened to the sleeves with tape for shipment to the analytical laboratory.

6.4.13. Field Screening of Soil, Rock, and Sediment Samples

Samples shall be screened in the field for the presence of contaminants, if required by the Investigation Work Plan or other sampling and analysis plan. Field screening results shall be recorded on the exploratory boring and excavation logs or other field logs. Field screening results are used as a general guideline to determine the nature and extent of possible contamination. In addition, screening results shall be used to aid in the selection of soil, rock, sediment, and vapor-phase samples for laboratory analysis. The primary screening methods to be used shall include:

1. Visual examination;
2. Headspace vapor screening for VOCs; and
3. Metals screening using X-ray fluorescence (XRF).

Additional screening for characteristics such as pH, high explosives, or for other specific compounds using field test kits shall be conducted where appropriate.

Headspace vapor screening shall target VOCs and shall be conducted by placing a soil, sediment, or rock sample in a plastic sample bag or a foil-sealed container, allowing head space for ambient air. The container shall be sealed and then shaken gently to expose the sample to the air trapped in the container. The sealed container shall be allowed to rest for a minimum of five (5) minutes while vapor concentrations equilibrate. Vapor concentrations present within the headspace will then be measured by inserting the probe of the monitoring instrument into a small opening in the bag or through the foil. The maximum value and the ambient air temperature shall be recorded on the log for each sample. A photo-ionization detector equipped with a 10.6 or higher electron volt (eV) lamp, combustible gas indicator, or other instrument approved by the Department shall be used for VOC field screening. The limitations, precision, and calibration procedures of the monitoring instrument to be used for VOC field screening shall be included in the Investigation Work Plan prepared for the OB and OD Treatment Units.

XRF shall target metals. XRF screening requires proper sample preparation and instrument calibration. Sample preparation and instrument calibration procedures shall be documented in the field logs. The methods and procedures for sample preparation and instrument calibration shall be approved by the Department prior to the start of field activities. The Permittee shall record on the field logs all conditions capable of influencing the results of field screening. The

Permittee shall submit to the Department a report detailing any conditions potentially influencing field screening results. This report shall be included in any report where the field screening results are presented. At a minimum, the Permittee shall submit the samples with the greatest apparent degree of contamination, based on field observations and field screening, for laboratory analysis. In addition, the Permittee shall submit the samples with no or little apparent contamination, based on field screening, for laboratory analysis if the intention is to confirm that the base (or other depth interval) of a boring or other sample location is not contaminated.

6.4.14. Field Quality Control for Soil, Rock, and Sediment Sampling

The Permittee shall collect Quality Control (QC) samples to monitor the quality of sample collection and laboratory analysis. Field duplicates shall consist of two samples either split from the same sample device or collected sequentially. Field duplicates shall be collected at a rate of at least 10 percent of the total number of environmental samples submitted for analysis. At a minimum, one duplicate sample shall always be collected and analyzed for the appropriate contaminants. The Permittee shall prepare and analyze equipment blanks from all sampling apparatus at a frequency of at least five (5) percent of the total number of samples submitted for analysis. Equipment blanks shall be generated by rinsing decontaminated sampling equipment with deionized water, and capturing the rinsate water in an appropriate sample container.
In the case of VOC analyses, the Permittee shall prepare and analyze field blanks at a frequency of at least one (1) per day for each medium sampled at the OB and OD Treatment Units. Reagent blanks shall be prepared and analyzed if chemical analytical procedures requiring reagents are employed in the field as part of the investigation or monitoring program. Each type of QC sample shall be submitted for laboratory analyses, and analyzed in the same batch that the environmental samples they represent.

6.4.15. Logging of Soil, Rock, and Sediment Samples

The physical characteristics of soil, rock, and sediment samples, such as mineralogy, ASTM soil classification, American Geological Institute rock classification, moisture content, texture, color, presence of stains or odors, field screening results, depth, location, method of sample collection, and other observations shall be recorded in a field log. Samples shall be visually inspected and the soil, sediment, or rock type classified in general accordance with ASTM D2487 (Unified Soil Classification System) and ASTM D2488 (Standard Practice for Description and Identification of Soils), or American Geological Institute Methods for soil and rock classification or in other ways approved by the Department. Detailed logs shall be completed in

the field by a qualified geologist. Additional information, such as the presence of water-bearing zones and any unusual or notable conditions encountered during drilling shall be recorded on the logs. Field boring logs, test pit logs, and field well construction diagrams shall be converted to a format acceptable for use in final reports submitted to the Department.

6.4.16. Requirements for Soil-Vapor Monitoring

Samples of subsurface vapors shall be collected from vapor monitoring points where required by the Department. The Permittee shall, as required by the Department, collect soil-vapor samples for field measurement of:

1. Percent oxygen;
2. Organic vapors (using a photo-ionization detector with a 10.6 eV lamp, a combustible vapor indicator or other method approved by the Department);
3. Percent carbon dioxide;
4. Static subsurface pressure; and
5. Other parameters, such as carbon monoxide and hydrogen sulfide.

The Permittee also shall collect soil-vapor samples for laboratory analysis of the following:

1. Percent moisture;
2. VOCs; and
3. Other analytes required by the Department.

When collecting soil-vapor samples for laboratory or field analysis, the Permittee shall continually monitor the concentrations of soil vapor from a given monitoring point with an appropriate field instrument (e.g., photoionization detector). The Permittee shall collect soil vapor samples after the field instrument readings have stabilized and after the sampling tubing and soil-vapor monitoring well have been appropriately purged to remove all stagnant vapor. Soil-vapor samples for laboratory analysis shall be collected using SUMMA canisters[1] or other sample collection method approved by the Department. The samples shall be analyzed for VOC concentrations by EPA Method TO-15 (as it may be updated) or equivalent VOC analytical method approved by the Department. In the field, soil-vapor measurements, the date and time of each measurement, and the type and serial number of field instrument used shall be

[1] The term “SUMMA” Canister is a trademark that refers to electropolished, passivated stainless steel vacuum sampling devices, such as TO canisters, SilcoCans, MiniCans, etc, which are cleaned, evacuated, and used to collect whole-air samples for laboratory analysis

recorded in a field log book. The method used to obtain soil-vapor field measurements and samples must be approved by the Department in writing prior to the start of monitoring. Soil vapor wells shall not be installed with the use of any fluids. Soil vapor wells may be completed by backfilling with native materials. If a soil vapor well is installed as a permanent monitoring point, the Permittee shall not sample the well before the expiration of the 24-hour equilibration period following completion of installation. Information on the design and construction of soil-vapor monitoring wells shall be recorded as for groundwater monitoring wells (Permit Section 6.3.17.10) as applicable. Soil-vapor monitoring wells shall be designed and constructed in a manner that will yield high quality samples. The design and depth of installation must be approved by the Department.

6.4.17. Technical Requirements for Groundwater Investigations

The Permittee shall conduct investigations of groundwater in accordance with Department approved work plans to fully characterize the nature, vertical and lateral extent, concentration, rate of migration, fate, and transport of groundwater contamination originating from the OB and OD Treatment Units to determine the need for, and scope of, corrective action. The investigation shall include an evaluation of the physical, biological, and chemical factors influencing the transport of hazardous constituents and other contaminants in groundwater. The Permittee shall implement the groundwater investigation requirements in accordance with the requirements set forth in this Permit Section (6.3.17) and in approved work plans. All data shall be collected according to Department, EPA and industry accepted methods and procedures, and in accordance with this Permit Section (6.3.17) and any other requirements of this Permit.

6.4.17.1. Objectives

The Permittee shall implement groundwater investigations to determine the following as required by the Department:

1. Nature, extent, rate of migration, and concentration of historical and current releases of contaminants to groundwater;
2. Fate and transport, including boundary conditions, of contaminants releases within groundwater;
3. The depth to groundwater, water table elevations, potentiometric surfaces, and any seasonal variations;
4. Groundwater flow directions and velocities;
5. Migration of groundwater across hydrostratigraphic and structural boundaries;

6. Watershed and regional water balance information for evaluating contaminant fate and transport including: *i)* recharge and discharge locations, rates, and volumes, *ii)* evapotranspiration data and *iii)* stream-flow data;
7. Water supply well pumping influences, including data for wells not owned by the Permittee, if available;
8. Saturated and unsaturated hydraulic-conductivity (Kx,y,z), porosity, effective porosity, permeability, transmissivity, particle-size, storage coefficients, and estimated fracture/secondary porosity;
9. Contaminant concentrations in soil, rock, sediment, air, and vapor; and absorption coefficients (Kds);
10. Changes in groundwater chemistry and the causes;
11. Regional and perched aquifer boundaries;
12. Geologic, hydrostratigraphic, and structural relationships; and,
13. General water chemistry.

In selecting a site for a new well, the Permittee shall consider paleotopography, fracture density and orientation, source areas, contaminant characteristics, geologic structures, groundwater flow direction, and the known occurrences of groundwater. All existing and newly installed wells and piezometers shall be surveyed in accordance with the requirements described in Permit Section 6.3.8.

6.5 KAFB Performance Based Contracts

6.5.1 KAFB Bulk Fuels Facility Fuel Release

On 30 September 2010, the Air Force issued a Performance Based Contract (PBC) to remediate soil and groundwater fuel contamination released from the KAFB Bulk Fuels Storage Facility (BFF). Specific performance objectives can be found in Appendix L.

6.5.2 KAFB Open Burn/Open Detonation Unit Closure

On 29 September 2011, the Air Force issued a PBC to achieve clean closure on the Open Burn and Open. Specific performance objectives can be found in Appendix L.

6.5.3 KAFB Installation Corrective Action

On 20 September 2013, the Air Force issued a PBC to remediate existing SWMU's and or AOC's. Specific performance objectives for SWMU's and AOC's can be found in Appendix L.

APPENDIX A

FACILITY INFORMATION

APPENDIX A
FACILITY INFORMATION

The information in this appendix is submitted to address the applicable Part B permit application facility description requirements in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), §270.14(b)(1, 10, 11, and 19); 20.4.1 NMAC §270.14(c); 20.4.1 NMAC §270.23(b); and 20.4.1 NMAC §264.18(b). The following subject areas are addressed herein:

- A general description of the Kirtland Air Force Base (KAFB) facility and the Explosive Ordnance Disposal (EOD) Range [20.4.1 NMAC §270.14(b)(1)];
- Location information for compliance with the seismic standard and floodplain standard requirements [20.4.1 NMAC §270.14(b)(11) and §270.14(b)(19)(ii), and 20.4.1 NMAC §264.18(a) and (b)];
- Topographic map requirements [20.4.1 NMAC §270.14(b)(19) and §270.23(b)]; and
- Additional information requirements [20.4.1 NMAC §270.14(c)].

A.1 GENERAL DESCRIPTION [20.4.1 NMAC, incorporating 40 CFR §270.14(b)(1)]

The KAFB facility, which is owned and operated by the U.S. Air Force, is located in Bernalillo County in north-central New Mexico. The regional location of KAFB is shown on Figure A-1. KAFB, located just south of and adjacent to Albuquerque, comprises an area of approximately 52,233 acres. The central mission of KAFB is the administration of defense programs for the U.S. Department of Defense.

The EOD Range is located in the south-central portion of the KAFB facility. The EOD Range is southeast of the former Manzano Base, east of Demolition Range Road, and approximately two miles north of the southern perimeter of KAFB (Figure A-2). The EOD Range occupies generally flat, gently west-sloping mesa land located between the Rio Grande Valley to the west and near the base of the Manzano Mountains to the east. The nearest surface water body is the Rio Grande, located about 10 miles west of the EOD Range.

The open burn (OB) and open detonation (OD) units (no longer used since late 2010) are located at the EOD Range. These units were used to treat (i.e., burn or detonate) reactive (D003) and ignitable (D001) hazardous wastes, such as bulk explosives; damaged, defective, expired, and unserviceable munitions; and explosive-contaminated wastes. These waste types were generated during mission and research and development activities. Descriptions of the OB and OD units are provided in Section 2.0 and Appendix G of this Part B permit renewal application.

A.2 LOCATION INFORMATION [20.4.1 NMAC, incorporating 40 CFR §270.14(b)(11)] Location information addressing the seismic standard and 100-year floodplain standard are provided, in accordance with 20.4.1 NMAC, incorporating 40 CFR §270.14(b)(11).

A.2.1 Seismic Standard [20.4.1 NMAC, incorporating 40 CFR §270.14(b)(11)(i and ii); 20.4.1 NMAC §264.18(a)] KAFB is an "existing" facility that met the requirements for interim status under Section 74-4-9 of the New Mexico Hazardous Waste Act and Section 3005(e) of the Resource Conservation and Recovery Act (RCRA). The U.S. Environmental Protection Agency specifically exempted "existing" facilities operating under interim status from the requirement under 20.4.1 N MAC, incorporating 40 CFR §270.14(b)(11), to submit a Part B permit application that demonstrates compliance with the seismic standards under 20.4.1 NMAC §264.18(a) [see 46 *Federal Register [FR]* 2802 and 46 *FR* 2813 (January 12, 1981)].

A.2.2 Floodplain Standard [20.4.1 NMAC, incorporating 40 CFR §270.14(b)(11)(iii), (iv), and (v); 20.4.1 NMAC, incorporating 40 CFR §270.14(b)(19)(ii); 20.4.1 NMAC §264.18(b)] The extent of the 100-year floodplains of Tijeras Arroyo and Arroyo del Coyote is shown on Map A-1. Map A-1 includes information from a U.S. Army Corps of Engineers (COE) map (COE, 1979), which was prepared using Federal Emergency Management Administration (FEMA) guidelines. The FEMA guidelines are equivalent to the mapping techniques used to prepare Federal Insurance Administration floodplain maps. As shown on Map A-1, the EOD Range is not located within a 100-year floodplain, as defined in 20.4.1 NMAC §264.18(b)(2)(i), and as regulated under 20.4.1 NMAC §264.18(b)(1). Thus, the floodplain requirements are not applicable to the OB and OD units at the EOD Range.

A.3 TOPOGRAPHIC MAPS [20.4.1 NMAC, incorporating 40 CFR §270.14(b)(19) and §270.23(b)] Due to the size of KAFB, several maps and figures are provided to meet the requirements of 20.4.1 NMAC §270.14(b)(19) incorporating 40 CFR §270.23(b). Maps and figures clearly show the map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- A shaded relief map showing the KAFB facility, including the EOD Range, as Map A-1.
- A topographic map showing the KAFB facility, including the EOD Range, as Map A-2.
- A topographic map showing a distance of 1,000 feet beyond the OB/OD unit boundaries, using a scale of 1 inch to 200 feet, as Map A-3.
- The 100-year floodplain area (i.e., portions of Tijeras Arroyo and Arroyo del Coyote) is shown on Map A-1.The area of the 100-year floodplain is based on the data provided by the COE (COE, 1979). As illustrated on Map A-1, the EOD Range is not located in a 100-year floodplain.

- Intermittent streams may flow through any of the canyons and arroyos within the KAFB boundaries. However, there here are no permanent natural surface waters within the KAFB boundary. Tijeras Arroyo and Arroyo del Coyote carry water intermittently as a result of rainfall and snowmelt at KAFB and in the Manzanita and Sandia mountains east of the KAFB facility. There are springs, which yield localized surface flow to arroyos, in Laurance Canyon and Sol se Mete Canyon in the eastern part of KAFB. These localized surface flows infiltrate into the alluvium within a very short distance downstream of the springs. There are also springs (or rock seeps) in the former Manzano Base area.
- Surrounding land uses are shown on Figure A-4, and land uses within the KAFB boundary are shown on Figure A-5. Land use in the vicinity of the KAFB facility is urban to the immediate northwest, north, and northeast. The urbanized area is predominantly residential, with commercial development along more heavily traveled streets. Undeveloped grazing land of the Isleta Indian Reservation is located to the south. .Undeveloped public grazing land lies to the west and southwest of KAFB. Military (base) housing is located within KAFB. The Albuquerque International Sunport is located just west of KAFB.
- The legal boundary of the KAFB facility is shown on Map A-1.
- Access controls (fences, gates) for the KAFB facility are shown on Figure A-6. KAFB is a secure facility enclosed by chain-link and barbed-wire fences. The KAFB boundary is routinely patrolled by security guards. Access to KAFB is provided by six entrance gates. Three of the entrance gates (Truman, Gibson, and Eubank) are open at all times and are continuously guarded by Air Force personnel. The other gates (Carlisle, Southgate and Wyoming) are open for facility access during scheduled periods of the day, guarded by Air Force personnel during operation, and securely locked at other times. Access controls for the EOD Range are shown on Figure A-3.
- Withdrawal wells, both on-site and off-site, are shown on Map A-1. There are no injection wells at KAFB. None of the drinking water-supply wells located at the KAFB facility and shown on Map A-1 were expected to be influenced by hazardous waste management activities at the EOD Range because treatment of hazardous waste occurred only in the controlled area of the EOD Range, which is over four miles south-southwest of the nearest drinking water-supply well.
- The locations of buildings, treatment operations, and other structures (i.e.-built-up areas, access streets and internal roads) at the KAFB facility are shown on Map A-1. The location of the runoff control system (i.e., the earthen berm) at the EOD Range is shown on Figure A-3.
- An earthen berm provided a barrier to prevent drainage from the area of the OB and

OD units; the location of this berm is shown on Figure A-3. The EOD Range is not located within the 100-year floodplain and there are no permanent natural surface bodies of water within the boundaries of KAFB. The existing two-foot high earthen berm was routinely maintained (until treatment activity was terminated in 2010) and was adequate for preventing run-on, runoff, or flooding that could result from storm events, which are the most likely sources of surface water flow.

- The location of the EOD Range is shown on Maps A-1 and A-2, and the locations of the operational units (i.e., the OB and OD units) where hazardous waste was treated are shown on Map A-1, Map A-2, Map A-3 and Figure A-3.

Contour lines on the topographic map (Map A-2) are in intervals sufficient to detail natural drainage at the KAFB facility and in the vicinity of the OB and OD units at the EOD Range. As provided in 20.4.1 NMAC, incorporating 40 CFR §270.14(b)(19), KAFB has submitted Map A-2 at a scale of one inch equals 0.5 mile and with contour intervals of 50 feet due to the extent of the KAFB facility and the varied topographic relief in the area.

A.4 ADDITIONAL INFORMATION REQUIREMENTS

[20.4.1 NMAC, incorporating 40 CFR §270.14(c)] Additional information regarding protection of groundwater is required from owners or operators of hazardous waste facilities containing a regulated unit, in accordance with 20.4.1 NMAC, incorporating 40 CFR §270.14(c). Regulated units, as described in 20.4.1 NMAC, incorporating 40 CFR §264.90(a)(2), include surface impoundments, waste piles, land treatment units, or landfills that receive hazardous waste after July 26, 1982. There are no "regulated units" at the KAFB facility; therefore, the requirements of 20.4.1 NMAC, incorporating 40 CFR §270.14(c) are not applicable.

A.5 REFERENCES

COE, 1979, "Special Flood Hazard Information: Tijeras Arroyo and Arroyo del Coyote, KAFB, New Mexico," U.S. Army Corps of Engineers, Albuquerque, NM.

Federal Register, 1981, Volume 46, pgs. 2802-2813, January 12, 1981.

KAFB, 2002, "Economic Impact Statement FY02," Kirtland Air Force Base, Albuquerque, NM.

Meyers, L., Kirtland Air Force Base, Construction and Engineering Department, Albuquerque, New Mexico, March 1991, Personal Communication to B.A. Sladek, IT Corporation, Albuquerque, NM.

URS, 2001, "Carbon Monoxide Monitoring Study, Kirtland Air Force Base, Albuquerque, New Mexico," prepared for 377th Air Base Wing, Kirtland Air Force Base, Albuquerque, NM, by URS Group Inc., July 2001.

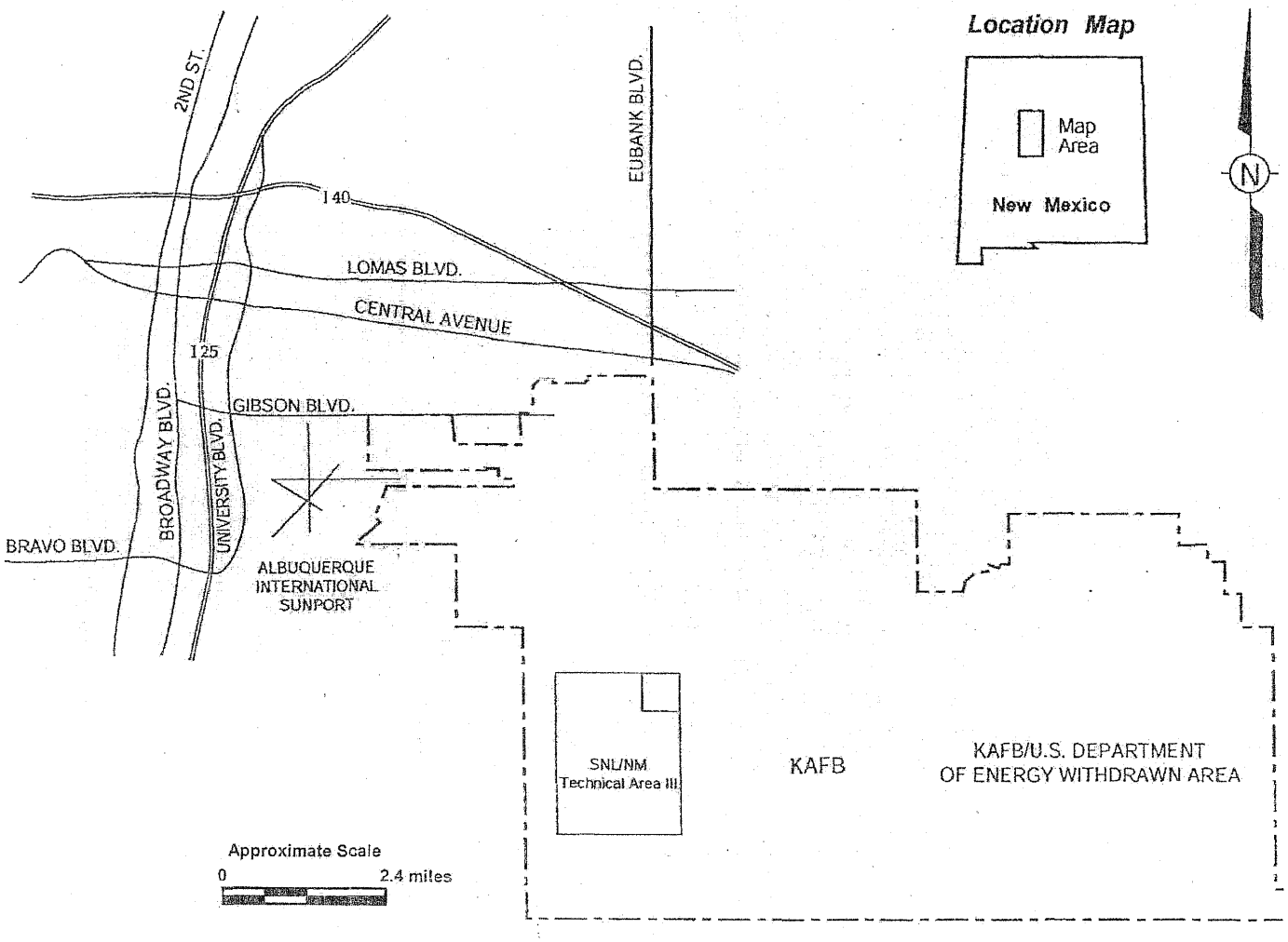


Figure A-1
Regional Location of Kirtland Air Force Base (KAFB)

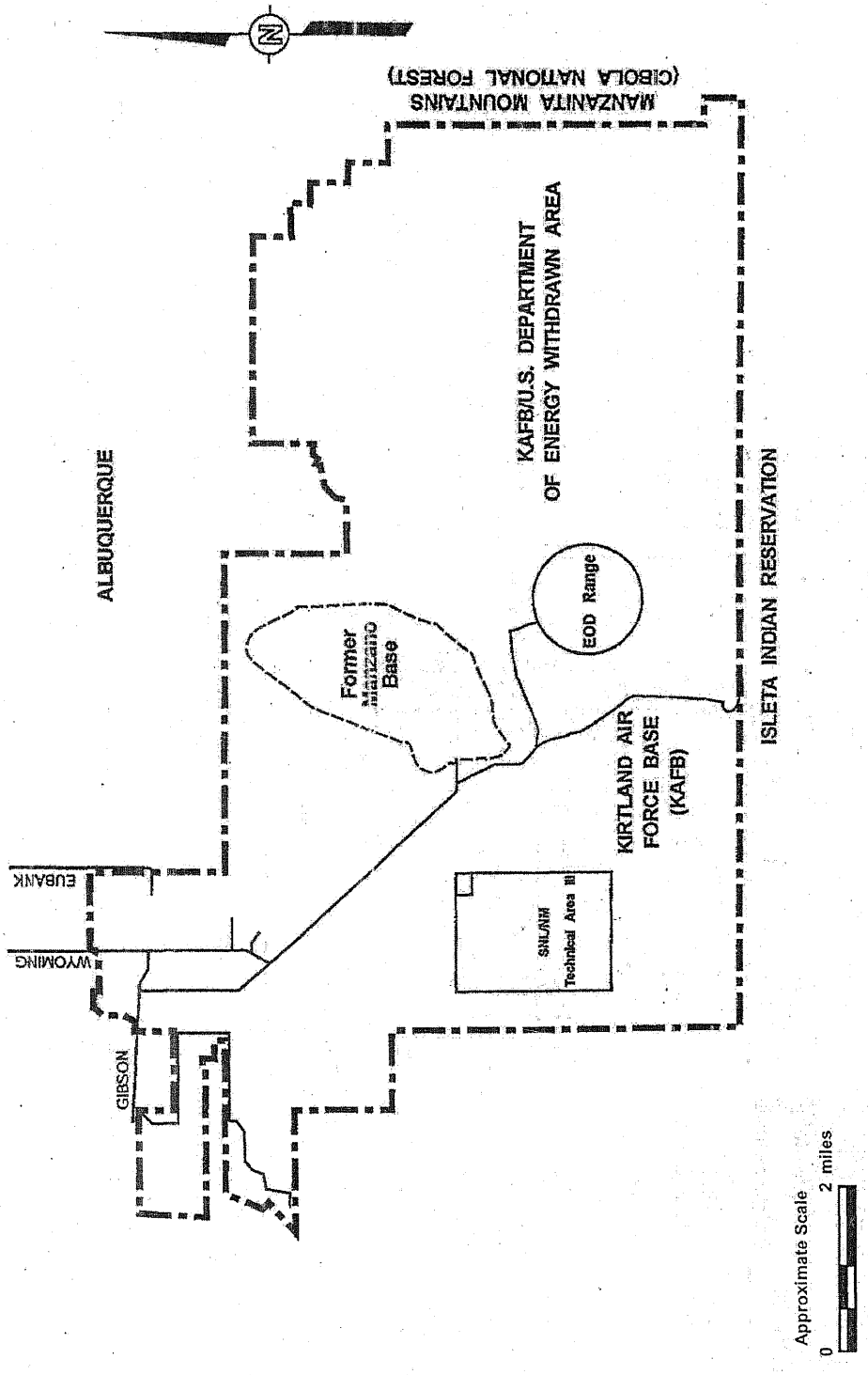


Figure A-2
Location of the Explosive Ordnance Disposal (EOD) Range

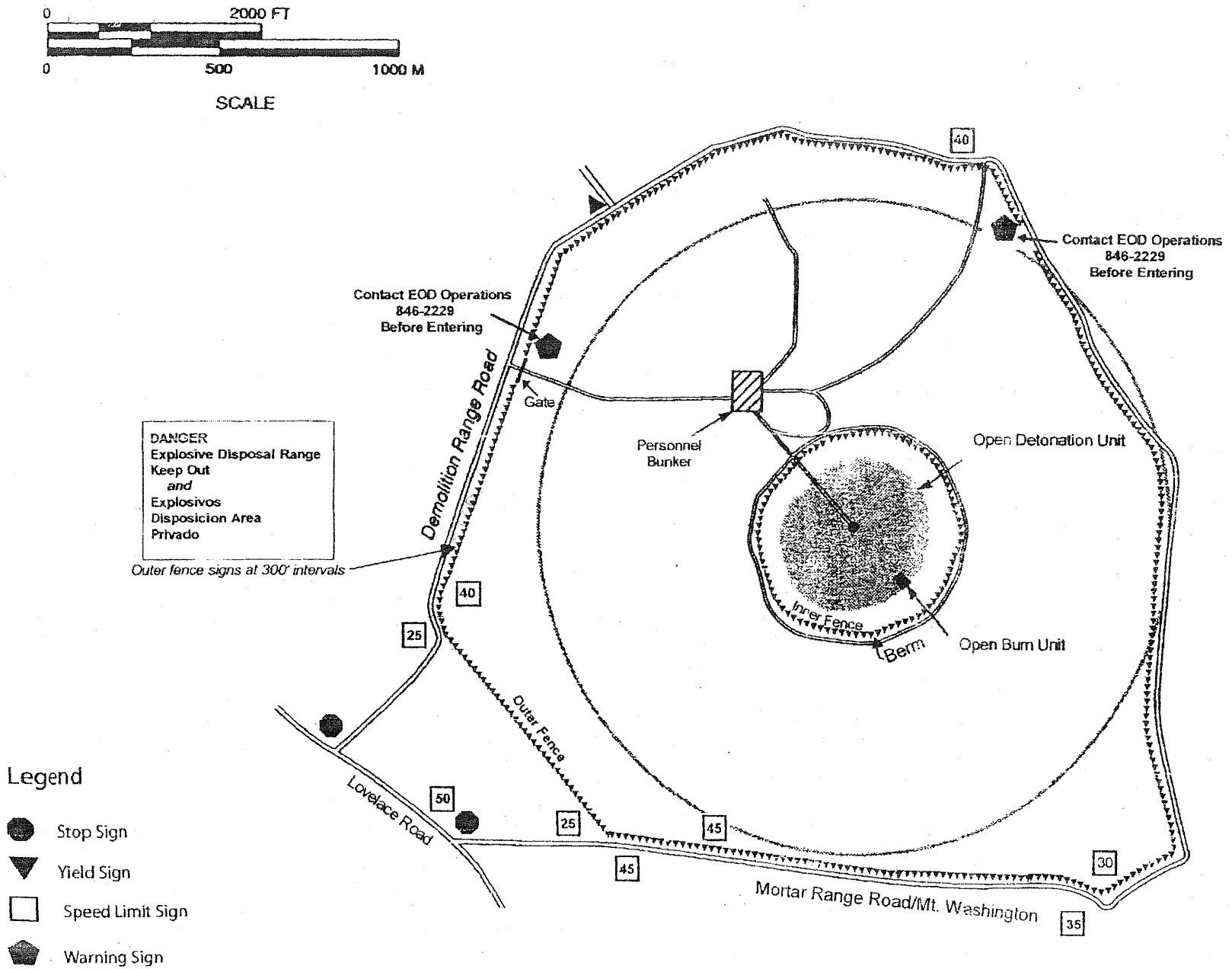


Figure A-3
Locations of Traffic Control Signs, Access Controls, and Runoff Control Berm
in the Vicinity of the Explosive Ordnance Disposal Range

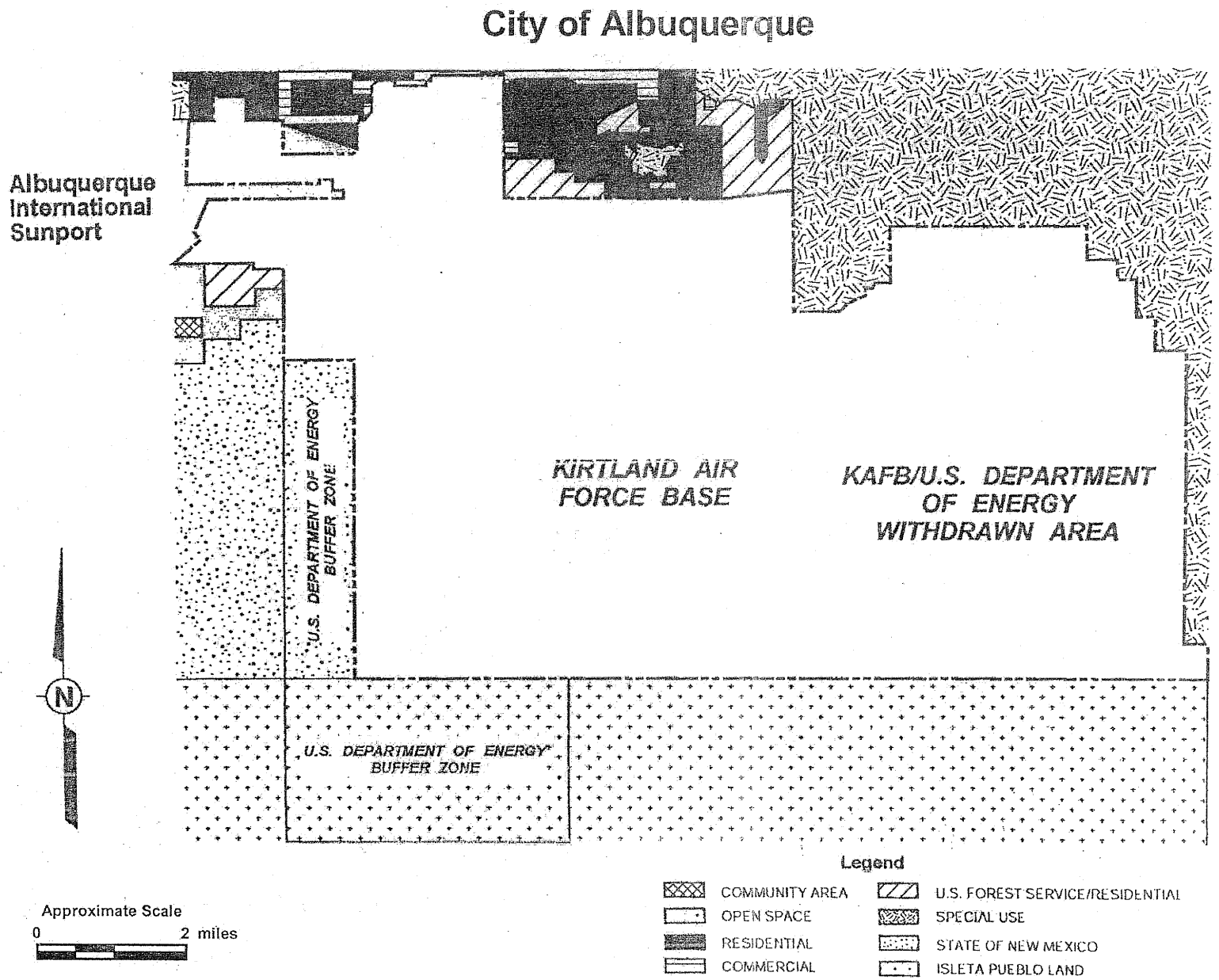


Figure A-4
Land Uses Adjacent to Kirtland Air Force Base

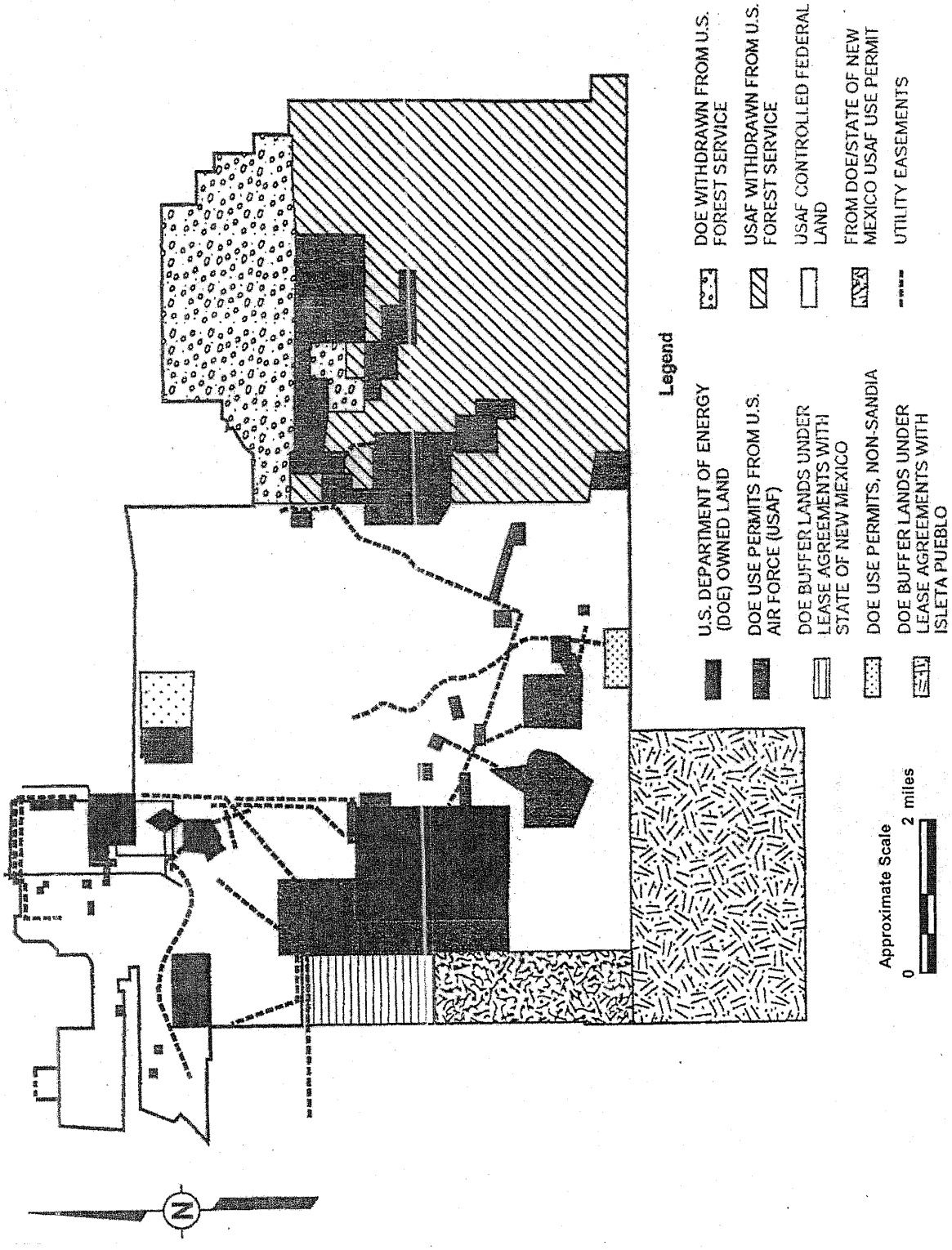


Figure A-5
Land Uses Within the Kirtland Air Force Base Boundary

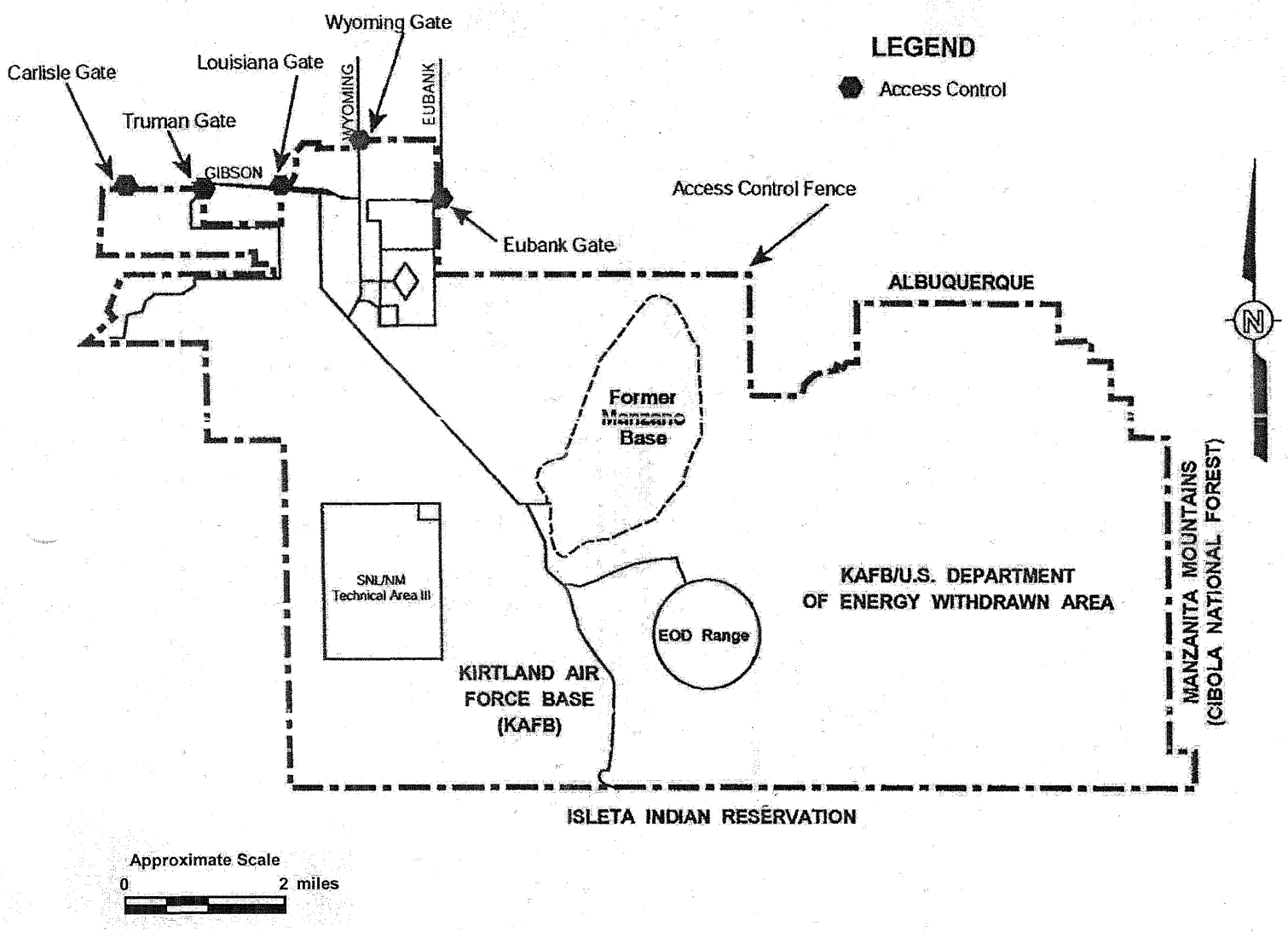
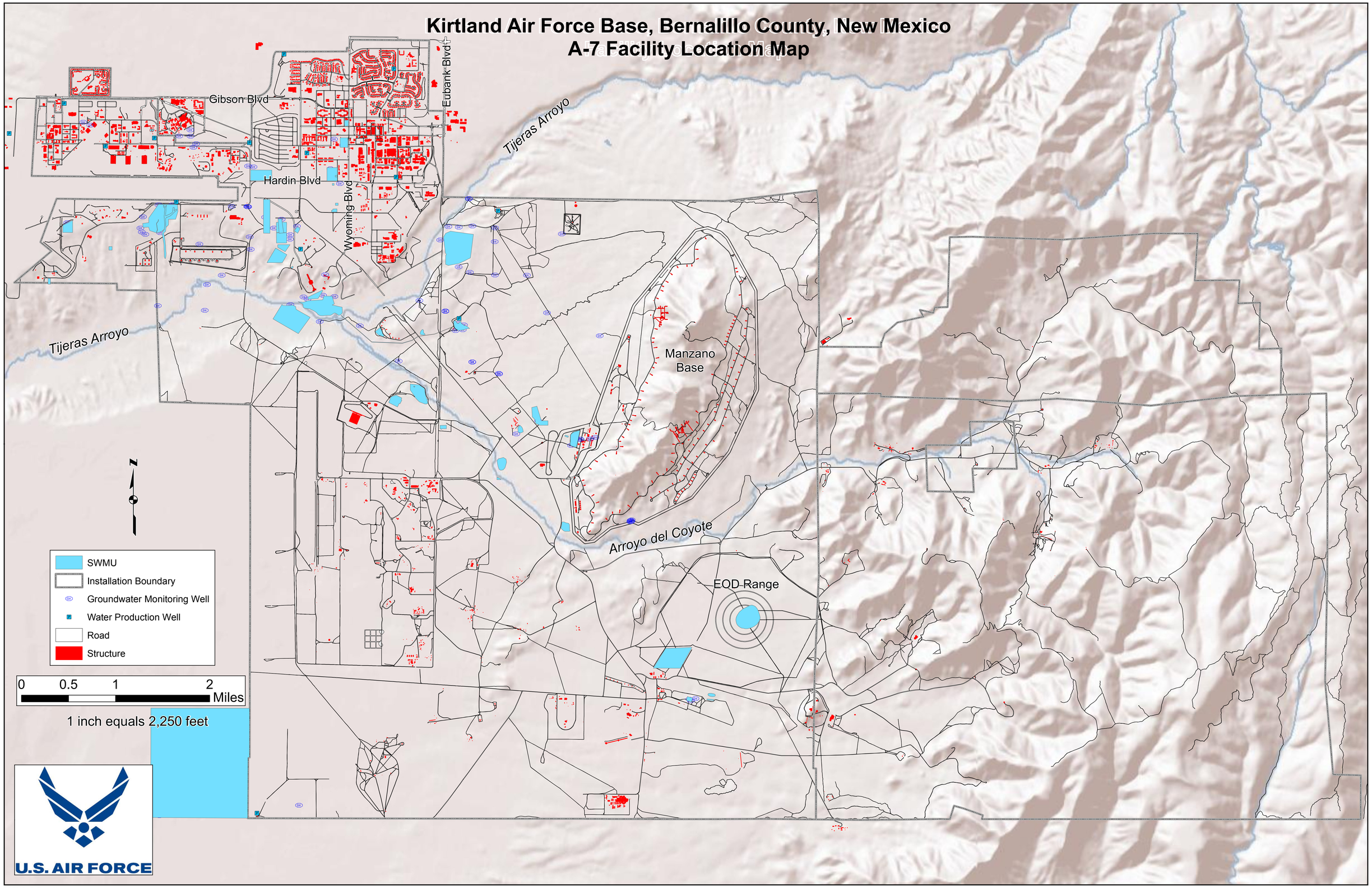


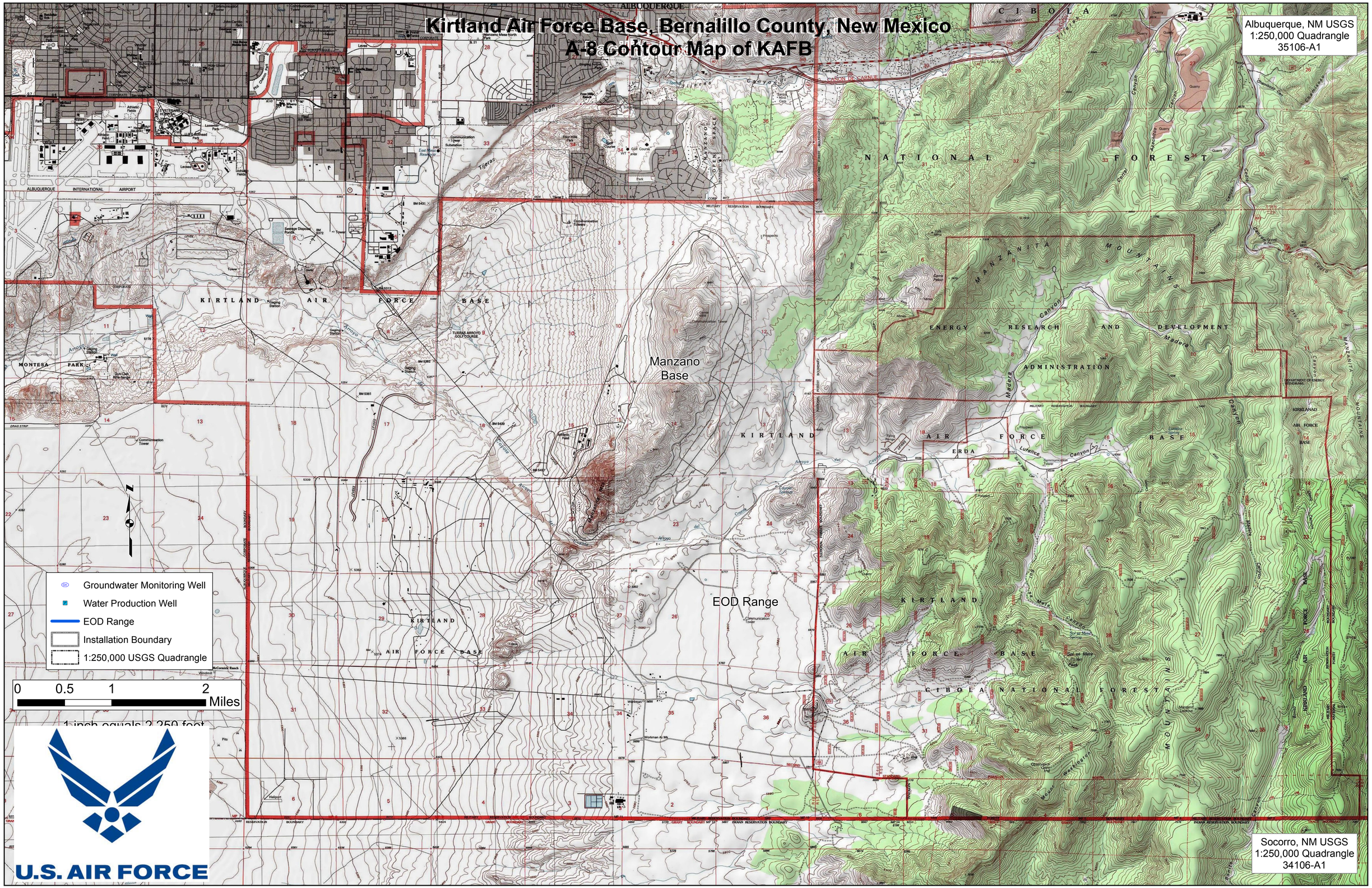
Figure A-6
Kirtland Air Force Base Access Controls

Kirtland Air Force Base, Bernalillo County, New Mexico
A-7 Facility Location Map



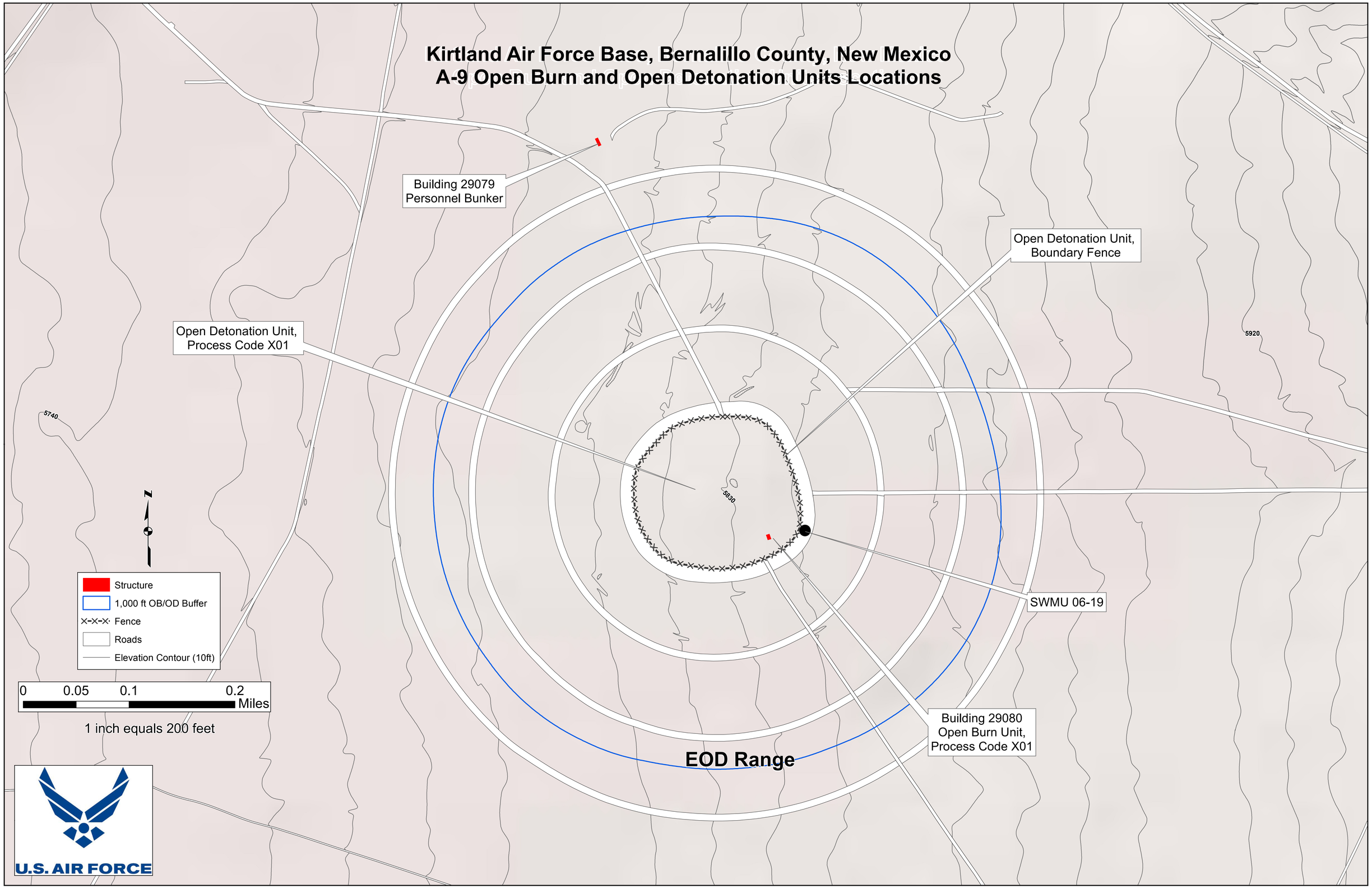
7/2/2013 - D. Reynolds

Kirtland Air Force Base, Bernalillo County, New Mexico
A-8 Contour Map of KAFB



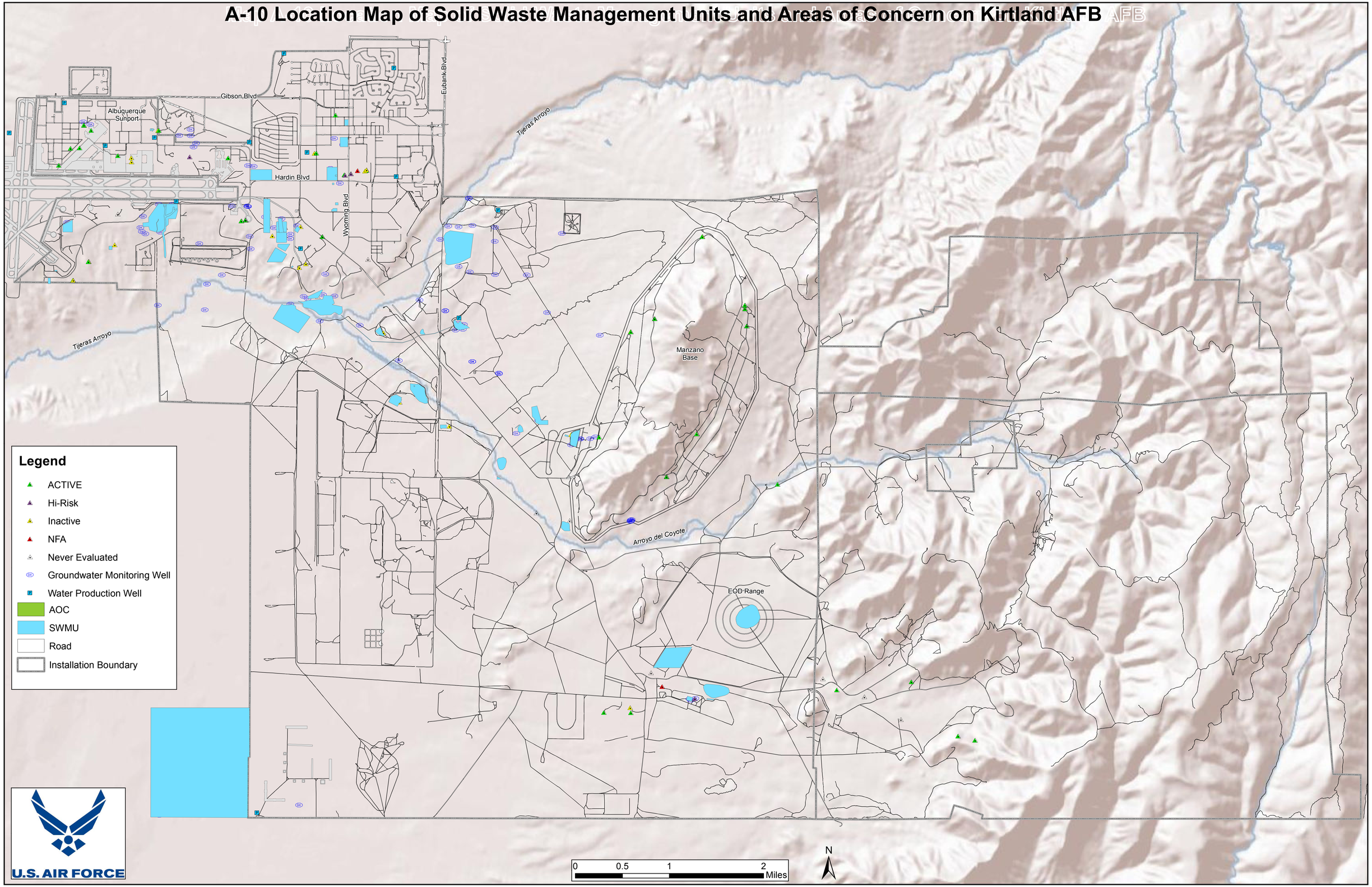
6/28/13 - D. Reynolds

Kirtland Air Force Base, Bernalillo County, New Mexico
A-9 Open Burn and Open Detonation Units Locations



6/28/13 - D. Reynolds

A-10 Location Map of Solid Waste Management Units and Areas of Concern on Kirtland AFB



T:\Geobase\EM_Env\ERP\Map A 10 Location Map of Solid Waste Management Units and Areas of Concern on Kirtland AFB.mxd

APPENDIX B

WASTE ANALYSIS PLAN

APPENDIX B
WASTE ANALYSIS PLAN

This Waste Analysis Plan (WAP) describes the procedures used to characterize wastes that were treated and residues that were generated during treatment at the Explosive Ordnance Disposal (EOD) Range at the Kirtland Air Force Base (KAFB) facility (until cessation of all waste treatment activities in 2010). It addresses the applicable waste analysis requirements in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), incorporating 40 CFR §264.13 and §264.602, 20.4.1 NMAC incorporating 40 CFR §270.14(b), and 20.4.1 NMAC, Subpart VIII, Part 268. The content of this WAP follows the guidance provided in "Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes: A Guidance Manual" (U.S. Environmental Protection Agency [EPA], 1994). Accordingly, this WAP is organized to address the six major elements recommended in the guidance, as follows:

- Section B.1, Facility Description, references general descriptions of the KAFB facility and the EOD Range, and summarizes additional descriptive information about the EOD Range where treatment was conducted at the open burn (OB) and open detonation (OD) units. It also summarizes the processes and activities that generated or were used to manage wastes, and describes the wastes that were treated, the waste residues previously generated during treatment, and the hazardous waste management units at the KAFB facility.
- Section B.2, Waste Analysis Parameters, discusses briefly the selection of waste characterization parameters for the waste [previously] treated at the EOD Range. It also identifies the analytical parameters for treatment residues that were generated at the OB unit at the EOD Range, and presents the rationale for the selection of these analytical parameters. In addition, this section references Appendix I of this Part B permit renewal application for the analytical parameters for soil monitoring sampling at the OD unit (while it was in operation).
- Section B.3, Waste Characterization Procedures, describes the procedures that were used to characterize the wastes [previously] treated at the EOD Range, and the procedures that were used to characterize the treatment residues generated at the OB unit. It also references Appendix I of this Part B permit renewal application for the procedures that were used to sample and analyze soils for soil monitoring at the OD unit (while it was in operation).
- Section B.4, Analytical Laboratory Selection and Testing/Analytical Methods, presents information on the selection of the analytical laboratory and the methods that were used to characterize the treatment residues [previously] generated at the OB unit. It also references Appendix I of this Part B permit renewal application for similar information regarding analysis of soils as part of the Soil Monitoring Plan at the OD unit (while it was in operation).
- Section B.5, Waste Re-evaluation Frequencies, discusses the criteria used to determine the frequencies by which waste characterization information were re-evaluated (while the unit was in operation).

- Section B.6, Special Procedural Requirements, identifies the special procedures that were followed if wastes were received from off-site generators and for ignitable, reactive, and incompatible wastes, and the provisions for complying with land disposal restrictions (LDR) requirements.

The information collected under this WAP provided KAFB personnel with information that was sufficient to safely manage the hazardous wastes treated and the residues resulting from treatment at the EOD Range (while it was in use). The Chief of the Environmental Management (EM) Branch was responsible for updating the WAP (while the unit was active). An archive copy of the WAP will be maintained at the EM Branch Office (through the Closure process).

B.1 FACILITY DESCRIPTION

General descriptions for the KAFB facility and the EOD Range are provided in Section A.1 of Appendix A of this Part B permit renewal application. A description of [previous] waste management practices at the EOD Range is provided in Section G.2 in Appendix G of this Part B permit renewal application.

B.1.1 Description of [previous] Facility Processes and Activities

The OB and OD units at the EOD Range were used to treat reactive and ignitable hazardous wastes. These wastes were typically in the form of bulk explosives; damaged, defective, expired, or unserviceable munitions; explosives from research and development activities; and explosives-contaminated waste. Wastes treated in the OB and OD units at the EOD Range were generated at the facilities listed in Table B-1. These wastes were generated as a result of specific processes and activities that were well defined and well controlled. Nonhazardous wastes (e.g., contraband, firearms) were also treated at the OB and OD units as a service in support of the various agencies listed in Table B-1. Waste is no longer transported to or accepted by the EOD Range for treatment; since all treatment activities within the OB and OD units terminated in 2010).

B.1.2 Hazardous Wastes [previously] Managed at the EOD Range

Hazardous wastes [previously] treated in the OB and OD units at the EOD Range exhibited the characteristic of reactivity (D003). Some of these wastes also exhibited the characteristics of ignitability (D001) and corrosivity (D002). Some wastes [previously treated] potentially contained toxicity characteristic metals, identified by the following specific EPA Hazardous Waste Numbers: arsenic (D004), barium (D005), cadmium (D006), chromium (D007), lead (D008), mercury (D009), selenium (D010), silver (D011), as well as the toxicity characteristic

organics listed in Section XIV of the Part A permit renewal application. The characteristics of the hazardous wastes [previously] treated at the EOD Range were identified using knowledge of process (KOP) and written documentation provided by the generators. Treatment by OB or OD was conducted to remove the characteristics of ignitability (D001) and reactivity (D003). Incompatible wastes were not accepted for treatment at the EOD Range.

Residue generated as a result of treatment in the OB unit was comprised primarily of ash. Lead slag and metal casings were common components of the residue. These residual wastes potentially contained toxicity characteristic metals (D004-D011) that could become concentrated in the residue. Toxicity characteristic organics listed in Section XIV of the Part A permit renewal application (that may have been present in the original wastes were destroyed during OB; however, the residual waste (i.e., the ash) was characterized to ensure that trace amounts of these organic compounds was no longer present in the residue.

Both the hazardous wastes treated at the EOD Range and the waste residues generated as a result of treatment were classified as non-wastewater under the LDR regulations in 20.4.1 NMAC, Subpart VIII, Part 268.

B.1.2.1 Descriptions of [previously] Acceptable Waste Categories

Categories of hazardous wastes that were accepted for treatment at the EOD Range (while it operated) included explosives, propellants, and pyrotechnics in the form of pure substances and explosives-contaminated wastes. As discussed in Section B.3, waste generators were required to provide KOP and written documentation that accurately described their waste; this documentation was used to determine if the waste was within an acceptable waste category. Waste explosive substances, waste propellants, waste pyrotechnics, and munitions (e.g., hand grenades) that were treated in the OB and OD units at the EOD Range included, but were not limited to, the items listed in Tables B-2 and B-3, respectively.

Energetic materials are chemical compounds, or mixtures of chemical compounds, that are divided into three groups according to use: explosives; propellants; and pyrotechnics. Explosives and propellants that have been properly initiated evolve large volumes of hot gas in a short time. The difference between explosives and propellants is the rate at which the reaction proceeds. In explosives, a fast reaction produces a very high pressure shock in the surrounding medium. This shock is capable of shattering objects. In propellants, a slower

reaction produces a lower pressure over a longer period of time. This lower sustained pressure is used to propel objects. Pyrotechnics evolve large amounts of heat, but much less gas than propellants or explosives. A pyrotechnic mixture, when ignited, is capable of reacting exothermically to produce light, heat, smoke, sound, or gas. Various external stimuli can cause release of the energy contained in energetic materials. Knowing the response of individual energetic materials to specific stimuli is important from the safety point of view. Energetic materials are sensitive to four external stimuli: impact; shock; electrostatic; and thermal.

An explosive train is the arrangement of primary and initiating explosives in ordnance arranged according to the most sensitive and least powerful to the least sensitive and most powerful (initiator - booster - burster). A small quantify of an initiating compound or mixture, such as lead azide, is used to detonate a larger quantity of a booster compound, such as tetryl, that results in the main or booster charge (primary explosive) of an RDX composition, TNT, or other detonating compound or mixture.

A booster is a high-explosive element sufficiently sensitive so as to be actuated by small explosive elements in a fuse or primer and powerful enough to cause detonation of the main explosive filling. It is also an auxiliary or initial propulsion system which travels with a missile or aircraft and which may or may not separate from the parent craft when its impulse has been delivered. A booster system may contain, or consist of, one or more units.

An electro-explosive device (or EED) is an explosive or pyrotechnic component that initiates an explosive, burning, electrical, or mechanical train and is activated by the application of electrical energy.

It was at times necessary to saturate the wastes with safing fluid (e.g., water, acetone, alcohol, hydraulic fluid, diesel fuel) before they were placed in a unit for treatment.

B.1.2.2 Chemical and Physical Properties

Knowledge of the chemical and physical properties of the hazardous wastes [previously] treated in the OB and OD units at the EOD Range was essential for proper waste management. The hazardous wastes treated at the EOD Range consisted mainly of ignitable and reactive compounds, and at times contained toxicity characteristic metals and organic compounds, as described below.

Ignitable (D001) and reactive (D003) wastes, such as those listed in Tables B-2 and B-3, were treated at the EOD Range. On occasion, corrosive (D002) wastes (e.g., picric acid) were also be treated at the EOD Range. The wastes [previously] treated included explosives, propellants, munitions, and pyrotechnics.

Arsenic (D004), barium (D005), cadmium (D006), chromium (D007), lead (D008), mercury (D009), selenium (D010), and silver (D011) are toxicity characteristic metals that occurred in the wastes or in the casings surrounding the wastes [previously] treated at the EOD Range. The toxicity characteristic organic compounds listed in Section XIV of the Part A permit renewal application were also present in the wastes treated. As a result of treatment, any organic compounds (if they were present in the waste) would have been destroyed due to temperatures ranging from 1500 to 2000° F (815 to 1093° C) in the OB unit and exceeding 3000° F (1649° C) in the OD unit.

The hazardous wastes treated at the OB and OD units were mostly in solid form. However, on occasion, waste in liquid form (e.g., picric acid) was treated at these units.

B.1.3 Description of [previously operated] Hazardous Waste Management Units

The hazardous waste management units [previously] operated at the KAFB facility included only the OB and OD units that are addressed in this Part B permit renewal application. A physical description of the OB and OD miscellaneous units, a discussion of waste types [previously] managed in each unit, and information on [previous] waste management operations at the units (including containers and container handling) are presented in Section 2.0 and/or Appendix G of this Part B permit renewal application.

Specific physical and chemical operating constraints were observed to ensure that the treatment process integrity was maintained. These constraints were met by adhering to the operating acceptance limits established at the EOD Range. Operating acceptance limits reflected both the process and equipment design limitations. These limits determined the range of hazardous wastes that could be managed safely in the OB and OD units at the EOD Range while meeting regulatory requirements (of the time) and complying with permit conditions. Hazardous wastes that did not meet those operating acceptance limits were not approved for treatment at the EOD Range or were returned to the generator upon verification that the operating acceptance limits criteria had not been met. The operating acceptance limits established for the EOD Range were as follows:

OB Unit

- The maximum net explosive weight (NEW) treated during any single OB event could not exceed 1,500 pounds (lbs.) uncased explosives or 200 lbs. cased munitions.
- The maximum total quantity of waste (hazardous and nonhazardous combined) treated during any single OB event could not exceed 5,000 lbs.

OD Unit

- The maximum NEW treated during any single OD event could not exceed 1,500 lbs. uncased explosives and 200 lbs. cased munitions.

B.2 WASTE ANALYSIS PARAMETERS

As described in Section B.3, characterization of the hazardous wastes [previously] treated in the OB and OD units at the EOD Range was accomplished by the generator, typically using KOP. This characterization information was reviewed by EOD personnel to ensure that the hazardous wastes proposed for treatment were properly characterized for their physical and chemical properties and could be managed safely. KOP for the hazardous wastes treated was used in lieu of sampling and analysis because the waste treated was generated during known and documented processes, and the composition of explosives was well controlled. In addition, the inherent health and safety risks outweighed the potential value of the data that could be obtained by testing the waste (i.e., sampling and subsequent laboratory analysis would have presented unnecessary hazards to personnel).

A brief discussion on the selection of waste characterization parameters for the wastes [previously] treated at and resulting from treatment at the EOD Range is presented in Section B.2.1.

The ash residue resulting from treatment at the OB unit was characterized by sampling and analysis for LDR purposes the first time a specific waste was treated. A discussion of the criteria and rationale for parameters selection for these residues is presented in Section B.2.1. When sampling and analysis data for an ash residue was available, these data values were used as KOP to characterize subsequent, identical or similar, ash residues.

At the OD unit, the hazardous waste in its original form was destroyed and, therefore, rendered nonhazardous; however, potentially contaminated treatment residues remained at the unit. In order to effectively monitor potentially contaminated soils at the OD unit, KAFB implemented the Soil Monitoring Plan, which is included as Appendix I of this Part B permit renewal application and describes characterization by sampling and analysis. A discussion of the parameters selection for the potentially contaminated soils at the OD unit is presented in Appendix I.

B.2.1 Criteria and Rationale for Parameter Selection

The waste characterization information (e.g., KOP) provided by the KAFB and off-site generators for the hazardous wastes treated at the EOD Range included information on the presence of toxicity characteristic metals and organic compounds, as defined in 20.4.1 NMAC, Subpart II, incorporating 40 CFR Part 261, Subpart C, and the presence of any underlying hazardous constituents (UHC) listed in 20.4.1 NMAC incorporating 40 CFR §268.48. Waste characterization information on these parameters was necessary for safe and effective management of the wastes [previously] treated, to ensure that operating acceptance limits (see Section B.1.3) were not exceeded, and for waste determination and LDR purposes.

The residue remaining after treatment in the OB unit contained the toxicity characteristic for metals (D004-D011), and infrequently a potential for the toxicity characteristic organic compounds (see Section XIV in the Part A permit renewal application) that may have been present in the original wastes. Therefore, for LDR purposes, the ash residue was sampled and analyzed for the constituents known to be in the original wastes the first time a specific waste is treated using the Toxicity Characteristic Leaching Procedure (TCLP) or total analysis methods, as appropriate. As indicated in Section B.2, KOP was used to characterize the ash residue when sampling and analysis data for an identical or similar ash residue was available.

Residue remaining in the soil after treatment at the OD unit could contain toxicity characteristic metals, HE residues, and other constituents listed in Table I-1 of Appendix I. Therefore, soil sampling and analysis was conducted annually (while the unit was active) for these Table I-1 constituents, as described therein. Appendix F contains the Closure Plan for the unit.

B.2.2 Special Parameter Selection Requirements

There were no additional special parameter selection requirements for the wastes [previously] treated at the EOD Range and the residues resulting from treatment.

B.3 WASTE CHARACTERIZATION PROCEDURES

The approach to characterization was based on the chemical and physical nature of the waste. Characterization procedures used at the KAFB facility required all generators to provide KOP, related technical information, and/or other written documentation (including information on UHCs) for the wastes [previously] treated at the EOD Range. Characterization of the treatment residues generated at the OB unit was accomplished using sampling and analysis or KOP, as indicated in Section B.2.1. Annual characterization of the soils at the OD unit was accomplished

by sampling and analysis. Proper characterization resulted in appropriate waste classification and assignment of EPA Hazardous Waste Numbers, assisted in preparation of LDR documentation, and ensured proper management of the waste.

B.3.1 Characterization Strategy [through termination of operations in 2010)

The characterization strategy for the hazardous wastes [previously] treated at the EOD Range and for the treatment residues at the OB unit are described below. The characterization strategy for the annual sampling and analysis of soils at the OD unit, including sampling and analysis procedures and methods as well as health and safety measures, is presented in Appendix I of this revised Part B permit renewal application.

B.3.1.1 Wastes Treated

Prior to accepting waste for treatment at the EOD Range, a detailed chemical and/or physical description of the waste was provided by the generator. Characterization of hazardous waste was typically accomplished by the generator using KOP, related technical information, and/or other written documentation (e.g., an excess-explosives worksheet, LDR paperwork, Material Safety Data Sheets [MSDS]), and could be confirmed by EOD personnel using the Munitions Items Disposition Action System (MIDAS) or other appropriate databases. Process knowledge (KOP) was a subset of acceptable knowledge (AK), [previously] used to meet waste analysis requirements. KOP is described in 20.4.1 NMAC incorporating 40 CFR §264.13(a)(2) as data developed under 20.4.1 NMAC, Subpart II, incorporating 40 CFR Part 261, and existing published or documented data on the hazardous waste or on hazardous waste generated from similar processes. Hazardous waste components and characteristics were known based on existing or published data, such as that found in the MIDAS or other databases and in MSDSs, and waste generators document any alterations in original chemical/material composition. Because the wastes treated were generated during known and documented formulation processes or were of the original manufacturer's chemical composition, complete with MSDSs or equivalent technical information (e.g., information from the MIDAS database), KOP fulfilled 20.4.1 NMAC incorporating 40 CFR §264.13(a)(2) requirements for these wastes.

Records information on wastes previously treated by the EOD Shop have been archived by Base Environmental (Hazardous Waste Program Office). This data includes treatment dates, the wastes treated, and the types and quantities of explosive filler(s), if any. Ensuring that detailed and accurate waste characterization took place involved the steps outlined below.

All waste treated at the EOD Range was screened and verified prior to treatment. Screening ensured that the waste met the operating acceptance limits criteria presented in Section B.1.3, based on documentation provided by the generator. Verification was performed to ensure that the documentation was consistent with a visual inspection of the waste.

B.3.1.1.1 Screening

EOD personnel screened all waste intended for treatment to ensure that it met the operating acceptance limits criteria prior to transportation to the EOD Range. Screening was performed by the appointed EOD Team Chief based on the documentation provided by the generator of the waste. Documentation included, but was not limited to, a completed Ammunition Disposition Request (ADR), a hazardous waste manifest, an MSDS, and/or a description of the process generating the waste. If the documentation was incomplete, EOD personnel contacted the generator for further clarification. Documentation was provided for the contents of each container of waste. EOD personnel compared the information on the documentation against the operating acceptance limits criteria. Only waste that met the operating acceptance limits criteria was transported to the EOD Range for treatment.

B.3.1.1.2 Verification

All waste shipments to the EOD Range were verified in two phases. Phase 1 was to ensure shipping documentation completeness, and Phase 2 ensured that the waste delivered corresponded to the screened documentation provided for that waste. Waste was not accepted for treatment at the EOD Range until all verification was complete.

Phase 1 Verification

Upon receipt of a waste shipment at the EOD Range, a determination of shipping documentation completeness was made by EOD personnel. Each shipping document that accompanied an off-site waste shipment was checked to ensure that the following information was present and complete:

- The shipment identification number,
- The proper U.S. Department of Transportation basic description,
- The quantity (weight) of waste in the shipment,
- The number and type of containers in the shipment,
- A signed and dated certification of the shipment's content, and
- The shipment labels and placards matched the shipping document.

If there were discrepancies, they were resolved by contacting the generator before the shipping document was signed by EOD personnel. If the discrepancies could not be resolved, EOD personnel rejected the shipment. Rejected waste was returned to the generator.

Phase 2 Verification

When waste was transported to the EOD Range for treatment and removed from its outer container, the appointed EOD Team Chief, with assistance from other EOD personnel, visually compared the contents with the description on the documentation provided by the generator to ensure they matched. The visual inspection included content identification and quantity estimation. If any waste failed verification, it was returned to the generator to resolve the discrepancy.

B.3.1.2 OB Unit Treatment Residues

Potentially hazardous waste residue was generated as a result of treatment at the OB unit. This waste residue was comprised primarily of ash; residual lead slag and other metal items (e.g., casings) were also present in the residue. Ash residue resulting from each treated waste was further treated and/or disposed of properly based on KOP or sampling and analysis data.

If sampling and analysis was required, a simple random grab or composite sample was collected from the ash residue in accordance with the methods prescribed in *SW-846* or other accepted methods. The samples were analyzed for the appropriate toxicity characteristic metals (D004-D011), using the TCLP method, and for the appropriate toxicity characteristic organic compounds using the appropriate method for total analysis. If other UHCs were identified on the LDR paperwork provided by the generator for the original waste treated, they were also analyzed using appropriate methods. The samples were analyzed for the parameters identified in Table B-4 using the applicable *SW-846* methods indicated in that table. After sampling, the residue was containerized and disposed appropriately.

B.3.2 Sampling Equipment

Each sample of the ash residue was collected using appropriate sampling equipment, as recommended in *SW-846* or other approved sampling guidance. Samples of soil were collected, as described in Appendix I of this Part B permit renewal application.

B.3.3 Field Equipment Decontamination

Disposable field equipment was used in sampling the ash residue and soil to eliminate the

potential for cross contamination. Therefore, maintaining and decontaminating the field equipment for these activities was not necessary. If excavation of soil is necessary to achieve clean closure at the OD unit, equipment used to excavate soil will be decontaminated as described in Appendix F of this Part B permit renewal application.

B.3.4 Sample Preservation and Storage

The ash residue and soil samples were collected in clean containers and preserved, as appropriate, to ensure that their integrity remained intact during transport to the analytical laboratory. Container types, preservation techniques, and holding times for the potential analytes of interest are presented in Table B-5 for ash, and in Table F-5 of Appendix F for soil.

B.3.5 Quality Assurance/Quality Control

The quality assurance (QA) process ensured that the characterization data obtained and the decisions made based on those data were technically sound, statistically valid, and properly documented. Quality control (QC) procedures were implemented to measure the degree to which the QA objectives were fulfilled.

Because important decisions regarding the hazardous waste treated at the EOD Range were based on the results of waste characterization by KOP, a program to ensure the reliability of generator-provided data was essential. The two major facets of the KAFB program ensuring data reliability were (1) documentation to ensure that information was traceable to the contents of specific waste containers and (2) a QA program that mandated documentation of the generator's KOP. Documentation consisted of the documentation completed by the generator to identify knowledge of the waste and/or the process that generated the waste. The documentation was checked by EOD personnel, and records associated with waste screening and verification was maintained to document accurate waste characterization.

Decisions regarding the treatment and/or disposal of potentially hazardous waste generated as a result of treatment in the OB unit were based on the results of waste characterization by KOP or sampling and analysis of the ash residue. Decisions regarding the treatment and/or disposal of potentially hazardous soil generated as a result of treatment at the OD unit during closure were based on waste characterization by sampling and analysis of the soil (see Appendix F of this Part B permit renewal application). To measure the validity of sampling activities, QC samples were collected. If samples were analyzed for organics, a trip blank was prepared, when practicable, to document contamination that might have been attributable to shipping and field-handling procedures. A chain-of-custody form was completed and typically included the

type of sample collected (e.g., ash residue, soil); the names and signatures of the samplers; the sample numbers, date, and time of collection; the designation as a grab or composite sample (e.g., simple random composite); the names and signatures of any persons involved in transferring samples; and the shipping number for samples shipped to the off-site laboratory. Sampling personnel were properly trained in the use of the sampling equipment, sample containers, and sampling methodology to ensure that sampling activities were conducted appropriately.

B.3.6 Health and Safety Protocols

To protect their health and safety, sampling personnel were properly trained on the potential hazards associated with the treatment residues and on waste-handling procedures. Proper PPE (e.g., disposable gloves) were worn to minimize the potential for exposure to the waste.

B.4 ANALYTICAL LABORATORY AND TESTING/ANALYTICAL METHODS SELECTION

Characterization of the wastes treated in the OB and OD units at the EOD Range was accomplished using KOP, as presented in Section B.3. Therefore, a discussion of analytical laboratory selection and laboratory testing/analytical methods for these wastes is not presented in this WAP. Discussions on analytical laboratory selection and laboratory testing/analytical methods for soil monitoring and related closure at the OD unit are presented in Appendices F and I of this Part B permit renewal application. Because initial characterization of each specific ash residue at the OB unit was based on sampling and analysis, information on laboratory selection and laboratory testing/analytical methods for ash residue is presented below.

B.4.1 Analytical Laboratory Selection

An EPA-certified analytical laboratory was selected to perform the analysis of each specific ash residue generated at the OB unit. The selected laboratory was required to have a comprehensive QA/QC program, technical analytical expertise, and an effective information management system.

B.4.2 Testing and Analytical Methods Selection

The selection of analytical testing methods for the ash residue generated at the OB unit was based on the following:

- The physical state of the waste (i.e., ash),
- The analytes of interest (e.g., toxicity characteristic metals and organic compounds present in the original wastes),
- The required detection limits (i.e., regulatory thresholds), and
- Information requirements (e.g., to ensure compliance with LDR treatment standards).

Collectively, these factors contributed to the selection of the testing/analytical procedures included in Table B-4.

B.5 WASTE RE-EVALUATION FREQUENCIES

A re-evaluation of waste characterization data was conducted, as necessary, to ensure that the data was current and up to date, in accordance with 20.4.1 NMAC incorporating 40 CFR §264.13(a)(3). Updates of waste characterization information were required when:

- A change occurred in the process or operation generating the hazardous waste, and if
- The hazardous waste received from an off-site facility did not match the waste specified on the accompanying manifest or shipping paper.

Waste characterization data (e.g., KOP) for the wastes treated at the EOD Range were re-evaluated annually. This information was used to determine the appropriateness of current waste management practices and characterization methods.

B.6 SPECIAL PROCEDURAL REQUIREMENTS

Procedures for receiving wastes generated off site and for managing ignitable and reactive wastes are summarized below. In addition, provisions for ensuring compliance with LDR requirements are presented in this section.

B.6.1 Procedures for Receiving Wastes Generated Off Site

To minimize the potential for accepting incorrectly identified or unacceptable waste shipments from off site for treatment at the OB and OD units, the screening and verification procedures presented in Section B.3.1.1 were implemented. Any waste shipments that failed the screening and/or verification process were either not accepted at the EOD Range or were returned to the generator prior to acceptance to resolve any discrepancy. The information provided by off-site generators included the EPA Hazardous Waste Numbers and the appropriate LDR notifications and certifications.

B.6.2 Procedures for Ignitable, Reactive, and Incompatible Wastes

Wastes that exhibited the characteristics of reactivity and ignitability were treated in the OB and OD units at the EOD Range. These characteristics are documented with the KOP information provided by the waste generators, and the OB and OD units were designed for treatment of these wastes. Incompatible wastes were not managed at the EOD Range. Additional information on special requirements for ignitable, reactive, and incompatible wastes is presented in Section 2.5 of this Part B permit renewal application.

B.6.3 Provisions for [previous] Compliance with LDR Requirements

No exemption from or extension to LDR has been requested by KAFB. Similarly, a petition to allow land disposal of a waste prohibited under 20.4.1 NMAC, Subpart VIII, incorporating 40 CFR §268(C), would have been requested under 20.4.1 NMAC incorporating 40 CFR §268.6, if needed.

There are special waste analysis requirements under the LDR program for hazardous waste generators and treatment facilities. Generators of hazardous waste must determine if the waste, at the point of generation, must be treated before it can be land disposed; this determination can be made either by testing the waste or using KOP. Generally, hazardous wastes must meet applicable treatment standards prior to land disposal. These treatment standards are expressed in two ways:

- As constituent concentrations in the waste, either as an extract of the waste (as determined by TCLP), or as total waste analysis, or
- As specified treatment technologies.

Wastes that have concentration-based treatment standards must be evaluated to determine if applicable constituent concentration levels have been attained. This can be accomplished by testing the waste, or applying knowledge of the process or materials used to produce the waste (generators only). The TCLP method was generally used to evaluate whether treatment standards expressed as concentrations in the waste extract were met, and total waste analysis methods were used to evaluate whether treatment standards based on total waste concentrations were met.

Characteristic wastes that have treatment standards expressed as specified technologies in 20.4.1 NMAC incorporating 40 CFR §268.40 must also meet the Universal Treatment Standards (UTS) in 20.4.1 NMAC incorporating 40 CFR §268.48 prior to land disposal. Special rules regarding wastes that exhibit a characteristic are also presented in 20.4.1 NMAC incorporating 40 CFR §268.9. In 20.4.1 NMAC incorporating 40 CFR §268.9(c), it states that no prohibited waste that exhibits a characteristic under 20.4.1 NMAC, Subpart II, incorporating 40 CFR Part 261, Subpart C may be land disposed unless the waste complies with the treatment standards under 20.4.1 NMAC, Subpart VIII, incorporating 40 CFR Part 268, Subpart D. In addition, for wastes that exhibit a hazardous characteristic, the generator must determine the UHCs, as required in 20.4.1 NMAC incorporating 40 CFR §268.9(a).

The generator and treatment facility requirements (in force through termination of operations in 2010) ensuring compliance with LDR [at that time] are discussed in the following sections, and are summarized in Tables B-6 and B-7.

B.6.3.1 Generator Requirements

Generators were required to send a one-time written notice to the facility receiving each waste. This included on-site KAFB generators and off-site generators listed in Table B-1 that sent waste to the EOD Range for treatment, and the KAFB facility (as the "generator") when treated wastes were sent to an off-site facility for subsequent treatment and/or disposal. A copy of the one-time notice is maintained at the EM Branch Office. The notice included:

- Applicable EPA Hazardous Waste Numbers and the manifest number of the initial shipment,
- A statement that the waste was subject to LDRs,
- The UHCs in the characteristic wastes, if any,
- The applicable treatability group category as a non-wastewater,
- Waste code subdivisions based on waste-specific criteria, if appropriate, and
- Waste analysis data, if available.

For wastes or contaminated soil that did not meet treatment standards, the one-time written notice to the treatment facility included the generator paperwork requirements information referenced in 20.4.1 NMAC incorporating 40 CFR §268.7(a)(2). No further notification was necessary unless the waste or receiving facility changed. In this case, a new notification was sent to the receiving facility, and a copy of the new notification maintained at the EM Branch Office. For contaminated soil, a certification prepared in accordance with 20.4.1 NMAC incorporating 40 CFR §268.7(a)(2)(i) and signed by an authorized representative was included with the one-time notice.

For wastes that met treatment standards at the original point of generation, the one-time notice to the disposal facility included the generator paperwork requirements information and the certification statement referenced in 20.4.1 NMAC incorporating 40 CFR §268.7(a)(3)(i). For contaminated soil that met treatment standards at the original point of generation, the one-time notice to the disposal facility included the generator paperwork requirements information and the certification statement referenced in 20.4.1 NMAC incorporating 40 CFR §268.7(a)(3)(ii). If the waste changed, a new notification and certification was sent to the receiving facility, and a copy of each maintained at the EM Branch Office.

All of the supporting data used to determine that the waste was restricted from land disposal, either based solely on knowledge of the waste or on testing the waste, is retained at the EM Branch Office, as required in 20.4.1 NMAC incorporating 40 CFR §268.7(a)(6). Records of all notices, certifications, and waste characterization data (e.g., KOP, waste analysis data) will be maintained for at least three years from the date that the waste subject to such documentation was last sent to the off-site treatment, storage, or disposal facility (TSDF), in accordance with 20.4.1 NMAC incorporating 40 CFR §268.7(a)(8).

The alternative LDR treatment standards for contaminated soil presented in 20.4.1 NMAC incorporating 40 CFR §268.49 was applied to soils potentially contaminated as a result of treatment at the OD unit. Potentially contaminated soils were analyzed for the constituents subject to treatment. As defined in 20.4.1 NMAC incorporating 40 CFR §268.49(d), the constituents subject to treatment are those listed in the UTS table in 20.4.1 NMAC incorporating 40 CFR §268.48 that were reasonably expected to be present in any given volume of contaminated soil and that were present at concentrations greater than ten (10) times the UTS. If a decision was made to excavate soil (e.g., based on a risk assessment) and if the soils contained any of these constituents at a concentration greater than 10 times the UTS, they were sent to an off-site facility for treatment to comply with the standards in 20.4.1 NMAC incorporating 40 CFR §268.49(c).

For contaminated soils that did not meet treatment standards, a one-time written notice to the off-site treatment facility included the generator paperwork requirements information referenced in 20.4.1 NMAC incorporating 40 CFR §268.7(a)(2).No further notification was necessary unless the waste or receiving facility changed. In this case, a new notification was be sent to the receiving facility, and a copy of the new notification is maintained at the EM Branch Office. In addition to the notification, a certification prepared in accordance with 20.4.1 NMAC incorporating 40 CFR §268.7(a)(2)(i) and signed by an authorized representative is included with the one-time notice.

For contaminated soil that met treatment standards at the original point of generation, the one-time notice to the disposal facility included the generator paperwork requirements information and the certification statement in 20.4.1 NMAC incorporating 40 CFR §268.7(a)(3)(ii). If the waste changed, a new notification and certification was sent to the receiving facility, and a copy of each maintained at the EM Branch Office.

B.6.3.2 Treatment Facility Requirements

For the ignitable and reactive hazardous wastes treated at the EOD Range, the specified treatment technology in 20.4.1 NMAC incorporating 40 CFR §268.40 was deactivation. Deactivation was accomplished by treatment in the OB and OD units, which removed the hazardous characteristics of ignitability and/or reactivity. OB and OD are not considered by EPA as methods constituting land disposal, and they concluded that the LDR program is not applicable to OB and OD (51 *Federal Register* 40580). OB and OD are treatments that satisfy the LDR treatment standard for DEACT, but the processes themselves are not land disposal. Only the remaining residue resulting from treatment by OB and OD was subject to LDR.

In accordance with 20.4.1 NMAC incorporating 40 CFR §268.7(b)(1) and (2), the OB treatment residues (i.e., the ash) required testing of an extract of the residues using TCLP, or of the waste residues (not an extract), to assure that the applicable treatment standards presented in 20.4.1 NMAC incorporating 40 CFR §268.40 were met. Although unlikely after treatment at the OB unit to eliminate the characteristics of ignitability and reactivity, the residue could still exhibit the toxicity characteristic for metals (D004-D011) and/or organics (see Section XIV of the Part A permit renewal application). These are the UHCs that could reasonably be expected to be present in the hazardous waste at the point of generation. When OB treatment residue sampling and analysis data were available, these data were used as KOP to assure that the applicable treatment standards in 20.4.1 NMAC incorporating 40 CFR §268.40 were met (for future identical or similar ash residues.)

If the analysis indicated that the residues do not fully meet the treatment standards in 20.4.1 NMAC incorporating 40 CFR §268.40 and 20.4.1 NMAC incorporating 40 CFR §268.48, the residues were sent off site for additional treatment of the UHCs to meet the applicable treatment standards. A one-time certification signed by an authorized representative was submitted to the off-site treatment facility with the initial shipment of treatment residue of a restricted waste, as required by 20.4.1 NMAC incorporating 40 CFR §268.7(b)(4). The certification will also be prepared in accordance with 20.4.1 NMAC incorporating 40 CFR §268.7(b)(4)(iv), and included the notice and certification requirements in 20.4.1 NMAC incorporating 40 CFR §268.7(a), as required by 20.4.1 NMAC incorporating 40 CFR §268.7(b)(5). If the analysis indicated that the residues met the treatment standards and lead slag or metal casings were not present in the residue, they were sent off site for disposal. A one-time certification signed by an authorized representative was submitted to the off-site disposal facility with the initial shipment of treatment residue, as required by 20.4.1 NMAC incorporating 40 CFR §268.7(b)(4). The certification was also prepared in accordance with 20.4.1 NMAC incorporating 40 CFR §268.7(b)(4)(v), and included the notice and certification requirements in 20.4.1 NMAC incorporating 40 CFR §268.7(a), in accordance with 20.4.1 NMAC incorporating 40 CFR §268.7(b)(5).

Copies of certifications were placed in the files at the EM Branch Office. A new certification was sent to the off-site TSDF if the treatment residue changed or the receiving TSDF changed, and a copy of the new certification placed in the EM Branch Office files.

A one-time notice was sent with the initial shipment of treatment residue to the disposal facility. This notice included the paperwork requirements in 20.4.1 NMAC incorporating 40 CFR §268.7(b)(3)(ii), and a copy of the notice was placed in the files at the EM Branch Office, as required by 20.4.1 NMAC incorporating 40 CFR §268.7(b)(3).

B.7 REFERENCES

EPA, 1994, "Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes: A Guidance Manual," U.S. Environmental Protection Agency, Solid Waste and Emergency Response (OS-520), OSWER 9938.4-03, Office of Waste Programs Enforcement.

Table B-1
Potential Waste Generators (prior to August, 2010)

Drug Enforcement Agency
Bureau of Alcohol, Tobacco, and Firearms
New Mexico Institute of Mining and Technology
New Mexico Engineering Research Institute
University of New Mexico Civil Engineering Research Facility
Air Force Operation Technical Evaluation Center
Federal Bureau of Investigation
Bureau of Indian Affairs
Joint Task Force 6
EG&G
Transportation Safe Guards
Defense Evaluation Services Administration
U.S. Customs
U.S. Forest Service
Local and State Police Forces
Sandia National Laboratories/New Mexico
Defense Logistic Agency Phoenix
KAFB Munitions
Air Force Research Laboratory
New Mexico Air National Guard
U.S. Navy Weapons Facility, KAFB
898th AVDS
U.S. Department of Defense
U.S. Department of Energy
Department of Defense Munitions Activities
Government Contractors

Table B-2
List of Potential Hazardous Wastes [previously] Treated at the Open Burn Unit[a]

Common and/or Chemical Name - Symbol	Potential EPA Hazardous Waste Number(s)
Black Powder (Low Explosive)	D001, D003
Heat Powder	D001, D003
Titanium Tetrachloride	D003
Hexachloroethane (HC Smoke)	D034
IMR 4064	D001
IMR 4350	D001
JPN Propellant	D001, D003
Magnesium	D001, D003
Phosphorus Red, White	D001
Smokeless Powder	D003
Thermite (TH-3)	D001, D003
Known Inert Items:	
Aluminum	D001, D003
Iron	D001
Lead	D008
Lead Alloy	D008

The wastes included in this list may not be all inclusive.

Table B-3
List of Potential Hazardous Wastes [previously] Treated at the Open Detonation Unit[a]

Common and/or Chemical Name – Symbol	Potential EPA Hazardous Waste Code(s)
ALSC (Linear Shaped Charge), HNS	D001, D003
ALSC (RDX)	D001, D003
Amatol (AN, TNT)	D001, D003
Ammonium Nitrate (AN)	D003
Ammonium Perchlorate (AP)	D003
Ammonium Picrate	D001, D003
ANFO	D001, D003
APEX 1220	D001, D003
APEX 1320	D001, D003
ARTEC (HMX-water)	D001, D003
ATX-M	D001, D003
ATX 25RM Slurry	D001, D003
AWH Shape Charge	D001, D003
Baratol (High Explosive [HE])	D001, D003, D005
Barium Nitrate	D001, D003, D005
Barium Peroxide	D001, D003, D005
Barium Potassium Nitrate	D001, D003, D005
Barium Soluble Compounds	D001, D003, D005
BCTK Explosives	D001, D003
Benzene	D001, D018
BKN03 Propellant	D001, D003
Black Powder (Low Explosive)	D001, D003
Blasting Agent	D001, D003
Chromium	D007
CLSC (Copper Linear Shaped Charge)	D001, D003
Composition A (HE)	D001, D003
Composition B (HE)	D001, D003
Composition B/Baratol Mixture (HE)	D001, D003, D005
Composition C4 Class 3 (HE)	D001, D003
Cordite (Double-base gum)	D001, D003
Cyanotetrazolatopentamine Cobalt, Perchlorate	D001, D003
Cyclonite (HE, RDX)	D001, D003
Cyclotol (RDX, TNT)	D001, D003
C-1 Detasheet	D001, D003
C-3	D001, D003
C-4	D001, D003
C-6 Discs	D001, D003
DACP Powder	D001, D003
Detaflex	D003
Detasheet A	D001, D003
Detasheet A4	D001, D003
Detasheet A5	D001, D003
Detasheet C	D001, D003
Detasheet C1	D001, D003
Detasheet C2	D001, D003
Detasheet C3	D001, D003
Detasheet C4	D001, D003

Table B-3 (Continued)

Common and/or Chemical Name – Symbol	Potential EPA Hazardous Waste Code(s)
Detasheet C5	D001, D003
Detasheet C6	D001, D003
Detasheet D	D001, D003
Detasheet L	D001, D003
DetCord (PETN)	D001, D003
Detonators	D001, D003, D008
Detonators EBW	D001, D003
Detonators HBW, Ensign Bickford	D001, D003
Dinitrotoluene (DNT)	D001, D003, D030
Dipicrylamide	D001, D003
DBX	D003
Diazodinitrophenol (DDNP)	D003
Double Base Smokeless Powder	D001, D003
DNP	D001, D003
DNPT	D003
Dynamite	D003
Ednatol	D003
EL-506A (HE, PETN)	D001, D003
EL-506D (HE, PETN)	D001, D003
Extex 3003	D001, D003
Extex 8003	D001, D003
Explosive D	D001, D003
Explosive Piston Motors	D003
Flex Linear Shaped Charge	D001, D003, D008
Gas Pressure Generator	D001, D003
Heat Powder	D001, D003
Hexachlorethane (HC Smoke)	D034
Hexanitroazobenzene	D001, D003
HMX (octagen) High Melting Explosive	D001, D003
HNAB	D001, D003
Hexanitrostilbene (HNS)	D001, D003
HNS I	D001, D003
HNS II	D001, D003
HNS Titanium Powder	D001, D003
Holex 2506	D001, D003
Improved Military Rifle (IMR) propellant 4350	D001
IMR 4064	D001
Iremite 60	D001, D003
Iremite 80	D001, D003
Iragel	D001, D003
Ireco Booster 2-C, 3-C, 4-C	D001, D003
Iron Perchlorate	D003
Iron Potassium Perchlorate	D003
JPN Propellant	D001, D003
Kinestik Part A, B	D001, D003
Lead	D008
Lead Azide (HE)	D001, D003, D008

Table B-3 (Continued)

Common and/or Chemical Name – Symbol	Potential EPA Hazardous Waste Code(s)
Lead Case Flexible Linear Shaped Charge	D001, D003, D008
Lead Mononitraresorcinate (LMNR)	D001, D003, D008
Lead Sulfocyanate	D001, D003, D008
Lead Styphanate (HE)	D001, D003, D008
LX-04	D001, D003
LX-10	D001, D003
LX-13	D001, D003
LX-14	D001, D003
LX-15	D001, D003
LX-16	D001, D003
LX-17	D001, D003
M-6 Propellant	D001, D003
M-77 Water Gel Explosives	D001, D003, D005
MDF (RDX, HNS)	D001, D003
Mercury Fulminate (HE)	D001, D003, D009
Minol	D001, D003
N-5 Sheet Propellant	D001, D003
Nitrocellulose	D001, D003
Nitroglycerin	D001, D003
Nitroguanidine	D001, D003
Nitromethane	D001, D003
NQ	D001, D003
Octol LGE Cast	D001, D003
PBX 9010	D001, D003
PBX 9205	D001, D003
PBX 9404	D001, D003
PBX 9407	D001, D003
PBX 9504	D001, D003
PBXN-5	D001, D003
PBXN-6	D001, D003
PBXN-301	D001, D003
Pentaerythritol Tetranitrate (PETN) (HE)	D001, D003
PETN/Titanium Mix	D001, D003
PETN Zirconium	D001, D003
PETRIN	D001, D003
Pentaerythritol Tetranitrate	D001, D003
Pentolite (PETN/TNT) (HE)	D001, D003
Photo Flash Powder (simulators)	D001, D003
Picric Acid	D001, D002, D003
Picritol	D001, D003
Plain Wave Generator (PBX 9404)	D001, D003
Plasticized White Phosphorous	D001
Plasticizer	D001, D003
Polysulfide Prepolymer	D001, D003
Potassium Chlorate	D003
Potassium Nitrate	D003
Potassium Perchlorate (initiator)	D001, D003

Table B-3 (Continued)

Common and/or Chemical Name – Symbol	Potential EPA Hazardous Waste Code(s)
Primacord (PETN)	D001, D003
Propellant HPC-95, HPC-60	D001, D003
Propellant M-30, M1, M6	D001, D003
Propellant MC-1951	D001, D003
Propellant (TPH1207C)	D001, D003
RDX	D001, D003
RDX #5	D001, D003
Red Phosphorous	D001
RL-5-X Det Cord	D001, D003
Rocket Motor Double Base Propellant	D001, D003
RP-2	D001
RP-87	D001
Separation Explosives (RDX)	D001, D003
Semtex	D001, D003
Smokeless Powder	D003
Sodium Azide	D001, D003
Sodium Nitrate	D003
Strontium Nitrate	D003
Strontium Peroxide	D003
Tetryl (HE)	D001, D003
Tetrytol	D001, D003
TH-1	D001, D003
TH-3	D001, D003
Thermite Powder	D003
TH/KP	D001, D003
Titanium Tetrachloride	D003
TPH 3442 (propellant)	D003
Titanium Boron Powder	D001
Titanium Hydride	D001
Titanium Subhydride	D001
TLX	D001, D003
Trinitrotoluene (TNT)	D001, D003
Tritonal	D001, D003
TATB Pellets, Pad	D001, D003
Toluene (nitrated forms)	D001, D003
Torpex	D003
Tovex	D003
TPH 3386 (propellant)	D003
Triaminotrinitrobenzene (TATB)	D001, D003, D018
Trichloroethylene	D040
WAK 2, TP-H12	D001, D003
XTX 8003	D001, D003
Known Inert Items Destroyed:	
Aluminum	D001, D003
Iron	D001
Lead	D008
Lead Alloy	D008

The wastes included in this list may not be all inclusive.

Table B-4
Summary of Characterization Methods for Ash [previously] Generated by Open Burning[a]

Parameters	Method Numbers	Test Method	Rationale
Metals: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	*SW-846* [b] (1311, 6010B, 7000A, 7061A) (1311, 6010B, 7000A) (1311, 6010B, 7000A) (1311, 6010B, 7000A, 7195, 7196A, 7197) (1311, 6010B, 7000A) (1311, 6010B, 7000A, 7470A, 7471A) (1311, 6010B, 7000A, 7741A, 7742) (1311, 6010B, 7000A) or equivalent methods[c]	Toxicity characteristic leaching procedure (TCLP) Inductively-coupled plasma atomic emission spectroscopy Atomic absorption Coprecipitation Colorimetric Chelation/Extraction Manual cold vapor technique Acceptable knowledge[d]	Determine TCLP metals concentrations in samples of solid process residues
Volatile Organic Compounds (VOC)	*SW-846* [b] (8260B)	Total VOC analysis by gas chromatography/mass spectrometry (GC/MS) Acceptable knowledge[d]	Determine total VOC concentrations for comparison with Universal Treatment Standards (UTS)
Semivolatile Organic Compounds (SVOC)	*SW-846* [b] (8270C)	Total SVOC analysis by GC/MS Acceptable knowledge[d]	Determine total SVOC concentrations for comparison with UTS

[a] Ash generated by open burning is characterized for all TCLP metals.
[b] U.S. Environmental Protection Agency (EPA), 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.
[c] Equivalent methods, subject to EPA approval, may be substituted.
[d] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, EPA, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-5
Recommended Sample Containers, Preservation Techniques, and Holding Times[a]

Analyte Class and Sample Type	Container	Preservative	Holding Time
Volatile Organics			
Ash:	125-milliliter (mL) WM[b]-G[c] with Teflon-lined lid	See individual methods	14 days
Semivolatile Organics			
Ash:	250 mL WM[b]-G[c] with Teflon-lined lid	Cool to 4 degrees Celsius (ºC)	Samples extracted within 14 days and extracts analyzed within 40 days following extraction
Metals			
Ash:			
Metals (except hexavalent chromium and mercury)	200 gram (g) WM[b]-P[d] or G[c]	None	180 days
Hexavalent chromium	100 g WM[b]-P[d] or G[c]	Cool to 4ºC	One month to extraction; 4 days after extraction until analyzed
Mercury	200 g WM[b]-P[d] or G[c]	Cool to 4ºC	28 days

[a] Information primarily from U.S. Environmental Protection Agency (EPA), 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846,* EPA, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.
[b] WM = Wide-mouth
[c] G = Glass
[d] P = Polyethylene

Table B-6
Land Disposal Restrictions (LDR) Requirements for Generators

Type of Waste	General Requirement	Notification To:	One-Time Written Notice/Certification
All wastes treated at the Explosive Ordnance Disposal Range	U.S. Environmental Protection Agency Hazardous Waste Number(s)	Kirtland Air Force Base (KAFB) Treatment Facility	
	Statement that waste is subject to LDRs		
	Underlying hazardous constituents		
	Applicable treatability group (i.e., non-wastewater)		
	Waste code subdivisions (if applicable)		
	Waste analysis data (if available)		
	Identification of soil to be treated to the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §268.49 standards and contaminants subject to treatment		Notices and certifications in 20.4.1 NMAC §268.7(a)(3)(ii).
Wastes or contaminated soil that do not meet all treatment standards		KAFB Treatment Facility Off-Site Treatment Facility	Notice referenced in 20.4.1 NMAC §268.7(a)(2). For contaminated soil, notice referenced in 20.4.1 NMAC §268.7(a)(2) and certification in 20.4.1 NMAC §268.7(a)(2)(i).
Wastes or contaminated soil that meet the treatment standards at the original point of generation		KAFB Treatment Facility Off-Site Disposal Facility	For wastes, notice and certification referenced in 20.4.1 NMAC §268.7(a)(3)(i). For contaminated soil, notice referenced in 20.4.1 NMAC §268.7(a)(3)(ii).
Soils that do not meet 20.4.1 NMAC §268.49 alternative treatment standards		KAFB Treatment Facility Off-Site Treatment Facility	Notice in 20.4.1 NMAC §268.7(a)(2) and certification in 20.4.1 NMAC §268.7(a)(2)(i).
Soils that meet 20.4.1 NMAC §268.49 alternative treatment standards	If sent to a Subtitle C disposal facility:	KAFB Treatment Facility Off-Site Disposal Facility	Soil-specific certification in 20.4.1 NMAC §268.7(b)(4) and certification in 20.4.1 NMAC §268.7(a)(3)(ii).
	If sent to a Subtitle D disposal facility:	KAFB Treatment Facility New Mexico Environment Department	Notice in 20.4.1 NMAC §268.9(d)(1) and soil-specific certification in 20.4.1 NMAC §268.7(b)(4).

Table B-7
Land Disposal Restrictions (LDR) Requirements for Treatment Facilities

Type of Waste	General Requirement	Notification To:	One-Time Written Notice/Certification
All treatment residues and contaminated soil	Must meet all generator requirements in Table B-6, unless otherwise noted.	Kirtland Air Force Base (KAFB) Treatment Facility	
Waste residues that do not meet all 20.4.1 NMAC[a] §268.40 treatment standards		KAFB Treatment Facility Off-Site Treatment Facility	Notice and certification in 20.4.1 NMAC §268.7(b)(4)(iv), notice in 20.4.1 NMAC §268.7(b)(3)(ii), and appropriate notice and certification in Table B-6.
Waste residues that meet 20.4.1 NMAC §268.40 treatment standards	If sent to a Subtitle C disposal facility:	KAFB Treatment Facility Off-Site Disposal Facility	Notices and certifications in 20.4.1 NMAC §268.7(b)(4)(v) and 20.4.1 NMAC §268.7(b)(4), notice in 20.4.1 NMAC §268.7(b)(3)(ii).
	If sent to a Subtitle D disposal facility:	KAFB Treatment Facility New Mexico Environment Department	Notice in 20.4.1 NMAC §268.9(d)(1) and certification in 20.4.1 NMAC §268.7(b)(4).

[a] New Mexico Administrative Code, Title 20, Chapter 4, Part 1

APPENDIX C

INSPECTION PLAN

APPENDIX C

INSPECTION PLAN (during operations until August 2010)

The information in this appendix is submitted to address the Part B permit application inspection requirements in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), incorporating 40 CFR §270.14(b)(5), and 20.4.1 NMAC incorporating 40 CFR), incorporating 40 CFR §264.15 and 40 CFR §264.602. Pursuant to 20.4.1 NMAC incorporating 40 CFR §264.15(a), the open burn (OB) and open detonation (OD) units and the Explosive Ordnance Disposal (EOD) Range were inspected (during their operations) for malfunctions and deterioration, operator errors, discharges, and other conditions that might cause or lead to a release of hazardous waste to the environment or a threat to human health. Inspections were conducted often enough to identify problems in time to correct them before they harmed human health or the environment, as required by 20.4.1 NMAC incorporating 40 CFR §264.15(a).

The OB and OD units are miscellaneous units. Pursuant to the miscellaneous unit requirements in 20.4.1 NMAC incorporating 40 CFR §264.602, inspections of these units met the inspection requirements in 20.4.1 NMAC incorporating 40 CFR §264.15 and the equipment testing and maintenance requirements in 20.4.1 NMAC incorporating 40 CFR §264.33, as well as any additional requirements needed to protect human health and the environment. The requirements of 20.4.1 NMAC incorporating 40 CFR §§264.15 and incorporating 40 CFR 264.33 are discussed in Section C.2, along with how inspections at the EOD Range complied with those requirements. The OB and OD units are not subject to the inspection and monitoring requirements of 20.4.1 NMAC, Subpart V, incorporating 40 CFR Part 264, Subparts AA and BB because they are not designed with the equipment regulated under those requirements. In addition, the units are not subject to the inspection and monitoring requirements of 20.4.1 NMAC, Subpart V, incorporating 40 CFR §264, Subpart CC because the hazardous wastes were not treated in tanks, surface impoundments, or portable containers.

C.1 INSPECTION SCHEDULE

While the OB and OD units were in use, in accordance with 20.4.1 NMAC incorporating 40 CFR §264.15(b)(1), a written schedule was developed and followed at the EOD Range to routinely inspect the active operations for potential problems with safety and emergency equipment, security devices, and operating and structural equipment that were important to preventing, detecting, or responding to environmental or human hazards. Now that operations have terminated, a monthly inspection is conducted to insure access to the site is controlled, fencing and gates are secure and warning signs are still in place.

C.2 GENERAL INSPECTION REQUIREMENTS (PREVIOUS TO AUGUST 2010)

Due to the termination of waste treatment activities on the EOD Range, the requirements of 20.4.1 NMAC and 40 CFR §264.33 are no longer applicable. Discrepancies noted during monthly inspections will be reported to the base maintenance Contractor for correction in a timely manner.

C.2.1 Types of Problems

The requirements of 20.4.1 NMAC and 40 CFR §264.15(b)(3) are no longer applicable since all waste treatment operations were curtailed in late 2010.

C.2.2 Frequency of Inspections

The requirements of 20.4.1 NMAC and 40 CFR §264.15(b)(4) are no longer applicable since all waste treatment activity at the EOD Range was curtailed in 2010.

C.2.3 Remedial Action

The requirements of 20.4.1 NMAC and 40 CFR §264.15(d) are no longer applicable since all waste treatment activity at the EOD Range was curtailed in 2010.

C.3 INSPECTION RECORDS

EOD personnel use the inspection checklists shown in Tables C-1, C-2, and C-3. In accordance with 20.4.1 NMAC and 40 CFR §264.15(d), the inspection records are maintained for at least three years. The inspection logs are maintained at the EOD Shop, and include the date and time of the inspection, the name of the inspector, a notation of the observations made, and the date and nature of any repairs or other remedial actions.

Table C-1
Open Burn Unit Inspection Checklist

An Explosive Ordnance Disposal (EOD) Team Chief (Inspector) will perform and document an inspection **prior to a treatment event**.

Date of Inspection: _____ Time of Inspection: _____

Inspector' Name: _____

Inspector's Signature: _____

The EOD Team Chief must remedy all non-emergency problems and remediate deterioration or malfunctions as soon practicable or upon contractor-scheduled maintenance.

The EOD Team Chief must **STOP** the operation for any security, environmental, or human health hazard. Where a security infraction or hazard is imminent or has already occurred, remedial action must be taken immediately or upon contractor-scheduled maintenance prior to resuming operations.

Annotate any observations or comments at the end of this checklist.

	Open Burn (OB) Unit Inspection Requirements:	**Yes/No**
1	Is one EOD Range boundary gate left open for customers, workers, and off-site emergency crews?	
2	Is the EOD Range flag (and flagpole) in good condition and posted?	
3	Is the selected loading/unloading area free of explosives and reactive waste from previous operations, unnecessary combustibles and dry vegetation, and not subject to spills?	
4	Are first-aid kits available and serviceable?	
5	Are EOD Range personnel in possession of individually-issued personnel protective equipment (i.e., leather gloves, ANSI-rated eyewear)?	
6	Are hand-held radios available and operational?	
7	Is fire/spill control equipment available (i.e., shovels and hand tools) and serviceable?	
8	Are fire extinguishers available and serviceable?	
9	Are alternate EOD Range boundary gates locked?	
10	Is the OB area in good condition and suitable for conducting an operation (i.e., free of combustibles within 100-feet of the OB unit)?	
11	Is the burn pan free of standing water, explosives, and reactive waste from previous operations?	
12	Is the burn pan retractable roof and catwalk in good condition and suitable for conducting an operation (i.e., free of leaks or damage and appears structurally sound)?	
13	Is the burn pan concrete pad in good condition and suitable for conducting an operation (i.e., free of leaks, damage)?	
14	Is the burn pan in good condition and suitable for conducting an operation (i.e., free of leaks and cracks larger than 1-inch in width/diameter within 1-foot of the floor and appears structurally sound)?	
15	Is the burn pan floor in good condition and suitable for conducting an operation (i.e., free of leaks, splits, and cracks)?	
16	Are the burn pan door, hinge, and locking mechanism operational and in good condition?	

Table C-2
Open Detonation Unit Inspection Checklist

An Explosive Ordnance Disposal (EOD) Team Chief (Inspector) will perform and document an inspection **prior to a treatment event**.

Date of Inspection: _____ Time of Inspection: _____

Inspector' Name: _____

Inspector's Signature: _____

The EOD Team Chief must remedy all non-emergency problems and remediate deterioration or malfunctions as soon practicable or upon contractor-scheduled maintenance.

The EOD Team Chief must **STOP** the operation for any security, environmental, or human health hazard. Where a security infraction or hazard is imminent or has already occurred, remedial action must be taken immediately or upon contractor-scheduled maintenance prior to resuming operations.

Annotate any observations or comments at the end of this checklist.

	Open Detonation (OD) Unit Inspection Requirements:	**Yes/No**
1	Is an EOD Range boundary gate left open for customers, workers, and off-site emergency crews?	
2	Is the EOD Range flag (and flagpole) in good condition and posted?	
3	Is the selected loading/unloading area free of explosives and reactive waste from previous operations, unnecessary combustibles and dry vegetation, and not subject to spills?	
4	Are first-aid kits available and serviceable?	
5	Are EOD Range personnel in possession of individually-issued personnel protective equipment (i.e., leather gloves, ANSI-rated eyewear)?	
6	Are hand-held radios available and operational?	
7	Is fire/spill control equipment available (i.e. shovels and hand tools) and serviceable?	
8	Are fire extinguishers available and serviceable?	
9	Are alternate EOD Range boundary gates locked?	
10	Is the OD area in good condition and suitable for conducting an operation (i.e., free of combustibles within 200-feet of the location chosen for detonation; does not require grading or need holes filled)?	
11	Is the location, trench, or crater chosen for detonation free of standing water, explosives, and reactive waste from previous operations?	

Table C-3
Explosive Ordnance Disposal Range Inspection Checklist

An Explosive Ordnance Disposal (EOD) Team Chief (Inspector) will perform and document an inspection **at least monthly**.

Date of Inspection: _____ Time of Inspection: _____

Inspector's Name: _____

Inspector's Signature: _____

The EOD Team Chief must remedy all non-emergency problems, deterioration, or malfunctions as soon practicable or upon contractor-scheduled maintenance.

Annotate any observations or comments at the end of this checklist.

	EOD Range Inspection Requirements:	**Yes/No**
1	Is the EOD Range boundary fence in good condition and suitable for conducting an operation (i.e., with no breaks large enough for a person to pass through)?	
2	Are warning signs posted approximately 300-foot apart on the EOD Range boundary and are they in a readable condition (i.e., with no more than two adjacent signs missing or illegible)?	
3	Are the EOD Range boundary gates in good condition, working properly, and locked when the EOD Range is not in use?	
4	Is the run-off berm immediately surrounding the Open Detonation (OD) area at least two feet high and free of breaks and cracks?	
5	Are firebreaks in good condition and suitable for conducting an operation (i.e., free of dry vegetation crossing the entire width of the firebreak and passable by range vehicles)?	
6	Are EOD Range roads in good condition and passable by range vehicles?	
7	Is the earthen cover on the personnel bunker in good condition and suitable for conducting an operation (i.e., no exposed honeycomb or questionable integrity of the concrete structure)?	
8	Is there a serviceable fire extinguisher available in the personnel bunker?	
9	Are large metal fragments removed from the OD and Open Burn areas?	

APPENDIX D

PERSONNEL TRAINING PLAN

APPENDIX D
PERSONNEL TRAINING PLAN

Since all HW treatment operations were curtailed at the Explosive Ordnance Disposal (EOD) Range over 2 years ago, Kirtland Air Force Base EOD Personnel no longer require waste training in accordance with the Part B permit application requirements in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), incorporating 40 CFR §264.16, and 20.4.1 NMAC incorporating 40 CFR §270.14(b)(12). However, training records for those who previously operated the treatment facility are located at the EOD Branch, Bldg. 20413.

All EOD personnel previously involved in hazardous waste treatment activities at the OB/OD units completed the training program summarized in Table D-1.

Table D-1
Summary of Explosive Ordnance Disposal (EOD) Training Program

Course	Content	Frequency
Naval School for Explosive Ordnance Disposal (NAVSCOLEOD) Basic EOD Course	Covers all aspects of jobs associated with EOD operations	Initial
Explosive Safety	General Safety Requirements, Motor Vehicle Transportation, Disposal Range Requirements, Disposal Range Procedures, Range Safety, Standard Safety Guidelines, Site Entry, Site Control Personal Protective Equipment, Contingency Plan, Implementation, Procedures for Using Emergency Equipment, Procedures for Shutdown of Operations, Responses(s) to Emergencies, Emergency Coordinator(s), Evacuation Route and Procedures, Post-emergency Procedures	Initial/Annual
Relevant In-House Training	General Overview of Procedures to Perform Operations at the EOD Range; Waste Analysis Plan; Identification of Waste to be Managed; Waste Screening and Verification; Range Operation; Safety Practices; Security; Range Inspections; Preventive Procedures, Structures, and Equipment; Prevention of Reaction of Reactive Waste	Initial/Annual
Resource Conservation and Recovery Act Training	Hazardous Waste Management and Regulations – Overview, Hazardous Substances and Properties, General Facility Standards, Preparedness and Prevention, Contingency Plan and Emergency Procedures, Recordkeeping and Reporting	Initial/Annual

APPENDIX E

CONTINGENCY PLAN

APPENDIX E

CONTINGENCY PLAN

All Resource Conservation and Recovery Act (RCRA) related waste treatment operations were terminated at the Kirtland Air Force Base (KAFB) Explosive Ordnance Disposal (EOD) Range (in 2010) and no Hazardous Materials or Wastes have been accepted or tored at the EOD Range, OB or OD Units since that time. Therefore, the requirement for a Contingency Plan (in accordance with New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), incorporating 40 CFR §270.14(b)(7), and 20.4.1 NMAC, Subpart V, incorporating 40 CFR §264, Subpart D) is no longer applicable. Should any Natural or Human-caused incident occur within the boundaries of the EOD Range, response will be coordinated by the appropriate KAFB authorities (likely Security Forces or Fire Department) on a case by case basis (according to the incident at hand). KAFB EOD and/or Environmental Personnel would likely be advised after the fact, during normal business hours. Table E-1 details Emergency Contact information for any incident involving the EOD Range Area/Facilities.

Table E-1
Emergency Coordinator Contact Information for the (Inactive) Explosive Ordnance Disposal (EOD) Range at Kirtland Air Force Base (KAFB)

Contact or Name	Address	Office Phone	Home Phone
KAFB Command Post	Building 20604 KAFB, NM 87117	846-3777	NA
D. Brent Wilson, Base Civil Engineer	Building 20684 KAFB, NM 87117	846-7911 or 846-0411	281-5857
EOD Branch	Building 20413 KAFB, NM 87117	Call the KAFB Command Post at 846-3777[a]	NA

[a] The names of current EOD Supervisory personnel may be obtained by contacting the KAFB Command Post at 846-3777 and asking for EOD personnel with the rank of Staff Sergeant or above.

APPENDIX F

CLOSURE PLAN (submitted to NMED, March 2013)

KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO

Closure Plan for the Open Burn Unit

February 2013

377 MSG/CEIR
2050 Wyoming Blvd. SE
Kirtland AFB, New Mexico 87117-5270

40 CFR 270.11
DOCUMENT CERTIFICATION
FEBRUARY 2013

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

JOHN C. KUBINEC, Colonel, USAF

Commander, 377th Air Base Wing

This document has been approved for public release in accordance with Department of Defense Directives and Air Force Instructions.

X

Marie Vanover
Director, Public Affairs

KIRTLAND AIR FORCE BASE

377th Air Base Wing Public Affairs

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Summary of Laboratory Quality Control Procedures by Analytical Method

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1. INTRODUCTION

This closure plan describes the activities necessary to close the open burn (OB) treatment unit located within the Explosive Ordnance Disposal (EOD) Range at Kirtland Air Force Base (AFB). Figures 1-1 and 1-2 show the location of the EOD Range at Kirtland AFB, and the collocated open detonation (OD) and OB Units within the EOD Range. The last treatment event conducted at the OB Unit was in May 2008.

The OB Unit consists of a stationary steel container located on a concrete pad, surrounded by concrete walls on three sides. The eight-inch-thick concrete pad is 30.5 ft long by 10.5 ft wide, and the one-foot-thick concrete walls are 21.5 ft long, 10.5 ft wide, and 8 ft high. The northern portion (approximately 19 ft) of the reinforced concrete pad is level, and a two-ft-wide by approximately six-inch-high containment "hump" is located at the southern extent of the level portion of the pad to prevent run-on into or runoff from the concrete pad. The remaining portion (approximately 9 ft) of the concrete pad is sloped gently to the south, which allowed vehicular access to unload wastes for treatment at the OB Unit. On the northwest side of the OB Unit is a soil berm, measuring approximately 15 ft high and 40 feet long, which protected the unit from shock waves resulting from detonations at the collocated OD Unit. Inside the unit is a rectangular steel container constructed of heavy-duty steel. The steel container has a capacity of 12 cubic yards. It is 11 ft long, with an inner height of 4.3 ft and an overall height of 5.25 ft. The walls of the container are constructed of 11-gauge steel. A heavy-duty steel door is located at one end of the container, which was opened during waste placement and treatment residue removal. The OB Unit has a retractable, galvanized steel cover, which was rolled manually into place with pull chains along a steel framework (C-channels) during non-operational periods. The cover is slightly inclined to prevent precipitation from entering the Unit.

Until final closure of the unit is complete in accordance with the New Mexico Hazardous Waste Management Regulations and certification of closure has been approved by the New Mexico Environment Department (NMED or the Department), a copy of the approved Closure Plan and any revisions thereof shall be maintained at the EOD shop (building 20413). The operating record is currently maintained at the personnel bunker located at the EOD range. This Closure Plan and any revisions thereof shall be made available, upon request, to the Department.

If the OB Unit cannot be clean-closed, a post-closure care plan shall be prepared to address the hazardous constituents remaining at the site and submitted to the NMED for approval.

A closure plan for the OB Unit was previously submitted to the NMED on 21 June 2010, in accordance with the Settlement Agreement between the Water and Waste Management Division of the Department and United States Air Force, Kirtland Air Force Base (AFB) regarding Compliance Order HWB-09-00 (CO), Section V.13.b and VII.19.b. At that time, all of the final sampling and monitoring requirements were proposed for transfer into the closure plan for the collocated OD unit, which was not planned for closure until 2050. The June 2010 closure plan proposed only partial closure of the OB Unit.

The OD and OB Units are now scheduled to undergo final closure activities simultaneously. The OD Unit has a separate closure plan, but several elements of the OB and OD unit closure plans overlap and are noted within each document. Additionally, there is currently a perchlorate groundwater investigation occurring to the west of the EOD range. This investigation and its results are independent of this OB Unit closure plan.

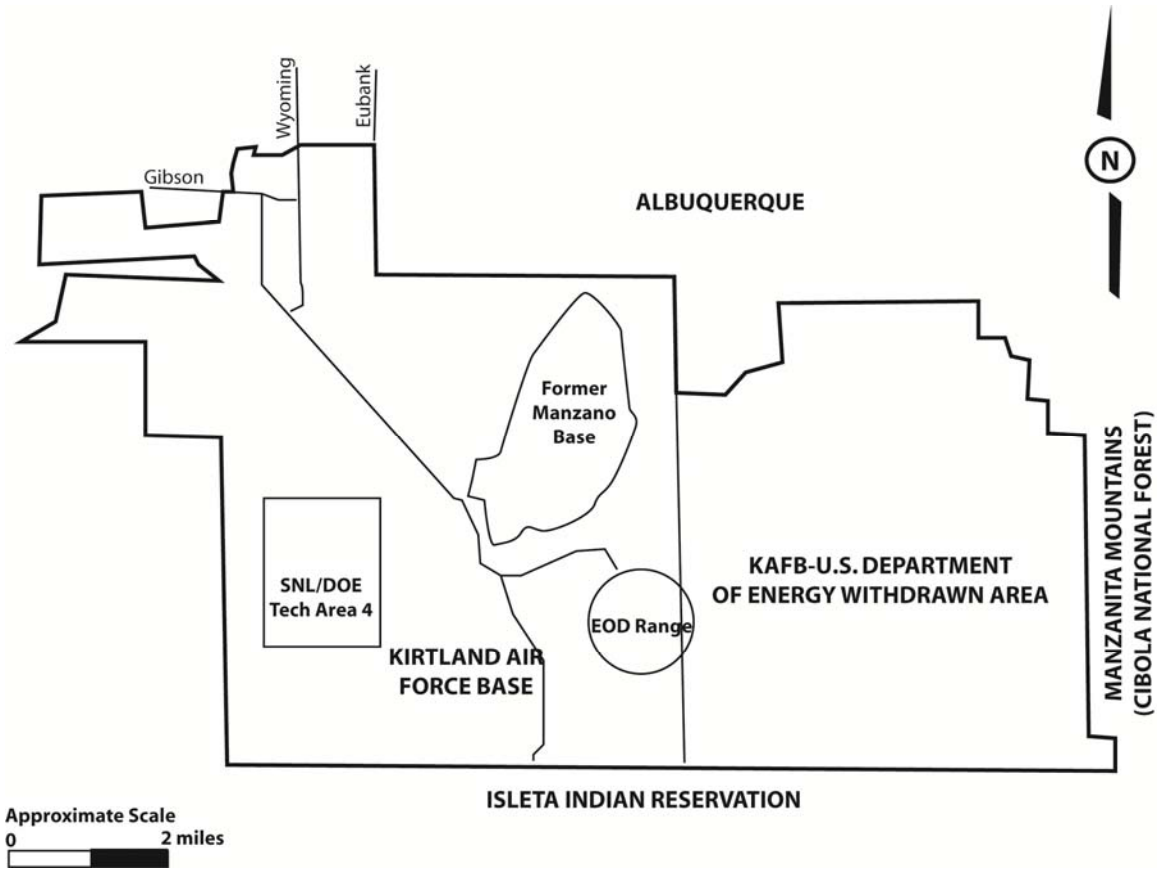

Figure 1-1. Location of EOD Range at Kirtland AFB

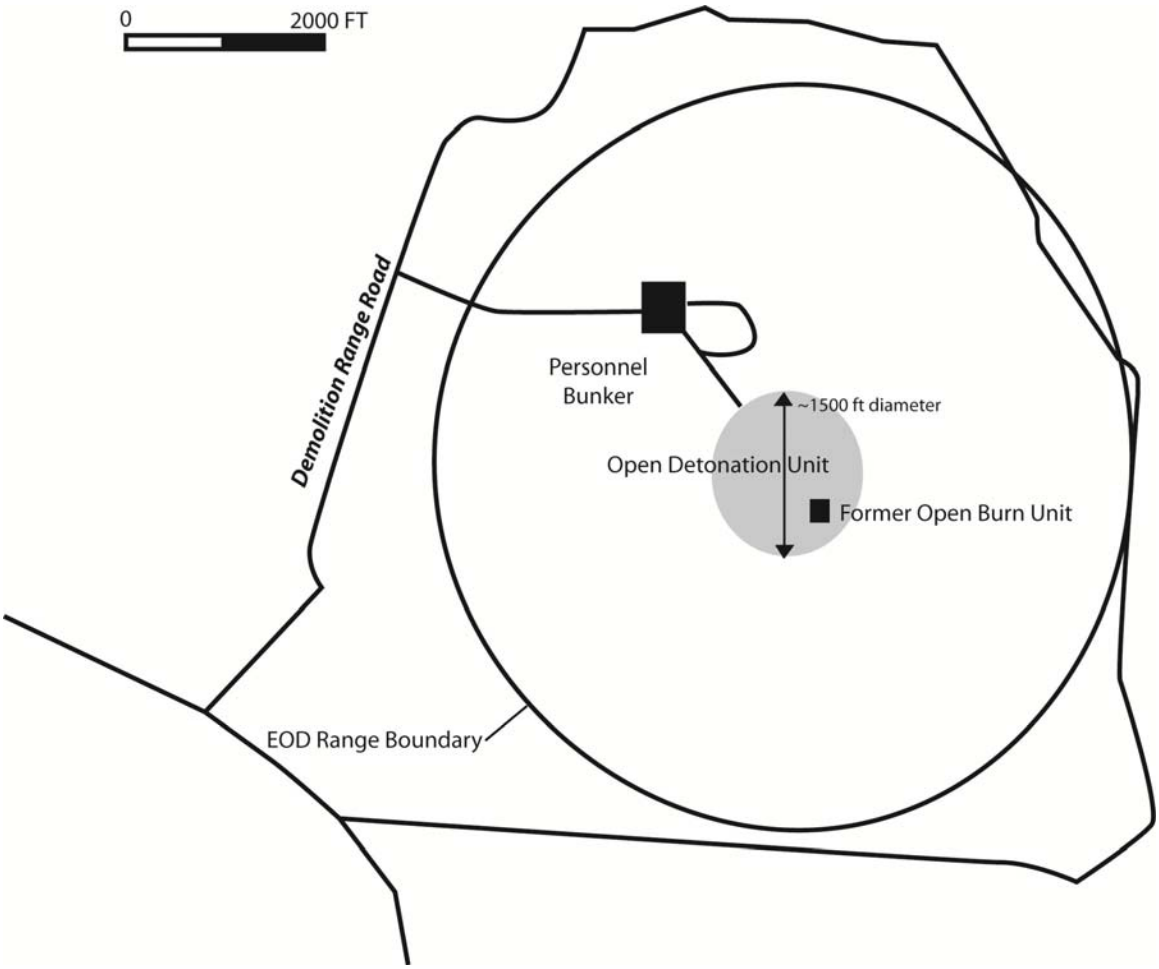

Figure 1-2. Location of Open Burn Unit and Open Detonation Unit at EOD Range

SWMU 06-19 (KAFB IRP site OT-29), which is located approximately 20 feet northeast of the present OB structure, requires corrective action. Corrective action at SMWU 06-19 shall comply with the provisions of the Resource Conservation and Recovery Act (RCRA).

1.1 General Closure Information

This closure plan has been prepared in compliance with the requirements of RCRA (42 U.S.C. §§6901 et seq.) and its implementing regulations at 40 CFR Parts 264 and 270 (see 40 CFR Part 264 Subparts G and X and 270.14(b)(13)), and state implementing statutes and regulations under which the state has delegated RCRA authority (see New Mexico Hazardous Waste Act, Chapter 74 Article 4 NMSA 1978 and 20.4.1 NMAC).

1.2 Closure Performance Standard

The OB Unit shall be closed to meet the following performance standards:

- Minimize the need for further maintenance;
- Control, minimize or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to ground water or surface waters or to the atmosphere; and
- Comply with the requirements of 40 CFR Part 264, Subpart G and 40 CFR §264.601.

1.3 Final Closure Activities

The last treatment event at the OB Unit occurred in May 2008. All treatment residues from this last treatment event have been removed from the unit. Kirtland AFB (the Permittee) officially ceased operation of the OB Unit on September 28, 2009 in accordance with the terms and conditions of Stipulated Final Order No. HWB-09-00(CO) and Settlement Agreement. The Permittee shall notify the Secretary of the Department, in writing, at least 45 days prior to the date that closure activities at the OB Unit shall commence.

Final closure activities at the OB Unit shall include:

- Removal of the OB structure, secondary containment curbing and equipment used at the OB Unit for hazardous waste treatment.
- Sampling of the soil underneath the base of the former OB Unit.
- Sifting of the soils beneath the OB Unit to a depth of one foot to remove scrap metal.
- Grading the area to level.
- Removing any soil or debris from the OB Unit that have contaminant concentrations which pose unacceptable risk to human health or the environment;
- Sending for treatment and disposal any solid and hazardous waste, including any treatment residues, to a permitted Treatment, Storage, or Disposal Facility (TSDF) in accordance with applicable regulatory requirements.

Final closure shall be complete when:

- All structures and equipment from the OB Unit have been removed;
- All solid and hazardous waste has been disposed of off-site as required by law;

- Sampling demonstrates that no unacceptable risk to human health or the environment exists in soil at the OB Unit;
- A Certification of Closure and Closure Report has been submitted to the Department; and
- The Department has approved the Certification of Closure and Closure Report.

1.4 Maximum Extent of Operations and Maximum Waste Inventory

The OB Unit was permitted on 26 July of 1995 as Permit# NM9570024423-OB, which allowed 80,000 pounds Net Explosive Weight (NEW) of hazardous waste munitions per year to be treated annually. Small arms ammunition and spent flare casings were treated at the OB Unit.

Operations at the OB Unit ceased in May 2008. Following the final treatment event, all wastes were removed from the unit. Based on the operating record, the total weight of material burned was approximately 60,466 pounds of NEW.

Closure activities and any corrective action that may be required shall be limited to the OB Unit. Any corrective action that may be required for a release from the OB Unit shall be conducted under the terms and conditions of the 2010 OD operating permit.

1.5 Schedule for Closure

Final closure of the Former OB Unit shall proceed by the general schedule presented in Table 1-1.

Table 1-1
Closure Schedule

Activity	Time Required
Notify the Department of receiving final volume of hazardous waste at the OB Unit	Completed
Removal of all hazardous waste from the OB Unit	Completed
Department approval of final OB Unit closure plan	TBD
Begin final closure activities	Day 0
Obtain analysis of soil samples	Day 45
Final closure activities completed	Day 180
Submit final report and closure certification to the Department	Day 240

Note: The schedule above indicates the calendar days on which activities shall start or be completed subsequent to commencing closure activities on day zero. Some activities may be conducted simultaneously or may require less time to complete.

1.6 Amendment of Closure Plan

All Closure Plan amendments, if necessary, shall be submitted by the Permittee in accordance with applicable regulations and the terms and conditions of the Subpart X, Permit Attachment F, Closure Plan, Written amendment request shall include a copy o the amended plan for approval by the Department.

1.7 Closure and Post-Closure Cost Estimate, Financial Assurance and Liability Requirements

Since the Kirtland AFB facility is a federal facility, it is currently exempt from the requirement to provide closure and post-closure care estimates and the requirements to provide financial assurance and liability insurance for closure and post-closure activities pursuant to 40 CFR Part 264, Subpart H.

1.8 Closure Certification

Within 60 days after completing final OB Unit closure activities, the Permittee shall submit, via certified mail, a certification that the unit has been closed in accordance with the specifications of the approved closure plan. The certification shall be signed by the Installation Commander, the designated Responsible Official for Kirtland AFB, and by an independent, professional engineer registered in the State of New Mexico. Documentation supporting the independent, registered professional engineer's certification shall be furnished to the Department with the certification.

1.9 Closure Report

Within 60 days of completion of the final closure activities, a closure report shall be submitted to the Department. The report shall document the closure activities conducted and contain, at a minimum, the following information:

- A summary of the closure activities;
- Any significant variance from the approved closure plan and the reason for the variance;
- A summary of sampling data associated with closure, including analytical results for all field and laboratory quality control samples;
- A quality assurance statement on the adequacy of the analyses to support closure;
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data);
- Disposal location and quantities of all solid and hazardous wastes removed from the OB Unit; and
- Certification of the accuracy of the report.

1.10 Survey Plat and Post-Closure Requirements

Upon final closure of the OB Unit a survey plat shall be prepared and certified by a professional land surveyor and submitted with the closure report to the Department. The survey plat shall also be simultaneously filed with the local zoning authority. In the event the OB Unit cannot be clean closed, a post-closure care plan shall be submitted to the Department for review and approval.

2. CLOSURE PROCEDURES

The last treatment event at the OB Unit occurred in May 2008, and there are no treatment residues remaining. The OB Unit structure, secondary containment, and equipment shall be removed from the site as part of closure.

The first phase of closure shall consist of a hazards survey of the OB Unit conducted by contractor health and safety personnel, which will include unexploded ordnance (UXO) safety personnel, and Kirtland AFB EOD personnel. The purpose of the survey will be to identify potential contamination concerns that may present hazards to workers during the closure activities and to specify any control measures necessary to reduce worker risk. This survey will provide the information necessary for health physics, UXO safety, and industrial hygiene personnel to identify worker qualifications, personal protective equipment (PPE), safety awareness, work permits, exposure control programs, and emergency coordination that will be required to perform closure. Any munitions and explosives of concern (MEC) identified during the hazard survey will be reported to and handled by Kirtland AFB EOD staff personnel only. All workers involved in the closure activities will be required to have training and medical monitoring as required by applicable regulations. Personnel performing closure activities will be required to wear PPE as specified by health physics and industrial hygiene personnel.

Sufficient sampling and analysis shall be required to demonstrate there are no contaminant concentrations which pose unacceptable risk to human health or the environment.

Soil at the OB Unit shall be characterized by sampling and analysis. Soil sampling shall follow the procedures described in section 2.3.1. Soil shall be analyzed for the parameters listed in tables 2-1, 2-2, and 2-3. If sampling and analysis of soil indicates the presence of hazardous waste or hazardous constituents above background levels, a risk assessment shall be conducted based on a residential land use scenario to determine whether the contaminants pose an unacceptable risk to human health or the environment. In lieu of a baseline risk assessment, the Permittee may compare the soil sampling results to the soil screening levels using the procedures listed in the department's most current version "Technical Background Document for Development of Soil Screening Levels" (as amended), provided the soil screening levels are based on a residential land use scenario. If the risk assessment demonstrates that the level of contamination is unacceptable, the contaminated soil exhibiting unacceptable risk shall be subject to corrective action shall be excavated and removed. The excavated soil shall be collected, transferred to containers, and, if applicable, managed and disposed of as a hazardous waste. Background soil concentrations for metals are those approved by the Department for the KAFB facility and are listed in Table 2-1.

2.1 Soil Sifting and Removal Procedures

The OB Unit (i.e., concrete base, walls, and curbing; steel container, cover and framework; brass sorter) shall be dismantled and removed. Soils beneath the unit shall be sifted to separate scrap metal greater than ½ inch in diameter. The soils shall be sifted to a depth of one foot. The OB Unit area shall be graded after sifting activities are completed.

2.1.1 Mesa Schoolhouse Well

The Mesa Schoolhouse Well, a Department of Energy/National Nuclear Surety Administration (DOE/NNSA) well authorized under Kirtland AFB permit #PERM/0-K1-91-0010 was monitored for groundwater contamination as part of the July 1995 OB Unit's sampling and analysis plan.

This sampling has been discontinued and the wellhead is secure. The well will remain in place for possible future monitoring by DOE/NNSA.

2.2 Sampling, Decontamination Procedures, and PPE

This section describes procedures and methods for soil sampling applicable to closure activities. While the procedures and methods are specific, other applicable procedures or methods given in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) may be used if conditions or experience show the alternate method to be more appropriate, and if approved by the Department. Sampling will be conducted in accordance with procedures given in “Samplers and Sampling Procedures for Hazardous Waste Steams” (EPA 600/2-80-018) or SW-846, as appropriate.

Surface and subsurface soil at the OB Unit shall be characterized by sampling and analysis.

The tools and equipment used during the sampling shall be scraped as necessary to remove any residue and cleaned with detergent and water. The wash water shall be collected and analyzed for characterization of waste. The wash water will be disposed of according to applicable regulations based on the results of the waste characterization samples.

All of the PPE worn by personnel performing closure activities will be disposable; therefore, all PPE shall be placed into containers and managed according to applicable regulations.

2.2.1 Soil Sampling

Once the OB Unit structure, curbing, and equipment are removed, three samples from beneath the unit shall be collected to a depth of zero to 6 inches. Additional, deeper soil sampling conducted during the closure of the OD unit shall also encompass the area of the OB Unit.

The samples shall be analyzed for the parameters listed in Tables 2-1, which includes all of hazardous constituents of the hazardous wastes that were detonated at the OB Unit.
Surface soil samples (zero to six inches depth) shall be collected with a wooden or Teflon™ trowel or scoop. Disposable sampling tools shall be used. In the event that Department requests split samples, sufficient soils shall be collected to provide split samples to the Department representatives. Only discrete grab samples shall be collected; no samples shall be composited.

Clean sampling equipment shall be used to collect each sample. Unused, disposable sampling equipment may be presumed clean if still in a factory-sealed wrapper prior to use. Reusable sampling equipment shall be decontaminated after each use by scraping to remove any loose material, washing with a detergent and water solution, rinsing several times with tap water, rinsing with deionized water, and drained of excess water, and air-dried or wiped dry.

2.2.2 Appropriate Sample Containers and Preservatives

Samples shall be placed in clean containers compatible with the intended analysis and shall be properly prepared and preserved to maintain sample integrity. The most recent version of SW-846 lists the proper container, preservative, and holding time for each chemical parameter of interest, and these requirements shall be followed for all samples collected during the closure process. Table 2-2 summarizes the sample containers, preservation techniques, and holding times for soil and liquid samples.

2.2.3 Sample Handling and Documentation

Each sample shall be labeled, sealed, and accompanied by a chain-of-custody and a request-for-analysis form. A chain-of-custody form shall be used to track samples from collection through analysis to ensure that the integrity of the samples is protected, and that analytical results can be attributed to specific closure activities or specific areas. The procedures followed during closure shall be equivalent to those provided in the most current version of SW-846. Important aspects of the procedures are presented below. A chain-of-custody form shall be prepared for all samples collected for laboratory analyses. The form includes:

- Sample identification number;
- Name and signature of sample collector;
- Date and time of sample collection;
- Location at which sample was collected;
- Type of waste (e.g., soil, liquid, etc.);
- Signatures of persons who have had samples in their possession;
- Dates and times of possession.

This form shall be initiated at the point of sample collection and shall then remain with the sample during transfer to the laboratory. The form shall be completed upon receipt at the laboratory and returned to Permittee for inclusion in facility operating record. The chain-of-custody form shall include a request-for analysis form that lists all analyses to be performed for the identified samples and all special instructions relating to sample management or analysis. Any potential hazards posed by the samples shall be listed on the request-for-analysis form.

The sample containers shall be sealed with gummed paper seals attached to the containers in such a way that the seals must be broken in order to open the containers. The seals and sample labels must be completed with a waterproof pen. The sample labels are necessary to prevent misidentification of samples and shall include the following information: a unique sample number; name or initials of sample collector; sample collection date and time; sample location; and, sample type, depth, and description.

A closure sampling field log book shall be kept and shall contain all information pertinent to field surveys and sampling. Sufficient information shall be recorded so that a person can reasonably reconstruct what occurred at a sampling event without relying on a collector’s memory. The log book shall have bound and consecutively numbered pages in 8 by 11-inch format. Minimum entries shall include:

- Purpose of sample;
- Location of sampling;
- Name and business address of person making log entry;
- Number, type, and volume of sample;
- Description of each sampling methodology and equipment used;
- Date and time of sample collection;
- Sample destination and transporter's name (name of laboratory, UPS, etc.);
- Map or photograph of the sampling site;
- Field observations (ambient temperature, sky conditions, past 24-hour precipitation, etc.);
- Field measurements, if any (pH, flammability, conductivity, explosivity, etc.);
- Collector's sample identification number(s);
- Signature of person responsible for the log entry.

Documentation of sample acceptance at the laboratory shall be provided following sample screening and log-in. This documentation may consist of signed copies of the chain-of-custody, documentation or a letter detailing the field sample numbers accepted. Corresponding laboratory sample identification numbers shall be provided. The laboratory is required to have procedures for minimizing cross contamination of samples and securing sample custody within the laboratory.

2.2.4 Sample Shipping

Samples shall be packaged and shipped to the laboratory in accordance with DOT shipping requirements and in a manner to ensure that the integrity of the samples is protected. The sample containers shall be cushioned to protect against breakage or puncture.

2.2.5 Sample Analysis

Closure samples shall be analyzed by an EPA-certified commercial laboratory. The analytical laboratory shall have procedures for minimizing cross-contamination of samples and securing sample custody within the laboratory. Test methods for analysis of all samples shall be performed according to procedures documented in the most current version of SW-846. Hazardous constituents associated with the regulated wastes treated at the OB Unit are included in these analyses. Analytical methods, detection limits, and instrumentation are provided in Table 2-1 for metals, organics analysis; and high explosives (HE).

Minimum calibration, operation, and quality control (bias, precision, blank and matrix effects) requirements for laboratory analyses shall be performed as listed in the individual analytical methods of SW-846. All laboratory analyst notebooks, log sheets, instrument printouts, charts, and calculations relevant to analyses of these samples shall be identified and remain accessible. This information may be requested for independent review and validation. If requested by the Department, this information shall be provided.

2.2.6 Quality Assurance/Quality Control Program

Because decisions about closure activities may be based, in part, on analyses of samples, a program to ensure reliability of analytical data is mandatory. Data reliability shall be ensured by documenting sample management so that analyses are traceable to specific areas of potential contamination and by following a quality assurance/quality control (QA/QC) program that mandates documentation of the precision and accuracy of laboratory analyses, as well as data completeness, representativeness, and comparability.

Sampling activities shall include collection of QC samples in addition to field documentation requirements. QC samples to be collected include: duplicate samples, trip blanks, and equipment blanks. Table 2-3 summarizes field QC sample requirements.

Blanks and duplicate samples shall be collected to determine potential errors introduced in the data from sample collection and handling activities. To determine the potential for cross contamination, equipment blanks consisting of rinsate from decontaminated grading equipment shall be collected and analyzed. At least one equipment blank shall be collected for every ten samples collected with non-dedicated sampling equipment. Duplicate samples shall be collected at a frequency of one duplicate sample for every ten field samples. In no case will less than one equipment blank or duplicate sample be collected for a sampling effort. These blank and

duplicate samples shall be identified and treated as separate samples. Acceptance criteria for QA/QC sample analyses shall be compatible with the most recent version of SW-846 or other applicable EPA guidance.

The analytical laboratory shall operate under a QA program plan (QAPP) that meets the requirements of SW-846. QC procedures in the analytical laboratory are guided by the laboratory's QAPP. Laboratory QC samples are required to establish the accuracy and precision of analytical data in order to determine the quality of the data. Attachment 1 lists laboratory QC procedures by analytical methods.

The analytical laboratory data shall be validated using the following criteria:

- Completeness of data deliverable;
- Collection, extraction, and analysis holding times;
- Blank data;
- Laboratory control sample results;
- Matrix spike/matrix spike duplicate results;
- Laboratory duplicate sample results; and
- Overall data assessment and usability.

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Table 2-1

Comparison of Reporting Levels to Screening Objectives in Soil, Open Burn Unit at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Residential SSG (Feb 2012)	Coyote Test Field Super Group Background Values (surface soil)	Coyote Test Field Super Group Background Values (subsurface soil)	EPA Regional Screening Levels, Residential (Nov 2012)	LOQ	LOD	DL
SW6010B	Antimony	7440-36-0	mg/kg	31.3	3.9	3.9	--	3	2	0.94
SW6010B	Barium	7440-39-3	mg/kg	15,596	130	214	--	2	0.5	0.12
SW6010B	Beryllium	7440-41-7	mg/kg	156	0.65	0.65	--	0.3	0.1	0.03
SW6010B	Cadmium	7440-43-9	mg/kg	70.3	1	0.9	--	0.3	0.1	0.03
SW6010B	Chromium	7440-47-3	mg/kg	117,321/2.97	17.3	12.8	--	1	0.5	0.14
SW6010B	Cobalt	7440-48-4	mg/kg	--	5.2	5.2	23	1	0.5	0.25
SW6010B	Copper	7440-50-8	mg/kg	3,129	15.4	18.2	--	1.5	0.5	0.22
SW6010B	Lead	7439-92-1	mg/kg	400	21.4	11.8	--	1	0.5	0.26
SW6010B	Nickel	7440-02-0	mg/kg	1,564	11.5	11.5	--	1	0.5	0.24
SW6010B	Selenium	7782-49-2	mg/kg	391	1	1	--	4	2.5	1.4
SW6010B	Silver	7440-22-4	mg/kg	391	1	1	--	0.5	0.2	0.09
SW6010B	Tin	7440-31-5	mg/kg	--	--	--	47,000	100	25	11
SW6010B	Vanadium	7440-62-2	mg/kg	391	20.4	21.5	--	2	0.5	0.19
SW6010B	Zinc	7440-66-6	mg/kg	23,464	62	62	--	2	1	0.19
SW6020A	Arsenic	7440-38-2	mg/kg	3.9	5.6	7.4	--	0.5	0.3	0.15
SW6020A	Thallium	7440-28-0	mg/kg	0.78	1.1	1.1	--	0.15	0.1	0.05
SW7471A	Mercury	7439-97-6	mg/kg	15.6/7.82	0.25	0.10	--	0.04	0.012	0.0086
SW6850	Perchlorate	14797-73-0	µg/kg	54,800	--	--	--	5	0.4	0.26
SW7580	White Phosphorus	7723-14-0W	µg/kg	--	--	--	1,600	0.1	0.05	0.015
SW8260B	1,1,1-Trichloroethane	71-55-6	µg/kg	15,609,580	--	--	--	5	1	0.36
SW8260B	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	8,021	--	--	--	5	1	0.68
SW8260B	1,1,2-Trichloroethane	79-00-5	µg/kg	2,811	--	--	--	5	1	0.44
SW8260B	1,1,2-trichloro-1,1,2-trifluoroethane	76-13-1	µg/kg	72,080,604	--	--	--	10	1	0.83
SW8260B	1,1-Dichloroethane	75-34-3	µg/kg	64,514	--	--	--	5	1	0.29
SW8260B	1,1-Dichloroethene	75-35-4	µg/kg	448,879	--	--	--	5	0.5	0.26
SW8260B	1,2,3-Trichlorobenzene	87-61-6	µg/kg	--	--	--	49,000	5	1	0.75
SW8260B	1,2,3-Trichloropropane	96-18-4	µg/kg	50	--	--	--	5	1	0.76
SW8260B	1,2,4-Trichlorobenzene	120-82-1	µg/kg	72,980	--	--	--	5	1	0.75
SW8260B	1,2,4-Trimethylbenzene	95-63-6	µg/kg	--	--	--	62,000	5	1	0.51
SW8260B	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	µg/kg	186	--	--	--	10	1	0.88
SW8260B	1,2-Dibromoethane (EDB)	106-93-4	µg/kg	588	--	--	--	10	1	0.27
SW8260B	1,2-Dichlorobenzene	95-50-1	µg/kg	2,306,711	--	--	--	5	1	0.64
SW8260B	1,2-Dichloroethane	107-06-2	µg/kg	7,885	--	--	--	5	1	0.73
SW8260B	1,2-Dichloropropane	78-87-5	µg/kg	15,238	--	--	--	5	1	0.6
SW8260B	1,3,5-Trimethylbenzene	108-67-8	µg/kg	--	--	--	780,000	5	1	0.35
SW8260B	1,3-Dichlorobenzene*	541-73-1	µg/kg	--	--	--	--	5	1	0.3
SW8260B	1,4-Dichlorobenzene	106-46-7	µg/kg	31,731	--	--	--	5	1	0.78
SW8260B	1,4-Dioxane	123-91-1	µg/kg	48,634	--	--	--	250	75	39
SW8260B	2-Butanone (MEK)	78-93-3	µg/kg	37,076,608	--	--	--	10	3	1.4
SW8260B	2-Hexanone	591-78-6	µg/kg	--	--	--	210,000	10	1	0.74
SW8260B	4-Methyl-2-pentanone (MIBK)	108-10-1	µg/kg	51,578	--	--	--	10	1	0.92
SW8260B	Acetone	67-64-1	µg/kg	66,556,733	--	--	--	20	3	1.4
SW8260B	Benzene	71-43-2	µg/kg	15,381	--	--	--	5	1	0.26
SW8260B	Bromochloromethane	74-97-5	µg/kg	--	--	--	160,000	5	1	0.94
SW8260B	Bromodichloromethane	75-27-4	µg/kg	5,411	--	--	--	5	1	0.53
SW8260B	Bromoform	75-25-2	µg/kg	--	--	--	--	5	1	0.4
SW8260B	Bromomethane	74-83-9	µg/kg	16,485	--	--	--	5	3	0.86
SW8260B	Carbon disulfide	75-15-0	µg/kg	1,532,527	--	--	--	10	1	0.49
SW8260B	Carbon tetrachloride	56-23-5	µg/kg	10,833	--	--	--	5	1	0.53
SW8260B	Chlorobenzene	108-90-7	µg/kg	376,370	--	--	--	5	1	0.29
SW8260B	Chloroethane	75-00-3	µg/kg	29,806,983	--	--	--	5	1	0.45
SW8260B	Chloroform	67-66-3	µg/kg	5,864	--	--	--	5	1	0.26
SW8260B	Chloromethane	74-87-3	µg/kg	274,707	--	--	--	5	1	0.5
SW8260B	cis-1,2-Dichloroethene	156-59-2	µg/kg	156,428	--	--	--	5	1	0.89
SW8260B	cis-1,3-Dichloropropene*	10061-01-5	µg/kg	33713	--	--	--	5	1	0.64
SW8260B	Cyclohexane	1735-17-7	µg/kg	--	--	--	7,000,000	(a)	(a)	(a)
SW8260B	Dibromochloromethane	124-48-1	µg/kg	12,127	--	--	--	5	0.5	0.21
SW8260B	Dichlorodifluoromethane (Freon 12)	75-71-8	µg/kg	168,142	--	--	--	5	3	0.89
SW8260B	Ethylbenzene	100-41-4	µg/kg	68,448	--	--	--	5	1	0.34
SW8260B	Isopropylbenzene	98-82-8	µg/kg	2,430,743	--	--	--	5	1	0.52
SW8260B	Methyl Acetate	79-20-9	µg/kg	78,214,000	--	--	--	(a)	(a)	(a)
SW8260B	Methly Cyclohexane	108-87-2	µg/kg	5,625,911	--	--	--	(a)	(a)	(a)
SW8260B	Methyl tert-butyl ether (MTBE)	1634-04-4	µg/kg	901,073	--	--	--	10	1	0.6
SW8260B	Methylene chloride	75-09-2	µg/kg	409,376	--	--	--	5	1	0.84
SW8260B	m-Xylene & p-Xylene	136777-61-2	µg/kg	774,289	--	--	--	5	1	0.81
SW8260B	Naphthalene	91-20-3	µg/kg	42,976	--	--	--	5	1	0.63
SW8260B	o-Xylene	95-47-6	µg/kg	898,344	--	--	--	5	0.5	0.33
SW8260B	Styrene	100-42-5	µg/kg	7,277,612	--	--	--	5	1	0.31
SW8260B	Tetrachloroethene	127-18-4	µg/kg	7,021	--	--	--	5	1	0.61
SW8260B	Toluene	108-88-3	µg/kg	5,274,400	--	--	--	5	1	0.61
SW8260B	trans-1,2-Dichloroethene	156-60-5	µg/kg	269,586	--	--	--	5	1	0.38
SW8260B	trans-1,3-Dichloropropene*	10061-02-6	µg/kg	33713	--	--	--	5	1	0.75
SW8260B	Trichloroethene	79-01-6	µg/kg	8,767	--	--	--	5	1	0.6
SW8260B	Trichlorofluoromethane (Freon 11)	75-69-4	µg/kg	1,412,976	--	--	--	10	1	0.34
SW8260B	Vinyl chloride	75-01-4	µg/kg	728	--	--	--	5	1	0.36

Table 2-1

Comparison of Reporting Levels to Screening Objectives in Soil, Open Burn Unit at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Residential SSG (Feb 2012)	Coyote Test Field Super Group Background Values (surface soil)	Coyote Test Field Super Group Background Values (subsurface soil)	EPA Regional Screening Levels, Residential (Nov 2012)	LOQ	LOD	DL
SW8270C	1,1-biphenyl	92-52-4	ug/kg	57117	--	--	--	330	NA	165
SW8270C	1,2,4,5-tetrachlrorbenzene	95-94-3	µg/kg	18,331	--	--	--	(a)	(a)	(a)
SW8270C	2,4,5-Trichlorophenol	95-95-4	µg/kg	6,110,491	--	--	--	330	167	83
SW8270C	2,4,6-Trichlorophenol	88-06-2	µg/kg	61,105	--	--	--	330	167	84
SW8270C	2,4-Dichlorophenol	120-83-2	µg/kg	183,315	--	--	--	330	167	89
SW8270C	2,4-Dimethylphenol	105-67-9	µg/kg	1,222,098	--	--	--	500	167	167
SW8270C	2,4-Dinitrotoluene	121-14-2	µg/kg	15,689	--	--	--	330	167	89
SW8270C	2,6-Dichlorophenol*	87-65-0	µg/kg	--	--	--	--	500	167	165
SW8270C	2,6-Dinitrotoluene	606-20-2	µg/kg	61,105	--	--	--	330	167	99
SW8270C	2-Chloronaphthalene	91-58-7	µg/kg	6,257,143	--	--	--	330	167	81
SW8270C	2-Chlorophenol	95-57-8	µg/kg	391,071	--	--	--	330	167	88
SW8270C	2-Methylnaphthalene	91-57-6	µg/kg	--	--	--	230,000	330	167	85
SW8270C	2-Methylphenol	95-48-7	µg/kg	--	--	--	3,100,000	330	167	58
SW8270C	2-Nitroaniline	88-74-4	µg/kg	--	--	--	610,000	1600	167	84
SW8270C	2-Nitrophenol*	88-75-5	µg/kg	--	--	--	--	330	167	82
SW8270C	2,2-oxybis(1-chloropropane)*	52438-91-2	µg/kg	--	--	--	--	330	167	54
SW8270C	3,3'-Dichlorobenzidine	91-94-1	µg/kg	10,808	--	--	--	1600	167	94
SW8270C	3-Methylphenol & 4-Methylphenol	65794-96-9	µg/kg	--	--	--	3,100,000	1000	660	330
SW8270C	3-Nitroaniline*	99-09-2	µg/kg	--	--	--	--	1600	333	167
SW8270C	4,6-Dinitro-2-methylphenol	534-52-1	µg/kg	4,888	--	--	--	2000	333	81
SW8270C	4-Bromophenyl phenyl ether*	101-55-3	µg/kg	--	--	--	--	330	167	85
SW8270C	4-Chloro-3-methylphenol	59-50-7	µg/kg	--	--	--	6,100,000	330	167	92
SW8270C	4-Chloroaniline	106-47-8	µg/kg	--	--	--	2,400	330	167	58
SW8270C	4-Chlorophenyl phenyl ether*	7005-72-3	µg/kg	--	--	--	--	330	167	93
SW8270C	4-Nitroaniline	100-01-6	µg/kg	--	--	--	24,000	1600	167	88
SW8270C	4-Nitrophenol*	100-02-7	µg/kg	--	--	--	--	2000	333	280
SW8270C	Acenaphthene	83-32-9	µg/kg	3,440,510	--	--	--	330	167	83
SW8270C	Acenaphthylene*	208-96-8	µg/kg	--	--	--	--	330	167	85
SW8270C	Anthracene	120-12-7	µg/kg	17,202,560	--	--	--	330	167	86
SW8270C	Acetophenone	17537-31-4	µg/kg	7,821,428	--	--	--	(a)	(a)	(a)
SW8270C	Azobenzene (as 1,2 diphenyl hydrazine)	103-33-3	µg/kg	6079	--	--	610	330	167	92
SW8270C	Atrazine	93616-39-8	µg/kg	--	--	--	2,100	(a)	(a)	(a)
SW8270C	Benzaldehyde	100-52-7	µg/kg	--	--	--	7,800,000	(a)	(a)	(a)
SW8270C	Benz(a)anthracene	56-55-3	µg/kg	1,476	--	--	--	330	167	92
SW8270C	Benzo(a)pyrene	50-32-8	µg/kg	147	--	--	--	330	167	94
SW8270C	Benzo(b)fluoranthene	205-99-2	µg/kg	1,476	--	--	--	330	167	95
SW8270C	Benzo(ghi)perylene*	191-24-2	µg/kg	--	--	--	--	330	167	110
SW8270C	Benzo(k)fluoranthene	207-08-9	µg/kg	14,762	--	--	--	330	167	113
SW8270C	bis(2-Chloroethoxy)methane	111-91-1	µg/kg	--	--	--	180,000	330	167	88
SW8270C	bis(2-Chloroethyl) ether	111-44-4	µg/kg	6	--	--	--	330	167	81
SW8270C	bis(2-Ethylhexyl) phthalate	117-81-7	µg/kg	347,387	--	--	--	330	167	98
SW8270C	Butyl benzyl phthalate	85-68-7	µg/kg	--	--	--	260,000	330	167	95
SW8270C	Carbazole*	86-74-8	µg/kg	--	--	--	--	330	167	95
SW8270C	Caprolactam	105-60-2	µg/kg	--	--	--	31,000,000	(a)	(a)	(a)
SW8270C	Chrysene	218-01-9	µg/kg	148,629	--	--	--	330	167	84
SW8270C	Dibenz(a,h)anthracene	53-70-3	µg/kg	147	--	--	--	330	167	102
SW8270C	Dibenzofuran	132-64-9	µg/kg	--	--	--	78,000	330	167	86
SW8270C	Diethyl phthalate	84-66-2	µg/kg	48,883,929	--	--	--	330	167	90
SW8270C	Dimethyl phthalate	131-11-3	µg/kg	611,049,107	--	--	--	330	167	87
SW8270C	Di-n-butyl phthalate	84-74-2	µg/kg	6,110,491	--	--	--	330	167	97
SW8270C	Di-n-octyl phthalate*	117-84-0	µg/kg	--	--	--	--	330	167	97
SW8270C	Fluoranthene	206-44-0	µg/kg	2,293,674	--	--	--	330	167	95
SW8270C	Fluorene	86-73-7	µg/kg	2,293,674	--	--	--	330	167	92
SW8270C	Hexachlorobenzene	118-74-1	µg/kg	3,040	--	--	--	330	167	89
SW8270C	Hexachlorobutadiene	87-68-3	µg/kg	--	--	--	--	330	167	82
SW8270C	Hexachloroethane	67-72-1	µg/kg	42,773	--	--	--	330	167	81
SW8270C	Hexachlorocyclopentadiene	77-47-4	µg/kg	366,000	--	--	--	1600	250	62
SW8270C	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	1,476	--	--	--	330	167	96
SW8270C	Isophorone	78-59-1	µg/kg	5,119,394	--	--	--	330	167	93
SW8270C	Naphthalene	91-20-3	µg/kg	42,976	--	--	--	330	167	82
SW8270C	Nitrobenzene	98-95-3	µg/kg	53,500	--	--	--	330	167	76
SW8270C	N-Nitrosodimethylamine	62-75-9	µg/kg	22.5	--	--	--	330	167	96
SW8270C	N-Nitrosodi-n-propylamine	621-64-7	µg/kg	--	--	--	69	330	167	84
SW8270C	N-Nitrosodiphenylamine	86-30-6	µg/kg	992,516	--	--	--	330	167	86
SW8270C	Pentachlorophenol	87-86-5	µg/kg	8,935	--	--	--	330	167	51
SW8270C	Phenanthrene	85-01-8	µg/kg	1,833,147	--	--	--	330	167	94
SW8270C	Phenol	108-95-2	µg/kg	18,331,180	--	--	--	330	167	83
SW8270C	Pyrene	129-00-0	µg/kg	1,720,256	--	--	--	330	167	94

Table 2-1

Comparison of Reporting Levels to Screening Objectives in Soil, Open Burn Unit at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Residential SSG (Feb 2012)	Coyote Test Field Super Group Background Values (surface soil)	Coyote Test Field Super Group Background Values (subsurface soil)	EPA Regional Screening Levels, Residential (Nov 2012)	LOQ	LOD	DL
SW8290	2,3,7,8-TCDF*	51207-31-9	pg/g	449	--	--	--	1	0.15	EDL
SW8290	2,3,7,8-TCDD	1746-01-6	pg/g	44.9	--	--	--	1	0.15	EDL
SW8290	1,2,3,7,8-PeCDF*	57117-41-6	pg/g	--	--	--	--	5	0.75	EDL
SW8290	2,3,4,7,8-PeCDF*	57117-31-4	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,7,8-PeCDD*	40321-76-4	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,7,8-HxCDF*	70648-26-9	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,6,7,8-HxCDF*	57117-44-9	pg/g	--	--	--	--	5	0.75	EDL
SW8290	2,3,4,6,7,8-HxCDF*	60851-34-5	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,7,8,9-HxCDF*	72918-21-9	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,7,8-HxCDD*	39227-28-6	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,6,7,8-HxCDD*	57653-85-7	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,7,8,9-HxCDD*	19408-74-3	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,6,7,8-HpCDF*	67562-39-4	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,7,8,9-HpCDF*	55673-89-7	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,6,7,8-HpCDD*	35822-46-9	pg/g	--	--	--	--	5	0.75	EDL
SW8290	OCDF*	39001-02-0	pg/g	--	--	--	--	10	1.5	EDL
SW8290	OCDD*	3268-87-9	pg/g	--	--	--	--	10	1.5	EDL
SW8330B	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	mg/kg	3,911	--	--	--	0.25	0.05	0.012
SW8330B	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	mg/kg	58.2	--	--	--	0.25	0.05	0.012
SW8330B	1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	mg/kg	--	--	--	2,200,000	0.25	0.05	0.01
SW8330B	1,3-Dinitrobenzene (1,3-DNB)	99-65-0	mg/kg	--	--	--	6,100	0.25	0.05	0.0042
SW8330B	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	mg/kg	244	--	--	--	0.25	0.05	0.01
SW8330B	Nitrobenzene (NB)	98-95-3	mg/kg	53.5	--	--	--	0.25	0.05	0.0176
SW8330B	2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	mg/kg	39.1	--	--	--	0.25	0.05	0.0194
SW8330B	4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	mg/kg	--	--	--	150,000	0.25	0.05	0.01
SW8330B	2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	mg/kg	--	--	--	150,000	0.25	0.05	0.0125
SW8330B	2,4-Dinitrotoluene (2,4-DNT)	121-14-2	mg/kg	7.15	--	--	--	0.25	0.05	0.0053
SW8330B	2,6-Dinitrotoluene (2,6-DNT)	606-20-2	mg/kg	7.15	--	--	--	0.25	0.05	0.0073
SW8330B	2-Nitrotoluene (2-NT)	88-72-2	mg/kg	29.1	--	--	--	0.5	0.05	0.013
SW8330B	3-Nitrotoluene (3-NT)	99-08-1	mg/kg	7.8	--	--	--	0.25	0.05	0.0155
SW8330B	4-Nitrotoluene (4-NT)	99-99-0	mg/kg	244	--	--	--	0.25	0.05	0.0182
SW8330B	Nitroglycerin	55-63-0	mg/kg	6.11	--	--	--	0.5	0.25	0.015
SW8330B	PETN	78-11-5	mg/kg	--	--	--	120,000	0.5	0.25	0.025

The laboratory does not analyze for these compounds. The compounds will be tentatively identified based on a computer library search of the sample chromotography. If found, the coumpound concentration will be reported as an estimated value.

The detection limit exceeds most stringent criteria.

Constituents with "%" units are surrogates and are not a part of the target analytes.

* Risk based screening levels will be calculated if analyte is detected and toxicological information is available

DL - Detection limit

LOD - Limit of detection

LOQ - Limit of quantitation

mg/kg - milligrams per kilogram

pg/g - picograms per gram

RPD - relative percent difference

RSD - relative standard deviation for multi-incremental sample collection

SSG - soil screening goal

µg/kg - micrograms per kilogram

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Table 2-2
Analytical Methods, Sample Containers, Preservation Requirements and Holding Times for Soil Samples, Open Burn Unit, Kirtland Air Force Base, New Mexico

Matrix	Analytical Group	Analytical and Preparation Method	Sample Volume	Containers	Preservation Requirements	Maximum Holding Time
Soil	Metals (including mercury)	SW6010B/ SW6020 and SW7471A	1 gram	250-ml glass or polyethylene	4±2 degrees Celsius (ºC)	180 days from date of collection for metals; 28 days from collection to analysis for mercury
Soil	Volatile Organic Compounds (VOCs)	SW8260B/ SW5035	3 different 5-gram aliquots	6 40-milliliters (ml) volatile organic analysis (VOA) vials	Per sample collection: 2 VOA vials with 10-ml water and 1 VOA vial with 10-ml methanol. All vials contain a stir bar. or 3 VOA vials containing stir bars will have a 5-gram sample aliquot added, seals and frozen on site with dry ice. Samples must remain frozen in shipment and storage at the lab until analysis.	Freeze within 48 hours of arrival at the lab, analyze within 14 days from data of collection Analyze within 14 days from data of collection
Soil	Semivolatile Organic Compounds (SVOCs)	SW8270C	30 grams	250-ml glass	4±2ºC	14 days from date of collection to extraction and 40 days from extraction to analysis
Soil	Perchlorate	SW6850	30 grams	250-ml glass	4±2ºC	28days
Soil	Explosives	SW8330B	10 grams	250-ml glass	4±2ºC	14 days from date of collection to extraction and 40 days from extraction to analysis
Soil	White Phosphorous	SW7580	40 grams	250-ml glass	4±2ºC	30 days from date of collection to extraction and analysis
Soil	Dioxins/Furans	SW8290	30 grams	250-ml glass	4±2ºC	30 days from date of collection to extraction and 45 days from extraction to analysis

Table 2-3
Summary of Field Quality Control Samples for Soil Samples, Open Burn Unit, Kirtland Air Force Base, New Mexico

Quality Control Sample Type	Sample Matrix	Applicable Analysis	Frequency	Purpose
Trip blank	Soil	VOCs[a]	One per sample cooler containing VOC samples	Document any contamination attributable to shipping and field handling procedures
Field Duplicate	Soil	VOCs, SVOCs[b], metals, HE[c], Dioxins/Furans White Phosphorus Perchlorate	Minimum of one per 10 environmental samples per media type	Document precision of the sampling/analysis process
Equipment blank	Soil	VOCs, SVOCs[b], metals, HE[c], Dioxins/Furans White Phosphorus Perchlorate	One sample per day per media type for non-dedicated sampling equipment	Document whether decontamination of sampling equipment was adequate

a. VOCs - volatile organic compounds
b. SVOCs - semivolatile organic compounds
c. HE - high explosive

3. MANAGEMENT OF WASTE FROM CLOSURE ACTIVITIES

Wastes that are expected to be generated during the closure activities at the OB Unit include: concrete and steel from the removal of the OB Unit equipment; excess soil from sampling; decontamination water; brushes used to decontaminate equipment; PPE; scrap metal and excavated soils. The volume of liquid waste generated during the cleaning of excavation and grading equipment shall be minimized by only using the amount of wash water and rinse water necessary to achieve successful decontamination. Solvents shall not be used. Waste will be disposed of in accordance with all applicable environmental regulations.

3.1 Waste Management

Wastes associated with closure activities at the OB Unit shall be managed as follows:

- Wastes shall be stored in appropriate containers that are compatible with the wastes and are in good condition.
- If analytical results indicate that the waste is hazardous or the Kirtland AFB project manager determines that the waste will be classified as hazardous, Permittee shall manage the waste in accordance with all applicable regulations in 40 CFR §261-268.
- Waste containers shall remain within the OD Unit boundary under the control of the personnel generating the waste until it is transported for treatment and disposal.
- Waste containers shall be segregated according to the compatibility and chemical waste type.
- Waste shall be stored in containers that remain closed, except when adding or removing wastes.
- Waste containers bearing free liquid shall be provided with secondary containment of sufficient volume to prevent spilled liquids from being released onto the ground.
- Waste containers shall be managed in such a manner as to prevent ruptures and leaks.
- Waste containers shall be labeled appropriately, pending receipt of analytical results. Labels shall be filled out appropriately and marked using permanent marker or pen. Label information shall include waste source, suspected contaminants, contents, depth (if appropriate), the date which accumulation began, and a contact name.

3.2 Waste Characterization

Characterization of the liquid waste and excavated soil generated during the closure of the OB Unit shall be based upon the results of sampling and analysis. Any decontamination water shall be analyzed for the constituents listed in Tables 2-1. PPE shall be managed according to applicable regulations.

3.3 Waste Disposal

All wastes from closure activities determined to be hazardous shall be managed in accordance with the Hazardous Waste Management Regulations from the time of generation. Hazardous wastes shall be shipped off-site for treatment and disposal at a permitted RCRA facility. Wastes characterized as nonhazardous (e.g., decontamination liquids) shall be evaluated to determine the appropriate disposal method in accordance with applicable law.

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4. REFERENCES

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IT Corporation, 1996, "Background Concentrations of Constituents of Concern to the Sandia National Laboratories/New Mexico Environmental Restoration Project and the Kirtland Air Force Base Installation Restoration Program," prepared for Sandia National Laboratories/New Mexico Environmental Restoration Department 7585, Albuquerque, NM.

NMED, 2012, "Risk Assessment Guidance for Site Investigations and Remediation," New Mexico Environment Department, Santa Fe, New Mexico. June.

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Attachment 1
Summary of Laboratory Quality Control Procedures by Analytical Method

ATTACHMENT 1, TABLE 1
Summary of Calibration and Quality Control Procedures for Gas Chromatography Method 7580 (White Phosphorous)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Multipoint ICAL for all analytes (minimum five standards)	Before sample analysis	One of the following options. Option 1: Linear—RSD for each analyte ≤ 20%. Option 2: Linear—least squares regression r ≥0.995 for each analyte. Option 3: Nonlinear—COD ≥0.99 (six points will be used for second order, seven points will be used for third order) .	Correct problem then repeat ICAL.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL. Calibration may not be forced through the origin. All quantitation for multicomponent analytes, such as technical chlordane, toxaphene, and Aroclors, must be performed form a five-point calibration. Results may not be quantified from a single point.
Second-source calibration verification	Immediately after each ICAL	All analytes within ± 20% of expected value	Correct problem and verify second-source standard. Rerun second-source verification. If that fails, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position established for each analyte and surrogate	Each ICAL and after the initial daily CCV	Position will be set using the midpoint standard of the ICAL curve. On days when an ICAL is not performed, the CCV is used.	NA	NA
Retention time window width established for each analyte and surrogate	At method setup and after major maintenance (for example, column change)	±3 times standard deviation for each analyte retention time from 72-hour study.	NA	NA
Retention time window verification for each analyte and surrogate	Each calibration verification	Analyte within established window.	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check.	**ICV:** Flagging criteria are not appropriate for initial verification. **CCV:** Apply Q-flag to all results for the specific analyte(s) in the sample that are outside the established window.

ATTACHMENT 1, TABLE 1

Summary of Calibration and Quality Control Procedures for Gas Chromatography Method 7580 (White Phosphorous)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
CCV	Daily, before sample analysis unless ICAL performed on same day, after every 10 samples, and at the end of the analysis sequence	All analytes within ± 15% of expected value (% D).	Correct problem, then rerun. If that fails, repeat ICAL. Reanalyze all samples since last successful calibration verification.	**If reanalysis cannot be performed,** apply Q-flag to all results for the specific analyte(s) >15%D for all samples associated with the calibration verification.
Method blank	One per analytical batch	No analytes detected > ½ LOQ. For common laboratory contaminants no analytes detected > LOQ and see Worksheet #36, Section 36.2.5.	Assess data. Correct problem. If necessary, reprepare and reanalyze method blank and all samples processed with the contaminated blank.	Apply "B" flag to all associated positive results for the specific analyte(s), as appropriate. See Worksheet #36, Section 36.2.5.
LCS for all analytes (must contain all target analytes)	One per analytical batch	Acceptance criteria: Worksheet #15.	Correct problem, then reanalyze. If still out, reprepare and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
MS/MSD	One per 20 project samples per matrix as a minimum and as defined on the chain-of-custody form	Acceptance criteria: Worksheet #15.	Assess data to determine whether there is a matrix effect or analytical error. Review LCS for failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an eval-uation can be made regarding PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: • %R for MS or MSD > upper control limit • %R for MS or MSD < lower control limit • MS/MSD RPD > control limit

ATTACHMENT 1, TABLE 1
Summary of Calibration and Quality Control Procedures for Gas Chromatography Method 7580 (White Phosphorous)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Second-column confirmation (not required for Methods 8015B [DRO or GRO]	All positive results	Same as for initial or primary column analysis.	Same as for initial or primary column analysis.	Apply J-flag if RPD > 40% from first column result. Apply Q-flag to all results for the specific analyte(s) in the sample not confirmed.
DL study (as part of the LOD process; see Section D.1.2.1 of the DoD QSM[c])	At initial setup and then once per 12-month period or quarterly DL verification	Detection limits established will be ≤ ½ the RL in Worksheet #15 Tables (see 40 CFR, Part 136, Appendix B). For the verification check to be valid, analytes must be detected and identified by method-specified criteria or the verification check must produce a response that is at least 3 times the instrument noise level and greater than the response in the blanks associated with the MDL study.	Continue the MDL study until all criteria are met.	NA.
LOD determination and verification (see Section D.1.2.1 and Box D-13 of the DoD QSM[c])	At initial setup and verified quarterly (if a laboratory uses multiple instruments for a given method, the LOD must be verified on each)	The apparent signal-to-noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If LOD verification fails, the laboratory must (1) repeat the MDL determination and LOD verification at a higher concentration or (2) perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	NA; samples may not be analyzed without a valid LOD.

ATTACHMENT 1, TABLE 1
Summary of Calibration and Quality Control Procedures for Gas Chromatography Method 7580 (White Phosphorous)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
LOQ establishment and verification (see Section D.1.2.2 and Box D-14 of the DoD QSM[c])	At initial setup (1) verify LOQ; and (2) determine precision and bias at the LOQ; then verify LOQ quarterly (if laboratory uses multiple instruments for a given method, the LOQ must be verified on each; see Box D-14 of the DoD QSM[c])	(1) LOQ and associated precision and bias must meet client requirements and be reported; or (2) in the absence of client requirements, must meet LCS control limits (see Box D-14 of the DoD QSM[c]).	If the LOQ verification fails, laboratory must either establish a higher LOQ or modify method to meet client-required precision and bias.	NA; samples may not be analyzed without a valid LOQ.
Results reported between the DL and LOD, and the LOD and LOQ	None	None.	None.	Apply F-flag to all results between DL and LOQ. If no result below the LOD, report to the LOD, flag "U."
Demonstrate acceptable analyst capability	Before using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C of DoD QSM[c])	QC acceptance criteria published by DoD, if available; otherwise, method-specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for analytes not meeting criteria (see section C.1.f of DoD QSM[c]).	NA. This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis will be allowed by an analyst until capability is demonstrated.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October.

ATTACHMENT 1, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Mass spectrometer tuning check Use bromofluorobenzene (SW8260B) or decafluorotriphenylphos-phine (SW8270C)	Before ICAL and calibration verification	Refer to criteria listed in method description.	Retune instrument and verify.	Not appropriate.
GC performance check (8270C only or when SW8270 is used for pesticide analyses)	Daily before analysis of sample or calibration standards	Degradation ≤ 20% for DDT. No visible peak tailing for benzidine or pentachlorophenol (as a default, tailing factors should be less than 2.0).	Correct problem, then repeat performance check.	Not appropriate.
Multipoint ICAL for all analytes (minimum five standards)	Before sample analysis	SPCCs: Average RF ≥ 0.30 (SW8260B), ≥ 0.050 (SW8270C) CCCs: % RSD for RFs ≤ 30% and one of the options below; Option 1: Linear—RSD for each analyte < 15%. Option 2: Linear—linear least squares regression r > 0.995 for each analyte. Option 3: Nonlinear—COD ≥ 0.99 (6 points will be used for second order, 7 points will be used for third order). This is not a preferred option.	Correct problem, then repeat ICAL.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL. Calibration may not be forced through the origin.

ATTACHMENT 1, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Second-source calibration verification	Once per ICAL	All analytes within ± 20% of expected value.	Correct problem and verify second-source standard. Rerun second-source verification. If that fails, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position will be set using the midpoint standard of the ICAL curve. On days when an ICAL is not performed, the CCV is used.	NA.	NA.
Retention time window verification for each analyte	Each sample	RRT of the analyte within ± 0.06 RRT units of ICAL. Laboratories may update the retention times based on the CCV to account for minor performance fluctuations or after routine system maintenance (e.g., column clipping. With each sample, the RRT will be compared with the most recently updated RRT. If the RRT has changed by more than ±0.06 RRT units since the last update, there has been a significant change in system performance and the laboratory must take appropriate corrective actions as required by the method and rerun the ICAL to re-establish the retention times.	Correct problem then reanalyze all samples analyzed since the last retention time check.	Apply Q-flag to all results for the specific analyte(s) in the sample that are outside the established window.

ATTACHMENT 1, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
CCV	Daily, before sample analysis (unless ICAL performed on same day), and after every 12 hours of analysis time	SPCCs: Average RF ≥ 0.30 (SW8260B), ≥ 0.050 (SW8270C) CCCs: % RSD for RFs ≤ 30% and All analytes within ± 20% D of expected value from ICAL.	Correct problem, then rerun CCV. If that fails, repeat ICAL.	Apply Q-flag to all results for the specific analyte(s) > 20% D for all samples associated with the calibration verification.
ISs	Each sample, standard, and QC sample	Retention time ± 30 seconds from retention time of the IS in the ICAL midpoint standard. Extracted ion current profile area within -50% to +100% of area from IS in ICAL mid-point standard.	Inspect mass spectrometer and GC for malfunctions and make corrections as appropriate. Reanalysis of samples analyzed while the system was malfunctioning is mandatory.	Apply Q-flag to all results for analytes associated with a failed IS (unless a matrix effect can be verified), then apply M-flag.
Method blank	One per analytical batch	No analytes detected > ½ LOQ. For common laboratory contaminants, no analytes detected > LOQ. See Worksheet #36, Section 36.2.5.	Assess data. Correct problem. If necessary, reprepare and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s), as appropriate. See Worksheet #36, Section 36.2.5.

ATTACHMENT 1, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Worksheet #15.	Correct problem, then reanalyze. If still out, reprepare and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
MS/MSD	One per 20 samples per matrix as a minimum and as defined on the chain-of-custody form	Acceptance criteria: Worksheet #15.	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an evaluation can be made regarding the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > upper control limit (2) %R for MS or MSD < lower control limit (3) MS/MSD RPD > control limit
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Worksheet #15.	Correct problem, then reprepare and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes. If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ-flag to all associated nondetects. If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.

ATTACHMENT 1, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process; see Section D.1.2.1 of the DoD QSM[c])	At initial setup and then once per 12-month period or quarterly DL verification	Detection limits established will be ≤ ½ the RL in Worksheet 15. See 40 CFR, Part 136, Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3 times the instrument noise level and greater than the response in the blanks associated with the MDL study.	Continue the MDL study until all criteria are met.	NA.
LOD determination and verification (see Section D.1.2.1 and Box D-13 of the DoD QSM[c])	At initial setup and verified quarterly (if a laboratory uses multiple instruments for a given method, the LOD must be verified on each)	The apparent signal-to-noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must (1) repeat the detection limit determination and LOD verification at a higher concentration or (2) perform and pass two consecutive LOD verifi-cations at a higher concen-tration. The LOD is set at the higher concentration.	NA; samples may not be analyzed without a valid LOD.
LOQ establishment and verification (see Section D.1.2.2 and Box D-14 of the DoD QSM[c])	At initial setup: (1) verify LOQ; and (2) determine precision and bias at the LOQ; then verify LOQ quarterly (if a laboratory uses multiple instruments for a given method, the LOQ must be verified on each; see Box D-14 of DoD QSM[c]	(1) The LOQ and associated precision and bias must meet client requirements and must be reported or (2) in the absence of client require-ments, must meet LCS control limits. See Box D-14 of the DoD QSM[c].	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	NA; samples may not be analyzed without a valid LOQ.

ATTACHMENT 1, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Results reported between the DL and LOD, and the LOD and LOQ	None	None.	None.	Apply F-flag to all results between DL and LOQ. If no result below the LOD, report to the LOD, flag "U."
Demonstrate acceptable analyst capability	Before using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C of DoD QSM[c])	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see Section C.1.f of the DoD QSM[c]).	NA. This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis will be allowed by an analyst until capability is demonstrated.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October.

Notes:

D = difference when using RFs or drift when using least square, regression, or nonlinear calibration
RF = response factor
RRT = relative retention time

ATTACHMENT 1, TABLE 3
Summary of Calibration and Quality Control Procedures for Method SW8330B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Minimum five-point initial calibration for target analytes, lowest concentration standard at or below the reporting limit.	Initial calibration prior to sample analysis	Average RF: RSD </= 20%; Linear: r>0.995, intercept < MDL. Apparent S/N ratio of standard at RL (LOQ) must be at least 5:1.	Evaluate standards, chromatography, and detector response. If problem found with above, correct as appropriate, then repeat initial calibration
Second-source calibration verification	Once per ICAL	All analytes within ± 20% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Low standard verification	Immediately following ICAL.	Less than 50 % difference for target analytes;	Evaluate data. If problem (e.g., concentrated standard, plugged injector needle) found, correct, then repeat low-level verification. If still fails, repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
CCV	Daily, before sample analysis unless ICAL performed on same day and every 24 hours of analysis time	All analytes within ± 20% of expected value	Correct problem, rerun CCV. If that fails, repeat initial calibration.	Apply Q-flag to all results for the specific analyte(s) > 30 %D for all samples associated with the calibration verification.
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Worksheet #15.	Correct problem, then reprepare and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes. If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ-flag to all associated nondetects. If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.

ATTACHMENT 1, TABLE 3
Summary of Calibration and Quality Control Procedures for Method SW8330B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Method Blank	One per preparation batch	No target analytes ≥ ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	No target analytes ≥ ½ LOQ in accordance with DoD QSM requirements
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Table 7-4	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected AB.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
Confirmation Analysis	When target analytes detected on the primary column at concentrations > LOD.	Calibration and QC criteria the same as for initial/primary analsyis. Results between primary and secondary column RPD ≤ 40%	Evaluate data, then report with flag to denote RPD > 40%. Narrate obvious matrix issues.	RPD between primary and confirmation analysis ≤ 40%..
Soil Grinding Blank	When puck mill grinding is performed, one blank between each sample processed.	Blank material ground and subsampled as with the samples. Composited prior to analysis. No target analytes detected at > than 1/2 the LOQ	All blanks are reported, and data is flagged/narrated if the criteria are exceeded.	No target analytes ≥ ½ LOQ in accordance with DoD QSM requirements
Grinding Certified Reference Material (CRM)	When puck mill grinding is performed, CRM is ground for every 20 samples ground.	Within the control limits supplied by manufacturer of material	Evaluate the data, narrate any outliers and report.	Manufacturer's acceptance limits.

ATTACHMENT 1, TABLE 3
Summary of Calibration and Quality Control Procedures for Method SW8330B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process, reference Section D.1.2.1 of the DoD QSM)	At initial setup and subsequently once per 12-month period or quarterly DL verification checks.	DL established shall meet 40 CFR, Part 136 Appendix B.	Continue to run the DL study until all criteria are passing	N/A
LOD determination and verification (reference Section D.1.2.1 and grey box D-13 of the QSM)	At initial set-up and verified quarterly. If a laboratory uses multiple instruments for a given method, the LOD must be verified on each	The apparent signal to noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must: 1) Repeat the detection limit determination and LOD verification at a higher concentration; or 2) Perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	Not Applicable, Samples may not be analyzed without a valid LOD.
LOQ establishment and verification (reference Section D.1.2.2 and grey box D-14 of the QSM)	At initial setup: 1) Verify LOQ; and 2) Determine precision and bias at the LOQ. Subsequently, verify LOQ quarterly. If a laboratory uses multiple instruments for a given method, the LOQ must be verified on each. See Box D-14.	1) The LOQ and associated precision and bias must meet client requirements and must be reported; or 2) In the absence of client requirements, must meet control limits of the LCS. See Box D-14 of the DOD QSM.	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	Not Applicable, Samples may not be analyzed without a valid LOD.
Results reported between DL and LOD and the LOD and the LOQ	None	None	None	Apply F-flag to all results between DL and LOQ. If no Detection determined below the LOD, report to the LOD, flag U.

a All corrective actions associated with project work shall be documented, and all records shall be maintained by the laboratory.
b Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

ATTACHMENT 1, TABLE 4
Summary of Calibration and Quality Control Procedures for Method SW6850

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Tuning (Mass Calibration Verification)	Prior to ICAL and after any mass calibration or maintenance is performed.	Quantitation ions within 0.3 m/z of expected mass.	Perform mass calibration on the MS/MS. If required, consult with instrument engineer for further maintenance.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Minimum six-point initial calibration for target analytes, lowest concentration standard at or below the reporting limit	Initial calibration prior to sample analysis	Linear: $r^2 > 0.990$ ($r>0.995$) with intercept ≤ LOD, or Average Response Factor: RSD≤ 20%.	Evaluate standards, chromatography, and mass spectrometer response. If problem found with above, correct as appropriate, then repeat initial calibration.	Evaluate standards, chromatography, and detector response. If problem found with above, correct as appropriate, then repeat initial calibration
Second-source calibration verification	Once per six-point initial calibration	Perchlorate within ±15% of the true value	Evaluate data. If problem (e.g., concentrated standard, plugged transfer line) found, correct, then repeat second source verification. If it still fails, then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Daily calibration verification	Mid-range standard analyzed before sample analysis, after every 10 samples, and at the end of the sequence.	Perchlorate within ±15% of the true value	Correct problem, then repeat. If still fails, repeat initial calibration	Apply Q-flag to all results for the specific analyte for all samples associated with the calibration verification.
Limit of Detection verification (LODv) (per batch)	Prior to sample analysis and at the end of the analysis sequence.	Perchlorate within ± 30% of the true value	Correct problem. Evaluate samples. Samples with results > RL (LOQ) may be reported. Samples since the last passing LODv with results ≤ RL (LOQ) must be reanalyzed.	Apply Q-flag to all results for the specific analyte for all samples associated with the calibration verification.
Laboratory Reagent Blank	Prior to ICAL, following samples with overrange concentration of perchlorate, and at the end of the analytical sequence.	No perchlorate detected > LOQ	Reanalyze reagent blank (until no carryover seen), and any samples with perchlorate detections since the contaminated blank.	No target analytes ≥ ½ LOQ

ATTACHMENT 1, TABLE 4
Summary of Calibration and Quality Control Procedures for Method SW6850

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Internal Standard	Every Calibration Standard	ICAL: IS for each standard must be within ± 50% of the average area of the ICAL. ICV, CCV: Within ± 50% of the average area of the ICAL or within ± 50% of the 1st CCV of the run, if the ICAL is not run the same day.	Evaluate the system. Reanalyze/repeat the calibration.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples.
Method Blank	One per preparation batch	No target analytes ≥ ½ LOQ in accordance with DoD QSM requirements	Correct problem, then re-extract and reanalyze method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	No target analytes ≥ ½ LOQ
Interference Check Sample (ICS)	One per preparation batch	70% -130%	Reanalyze once. If still outside the acceptance limits, evaluate to determine if cleanup filters or column degradation are suspect, replace appropriate materials and reprepare (filters) or reanalyze (column). Repeat the Interference Threshold Study to deter. If problem still exists, recalibrate.	Recovery as described in DoD Perchlorate Handbook.
IS	During acquisition of calibration standard, samples, and QC check samples	Areas within -50% to +100% of the midpoint of the last ICAL for each sample and QC in accordance with DoD QSM requirements	Inspect LCMS for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning in accordance with DoD QSM requirements	Meets all EPA Method requirements

ATTACHMENT 1, TABLE 4
Summary of Calibration and Quality Control Procedures for Method SW6850

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Isotope Ratio $^{35}CL/^{37}CL$	Every sample, batch QC sample and standard	Monitor for either the parent ion at masses 99/101 or the daughter ion at masses 83/85 depending on which ions are quantified.	Re-extract, re-clean, and/or reanalyze affected sample(s). If problem persists, perform post-spike or dilution as appropriate to confirm presence of perchlorate	Theoretical ratio approx. 3.06 Must fall within 2.3 to 3.8
LCS	One LCS per analytical/preparation batch, spiked at the LOQ.	QC acceptance criteria: 80% to 120% accuracy,15% precision, as per QSM and DoD Perchlorate Handbook	Reanalyze LCS once. If acceptable, report. Otherwise, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	QC acceptance criteria: 80% to 120% accuracy, 15% precision.
MS/MSD	One MS/MSD per batch, spiked at the LOQ.	QC acceptance criteria: 80% to 120% accuracy,15% precision, as per QSM and DoD Perchlorate Handbook	Identify problem; if not related to matrix interference, re-extract and reanalyze MS/MSD in accordance with DoD QSM requirements	QC acceptance criteria: 80% to 120% accuracy, 15% precision.
DL study (as part of the LOD process, reference Section D.1.2.1 of the DoD QSM)	At initial setup and subsequently once per 12-month period or quarterly DL verification checks.	DL established shall meet 40 CFR, Part 136 Appendix B.	Continue to run the DL study until all criteria are passing	N/A
LOD determination and verification (reference Section D.1.2.1 and grey box D-13 of the QSM)	At initial set-up and verified quarterly. If a laboratory uses multiple instruments for a given method, the LOD must be verified on each	The apparent signal to noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must: 1) Repeat the detection limit determination and LOD verification at a higher concentration; or 2) Perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	Not Applicable, Samples may not be analyzed without a valid LOD.

ATTACHMENT 1, TABLE 4

Summary of Calibration and Quality Control Procedures for Method SW6850

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
LOQ establishment and verification (reference Section D.1.2.2 and grey box D-14 of the QSM)	At initial setup: 1) Verify LOQ; and 2) Determine precision and bias at the LOQ. Subsequently, verify LOQ quarterly. If a laboratory uses multiple instruments for a given method, the LOQ must be verified on each. See Box D-14.	1) The LOQ and associated precision and bias must meet client requirements and must be reported; or 2) In the absence of client requirements, must meet control limits of the LCS. See Box D-14 of the DOD QSM.	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	Not Applicable, Samples may not be analyzed without a valid LOD.
Results reported between DL and LOD and the LOD and the LOQ	None	None	None	Apply F-flag to all results between DL and LOQ. If no Detection determined below the LOD, report to the LOD, flag U.

a All corrective actions associated with project work shall be documented, and all records shall be maintained by the laboratory.

b Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

ATTACHMENT 1, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Instrument detection limit study	At initial setup and after significant change in instrument type, personnel, test method, or sample matrix	Instrument detection limits will be < LOD.	NA.	NA.
Linear dynamic range or high-level check standard	Every 6 months	Within ± 10% of true value.	Correct problem, then reanalyze or reset linear range.	Apply J-flag to the specific analyte(s) for all results not within linear range.
ICAL for all analytes (minimum one standard and a blank 3- to 5-point standard preferred)	Daily before sample analysis	If more than one standard is used, correlation coefficient must be ≥ 0.995.	If applicable, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
ICV (second source)	Daily after ICAL	All analytes within ± 10% of expected value.	Correct problem and verify second-source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
CCV (Instrument Check Standard)	After every 10 samples and at the end of the analysis sequence	All analyte(s) within ± 10% of expected value and RSD of replicate integrations < 5%.	Correct problem, then repeat CCV and reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) >10 %D for all samples associated with the calibration verification.
Calibration blank	Before beginning a sample run, after every calibration verification	No analytes detected > LOD.	Correct problem, then analyze calibration blank and previous 10 samples.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate.
Low-level calibration check standard (at or below LOQ)	Daily, after ICAL; not required for multipoint calibration (3 or more points) with low standard at or below LOQ.	Analyte(s) with ± 20% of expected value.	Correct problem, then reanalyze.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the LOQ.

ATTACHMENT 1, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Method blank	One per analytical batch	No analytes detected > ½ LOQ. For common laboratory contaminants, no analytes detected > LOQ. See Worksheet #36, Section 36.2.5.	Assess data. Correct problem. If necessary, reprepare and reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s), as appropriate. See Worksheet #36, Section 36.2.5.
ICS	At the beginning of an analytical run	ICS A: All non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes). ICS AB: Within ± 20% of expected value.	Terminate analysis; locate and correct problem; reanalyze ICS and all associated samples.	Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS. If corrective action fails, apply Q-flag to the specific analyte(s).
LCS for all analytes	One per analytical batch	Acceptance criteria: Worksheet #15.	Correct problem then reanalyze. If still out, reprepare and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
Dilution test	Each new sample matrix, at least once per analytical batch (only applicable for analytes with concentrations > 50 times LOQ)	Fivefold (1+4) dilution must agree within ± 10% of the original determination.	Add post-digestion spike.	Apply J-flag to all sample results for the specific analyte from the same matrix in the batch if either of following exist: (1) dilution test not run and batch had analyte concentrations >50X LOQ or (2) %D ≥10 and post-digestion spike not performed.

ATTACHMENT 1, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Post-digestion spike addition	When dilution test fails or if an analyte's concentration for all samples in a batch is less than 50 times LOQ (<25 for Method SW7470A/ SW7471A)	Recovery within 75–125% of expected results (85-115 for SW7470A/ SW7471A).	Check for instrumental problem, then reanalyze post-digestion spike addition if appropriate.	Apply J-flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition. If post-digestion spike addition recovery is < 10%, apply Q-flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition.
MS/MSD	One per 20 samples per matrix as a minimum and as defined on the chain-of-custody form	Acceptance criteria: Worksheet #15.	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS or failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an evaluation can be made regarding PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL (2) %R for MS or MSD < LCL (3) MS/MSD RPD > control limit

ATTACHMENT 1, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process; see Section D.1.2.1 of the DoD QSM[c])	At initial setup and then once per 12-month period or quarterly DL verification checks	Detection limits established will be ≤ ½ the RL in Worksheet #15 Tables. See 40 CFR, Part 136, Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3X the instrument noise level and greater than the response in the blanks associated with the MDL study.	Continue the MDL study until all criteria are met.	NA.
LOD determination and verification (reference Section D.1.2.1 and Box D-13 Of the DoD QSM[c])	At initial setup and verified quarterly (if a laboratory uses multiple instruments for a given method, the LOD must be verified on each)	The apparent signal-to-noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must (1) repeat the detection limit determination and LOD verification at a higher concentration; or (2) perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	NA; samples may not be analyzed without a valid LOD.
LOQ establishment and verification (see Section D.1.2.2 and Box D-14 of the DoD QSM[c])	At initial setup: (1) verify LOQ and (2) determine precision and bias at the LOQ; then verify LOQ quarterly (if a laboratory uses multiple instruments for a given method, the LOQ must be verified on each; see Box D-14 of the DoD QSM[c]).	1) The LOQ and associated precision and bias must meet client requirements and must be reported; or (2) in the absence of client requirements, must meet control limits of the LCS. See Box D-14 of the DoD QSM[c].	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	NA; samples may not be analyzed without a valid LOQ.

ATTACHMENT 1, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Results reported between the DL and LOD, and the LOD and LOQ	None	None.	None.	Apply F-flag to all results between DL and LOQ. If no result below the LOD, report to the LOD, flag "U."
Demonstrate acceptable analyst capability	Before using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C of the DoD QSM[c])	QC acceptance criteria published by DoD, if available; otherwise method-specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see Section C.1.f of the DoD QSM[c]).	NA. This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis will be allowed by analyst until capability is demonstrated.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October.

ATTACHMENT 1, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS tuning sample	Before ICAL.	Mass calibration ≤ 0.1 amu from the true value. Resolution <0.9 amu full width at 10% peak height. Stability: RSD ≤ 5% for at least four replicate analyses.	Retune instrument then reanalyze tuning solution.	Not appropriate.
ICAL for all analytes (minimum one standard and a blank)	Daily before sample analysis	If more than one standard is used, correlation coefficient must be ≥ 0.995.	If applicable, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
ICV (second source)	After ICAL, before beginning a sample run at a concentration other than used for calibration	All analytes within ± 10% of expected value.	Correct problem and verify second-source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
CCV	After every 10 samples and at the end of the analysis sequence—at a concentration near the middle of the calibration range	All analytes within ± 10% of expected value.	Correct problem, then repeat CCV and reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) >10 %D for all samples associated with the calibration verification.
Calibration blank	Before beginning a sample run, after every 10 samples and at end of the analysis sequence	No analytes detected > LOD.	Correct problem, then analyze calibration blank and previous 10 samples.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate.
Low-level calibration check standard (at or below LOQ)	Daily, after ICAL Not required if multipoint calibration (3 or more points) with low standard at or below LOQ is performed	All analyte(s) with ± 20% of expected value.	Correct problem then reanalyze.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the LOQ.

ATTACHMENT 1, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Linear range calibration (high) check standard	Every 6 months	Analyte within ± 10% of expected value.	Correct problem then reanalyze or reset linear range.	Apply J-flag to the specific analyte(s) for all results not within linear range.
Method blank (Preparation blank)	One per analytical batch	No analytes detected > ½ LOQ For common laboratory contaminants, no analytes detected > LOQ. See Worksheet #36, Section 36.2.5.	Assess data. Correct problem. If necessary, reprepare and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See Worksheet #36, Section 36.2.5.
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run or once during an 12-hour period, whichever is more frequent	**ICS-A:** All non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes). **ICS-AB:** Within ± 20% of expected value.	Terminate analysis; locate and correct problem; reanalyze ICS; reanalyze all affected samples.	Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS. If corrective action fails, apply Q-flag to the specific analyte(s).
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Worksheet #15.	Correct problem then reanalyze. If still out, reprepare and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
Dilution test	Each matrix in a analytical batch (only applicable for analytes with concentrations ≥ 100X LOD)	Fivefold (1+4) dilution must agree within ± 10% of the original determination.	Add post-digestion spike.	Apply J-flag to all sample results for the specific analyte from the same matrix in the batch if either of following exist: (1) dilution test not run and batch had analyte concentrations ≥100 times LOD or (2) % D ≥ 10 and post-digestion spike not performed.

ATTACHMENT 1, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Post-digestion spike addition	When dilution test fails or if an analyte's concentration for all samples in a batch is less than 100X LOD	Recovery within 75–125% of expected results.	Dilute the sample; reanalyze post-digestion spike addition.	Apply "J" flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition. If post-digestion spike addition recovery is < 10%, apply "Q" flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition.
MS/MSD	One per 20 samples per matrix	Acceptance criteria: Worksheet #15.	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an evaluation can be made regarding PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL, (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > control limits
ISs	Every sample	IS intensity within 30-120% of intensity of the IS in the ICAL.	Perform corrective action as described in Method SW6020, Section 8.3.	Flagging criteria are not appropriate. No samples may be analyzed without a valid IS response.
Instrument detection limit study	At initial setup	Detection limits established will be ≤ LOD.	None.	NA. Samples cannot be analyzed without a valid instrument detection limit.

ATTACHMENT 1, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process; see Section D.1.2.1 of the DoD QSM[c])	At initial setup and then once per 12-month period or quarterly DL verification.	Detection limits established will be ≤ ½ the RL in Worksheet #15 tables. See 40 CFR, Part 136 Appendix B. Analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3 times the instrument noise level and greater than the response in the blanks associated with the MDL study.	Continue to run the MDL study until all criteria are passing.	NA.
LOD determination and verification (see Section D.1.2.1 and Box D-13 of the DoD QSM[c])	At initial setup and verified quarterly. If a laboratory uses multiple instruments for a given method, the LOD must be verified on each	The apparent signal to noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must: (1) Repeat the detection limit determination and LOD verification at a higher concentration; or (2) Perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	NA; samples may not be analyzed without a valid LOD.
LOQ establishment and verification (see Section D.1.2.2 and Box D-14 of the DoD QSM[c])	At initial setup: (1) verify LOQ and (2) determine precision and bias at the LOQ; then verify LOQ quarterly (if a laboratory uses multiple instruments for a given method, the LOQ must be verified on each; see Box D-14 of the DoD QSM[c])	(1) The LOQ and associated precision and bias must meet client requirements and must be reported; or (2) In the absence of client requirements, must meet control limits of the LCS. See Box D-14 of the DoD QSM[c].	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	NA; samples may not be analyzed without a valid LOQ.

ATTACHMENT 1, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Results reported between the DL and LOD, and the LOD and LOQ	None	None.	None.	Apply F-flag to all results between DL and LOQ. If no result below the LOD, report to the LOD, flag "U."
Demonstrate acceptable analyst capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C of the DoD QSM[c])	QC acceptance criteria published by DoD, if available; otherwise method-specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see Section C.1.f of the DoD QSM[c]).	NA. This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis will be allowed by an analyst until capability is demonstrated.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October.

ATTACHMENT 1, TABLE 7

Summary of Calibration and Quality Control Procedures for Method SW8290 (Dioxins and Furans)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS tuning check (use PFK)	Before initial calibration or calibration verification and after every 12-hour period	Tune the instrument to meet the minimum resolving power of 10,000 at m/z 304.9824. Ensure that the exact mass of m/z 380.9760 is within 5 ppm of the required value. Monitor the lock mass selected ion current profile.	Retune instrument; verify. Rerun affected samples.	Not appropriate
GC column performance check	Before initial calibration or calibration verification	Peak separation between 2,3,7,8-TCDD and other TCDD isomers valley of ≤ 25%. and First and last eluters of all eight homologue retention time windows identified labeled (F/L) on the chromatogram and Absolute retention times for switching from one homologous series to the next > 10 seconds for all components of the mixture	Correct problem then repeat column performance check.	Flagging criteria are not appropriate.
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Before sample analysis, as needed by failure of routine calibration verification standard, or when a new lot is used for standard source of CCV, sample fortification solution (IS), or recovery standards	Ion abundance ratios in accordance with Table 8 of Method SW8290 and S/N ratio ≥ 10 for all target analyte ion current profiles and % RSD ± 20% for 17 unlabeled standards and % RSD ± 30% for the 9 labeled IS.	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.

ATTACHMENT 1, TABLE 7

Summary of Calibration and Quality Control Procedures for Method SW8290 (Dioxins and Furans)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Routine (continuing) calibration check (Use HRCC-3 calibration standard) (CCV)	At the beginning of each 12-hour period (after successful GC resolution and MS resolution checks), and at the end of 12-hour shift.	Ion abundance ratios in accordance with Table 8, Method SW8290 and RF within ± 20% D for unlabeled standards from mean RF from initial calibration and RF within ± 30% for labeled standards from mean RF from initial calibration **End of run CCV only:** If the RF for an unlabeled or labeled standard fails by ≤ 5% in the final CCV, a new "daily" mean RF may be calculated using the initial and final RF values and used to determine the specific analyte concentrations for all samples analyzed during the shift.	Correct problem, repeat calibration verification standard one more time. If that fails, then repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification. Evaluation of corresponding labeled/unlabeled standards may impact the corrective action required. **End of run CCV:** If the RF for an unlabeled or labeled standard fails by > 5% in the final CCV, run a new ICAL immediately (within 2 hours) and use the new RF values to process the samples. Alternatively, reanalyze all samples with positive detections.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified. **End of run CCV:** Apply Q-flag to all results for the specific analyte(s) in the sample which are not reprocessed or reanalyzed.

ATTACHMENT 1, TABLE 7

Summary of Calibration and Quality Control Procedures for Method SW8290 (Dioxins and Furans)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
PCDD/PCDF identification	Verify all sample positive detections per Method SW8290	Retention time of sample components in accordance with stated criteria in Method SW8290 (Section 7.8.4.1) and Ion abundance ratios for all analytes, ISs, and recovery standards in accordance with criteria in Method SW8290 (Table 8, Section 7.8.4.2) and S/N ratio of all labeled analytes ≥ 10 times background noise (Method SW8290 Section 7.8.4.3) and S/N ratio of all remaining analyte ions ≥ 2.5 times background noise (Method SW8290 Section 7.8.4.3) and For PCDF, no signal present having a S/N ratio ≥ 2.5 for the corresponding ether (PCDPE) detected at the same retention time (± 2 sec, (Section 7.8.4.4)	Correct problem, then reprep and reanalyze the sample(s) with failed criteria for any of the internal, recovery, or standards. If PCDPE is detected or if sample peaks present do not meet all identification criteria, calculate the EMPC (estimated maximum possible concentration) according to Method SW8290 Section 7.9.5.2.	Flagging criteria are not appropriate. Positive identification of 2,3,7,8-TCDF on the DB-5 or equivalent column must be confirmed on a column capable of isomer specificity (DB-225) (see Method SW8290 Section 3.4). If peak identification criteria are met but ion abundance criteria fail for the analyte and IS, the sample should be presumed to have interfering contaminants. The sample should be rerun or the extract reanalyzed.
ISs	Every sample, standard, and QC sample.	Percent recovery for each IS (before any dilutions) within 40–135% (Method SW8290 Section 8.4)	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while the system was malfunctioning is mandatory.	Apply Q-flag to all results for analytes associated with a failed IS unless a matrix effect can be verified, then apply M.
Sample specific estimated detection limit (EDL)	Every sample that indicates nondetects or detections that are < 2.5 times background noise	Method 8290 Section 7.9.5 describes the calculation	N/A	N/A
Sample estimated maximum possible concentration (EMPC)	If PCDPE is detected or if sample peaks present do not meet all ion abundance ratio criteria	Method 8290 Section 7.9.5 describes the calculation	N/A	Apply J-flag to all EMPC values.

ATTACHMENT 1, TABLE 7

Summary of Calibration and Quality Control Procedures for Method SW8290 (Dioxins and Furans)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Method Blank	Minimum one per preparation batch. A method blank is required after a calibration run and before any sample run.	No analytes detected > ½ LOQ	Assess data and correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s), as appropriate.
MS/MSD	One MS/MSD per every 20 samples per matrix	Acceptance criteria: Tables 7-2 and 7-3	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > CL
Sample duplicate	One per analytical batch. This may be replaced by the MSD.	Acceptance criteria: Tables 7-2 and 7-3	Verify instrument performance, review analytical procedures.	For the specific analyte(s) in parent sample, apply J-flag.
Results reported below the lowest standard	None	None	None	Apply F-flag to all results below the lowest calibration standard.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October

KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO

Closure Plan for Open Detonation Unit

March 2013

377 MSG/CEIR
2050 Wyoming Blvd. SE
Kirtland AFB, New Mexico 87117-5270

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40 CFR 270.11
DOCUMENT CERTIFICATION
MARCH 2013

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

JOHN C. KUBINEC, Colonel, USAF
Commander, 377th Air Base Wing

This document has been approved for public release in accordance with Department of Defense Directives and Air Force Instructions.

X

Marie Vanover
Director, Public Affairs

KIRTLAND AIR FORCE BASE

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1. INTRODUCTION

This closure plan describes the activities necessary to close the Open Detonation (OD) treatment unit located within the Explosive Ordnance Disposal (EOD) Range at Kirtland Air Force Base (AFB). The OD Unit consists of a cleared circular area approximately 1,500 ft in diameter and surrounded and delineated by an approximately two-foot (ft) high earthen berm. Figures H-1 and H-2 show the location of the EOD Range at Kirtland AFB, and the collocated OD and Open Burn (OB) Units within the EOD Range. Detonations were conducted in pits measuring approximately 30 ft long, 15 wide and 12 ft deep.

Until final closure of the unit is complete in accordance with the New Mexico Hazardous Waste Management Regulations and certification of closure has been approved by the New Mexico Environment Department (NMED or the Department), a copy of the approved Closure Plan, and any revisions thereof, shall be maintained in the Operating Record. This Closure Plan, and any revisions thereof, shall be made available, upon request, to the Department.

If the OD Unit cannot be clean-closed, a post-closure care plan addressing the hazardous constituents remaining at the site shall be prepared and submitted to the Department for approval.

The OD Unit is collocated with the OB treatment unit at the EOD Range. The OD and OB Units are scheduled to undergo final closure activities simultaneously. The OB Unit has a separate closure plan, but several elements of the OB and OD Unit closure plans overlap and are noted within the documents. Additionally, there is currently a perchlorate groundwater investigation occurring to the west of the EOD range. This investigation and its results are independent of this OD Unit closure plan.

As per Kirtland AFB's Hazardous Waste Treatment Facility Operating Permit for the Open Detonation Unit (Permit), Attachment I, Table I-3 , SWMU 06-19 (KAFB IRP site OT-29), which is located approximately 20 ft northeast of the present OB structure, requires corrective action. Corrective action at SWMU 06-19 shall comply with the provisions of the Resource Conservation and Recovery Act (RCRA).

1.1 General Closure Information

This closure plan has been prepared in compliance with the requirements of RCRA (42 U.S.C. §§6901 et seq.) and its implementing regulations at 40 CFR Parts 264 and 270 (see 40 CFR Part 264 Subparts G and X and 270.14(b)(13)), and state implementing statutes and regulations under which the state has delegated RCRA authority (see New Mexico Hazardous Waste Act, Chapter 74 Article 4 NMSA 1978 and 20.4.1 NMAC).

1.2 Closure Performance Standard

The OD Unit shall be closed to meet the following performance standards:

- Minimize the need for further maintenance;
- Control, minimize or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to ground water or surface waters or to the atmosphere; and
- Comply with the requirements of 40 CFR Part 264, Subpart G and 40 CFR §264.601.

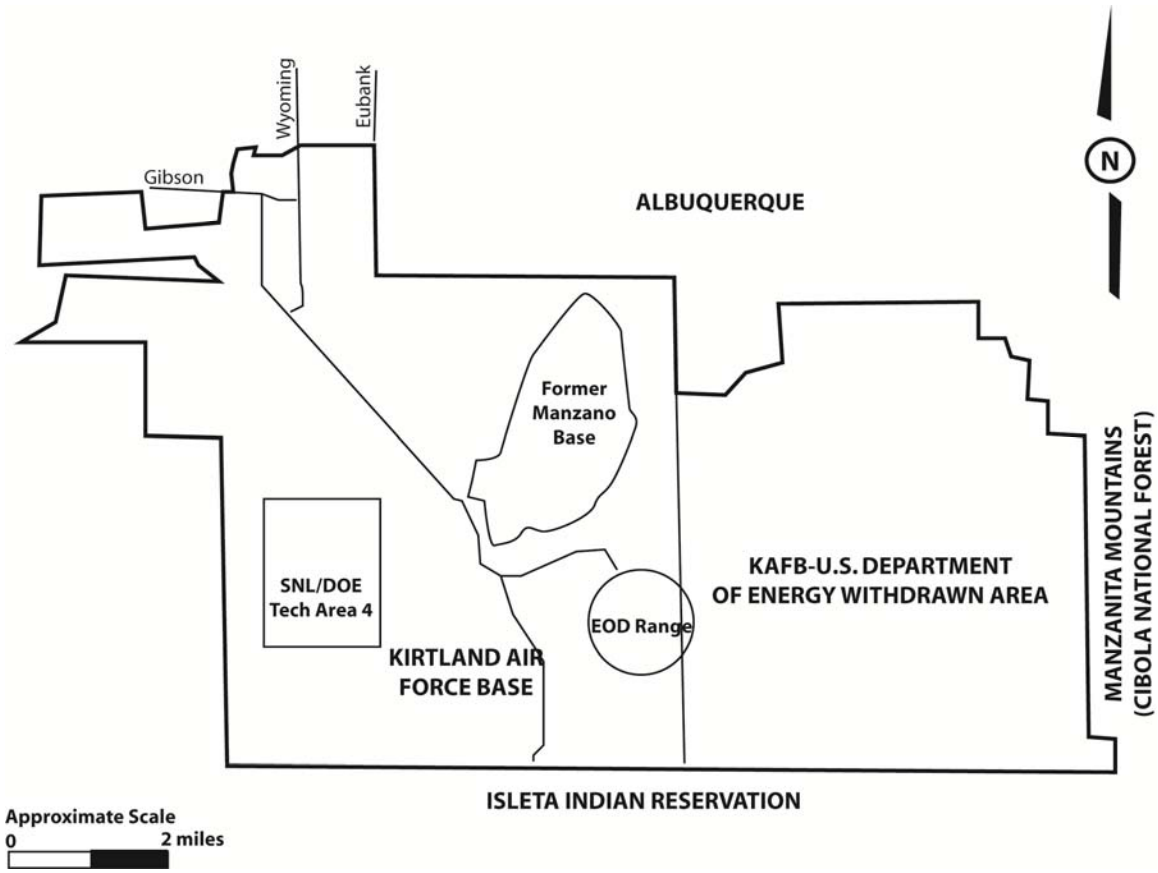

Figure H-1. Location of EOD Range at Kirtland AFB

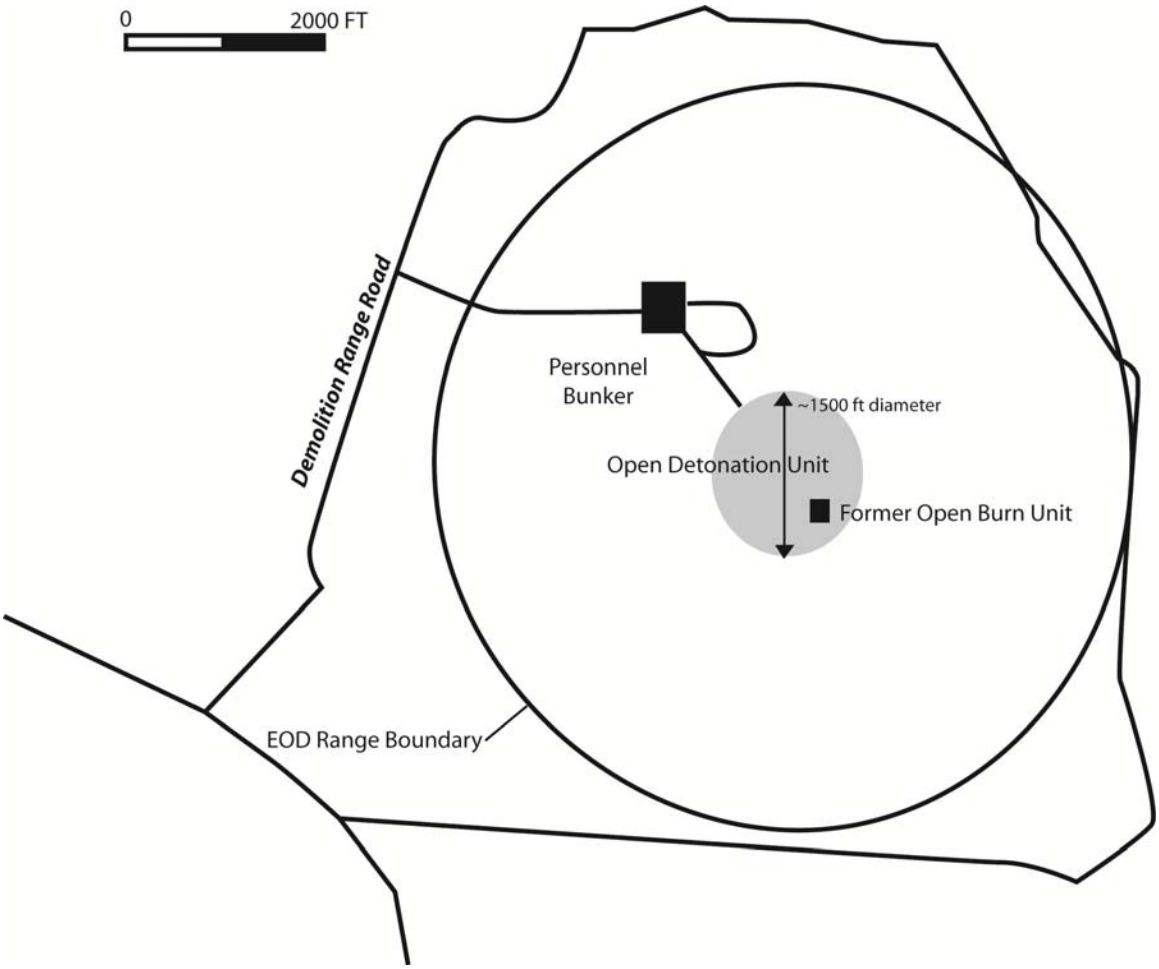

Figure H-2. Location of Open Burn Unit and Open Detonation Unit at EOD Range

1.3 Final Closure Activities

The last treatment event at the OD Unit occurred on 11 August 2010. The Department was notified on 13 August 2010 that, effective immediately, Kirtland AFB had closed the OD Unit for all treatment activities.. The Permittee shall notify the Department, in writing, at least 45 calendar days prior to the date that closure activities shall commence.

Final closure activities at the OD Unit shall consist of:

-
- Installation of four groundwater monitoring wells at the EOD range (one upgradient and three downgradient wells) and eight consecutive quarters of groundwater sampling to determine the presence or absence of groundwater contamination;
- Removing any soil or debris from the OD Unit that have contaminant concentrations which pose unacceptable risk to human health or the environment;
- Sending for treatment and disposal any solid and hazardous waste, including any treatment residues, to a permitted Treatment, Storage, or Disposal Facility (TSDF) in accordance with applicable regulatory requirements.

Final closure for the OD Unit shall be completed when:

- All solid and hazardous waste has been disposed of off-site as required by law;
- Sampling and analysis demonstrates that no unacceptable risk to human health or the environment originating from the OD Unit exists in soil or groundwater;
- A Certification of Closure and Closure Report has been submitted to the Department; and
- The Department has approved the Certification of Closure and Closure Report.

1.4 Maximum Extent of Operations and Maximum Waste Inventory

The OD Unit was previously permitted on 20 December 1994 as Permit# NM9570024423-OD, which allowed 100,000 pounds of net explosive weight (NEW) to be treated at the OD Unit annually. Rocket motors, large caliber munitions, explosive wastes and firearms were treated at the OD Unit. Based on the operating record, the maximum inventory treated at the OD Unit was approximately 316,012 pounds of NEW.

Closure activities and any corrective action that may be required shall not be limited to the OD Unit if contamination has migrated beyond the OD Unit boundary. Any corrective action that may be required because of a release at the OB Unit shall be conducted under the term and conditions of the 2010 Permit. This will allow for an efficient closure of the OB Unit.

1.5 Schedule for Closure

Final closure of the OD Unit shall proceed by the general schedule presented in Table H-1.

Table H-1
Closure Schedule for the Open Detonation Unit at Kirtland AFB

Activity	Time Required
Notify the Department of receiving final volume of hazardous waste at the OD Unit	Completed
Removal of all hazardous waste from the OD Unit	Completed
Department approval of final OD Unit closure plan	TBD
Commence closure activities	Day 0
Remove all solid and hazardous waste	Day 90
Commence groundwater monitoring well installations	Day 90
Complete groundwater monitoring well installations	Day 180
Complete all closure activities, except groundwater monitoring	Day 360
Complete 8 quarters of groundwater monitoring	Day 900
Submit Closure Report and certification to NMED	Day 960

Note: The schedule above indicates calendar days on which closure activities shall be started or completed subsequent to commencing of closure activities at day zero. Some activities may be conducted simultaneously or may require less time to complete.

1.6 Amendment of Closure Plan

All Closure Plan Amendments, if necessary, shall be submitted by the Permitee in accordance with applicable regulations and Permit Section 4.1. Written amendment requests shall include a copy of the amended plan for approval by the Department.

1.7 Closure and Post-Closure Cost Estimate, Financial Assurance and Liability Requirements

Since Kirtland AFB facility is a federal facility, it is currently exempt from the requirement to provide closure and post-closure care estimates and the requirements to provide financial assurance and liability insurance for closure and post-closure activities pursuant to 40 CFR Part 264, Subpart H.

1.8 Closure Certification

Within 60 days after completing final OB and OD Unit closure activities, Kirtland AFB shall submit, via certified mail, a certification that the units have been closed in accordance with the specifications of the approved closure plan. The certification shall be signed by the Installation Commander, the designated Responsible Official for Kirtland AFB, and by an independent, professional engineer registered in the State of New Mexico. Documentation supporting the independent, registered professional engineer's certification shall be furnished to the Department with the certification.

1.9 Closure Report

Within 60 days of completion of the final closure activities, a closure report shall be submitted to the Department. The report shall document the closure activities conducted and contain, at a minimum, the following information:

- A summary of the closure activities;
- Any significant variance from the approved closure plan and the reason for the variance;
- A summary of sampling data associated with closure, including analytical results for all field and laboratory quality control samples;
- A quality assurance statement on the adequacy of the analyses to support closure;
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data);
- Disposal location and quantities of all solid and hazardous wastes removed from the OD Unit;
- Certification of the accuracy of the report; and
- Survey plat.

1.10 Survey Plat and Post-Closure Requirements

Upon completion of closure activities at the OD Unit, a survey plat shall be prepared, certified by a professional land surveyor, and submitted with the closure report to the Department. The survey plat shall also be simultaneously filed with the local zoning authority. In the event that the OD Unit cannot be clean closed, a post-closure care plan shall be submitted to the Department for review and approval.

2. CLOSURE PROCEDURES

There is no hazardous waste present at the OD Unit; the last treatment event at the OD Unit occurred on 11 August 2010, and there are no treatment residues remaining. There are no structures or equipment at the OD Unit. (The structures associated with the collocated OB Unit are addressed under the OB Unit closure plan.)

The first phase of closure shall consist of a hazards survey of the OD Unit conducted by qualified contractor health physics and industrial hygiene personnel, which will include unexploded ordnance (UXO) safety personnel, and Kirtland AFB EOD personnel. The purpose of the survey shall be to locate and remove any "kick-out" (untreated waste, waste fragments, or UXO), and to identify potential contamination concerns that may present hazards to workers during the closure activities and to specify any control measures necessary to reduce worker risk. This survey will provide the information necessary for health physics, UXO safety, and industrial hygiene personnel to identify worker qualifications, personal protective equipment (PPE), safety awareness, work permits, exposure control programs, and emergency coordination that will be required to perform closure. Any munitions and explosives of concern (MEC) identified during the hazard survey will be reported to and handled by Kirtland AFB EOD staff personnel only in accordance with standard operating procedures. All workers involved in the closure activities will be required to have training and medical monitoring as required by applicable regulations. Personnel performing closure activities will be required to wear PPE as specified by health physics, UXO safety, and industrial hygiene personnel.

Sufficient sampling and analysis shall be required to demonstrate there are no contaminant concentrations which pose unacceptable risk to human health or the environment. Soil and groundwater samples shall be analyzed for parameters listed in Tables H-2 and H-3 to quantify contamination, if any, originating from the OD Unit.

Groundwater sampling results shall be compared to the New Mexico Water Quality Control Commission water quality standards and the Federal Safe Drinking Water Act maximum contaminant levels (MCLs), included in Table H-3. If the levels of hazardous constituents in the groundwater exceed the water quality standards or MCLs, a risk assessment shall be prepared. If the risk assessment demonstrates that the level of contamination is unacceptable, the groundwater shall be subject to corrective action, and a corrective action work plan subject to NMED review and approval shall be developed. For perchlorate, Kirtland AFB will apply the Office of the Under Secretary of Defense *Perchlorate Release Management Policy* dated 22 April 2009.

Surface and subsurface soil at the OD Unit shall be characterized by sampling and analysis. Soil sampling shall follow the procedures described in Section 2.2.1 of this Permit Attachment (H). Soil shall be analyzed for the parameters listed in Table H-2. If sampling and analysis of soil indicates the presence of hazardous waste or hazardous constituents above background levels, a risk assessment shall be conducted based on a residential land-use scenario to determine whether the contaminants pose an unacceptable risk to human health or the environment. In lieu of a baseline risk assessment, the Permittee may compare the soil sampling results to the soil screening levels using the procedures listed in the Departments most current version of "Technical Background Document for Development of Soil Screening Levels," as amended, provided the soil screening levels are based on a residential land-use scenario. If the risk assessment demonstrates that the level of contamination is unacceptable, the contaminated soil exhibiting unacceptable risk shall be subject to corrective action under Permit Part 6 and shall be excavated and removed. The excavated soil shall be collected, transferred to containers, and, if

applicable, managed and disposed of as hazardous waste. The Permittee shall conduct corrective action activities at the OD Unit using the cleanup levels in Permit Section 6.2.3 if corrective action is necessary. Clean up levels shall be based on a residential land use scenario. Background soil concentrations for metals are those approved by the Department for the KAFB Facility, and are listed in Table D-4 of Permit Attachment D.

2.1 Monitoring Wells

2.1.1 Installation of New Monitoring Wells

The OD Unit is subject to the environmental performance standards of 40 C.F.R. § 264.601. As such, groundwater monitoring shall be conducted as part of closure activities to demonstrate that operations did not impact groundwater. Four monitoring wells, one upgradient and three downgradient of the OD Unit, shall be installed. The locations of the proposed monitoring wells are presented in Figure H-3.

A monitoring well installation plan is included as Attachment 1 to this Closure Plan. The Monitoring Well Installation Plan addresses:

- Well locations,
- Drilling specifications,
- Well construction specifications,
- Well development procedures,
- A schedule for implementation and completion of the well installations;
- Preparation and submittal of a well completion report; and
- Groundwater sampling and analysis requirements for eight quarters.

In addition, the wells installed at the OD Unit shall meet the groundwater monitoring requirements of 40 C.F.R. §§ 264.97(a)(2), (b), and (c). Within 30 days of completing well installation, Kirtland AFB shall submit a well completion report to the Department for approval.

Groundwater monitoring wells shall be properly plugged and abandoned in accordance with applicable New Mexico statutes and regulations, provided groundwater contamination has not occurred. If groundwater contamination has occurred, these monitoring wells shall be maintained for the purpose of implementing corrective action. The wells shall not be plugged or abandoned until the Department has approved closure of the OD Unit.

2.1.2 Mesa Schoolhouse Well

The Mesa Schoolhouse Well, a Department of Energy/National Nuclear Surety Administration (DOE/NNSA) well authorized under Kirtland AFB permit #PERM/0-K1-91-0010 was monitored for groundwater contamination as part of the December 1994 OD Unit’s sampling and analysis plan. This sampling has been discontinued and the wellhead is secure. The well will remain in place for possible future monitoring by DOE/NNSA

2.2 Sampling, Decontamination Procedures, and PPE

This section describes procedures and methods for soil and liquid sampling applicable to closure activities. While the procedures and methods are specific, other applicable procedures or methods given in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) may

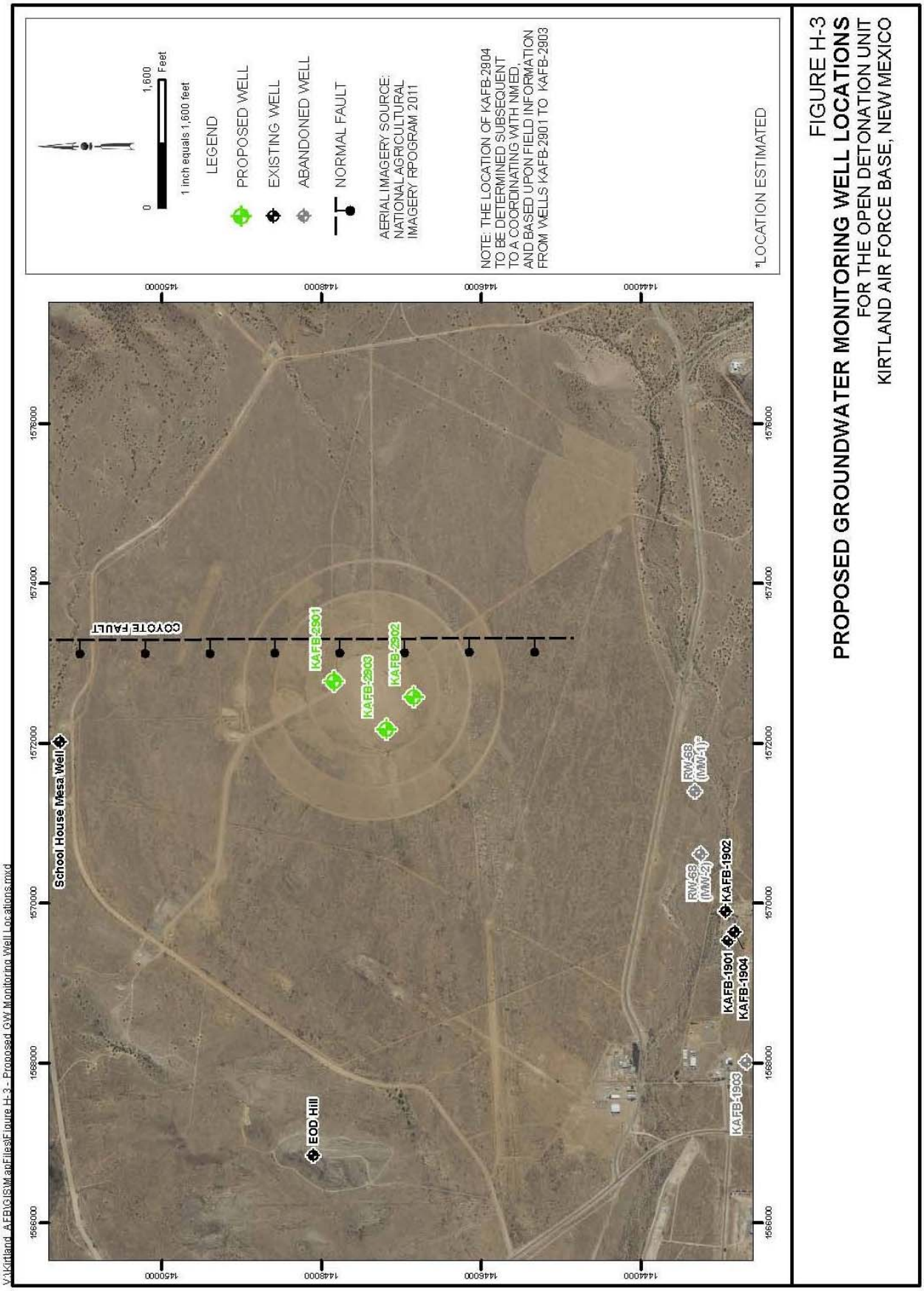

FIGURE H-3
PROPOSED GROUNDWATER MONITORING WELL LOCATIONS
FOR THE OPEN DETONATION UNIT
KIRTLAND AIR FORCE BASE, NEW MEXICO

be used if conditions or experience show the alternate method to be more appropriate, and if approved by the Department. All sampling procedures actually used shall be annotated in the final closure report. Sampling shall be conducted in accordance with procedures given in "Samplers and Sampling Procedures for Hazardous Waste Streams" (EPA 600/2-80-018) or SW-846, as appropriate.

Surface and subsurface soil at the OD Unit shall be characterized by sampling and analysis.

The tools and equipment used during the sampling shall be vacuumed, cleaned with detergent and water, and scraped as necessary to remove any residue. The wash water shall be collected and analyzed for characterization of waste. The vacuums used and their contents shall be containerized and shipped off site as hazardous waste for disposal.

All of the PPE worn by personnel performing closure activities will be disposable; therefore, all PPE shall be placed into containers and managed as hazardous waste. This waste shall be considered to be contaminated with all of the hazardous waste constituents contained in the wastes that have been treated at the OB Unit and the OD Unit. All contained PPE wastes shall be transported to a permitted facility for disposal.

2.2.1 Soil Sampling

Soil samples shall be conducted on a 25-ft by 25-ft grid spacing from the surface to 15 ft below ground surface at five ft intervals (total of four samples per location). At a minimum, the grid shall encompass all portions of the OD Unit that have hosted or may have hosted a pit used for the treatment of hazardous waste. (Figure H-4).

Surface soil samples will be collected approximately 25 ft from the OB Unit. Three samples shall be collected from each side of the OB for a total of 12 surface soil samples. These samples will characterize potential contamination from the OB Unit that may have migrated onto the OD Unit.

The soil samples shall be analyzed for the parameters listed in Table H-2 which include all hazardous constituents of the hazardous wastes that were detonated at the OD Unit.

Surface soil samples (zero to six inches depth) shall be collected with a wooden or Teflon™ trowel or scoop. Disposable sampling tools shall be used. In the event that the Department requests split samples, sufficient soils shall be collected to provide split samples to the Department representatives.

A Veihmeyer soil sampler, auger drill, direct push technology or other appropriate method shall be used to collect subsurface soil samples. Only discrete grab samples shall be collected; no samples shall be composited.

Clean sampling equipment shall be used to collect each sample. Unused, disposable sampling equipment may be presumed clean if still in a factory-sealed wrapper prior to use. Reusable sampling equipment shall be decontaminated after each use by scraping to remove any loose material, washing with a detergent and water solution, rinsing several times with tap water, rinsing with deionized water, and drained of excess water, and air-dried or wiped dry.

V:\Kirtland_AFB\GIS\MapFiles\Figure H-4 - Proposed Discrete Soil Sampling Locations.mxd

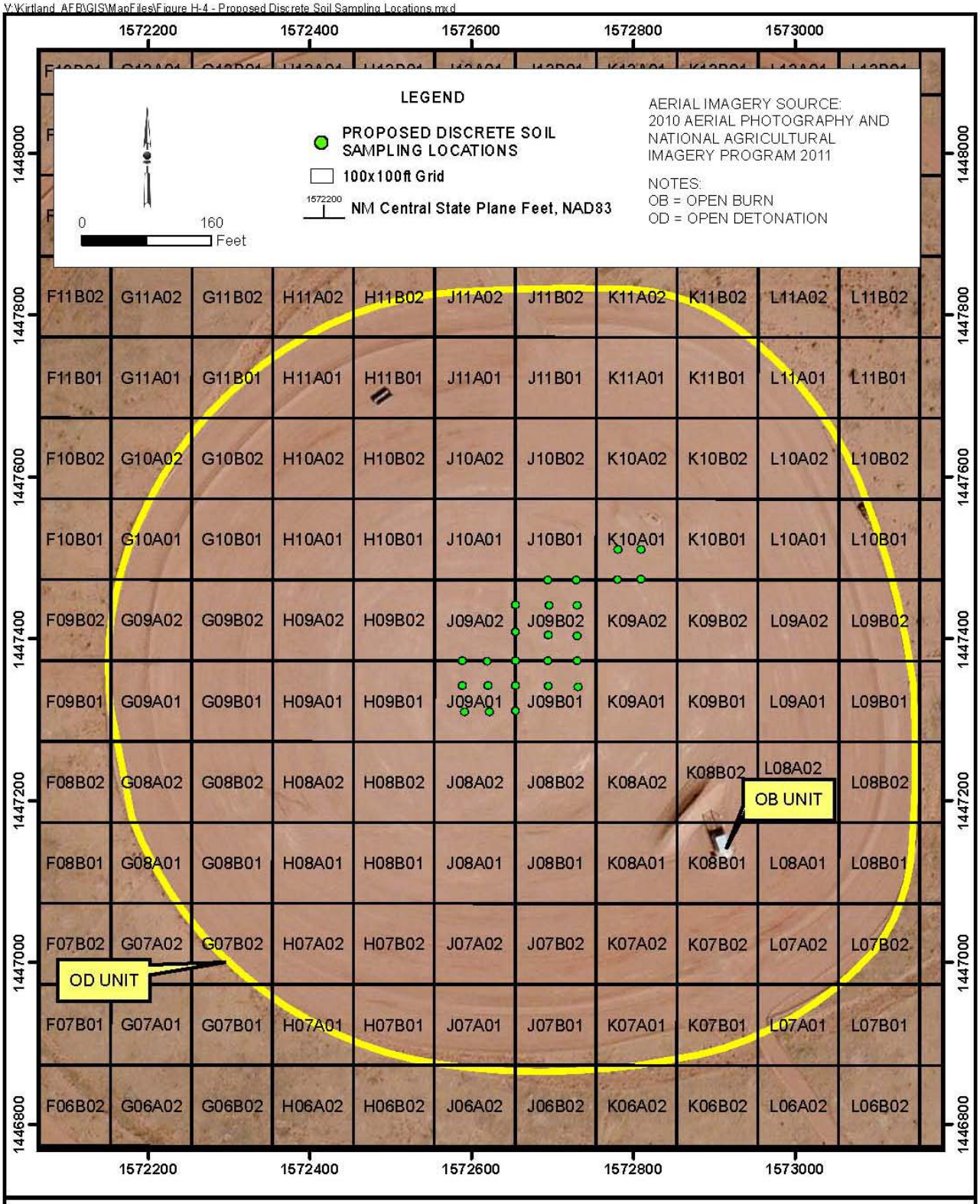

FIGURE H-4
PROPOSED DISCRETE SOIL SAMPLING LOCATIONS
OPEN DETONATION CLOSURE PLAN
KIRTLAND AIR FORCE BASE, NEW MEXICO

2.2.2 Liquid Sampling

Groundwater samples shall be collected from the groundwater monitoring wells installed at the OD Unit. Eight consecutive quarters of groundwater monitoring shall be conducted initially, following installation of the wells. Groundwater samples will be obtained using methods approved by the Department within eight hours of the completion of well purging. The samples shall be analyzed for the parameters listed in Table H-3, which include all hazardous constituents of the hazardous wastes that were treated at the OD Unit.

Groundwater in monitoring wells with low recharge rates and that purge dry shall be sampled when the water level in the well has recovered sufficiently to collect the required samples. A low-flow bladder pump shall be utilized. Groundwater samples intended for metals analysis shall be submitted to the laboratory for analyses of total metals; the samples will not be filtered in the field or laboratory.

Glass tubes shall be used to sample liquids, except groundwater. The primary advantage to using this type of sampling device is that the tube can be disposed of after each sample is collected, thus eliminating cross-contamination. Alternatively, a Coliwasa sampler may be used to sample liquids, except groundwater.

2.2.3 Appropriate Sample Containers and Preservatives

Samples shall be placed in clean containers compatible with the intended analysis and shall be properly prepared and preserved to maintain sample integrity. The most recent version of SW-846 lists the proper container, preservative, and holding time for each chemical parameter of interest, and these requirements will be followed for all samples collected during the closure process. Table H-4 summarize the sample containers, preservation techniques, and holding times for soil and liquid samples (including groundwater).

2.2.4 Sample Handling and Documentation

Each sample shall be labeled, sealed, and accompanied by a chain-of-custody and a request-for-analysis form. A chain-of-custody form shall be used to track samples from collection through analysis to ensure that the integrity of the samples is protected, and that analytical results can be attributed to specific samples of environmental media or waste. The procedures followed during closure will be equivalent to those provided in the most current version of SW-846. Important aspects of the procedures are presented below. A chain-of-custody form will be prepared for all samples collected for laboratory analyses. The form includes:

- • Sample identification number;
- • Name and signature of sample collector;
- • Date and time of sample collection;
- • Location at which sample was collected;
- • Type of waste (e.g., soil, liquid, etc.);
- • Signatures of persons who have had samples in their possession;
- • Dates and times of possession.

This form will be initiated at the point of sample collection and will then remain with the sample during transfer to the laboratory. The form will be completed upon receipt at the laboratory and returned to Kirtland AFB for inclusion in facility operating record. The chain-of-custody form

will include a request-for analysis form that lists all analyses to be performed for the identified samples and all special instructions relating to sample management or analysis. Any potential hazards posed by the samples shall be listed on the request-for-analysis form.

The sample containers will be sealed with gummed paper seals attached to the containers in such a way that the seals must be broken in order to open the containers. The seals and sample labels must be completed with a waterproof pen. The sample labels are necessary to prevent misidentification of samples and shall include the following information: a unique sample number; name or initials of sample collector; sample collection date and time; sample location; and, sample type, depth, and description.

A closure sampling field log book will be kept and will contain all information pertinent to field surveys and sampling. Sufficient information shall be recorded so that a person can reasonably reconstruct what occurred at a sampling event without relying on a collector's memory. The log book shall have bound and consecutively numbered pages in 8 by 11-inch format. Minimum entries will include:

- Purpose of sample;
- Location of sampling;
- Name and business address of person making log entry;
- Number, type, and volume of sample;
- Description of each sampling methodology and equipment used;
- Date and time of sample collection;
- Sample destination and transporter's name (name of laboratory, UPS, etc.);
- Map or photograph of the sampling site;
- Field observations (ambient temperature, sky conditions, past 24-hour precipitation, etc.);
- Field measurements, if any (pH, flammability, conductivity, explosivity, etc.);
- Collector's sample identification number(s);
- Signature of person responsible for the log entry.

Documentation of sample acceptance at the laboratory will be provided following sample screening and log-in. This documentation may consist of signed copies of the chain-of-custody, documentation or a letter detailing the field sample numbers accepted. Corresponding laboratory sample identification numbers will be provided. The laboratory is required to have procedures for preventing cross contamination of samples and securing sample custody within the laboratory.

2.2.5 Sample Shipping

Samples shall be packaged and shipped to the laboratory in accordance with DOT shipping requirements and in a manner to ensure that the integrity of the samples is protected. The sample containers shall be cushioned to protect against breakage or puncture.

2.2.6 Sample Analysis

Soil, groundwater, and waste samples will be analyzed by an ELAP-certified laboratory. The analytical laboratory shall have procedures for preventing cross-contamination of samples and securing sample custody within the laboratory. Test methods for analysis of all samples will be performed according to procedures documented in the most current version of SW-846. Hazardous constituents associated with the regulated wastes treated at the OD Unit are included in these analyses. Analytical methods, detection limits, and instrumentation are provided in

Table H-2 for soil analysis; and in Table H-3 for groundwater analysis. Minimum calibration, operation, and quality control (bias, precision, blank and matrix effects) requirements for laboratory analyses shall be performed as listed in the individual analytical methods of SW-846. All laboratory analyst notebooks, log sheets, instrument printouts, charts, and calculations relevant to analyses of these samples shall be identified and remain accessible. This information may be requested for independent review and validation. If requested by the Department, this information shall be provided by the Permittee.

2.2.7 Quality Assurance/Quality Control Program

Because decisions about closure activities may be based, in part, on analyses of samples, a program to ensure reliability of analytical data is mandatory. Data reliability will be ensured by documenting sample management so that analyses are traceable to specific areas of potential contamination and by following a quality assurance/quality control (QA/QC) program that mandates documentation of the precision and accuracy of laboratory analyses, as well as data completeness, representativeness, and comparability.

Sampling activities will include collection of QC samples in addition to field documentation requirements. QC samples to be collected include: duplicate samples, trip blanks, field blanks, and rinsate blanks. Table H-5 summarizes field QC sample requirements.

Blanks and duplicate samples shall be collected to determine potential errors introduced in the data from sample collection and handling activities, laboratory error, and to assess analytical precision. To determine the potential for cross contamination, rinsate blanks consisting of rinsate from decontaminated equipment shall be collected and analyzed. At least one rinsate blank will be collected for every ten samples collected using non-dedicated sampling equipment. Duplicate samples will be collected at a frequency of one duplicate sample for every ten field samples. In no case will less than one rinsate blank or duplicate sample be collected for a sampling effort. Trip blanks will be collected on a daily basis and included in each shipment of samples that contain VOCs samples. Trip blanks are analyzed for VOCs only and are used to assess possible VOC contamination from outside sources. Trip blanks are shipped from the analytical laboratory and maintained with the sample bottles throughout the sampling process. These blank and duplicate samples will be identified and treated as separate samples. Acceptance criteria for QA/QC sample analyses will be compatible with the most recent version of SW-846 or other applicable guidance.

The analytical laboratory shall operate under a QA program plan (QAPP) that meets the requirements of SW-846. QC procedures in the analytical laboratory are guided by the laboratory's QAPP. Laboratory QC samples are required to establish the accuracy and precision of analytical data in order to determine the quality of the data. Table H-4- lists laboratory QC procedures by analytical methods.

The analytical laboratory data shall be evaluated using the following criteria:

- Completeness of data deliverable;
- Collection, extraction, and analysis holding times;
- Blank data;
- Laboratory control sample results;
- Matrix spike/matrix spike duplicate results;
- Laboratory duplicate sample results; and
- Overall data assessment and usability.

Table H-2

Comparison of Reporting Levels to Screening Objectives in Soil, Open Detonation Unit at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Residential SSG (Feb 2012)	Coyote Test Field Super Group Background Values (surface soil)	Coyote Test Field Super Group Background Values (subsurface soil)	EPA Regional Screening Levels, Residential (Nov 2012)	LOQ	LOD	DL
SW6010B	Antimony	7440-36-0	mg/kg	31.3	3.9	3.9	--	3	2	0.94
SW6010B	Barium	7440-39-3	mg/kg	15,596	130	214	--	2	0.5	0.12
SW6010B	Beryllium	7440-41-7	mg/kg	156	0.65	0.65	--	0.3	0.1	0.03
SW6010B	Cadmium	7440-43-9	mg/kg	70.3	1	0.9	--	0.3	0.1	0.03
SW6010B	Chromium	7440-47-3	mg/kg	117,321/2.97	17.3	12.8	--	1	0.5	0.14
SW6010B	Cobalt	7440-48-4	mg/kg	--	5.2	5.2	23	1	0.5	0.25
SW6010B	Copper	7440-50-8	mg/kg	3,129	15.4	18.2	--	1.5	0.5	0.22
SW6010B	Lead	7439-92-1	mg/kg	400	21.4	11.8	--	1	0.5	0.26
SW6010B	Nickel	7440-02-0	mg/kg	1,564	11.5	11.5	--	1	0.5	0.24
SW6010B	Selenium	7782-49-2	mg/kg	391	1	1	--	4	2.5	1.4
SW6010B	Silver	7440-22-4	mg/kg	391	1	1	--	0.5	0.2	0.09
SW6010B	Tin	7440-31-5	mg/kg	--	--	--	47,000	100	25	11
SW6010B	Vanadium	7440-62-2	mg/kg	391	20.4	21.5	--	2	0.5	0.19
SW6010B	Zinc	7440-66-6	mg/kg	23,464	62	62	--	2	1	0.19
SW6020A	Arsenic	7440-38-2	mg/kg	3.9	5.6	7.4	--	0.5	0.3	0.15
SW6020A	Thallium	7440-28-0	mg/kg	0.78	1.1	1.1	--	0.15	0.1	0.05
SW7471A	Mercury	7439-97-6	mg/kg	15.6/7.82	0.25	0.10	--	0.04	0.012	0.0086
SW6850	Perchlorate	14797-73-0	µg/kg	54,800	--	--	--	5	0.4	0.26
SW7580	White Phosphorus	7723-14-0W	µg/kg	--	--	--	1,600	0.1	0.05	0.015
SW8260B	1,1,1-Trichloroethane	71-55-6	µg/kg	15,609,580	--	--	--	5	1	0.36
SW8260B	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	8,021	--	--	--	5	1	0.68
SW8260B	1,1,2-Trichloroethane	79-00-5	µg/kg	2,811	--	--	--	5	1	0.44
SW8260B	1,1,2-trichloro-1,1,2-trifluoroethane	76-13-1	µg/kg	72,080,604	--	--	--	10	1	0.83
SW8260B	1,1-Dichloroethane	75-34-3	µg/kg	64,514	--	--	--	5	1	0.29
SW8260B	1,1-Dichloroethene	75-35-4	µg/kg	448,879	--	--	--	5	0.5	0.26
SW8260B	1,2,3-Trichlorobenzene	87-61-6	µg/kg	--	--	--	49,000	5	1	0.75
SW8260B	1,2,3-Trichloropropane	96-18-4	µg/kg	50	--	--	--	5	1	0.76
SW8260B	1,2,4-Trichlorobenzene	120-82-1	µg/kg	72,980	--	--	--	5	1	0.75
SW8260B	1,2,4-Trimethylbenzene	95-63-6	µg/kg	--	--	--	62,000	5	1	0.51
SW8260B	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	µg/kg	186	--	--	--	10	1	0.88
SW8260B	1,2-Dibromoethane (EDB)	106-93-4	µg/kg	588	--	--	--	10	1	0.27
SW8260B	1,2-Dichlorobenzene	95-50-1	µg/kg	2,306,711	--	--	--	5	1	0.64
SW8260B	1,2-Dichloroethane	107-06-2	µg/kg	7,885	--	--	--	5	1	0.73
SW8260B	1,2-Dichloropropane	78-87-5	µg/kg	15,238	--	--	--	5	1	0.6
SW8260B	1,3,5-Trimethylbenzene	108-67-8	µg/kg	--	--	--	780,000	5	1	0.35
SW8260B	1,3-Dichlorobenzene*	541-73-1	µg/kg	--	--	--	--	5	1	0.3
SW8260B	1,4-Dichlorobenzene	106-46-7	µg/kg	31,731	--	--	--	5	1	0.78
SW8260B	1,4-Dioxane	123-91-1	µg/kg	48,634	--	--	--	250	75	39
SW8260B	2-Butanone (MEK)	78-93-3	µg/kg	37,076,608	--	--	--	10	3	1.4
SW8260B	2-Hexanone	591-78-6	µg/kg	--	--	--	210,000	10	1	0.74
SW8260B	4-Methyl-2-pentanone (MIBK)	108-10-1	µg/kg	51,578	--	--	--	10	1	0.92
SW8260B	Acetone	67-64-1	µg/kg	66,556,733	--	--	--	20	3	1.4
SW8260B	Benzene	71-43-2	µg/kg	15,381	--	--	--	5	1	0.26
SW8260B	Bromochloromethane	74-97-5	µg/kg	--	--	--	160,000	5	1	0.94
SW8260B	Bromodichloromethane	75-27-4	µg/kg	5,411	--	--	--	5	1	0.53
SW8260B	Bromoform	75-25-2	µg/kg	--	--	--	--	5	1	0.4
SW8260B	Bromomethane	74-83-9	µg/kg	16,485	--	--	--	5	3	0.86
SW8260B	Carbon disulfide	75-15-0	µg/kg	1,532,527	--	--	--	10	1	0.49
SW8260B	Carbon tetrachloride	56-23-5	µg/kg	10,833	--	--	--	5	1	0.53
SW8260B	Chlorobenzene	108-90-7	µg/kg	376,370	--	--	--	5	1	0.29
SW8260B	Chloroethane	75-00-3	µg/kg	29,806,983	--	--	--	5	1	0.45
SW8260B	Chloroform	67-66-3	µg/kg	5,864	--	--	--	5	1	0.26
SW8260B	Chloromethane	74-87-3	µg/kg	274,707	--	--	--	5	1	0.5
SW8260B	cis-1,2-Dichloroethene	156-59-2	µg/kg	156,428	--	--	--	5	1	0.89
SW8260B	cis-1,3-Dichloropropene*	10061-01-5	µg/kg	33713	--	--	--	5	1	0.64
SW8260B	Cyclohexane	1735-17-7	µg/kg	--	--	--	7,000,000	(a)	(a)	(a)
SW8260B	Dibromochloromethane	124-48-1	µg/kg	12,127	--	--	--	5	0.5	0.21
SW8260B	Dichlorodifluoromethane (Freon 12)	75-71-8	µg/kg	168,142	--	--	--	5	3	0.89
SW8260B	Ethylbenzene	100-41-4	µg/kg	68,448	--	--	--	5	1	0.34
SW8260B	Isopropylbenzene	98-82-8	µg/kg	2,430,743	--	--	--	5	1	0.52
SW8260B	Methyl Acetate	79-20-9	µg/kg	78,214,000	--	--	--	(a)	(a)	(a)
SW8260B	Methly Cyclohexane	108-87-2	µg/kg	5,625,911	--	--	--	(a)	(a)	(a)
SW8260B	Methyl tert-butyl ether (MTBE)	1634-04-4	µg/kg	901,073	--	--	--	10	1	0.6
SW8260B	Methylene chloride	75-09-2	µg/kg	409,376	--	--	--	5	1	0.84
SW8260B	m-Xylene & p-Xylene	136777-61-2	µg/kg	774,289	--	--	--	5	1	0.81
SW8260B	Naphthalene	91-20-3	µg/kg	42,976	--	--	--	5	1	0.63
SW8260B	o-Xylene	95-47-6	µg/kg	898,344	--	--	--	5	0.5	0.33
SW8260B	Styrene	100-42-5	µg/kg	7,277,612	--	--	--	5	1	0.31
SW8260B	Tetrachloroethene	127-18-4	µg/kg	7,021	--	--	--	5	1	0.61
SW8260B	Toluene	108-88-3	µg/kg	5,274,400	--	--	--	5	1	0.61
SW8260B	trans-1,2-Dichloroethene	156-60-5	µg/kg	269,586	--	--	--	5	1	0.38
SW8260B	trans-1,3-Dichloropropene*	10061-02-6	µg/kg	33713	--	--	--	5	1	0.75
SW8260B	Trichloroethene	79-01-6	µg/kg	8,767	--	--	--	5	1	0.6
SW8260B	Trichlorofluoromethane (Freon 11)	75-69-4	µg/kg	1,412,976	--	--	--	10	1	0.34
SW8260B	Vinyl chloride	75-01-4	µg/kg	728	--	--	--	5	1	0.36

Table H-2

Comparison of Reporting Levels to Screening Objectives in Soil, Open Detonation Unit at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Residential SSG (Feb 2012)	Coyote Test Field Super Group Background Values (surface soil)	Coyote Test Field Super Group Background Values (subsurface soil)	EPA Regional Screening Levels, Residential (Nov 2012)	LOQ	LOD	DL
SW8270C	1,1-biphenyl	92-52-4	ug/kg	57117	--	--	--	330	NA	165
SW8270C	1,2,4,5-tetrachlrorbenzene	95-94-3	µg/kg	18,331	--	--	--	(a)	(a)	(a)
SW8270C	2,4,5-Trichlorophenol	95-95-4	µg/kg	6,110,491	--	--	--	330	167	83
SW8270C	2,4,6-Trichlorophenol	88-06-2	µg/kg	61,105	--	--	--	330	167	84
SW8270C	2,4-Dichlorophenol	120-83-2	µg/kg	183,315	--	--	--	330	167	89
SW8270C	2,4-Dimethylphenol	105-67-9	µg/kg	1,222,098	--	--	--	500	167	167
SW8270C	2,4-Dinitrotoluene	121-14-2	µg/kg	15,689	--	--	--	330	167	89
SW8270C	2,6-Dichlorophenol*	87-65-0	µg/kg	--	--	--	--	500	167	165
SW8270C	2,6-Dinitrotoluene	606-20-2	µg/kg	61,105	--	--	--	330	167	99
SW8270C	2-Chloronaphthalene	91-58-7	µg/kg	6,257,143	--	--	--	330	167	81
SW8270C	2-Chlorophenol	95-57-8	µg/kg	391,071	--	--	--	330	167	88
SW8270C	2-Methylnaphthalene	91-57-6	µg/kg	--	--	--	230,000	330	167	85
SW8270C	2-Methylphenol	95-48-7	µg/kg	--	--	--	3,100,000	330	167	58
SW8270C	2-Nitroaniline	88-74-4	µg/kg	--	--	--	610,000	1600	167	84
SW8270C	2-Nitrophenol*	88-75-5	µg/kg	--	--	--	--	330	167	82
SW8270C	2,2-oxybis(1-chloropropane)*	52438-91-2	µg/kg	--	--	--	--	330	167	54
SW8270C	3,3'-Dichlorobenzidine	91-94-1	µg/kg	10,808	--	--	--	1600	167	94
SW8270C	3-Methylphenol & 4-Methylphenol	65794-96-9	µg/kg	--	--	--	3,100,000	1000	660	330
SW8270C	3-Nitroaniline*	99-09-2	µg/kg	--	--	--	--	1600	333	167
SW8270C	4,6-Dinitro-2-methylphenol	534-52-1	µg/kg	4,888	--	--	--	2000	333	81
SW8270C	4-Bromophenyl phenyl ether*	101-55-3	µg/kg	--	--	--	--	330	167	85
SW8270C	4-Chloro-3-methylphenol	59-50-7	µg/kg	--	--	--	6,100,000	330	167	92
SW8270C	4-Chloroaniline	106-47-8	µg/kg	--	--	--	2,400	330	167	58
SW8270C	4-Chlorophenyl phenyl ether*	7005-72-3	µg/kg	--	--	--	--	330	167	93
SW8270C	4-Nitroaniline	100-01-6	µg/kg	--	--	--	24,000	1600	167	88
SW8270C	4-Nitrophenol*	100-02-7	µg/kg	--	--	--	--	2000	333	280
SW8270C	Acenaphthene	83-32-9	µg/kg	3,440,510	--	--	--	330	167	83
SW8270C	Acenaphthylene*	208-96-8	µg/kg	--	--	--	--	330	167	85
SW8270C	Anthracene	120-12-7	µg/kg	17,202,560	--	--	--	330	167	86
SW8270C	Acetophenone	17537-31-4	µg/kg	7,821,428	--	--	--	(a)	(a)	(a)
SW8270C	Azobenzene (as 1,2 diphenyl hydrazine)	103-33-3	µg/kg	6079	--	--	610	330	167	92
SW8270C	Atrazine	93616-39-8	µg/kg	--	--	--	2,100	(a)	(a)	(a)
SW8270C	Benzaldehyde	100-52-7	µg/kg	--	--	--	7,800,000	(a)	(a)	(a)
SW8270C	Benz(a)anthracene	56-55-3	µg/kg	1,476	--	--	--	330	167	92
SW8270C	Benzo(a)pyrene	50-32-8	µg/kg	147	--	--	--	330	167	94
SW8270C	Benzo(b)fluoranthene	205-99-2	µg/kg	1,476	--	--	--	330	167	95
SW8270C	Benzo(ghi)perylene*	191-24-2	µg/kg	--	--	--	--	330	167	110
SW8270C	Benzo(k)fluoranthene	207-08-9	µg/kg	14,762	--	--	--	330	167	113
SW8270C	bis(2-Chloroethoxy)methane	111-91-1	µg/kg	--	--	--	180,000	330	167	88
SW8270C	bis(2-Chloroethyl) ether	111-44-4	µg/kg	6	--	--	--	330	167	81
SW8270C	bis(2-Ethylhexyl) phthalate	117-81-7	µg/kg	347,387	--	--	--	330	167	98
SW8270C	Butyl benzyl phthalate	85-68-7	µg/kg	--	--	--	260,000	330	167	95
SW8270C	Carbazole*	86-74-8	µg/kg	--	--	--	--	330	167	95
SW8270C	Caprolactam	105-60-2	µg/kg	--	--	--	31,000,000	(a)	(a)	(a)
SW8270C	Chrysene	218-01-9	µg/kg	148,629	--	--	--	330	167	84
SW8270C	Dibenz(a,h)anthracene	53-70-3	µg/kg	147	--	--	--	330	167	102
SW8270C	Dibenzofuran	132-64-9	µg/kg	--	--	--	78,000	330	167	86
SW8270C	Diethyl phthalate	84-66-2	µg/kg	48,883,929	--	--	--	330	167	90
SW8270C	Dimethyl phthalate	131-11-3	µg/kg	611,049,107	--	--	--	330	167	87
SW8270C	Di-n-butyl phthalate	84-74-2	µg/kg	6,110,491	--	--	--	330	167	97
SW8270C	Di-n-octyl phthalate*	117-84-0	µg/kg	--	--	--	--	330	167	97
SW8270C	Fluoranthene	206-44-0	µg/kg	2,293,674	--	--	--	330	167	95
SW8270C	Fluorene	86-73-7	µg/kg	2,293,674	--	--	--	330	167	92
SW8270C	Hexachlorobenzene	118-74-1	µg/kg	3,040	--	--	--	330	167	89
SW8270C	Hexachlorobutadiene	87-68-3	µg/kg	--	--	--	--	330	167	82
SW8270C	Hexachloroethane	67-72-1	µg/kg	42,773	--	--	--	330	167	81
SW8270C	Hexachlorocyclopentadiene	77-47-4	µg/kg	366,000	--	--	--	1600	250	62
SW8270C	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	1,476	--	--	--	330	167	96
SW8270C	Isophorone	78-59-1	µg/kg	5,119,394	--	--	--	330	167	93
SW8270C	Naphthalene	91-20-3	µg/kg	42,976	--	--	--	330	167	82
SW8270C	Nitrobenzene	98-95-3	µg/kg	53,500	--	--	--	330	167	76
SW8270C	N-Nitrosodimethylamine	62-75-9	µg/kg	22.5	--	--	--	330	167	96
SW8270C	N-Nitrosodi-n-propylamine	621-64-7	µg/kg	--	--	--	69	330	167	84
SW8270C	N-Nitrosodiphenylamine	86-30-6	µg/kg	992,516	--	--	--	330	167	86
SW8270C	Pentachlorophenol	87-86-5	µg/kg	8,935	--	--	--	330	167	51

Table H-2

Comparison of Reporting Levels to Screening Objectives in Soil, Open Detonation Unit at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Residential SSG (Feb 2012)	Coyote Test Field Super Group Background Values (surface soil)	Coyote Test Field Super Group Background Values (subsurface soil)	EPA Regional Screening Levels, Residential (Nov 2012)	LOQ	LOD	DL
SW8290	2,3,7,8-TCDF*	51207-31-9	pg/g	449	--	--	--	1	0.15	EDL
SW8290	2,3,7,8-TCDD	1746-01-6	pg/g	44.9	--	--	--	1	0.15	EDL
SW8290	1,2,3,7,8-PeCDF*	57117-41-6	pg/g	--	--	--	--	5	0.75	EDL
SW8290	2,3,4,7,8-PeCDF*	57117-31-4	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,7,8-PeCDD*	40321-76-4	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,7,8-HxCDF*	70648-26-9	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,6,7,8-HxCDF*	57117-44-9	pg/g	--	--	--	--	5	0.75	EDL
SW8290	2,3,4,6,7,8-HxCDF*	60851-34-5	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,7,8,9-HxCDF*	72918-21-9	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,7,8-HxCDD*	39227-28-6	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,6,7,8-HxCDD*	57653-85-7	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,7,8,9-HxCDD*	19408-74-3	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,6,7,8-HpCDF*	67562-39-4	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,7,8,9-HpCDF*	55673-89-7	pg/g	--	--	--	--	5	0.75	EDL
SW8290	1,2,3,4,6,7,8-HpCDD*	35822-46-9	pg/g	--	--	--	--	5	0.75	EDL
SW8290	OCDF*	39001-02-0	pg/g	--	--	--	--	10	1.5	EDL
SW8290	OCDD*	3268-87-9	pg/g	--	--	--	--	10	1.5	EDL
SW8330B	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	mg/kg	3,911	--	--	--	0.25	0.05	0.012
SW8330B	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	mg/kg	58.2	--	--	--	0.25	0.05	0.012
SW8330B	1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	mg/kg	--	--	--	2,200,000	0.25	0.05	0.01
SW8330B	1,3-Dinitrobenzene (1,3-DNB)	99-65-0	mg/kg	--	--	--	6,100	0.25	0.05	0.0042
SW8330B	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	mg/kg	244	--	--	--	0.25	0.05	0.01
SW8330B	Nitrobenzene (NB)	98-95-3	mg/kg	53.5	--	--	--	0.25	0.05	0.0176
SW8330B	2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	mg/kg	39.1	--	--	--	0.25	0.05	0.0194
SW8330B	4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	mg/kg	--	--	--	150,000	0.25	0.05	0.01
SW8330B	2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	mg/kg	--	--	--	150,000	0.25	0.05	0.0125
SW8330B	2,4-Dinitrotoluene (2,4-DNT)	121-14-2	mg/kg	7.15	--	--	--	0.25	0.05	0.0053
SW8330B	2-Nitrotoluene (2-NT)	88-72-2	mg/kg	29.1	--	--	--	0.5	0.05	0.013
SW8330B	3-Nitrotoluene (3-NT)	99-08-1	mg/kg	7.8	--	--	--	0.25	0.05	0.0155
SW8330B	4-Nitrotoluene (4-NT)	99-99-0	mg/kg	244	--	--	--	0.25	0.05	0.0182
SW8330B	Nitroglycerin	55-63-0	mg/kg	6.11	--	--	--	0.5	0.25	0.015
SW8330B	PETN	78-11-5	mg/kg	--	--	--	120,000	0.5	0.25	0.025

The laboratory does not analyze for these compounds. The compounds will be tentatively identified based on a computer library search of the sample chromotography. If found, the coumpound concentration will be reported as an estimated value.

The detection limit exceeds most stringent criteria.

Constituents with "%" units are surrogates and are not a part of the target analytes.

* Risk based screening levels will be calculated if analyte is detected and toxicological information is available

DL - Detection limit

LOD - Limit of detection

LOQ - Limit of quantitation

mg/kg - milligrams per kilogram

pg/g - picograms per gram

RPD - relative percent difference

RSD - relative standard deviation for multi-incremental sample collection

SSG - soil screening goal

µg/kg - micrograms per kilogram

Table H-3
Comparison of Reporting Levels to Screening Objectives in Groundwater, Open Detonation Unit at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Water Quality Standard	EPA Maximum Contaminant Levels/Seconday Contaminant Levels[a]	EPA Regional Screening Levels Tap Water (Nov 2012)	DOE Open Burn Suggested Maximum Background (Dec 1998)	LOQ	LOD	DL
SW6010B	Barium	7440-39-3	ug/L	1,000	2,000	--	120	20	5	0.25
SW6010B	Beryllium	7440-41-7	ug/L	--	4	--	4	3	1	0.3
SW6010B	Cadmium	7440-43-9	ug/L	10	5	--	0.47	3	1	0.5
SW6010B	Chromium	7440-47-3	ug/L	50	100	--	43	10	5	1.2
SW6010B	Cobalt	7440-48-4	ug/L	50	--	--	2.5	10	5	3
SW6010B	Copper	7440-50-8	ug/L	1,000	1,300 (1,000)	--	<50	15	5	2.1
SW6010B	Lead	7439-92-1	ug/L	50	15	--	10	10	5	2.5
SW6010B	Nickel	7440-02-0	ug/L	--	--	300	28	10	5	2.4
SW6010B	Selenium	7782-49-2	ug/L	50	50	--	5	40	25	13
SW6010B	Silver	7440-22-4	ug/L	50	100	--	<10	5	2	0.84
SW6010B	Tin	7440-31-5	ug/L	--	--	9300	50	50	15	1.7
SW6010B	Vanadium*	7440-62-2	ug/L	--	--	--	13	20	5	1.9
SW6010B	Zinc	7440-66-6	ug/L	10,000	(5,000)	--	260	20	10	3
SW6020A	Antimony	7440-36-0	ug/L	--	6	--	6	6	4	2
SW6020A	Arsenic	7440-38-2	ug/L	100	10	--	14	3	2	1
SW6020A	Thallium	7440-28-0	ug/L	--	2	--	2	1.5	1	0.5
SW7470A	Mercury	7439-97-6	ug/L	2	2	--	2	0.3	0.1	0.1
SW6850	Perchlorate	14797-73-0	ug/L	4[b]	--	--	--	0.5	0.25	0.082
SW8260B	1,1,1-Trichloroethane	71-55-6	ug/L	60	200	--	--	1	0.4	0.19
SW8260B	1,1,2,2-Tetrachloroethane	79-34-5	ug/L	10	--	--	--	1	0.2	0.09
SW8260B	1,1,2-trichloro-1,1,2-trifluoroethane*	76-13-1	ug/L	--	--	--	--	50	0.4	0.25
SW8260B	1,1,2-Trichloroethane	79-00-5	ug/L	10	5	--	--	1	0.4	0.31
SW8260B	1,1-Dichloroethane	75-34-3	ug/L	25	--	--	--	1	0.2	0.1
SW8260B	1,1-Dichloroethene	75-35-4	ug/L	5	7	--	--	1	0.4	0.14
SW8260B	1,2,3-Trichlorobenzene	87-61-6	ug/L	70	--	--	--	1	0.4	0.14
SW8011	1,2,3-Trichloropropane	96-18-4	ug/L	--	--	0.00065	--	0.2	0.09	0.09
SW8260B	1,2,4-Trichlorobenzene	120-82-1	ug/L	--	70	--	--	1	0.4	0.1
SW8260B	1,2,4-Trimethylbenzene	95-63-6	ug/L	--	--	15	--	1	0.2	0.12
SW8011	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	ug/L	--	0.2	NA	--	0.02	0.005	0.005
SW8011	1,2-Dibromoethane (EDB)	106-93-4	ug/L	0.1	0.05	NA	--	0.02	0.005	0.0022
SW8260B	1,2-Dichlorobenzene	95-50-1	ug/L	--	600	--	--	1	0.4	0.14
SW8260B	1,2-Dichloroethane	107-06-2	ug/L	10	5	--	--	1	0.4	0.22
SW8260B	1,2-Dichloropropane	78-87-5	ug/L	--	5	--	--	1	0.2	0.15
SW8260B	1,3,5-Trimethylbenzene	108-67-8	ug/L	--	--	87	--	1	0.2	0.14
SW8260B	1,3-Dichlorobenzene*	541-73-1	ug/L	--	--	--	--	1	0.4	0.11
SW8260B	1,4-Dichlorobenzene	106-46-7	ug/L	--	75	--	--	1	0.2	0.13
SW8260B	1,4-Dioxane	123-91-1	ug/L	--	--	0.67	--	1	TBD	0.12
SW8260B	2-Butanone (MEK)	78-93-3	ug/L	--	--	4,900	--	2	0.4	0.35
SW8260B	2-Hexanone	591-78-6	ug/L	--	--	34	--	2	0.4	0.17
SW8260B	4-Methyl-2-pentanone (MIBK)	108-10-1	ug/L	--	--	1,000	--	2	0.4	1
SW8260B	Acetone	67-64-1	ug/L	--	--	12,000	--	10	4	2.1
SW8260B	Benzene	71-43-2	ug/L	10	5	--	--	1	0.2	0.13
SW8260B	Bromochloromethane	74-97-5	ug/L	--	--	83	--	1	0.4	0.14
SW8260B	Bromodichloromethane	75-27-4	ug/L	--	100	--	--	1	0.4	0.14
SW8260B	Bromoform	75-25-2	ug/L	--	100	--	--	1	0.4	0.1
SW8260B	Bromomethane	74-83-9	ug/L	--	--	7	--	1	0.4	0.29
SW8260B	Carbon disulfide	75-15-0	ug/L	--	--	720	--	2	0.2	0.16
SW8260B	Carbon tetrachloride	56-23-5	ug/L	10	5	--	--	1	0.4	0.15
SW8260B	Chlorobenzene	108-90-7	ug/L	--	100	--	--	1	0.2	0.12
SW8260B	Chloroethane	75-00-3	ug/L	--	--	21,000	--	1	0.4	0.34
SW8260B	Chloroform	67-66-3	ug/L	100	100	--	--	1	0.2	0.12
SW8260B	Chloromethane	74-87-3	ug/L	--	--	190	--	1	0.4	0.25
SW8260B	cis-1,2-Dichloroethene	156-59-2	ug/L	--	70	--	--	1	0.4	0.1
SW8260B	cis-1,3-Dichloropropene*	10061-01-5	ug/L	--	--	--	--	1	0.4	0.22
SW8260B	Cyclohexane*	1735-17-7	ug/L	--	--	--	--	(a)	(a)	(a)
SW8260B	Dibromochloromethane	124-48-1	ug/L	--	100	--	--	1	0.4	0.13
SW8260B	Dichlorodifluoromethane (Freon 12)	75-71-8	ug/L	--	--	190	--	1	0.4	0.16
SW8260B	Ethylbenzene	100-41-4	ug/L	750	700	--	--	1	0.2	0.1
SW8260B	Isopropylbenzene	98-82-8	ug/L	--	--	390	--	1	0.2	0.12
SW8260B	Methyl tert-butyl ether (MTBE)	1634-04-4	ug/L	--	(5)	--	--	2	0.4	0.19
SW8260B	Methylene chloride	75-09-2	ug/L	100	5	--	--	1	0.4	0.35
SW8260B	Methyl Acetate*	79-20-9	ug/L	--	--	--	--	(a)	(a)	(a)
SW8260B	Methly Cyclohexane*	108-87-2	ug/L	--	--	--	--	(a)	(a)	(a)
SW8260B	m-Xylene & p-Xylene	136777-61-2	ug/L	--	10,000	--	--	1	0.8	0.18
SW8260B	Naphthalene	91-20-3	ug/L	30	--	NA	--	1	0.2	0.15
SW8260B	o-Xylene	95-47-6	ug/L	--	10,000	--	--	1	0.4	0.1
SW8260B	Styrene	100-42-5	ug/L	--	100	--	--	1	0.2	0.15
SW8260B	Tetrachloroethene	127-18-4	ug/L	--	5	--	--	1	0.2	0.1
SW8260B	Toluene	108-88-3	ug/L	750	1,000	--	--	1	0.4	0.25
SW8260B	trans-1,2-Dichloroethene	156-60-5	ug/L	--	100	--	--	1	0.4	0.11
SW8260B	trans-1,3-Dichloropropene*	10061-02-6	ug/L	--	--	--	--	1	0.2	0.08
SW8260B	Trichloroethene	79-01-6	ug/L	100	5	--	--	1	0.4	0.13
SW8260B	Trichlorofluoromethane (Freon 11)	75-69-4	ug/L	--	--	1,100	--	1	0.4	0.23
SW8260B	Vinyl chloride	75-01-4	ug/L	1	2	--	--	1	0.4	0.22

Table H-3

Comparison of Reporting Levels to Screening Objectives in Groundwater, Open Detonation Unit at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Water Quality Standard	EPA Maximum Contaminant Levels/Seconday Contaminant Levels[a]	EPA Regional Screening Levels Tap Water (Nov 2012)	DOE Open Burn Suggested Maximum Background (Dec 1998)	LOQ	LOD	DL
SW8270C	1,1-biphenyl	92-52-4	ug/L	--	--	0.83	--	10	NA	5
SW8270C	1,2,4,5-tetrachlrorbenzene	95-94-3	ug/L	--	--	1.2	--	10	2.1	0.54
SW8270C	2,4,5-Trichlorophenol	95-95-4	ug/L	--	--	890	--	10	3.0	2
SW8270C	2,4,6-Trichlorophenol	88-06-2	ug/L	--	--	3.5	--	10	3.0	2
SW8270C	2,4-Dichlorophenol	120-83-2	ug/L	--	--	35	--	10	3.0	2.6
SW8270C	2,4-Dimethylphenol	105-67-9	ug/L	--	--	270	--	10	3.0	2.2
SW8270C	2,4-Dinitrotoluene	121-14-2	ug/L	--	--	0.2	--	10	3.0	2
SW8270C	2,6-Dichlorophenol*	87-65-0	ug/L	--	--	--	--	15	3.0	5
SW8270C	2,6-Dinitrotoluene	606-20-2	ug/L	--	--	15	--	10	3.0	2
SW8270C	2-Chloronaphthalene	91-58-7	ug/L	--	--	550	--	10	3.0	1.3
SW8270C	2-Chlorophenol	95-57-8	ug/L	--	--	71	--	10	3.0	1.6
SW8270C	2-Methylphenol	95-48-7	ug/L	--	--	720	--	10	3.0	0.93
SW8270C	2-Nitroaniline	88-74-4	ug/L	--	--	150	--	50	3.0	2
SW8270C	2-Nitrophenol*	88-75-5	ug/L	--	--	--	--	10	3.0	1.9
SW8270C	2,2-oxybis(1-chloropropane)*	52438-91-2	ug/L	--	--	--	--	10	3	1.3
SW8270C	3,3'-Dichlorobenzidine	91-94-1	ug/L	--	--	0.11	--	50	3.0	0.96
SW8270C	3-Methylphenol & 4-Methylphenol	65794-96-9	ug/L	--	--	720	--	30	20	10
SW8270C	3-Nitroaniline*	99-09-2	ug/L	--	--	--	--	50	3.0	1.4
SW8270C	4,6-Dinitro-2-methylphenol	534-52-1	ug/L	--	--	1.2	--	60	20	2.2
SW8270C	4-Bromophenyl phenyl ether*	101-55-3	ug/L	--	--	--	--	10	3.0	1.1
SW8270C	4-Chloro-3-methylphenol	59-50-7	ug/L	--	--	1,100	--	10	3.0	2
SW8270C	4-Chloroaniline	106-47-8	ug/L	--	--	0.32	--	10	3.0	2
SW8270C	4-Chlorophenyl phenyl ether*	7005-72-3	ug/L	--	--	--	--	10	3.0	1.1
SW8270C	4-Nitroaniline	100-01-6	ug/L	--	--	3.3	--	50	3.0	1.5
SW8270C	4-Nitrophenol*	100-02-7	ug/L	--	--	--	--	60	20	6.1
SW8270C	Acetophenone	17537-31-4	ug/L	--	--	1,500	--	10	3	0.78
SW8270C	Azobenzene (as 1,2 Diphenylhydrazine)	103-33-3	ug/L	--	--	0.067	--	10	3.0	0.71
SW8270C	Atrazine	93616-39-8	ug/L	--	--	0.26	--	(a)	(a)	(a)
SW8270C	Benzaldehyde	100-52-7	ug/L	--	--	1,500	--	(a)	(a)	(a)
SW8270C	bis(2-Chloroethoxy)methane	111-91-1	ug/L	--	--	46	--	10	3.0	1
SW8270C	bis(2-Chloroethyl) ether	111-44-4	ug/L	--	--	0.012	--	10	3.0	1.5
SW8270C	bis(2-Ethylhexyl) phthalate	117-81-7	ug/L	--	6	--	--	10	3.0	1
SW8270C	Butyl benzyl phthalate	85-68-7	ug/L	--	--	14	--	10	3.0	1.4
SW8270C	Caprolactam	105-60-2	ug/L	--	--	7,700	--	(a)	(a)	(a)
SW8270C	Carbazole*	86-74-8	ug/L	--	--	--	--	10	3.0	1.2
SW8270C	Dibenzofuran	132-64-9	ug/L	--	--	5.8	--	10	3.0	1.1
SW8270C	Diethyl phthalate	84-66-2	ug/L	--	--	11,000	--	10	3.0	0.93
SW8270C	Dimethyl phthalate*	131-11-3	ug/L	--	--	--	--	10	3.0	0.88
SW8270C	Di-n-butyl phthalate	84-74-2	ug/L	--	--	670	--	10	3.0	1.1
SW8270C	Di-n-octyl phthalate*	117-84-0	ug/L	--	--	--	--	10	3.0	1.5
SW8270C	Hexachlorobenzene	118-74-1	ug/L	--	1	--	--	10	3.0	1.4
SW8270C	Hexachlorobutadiene	87-68-3	ug/L	--	--	0.26	--	10	3.0	1.3
SW8270C	Hexachloroethane	67-72-1	ug/L	--	--	0.79	--	10	3.0	1.4
SW8270C	Hexachlorocyclopentadiene	77-47-4	ug/L		--	22	--	10	3	0.214
SW8270C	Isophorone	78-59-1	ug/L	--	--	67	--	10	3.0	1
SW8270C	Nitrobenzene	98-95-3	ug/L	--	--	0.12	--	10	3.0	1.6
SW8270C	N-Nitrosodimethylamine	62-75-9	ug/L	--	--	0.0004	--	15	3.0	0.96
SW8270C	N-Nitrosodi-n-propylamine	621-64-7	ug/L	--	--	0.0093	--	10	3.0	1.4
SW8270C	2,4,6-Tribromophenol		%	--	--	--	--	--	--	--
SW8270C	2-Flourophenol		%	--	--	--	--	--	--	--
SW8270C	Nitrobenzene-d5		%	--	--	--	--	--	--	--
SW8270C-SIM	1-methylnaphthalene	90-12-0	ug/L	--	--	0.97	--	0.1	0.01	0.006
SW8270C-SIM	2-methylnaphthalene	91-57-6	ug/L	--	--	27	--	0.1	0.01	0.006
SW8270C-SIM	Acenaphthene	83-32-9	ug/L	--	--	400	--	0.1	0.01	0.003
SW8270C-SIM	Acenaphthylene	208-96-8	ug/L	--	--	--	--	0.1	0.01	0.003
SW8270C-SIM	Anthracene	120-12-7	ug/L	--	--	1300	--	0.1	0.01	0.004
SW8270C-SIM	Benzo (a) anthracene	56-55-3	ug/L	--	--	0.029	--	0.1	0.01	0.005
SW8270C-SIM	Benzo (a) pyrene	50-32-8	ug/L	0.7	0.2	--	--	0.1	0.01	0.004
SW8270C-SIM	Benzo (b) fluoranthene	205-99-2	ug/L	--	--	0.029	--	0.1	0.02	0.012
SW8270C-SIM	Benzo (g,h,i) perylene	191-24-2	ug/L	--	--	--	--	0.1	0.01	0.006
SW8270C-SIM	Benzo (k) fluoranthene	207-08-9	ug/L	--	--	0.29	--	0.1	0.01	0.008
SW8270C-SIM	Chrysene	218-01-9	ug/L	--	--	2.9	--	0.1	0.01	0.004
SW8270C-SIM	Dibenzo (a,h) anthracene	53-70-3	ug/L	--	--	0.0029	--	0.1	0.02	0.014
SW8270C-SIM	Fluoranthene	206-44-0	ug/L	--	--	630	--	0.1	0.01	0.004
SW8270C-SIM	Fluorene	86-73-7	ug/L	--	--	220	--	0.1	0.01	0.004
SW8270C-SIM	Indeno (1,2,3-c,d) pyrene	193-39-5	ug/L	--	--	0.029	--	0.1	0.02	0.014
SW8270C-SIM	Phenanthrene	85-01-8	ug/L	--	--	--	--	0.1	0.01	0.006
SW8270C-SIM	Pyrene	129-00-0	ug/L	--	--	87	--	0.1	0.01	0.004

Table H-3

Comparison of Reporting Levels to Screening Objectives in Groundwater, Open Detonation Units at Kirtland Air Force Base, New Mexico

Method	Analyte	CAS #	Units	New Mexico Water Quality Standard	EPA Maximum Contaminant Levels/Seconday Contaminant Levels[a]	EPA Regional Screening Levels Tap Water (Nov 2012)	DOE Open Burn Suggested Maximum Background (Dec 1998)	LOQ	LOD	DL
SW8290	2,3,7,8-TCDF*	51207-31-9	pg/L	--	--	--	--	10	2.5	EDL
SW8290	2,3,7,8-TCDD*	1746-01-6	pg/L	--	--	--	--	10	2.5	EDL
SW8290	1,2,3,7,8-PeCDF*	57117-41-6	pg/L	--	--	--	--	50	6.5	EDL
SW8290	2,3,4,7,8-PeCDF*	57117-31-4	pg/L	--	--	--	--	50	6.5	EDL
SW8290	1,2,3,7,8-PeCDD*	40321-76-4	pg/L	--	--	--	--	50	6.5	EDL
SW8290	1,2,3,4,7,8-HxCDF*	70648-26-9	pg/L	--	--	--	--	50	6.5	EDL
SW8290	1,2,3,6,7,8-HxCDF*	57117-44-9	pg/L	--	--	--	--	50	12.5	EDL
SW8290	2,3,4,6,7,8-HxCDF*	60851-34-5	pg/L	--	--	--	--	50	6.5	EDL
SW8290	1,2,3,7,8,9-HxCDF*	72918-21-9	pg/L	--	--	--	--	50	6.5	EDL
SW8290	1,2,3,4,7,8-HxCDD*	39227-28-6	pg/L	--	--	--	--	50	12.5	EDL
SW8290	1,2,3,6,7,8-HxCDD*	57653-85-7	pg/L	--	--	--	--	50	12.5	EDL
SW8290	1,2,3,7,8,9-HxCDD*	19408-74-3	pg/L	--	--	--	--	50	12.5	EDL
SW8290	1,2,3,4,6,7,8-HpCDF*	67562-39-4	pg/L	--	--	--	--	50	6.5	EDL
SW8290	1,2,3,4,7,8,9-HpCDF*	55673-89-7	pg/L	--	--	--	--	50	12.5	EDL
SW8290	1,2,3,4,6,7,8-HpCDD*	35822-46-9	pg/L	--	--	--	--	50	12.5	EDL
SW8290	OCDF*	39001-02-0	pg/L	--	--	--	--	100	25	EDL
SW8290	OCDD*	3268-87-9	pg/L	--	--	--	--	100	50	EDL
SW8330B	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	ug/L	--	--	780	--	0.15	0.05	0.036
SW8330B	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	ug/L	--	--	0.61	--	0.25	0.05	0.036
SW8330B	1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	ug/L	--	--	460	--	0.1	0.05	0.03
SW8330B	1,3-Dinitrobenzene (1,3-DNB)	99-65-0	ug/L	--	--	1.5	--	0.15	0.1	0.05
SW8330B	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	ug/L	--	--	61	--	0.15	0.1	0.05
SW8330B	Nitrobenzene (NB)	98-95-3	ug/L	--	--	0.12	--	0.15	0.1	0.05
SW8330B	2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	ug/L	--	--	2.2	--	0.15	0.1	0.05
SW8330B	4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	ug/L	--	--	30	--	0.15	0.1	0.05
SW8330B	2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	ug/L	--	--	30	--	0.3	0.1	0.1
SW8330B	2,6-Dinitrotoluene (2,6-DNT)	606-20-2	ug/L	--	--	15	--	0.15	0.1	0.05
SW8330B	2-Nitrotoluene (2-NT)	88-72-2	ug/L	--	--	0.27	--	1	0.1	0.088
SW8330B	3-Nitrotoluene (3-NT)	99-08-1	ug/L	--	--	1.3	--	0.5	0.1	0.057
SW8330B	4-Nitrotoluene (4-NT)	99-99-0	ug/L	--	--	3.7	--	1	0.1	0.088
SW8330B	Nitroglycerin	55-63-0	ug/L	--	--	1.5	--	1	0.5	0.33
SW8330B	PETN	78-11-5	ug/L	--	--	16	--	1	0.5	0.3
SW8330B	3,4-Dinitrotoluene (Surrogate)	610-39-9	%	--	--	--	--	--	--	--
SW7825	White phosphorous	7723-14-0	ug/L	--	--	0.31	--	0.05	0.025	0.015

The laboratory does not analyze for these compounds. The compounds will be tentatively identified based on a computer library search of the sample chromotography. If found, the coumpound concentration will be reported as an estimated value.

The detection limit exceeds most stringent criteria.

[a] Secondary Contaminant Levels are in parentheses

[b] KAFB RCRA permit screening criteria for perchlorate

* Risk based screening levels will be calculated if analyte is detected and toxicological information is available

DL - Detection limit

LOD - Limit of detection

LOQ - Limit of quantitation

mg/L - milligrams per liter

pg/L - picograms per liter

RPD - relative percent difference

µg/L - micrograms per liter

NA - not applicable

Table H-4
Sample Containers, Preservation Techniques, and Holding Times for Soil and Groundwater Samples

Matrix	Analytical Group	Analytical and Preparation Method/SOP Reference	Sample Volume	Containers	Preservation Requirements	Maximum Holding Time
Soil	Metals (including mercury)	SW6010B/ SW6020 and SW7471A	1 gram	250-ml glass or polyethylene	4±2 degrees Celsius (ºC)	180 days from date of collection for metals; 28 days from collection to analysis for mercury
Soil	Volatile Organic Compounds (VOCs)	SW8260B/ SW5035	3 different 5-gram aliquots	6 40-milliliters (ml) volatile organic analysis (VOA) vials	Per sample collection: 2 VOA vials with 10-ml water and 1 VOA vial with 10-ml methanol. All vials contain a stir bar. Or 3 VOA vials containing stir bars will have a 5-gram sample aliquot added, seals and frozen on site with dry ice. Samples must remain frozen in shipment and storage at the lab until analysis.	Freeze within 48 hours of arrival at the lab, analyze within 14 days from data of collection Analyze within 14 days from data of collection
Soil	Semivolatile Organic Compounds (SVOCs)	SW8270C	30 grams	250-ml glass	4±2ºC	14 days from date of collection to extraction and 40 days from extraction to analysis
Soil	Perchlorate	SW6850	30 grams	250-ml glass	4±2ºC	28days
Soil	Explosives	SW8330B	10 grams	250-ml glass	4±2ºC	14 days from date of collection to extraction and 40 days from extraction to analysis
Soil	White Phosphorous	SW7580	40 grams	250-ml glass	4±2ºC	30 days from date of collection to extraction and analysis
Soil	Dioxins/ Furans	SW8290	30 grams	250-ml glass	4±2ºC	30 days from date of collection to extraction and 45 days from extraction to analysis
Groundwater	Dissolved metals (including mercury)	SW6010B/ 6020 and SW7470A	100-ml	1-liter polyethylene	pH < 2 with nitric acid; 4±2ºC	28 days from date of collection for Hg, 180 days for others
Groundwater	VOCs	SW8260B	3 40-ml vials	3 40-ml VOA vials	No headspace; 4±2ºC	7 days from data of collection
Groundwater	SVOCs	SW8270C	1 liter	2 1-liter amber glass	4±2ºC	7 days from date of collection to extraction and 40 days from extraction to analysis
Groundwater	Explosives	SW8330B	1 liter	2 1-liter amber glass	4±2ºC	7 days from date of collection to extraction and 40 days from extraction to analysis
Groundwater	Perchlorate	SW6850	1 liter	1- 250mL precleaned sterile, plastic containers	Field filtered with 1/3 volume headspace to remove and/or minimize microbial and anaerobic bacteria. Store at 4 ± 2 C	28 days
Groundwater	White Phosphorous	SW7580	120 ml	1-liter amber glass	4±2ºC	5 days from date of collection to extraction and analysis
Groundwater	Dioxins/ Furans	SW8290	1 liter	2 1-liter amber glass	4±2ºC	30 days from date of collection to extraction and 45 days from extraction to analysis

Table H-5
Summary of Field Quality Control Samples

Quality Control Sample Type	Sample Matrix	Applicable Analysis	Frequency	Purpose
Trip blank	Soil/Water	VOCs[a]	One per day, per cooler containing VOC samples	Document any contamination attributable to shipping and field handling procedures
Field Duplicate	Soil/Water	VOCs, SVOCs[b], metals, HE[c], Dioxins/Furans, White Phosphorus, Perchlorate	Minimum of one per 10environmental samples per media type	Document precision of the sampling/analysis process
Equipment blank	Soil/Water	VOCs, SVOCs[b], metals, HE[c], Dioxins/Furans, White Phosphorus, Perchlorate	One sample per day per media type for non-dedicated sampling equipment	Document whether decontamination of sampling equipment was adequate

[a.] VOCs = volatile organic compounds.
[b.] SVOCs = semivolatile organic compounds.
[c.] HE = High Explosives

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3. MANAGEMENT OF WASTE FROM CLOSURE ACTIVITIES

Wastes that are expected to be generated during the final closure activities at the OD Unit include: excess soil from sampling; well purge water, drill cuttings, decontamination water; PPE; and excavated soils. To minimize the amount of waste to be generated during closure activities, excess soil cuttings from borings will be replaced in the auger holes. The volume of liquid waste generated during the cleaning of equipment is to be minimized by using only the smallest amount of wash rinse water necessary to achieve successful decontamination. Solvents will not be used.

3.1 Waste Management

Wastes associated with closure activities at the OD Unit will be managed as follows:

- Wastes will be stored in appropriate containers that are compatible with the wastes and are in good condition.
- If analytical results indicate that the waste is hazardous or the Kirtland AFB project manager determines that the waste will be classified as hazardous, Kirtland AFB will manage the waste in accordance with all applicable regulations in 40 CFR §261-268.
- Waste containers shall remain within the OD Unit boundary under the control of the personnel generating the waste until it is transported for treatment and disposal.
- Waste containers will be segregated according to the compatibility and chemical waste type.
- Waste will be stored in containers that remain closed, except when adding or removing wastes.
- Waste containers bearing free liquid will be provided with secondary containment of sufficient volume to prevent spilled liquids from being released onto the ground.
- Waste containers will be managed in such a manner as to prevent ruptures and leaks.
- Waste containers will be labeled appropriately, pending receipt of analytical results. Labels will be filled out appropriately and marked using permanent marker or pen. Label information will include waste source, suspected contaminants, contents, depth (if appropriate), the date which accumulation began, and a contact name.

3.2 Waste Characterization

Characterization of the liquid waste and excavated soil generated during the closure of the OD Unit will be based upon the results of sampling and analysis. Decontamination water will be analyzed for the constituents listed in Tables H-3. PPE will be managed as non- hazardous waste and will be managed appropriately.

3.3 Waste Disposal

All wastes from closure activities determined to be hazardous will be managed in accordance with the Hazardous Waste Management Regulations from the time of generation. Hazardous wastes will be shipped off-site for treatment and disposal at a permitted RCRA facility. Wastes characterized as nonhazardous will be evaluated to determine the appropriate disposal method in accordance with applicable law.

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4. REFERENCES

EPA, 2012, "Regional Screening Level Summary Table," U.S. Environmental Protection Agency, Washington, D.C. November.

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IT Corporation, 1996, "Background Concentrations of Constituents of Concern to the Sandia National Laboratories/New Mexico Environmental Restoration Project and the Kirtland Air Force Base Installation Restoration Program," prepared for Sandia National Laboratories/New Mexico Environmental Restoration Department 7585, Albuquerque, NM.

NMED, 2012, "Risk Assessment Guidance for Site Investigations and Remediation," New Mexico Environment Department, Santa Fe, New Mexico. June.

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Appendix 1
Monitoring Well Installation Work Plan

ENVIRONMENTAL RESTORATION PROGRAM
KIRTLAND AIR FORCE BASE, NEW MEXICO

Monitoring Well Installation Work Plan for the Open Detonation Unit at Kirtland Air Force Base, Bernalillo County, New Mexico

February 2013

Prepared for

U.S. Army Corps of Engineers
4101 Jefferson Plaza, NE 87109
Albuquerque, New Mexico

Contract No. W912DR-09-D-0004
Contract Line Item No. 2012AA

Prepared by

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NOTICE

CH2M HILL prepared this work plan addendum for the U.S. Air Force to aid in the implementation of final closure actions under the Environmental Restoration Program (ERP). As the plan relates to actual or possible releases of potentially hazardous substances, its release prior to a U.S. Air Force final decision on remedial action may be in the public's interest. The limited objectives of this work plan and the ongoing nature of the ERP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this work plan, because subsequent facts may become known that may make this work plan premature or inaccurate.

A copy of this document is available for public review at the Central New Mexico Community College, Montoya Campus Library Reference Section, at 4700 Morris NE, Albuquerque, New Mexico.

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13. SUPPLEMENTARY NOTES		
14. ABSTRACT This work plan specifies the activities that will be performed to investigate potential groundwater contamination associated with the operations of the Open Burn and Open Detonation Units at Kirtland Air Force Base, New Mexico. Descriptions of planned groundwater well installation, sampling procedures, and sample analysis are presented in this work plan.		
15. SUBJECT TERMS Open Burn, Open Detonation, Explosive Ordnance Disposal, OT-29 , explosives, metals, perchlorate, groundwater		

16. SECURITY CLASSIFICATION OF: Unclassified			**17. LIMITATION OF ABSTRACT** UU	**18. NO. OF PAGES** **43**	**19a. NAME OF RESPONSIBLE PERSON**
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New Mexico Office of the State Engineer, Application for Permit to Drill a Well with no Consumptive Use of Water

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
APP	Accident Prevention Plan
ARCH	air-rotary casing hammer
ASTM	American Society for Testing and Materials
bgs	below ground surface
C&D	construction and demolition
EOD	Explosive Ordnance Disposal
ERP	Environmental Restoration Program
FSP	Field Sampling Plan
ft	foot (feet)
HWB	Hazardous Waste Bureau
ID	inside diameter
IDW	investigation-derived waste
KAFB	Kirtland Air Force Base
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
NTU	nephelometric turbidity unit
OB	Open Burn
OD	Open Detonation
PID	photo ionization detector
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RCRA	*Resource Conservation and Recovery Act*
redox	oxidation-reduction
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TCLP	toxicity characteristic leachate procedure

ACRONYMS AND ABBREVIATIONS (Concluded)

USACE	United States Army Corps of Engineers
USAF	United States Air Force
UXO	Unexploded Ordnance
VOC	volatile organic compound

EXECUTIVE SUMMARY

This work plan describes the proposed monitoring well installation activities near the Open Detonation (OD) unit on Kirtland Air Force Base (AFB), New Mexico. The primary project objective is the installation and sampling of four groundwater monitoring wells, one upgradient and three downgradient of the site, to evaluate potential groundwater impacts from the operation of the OD unit. Field activities will be performed in accordance with the *Kirtland Air Force Base, Base-Wide Plans for the Environmental Compliance Program* and the *Hazardous Waste Treatment Facility Operating Permit EPA ID No. NM9570024423*, and the site-specific Accident Prevention Plan (APP) and site Safety and Health Plan (SSHP) prepared for this project.

Installation of the monitoring wells will facilitate groundwater sampling from the uppermost groundwater unit, both upgradient and downgradient of potential source areas at the OD unit. Based on data from nearby wells, groundwater at the proposed locations is expected to occur under confined conditions within the Paleozoic sedimentary rocks of the Madera Group or Sandia Formation or the underlying Precambrian granite. The depth to the uppermost water bearing zones at the proposed well locations is expected to range from approximately 100 to 200 feet (ft) below ground surface (bgs). The monitoring wells will be installed using the air rotary casing hammer (ARCH) drilling method to facilitate lithologic description of the drill cuttings and allow for the identification of groundwater zones.

The monitoring wells will be completed using 4-inch-inside diameter (ID), Schedule 80 polyvinyl chloride (PVC) casing with a 5-ft well sump, 20-ft of slotted well screen, and approximately 2 to 3 ft of stickup at the surface. The depth of the well screen intervals will be based on the lithologic information and depth to groundwater.

Well drilling and installation activities will be documented in a Well Completion Report. Up to eight consecutive quarters of groundwater monitoring are currently planned for the four monitoring wells. Annual Periodic Groundwater Monitoring Reports will be prepared following each four quarters of groundwater monitoring. Currently, two Periodic Groundwater Monitoring Reports are planned.

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1 INTRODUCTION

This work plan describes the proposed monitoring well installation and sampling activities near the Open Detonation (OD) unit on Kirtland Air Force Base (AFB), New Mexico. The primary project objective is the installation and sampling of four groundwater monitoring wells, one upgradient and three downgradient of the site, to evaluate the potential groundwater impacts from the operation of the OD unit. The general site location is shown in Figure 1.

The new monitoring wells will be installed in the vicinity of the OD Unit. The proposed monitoring well locations are shown on Figure 2. Installation of the monitoring wells will facilitate groundwater sampling from the uppermost groundwater both up and downgradient of potential source areas associated with the OD unit. Based on data from nearby wells, groundwater at the proposed locations is expected to occur under confined conditions within the Paleozoic sedimentary rocks of the Madera Group or Sandia Formation or the underlying Precambrian granite. The depth to the uppermost water bearing zones at the proposed well locations is expected to range from approximately 100 to 200 feet (ft) below ground surface (bgs). Final well design will be dependent on field conditions and the placement of the fourth well will be performed in consultation the New Mexico Environment Department-Hazardous Waste Bureau (NMED-HWB).

This work plan was prepared as part of the U.S. Air Force (USAF) Environmental Restoration Program (ERP) under contract number W912DR-09-D-004, Delivery Order DM04, in accordance with the U.S. Army Corps of Engineers (USACE) Performance Work Statement dated 29 July 2011. This work plan has been revised to address NMED comments on the October 2010 Closure Plan for the Open Detonation Unit (USAF, 2010).

1.1 Site Description

The Open Burn (OB) and OD units are located within the EOD Range at Kirtland AFB. The EOD Range is located in the southeast portion of Kirtland AFB, east of Lovelace Road and south of the former Manzano Base. Figure 1 shows the location of the EOD Range at Kirtland AFB and the collocated OD and OB units within the EOD Range.

The OD unit consists of a cleared circular area approximately 1,500 ft in diameter and surrounded by an approximately 2–ft-high earthen berm. Detonations were conducted in pits approximately 30 ft long, 15 ft wide, and 12 ft deep within this area. The OD unit was permitted on 20 December 1994 as Permit Number NM9570024423-OD, which allowed 100,000 pounds of net explosive weight to be treated at the OD unit annually. Rocket motors, large caliber munitions, explosive wastes, and firearms were treated at the OD unit. Operations at the OD unit ceased in August 2010.

The OB unit is collocated with the OD unit and consists of a steel container on a reinforced concrete slab foundation, surrounded by concrete walls on three sides. The 8-inch-thick concrete slab is 30.5 ft long by 10.5 ft wide, and the 1-ft-thick concrete walls are 21.5 ft long, 10.5 ft wide, and 9 ft high. The northern portion of the reinforced concrete pad is level, and a 2-ft-wide by approximately 6-inch-high containment hump is location at the southern extent of the level portion of the pad to prevent run-on to or runoff from the concrete pad. The remaining portion of the concrete slab is sloped gently to the south, which allowed vehicular access to unload wastes for treatment at the OB unit. On the northwest side of the OB unit is a soil berm, measuring approximately 15 ft high and 40 ft long, which protected the unit from shock waves resulting from detonations at the collocated OD unit.

The steel container has a capacity of approximately 12 cubic yards. It is approximately 11 ft long with an inner height of 4.3 ft and an overall height of 5.25 ft. A heavy steel door is located at one end of the container to facilitate placement of wastes and removal of treatment residues. The OB unit has retractable, galvanized steel cover which covered the unit during nonoperational periods. The cover is slightly inclined to prevent precipitation from entering the unit. The last treatment event conducted at the OB unit was in May 2008.

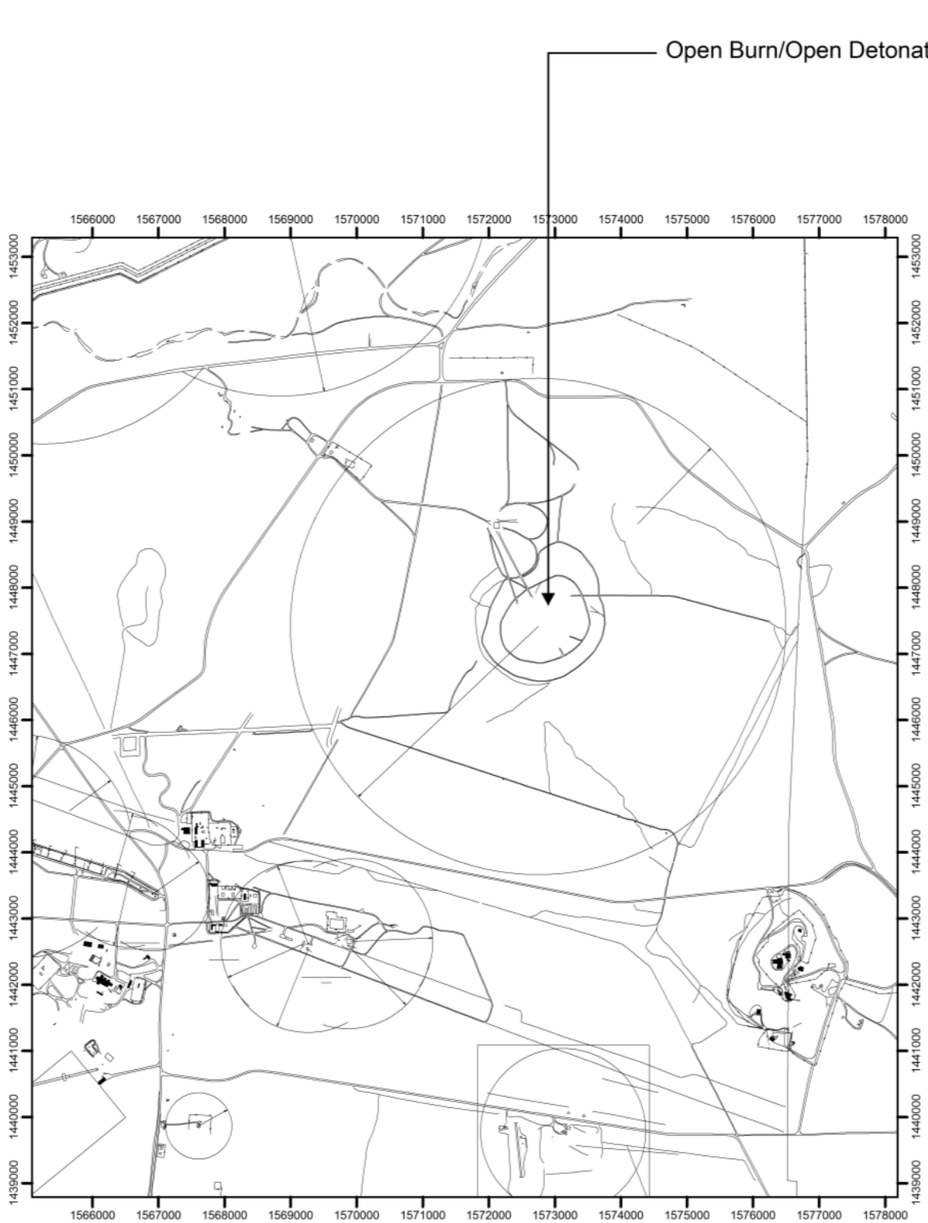
1.2 Hydrogeologic Setting

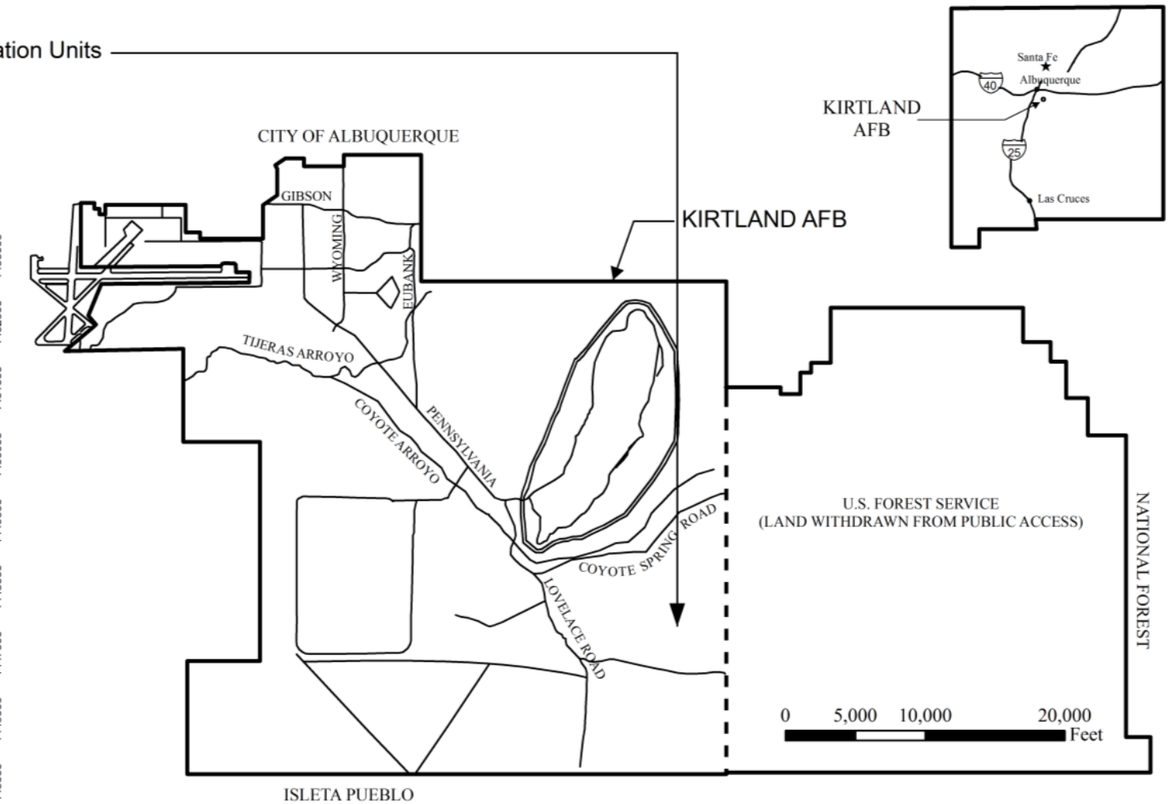
The EOD Range is located within the Tijeras fault complex hydrogeologic region at Kirtland AFB (Sandia National Laboratories/New Mexico [SNL/NM], 2011a). The Sandia, Hubbel Springs, and Tijeras faults converge in this area and define eastern edge of the Albuquerque Basin. Within the Tijeras fault complex, a thin layer of alluvium covers bedrock. The hydrogeology in this area is poorly understood due to the complex geology created by the fault systems. On the eastern side of the Tijeras fault complex, the depth to groundwater ranges from about 45 to 325 ft bgs. Most of the monitoring wells in this area are completed in fractured bedrock at relatively shallow depths and produce modest yields of groundwater (SNL/NM, 2011a).

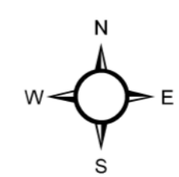
The nearest existing wells to the proposed monitoring well locations include the School House Well approximately 3,500 ft north-northwest of the OD unit; the EOD Hill Well approximately 4,300 ft west-northwest of the OD unit; three wells at Lake Christian (Kirtland AFB Solid Waste Management Unit [SWMU] 6-22), roughly 5,500 ft southeast of the OD unit; and three monitoring wells installed at the Old Burn Site (SNL SWMU 68), approximately 7,000 ft south of the OD unit. Nearby former monitoring well locations include two wells at the Radium Dump/Slag Piles (Kirtland AFB SWMU RW-68); approximately 4,500 ft south-southeast of the OD unit; and one well at Lake Christian (Kirtland AFB SWMU 6-22), roughly 5,500 ft southeast of the OD unit. The existing and former well locations are shown in Figure 3.

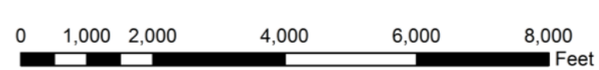
All of the nearby wells are completed in water bearing zones of the Paleozoic sedimentary rocks of the Madera Group or Sandia Formation or the underlying Precambrian granite. The available borehole logs and well completion diagrams from the surrounding wells and former well locations indicate that the uppermost groundwater occurs under confined conditions.

The groundwater flow direction in the vicinity of the EOD Range is not well defined and is assumed to mirror the topographic gradient of the land surface. There are several north-south trending faults mapped along the Sandia/Manzanita/Manzano Mountain range front. In the vicinity of the OD unit, one normal fault crosses along the eastern edge of the EOD range, identified as the Coyote Fault in Figure 3. This fault was encountered during drilling boreholes at the Old Burn Site (SNL SWMU 68), located south of the OD unit (SNL/NM, 2011b). This fault location is important to the OD unit investigation because it likely influences the groundwater flow across the site from east to west and may act as a hydraulic barrier. Comparison of water levels in the upgradient well and the downgradient wells will provide data on the possible influence the fault has on local groundwater flow. The majority of the EOD Range is located west of the inferred location of the fault. The triangular configuration of the proposed downgradient monitoring wells and the measured groundwater elevations in the wells will be used to calculate the groundwater flow direction and hydraulic gradient in the uppermost groundwater aquifer across the majority of the site.









LEGEND

1541850 NM Central State Plane Feet, NAD 83

Revision Date: 12/7/2011	File: OBODRangeLocation.mxd

Figure 1. Site Location for the Open Burn and Open Detonation Units

Monitoring Well Installation Work Plan for the Open Burn and Open Detonation Units

Kirtland Air Force Base, New Mexico

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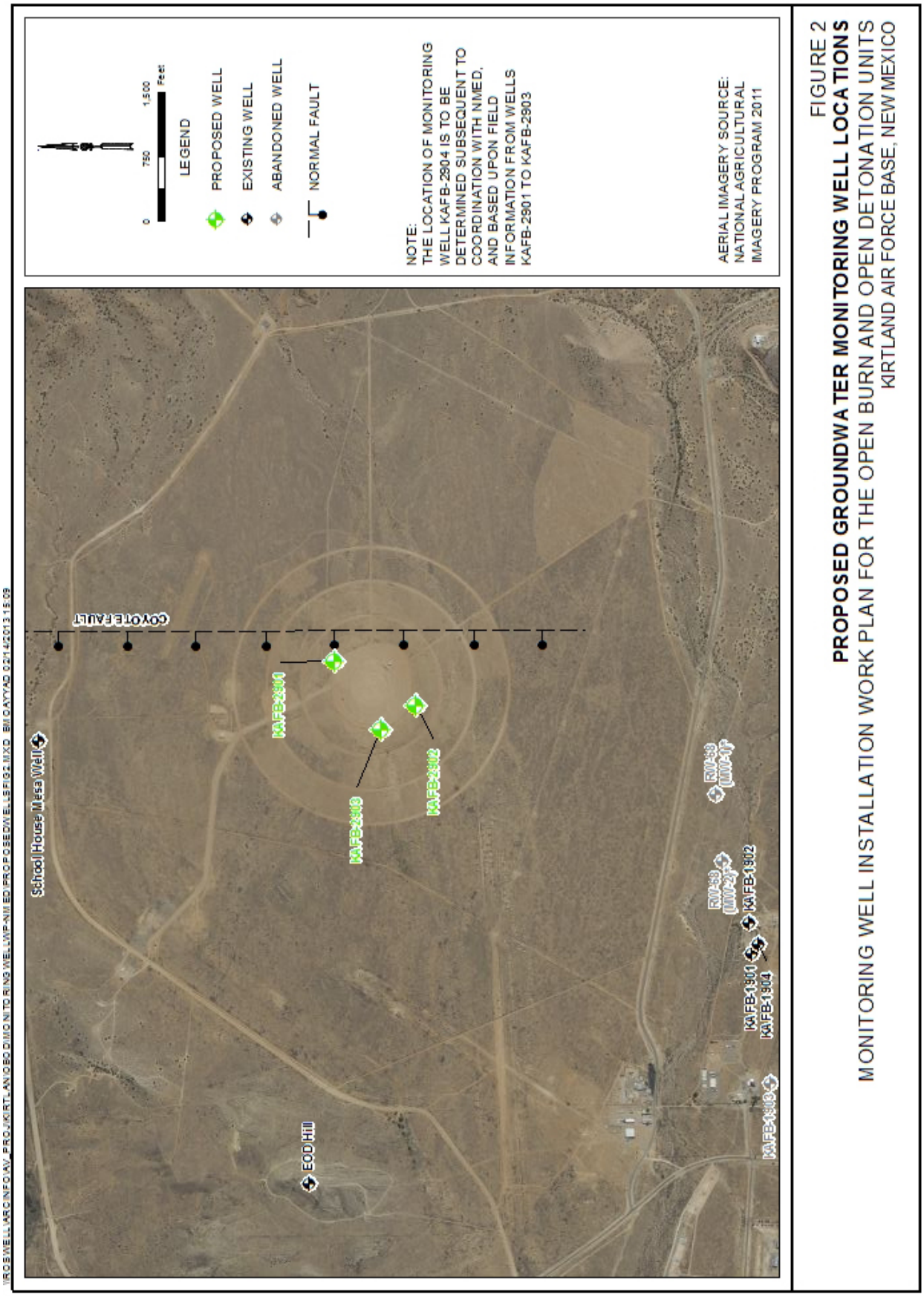

FIGURE 2
PROPOSED GROUNDWATER MONITORING WELL LOCATIONS
MONITORING WELL INSTALLATION WORK PLAN FOR THE OPEN BURN AND OPEN DETONATION UNITS
KIRTLAND AIR FORCE BASE, NEW MEXICO

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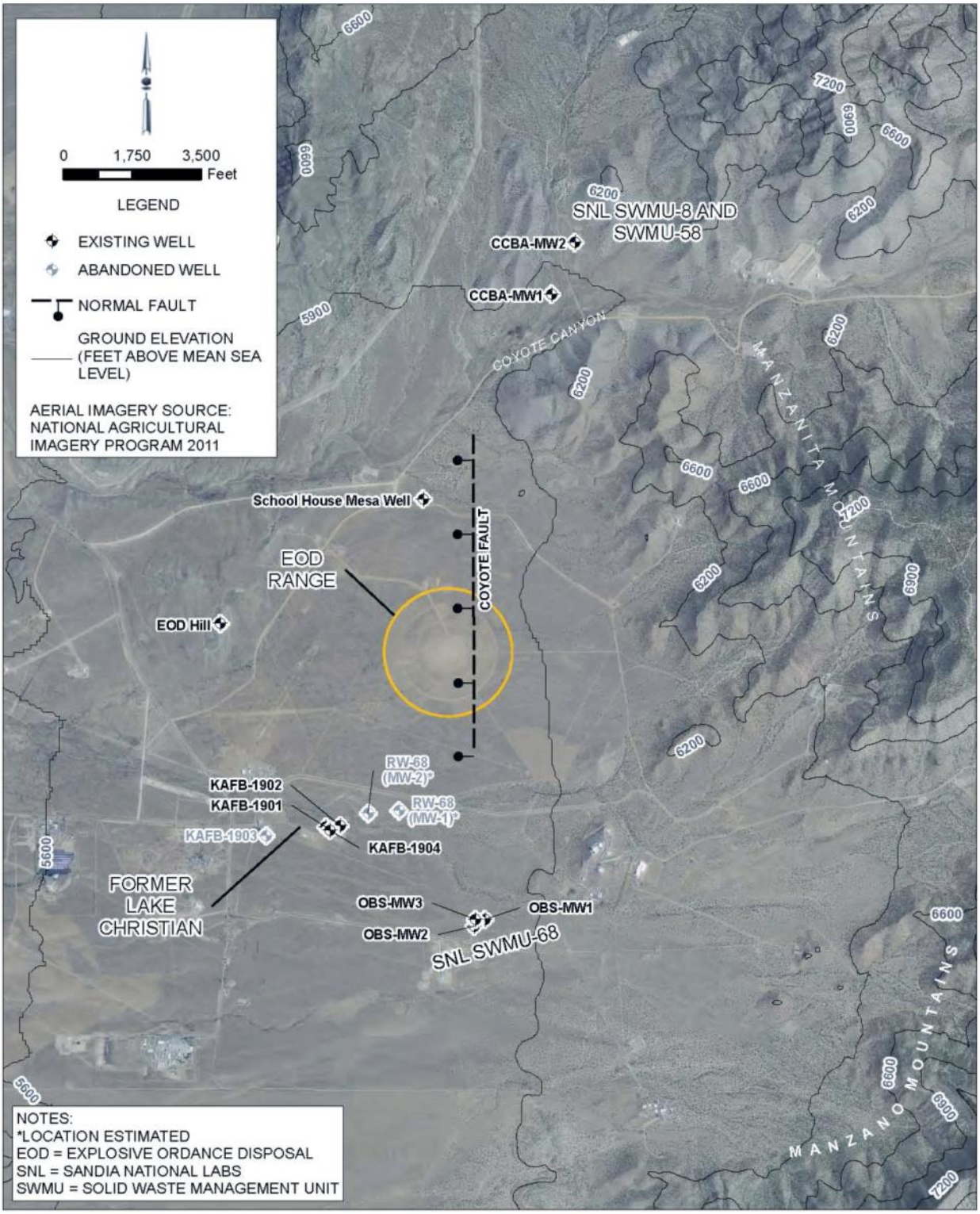

FIGURE 3
AREA FEATURES AND WELL LOCATIONS
MONITORING WELL INSTALLATION WORK PLAN FOR THE OPEN BURN AND OPEN DETONATION UNITS
KIRTLAND AIR FORCE BASE, NEW MEXICO

The depth to the uppermost water bearing zones at the proposed well locations is expected to range from approximately 100 to 200 ft bgs. The horizontal groundwater flow velocity is estimated to be on the order of 50 to 100 ft/year. Based on a history of at least 40 or more years of activities in the EOD Range area, potential contaminant impacts in groundwater could be expected to have traveled roughly 2,000 to 4,000 ft downgradient based on those flow velocity estimates.

The three proposed well locations were selected in consultation with the NMED-HWB. One presumed upgradient and two presumed downgradient locations were selected for installation of the wells. Location of the fourth well will be determined in consultation with the NMED-HWB following installation of the three proposed wells based on gradient and flow direction.

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2 INVESTIGATION ACTIVITIES

Well installation activities will be conducted in accordance with the *Kirtland Air Force Base, Base-Wide Plans for the Environmental Restoration Program, 2004 Update* (USAF, 2004) and with the *Resource Conservation and Recovery Act* (RCRA) Permit (NMED, 2010). The procedures in Section 3.5 of the RCRA Permit, as well as procedures of the Base-Wide Plans, Standard Operating Procedure (SOP) B1.3: Monitoring Well Installation, will be adhered to for this project, unless they are specifically modified by this work plan.

2.1 Mobilization

The schedule of events for the investigation activities will commence by drilling and installing three groundwater monitoring wells as shown in Figure 2. Following well installations, the gradient and flow direction will be established within the investigation area. CH2M HILL personnel will then meet with NMED-HWB to determine the appropriate location of the fourth groundwater monitoring well. The fourth monitoring well, KAFB-2904, will be installed and followed directly by the first groundwater monitoring event for the new wells. Quarterly groundwater monitoring will be conducted according to this work plan. At the conclusion of the investigation and four quarters of monitoring activities, CH2M HILL will provide a report with recommendations based on the data collected from the first four quarters of monitoring.

An exploratory well application permit (Attachment) for each well will be filed with the New Mexico Office of the State Engineer (NMOSE) in accordance with the Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells (NMOSE, 2005). The Bernalillo County well installation regulations are not applicable to wells installed on Kirtland AFB. All well locations will be cleared by Unexploded Ordnance (UXO) support personnel prior to mobilization of drilling activities. An environmental impact analysis will be performed through the Base Civil Engineering and Natural Resources Request (AF Form 813). A utility clearance of the area will be performed using Base Civil Engineering Clearance Requests (AF IMT 103), Base Civil Engineer Work Requests (AF IMT 332), and New Mexico One Call services. A surface disturbance permit will not be required because the total disturbed area of the wells is less than 1 acre.

2.2 Drilling Method and Sequence

The boreholes will be installed using air-rotary casing hammer (ARCH) drilling method. This method has been successfully used for the installation of nearby monitoring wells and should facilitate lithologic description of drill cuttings and allow for the observation of soil/bedrock moisture content for identification of groundwater zones. The ARCH drilling method will be used to advance the boring through the vadose zone and anchor the drive casing in the underlying bedrock.

The specific depths will be determined in the field based onsite conditions such as lithology and presence of groundwater. The following sequence of drilling is anticipated based on known hydrogeologic conditions and drill method capabilities:

1. Initiate boring with the ARCH method using an 8½-inch tri-cone bit and 9-5/8-inch diameter drive casing. Advance the drive casing to the depth of the contact between the alluvium and underlying bedrock.
2. Set the drive casing in the bedrock and continue drilling the borehole using an open hole drilling technique. If dense bedrock conditions are encountered in the boring, a change from a tri-cone bit to a down hole hammer bit may be required.

3. Advance the boring into the uppermost water bearing unit. Complete the borehole approximately 25 ft into the water bearing unit.

During the ARCH drilling activities, the field staff will monitor for the presence of groundwater by visually inspecting drill cuttings for moisture. If the cuttings become wet, the borehole will be allowed to sit idle for approximately one hour. A water level probe will then be lowered into the borehole to assess whether groundwater has accumulated and this information will be documented on the field log.

Field screening of the soil cuttings for the presence of volatile organic compounds (VOCs) will be conducted during the drilling process using a portable photo ionization detector (PID) as described in Base-Wide Plans, Appendix B, SOP B3.1: Photo-ionization Detectors and Organic Vapor Analyzers (USAF, 2004). As the boreholes are advanced, the field geologist will continuously collect soil cuttings to aid in the preparation of lithologic logs. The monitoring well lithologic log will be completed as described in Base-Wide Plans, Appendix B SOP B1.1: Borehole and Sample Logging. Drill cuttings from ARCH method drilling will be stored at the well site on plastic sheeting or in roll-off containers and managed as investigation-derived waste (IDW).

Groundwater purged from the boring during borehole advancement and sampling will be allowed to settle in roll-off bins then transferred to holding tank(s). These plastic holding tanks will be managed as IDW along with decontamination and well development fluids.

Decontamination of the drill rig, drill tools, sampling equipment, and associated equipment will be accomplished by steam cleaning prior to drilling each well. Decontamination activities will be conducted at a central location with water obtained from an approved onsite source. Decontamination fluids will be contained in polyethylene tanks and managed as IDW.

2.2.1 Subsurface Soil Sampling

Soil and rock sampling will be performed for lithologic description. Subsurface soil laboratory analysis is not proposed as part of this investigation. No soil or rock samples will be submitted for laboratory analysis.

2.3 Monitoring Well Construction

Monitoring wells will be designed and constructed based on the lithology and groundwater elevations encountered at each proposed well location. The well construction details may be subject to change based on the observed field conditions, but procedures and methods will comply with Section 3.5 of the RCRA Permit and the OSE criteria. The anticipated well constructions details are shown in Figure 4. The proposed monitoring well design includes the use of 4-inch-inside diameter (ID), Schedule 80 polyvinyl chloride (PVC) casing with a 5-ft well sump, 20-ft of 0.020-inch slot size well screen, and approximately 2 to 3 ft of stickup at the surface. Centralizers will be used to stabilize the well casing within the borehole at the top and bottom of the screen interval and at a minimum spacing of 40 ft on casing above the top of the well screen. Wells will be completed as follows:

- The sand filter pack type will be determined based on field observations and will extend from the bottom of the silt trap to 5 ft above the top of the screen. However, it is anticipated that a filter pack of 10-20 gradation Colorado Silica Sand will be used in the construction of the monitoring wells. The filter pack sand will be placed through a tremie pipe. Approximately 2 ft of barrier sand, 100 percent passing an American Society for Testing and Materials (ASTM) U.S. Standard Sieve No. 60, will be placed above the filter pack to inhibit flow of grout into the filter pack.

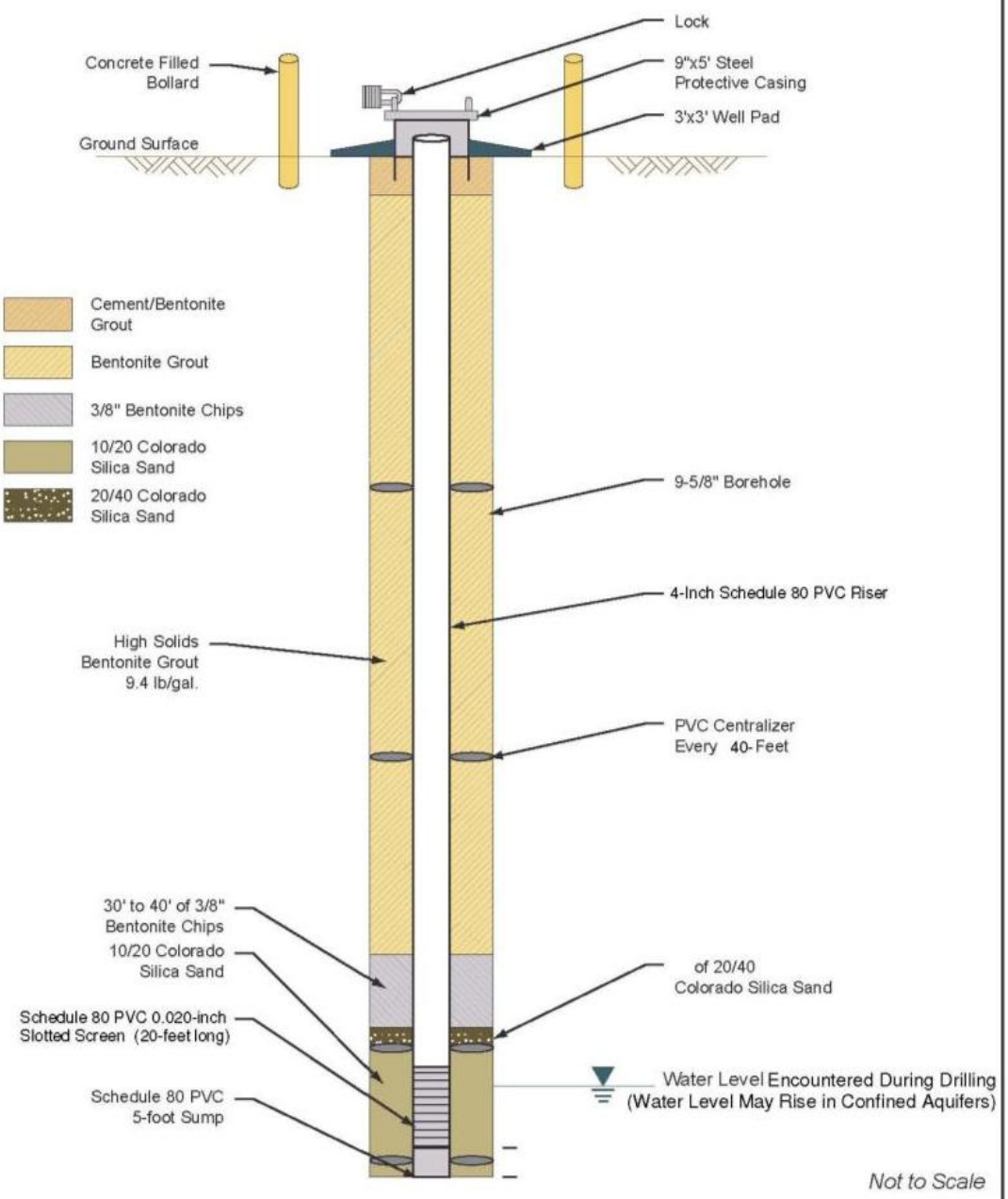

FIGURE 4
PROPOSED MONITORING WELL DESIGN
MONITORING WELL INSTALLATION WORK PLAN
FOR THE OPEN BURN AND OPEN DETONATION UNITS
KIRTLAND AIR FORCE BASE, NEW MEXICO

- A minimum of 10 ft of bentonite chips or pellets will be installed above the filter pack through a tremie pipe. The seal will be hydrated with clean potable water in 6-inch lifts. Setup time for the bentonite will be at the discretion of the field geologist.

- The annular space above the hydrated bentonite seal will be backfilled with bentonite slurry. Bentonite slurries are effective in sealing off groundwater units above the screened and sand-packed intervals of a well and are less likely to damage the well casing than bentonite-cement grout. The bentonite slurry will be installed through a tremie pipe. The bentonite slurry will extend from the bentonite pellet seal to approximately 50 ft bgs.

- The remaining 50 ft of annular space will be filled with bentonite-cement grout consisting of 94 pounds of Portland cement, 3 percent by weight sodium bentonite powder, and 7 gallons of contaminant-free water. The bentonite-cement grout will be placed using a grout pump and tremie pipe to within 5 ft of the land surface. The grout will be allowed to set for at least 24 hours before well development begins.

- The monitoring wells will be completed at the surface in accordance with Kirtland AFB specifications as presented in SOP B1.3 of the *Base-Wide Plans, Field Sampling Plan* (FSP) (USAF, 2004). The surface completion will consist of a 5-foot-long, 9-inch-diameter steel stand pipe with locking cap cemented into a 3-foot-square concrete well pad. Four concrete-filled steel bollards will be installed at the corners of the well pad to protect the well from vehicle damage.

- At the conclusion of the project, when wells KAFB-2901, KAFB-2902, KAFB-2903, and KAFB-2904 are no longer needed, the wells will be properly abandoned in compliance with *Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells* (NMOSE, 2005).

2.4 Well Development and Sampling

Monitoring wells will be developed using a variety of techniques including swabbing, surging, bailing, air lifting and pumping. Monitoring well development will adhere to procedures outlined in Base-Wide Plans, Appendix B, SOP B1.4: Monitoring Well Development (USAF, 2004). Monitoring well development will be performed within one week after well installation but no sooner than 24 hours after grout installation. Groundwater discharged from the wells will be monitored for pH, temperature, specific conductance, dissolved oxygen, oxidation-reduction (redox) potential, and turbidity. Each monitoring well screen will be developed until pH and specific conductance stabilize and the water appears substantially free of sediment. The development goal is to reduce the turbidity to less than 10 nephelometric turbidity units (NTUs) and a less than 10 percent variance in the other parameters observed in the final three readings. However, a final turbidity of less than 100 NTUs is acceptable. If the field parameters have not stabilized after 4 hours of continuous pumping, the well will be allowed to sit overnight and development will continue the following day for a maximum of 2 hours. If the turbidity still does not fall below 100 NTUs, the USACE Project Manager will be contacted and further direction will be sought.

Proposed monitoring wells KAFB-2901, KAFB-2902, and KAFB-2903 will be developed and surveyed subsequent to installation. A static groundwater elevation from each surveyed and developed well will be measured and used to determine the groundwater gradient and flow direction across the OD unit area. This information will be used to determine the location and design of KAFB-2904.

2.4.1 Well Survey

A New Mexico licensed professional surveyor will survey the horizontal well locations relative to New Mexico State Plane Coordinates and the vertical elevations to the nearest one-hundredth of 1 ft for the newly installed monitoring wells. Surveying will be conducted in accordance with SOP B1.9 of the Base-Wide Plans FSP (USAF, 2004).

2.4.2 Groundwater Gradient Calculations

Depth to water measurements for static conditions will be collected from monitoring wells KAFB-2901, KAFB-2902, and KAFB-2903 subsequent to well development. These measurements will be converted to groundwater elevation data using well survey data. These elevations will be mapped, and gradients will be calculated perpendicular to the equipotential groundwater contours. The direction and magnitude of groundwater gradients will provide information that will be used to propose optimum locations for monitoring well KAFB-2904. Kirtland AFB and CH2MHILL will consult with the NMED-HWB to determine the final location of KAFB-2904. Groundwater elevations may also be collected from comparable aquifer units from nearby monitoring wells. The previously installed wells surrounding the investigation area include KAFB-1901, KAFB-1902, KAFB-1904, EOD Hill Well, and School House Mesa Well.

2.5 Sampling and Analysis Plan

Groundwater monitoring will be performed subsequent to well development at a quarterly frequency for up to eight quarters. Groundwater elevations will be measured in each well prior to sampling. Groundwater elevations will be used to determine groundwater flow rate and gradient on a quarterly basis. Well purging methods will comply with the RCRA Permit Section 6.5.17.4 and groundwater samples will be analyzed for VOCs, semivolatile organic compounds (SVOCs), explosives, perchlorate, white phosphorus, target analyte list metals, dioxins, and furans. Data will be of sufficient precision and quality to meet data quality objectives and to ensure that method detection limits are less than cleanup levels where technologically feasible.

Up to eight consecutive quarters of groundwater monitoring are currently planned at the four monitoring wells. If groundwater contamination from the operation of the OD unit is not detected in the monitoring wells, they will be properly plugged and abandoned in accordance with NMOSE regulations and NMED guidance. If groundwater contamination from the operation of the OD unit is identified, the monitoring wells will be maintained for the purpose of monitoring corrective action.

2.5.1 Well Purging and Field Measurements

Each monitoring well shall be purged by removing groundwater prior to sampling in order to ensure that fresh formation water is sampled. One to three well-bore volumes will be purged from each well prior to sampling. A well-bore volume is defined as the volume of water in the saturated filter pack plus the volume of all standing water within the well screen and casing. Purge water will be contained in polyethylene tanks for subsequent characterization and management as IDW. The following groundwater field parameters will be measured during well purging: pH, specific conductance, dissolved oxygen concentration, turbidity, redox potential, and temperature. The volume of groundwater purged, the field parameter readings obtained at each time interval, and the instruments used to measure the field parameters shall be recorded on the field monitoring log. Water samples shall be obtained from a well only after the measured values of purge water field parameters have stabilized to within 10 percent for three consecutive measurements or once three well-bore volumes have been purged from the well.

Groundwater samples will be collected using a pneumatic pump, a submersible electronic pump, or a bailer within eight hours of the completion of well purging. Groundwater in monitoring wells with low recharge rates and that purge dry will be sampled when the water level in the well has recovered sufficiently to collect the required sample volume. Sample handling, preservation, and storage will comply with the RCRA Permit requirements of Table H-6.

2.5.2 Laboratory Analysis and Quality Control/Quality Assurance Procedures

Groundwater samples will be collected from each monitoring well and analyzed for VOCs, SVOCs, explosives, perchlorate, white phosphorus, target analyte list metals, dioxins, and furans. The proposed suite of parameters and analyses for the groundwater samples is presented in Table 2-1. The contacted laboratory must meet DoD certification requirements. To ensure that data is of sufficient precision, laboratory method detection limits will be those shown in the approved OD Unit Closure Plan. To ensure that analytical data is of sufficient quality and that laboratory and field methods are assured of proper quality field quality control samples will be collected in compliance with the approved OD Unit Closure Plan. Level 4 laboratory data will be requested and validated by qualified chemists to meet criteria specified by the NMED and the DoD.

Data reliability will be ensured by documenting sample management so that analyses are traceable to specific areas of potential contamination and by following a quality assurance/quality control (QA/QC) program that mandates documentation of the precision and accuracy of laboratory analyses, as well as data representativeness, completeness, comparability, and sensitivity.

The QC samples to be collected include: field duplicate samples, trip blanks, and rinsate blanks as discussed in the Open Detonation Unit Closure Plan. Sample designations will follow the Kirtland AFB guidelines as outlined in Section 4.2.1 of the Base-Wide Plans, FSP (USAF, 2004). The well identification numbers assigned to the four new wells for this investigation are: KAFB-2901, KAFB-2902, KAFB-2903, and KAFB-2904. The proposed sample number scheme is presented in Table 2-2.

Table 2-1. Groundwater Monitoring Parameters and Testing Methods for the Groundwater Investigation of the OD Unit

Analysis	Method	Testing Location	Data Use
Groundwater elevation	Groundwater probe	Field	Groundwater flow direction
pH	pH probe	Field, flow-through cell	General groundwater parameter
Temperature	Digital thermometer	Field, flow-through cell	General groundwater parameter
Specific conductance	Conductivity meter	Field, flow-through cell	General groundwater parameter
Dissolved oxygen	Dissolved oxygen probe	Field, flow-through cell	Assess aerobic or anaerobic aquifer conditions
Oxidation-reduction potential	EH meter	Field, flow-through cell	Assess conditions for natural attenuation of contaminants
Turbidity	Turbidity meter	Field, flow-through cell	General groundwater parameter
Volatile Organic Compounds	SW-846 8260B[a]	Laboratory	Assess potential contamination from OB/OD Unit Operations
Semi-Volatile Organic Compounds	SW-846 8270D[a]	Laboratory	Assess potential contamination from OB/OD Unit Operations
Perchlorate	SW-846 6850[a]	Laboratory	Assess potential contamination from OB/OD Unit Operations
White Phosphorus	SW-846 7580[a]	Laboratory	Assess potential contamination from OB/OD Unit Operations
Explosives	SW-846 8330B[a]	Laboratory	Assess potential contamination from OB/OD Unit Operations
Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, slelenium, silver, thallium, tin, vanadium, and zinc)	SW-846 6010B, 7000B, 7470B[a]	Laboratory	Assess potential contamination from OB/OD Unit Operations
Dioxins and Furans	SW-846 8280B, 8290A[a]	Laboratory	Assess potential contamination from OB/OD Unit Operations

[a] EPA, 1996
EH = hydrogen electrode
EPA = U.S. Environmental Protection Agency

Table 2-2. Proposed Groundwater Sample Identification for the Groundwater Investigation of the OD Unit

Sample Identifier[a]	Sample Type
OT29-GW-2901-_____	Normal
OT29-GW-2902-_____	Normal
OT29-GW-2903-_____	Normal
OT29-GW-2904-_____	Normal
OT29-FD-2901-_____	Duplicate
OT29-EB-2902-_____	Equipment Blank
OT29-TB-2903-_____	Trip Blank[b]
OT29-MS-2904-_____	Matrix Spike
OT29-MSD-2904-_____	Matrix Spike Duplicate

[a] The six digit sample date will make up the last portion of the sample identification number
[b] Trip Blanks will only be analyzed for VOCs.

2.6 Investigation Derived Waste

Soil cuttings recovered during drilling operations are expected to be nonhazardous, native material. The cuttings will be stockpiled on plastic sheet or in roll-off containers at each well site.

Upon completion of drilling activities, composite samples will be collected from the cuttings and analyzed for the full suite of toxicity characteristic leachate procedure (TCLP) parameters. The full suite of TCLP parameters includes analyses for VOCs, SVOCs, the eight RCRA-listed metals, pesticides, and herbicides along with reactivity, ignitability, and corrosivity. If the sample results indicate the cuttings are nonhazardous waste, the cuttings will be disposed of in the Kirtland AFB construction and demolition (C&D) landfill.

Decontamination will be conducted on a concrete pad constructed for that purpose (located near Pennsylvania Road, southeast of the Tijeras Arroyo Golf Course) or on plastic sheeting at the site. Wastewater from the equipment decontamination will be stored in plastic holding tanks along with purge water from well development activities and groundwater sampling. IDW water samples will be collected from the tanks and analyzed for VOCs, SVOCs, and RCRA-listed metals. The sample analytical results will be compared to the New Mexico Water Quality Control Commission standards and the Albuquerque Bernalillo County Water Utility Authority standards to determine the appropriate disposal option.

2.7 Site Safety and Health Plan

All environmental drilling and monitoring activities will be conducted in accordance with the SSHP prepared for the OD Closure Activities.

2.8 Reporting

One well completion report will be prepared to document the drilling and well installation activities. No laboratory analytical data will be presented in the well completion report. The well completion report will

be submitted to NMED for approval within 60 days of the completion of well installation activities. The well installation report will include the following information:

- Descriptions of the field program including the drilling, well installation, surveying, and IDW management activities;
- Field documentation including soil boring logs, well construction diagrams, well development logs, and survey data.

Field and laboratory data will be submitted to the NMED within 90 days after all samples are collected for each quarter.

Periodic groundwater monitoring reports will be prepared to document quarterly groundwater monitoring results. All validated groundwater laboratory results will be presented in periodic groundwater monitoring reports which comply with Section 6.2.4.4 of the RCRA Permit. Groundwater analytical results will be compared to New Mexico water quality control standards and EPA maximum contaminant levels and secondary screening levels to determine if contamination above standards is present in the groundwater monitoring wells. Each quarter of analytical data will be evaluated for the presence of potential contaminants. The Periodic Groundwater Monitoring Reports for the OD unit will be prepared annually and following four quarters of groundwater monitoring and submitted within 90 days after the completion of the last quarterly monitoring event. Currently, up to eight consecutive quarters of groundwater monitoring and two Periodic Groundwater Monitoring Reports are planned.

2.9 Project Schedule

Table 2-3 outlines the project schedule. The monitoring well drilling and installation activities will be conducted upon approval of the OD Unit Closure Plan and this Monitoring Well Installation Plan. The well installation activities will be documented in a Well Completion Report. Final validated groundwater analytical results from four quarters of groundwater sampling will be reported in an Annual Groundwater Monitoring Report for the OD units.

Table 2-3. Proposed Schedule of Activities for Groundwater Monitoring Well Installation for the Closure of the OD Unit

Activity	Duration (calendar days)	Start Date
Preparation of Plans		
Submit Well Installation work plan to NMED		First Quarter 2013
NMED Review of work plan	45	First Quarter 2013
Receipt of NMED comments on work plan		Second Quarter 2013
Prepare and submit revised work plan	30	Upon receipt of comments
Field Investigation		
Mobilize drilling equipment	3	15 days following work plan approval
Well installation, development, and surveying collection of IDW soil and water samples	28	Following mobilization
IDW characterization, and disposal	45	Following well installation
Preparation of Well Completion Report		
Initiate Well Completion Report Preparation	60	Upon completion of all well drilling, development, and surveying activities
Submit Well Completion Report to USACE, USAF, and NMED	1	60 days following well installation
Quarterly Groundwater Monitoring and Periodic Reporting		
Conduct quarterly groundwater monitoring	3	Following installation of four groundwater monitoring wells and on a quarterly basis
Submit field and laboratory data from monitoring event	1	90 days following collection of groundwater samples on a quarterly basis
Prepare Periodic Groundwater Monitoring Report	90	Following collection of four quarters of groundwater samples
Submit Periodic Groundwater Monitoring Report to USACE, USAF, and NMED	1	90 days following collection of fourth quarter groundwater samples

REFERENCES

EPA, 1996. *EPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846)*, 3d ed. U.S. Environmental Protection Agency, September 1986; Final Update I, July 1992; Final Update IIA, August 1993; Final Update II, September 1994, Final Update IIB, January 1995; Final Update III, December 1996.

NMED, 2010. *Hazardous Waste Treatment Facility Operating Permit EPA ID No. NM9570024423.* Issued to United States Air Force for the Open Detonation Unit at Kirtland Air Force Base, Bernalillo County, New Mexico. July.

NMOSE, 2005. *Rules and Regulations Governing Well Driller Licensing; Construction, Repair, and Plugging of Wells* New Mexico Office of the State Engineer. August.

SNL/NM, 2011a. *Annual Groundwater Monitoring Report, Calendar Year 2010, Sandia Report SAND2011-5781P*. Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico. September.

SNL/NM, 2011b. *Groundwater Monitoring Well Installation Report for SWMU 8 (Open Dump Coyote Canyon Blast Area), SWMU 58 (Coyote Canyon Blast Area), and SWMU 68 (Open Burn Site).* Environmental Restoration Operations. Sandia National Laboratories/New Mexico. November.

SNL/NM, 2010. *Low-Level Perchlorate Contamination and Complex Regulatory Requirements at the Burn Site Groundwater Investigation Study Area, Sandia National Laboratories/New Mexico. Paper ID-10395.* Waste Management Conference. Phoenix, Arizona. March.

USAF, 2010. *Closure Plan for the Open Burn Unit.* U.S. Air Force, Kirtland Air Force Base, New Mexico. October.

USAF, 2004. *Kirtland Air Force Base, Base-Wide Plans for the Environmental Restoration Program, 2004 Update.* U.S. Air Force, Kirtland Air Force Base, New Mexico. April.

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ATTACHMENT

NEW MEXICO OFFICE OF THE STATE ENGINEER WELL APPLICATION PERMIT

File No.

NEW MEXICO OFFICE OF THE STATE ENGINEER

APPLICATION FOR PERMIT TO DRILL A WELL
WITH NO CONSUMPTIVE USE OF WATER

(check applicable box):

For fees, see State Engineer website: http://www.ose.state.nm.us/

Purpose:	☐ Pollution Control And / Or Recovery	☐ Geo-Thermal
☐ Exploratory	☐ Construction Site De-Watering	☐ Other (Describe):
☐ Monitoring	☐ Mineral De-Watering	
A separate permit will be required to apply water to beneficial use.		
☐ Temporary Request - Requested Start Date:		Requested End Date:
Plugging Plan of Operations Submitted? ☐ Yes ☐ No		

1. APPLICANT(S)

Name:	Name:
Contact or Agent: check here if Agent ☐	Contact or Agent: check here if Agent ☐
Mailing Address:	Mailing Address:
City:	City:
State: Zip Code:	State: Zip Code:
Phone: ☐ Home ☐ Cell Phone (Work):	Phone: ☐ Home ☐ Cell Phone (Work):
E-mail (optional):	E-mail (optional):

2. WELL(S) Describe the well(s) applicable to this application.

Location Required: Coordinate location must be reported in NM State Plane (NAD 83), UTM (NAD 83), or Latitude/Longitude (Lat/Long - WGS84)

☐ NM State Plane (NAD83) (Ft)
☐ NM West Zone
☐ NM East Zone
☐ NM Central Zone

☐ UTM (NAD83) (Meters)
☐ Zone 12N
☐ Zone 13N

☐ Lat/Long (WGS84) (to the nearest 1/10th of second)

Well Number (if known):	X or Easting or Latitude:	Y or Northing or Longitude:	**Optional: Complete boxes labeled "Other" below with PLSS (Public Land Survey System, i.e. Quarters, Section, Township, Range); Hydrographic Survey Map & Tract; Lot, Block & Subdivision; OR Land Grant Name if known.**

NOTE: If more well locations need to be described, complete form WR-08 (Attachment 1 – POD Descriptions)
Additional well descriptions are attached: ☐ Yes ☐ No If yes, how many_____

Other description relating well to common landmarks, streets, or other:

Well is on land owned by:

Well Information: NOTE: If more than one (1) well needs to be described, provide attachment. Attached? ☐ Yes ☐ No
If yes, how many_____

Approximate depth of well (ft):	Outside diameter of well casing (inches):
Driller Name:	Driller License Number:

3. ADDITIONAL STATEMENTS OR EXPLANATIONS

FOR OSE INTERNAL USE

Application for Permit, Form wr-07

File Number:	Trn Number:

4. SPECIFIC REQUIREMENTS: The applicant must include the following, as applicable to each well type. Please check the appropriate boxes, to indicate the information has been included and/or attached to this application:

Exploratory: ☐ Include a description of any proposed pump test, if applicable.	**Pollution Control and/or Recovery:** ☐ Include a plan for pollution control/recovery, that includes the following: ☐ A description of the need for the pollution control or recovery operation. ☐ The estimated maximum period of time for completion of the operation. ☐ The annual diversion amount. ☐ The annual consumptive use amount. ☐ The maximum amount of water to be diverted and injected for the duration of the operation. ☐ The method and place of discharge. ☐ The method of measurement of water produced and discharged. ☐ The source of water to be injected. ☐ The method of measurement of water injected. ☐ The characteristics of the aquifer. ☐ The method of determining the resulting annual consumptive use of water and depletion from any related stream system. ☐ Proof of any permit required from the New Mexico Environment Department. ☐ An access agreement if the applicant is not the owner of the land on which the pollution plume control or recovery well is to be located.	**Construction De-Watering:** ☐ Include a description of the proposed dewatering operation, ☐ The estimated duration of the operation, ☐ The maximum amount of water to be diverted, ☐ A description of the need for the dewatering operation, and, ☐ A description of how the diverted water will be disposed of.	**Mine De-Watering:** ☐ Include a plan for pollution control/recovery, that includes the following: ☐ *A DESCRIPTION OF THE NEED FOR MINE DEWATERING.* ☐ The estimated maximum period of time for completion of the operation. ☐ The source(s) of the water to be diverted. ☐*THE GEOHYDROLOGIC CHARACTERISTICS OF THE AQUIFER(S).* ☐The maximum amount of water to be diverted per annum. ☐The maximum amount of water to be diverted for the duration of the operation. ☐The quality of the water. ☐The method of measurement of water diverted. ☐The recharge of water to the aquifer. ☐Description of the estimated area of hydrologic effect of the project. ☐The method and place of discharge. ☐*AN ESTIMATION OF THE EFFECTS ON SURFACE WATER RIGHTS AND UNDERGROUND WATER RIGHTS FROM THE MINE DEWATERING PROJECT.* ☐*A DESCRIPTION OF THE METHODS EMPLOYED TO ESTIMATE EFFECTS ON SURFACE WATER RIGHTS AND UNDERGROUND WATER RIGHTS.* ☐Information on existing wells, rivers, springs, and wetlands within the area of hydrologic effect.
Monitoring: ☐ Include the reason for the monitoring well, and, ☐ The duration of the planned monitoring.		**Geo-Thermal:** ☐ Include a description of the geothermal heat exchange project, ☐ The amount of water to be diverted and re-injected for the project, ☐ The time frame for constructing the geothermal heat exchange project, and, ☐ The duration of the project. ☐ Preliminary surveys, design data, and additional information shall be included to provide all essential facts relating to the request.	

ACKNOWLEDGEMENT

I, We (name of applicant(s)), _____
Print Name(s)

affirm that the foregoing statements are true to the best of (my, our) knowledge and belief.

_____ _____
Applicant Signature Applicant Signature

ACTION OF THE STATE ENGINEER

This application is:

☐ approved ☐ partially approved ☐ denied

provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare and further subject to the attached conditions of approval.

Witness my hand and seal this _____ day of _____ 20 _____ , for the State Engineer,

_____, State Engineer

By: _____ _____
Signature Print

Title: _____
Print

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Appendix 2
Soil Sampling Information

V:\Kirtland_AFB\GIS\MapFiles\Figure H-4 - Proposed Discrete Soil Sampling Locations.mxd

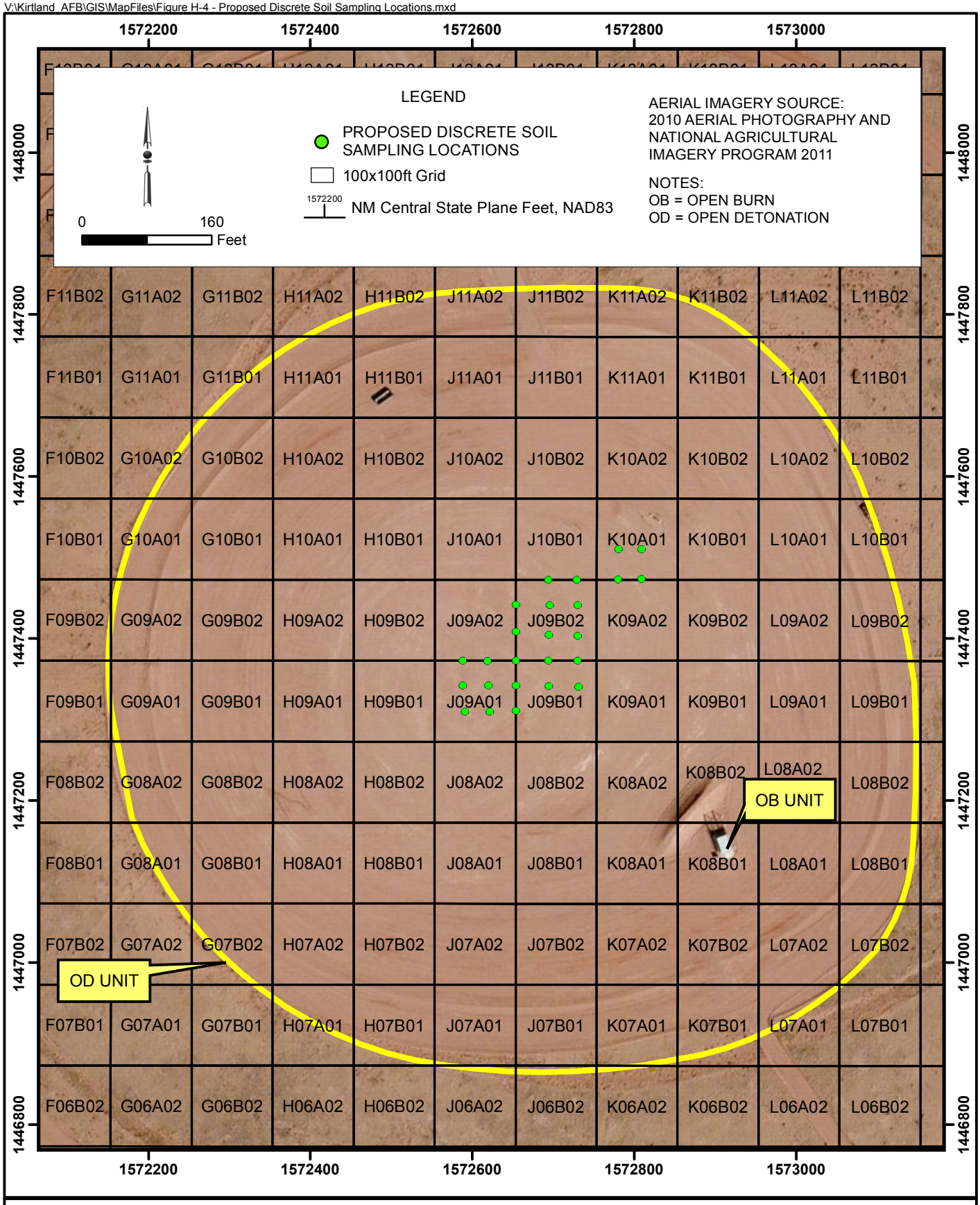
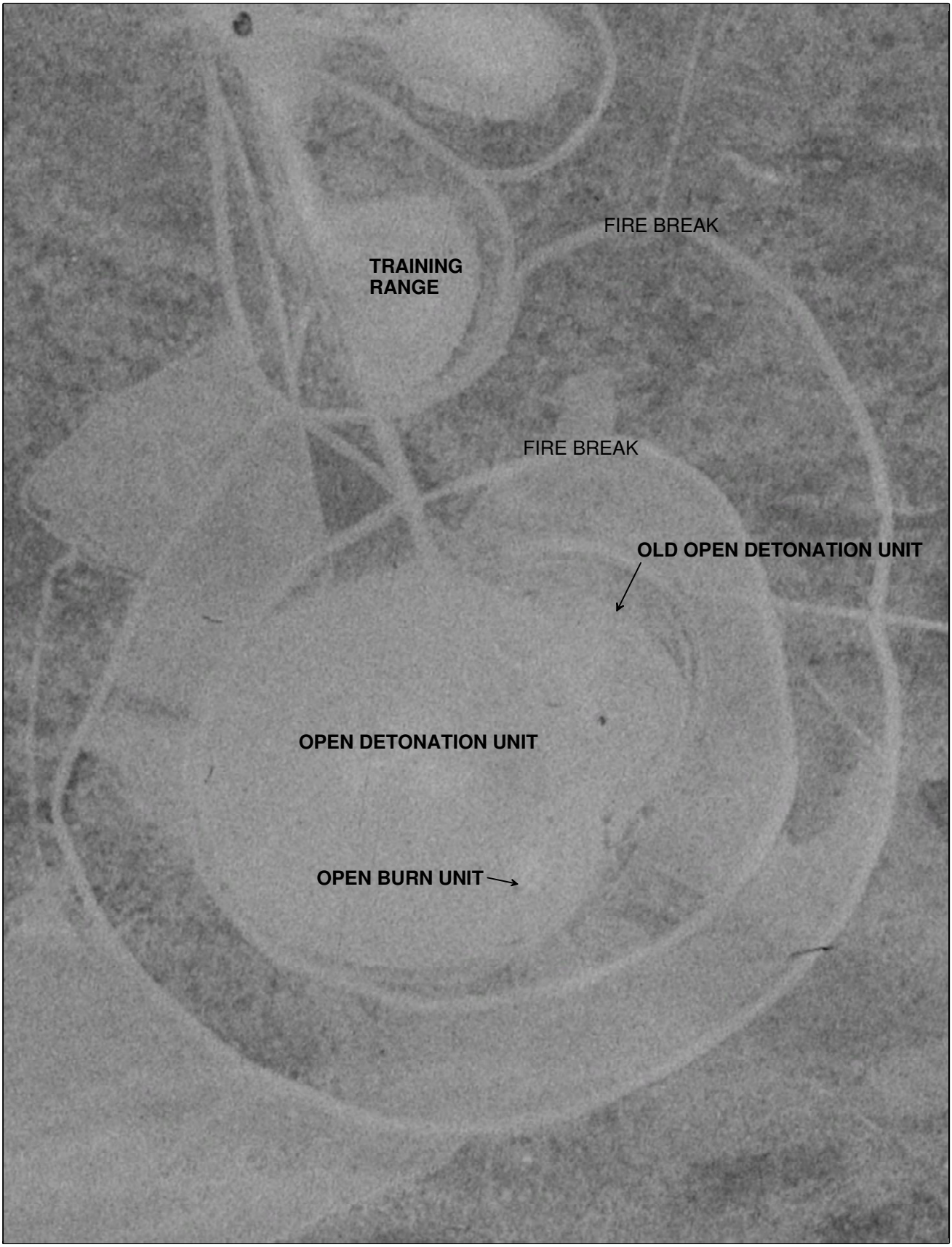


FIGURE H-4
PROPOSED DISCRETE SOIL SAMPLING LOCATIONS
OPEN DETONATION CLOSURE PLAN
KIRTLAND AIR FORCE BASE, NEW MEXICO



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1991 Aerial Photograph

CH2MHILL

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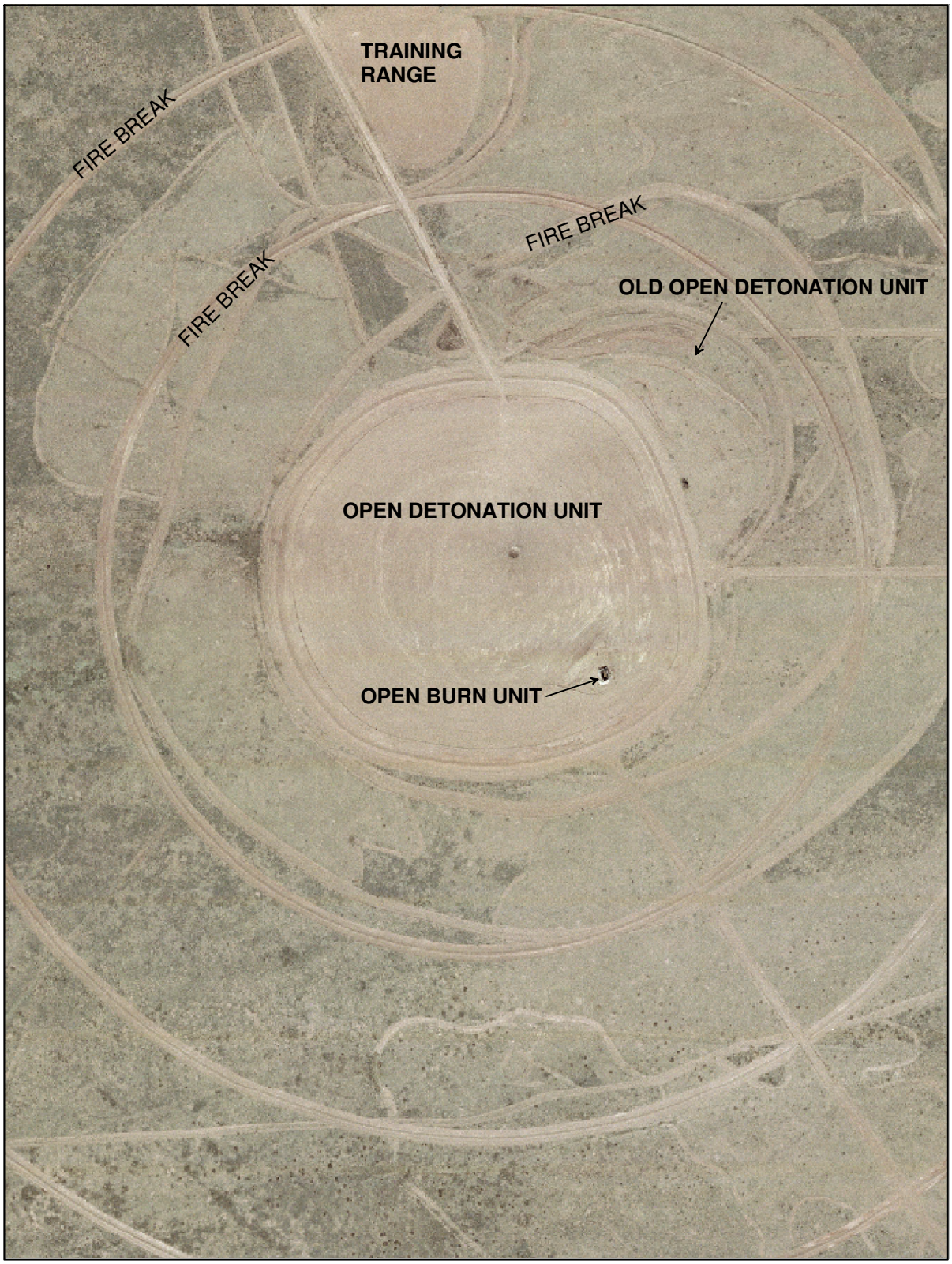
1999 Aerial Photograph

CH2MHILL

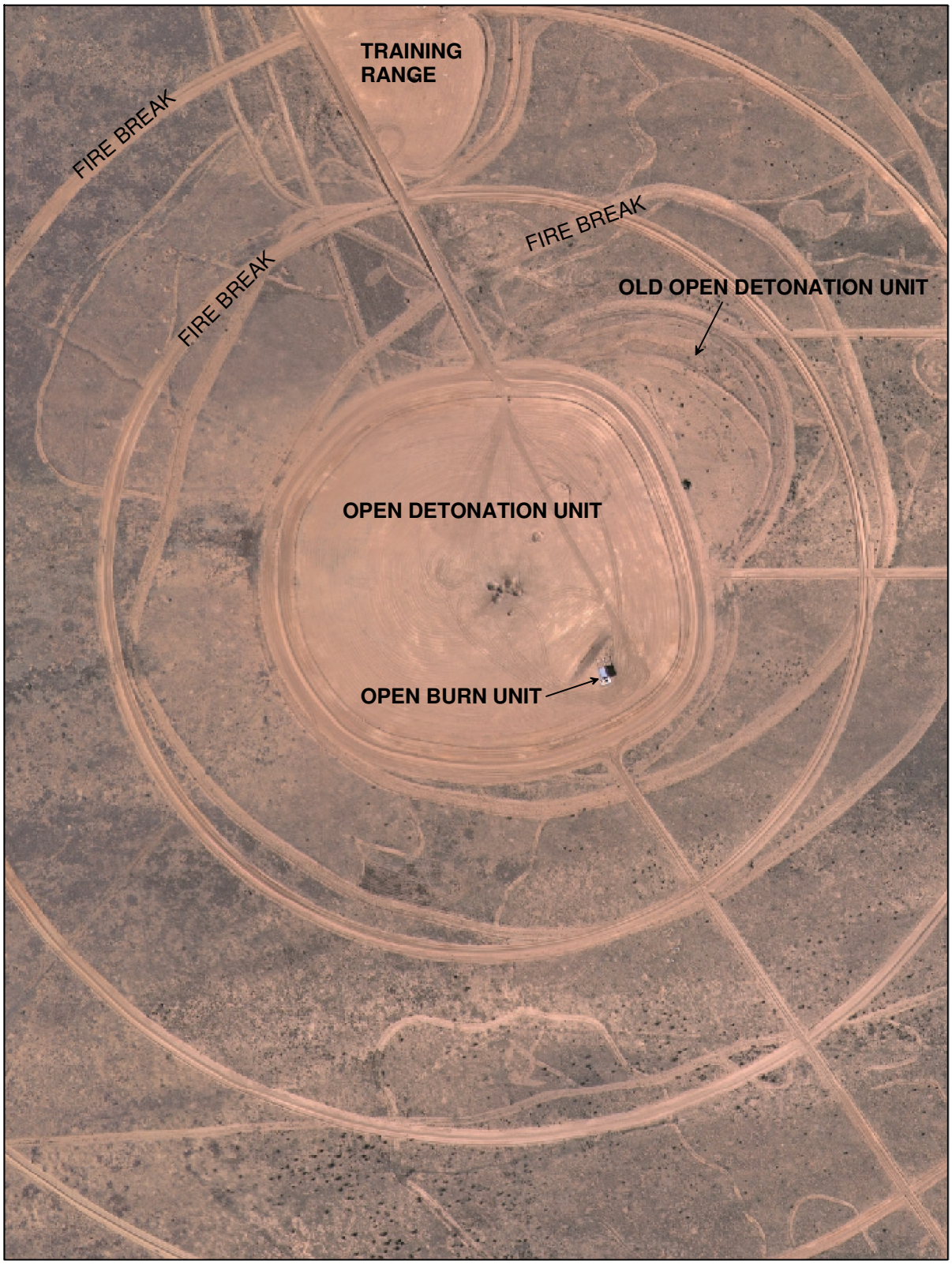


0 150 300
Feet

N

2002 Aerial Photograph

CH2MHILL



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Feet

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2004 Aerial Photograph

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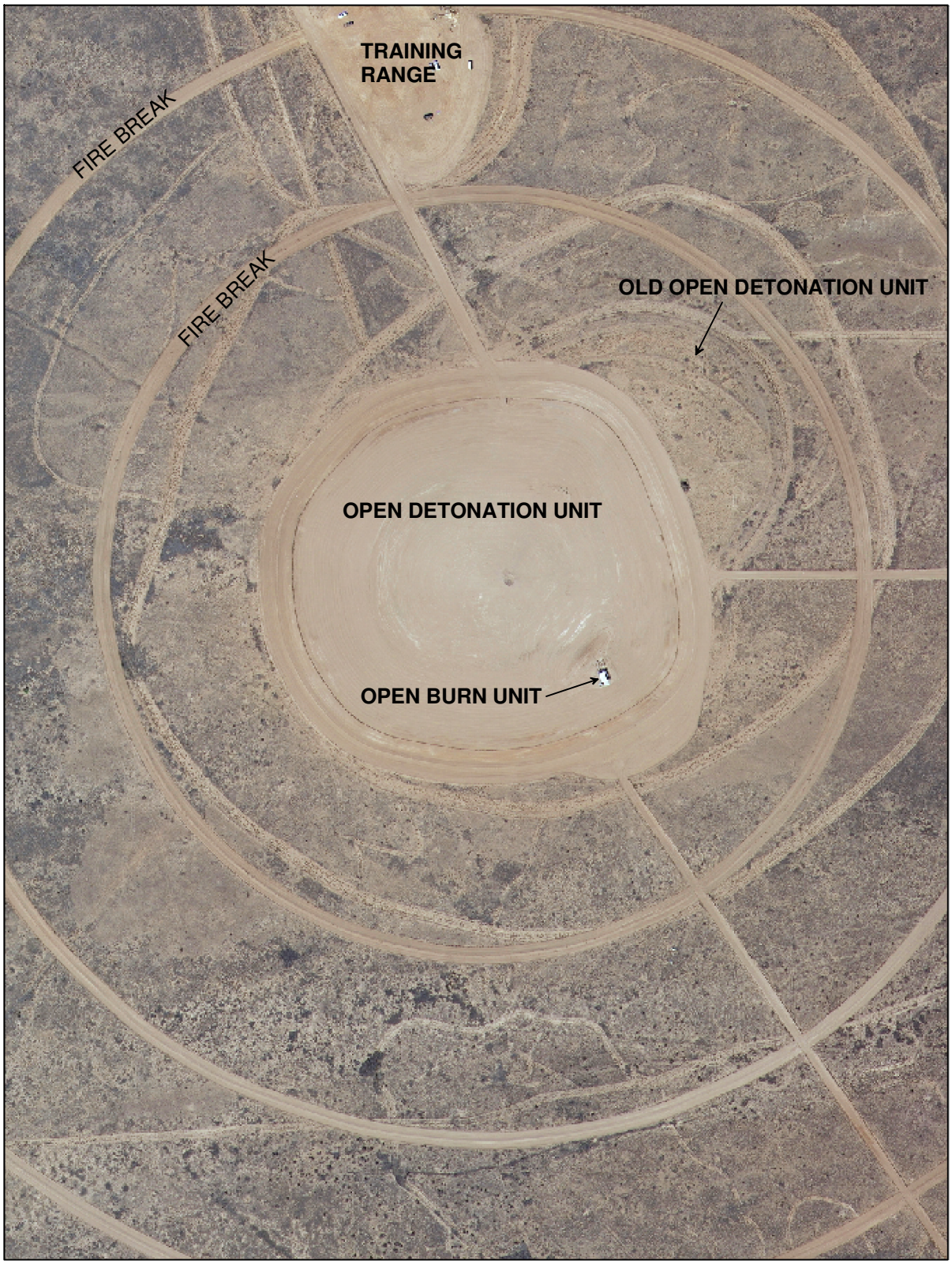

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Feet

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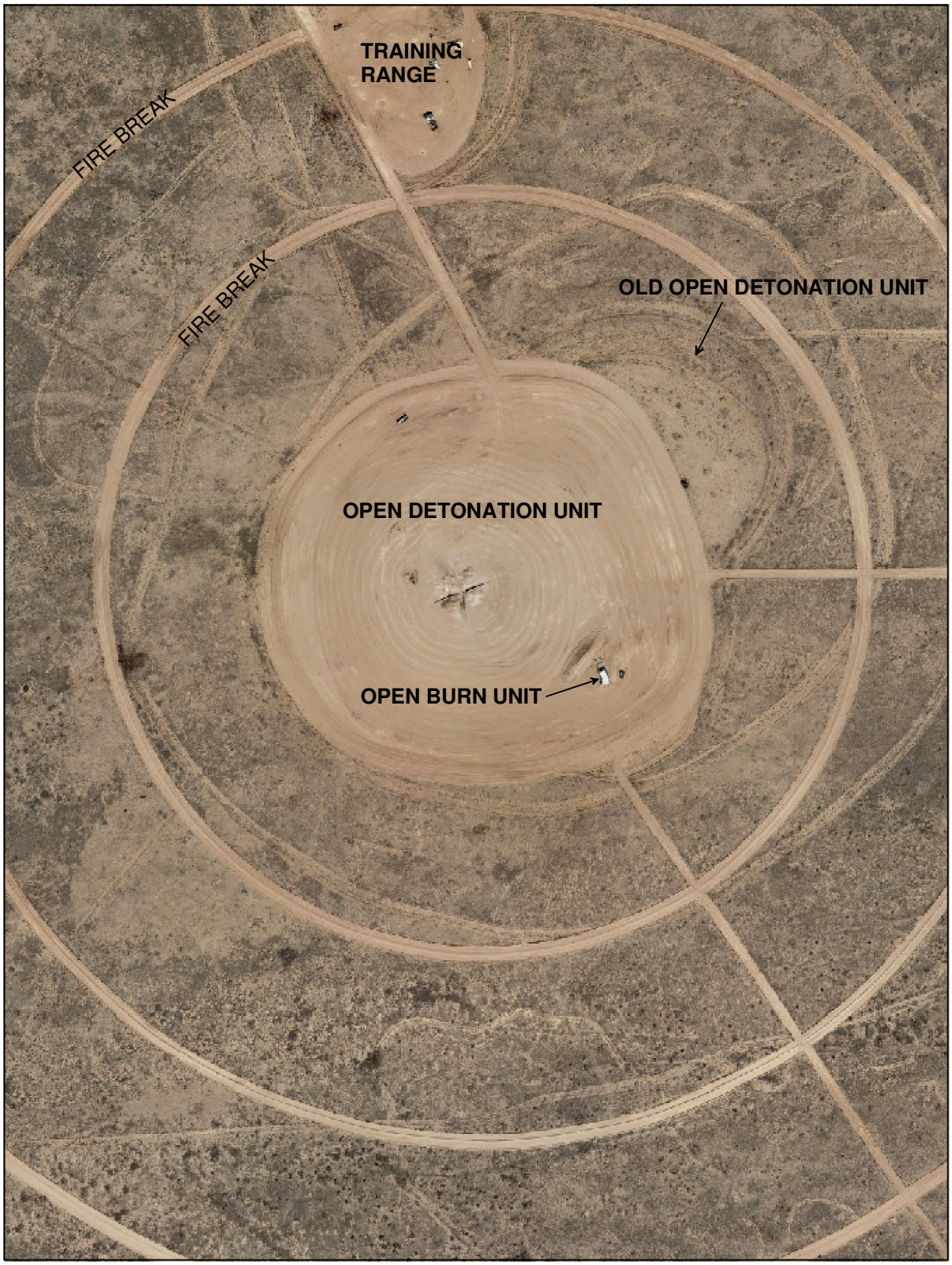
2006 Aerial Photograph

CH2MHILL



0 150 300
Feet

N

2008 Aerial Photograph

CH2MHILL

0 150 300
Feet

N

2010 Aerial Photograph

CH2MHILL

Attachment 2, Table 1

Proposed Discrete Soil Samples for the Open Detonation Unit, Kirtland Air Force Base, New Mexico

Soil Boring	Sample Identification	Depth (feet below ground surface)	Sample Type	**Metals** Methods SW-846 6010B, 6020A, 7471B	**VOCs** (Per Table H-3 of RCRA Permit) Method SW-846 8260B	**SVOCs** (Per Table H-3 of RCRA Permit) Method SW-846 8270C	**Total Explosives** (Per Table D-4 of RCRA Permit) Method SW-846 8330B	**Perchlorate** Method SW-846 6850	**White Phosphorous** Method SW-846 7580	**Dioxins** Method SW-846 8290
J09A1-1	OT29-SO-J09A1-1-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09A1-1-001	0 - 1	Field Duplicate	X	X	X	X	X	X	X
	OT29-SO-J09A1-1-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09A1-1-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-1-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09A1-2	OT29-SO-J09A1-2-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09A1-2-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09A1-2-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-2-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09A1-3	OT29-SO-J09A1-3-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09A1-3-0001MS	0 - 1	MS/MSD	X	X	X	X	X	X	X
	OT29-SO-J09A1-3-0001MSD	0 - 1	MS/MSD	X	X	X	X	X	X	X
	OT29-SO-J09A1-3-0405	4 - 5	Normal	X			X	X		
	OT29-FD-J09A1-3-0405	4 - 5	Field Duplicate	X			X	X		
	OT29-SO-J09A1-3-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-3-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09A1-4	OT29-SO-J09A1-4-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09A1-4-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09A1-4-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-4-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09A1-5	OT29-SO-J09A1-5-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-FD-J09A1-5-0001	0 - 1	Field Duplicate	X			X	X		
	OT29-SO-J09A1-5-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09A1-5-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-5-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09A1-6	OT29-SO-J09A1-6-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09A1-6-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09A1-6-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-6-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09A1-7	OT29-SO-J09A1-7-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09A1-7-0405	4 - 5	Normal	X			X	X		
	OT29-FD-J09A1-7-0405	4 - 5	Field Duplicate	X			X	X		
	OT29-SO-J09A1-7-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-7-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09A1-8	OT29-SO-J09A1-8-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09A1-8-0001MS	0 - 1	MS/MSD	X	X	X	X	X	X	X
	OT29-SO-J09A1-8-0001MSD	0 - 1	MS/MSD	X	X	X	X	X	X	X
	OT29-SO-J09A1-8-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09A1-8-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-8-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09A1-9	OT29-SO-J09A1-9-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09A1-9-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09A1-9-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09A1-9-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B1-1	OT29-SO-J09B1-1-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-FD-J09B1-1-0001	0 - 1	Field Duplicate	X	X	X	X	X	X	X
	OT29-SO-J09B1-1-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B1-1-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B1-1-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B1-2	OT29-SO-J09B1-2-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09B1-2-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B1-2-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B1-2-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B1-3	OT29-SO-J09B1-3-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09B1-3-0405	4 - 5	Normal	X			X	X		
	OT29-FD-J09B1-3-0405	4 - 5	Field Duplicate	X			X	X		
	OT29-SO-J09B1-3-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B1-3-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B1-4	OT29-SO-J09B1-4-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09B1-4-0001MS	0 - 1	MS/MSD	X			X	X		
	OT29-SO-J09B1-4-0001MSD	0 - 1	MS/MSD	X			X	X		
	OT29-SO-J09B1-4-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B1-4-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B1-4-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B2-1	OT29-SO-J09B2-1-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09B2-1-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B2-1-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B2-1-1415	14 - 15	Normal	X	X	X	X	X	X	X

Attachment 2, Table 1

Proposed Discrete Soil Samples for the Open Detonation Unit, Kirtland Air Force Base, New Mexico

Soil Boring	Sample Identification	Depth (feet below ground surface)	Sample Type	**Metals** Methods SW-846 6010B, 6020A, 7471B	**VOCs** (Per Table H-3 of RCRA Permit) Method SW-846 8260B	**SVOCs** (Per Table H-3 of RCRA Permit) Method SW-846 8270C	**Total Explosives** (Per Table D-4 of RCRA Permit) Method SW-846 8330B	**Perchlorate** Method SW-846 6850	**White Phosphorous** Method SW-846 7580	**Dioxins** Method SW-846 8290
J09B2-2	OT29-SO-J09B2-2-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-FD-J09B2-2-0001	0 - 1	Field Duplicate	X	X	X	X	X	X	X
	OT29-SO-J09B2-2-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B2-2-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B2-2-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B2-3	OT29-SO-J09B2-3-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09B2-3-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B2-3-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B2-3-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B2-4	OT29-SO-J09B2-4-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-FD-J09B2-4-0001	0 - 1	Field Duplicate	X	X	X	X	X	X	X
	OT29-SO-J09B2-4-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B2-4-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B2-4-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B2-5	OT29-SO-J09B2-5-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09B2-5-0001MS	0 - 1	MS/MSD	X	X	X	X	X	X	X
	OT29-SO-J09B2-5-0001MSD	0 - 1	MS/MSD	X	X	X	X	X	X	X
	OT29-SO-J09B2-5-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B2-5-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B2-5-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B2-6	OT29-SO-J09B2-6-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09B2-6-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B2-6-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B2-6-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B2-7	OT29-SO-J09B2-7-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-FD-J09B2-7-0001	0 - 1	Field Duplicate	X	X	X	X	X	X	X
	OT29-SO-J09B2-7-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B2-7-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B2-7-0910MS	9 - 10	MS/MSD	X			X	X		
	OT29-SO-J09B2-7-0910MSD	9 - 10	MS/MSD	X			X	X		
	OT29-SO-J09B2-7-1415	14 - 15	Normal	X	X	X	X	X	X	X
J09B2-8	OT29-SO-J09B2-8-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-J09B2-8-0405	4 - 5	Normal	X			X	X		
	OT29-SO-J09B2-8-0910	9 - 10	Normal	X			X	X		
	OT29-SO-J09B2-8-1415	14 - 15	Normal	X	X	X	X	X	X	X
K10A1-1	OT29-SO-K10A1-1-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-K10A1-1-0405	4 - 5	Normal	X			X	X		
	OT29-FD-K10A1-1-0405	4 - 5	Field Duplicate	X			X	X		
	OT29-SO-K10A1-1-0910	9 - 10	Normal	X			X	X		
	OT29-SO-K10A1-1-1415	14 - 15	Normal	X	X	X	X	X	X	X
K10A1-2	OT29-SO-K10A1-2-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-K10A1-2-0405	4 - 5	Normal	X			X	X		
	OT29-SO-K10A1-2-0910	9 - 10	Normal	X			X	X		
	OT29-SO-K10A1-2-1415	14 - 15	Normal	X	X	X	X	X	X	X
K10A1-3	OT29-SO-K10A1-3-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-K10A1-3-0405	4 - 5	Normal	X			X	X		
	OT29-SO-K10A1-3-0910	9 - 10	Normal	X			X	X		
	OT29-SO-K10A1-3-1415	14 - 15	Normal	X	X	X	X	X	X	X
K10A1-4	OT29-SO-K10A1-4-0001	0 - 1	Normal	X	X	X	X	X	X	X
	OT29-SO-K10A1-4-0405	4 - 5	Normal	X			X	X		
	OT29-SO-K10A1-4-0910	9 - 10	Normal	X			X	X		
	OT29-SO-K10A1-4-1415	14 - 15	Normal	X	X	X	X	X	X	X
QC	OT29-WW-RINSATE1	-	Equipment Blank	X	X	X	X	X	X	X
	OT29-WW-RINSATE2	-	Equipment Blank	X	X	X	X	X	X	X
	OT29-WW-RINSATE3	-	Equipment Blank	X	X	X	X	X	X	X
	OT29-WW-TB1	-	Trip Blank		X					
	OT29-WW-TB2	-	Trip Blank		X					
	OT29-WW-TB3	-	Trip Blank		X					
			Total Normal Samples	100	50	50	100	100	50	50
			Total Field Duplicates	10	5	5	10	10	5	5
			Total Matrix Spike/Matrix Spike Duplicates	5	3	3	5	5	3	3
			Total Equipment Blanks	3	3	3	3	3	3	3
			Total Trip Blanks		3					

Appendix 3
Summary of Laboratory Quality Control Procedures by Analytical Method

ATTACHMENT 3, TABLE 1
Summary of Calibration and Quality Control Procedures for Gas Chromatography Method 7580 (White Phosphorous)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Multipoint ICAL for all analytes (minimum five standards)	Before sample analysis	One of the following options. Option 1: Linear—RSD for each analyte ≤ 20%. Option 2: Linear—least squares regression r ≥0.995 for each analyte. Option 3: Nonlinear—COD ≥0.99 (six points will be used for second order, seven points will be used for third order) .	Correct problem then repeat ICAL.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL. Calibration may not be forced through the origin. All quantitation for multicomponent analytes, such as technical chlordane, toxaphene, and Aroclors, must be performed form a five-point calibration. Results may not be quantified from a single point.
Second-source calibration verification	Immediately after each ICAL	All analytes within ± 20% of expected value	Correct problem and verify second-source standard. Rerun second-source verification. If that fails, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position established for each analyte and surrogate	Each ICAL and after the initial daily CCV	Position will be set using the midpoint standard of the ICAL curve. On days when an ICAL is not performed, the CCV is used.	NA	NA
Retention time window width established for each analyte and surrogate	At method setup and after major maintenance (for example, column change)	±3 times standard deviation for each analyte retention time from 72-hour study.	NA	NA
Retention time window verification for each analyte and surrogate	Each calibration verification	Analyte within established window.	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check.	**ICV:** Flagging criteria are not appropriate for initial verification. **CCV:** Apply Q-flag to all results for the specific analyte(s) in the sample that are outside the established window.

ATTACHMENT 3, TABLE 1
Summary of Calibration and Quality Control Procedures for Gas Chromatography Method 7580 (White Phosphorous)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
CCV	Daily, before sample analysis unless ICAL performed on same day, after every 10 samples, and at the end of the analysis sequence	All analytes within ± 15% of expected value (% D).	Correct problem, then rerun. If that fails, repeat ICAL. Reanalyze all samples since last successful calibration verification.	**If reanalysis cannot be performed,** apply Q-flag to all results for the specific analyte(s) >15%D for all samples associated with the calibration verification.
Method blank	One per analytical batch	No analytes detected > ½ LOQ. For common laboratory contaminants no analytes detected > LOQ and see Worksheet #36, Section 36.2.5.	Assess data. Correct problem. If necessary, reprepare and reanalyze method blank and all samples processed with the contaminated blank.	Apply "B" flag to all associated positive results for the specific analyte(s), as appropriate. See Worksheet #36, Section 36.2.5.
LCS for all analytes (must contain all target analytes)	One per analytical batch	Acceptance criteria: Worksheet #15.	Correct problem, then reanalyze. If still out, reprepare and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
MS/MSD	One per 20 project samples per matrix as a minimum and as defined on the chain-of-custody form	Acceptance criteria: Worksheet #15.	Assess data to determine whether there is a matrix effect or analytical error. Review LCS for failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an eval-uation can be made regarding PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: • %R for MS or MSD > upper control limit • %R for MS or MSD < lower control limit • MS/MSD RPD > control limit
Second-column confirmation (not required for Methods 8015B [DRO or GRO]	All positive results	Same as for initial or primary column analysis.	Same as for initial or primary column analysis.	Apply J-flag if RPD > 40% from first column result. Apply Q-flag to all results for the specific analyte(s) in the sample not confirmed.

ATTACHMENT 3, TABLE 1
Summary of Calibration and Quality Control Procedures for Gas Chromatography Method 7580 (White Phosphorous)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process; see Section D.1.2.1 of the DoD QSM[c])	At initial setup and then once per 12-month period or quarterly DL verification	Detection limits established will be ≤ ½ the RL in Worksheet #15 Tables (see 40 CFR, Part 136, Appendix B). For the verification check to be valid, analytes must be detected and identified by method-specified criteria or the verification check must produce a response that is at least 3 times the instrument noise level and greater than the response in the blanks associated with the MDL study.	Continue the MDL study until all criteria are met.	NA.
LOD determination and verification (see Section D.1.2.1 and Box D-13 of the DoD QSM[c])	At initial setup and verified quarterly (if a laboratory uses multiple instruments for a given method, the LOD must be verified on each)	The apparent signal-to-noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If LOD verification fails, the laboratory must (1) repeat the MDL determination and LOD verification at a higher concentration or (2) perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	NA; samples may not be analyzed without a valid LOD.
LOQ establishment and verification (see Section D.1.2.2 and Box D-14 of the DoD QSM[c])	At initial setup (1) verify LOQ; and (2) determine precision and bias at the LOQ; then verify LOQ quarterly (if laboratory uses multiple instruments for a given method, the LOQ must be verified on each; see Box D-14 of the DoD QSM[c])	(1) LOQ and associated precision and bias must meet client requirements and be reported; or (2) in the absence of client requirements, must meet LCS control limits (see Box D-14 of the DoD QSM[c]).	If the LOQ verification fails, laboratory must either establish a higher LOQ or modify method to meet client-required precision and bias.	NA; samples may not be analyzed without a valid LOQ.

ATTACHMENT 3, TABLE 1
Summary of Calibration and Quality Control Procedures for Gas Chromatography Method 7580 (White Phosphorous)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Results reported between the DL and LOD, and the LOD and LOQ	None	None.	None.	Apply F-flag to all results between DL and LOQ. If no result below the LOD, report to the LOD, flag "U."
Demonstrate acceptable analyst capability	Before using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C of DoD QSM[c])	QC acceptance criteria published by DoD, if available; otherwise, method-specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for analytes not meeting criteria (see section C.1.f of DoD QSM[c]).	NA. This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis will be allowed by an analyst until capability is demonstrated.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October.

ATTACHMENT 3, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Mass spectrometer tuning check Use bromofluorobenzene (SW8260B) or decafluorotriphenylphos-phine (SW8270C)	Before ICAL and calibration verification	Refer to criteria listed in method description.	Retune instrument and verify.	Not appropriate.
GC performance check (8270C only or when SW8270 is used for pesticide analyses)	Daily before analysis of sample or calibration standards	Degradation ≤ 20% for DDT. No visible peak tailing for benzidine or pentachlorophenol (as a default, tailing factors should be less than 2.0).	Correct problem, then repeat performance check.	Not appropriate.
Multipoint ICAL for all analytes (minimum five standards)	Before sample analysis	SPCCs: Average RF ≥ 0.30 (SW8260B), ≥ 0.050 (SW8270C) CCCs: % RSD for RFs ≤ 30% and one of the options below; Option 1: Linear—RSD for each analyte < 15%. Option 2: Linear—linear least squares regression r > 0.995 for each analyte. Option 3: Nonlinear—COD ≥ 0.99 (6 points will be used for second order, 7 points will be used for third order). This is not a preferred option.	Correct problem, then repeat ICAL.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL. Calibration may not be forced through the origin.

ATTACHMENT 3, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Second-source calibration verification	Once per ICAL	All analytes within ± 20% of expected value.	Correct problem and verify second-source standard. Rerun second-source verification. If that fails, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position will be set using the midpoint standard of the ICAL curve. On days when an ICAL is not performed, the CCV is used.	NA.	NA.
Retention time window verification for each analyte	Each sample	RRT of the analyte within ± 0.06 RRT units of ICAL. Laboratories may update the retention times based on the CCV to account for minor performance fluctuations or after routine system maintenance (e.g., column clipping. With each sample, the RRT will be compared with the most recently updated RRT. If the RRT has changed by more than ±0.06 RRT units since the last update, there has been a significant change in system performance and the laboratory must take appropriate corrective actions as required by the method and rerun the ICAL to re-establish the retention times.	Correct problem then reanalyze all samples analyzed since the last retention time check.	Apply Q-flag to all results for the specific analyte(s) in the sample that are outside the established window.

ATTACHMENT 3, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
CCV	Daily, before sample analysis (unless ICAL performed on same day), and after every 12 hours of analysis time	SPCCs: Average RF ≥ 0.30 (SW8260B), ≥ 0.050 (SW8270C) CCCs: % RSD for RFs ≤ 30% and All analytes within ± 20% D of expected value from ICAL.	Correct problem, then rerun CCV. If that fails, repeat ICAL.	Apply Q-flag to all results for the specific analyte(s) > 20% D for all samples associated with the calibration verification.
ISs	Each sample, standard, and QC sample	Retention time ± 30 seconds from retention time of the IS in the ICAL midpoint standard. Extracted ion current profile area within -50% to +100% of area from IS in ICAL mid-point standard.	Inspect mass spectrometer and GC for malfunctions and make corrections as appropriate. Reanalysis of samples analyzed while the system was malfunctioning is mandatory.	Apply Q-flag to all results for analytes associated with a failed IS (unless a matrix effect can be verified), then apply M-flag.
Method blank	One per analytical batch	No analytes detected > ½ LOQ. For common laboratory contaminants, no analytes detected > LOQ. See Worksheet #36, Section 36.2.5.	Assess data. Correct problem. If necessary, reprepare and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s), as appropriate. See Worksheet #36, Section 36.2.5.

ATTACHMENT 3, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Worksheet #15.	Correct problem, then reanalyze. If still out, reprepare and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
MS/MSD	One per 20 samples per matrix as a minimum and as defined on the chain-of-custody form	Acceptance criteria: Worksheet #15.	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an evaluation can be made regarding the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > upper control limit (2) %R for MS or MSD < lower control limit (3) MS/MSD RPD > control limit
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Worksheet #15.	Correct problem, then reprepare and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes. If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ-flag to all associated nondetects. If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.

ATTACHMENT 3, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process; see Section D.1.2.1 of the DoD QSM[c])	At initial setup and then once per 12-month period or quarterly DL verification	Detection limits established will be ≤ ½ the RL in Worksheet 15. See 40 CFR, Part 136, Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3 times the instrument noise level and greater than the response in the blanks associated with the MDL study.	Continue the MDL study until all criteria are met.	NA.
LOD determination and verification (see Section D.1.2.1 and Box D-13 of the DoD QSM[c])	At initial setup and verified quarterly (if a laboratory uses multiple instruments for a given method, the LOD must be verified on each)	The apparent signal-to-noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must (1) repeat the detection limit determination and LOD verification at a higher concentration or (2) perform and pass two consecutive LOD verifi-cations at a higher concen-tration. The LOD is set at the higher concentration.	NA; samples may not be analyzed without a valid LOD.
LOQ establishment and verification (see Section D.1.2.2 and Box D-14 of the DoD QSM[c])	At initial setup: (1) verify LOQ; and (2) determine precision and bias at the LOQ; then verify LOQ quarterly (if a laboratory uses multiple instruments for a given method, the LOQ must be verified on each; see Box D-14 of DoD QSM[c]	(1) The LOQ and associated precision and bias must meet client requirements and must be reported or (2) in the absence of client require-ments, must meet LCS control limits. See Box D-14 of the DoD QSM[c].	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	NA; samples may not be analyzed without a valid LOQ.
Results reported between	None	None.	None.	Apply F-flag to all results

ATTACHMENT 3, TABLE 2
Summary of Calibration and Quality Control Procedures for Methods SW8260B, SW8270C, and SW8270C(SIM)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
the DL and LOD, and the LOD and LOQ				between DL and LOQ. If no result below the LOD, report to the LOD, flag "U."
Demonstrate acceptable analyst capability	Before using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C of DoD QSM[c])	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see Section C.1.f of the DoD QSM[c]).	NA. This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis will be allowed by an analyst until capability is demonstrated.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October.

Notes:

D = difference when using RFs or drift when using least square, regression, or nonlinear calibration
RF = response factor
RRT = relative retention time

ATTACHMENT 3, TABLE 3
Summary of Calibration and Quality Control Procedures for Method SW8330B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Minimum five-point initial calibration for target analytes, lowest concentration standard at or below the reporting limit.	Initial calibration prior to sample analysis	Average RF: RSD </= 20%; Linear: r>0.995, intercept < MDL. Apparent S/N ratio of standard at RL (LOQ) must be at least 5:1.	Evaluate standards, chromatography, and detector response. If problem found with above, correct as appropriate, then repeat initial calibration
Second-source calibration verification	Once per ICAL	All analytes within ± 20% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Low standard verification	Immediately following ICAL.	Less than 50 % difference for target analytes;	Evaluate data. If problem (e.g., concentrated standard, plugged injector needle) found, correct, then repeat low-level verification. If still fails, repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
CCV	Daily, before sample analysis unless ICAL performed on same day and every 24 hours of analysis time	All analytes within ± 20% of expected value	Correct problem, rerun CCV. If that fails, repeat initial calibration.	Apply Q-flag to all results for the specific analyte(s) > 30 %D for all samples associated with the calibration verification.
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Worksheet #15.	Correct problem, then reprepare and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes. If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ-flag to all associated nondetects. If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.

ATTACHMENT 3, TABLE 3
Summary of Calibration and Quality Control Procedures for Method SW8330B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Method Blank	One per preparation batch	No target analytes ≥ ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	No target analytes ≥ ½ LOQ in accordance with DoD QSM requirements
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Table 7-4	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected AB.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
Confirmation Analysis	When target analytes detected on the primary column at concentrations > LOD.	Calibration and QC criteria the same as for initial/primary analsyis. Results between primary and secondary column RPD ≤ 40%	Evaluate data, then report with flag to denote RPD > 40%. Narrate obvious matrix issues.	RPD between primary and confirmation analysis ≤ 40%..
Soil Grinding Blank	When puck mill grinding is performed, one blank between each sample processed.	Blank material ground and subsampled as with the samples. Composited prior to analysis. No target analytes detected at > than 1/2 the LOQ	All blanks are reported, and data is flagged/narrated if the criteria are exceeded.	No target analytes ≥ ½ LOQ in accordance with DoD QSM requirements
Grinding Certified Reference Material (CRM)	When puck mill grinding is performed, CRM is ground for every 20 samples ground.	Within the control limits supplied by manufacturer of material	Evaluate the data, narrate any outliers and report.	Manufacturer's acceptance limits.

ATTACHMENT 3, TABLE 3
Summary of Calibration and Quality Control Procedures for Method SW8330B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process, reference Section D.1.2.1 of the DoD QSM)	At initial setup and subsequently once per 12-month period or quarterly DL verification checks.	DL established shall meet 40 CFR, Part 136 Appendix B.	Continue to run the DL study until all criteria are passing	N/A
LOD determination and verification (reference Section D.1.2.1 and grey box D-13 of the QSM)	At initial set-up and verified quarterly. If a laboratory uses multiple instruments for a given method, the LOD must be verified on each	The apparent signal to noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must: 1) Repeat the detection limit determination and LOD verification at a higher concentration; or 2) Perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	Not Applicable, Samples may not be analyzed without a valid LOD.
LOQ establishment and verification (reference Section D.1.2.2 and grey box D-14 of the QSM)	At initial setup: 1) Verify LOQ; and 2) Determine precision and bias at the LOQ. Subsequently, verify LOQ quarterly. If a laboratory uses multiple instruments for a given method, the LOQ must be verified on each. See Box D-14.	1) The LOQ and associated precision and bias must meet client requirements and must be reported; or 2) In the absence of client requirements, must meet control limits of the LCS. See Box D-14 of the DOD QSM.	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	Not Applicable, Samples may not be analyzed without a valid LOD.
Results reported between DL and LOD and the LOD and the LOQ	None	None	None	Apply F-flag to all results between DL and LOQ. If no Detection determined below the LOD, report to the LOD, flag U.

a All corrective actions associated with project work shall be documented, and all records shall be maintained by the laboratory.
b Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

ATTACHMENT 3, TABLE 4
Summary of Calibration and Quality Control Procedures for Method SW6850

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Tuning (Mass Calibration Verification)	Prior to ICAL and after any mass calibration or maintenance is performed.	Quantitation ions within 0.3 m/z of expected mass.	Perform mass calibration on the MS/MS. If required, consult with instrument engineer for further maintenance.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Minimum six-point initial calibration for target analytes, lowest concentration standard at or below the reporting limit	Initial calibration prior to sample analysis	Linear: $r^2 > 0.990$ (r>0.995) with intercept ≤ LOD, or Average Response Factor: RSD≤ 20%.	Evaluate standards, chromatography, and mass spectrometer response. If problem found with above, correct as appropriate, then repeat initial calibration.	Evaluate standards, chromatography, and detector response. If problem found with above, correct as appropriate, then repeat initial calibration
Second-source calibration verification	Once per six-point initial calibration	Perchlorate within ±15% of the true value	Evaluate data. If problem (e.g., concentrated standard, plugged transfer line) found, correct, then repeat second source verification. If it still fails, then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Daily calibration verification	Mid-range standard analyzed before sample analysis, after every 10 samples, and at the end of the sequence.	Perchlorate within ±15% of the true value	Correct problem, then repeat. If still fails, repeat initial calibration	Apply Q-flag to all results for the specific analyte for all samples associated with the calibration verification.
Limit of Detection verification (LODv) (per batch)	Prior to sample analysis and at the end of the analysis sequence.	Perchlorate within ± 30% of the true value	Correct problem. Evaluate samples. Samples with results > RL (LOQ) may be reported. Samples since the last passing LODv with results ≤ RL (LOQ) must be reanalyzed.	Apply Q-flag to all results for the specific analyte for all samples associated with the calibration verification.
Laboratory Reagent Blank	Prior to ICAL, following samples with overrange concentration of perchlorate, and at the end of the analytical sequence.	No perchlorate detected > LOQ	Reanalyze reagent blank (until no carryover seen), and any samples with perchlorate detections since the contaminated blank.	No target analytes ≥ ½ LOQ

ATTACHMENT 3, TABLE 4
Summary of Calibration and Quality Control Procedures for Method SW6850

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Internal Standard	Every Calibration Standard	ICAL: IS for each standard must be within ± 50% of the average area of the ICAL. ICV, CCV: Within ± 50% of the average area of the ICAL or within ± 50% of the 1st CCV of the run, if the ICAL is not run the same day.	Evaluate the system. Reanalyze/repeat the calibration.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples.
Method Blank	One per preparation batch	No target analytes ≥ ½ LOQ in accordance with DoD QSM requirements	Correct problem, then re-extract and reanalyze method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	No target analytes ≥ ½ LOQ
Interference Check Sample (ICS)	One per preparation batch	70% -130%	Reanalyze once. If still outside the acceptance limits, evaluate to determine if cleanup filters or column degradation are suspect, replace appropriate materials and reprepare (filters) or reanalyze (column). Repeat the Interference Threshold Study to deter. If problem still exists, recalibrate.	Recovery as described in DoD Perchlorate Handbook.
IS	During acquisition of calibration standard, samples, and QC check samples	Areas within -50% to +100% of the midpoint of the last ICAL for each sample and QC in accordance with DoD QSM requirements	Inspect LCMS for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning in accordance with DoD QSM requirements	Meets all EPA Method requirements

ATTACHMENT 3, TABLE 4
Summary of Calibration and Quality Control Procedures for Method SW6850

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Isotope Ratio $^{35}CL/^{37}CL$	Every sample, batch QC sample and standard	Monitor for either the parent ion at masses 99/101 or the daughter ion at masses 83/85 depending on which ions are quantified.	Re-extract, re-clean, and/or reanalyze affected sample(s). If problem persists, perform post-spike or dilution as appropriate to confirm presence of perchlorate	Theoretical ratio approx. 3.06 Must fall within 2.3 to 3.8
LCS	One LCS per analytical/preparation batch, spiked at the LOQ.	QC acceptance criteria: 80% to 120% accuracy,15% precision, as per QSM and DoD Perchlorate Handbook	Reanalyze LCS once. If acceptable, report. Otherwise, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	QC acceptance criteria: 80% to 120% accuracy, 15% precision.
MS/MSD	One MS/MSD per batch, spiked at the LOQ.	QC acceptance criteria: 80% to 120% accuracy,15% precision, as per QSM and DoD Perchlorate Handbook	Identify problem; if not related to matrix interference, re-extract and reanalyze MS/MSD in accordance with DoD QSM requirements	QC acceptance criteria: 80% to 120% accuracy, 15% precision.
DL study (as part of the LOD process, reference Section D.1.2.1 of the DoD QSM)	At initial setup and subsequently once per 12-month period or quarterly DL verification checks.	DL established shall meet 40 CFR, Part 136 Appendix B.	Continue to run the DL study until all criteria are passing	N/A
LOD determination and verification (reference Section D.1.2.1 and grey box D-13 of the QSM)	At initial set-up and verified quarterly. If a laboratory uses multiple instruments for a given method, the LOD must be verified on each	The apparent signal to noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must: 1) Repeat the detection limit determination and LOD verification at a higher concentration; or 2) Perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	Not Applicable, Samples may not be analyzed without a valid LOD.

ATTACHMENT 3, TABLE 4
Summary of Calibration and Quality Control Procedures for Method SW6850

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
LOQ establishment and verification (reference Section D.1.2.2 and grey box D-14 of the QSM)	At initial setup: 1) Verify LOQ; and 2) Determine precision and bias at the LOQ. Subsequently, verify LOQ quarterly. If a laboratory uses multiple instruments for a given method, the LOQ must be verified on each. See Box D-14.	1) The LOQ and associated precision and bias must meet client requirements and must be reported; or 2) In the absence of client requirements, must meet control limits of the LCS. See Box D-14 of the DOD QSM.	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	Not Applicable, Samples may not be analyzed without a valid LOD.
Results reported between DL and LOD and the LOD and the LOQ	None	None	None	Apply F-flag to all results between DL and LOQ. If no Detection determined below the LOD, report to the LOD, flag U.

a All corrective actions associated with project work shall be documented, and all records shall be maintained by the laboratory.
b Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

ATTACHMENT 3, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Instrument detection limit study	At initial setup and after significant change in instrument type, personnel, test method, or sample matrix	Instrument detection limits will be < LOD.	NA.	NA.
Linear dynamic range or high-level check standard	Every 6 months	Within ± 10% of true value.	Correct problem, then reanalyze or reset linear range.	Apply J-flag to the specific analyte(s) for all results not within linear range.
ICAL for all analytes (minimum one standard and a blank 3- to 5-point standard preferred)	Daily before sample analysis	If more than one standard is used, correlation coefficient must be ≥ 0.995.	If applicable, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
ICV (second source)	Daily after ICAL	All analytes within ± 10% of expected value.	Correct problem and verify second-source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
CCV (Instrument Check Standard)	After every 10 samples and at the end of the analysis sequence	All analyte(s) within ± 10% of expected value and RSD of replicate integrations < 5%.	Correct problem, then repeat CCV and reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) >10 %D for all samples associated with the calibration verification.
Calibration blank	Before beginning a sample run, after every calibration verification	No analytes detected > LOD.	Correct problem, then analyze calibration blank and previous 10 samples.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate.
Low-level calibration check standard (at or below LOQ)	Daily, after ICAL; not required for multipoint calibration (3 or more points) with low standard at or below LOQ.	Analyte(s) with ± 20% of expected value.	Correct problem, then reanalyze.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the LOQ.

ATTACHMENT 3, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Method blank	One per analytical batch	No analytes detected > ½ LOQ. For common laboratory contaminants, no analytes detected > LOQ. See Worksheet #36, Section 36.2.5.	Assess data. Correct problem. If necessary, reprepare and reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s), as appropriate. See Worksheet #36, Section 36.2.5.
ICS	At the beginning of an analytical run	ICS A: All non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes). ICS AB: Within ± 20% of expected value.	Terminate analysis; locate and correct problem; reanalyze ICS and all associated samples.	Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS. If corrective action fails, apply Q-flag to the specific analyte(s).
LCS for all analytes	One per analytical batch	Acceptance criteria: Worksheet #15.	Correct problem then reanalyze. If still out, reprepare and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
Dilution test	Each new sample matrix, at least once per analytical batch (only applicable for analytes with concentrations > 50 times LOQ)	Fivefold (1+4) dilution must agree within ± 10% of the original determination.	Add post-digestion spike.	Apply J-flag to all sample results for the specific analyte from the same matrix in the batch if either of following exist: (1) dilution test not run and batch had analyte concentrations >50X LOQ or (2) %D ≥10 and post-digestion spike not performed.

ATTACHMENT 3, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Post-digestion spike addition	When dilution test fails or if an analyte's concentration for all samples in a batch is less than 50 times LOQ (<25 for Method SW7470A/ SW7471A)	Recovery within 75–125% of expected results (85-115 for SW7470A/ SW7471A).	Check for instrumental problem, then reanalyze post-digestion spike addition if appropriate.	Apply J-flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition. If post-digestion spike addition recovery is < 10%, apply Q-flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition.
MS/MSD	One per 20 samples per matrix as a minimum and as defined on the chain-of-custody form	Acceptance criteria: Worksheet #15.	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS or failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an evaluation can be made regarding PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL (2) %R for MS or MSD < LCL (3) MS/MSD RPD > control limit

ATTACHMENT 3, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process; see Section D.1.2.1 of the DoD QSM[c])	At initial setup and then once per 12-month period or quarterly DL verification checks	Detection limits established will be ≤ ½ the RL in Worksheet #15 Tables. See 40 CFR, Part 136, Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3X the instrument noise level and greater than the response in the blanks associated with the MDL study.	Continue the MDL study until all criteria are met.	NA.
LOD determination and verification (reference Section D.1.2.1 and Box D-13 Of the DoD QSM[c])	At initial setup and verified quarterly (if a laboratory uses multiple instruments for a given method, the LOD must be verified on each)	The apparent signal-to-noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must (1) repeat the detection limit determination and LOD verification at a higher concentration; or (2) perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	NA; samples may not be analyzed without a valid LOD.
LOQ establishment and verification (see Section D.1.2.2 and Box D-14 of the DoD QSM[c])	At initial setup: (1) verify LOQ and (2) determine precision and bias at the LOQ; then verify LOQ quarterly (if a laboratory uses multiple instruments for a given method, the LOQ must be verified on each; see Box D-14 of the DoD QSM[c]).	1) The LOQ and associated precision and bias must meet client requirements and must be reported; or (2) in the absence of client requirements, must meet control limits of the LCS. See Box D-14 of the DoD QSM[c].	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	NA; samples may not be analyzed without a valid LOQ.

ATTACHMENT 3, TABLE 5
Summary of Calibration and Quality Control Procedures for Method SW6010B and SW7470A/71A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Results reported between the DL and LOD, and the LOD and LOQ	None	None.	None.	Apply F-flag to all results between DL and LOQ. If no result below the LOD, report to the LOD, flag "U."
Demonstrate acceptable analyst capability	Before using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C of the DoD QSM[c])	QC acceptance criteria published by DoD, if available; otherwise method-specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see Section C.1.f of the DoD QSM[c]).	NA. This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis will be allowed by analyst until capability is demonstrated.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October.

ATTACHMENT 3, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS tuning sample	Before ICAL.	Mass calibration ≤ 0.1 amu from the true value. Resolution <0.9 amu full width at 10% peak height. Stability: RSD ≤ 5% for at least four replicate analyses.	Retune instrument then reanalyze tuning solution.	Not appropriate.
ICAL for all analytes (minimum one standard and a blank)	Daily before sample analysis	If more than one standard is used, correlation coefficient must be ≥ 0.995.	If applicable, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
ICV (second source)	After ICAL, before beginning a sample run at a concentration other than used for calibration	All analytes within ± 10% of expected value.	Correct problem and verify second-source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
CCV	After every 10 samples and at the end of the analysis sequence—at a concentration near the middle of the calibration range	All analytes within ± 10% of expected value.	Correct problem, then repeat CCV and reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) >10 %D for all samples associated with the calibration verification.
Calibration blank	Before beginning a sample run, after every 10 samples and at end of the analysis sequence	No analytes detected > LOD.	Correct problem, then analyze calibration blank and previous 10 samples.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate.
Low-level calibration check standard (at or below LOQ)	Daily, after ICAL Not required if multipoint calibration (3 or more points) with low standard at or below LOQ is performed	All analyte(s) with ± 20% of expected value.	Correct problem then reanalyze.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the LOQ.
Linear range calibration (high) check standard	Every 6 months	Analyte within ± 10% of expected value.	Correct problem then reanalyze or reset linear range.	Apply J-flag to the specific analyte(s) for all results not within linear range.

ATTACHMENT 3, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Method blank (Preparation blank)	One per analytical batch	No analytes detected > ½ LOQ For common laboratory contaminants, no analytes detected > LOQ. See Worksheet #36, Section 36.2.5.	Assess data. Correct problem. If necessary, reprepare and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See Worksheet #36, Section 36.2.5.
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run or once during an 12-hour period, whichever is more frequent	**ICS-A:** All non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes). **ICS-AB:** Within ± 20% of expected value.	Terminate analysis; locate and correct problem; reanalyze ICS; reanalyze all affected samples.	Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS. If corrective action fails, apply Q-flag to the specific analyte(s).
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Worksheet #15.	Correct problem then reanalyze. If still out, reprepare and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
Dilution test	Each matrix in a analytical batch (only applicable for analytes with concentrations ≥ 100X LOD)	Fivefold (1+4) dilution must agree within ± 10% of the original determination.	Add post-digestion spike.	Apply J-flag to all sample results for the specific analyte from the same matrix in the batch if either of following exist: (1) dilution test not run and batch had analyte concentrations ≥100 times LOD or (2) % D ≥ 10 and post-digestion spike not performed.

ATTACHMENT 3, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Post-digestion spike addition	When dilution test fails or if an analyte's concentration for all samples in a batch is less than 100X LOD	Recovery within 75–125% of expected results.	Dilute the sample; reanalyze post-digestion spike addition.	Apply "J" flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition. If post-digestion spike addition recovery is < 10%, apply "Q" flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition.
MS/MSD	One per 20 samples per matrix	Acceptance criteria: Worksheet #15.	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an evaluation can be made regarding PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL, (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > control limits
ISs	Every sample	IS intensity within 30-120% of intensity of the IS in the ICAL.	Perform corrective action as described in Method SW6020, Section 8.3.	Flagging criteria are not appropriate. No samples may be analyzed without a valid IS response.
Instrument detection limit study	At initial setup	Detection limits established will be ≤ LOD.	None.	NA. Samples cannot be analyzed without a valid instrument detection limit.

ATTACHMENT 3, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
DL study (as part of the LOD process; see Section D.1.2.1 of the DoD QSM[c])	At initial setup and then once per 12-month period or quarterly DL verification.	Detection limits established will be ≤ ½ the RL in Worksheet #15 tables. See 40 CFR, Part 136 Appendix B. Analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3 times the instrument noise level and greater than the response in the blanks associated with the MDL study.	Continue to run the MDL study until all criteria are passing.	NA.
LOD determination and verification (see Section D.1.2.1 and Box D-13 of the DoD QSM[c])	At initial setup and verified quarterly. If a laboratory uses multiple instruments for a given method, the LOD must be verified on each	The apparent signal to noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must: (1) Repeat the detection limit determination and LOD verification at a higher concentration; or (2) Perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	NA; samples may not be analyzed without a valid LOD.
LOQ establishment and verification (see Section D.1.2.2 and Box D-14 of the DoD QSM[c])	At initial setup: (1) verify LOQ and (2) determine precision and bias at the LOQ; then verify LOQ quarterly (if a laboratory uses multiple instruments for a given method, the LOQ must be verified on each; see Box D-14 of the DoD QSM[c])	(1) The LOQ and associated precision and bias must meet client requirements and must be reported; or (2) In the absence of client requirements, must meet control limits of the LCS. See Box D-14 of the DoD QSM[c].	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	NA; samples may not be analyzed without a valid LOQ.

ATTACHMENT 3, TABLE 6
Summary of Calibration and Quality Control Procedures for Method SW6020A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Results reported between the DL and LOD, and the LOD and LOQ	None	None.	None.	Apply F-flag to all results between DL and LOQ. If no result below the LOD, report to the LOD, flag "U."
Demonstrate acceptable analyst capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C of the DoD QSM[c])	QC acceptance criteria published by DoD, if available; otherwise method-specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see Section C.1.f of the DoD QSM[c]).	NA. This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis will be allowed by an analyst until capability is demonstrated.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.

[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October.

ATTACHMENT 3, TABLE 7
Summary of Calibration and Quality Control Procedures for Method SW8290 (Dioxins and Furans)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS tuning check (use PFK)	Before initial calibration or calibration verification and after every 12-hour period	Tune the instrument to meet the minimum resolving power of 10,000 at m/z 304.9824. Ensure that the exact mass of m/z 380.9760 is within 5 ppm of the required value. Monitor the lock mass selected ion current profile.	Retune instrument; verify. Rerun affected samples.	Not appropriate
GC column performance check	Before initial calibration or calibration verification	Peak separation between 2,3,7,8-TCDD and other TCDD isomers valley of ≤ 25%. and First and last eluters of all eight homologue retention time windows identified labeled (F/L) on the chromatogram and Absolute retention times for switching from one homologous series to the next > 10 seconds for all components of the mixture	Correct problem then repeat column performance check.	Flagging criteria are not appropriate.
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Before sample analysis, as needed by failure of routine calibration verification standard, or when a new lot is used for standard source of CCV, sample fortification solution (IS), or recovery standards	Ion abundance ratios in accordance with Table 8 of Method SW8290 and S/N ratio ≥ 10 for all target analyte ion current profiles and % RSD ± 20% for 17 unlabeled standards and % RSD ± 30% for the 9 labeled IS.	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.

ATTACHMENT 3, TABLE 7
Summary of Calibration and Quality Control Procedures for Method SW8290 (Dioxins and Furans)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Routine (continuing) calibration check (Use HRCC-3 calibration standard) (CCV)	At the beginning of each 12-hour period (after successful GC resolution and MS resolution checks), and at the end of 12-hour shift.	Ion abundance ratios in accordance with Table 8, Method SW8290 and RF within ± 20% D for unlabeled standards from mean RF from initial calibration and RF within ± 30% for labeled standards from mean RF from initial calibration **End of run CCV only:** If the RF for an unlabeled or labeled standard fails by ≤ 5% in the final CCV, a new "daily" mean RF may be calculated using the initial and final RF values and used to determine the specific analyte concentrations for all samples analyzed during the shift.	Correct problem, repeat calibration verification standard one more time. If that fails, then repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification. Evaluation of corresponding labeled/unlabeled standards may impact the corrective action required. **End of run CCV:** If the RF for an unlabeled or labeled standard fails by > 5% in the final CCV, run a new ICAL immediately (within 2 hours) and use the new RF values to process the samples. Alternatively, reanalyze all samples with positive detections.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified. **End of run CCV:** Apply Q-flag to all results for the specific analyte(s) in the sample which are not reprocessed or reanalyzed.

ATTACHMENT 3, TABLE 7
Summary of Calibration and Quality Control Procedures for Method SW8290 (Dioxins and Furans)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
PCDD/PCDF identification	Verify all sample positive detections per Method SW8290	Retention time of sample components in accordance with stated criteria in Method SW8290 (Section 7.8.4.1) and Ion abundance ratios for all analytes, ISs, and recovery standards in accordance with criteria in Method SW8290 (Table 8, Section 7.8.4.2) and S/N ratio of all labeled analytes ≥ 10 times background noise (Method SW8290 Section 7.8.4.3) and S/N ratio of all remaining analyte ions ≥ 2.5 times background noise (Method SW8290 Section 7.8.4.3) and For PCDF, no signal present having a S/N ratio ≥ 2.5 for the corresponding ether (PCDPE) detected at the same retention time (± 2 sec, (Section 7.8.4.4)	Correct problem, then reprep and reanalyze the sample(s) with failed criteria for any of the internal, recovery, or standards. If PCDPE is detected or if sample peaks present do not meet all identification criteria, calculate the EMPC (estimated maximum possible concentration) according to Method SW8290 Section 7.9.5.2.	Flagging criteria are not appropriate. Positive identification of 2,3,7,8-TCDF on the DB-5 or equivalent column must be confirmed on a column capable of isomer specificity (DB-225) (see Method SW8290 Section 3.4). If peak identification criteria are met but ion abundance criteria fail for the analyte and IS, the sample should be presumed to have interfering contaminants. The sample should be rerun or the extract reanalyzed.
ISs	Every sample, standard, and QC sample.	Percent recovery for each IS (before any dilutions) within 40–135% (Method SW8290 Section 8.4)	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while the system was malfunctioning is mandatory.	Apply Q-flag to all results for analytes associated with a failed IS unless a matrix effect can be verified, then apply M.
Sample specific estimated detection limit (EDL)	Every sample that indicates nondetects or detections that are < 2.5 times background noise	Method 8290 Section 7.9.5 describes the calculation	N/A	N/A
Sample estimated maximum possible concentration (EMPC)	If PCDPE is detected or if sample peaks present do not meet all ion abundance ratio criteria	Method 8290 Section 7.9.5 describes the calculation	N/A	Apply J-flag to all EMPC values.

ATTACHMENT 3, TABLE 7
Summary of Calibration and Quality Control Procedures for Method SW8290 (Dioxins and Furans)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Method Blank	Minimum one per preparation batch. A method blank is required after a calibration run and before any sample run.	No analytes detected > ½ LOQ	Assess data and correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s), as appropriate.
MS/MSD	One MS/MSD per every 20 samples per matrix	Acceptance criteria: Tables 7-2 and 7-3	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to CH2M HILL so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > CL
Sample duplicate	One per analytical batch. This may be replaced by the MSD.	Acceptance criteria: Tables 7-2 and 7-3	Verify instrument performance, review analytical procedures.	For the specific analyte(s) in parent sample, apply J-flag.
Results reported below the lowest standard	None	None	None	Apply F-flag to all results below the lowest calibration standard.

[a]All corrective actions associated with project work will be documented, and all records will be maintained by the laboratory.
[b]Flagging criteria will be applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.
[c]DoD. 2010. *DoD Quality Systems Manual for Environmental Laboratories*. Version 4.2. October

APPENDIX G

OPEN BURN/OPEN DETONATION UNITS MANAGEMENT

APPENDIX G

OPEN BURN/OPEN DETONATION UNITS MANAGEMENT

All Waste Treatment Activities were terminated at the EOD Range (Open Burn/Open Detonation Units) in late 2010. The information provided in this appendix is submitted to address the previously applicable miscellaneous unit Part B permit application requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), incorporating 40 CFR §270.23, and 20.4.1 NMAC, Subpart V, incorporating 40 CFR §264, Subpart X. Thermal treatment requirements in 20.4.1 NMAC, Subpart VI, incorporating 40 CFR §265, Subpart P are also addressed. This appendix provides an overview of [previous] operations and waste management practices for the open burn (OB) and open detonation (OD) units, at the Explosive Ordnance Disposal (EOD) Range, on Kirtland Air Force Base (KAFB), and complements the information provided in Section 2.0 of this Part B permit renewal application. It includes detailed descriptions of the OB and OD treatment units and [previous] operational and waste management practices associated with them. Requirements for treatment effectiveness; ignitable, reactive, and incompatible wastes; security and access; and preparedness and prevention are also discussed. Applicable regulatory references for miscellaneous units and the corresponding location where the requirement is addressed in this Part B permit renewal application are summarized in Table 1-1.

The OB and OD units at the EOD Range were managed by the EOD Branch at KAFB. They are currently inactive and a [Proposed] Closure Plan was submitted to the Hazardous Waste Bureau. While active (prior to August 2010) EOD personnel were responsible for the safe handling and treatment of explosive waste and explosive-contaminated waste at KAFB.

G.1 OPEN BURN/OPEN DETONATION UNITS

The EOD Range at KAFB is located southeast of the former Manzano Base and approximately two miles north of the southern boundary of KAFB (Figure A-2). The OB and OD units located at the EOD Range, and were used to treat (i.e., burn or detonate) explosive and explosive-contaminated hazardous wastes to remove the characteristics of reactivity (D003) and ignitability (D001). The waste treated included explosives, propellants, and pyrotechnics in the form of pure substances; expired or unserviceable munitions; and explosive-contaminated waste items. Examples of [previous] potential hazardous items treated at the OB and OD units are presented in Tables B-2 and B-3 of Appendix B in this Part B permit renewal application. The hazardous waste [previously] treated at the OB and OD units were mostly in

solid form; however, on occasion, material in liquid form (e.g., picric acid) was treated at these units. The design and construction of both units are described below. Releases from the EOD Range that may have been harmful to human health or the environment were minimized by the location, design, and/or construction of the miscellaneous units.

The distance from the OB and OD units to the Isleta Indian Reservation (the nearest property boundary) is approximately two miles, and the distance to the Solar Optical Research (SOR) Facility (the nearest on-site building) is approximately one mile. The distance to the nearest off-site buildings exceeds four miles, and the distance to Eubank Boulevard (the closest public roadway) is over five miles. The nearest passenger railroad (Amtrak near Rio Bravo and Second Street) is 10.5 miles from the OB and OD units, and the distance to the closest human receptors (at the SOR Facility) is approximately one mile. Ecological receptors are in the immediate area of the OB and OD units (e.g., lizards, mice).

Treatment events at the OB and OD units were never conducted simultaneously (i.e., at both units at the same time). However, events may have been conducted within the same 24-hour period.

G.1.1 Open Burn Unit (while active, until 2010)

The OB unit consisted of a stationary steel container located on a concrete pad, surrounded by concrete walls on three sides. The eight-inch-thick concrete pad is 30.5 feet (ft) long by 10.5 ft wide, and the one-ft-thick concrete walls are 21.5 ft long, 10.5 ft wide, and 9 ft high. The northern portion (approximately 19 ft) of the reinforced concrete pad was level, and a two-ft-wide by approximately six-inch-high containment “hump” was located at the southern extent of the level portion of the pad to prevent run-on into or runoff from the concrete pad. The remaining portion (approximately 9 ft) of the concrete pad was sloped gently to the south, which allowed ease of vehicular access to unload wastes for treatment at the unit (see Supplement G-1 for additional details of the concrete pad and walls). The location of the OB unit at the EOD Range is shown on Figure A-2. The distance from the OB unit to the nearest electric power lines, located north of the OD unit, is approximately 3,750 ft. The distance to the nearest adjacent facility is approximately one mile.

The rectangular steel burn container, constructed of heavy-duty steel, is the equivalent of a Cooper Tank Roll-Off Container, with a capacity of 12 cubic yards. It is 11 ft long, with an inner height of 4.3 ft and an overall height of 5.25 ft; the base was approximately 11

inches above the concrete pad, which served as secondary containment. The walls of the container are constructed of 11-gauge steel. A heavy-duty steel door was located at one end of the container, which was opened during waste placement and ash residue removal.

The OB unit had a retractable, galvanized-steel cover, which was rolled manually into place with pull chains along a steel framework (C-channels) during non-operational periods. The cover was slightly inclined in the horizontal plane to prevent precipitation from entering the unit. When rolled into place after a treatment event, the cover also acted to prevent ash residue from being blown from the unit by wind until the residue could be safely removed from the unit for subsequent treatment and/or disposal. On the northwest side of the OB unit a soil berm, approximately 10 ft. high, protected the unit from shock waves resulting from detonations at the nearby OD unit.

G.1.2 Open Detonation Unit (while active, until 2010)

The OD unit consisted of a cleared area surrounded and delineated by the inner fence and an earthen berm, which was approximately two ft high. The approximately four-ft-high, three-strand barbed-wire inner fence is located just inside the earthen berm. The cleared area was bladed routinely to minimize fire danger, and a series of four concentric firebreaks were maintained beyond the inner fenced area. The location of the OD unit at the EOD Range is shown on Figure A-2. OD was conducted on the ground surface (on or in the ground), typically in trenches excavated for this purpose or in a a pre-existing crater. Both trenches and craters served to mitigate potential fires and fragmentation.

G.2 OPERATIONAL PROCEDURES AND WASTE MANAGEMENT PRACTICES

This section describes the operational procedures previously used to stage and treat wastes at the OB and OD units. Waste management practices previously used to manage the OB unit residues are also discussed. In addition, information on treatment effectiveness; ignitable, reactive, and incompatible wastes; security and access; and preparedness and prevention are presented herein.

KAFB minimized the impact to the environment by conducting OB and OD treatment operations in a controlled, remote area within the KAFB facility boundary. Treatment was conducted in accordance with the procedures in the most current Air Force technical manuals (e.g., Air Force Manual 91-201, United States Air Force [USAF], 2001; Technical Manual T.O. 11A-1-42, USAF, 2000; Branch Instruction 32-3001, KAFB, 2002), which are summarized herein. These manuals and instructions were updated periodically (while the Units were active) and are not included

with this Part B permit renewal application; however, copies can be viewed upon request for informational purposes only. Compliance with the procedures in these manuals and instructions was ensured by the EOD Branch Chief for all treatment operations, and the safe conduct of each treatment operation was the responsibility of the designated Range Safety Officer (RSO).

Treatment of hazardous waste at the OB and OD units was conducted using a non-continuous [batch] thermal treatment process that required a complete thermal cycle to treat a discrete quantity of hazardous waste, in accordance with 20.4.1 NMAC incorporating 40 CFR §265.373. The maximum amount of hazardous waste that could be treated at the EOD Range was 1,500 pounds (lbs.) net explosive weight (NEW) per treatment event; this amount required a minimum distance of 1,730 ft from adjacent properties in accordance with 20.4.1 NMAC incorporating 40 CFR §265.382. The closest property not owned by KAFB was at a distance greater than 1,730 ft from the OB and OD units at the EOD Range. Therefore, a safe distance was maintained between the treatment sites and the property of others, as required in 20.4.1 NMAC incorporating 40 CFR §265.382.

Potential Noise Pollution resulting from treatment activities was mitigated by conducting treatment in a remote area within the KAFB boundary. Although offensive noise level readings were never taken in the immediate vicinity of the EOD Range, it is reasonable to assume that the noise level exposure to the nearest public receptor (greater than 1730 ft.) away was within acceptable limits.

KAFB did not measure ground vibration during OD treatment operations. Due to the remote location of the unit, potential impacts to human health and the environment resulting from ground vibration were reasonably assumed to be minimal.

G.2.1 General OB/OD Procedures (Previous)

Until all treatment activity was terminated in 2010, the maximum hazardous waste treatment capacity of each unit (i.e., the EOD Range limit or operating acceptance limit) was 1,500 lbs. NEW uncased explosives or 200 lbs. cased munitions per treatment event. Hazardous and nonhazardous waste was treated together during a single OB event, and the maximum total quantity of combined waste (i.e., the operating acceptance limit) during such treatments was 5,000 lbs. The OB unit could be used to treat up to 80,000 lbs. NEW of hazardous wastes per year. The OD unit could be used to treat up to 100,000 lbs. NEW of hazardous wastes per year. The frequency of operations at the OB and OD units varied, as treatment events were conducted on an as-needed basis.

The minimum number of EOD personnel necessary were used to safely perform operations conducted such treatment at the EOD Range. A minimum of 2 persons were present for each

treatment event. When escorted visitors were present to observe the treatment operations, there was one EOD Technician/Specialist for every three casual observers.

All waste treated at the EOD Range was screened and verified prior to treatment. Screening was performed prior to transport to the EOD Range to ensure that the waste met the [previous] operating acceptance limits indicated above. Only waste that met the operating acceptance limits was transported to the EOD Range and accepted for treatment. Verification was performed at the EOD Range in two phases to ensure that the shipping documentation was complete and the waste delivered corresponded to the screened documentation provided for the waste. Waste was not accepted until all verification was complete. For Phase 1, the shipping document was checked upon receipt of a waste shipment at the EOD Range to verify the quantity of the waste, the number and type of containers, and the basic waste description. Any discrepancies were resolved with the waste generator before the shipping document was signed by EOD personnel. A waste shipment was rejected and returned to the generator if discrepancies couldn't be resolved. For Phase 2, the appointed EOD Team Chief visually compared the contents of the waste upon removal from its outer container at the EOD Range with the description on the documentation provided by the generator. The visual inspection included content identification and quantity estimation. If any waste failed the screening and/or verification process, it was either not accepted at the EOD Range or was returned to the generator prior to acceptance to resolve the discrepancy.

Waste was not transported to or accepted for treatment at the EOD Range unless all preparations for treatment had been completed. Use of the range was scheduled, and an Range Safety Officer (RSO) and a Team Chief for the treatment operation were assigned. Prior to conducting operations at the EOD Range, the Team Chief verified that the appropriate agencies were notified of the treatment operation and that required permits and clearances had been obtained. In addition, EOD personnel assembled equipment and tools (e.g., shovels, hand tools, as needed),communication devices, operating instructions, and explosives (if required) needed for the treatment operation.

Upon arrival at the EOD Range, an inspection of the appropriate unit was conducted. The range flag was raised and the wastes to be treated were secured in a designated holding area. The Team Chief identified the designated RSO and briefed other EOD team members and escorted visitors (when applicable) on the operation being performed, required safety precautions, and emergency procedures, and instructed all those present to be watchful for unsafe conditions at all times. The Team Chief assigned specific tasks to the EOD team members for each event.

Explosive materials were packaged for transport to the EOD Range in an appropriate container that provided protection equivalent to U.S. Department of Transportation (DOT)-authorized containers. Appropriate containers included the following:

- DOT-authorized containers;
- Reinforced ammunition containers;
- Strong fiberboard boxes; and
- Strong, cleated wooden boxes.

Waste to be treated was transported to the EOD Range on the day of the planned treatment event via roads within the KAFB boundary, including Southgate Avenue, Hardin Boulevard, Pennsylvania Street, Wyoming Boulevard, Lovelace Road, and Demolition Range Road. Waste containers were secured to the vehicle during transport. Vehicles transporting explosive wastes and explosives bore the appropriate “Explosives” placards at the front, on both sides, and the rear of the vehicle. These signs were covered or removed when the vehicle no longer carried the explosive wastes or explosives. Each transport vehicle carried two portable fire extinguishers that were in operational condition.

Waste containers were unloaded from the transport vehicle by qualified personnel. Outer waste containers were removed, and the waste was placed in the appropriate unit by qualified EOD Technicians/Specialists (see Section G.2.2 for additional information on waste staging). The waste was maintained at a safe distance from sources of ignition or heat until treatment took place. Unloading and waste placement were done manually or with heavy equipment.

Prior to the initiation of treatment, the Team Chief ensured that the range was clear of unauthorized personnel, that aircraft were not approaching the EOD Range, and that unauthorized vehicles were not within the EOD Range. The Team Chief also ensured that all authorized personnel at the range were in the personnel bunker, which provided protective cover. In addition, the Team Chief obtained final wind speed information from the solar-powered meteorological tower, located near the personnel bunker, to ensure that the wind speed didn’t exceed operating limits. Initiation for all operations was performed remotely by the RSO or his designee from the personnel bunker, located approximately 900 ft north of the inner fenced area. The personnel bunker was a reinforced concrete structure under an earthen cover.

Burning of waste in the OB unit was facilitated by using wood (e.g., wooden pallets) and a flammable liquid, such as diesel fuel, to initiate and sustain the burn and effectively remove the characteristics of reactivity and ignitability. Burn temperatures ranged from 1,500 to 2,000

degrees Fahrenheit (°F) (815 to 1,093 degrees Celsius [°C]). Most explosive and explosive-contaminated waste burns well enough that no additional source of heat was needed. The burn operation was monitored until the operation was complete. Treatment at the OB unit was considered complete when there was no longer any audible or visual (i.e., visible flame observed above the rim of the OB unit container) evidence of explosive destruction. Detonation of waste in the OD unit was performed using bulk explosives to countercharge the hazardous waste and effectively remove the characteristics of reactivity and ignitability. The detonation created temperatures up to 3,000°F (1,649°C). Treatment at both units was typically initiated by preparing an ignition train and effecting ignition. Electrical and non-electrical firing systems could be used to effect ignition at both units. Treatment at the OD unit was considered complete once the wastes were detonated.

The Team Chief or his designee was responsible for clearing any misfires. During any such event, a second qualified person served as a safety backup. A post-detonation inspection of the range was conducted to ensure that no fires resulted from the OD treatment operation.

After each treatment event, the treatment unit used was cleared of residue. For safety reasons, an inspection for residue at the OB unit was not conducted for at least 12 hours after the treatment operation was complete, and removal of any residue or reuse of either unit did not normally occur for a minimum of 24 hours. The door to the OB unit remained closed and the cover remained retracted for 24 hours after a burn. If any reactive waste remained after burning, it was segregated and treated again with the next scheduled burn to ensure that the characteristic of reactivity was removed. In the unlikely event that complete destruction of reactive wastes was not achieved at the OD unit, those wastes were treated again the same or the following day, as conditions allowed.

Treatment operations were not conducted during adverse atmospheric conditions. Operations were not conducted when lightning was within five miles or when extreme fire hazard conditions existed and wind speeds exceeded 10 miles per hour (mph). Operational procedures required that treatment at the OB unit could not be undertaken when wind speeds exceeded 15 mph, or on “No Burn” days designated by the City of Albuquerque Environmental Health Department Air Pollution Control Division. Operational procedures required that treatment at the OD unit would not be undertaken when wind speeds exceeded 20 mph; during sand, dust, or snow storms; when the cloud ceiling was less than 1,000 ft above the highest altitude of expected fragmentation; or when visibility was less than five miles.

G.2.2 Waste Staging (Previous)

Containerized hazardous wastes were transported to the EOD Range and staged for treatment by appropriately trained EOD personnel. Safety concerns dictated that these wastes were treated as soon as possible after arrival at the EOD Range. Typically, wastes were not staged unless they could be treated promptly. The inner containers, if present, were removed from the outer containers just before placement at the respective unit. The outer containers were returned to the generator for reuse. Inner containers were then staged in the appropriate treatment unit. At the OB unit, wastes were unloaded near the unit, then typically placed on wooden pallets (along with the donor charge) to help facilitate the burn. At the OD unit, wastes (including waste propellants) were unloaded with extreme care.

Waste was not stored at the OB or OD units for any purpose and was only present during planned treatment events. However, if for some reason a treatment event was aborted after the OB unit was loaded with waste and it was deemed unsafe to remove the waste, the OB unit could be be covered with the retractable cover, and the waste remained at the unit until it was possible to perform the treatment or safely remove the waste. If waste was placed in the OD unit and site conditions were deemed unsafe to detonate, the waste was removed and sent back to the generator until such time as the event could be rescheduled.

G.2.3 Waste Management Practices (Previous)

Hazardous wastes were treated at the EOD Range to remove the characteristics of reactivity and, for some wastes, ignitability. Toxicity characteristic metals and organic compounds that were present in the wastes treated at the EOD Range, and any metals (when present) could not be destroyed by OB. They remained in the residues, which were characterized by sampling and analysis for appropriate Toxicity Characteristic Leaching Procedure metals, organic compounds, and other underlying hazardous constituents, as needed, or by knowledge of process (KOP). The ash and other residues remaining after treatment in the OB unit were managed appropriately. If the analysis or KOP indicated that the residues from OB treatment were hazardous, the containerized residues were sent to a permitted off-site Subtitle C facility for subsequent treatment and disposal. When the analysis or KOP indicated that the residues from OB treatment were not hazardous, they were sent to a permitted off-site Subtitle D facility for disposal.

Operating procedures required that no ash be collected or removed for 24 hours following a burn. In accordance with this requirement, ash was usually sampled, (when necessary) within

three working days after the 24-hour period, unless a visual inspection indicated the waste needed to be treated again. In this case, the segregated waste requiring additional treatment was left in the OB unit, covered, and treated again as soon as conditions allowed. Containers of residue were stored temporarily within the bermed area of the OB unit's concrete pad, pending analysis (when necessary), after which they were sent off site for further treatment and/or disposal.

G.2.4 Treatment Effectiveness (Previous)

To address the applicable miscellaneous unit requirement specified in 20.4.1 NMAC incorporating 40 CFR §270.23(d), a demonstration of treatment effectiveness was included for the OB and OD units. As indicated in the U.S. Army Environmental Hygiene Agency (AEHA) guidance document titled "RCRA Part B Permit Writer's Guidance Manual for Department of Defense Open Burning/ Open Detonation Units" (AEHA, 1987) and in 20.4.1 NMAC incorporating 40 CFR §270.23(d), a demonstration of treatment effectiveness can be based on laboratory or field data. Detonation created temperatures in excess of 3000°F (1649°C), and burn temperatures typically reached 1500 to 2000°F (815 to 1093°C). As a result, these minimum temperatures were generally sufficient to degrade the hazardous wastes treated at the EOD Range.

G.2.5 Ignitable, Reactive, and Incompatible Wastes (Previous)

Applicable requirements for the management of ignitable and reactive wastes at the OB and OD units are addressed in Section 2.5 of this Part B permit renewal application. Incompatible wastes were not managed at the OB and OD units. This information is provided to meet the requirements of 20.4.1 NMAC incorporating 40 CFR §270.14(b)(9), and 20.4.1 NMAC incorporating 40 CFR §264.17.

G.2.6 Security and Access (Previous)

The following describes the security features that were in place at the KAFB facility and at the EOD Range during treatment operations (until all treatment activity was terminated in 2010), in accordance with the requirements of 20.4.1 NMAC incorporating 40 CFR §264.14, and 20.4.1 NMAC incorporating 40 CFR §270.14(b)(4) and §270.14(b)(19)(viii).

(Current) The EOD Range is located within KAFB, which has 24-hour security surveillance and means to control entry to the facility through entrance gates at all times. Surveillance is provided by KAFB Security Police, who continuously monitor and control entry inside the KAFB perimeter. The major duties of the KAFB security personnel are to control vehicle, personnel,

and material access/egress. The KAFB facility is enclosed by a 7.5-ft chain-link and barbed-wire fence, and during non-working hours, the KAFB perimeter fence is patrolled routinely by security personnel. Access to KAFB is provided through five controlled entrance gates. KAFB access control procedures are designed to ensure that only properly identified and authorized persons, vehicles, and property are allowed entrance to and exit from KAFB.

(Current) The OB and OD units at the EOD Range are surrounded by two three-strand barbed-wire industrial fences that are approximately four ft high; the outer fence is located along the outer perimeter of the range, and the inner fence, which delineates the boundary of the OD unit, is located just inside the berm that surrounds the OD unit. The height of three-strand barbed wire fences is sufficient to prevent the unknowing entry of persons or livestock into the OB and OD units. A gate is located at the entrance road to the EOD Range, and this gate is locked except when EOD personnel enter the area for inspections or treatment operations. In accordance with 20.4.1 NMAC incorporating 40 CFR §270.14(b)(19)(viii), the locations of the security fences and the access gate at the EOD Range are shown on Figure A-3 in Appendix A of this Part B permit renewal application.

(Current) Warning signs are posted near the entrance gate to the EOD Range and at approximately 300-ft intervals along the outer fence. The warning signs, which can be seen by personnel approaching the area, state “Danger—Explosive Disposal Range—Keep Out” in English, and “Explosivos Disposicion Area—Privado” in Spanish. The warning signs are legible from a distance of 25 ft.

(Previous) An access control system was maintained at the EOD Range to control entry to the active portion of the range. The entrance gate was kept closed and locked, except when EOD personnel entered the area for inspections or treatment operations. During treatment operations, the gate remained open in case emergency vehicle access was required; however, unauthorized entry was prevented because any vehicle entering would have to drive by the personnel bunker, where it would be stopped before entering the active portion of the range. All visitors to the EOD Range are escorted by EOD personnel. Collectively, the security procedures and features discussed above prevented the unknowing entry and minimized the possibility for the unauthorized entry of persons or livestock into the active portion of the EOD Range, in accordance with the requirements of 20.4.1 NMAC incorporating 40 CFR §264.14(b)(2).

G.2.7 Preparedness and Prevention Requirements (Previous)

These sections present how the OB and OD unit operations complied with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, incorporating 40 CFR §264, Subpart C.

G.2.7.1 Required Equipment

In accordance with the requirements of 20.4.1 NMAC incorporating 40 CFR §264.32, the OB and OD units were equipped with adequate emergency equipment, which included internal communication equipment, fire extinguishers, and fire and spill control equipment. Emergency equipment available at the EOD Range is discussed in the following sections.

An internal communications or alarm system capable of providing immediate emergency instructions to facility personnel was provided, as required by 20.4.1 NMAC incorporating 40 CFR §264.32(a). In addition, 20.4.1 NMAC incorporating 40 CFR §264.32(b) required that a telephone or two-way radio capable of summoning emergency assistance also be available. Treatment activities at the EOD Range were conducted only after notifying the KAFB Command Post (KCP). Whenever hazardous wastes were handled at the OB and OD units, two EOD personnel (at minimum) were involved in the operation. EOD personnel were equipped with two-way radios, capable of providing immediate emergency instructions and to summon assistance, if required. Hand-held radios were carried by EOD personnel and could be used for internal communications with EOD Control, the KCP, and the KAFB Fire Department.

As required by 20.4.1 NMAC incorporating 40 CFR §264.32(c), the vehicles used at the EOD Range carried portable fire extinguishers, shovels, and hand tools, for use if an unplanned fire occurred at the OB and OD units. A portable fire extinguisher was also kept at the EOD personnel bunker for response to unusual conditions, including unplanned fires. Because hazardous waste was not stored at the units, an unplanned fire would not have impacted the treatment units. A range fire due to treatment was unlikely because there were four concentric firebreaks surrounding the inner fenced area. In addition, OB treatment was conducted in a steel container, which was surrounded by concrete walls. There were no range fires resulting from treatment activity at either unit.

Shovels carried in the vehicles utilized at the EOD Range could be used to manage potential spills at the OB unit. Appropriate personal protective equipment was also available for use at the EOD Range.

Eyewash solutions were a component of the first-aid kits carried in the vehicles used at the EOD Range. These solutions could be used to decontaminate the eyes or skin of EOD personnel in the event any exposure to hazardous waste occurred.

Due to the isolated location of the OB and OD units and the EOD Range, there were no continuous supplies of fire control water at these units. Instead, the KAFB Fire Department was on call during any OB or OD treatment operation, and within minutes could provide tanker trucks equipped with water at adequate volume and pressure to fight potential fires, as required by 20.4.1 NMAC incorporating 40 CFR §264.32(d).

G.2.7.2 Testing and Maintenance of Equipment (Previous)

Communications systems, fire protection equipment, and decontamination equipment associated with the OB and OD units was tested and maintained according to the inspection schedule detailed in Appendix C of this Part B permit renewal application. The frequency of inspection was adequate to assure proper operation in the event of an emergency, as required by 20.4.1 NMAC incorporating 40 CFR §264.33. Repair and replacement of emergency equipment was performed, as needed.

G.2.7.3 Access to Communications or Alarm Systems (Previous)

Whenever treatment operations were conducted at the OB and OD units, personnel had immediate access to an emergency communication devices, either directly or through visual or voice contact with other individuals, in accordance with 20.4.1 NMAC incorporating 40 CFR §264.34. In the event of an emergency, hand-held radios allowed personnel to contact the KCP.

G.2.7.4 Space Requirements (Previous)

Adequate space was maintained at the OB and OD units to allow the unobstructed movement of personnel, fire-protection equipment, and decontamination equipment to any area of the EOD Range operations in the event of an emergency, as required by 20.4.1 NMAC incorporating 40 CFR §264.35.

G.2.7.5 Support Agreements with Outside Agencies

Since OB and OD Treatment Activities were terminated in 2010, Support Agreements required under 20.4.1 NMAC incorporating 40 CFR §264.37 are no longer required and hence expired.

G.2.7.6 Preventive Procedures, Structures, and Equipment (Previous)

Descriptions of the preventive procedures, structures, and equipment previously used at the OB and OD units are presented below. The information conforms to the requirements of 20.4.1 NMAC incorporating 40 CFR §270.14(b)(8). Adherence to the procedures and proper use of the structures and equipment helped to prevent hazards associated with loading and unloading operations, prevented runoff from hazardous waste handling areas, prevented contamination of water supplies, mitigated the effects of equipment failures and power outages, prevented undue

exposure of personnel to hazardous waste, and prevented releases to the atmosphere.

Properly trained EOD Technicians/Specialists transported waste to the EOD Range for treatment. Unloading of the waste at the OB and OD units was performed manually or with appropriate heavy equipment, such as forklifts. At the OB unit, vehicles used to transport the waste approached the unit from the gently sloped portion of the concrete pad to promote safe unloading and handling. Loading ash residue from the OB unit was typically performed manually. At the OD unit, vehicles parked adjacent to the location where the detonations occurred, and the waste was then unloaded and placed at the unit. Additionally, personnel involved in waste-handling operations at the units were knowledgeable about the physical and chemical properties of the waste managed at the site and took appropriate precautions to ensure that wastes were handled safely.

A two-ft. earthen berm surrounded the OD treatment unit to help prevent runoff to other areas of the facility or the environment. In addition, the concrete pad at the OB unit had a hump at one end to prevent runoff. Runoff at the OB unit was further prevented by the steel container, which provided containment and had a retractable cover to prevent precipitation from entering the unit. The OB and OD units were not located within the 100-year floodplain (Figure A-1); therefore, measures to prevent flooding at the units wasn't necessary.

It was not anticipated that there could be any impact to groundwater or other water supplies as a result of treatment operations at the OB and OD units because engineering and operational controls ensured that run-on and runoff were minimized. The OB unit was equipped with a retractable cover to prevent run-on, and an earthen berm surrounding the OD unit helped to prevent runoff. There were no water supply lines in the immediate vicinity of the OB and OD units, and the depth to groundwater at the EOD Range ranges from approximately 80 to 143 ft (Sandia National Laboratories/New Mexico [SNL/NM], 1996). The nearest drinking water-supply well is over four miles north-northwest of the EOD Range. There are no permanent natural surface water bodies within the KAFB boundary.

No electrical power was supplied to the EOD Range. The only equipment used at the OB and OD units was portable/mobile (e.g., hand tools, trucks, forklifts) utilized for unloading and/or placement of the wastes. If such heavy equipment experienced failure, replacement equipment was obtained within a short period of time. Therefore, operations at the units were not affected due to equipment failure or power outages.

Personnel exposure was minimized by restricting the handling of hazardous waste. Only properly trained EOD Technicians/Specialists handled waste to be treated at the OB and OD units. EOD Technicians/Specialists wore appropriate protective clothing, as needed (e.g., leather gloves, ANSI-rated eyewear). Hazardous waste destined for treatment was packaged in containers that were inspected before receipt and again before unloading at the appropriate unit. In case of personnel exposure, first-aid equipment (including eyewash solutions) was readily available.

Releases to the atmosphere resulting from previous treatment activities at the OB and OD units could not be prevented. However, impacts were kept to a minimum by conducting treatment operations in this remote, sparsely populated area and under appropriate atmospheric conditions. Treatment was performed only under the conditions included in the applicable permit obtained from the City of Albuquerque Environmental Health Department Air Pollution Control Division.

Containment at the OB unit was used to prevent releases during waste staging, burning, and residue management. The steel container provided primary containment, the concrete pad provides secondary containment, and the concrete hump located near the front of the pad helped ensure that any releases to the pad surface were contained on the pad and could be removed and properly treated or disposed of. The OB unit was covered between treatment events to prevent any residues from escaping to the atmosphere.

G.2.7.7 Prevention of Accidental Ignition or Reaction of Ignitable, Reactive, or Incompatible Waste (Previous)

This section details the precautions taken to prevent accidental ignition or reaction of ignitable and reactive wastes at the OB and OD units.

Wastes were never stored at the EOD Range prior to treatment, and the wastes were treated promptly upon transport to and acceptance at the EOD Range. Ignitable or reactive wastes were located at least 50 ft from the KAFB facility's property line at all times and were protected from sources of ignition, such as open flames, or reaction. A sign indicating "No Smoking" was conspicuously placed at the entrance to the inner fenced area of the EOD Range, as required by 20.4.1 NMAC incorporating 40 CFR §264.17(a). Aggressive vegetation control measures were taken in the treatment portion of the EOD Range, which helped to prevent brush fires. Together, these measures met the requirements of 20.4.1 NMAC §incorporating 40 CFR §264.17(a) and (b) and 264.176.

Incompatible wastes were not managed at the EOD Range. Therefore, the requirements of 20.4.1 NMAC incorporating 40 CFR §264.177, and 20.4.1 NMAC incorporating 40 CFR §270.15(d) are not applicable. Only containers made of or lined with materials that would not react with and were otherwise compatible with the waste to be managed were used for the wastes treated at the units.

G.3 REFERENCES

AEHA, 1987, "RCRA Part B Permit Writer's Guidance Manual for Department of Defense Open Burning/Open Detonation Units," U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

KAFB, 2002, "EOD Explosive Operations (On and Off Range) and Transportation of Munitions," Branch Instruction 32-3001, September 2002.

SNL/NM, 1996, "Site-Wide Hydrogeologic Characterization Project," Calendar Year 1995 Annual Report, Environmental Restoration Project, Sandia National Laboratories/New Mexico, Albuquerque, NM.

USAF, 2001, "Explosives Safety Standards," Air Force Manual 91-201, October 2001.

USAF, 2000, "General Instructions for Disposal of Conventional Munitions," Technical Manual T.O. 11A-1-42, Change 6, October 2000.

APPENDIX H

ENVIRONMENTAL PERFORMANCE STANDARDS

APPENDIX H

ENVIRONMENTAL PERFORMANCE STANDARDS

As required by the environmental performance standards in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), incorporating 40 CFR §264.601, miscellaneous units must be located, designed, constructed, operated, maintained, and closed in a manner that will ensure protection of human health and the environment. The open burn (OB) and open detonation (OD) miscellaneous units **[formerly operated – until 2010]** at the Explosive Ordnance Disposal (EOD) Range are located in a remote, sparsely-populated area of Kirtland Air Force Base (KAFB). The OB and OD units at the EOD Range were designed and operated to facilitate safe handling and treatment of wastes to prevent. adverse human health and environmental impacts. Design information and waste management practices for these units are detailed in Appendix G of this revised Part B permit renewal application. These miscellaneous units were operated and maintained and will be closed in a manner that will continue to ensure protection of human health and the environment. The Closure Plan for these units is presented in Appendix F of this Part B permit renewal application.

Detailed discussions of the site characteristics in the KAFB region are presented in this appendix, and land uses surrounding and within KAFB are discussed in Appendix A of this Part B permit renewal application, in accordance with 20.4.1 NMAC incorporating 40 CFR §270.23(b). Conditions and measures that will protect human health and the environment by preventing or minimizing any releases that may have adverse effects due to migration of hazardous waste or hazardous constituents to the groundwater/vadose zone, surface water/wetlands and the soil surface, and the air are also discussed in this appendix, as required by 20.4.1 NMAC incorporating 40 CFR §264.601. In addition, information on potential exposure of human or environmental receptors to hazardous waste or hazardous constituents is presented herein, as required by 20.4.1 NMAC incorporating 40 CFR §270.23(c).

The volume and physical and chemical characteristics of the wastes treated at the OB and OD units is described in the Waste Analysis Plan, which is included as Appendix B in this Part B permit renewal application. A description of emergency response actions to be taken to minimize adverse impacts of unanticipated events is presented in Appendix E of this Part B permit renewal application.

H.1 SITE CHARACTERISTICS

The geologic, hydrologic, and meteorologic characteristics for the KAFB region and, where available, the EOD Range are described in the following sections, as required in 20.4.1 NMAC incorporating 40 CFR §264.601. Information on air quality; vegetation and wildlife; and threatened, endangered, and sensitive species and habitats is also presented.

H.1.1 Geology

KAFB lies within the northern portion of the Mexican Highland section of the Basin and Range physiographic province (Hawley, 1986). KAFB is located along the eastern margin of the Albuquerque basin. This basin is a major structural feature of the Rio Grande rift, which is approximately 620 miles (mi) long. The Albuquerque basin is one of the largest of a series of north-trending, en echelon basins and is about 90 mi long and 31 mi wide. The basin is bounded by basement uplifts to the east (e.g., the Sandia, Manzanita, Manzano, and Los Piños uplifts). Numerous faults are located within the Albuquerque basin; they are interpreted as listric (Woodward, 1977; Russell and Snelson, 1994).

Over the past 30 to 40 million years, the Albuquerque basin underwent subsidence and approximately five mi of northwest-southeast extension (Woodward, 1977; Lozinsky, 1994). The presence of two half-grabens dividing the basin and bordered by major Neogene faults is suggested by deep seismic reflection data (Russell and Snelson, 1990, 1994). The two half-grabens are separated by the northeast-trending Tijeras fault zone, and the basin is characterized as a deep, inner depression filled with sediment and flanked by a series of faulted ramps along the margins. This interpretation is supported by extensive subsurface structural, stratigraphic, and geophysical investigations (Hawley and Haase, 1992).

The uppermost stratigraphic units comprising the Albuquerque basin are described in Section H.1.1.2. Precambrian rocks underlie the entire basin, and are exposed in the uplifted former Manzano Base region and the Manzanita Mountains, located in the central and eastern portions of KAFB, respectively. The Sandia Mountains are about 5,000 feet (ft) above the basin, giving a total difference in elevation between bedrock in the basin and the mountains of about 20,000 ft (Energy Research and Development Administration [ERDA], 1977). Landforms within the basin include mesas and structural benches, low hills and ridges, inset stream terraces, and graded alluvial slopes (Lozinsky et al., 1991; Kelley, 1977; Kelley and Northrup, 1975).

The East Mesa, where KAFB is located, has a generally west-southwestward ground-surface slope, ranging from about 250 feet per mile (ft/mi) near the mountains to 20 ft/mi near the Rio Grande. The distance from the foot of the mountains to the river varies from three mi in the northern part of the mesa to nine mi in the southern part.

H.1.1.1 Structure

KAFB is located in a structurally complex area with several major regional faults displaying a diverse pattern of fault trends and displacements. Rift-bounding faults present at KAFB include the Sandia, Coyote, Tijeras, and Hubbell Springs faults. These normal faults are west dipping and exhibit down-to-the-west displacement. The northeast-trending Tijeras fault zone crosses KAFB and intersects/merges with the Sandia and Hubbell Springs faults.

The Sandia Fault is a north- to northwest-trending, west-dipping normal fault. Although the location and lateral continuity of this fault along the eastern margin of the central Albuquerque basin are poorly constrained along its approximate 25 mi length, an exposure in Tijeras Arroyo documents the offset. This exposure shows Precambrian granitic rocks faulted against Pleistocene alluvial fan sediments. To the south, this fault intersects or merges with the Tijeras fault zone and the Hubbell Springs Fault; therefore, its southern extent is difficult to ascertain. A northern extension of the Sandia Fault, the Rincon Fault 12 mi north of KAFB, suggests late Quaternary displacement based on a topographic scarp along the Rincon Fault (Kelley, 1977). The interpretation of a significant vertical offset on the Sandia Fault is supported by subsurface geologic investigations along the west side of the former Manzano Base. These investigations showed significant increases in the thickness of late Tertiary Santa Fe Group units west of the fault, and documented a western fault strand with significant offset west of the Sandia Fault (Hawley and Haase, 1992; May and Russell, 1994; Sigma, 1984; Goodrich, 1992; Bartel et al., 1981).

The Coyote Fault is a north- to northwest-trending fault with an inferred length of 4.5 mi (Reiche, 1949; Kelley, 1977). This fault, located along the base of the Manzanita Mountains in the southeast portion of KAFB, forms the eastern margin of the Hubbell structural bench. It exhibits approximately 1,300 ft of down-to-the-west displacement. Geomorphically, the Coyote Fault is expressed as linear range-front facets. This fault likely influences groundwater pathways between the range block and the Hubbell Bench, as evidenced by the coincidence of Coyote Springs with the Coyote Fault. It is not known if this fault has experienced possible activity in

the late Quaternary; however, surficial mapping suggests the presence of subtle fault-related lineaments south of Coyote Springs and near South Fence Road. The Coyote Fault passes through a portion of the EOD Range.

The northeast-trending Tijeras fault zone is a series of several anastamosing subparallel fault strands and is a major structural feature that cross-cuts the Rio Grande rift. It extends about 58 mi from the central KAFB area northeast to the Cañoncito area within the Sangre de Cristo Mountains. On KAFB, this fault zone extends from an area southwest of the former Manzano Base, where it intersects or merges with the Sandia and Hubbell Springs faults, to the northeast through Tijeras Canyon, where it separates the Sandia and Manzanita mountains. Several subparallel faults with near-vertical dips and normal to left-lateral displacements comprise the Tijeras fault zone (Lisenbee et al., 1979; Maynard et al., 1991). Based on outcrop relationships along the fault trace on and northeast of KAFB, there have been multiple episodes of movement. These episodes, each having a different mode of displacement, occurred during the Precambrian, Paleozoic, Neogene, and Quaternary (Lisenbee et al., 1979; Abbott and Goodwin, 1995). There has been as much as 1.5 mi of left-lateral post-Cretaceous offset along the fault zone (Kelley and Northrop, 1975). The fault zone appears to display variable senses of Tertiary through Quaternary vertical displacement on KAFB (Lozinsky et al., 1991). The fault zone may be a potentially active structure, as evidenced by possible displacement of Quaternary colluvium in Tijeras Canyon (Lisenbee et al., 1979), and Machette (1982) suggests that the Tijeras fault zone was active on KAFB and the Isleta Indian Reservation during the Holocene. Late Pleistocene displacement south of the Travertine Hills, immediately southwest of the former Manzano Base, has been confirmed by surficial deposit mapping on KAFB. The Tijeras fault zone is located approximately two mi west of the EOD Range.

The north-trending Hubbell Springs Fault is a series of west-dipping normal fault strands along the western margin of the Hubbell structural bench. The fault intersects or merges with the Tijeras fault zone and the Sandia Fault in the south-central portion of KAFB. The Hubbell Springs Fault is a major potentially active fault and displays prominent geomorphic evidence of late Quaternary displacement. Machette (1982) indicates that while ample evidence exists to suggest multiple fault movements during the Quaternary, his observations of fault-scarp morphology do not indicate Holocene movement. Scarp-morphology data collected along two segments of the Hubbell Springs Fault indicate that the most recent movement of the fault

probably occurred during the late Pleistocene (Machette, 1982). The Hubbell Springs Fault is located approximately one mi southwest of the EOD Range.

H.1.1.2 Stratigraphy

The Neogene/Quaternary Santa Fe Group and Quaternary post-Santa Fe Group stratigraphic units are discussed in this section. Descriptions of underlying units (Precambrian basement complex, upper Paleozoic strata, lower Mesozoic strata, and Paleogene strata) can be found in the "Site-Wide Hydrogeologic Characterization Project Calendar Year 1995 Annual Report" (Sandia National Laboratories/New Mexico [SNL/NM], 1996).

The Santa Fe Group is comprised of complexly interstratified gravels, sands, silts, and clays representing synchronous basin filling and basin rifting from 30 to 5 million years ago (Ma). In the center of the rift, near the western margin of KAFB, the Santa Fe Group is over 14,500 ft thick. This sequence of sediments thins toward the edges of the basin where it is truncated by uplifted fault blocks. Based on depositional environments and age, Hawley and Haase (1992) subdivided the group into three major hydrostratigraphic units.

The lower Santa Fe unit represents deposition in an internally-drained basin prior to deep subsidence and uplift of the rift-margin ranges. It is comprised primarily of interfingered piedmont-slope alluvial fan deposits, eolian deposits, and fine-grained basin-floor deposits (Hawley and Haase, 1992). The lower unit ranges in age from 30 to 15 Ma and is up to 3,500 ft thick. It grades laterally from fine clastic sediments in the basin center to conglomeratic sandstones at the basin margins.

The middle Santa Fe unit is the thickest of the three units, and in places is 10,000 ft thick. This unit, deposited between 15 and 5 Ma when rift tectonism was most active, was formed by rapid sedimentation related to the active tectonism. Overall, the depositional environments were primarily alluvial, eolian, and playa-lake. Based on sediment source terranes, Hawley and Haase (1992) divided this thick unit into two subunits, characterized by coarse-grained piedmont-slope and alluvial-fan deposits and sandy to fine-grained basin-floor sediments. These two subunits are interstratified.

The upper Santa Fe unit was deposited from approximately 5 to 1 Ma, and possibly as late as 0.5 Ma. This 1,200-ft-thick unit was divided into three subunits by Hawley and Haase (1992),

based on sediment source terranes. Only two of these subunits are relevant at KAFB and are described herein. The first relevant subunit contains coarse-grained alluvial-fan and piedmont-veneer facies extending westward from the bases of the Sandia, Manzanita, and Manzano uplifts. It is characterized by poorly-sorted and weakly-stratified sand and conglomerate with an abundant matrix of silt and clay. The second relevant subunit is comprised of cross-stratified, thick, clean sand and pebbly gravel deposits of the ancestral Rio Grande. In the KAFB area west of the fault complex, these two subunits of the upper Santa Fe unit interfinger.

The Quaternary post-Santa Fe Group sediments include alluvial fan, fluvial, eolian, playa, colluvial, and floodplain deposits (Lambert, 1968; Hawley and Haase, 1992). These sediments were deposited approximately 0.5 to 1 Ma, and their depositional episodes may be related to Quaternary glacial-interglacial cycles. The multiple alluvial fans present throughout much of KAFB are derived from the former Manzano Base area and the Manzanita Mountains and related drainages. Along major drainages, discontinuous fluvial terraces are inset into older alluvial fans and interfinger with younger alluvial fans. Eolian deposits include active dunes, stabilized dunes, and eolian sheets that cover and modify alluvial deposits. Within the steep terrain of the mountains, colluvium is present, and in topographic and structural depressions in westernmost KAFB, playa deposits are present. Buried soils are common within many of these surficial deposits.

H.1.1.3 Soils

The soil stratigraphy on KAFB is complex. Surficial soils generally exhibit progressively greater soil development on progressively older deposits. Pleistocene deposits typically have moderately- to well-developed calcic horizons within five or six ft of the surface, whereas Holocene deposits generally lack calcic horizons. Development of calcic horizons is strongly dependent on the depth and rate of near-surface infiltration and reflects the long-term average depth of wetting.

Soil profiles may contain evidence of abundant bioturbation, which influences infiltration rates by providing near-surface pathways for vertical migration of water. The presence of relatively high amounts of secondary clay minerals associated with some bioturbated horizons suggests that bioturbation may promote increased drainage and weathering.

The upper parts of almost all soils include eolian sand and silt, and nearly every soil profile contains a significant component of eolian material at the surface. The majority of the soil profiles are developed in alluvium containing clasts of many rock types, and the type of parent material undoubtedly has a strong influence on soil characteristics and geochemistry.

Tijeras Series soil is present at and in the vicinity of the EOD Range. These soils are described as yellowish-brown, gravelly fine sandy loam. Soils in this series are found at elevations ranging from 5,000 to 6,500 ft, and on slopes ranging from 1 to 5 percent (%). Runoff and soil/water erosion hazards from Tijeras Series soil are described as moderate (U.S. Department of Agriculture [USDA], 1977). Soils of the Embudo, Madurez, and Latene Series comprise up to 20% of the Tijeras Series soils. Embudo Series soils consist of deep, well-drained, gravelly fine sandy loam. Elevations range from 5,000 to 6,000 ft with 1 to 5% slopes. Wink and Madurez soils make up about 15% of the Embudo Series, and Tijeras soils are associated with this series. Madurez Series soils also consist of deep, well-drained, gravelly fine sandy loam, and elevations range from 4,900 to 5,900 ft, with 1 to 5% slopes. Limited amounts of Bluepoint, Latene, and Wink soils are associated with the Madurez Series. The Latene Series soils consist of deep, well-drained, loamy to fine sandy soils (USDA, 1977), with elevations ranging from 5,000 to 6,000 ft and 1 to 5% slopes.

In 1992, two boreholes (KAFB 1902 and KAFB 1901) were drilled near the Lake Christian Well, which is approximately one mi southwest of the EOD Range (see Map A-1 in the revised Part A permit renewal application for the location of the Lake Christian Well). One borehole, KAFB 1902, was drilled to a depth of 50 ft. Soils at the 5-ft depth were described, in descending order, as 9.6 inches (in.) of light brown silt, 6 in. of light brown silt mixed with pieces of caliche, a 5-in.-thick caliche layer, and a well-sorted silt layer. At the 10-ft depth, limestone gravels were encountered. Soils at the 25-ft depth were described, in descending order, as 14.4 in. of medium-grained, subangular to subrounded, poorly-sorted silty sand mixed with gravel; 6 in. of fragmented limestone and a little feldspar; and hard-packed silt with gravel. At the 49.5-ft depth, the soils consisted of 6 in. of silty sand mixed with gravel, and cemented medium-coarse sand and gravel mixed with caliche. The second borehole (KAFB 1901) was drilled to a total depth of 240 ft. From 50 to 140 ft, the sediments were composed primarily of fine sand with lesser amounts of brown clay and small gravels. Beneath these sediments were, in descending order, 10-ft-thick layers of each of the following: reddish-brown clay; a bed of limestone; a layer of dark grey clay; and a bed of yellow, friable sandstone with yellow clay intermixed. Below these

layers were a 10-ft-thick layer of brown clay, a 30-ft-thick layer of brown to reddish-brown clay with a small amount of limestone and sandstone fragments, a 10-ft-thick coarse to very coarse sand layer with a large amount of yellow and darker clay, and finally, a 10-ft-thick layer of clay varying in color from light brown to light grey to dark grey.

A moderately-developed soil exposed in a soil pit in south-central KAFB showed a thin A horizon consisting primarily of reworked alluvium and eolian sand and silt (SNL/NM, 1996). This horizon is likely very permeable to the downward percolation of water. A Bw horizon, characterized by weak soil structure and a slight color reddening, was exposed beneath the A horizon. The absence of secondary calcium carbonate in this horizon suggests that the average depth of wetting in this soil is less than approximately 15 in., the depth at the base of this horizon. A moderately developed Btk horizon below the Bw horizon contains evidence of secondary carbonate and clay accumulation. This horizon has thin, discontinuous clay films that formed by translocation of material from overlying deposits. Beneath the Btk horizon are several Bk horizons that exhibit evidence of secondary accumulation of calcium carbonate, which decreases from this horizon downward, illustrating that the horizon at this depth (27 to 39 in.) is the zone of greatest precipitation of pedogenic carbonate. Transport of soluble carbonate salts in solution typically only occurs as deep as approximately 40 in., although depths of percolation may occasionally reach approximately 80 in. (SNL/NM, 1996). The lowermost Bk horizon contains approximately 7 weight % calcium carbonate, which probably reflects the original amount of calcium carbonate in the parent material. Therefore, the average depth of infiltration at this soil pit site, over geologic time scales, is probably less than 80 in., and because the soil is developed in a laterally extensive alluvial fan deposit, it probably impedes downward-percolating water over large areas.

H.1.2 Hydrology

The uppermost Santa Fe Group regional aquifer surface underlying the KAFB area is in the ancestral Rio Grande fluvial facies to the west and alluvial fan facies to the east (SNL/NM, 1996). Hawley and Haase (1992) estimated that hydraulic conductivities in the upper Santa Fe Group could range from less than 0.3 feet per day (ft/day) in the alluvial fan facies to more than 30 ft/day in the fluvial facies, based on an assessment of the ratio of (sand + gravel)/(silt + clay) in the various lithofacies.

Pumping test data obtained for the fluvial facies show that hydraulic conductivities can range from 12.0 to 147.1 ft/day (SNL/NM, 1996). Porosity values derived empirically from grain-size distribution data range from 0.26 to 0.45 for the fluvial facies (SNL/NM, 1995a). The uppermost water-bearing unit in the alluvial fan facies south of Tijeras Arroyo consists of up to 50 ft of silty clay, underlain by about 85 ft of sediments that include several approximately 10- to 15-ft-thick coarser-grained layers (SNL/NM, 1995b). The upper fine-grained unit in this area generally has a low hydraulic conductivity and acts semiconfined (SNL/NM, 1996). Overall, hydraulic conductivity values for the alluvial fan facies of the Santa Fe Group range from 0.01 to 27.4 ft/day, based on pumping test data collected for SNL/NM environmental restoration projects (SNL/NM, 1996).

In perched aquifer intervals in the alluvial fan facies in the vicinity of Tijeras Arroyo, hydraulic conductivities range from 17.6 to 50.2 ft/day, based on slug tests and pumping tests. Porosity data for the alluvial fan facies range from 0.17 to 0.64 (SNL/NM, 1996). Porosity of samples collected and measured directly from locations along Tijeras Arroyo and Arroyo del Coyote range from 0.35 to 0.48 (SNL/NM, 1995c).

Calculated storage coefficient values from aquifer tests in the Santa Fe Group range from 0.001 to 0.000033. According to Freeze and Cherry (1979), storativity of a confined aquifer ranges from 0.005 to 0.00005, while specific yield (the storage parameter for an unconfined aquifer) ranges from 0.01 to 0.30. The low calculated storage coefficients suggest that the Santa Fe Group aquifer should be considered a confined aquifer.

At KAFB, the local groundwater system is divided into three distinct hydrogeologic regions by the north-to-south trending fault complex (SNL/NM, 1996). The two regions associated with the area of the EOD Range are Hydrogeologic Regions (HR) 2 and 3. HR-2 is the region associated with the fault system, and HR-3 is located east of the fault system. The Coyote Fault crosses the EOD Range; thus, the available hydrologic information for HR-2 and HR-3 are described herein. The boundaries of these regions serve only to identify approximate geographic areas (SNL/NM, 1996).

HR-2 is comprised of the area that straddles the Sandia, Tijeras, and Hubbell Springs fault complex. In the region of the EOD Range, the subsurface geology for HR-2 includes the Santa Fe Group sediments. HR-3 is east of HR-2; it includes the eastern portion of KAFB and the

area west of the Coyote Fault bounded approximately by Coyote Springs Road and Lovelace Road. The general stratigraphy for HR-3 is complicated by faulting; piedmont alluvial material overlies portions of bedrock in this region.

In the HR-2 and HR-3 areas, limited available data from a slug test and a pumping test show that hydraulic conductivities for the shallow alluvium in these areas range from 6.24 to 152.2 ft/day. An aquifer pumping test conducted at a well in bedrock, described as fractured metamorphics, gave a hydraulic conductivity value of 1.70 to 2.22 ft/day. Other aquifer pumping tests at wells located in sandstone/siltstone units resulted in estimated hydraulic conductivities of 0.003 and 0.16 ft/day (SNL/NM, 1995d; SNL/NM, 1996). No direct data have been obtained to estimate porosity and storativity for the confined bedrock porous media or fractured rock aquifers in the HR-2 and HR-3 areas at KAFB (SNL/NM, 1996).

Lateral hydraulic gradients east of the fault zone vary significantly; they appear to be about equal to or greater than the topographic gradients. Lateral hydraulic gradients in the Lake Christian Well area, approximately one mi southwest of the EOD Range, are approximately 0.02 feet per feet (ft/ft).

On the west side of the fault complex, water levels of the uppermost aquifer unit are approximately 300 ft lower than water levels east of the complex (SNL/NM, 1996). An abrupt change in water level elevation occurs at the Hubbell Springs fault zone, and the apparent horizontal gradient of approximately 0.04 ft/ft is much greater than the gradients on the east and west, which are approximately 0.02 and 0.005 ft/ft, respectively (SNL/NM, 1996). Another precipitous change in water level elevation occurs at the Tijeras Fault along the southern boundary of KAFB where the apparent horizontal gradient is approximately 0.06 ft/ft compared to the much lower gradient (approximately 0.005 ft/ft) west of this fault.

In HR-2, the vertical gradient within the Santa Fe Group is downward and ranges from 0.006 to 0.25 ft/ft. Where hydraulic head data are available for both bedrock and the Santa Fe Group, the vertical gradient is upward at 0.15 ft/ft. Only one set of monitoring well data are available for HR-3; these data indicate that at that well location, the vertical gradient is upward at 0.11 ft/ft.

H.1.2.1 Surface Water

The major surface water feature in central New Mexico is the Rio Grande, which flows north to south through Albuquerque. There are no permanent natural surface waters within the KAFB boundary. The surface water at KAFB consists primarily of ephemeral flows in direct response to precipitation in the immediate area. There are also several known springs, which sometimes yield localized wetlands.

The major surface drainages at KAFB are Tijeras Arroyo, Arroyo del Coyote, and an unnamed drainage channel south of Arroyo del Coyote (SNL/NM, 1993a). These arroyos exhibit ephemeral flow, except for two very short reaches of channel, which flow intermittently (SNL/NM, 1996). However, most of the water rarely reaches the lower portions of the arroyos or the Rio Grande (SNL/NM, 1996; U.S. Geological Survey [USGS], 1977) because of evapotranspiration and percolation into permeable alluvial deposits. Tijeras Arroyo (above the confluence with Arroyo del Coyote) drains about 81 square mi, while Arroyo del Coyote (above the confluence with Tijeras Arroyo) drains about 27 square mi (U.S. Army Corps of Engineers [COE], 1979). The upper reaches of the arroyos cut through mountainous terrain at an average slope of about 130 ft/mi. As the arroyos enter onto the alluvial fan, bed slope decreases to an average of about 100 ft/mi.

Several known springs are located on KAFB. Some of these springs yield localized surface flow to arroyos. The localized flows typically infiltrate into the alluvium within a very short distance. Some of these springs and other seeps have resulted in small wetland areas.

Floods and runoff in the Albuquerque area typically occur between July and September, during high-intensity thunderstorms (SNL/NM, 1996). Floods in Tijeras Arroyo and Arroyo del Coyote are characterized by high peak flows, small volumes, and short durations. Obstructions, natural and manmade, within floodways can impede flood flows, creating backwater and increased water heights. Natural obstructions to flood flows occur in the arroyos, where vegetation has encroached into the channel areas. Tumbleweed and other plant debris that collect at culvert entrances create a potential obstruction to flood flows. Past experience in the Albuquerque area indicates culverts have a serious clogging tendency because of sediment. Manmade obstructions include bridges and culverts and their approach embankments.

The COE provides information on the areas within KAFB that are subject to flooding from Tijeras Arroyo and Arroyo del Coyote. The areas that will be inundated by a 100-year flood are shown on Map A-1 in Appendix A of this revised Part B permit renewal application. The EOD Range is located outside the 100-year floodplain, as shown on Map A-1.

H.1.2.2 Vadose Zone

The vadose zone is essentially the unsaturated region between the land surface and groundwater. At the EOD Range, the depth to groundwater and, thus, the thickness of the vadose zone, ranges from approximately 80 to 143 ft (SNL/NM, 1996). In general, at KAFB, water enters the vadose zone as infiltrating rainfall and channel losses from flows in arroyos, and leaves via evapotranspiration to the atmosphere and recharge to the underlying aquifer (SNL/NM, 1996). The climate at KAFB implies low recharge rates to the groundwater system as a result of low precipitation and high evapotranspiration. The largest localized recharge sources in the KAFB vicinity are probably Tijeras Arroyo and Arroyo del Coyote, which flow ephemerally, primarily during or after large thunderstorms (USGS, 1992).

The soils in the KAFB area are primarily well-drained loamy soils. Underlying these generally poorly-developed soils are unconsolidated alluvial deposits consisting of sands, gravels, silts, and clays of the Santa Fe Group and younger surficial deposits. A study was conducted to identify vadose zone hydrogeologic settings in the KAFB area. The results of this study indicate that recharge rates are quite small, with estimates ranging from 1 to 6 millimeters per year (Parsons et al., 1993). The mean values for the vadose zone obtained during this study are gravimetric moisture content (5.5%), bulk density (1.66 grams per cubic centimeter), saturated hydraulic conductivity (7E-3 centimeters per second), total organic carbon (539 milligrams per kilogram), and porosity (34.39%) (SNL/NM, 1996).

H.1.2.3 Groundwater

KAFB and the Albuquerque metropolitan area rely on groundwater from the Albuquerque basin as the principal water-supply source. The primary freshwater aquifers in the basin are located within the upper unit of the Santa Fe Group and, to a lesser extent, in the middle unit of the Santa Fe Group (SNL/NM, 1996). The regional aquifer is recharged primarily from the Rio Grande and, to a lesser degree, at the foot of the mountains through coarse alluvium at the openings of small canyons (Kues, 1986). Recharge is nearly nonexistent from percolation through soils overlying the water table.

Most of the water production wells for the City of Albuquerque are completed in the upper unit of the Santa Fe Group. From the foothills of the Sandia and Manzano mountains, the water table slopes at a low gradient diagonally down valley. The direction of groundwater flow has been altered in the areas influenced by groundwater pumping in the city's well fields, and pumping in excess of recharge has resulted in significant decline of the regional water table. Although this lowering is not uniform, it is most pronounced in the eastern portion of the basin. Cones of depression at the wells in this area are bounded by the Sandia Fault.

The groundwater settings for HR-2 and HR-3 are described herein. In the southern portion of HR-2, the regional aquifer is a porous media aquifer in the upper unit of the Santa Fe Group. In the alluvial fan facies of this unit, field data indicate that the uppermost part of the aquifer is semiconfined (SNL/NM, 1993b). Shallow, unconfined alluvial aquifers, particularly in the foothill canyons, and confined bedrock aquifer systems are present in HR-3 (SNL/NM, 1996). In the southern portion of HR-3, the uppermost aquifer is found in shallow alluvium, occurring locally in the foothill canyons and on the gently-sloping piedmont surface. Where this shallow alluvium is saturated, the aquifer will be unconfined and in porous media (SNL/NM, 1996).

The direction of groundwater flow is controlled by the direction of the hydraulic gradient and the variation of hydraulic conductivity along the groundwater flow lines. East of the Tijeras fault zone, groundwater generally flows from the northeast to the southwest (SNL/NM, 1996). As the groundwater moves westward into areas with gentler topography, the flow direction appears to shift to the west. Where groundwater crosses the Tijeras fault zone, the flow direction shifts slightly to the north-northwest until reaching a north-trending elongated trough west of the fault complex. In this trough region, created over several decades by pumping of the water-supply wells located along the northern boundary of KAFB, the groundwater flow direction changes to the north (SNL/NM, 1996). The porous media aquifer units underlying KAFB are heterogeneous; this heterogeneity is characterized by hydraulic conductivities that range over approximately 5 orders of magnitude (0.001 to 147.1 ft/day) resulting in a large range in groundwater velocity (SNL/NM, 1996).

Since the 1960s, when significant increases in groundwater withdrawal began, water level declines in the Albuquerque basin have been occurring. Basin-wide declines have been estimated to range from 20 to 160 ft (Thorne et al., 1993). Hydrographs from water-level data collected from monitoring wells in the HR-1 region on KAFB since the mid-1980s indicate that groundwater levels are declining at rates of between 0.2 to 3.0 feet per year (ft/yr) within the upper unit of the Santa Fe Group aquifer system (SNL/NM, 1995e). Generally, the rate of decline increases westward from the Sandia/Tijeras fault zone and northward near water-supply production wells. Across KAFB, Thorne et al. (1993) calculated that the groundwater level has lowered by 60 to 140 ft, based on steady-state condition estimates. Water level declines of 1.0 to 3.0 ft/yr in monitoring wells completed west of the eastern extent of fluvial deposits and 1.0 ft/yr or less in wells on the east have been documented by SNL/NM (1995e) since about 1990. Water levels in the HR-2 and HR-3 regions on KAFB are not currently affected by water-supply production within the Santa Fe Group aquifer system (SNL/NM, 1996). Long-term trends in these regions show that water levels have remained relatively constant, or are only increasing slightly.

In the Albuquerque area, the depth to groundwater ranges from as little as five ft. near the Rio Grande to as much as 1,400 ft. on the East Mesa. The depth to groundwater at KAFB varies from approximately 54 to 582 ft. Neutron/gamma logs taken at the KAFB 1901 and KAFB 1902 boreholes showed water levels at a depth of approximately 80 ft. below ground surface. At a USGS well on the southern edge of the EOD Range, the depth to groundwater is also about 80 ft. At the School House Mesa Well on the north side of the EOD Range, depth to groundwater is approximately 100 ft., and at the EOD Hill Well west of the EOD Range, depth to groundwater is about 143 ft. Thus, the overall depth to groundwater at the EOD Range varies from approximately 80 to 143 ft.

Quarterly groundwater monitoring is conducted at the School House Mesa Well. Samples are analyzed for herbicides, pesticides, anions, phenolics, metals, pH, turbidity, total organic halogens, and total organic carbon. The data are compared to Environmental Protection Agency (EPA) National Primary Drinking Water Standards.

In 2002, 1.24 billion gallons of water were pumped from KAFB's eight drinking water-supply wells, which are all located in the north and northwest portion of the facility (KAFB, 2003). The locations of these wells are shown on Map 1 in the revised Part A permit renewal application.

To meet all regulatory requirements, KAFB monitors its drinking water supply for various constituents. Water samples were collected in 2002 and analyzed for total coliforms, nitrate (as N), copper, lead, arsenic, barium, beryllium, selenium, gross alpha, gross beta, photon emitters, total trihalomethanes, calcium, magnesium, and manganese. Only total coliforms exceeded the maximum contaminant level (MCL). Positive samples for this contaminant were detected in April and August of 2002. The April detection had one positive follow-up sample; all subsequent samples were negative. There were two detections in August that exceeded the MCL for total coliforms; all follow-up samples were negative.

H.1.3 Meteorology

The climate in the Albuquerque area is characterized by low precipitation; wide temperature extremes; and generally clear, sunny days, which are typical of a high desert plateau. Frequent, drying winds; heavy rain showers, usually of short duration and often with erosive effects; and erratic, seasonal distribution of precipitation are also characteristic of the local climate. The annual normal daily mean temperature in Albuquerque is 56.8° Fahrenheit (°F) (National Oceanographic and Atmospheric Administration [NOAA], 2004). The average daily temperature range is relatively high, but extreme temperatures are rare. In Albuquerque, the temperature reaches 90°F an average of 62 days a year, with most of these days occurring from May through September. Freezing temperatures occur an average of 113 days each year, with the majority of these days occurring from November to early April. The air is normally dry, with an average relative humidity ranging from nearly 59% in the early morning to approximately 29% in the afternoon (NOAA, 2004). Other features of this climate are the large number of clear days and high percentage of sunshine. The average number of clear days per year is 167, with 76% sunshine possible.

H.1.3.1 Precipitation

The valley and mesa areas are arid, having an average annual precipitation of approximately 9.5 in. (NOAA, 2004). The average annual precipitation in the mountains is considerably higher, with up to 20 in. (SNL/NM, 1996). Precipitation amounts generally increase with increasing elevation. Much of the average annual precipitation occurs in the form of brief but heavy thunderstorms during the summer period, July through September; the intensity of summertime rainfall varies substantially over short distances. The average number of days per year having 0.10 in. or more precipitation for the Albuquerque area is 61 (NOAA, 2004). Evapotranspiration in the area has been estimated at 95 percent of the annual rainfall (Thomson and Smith, 1985).

The winter months, November through March, are generally very dry, with the cumulative moisture for these months averaging approximately 2.5 in. (NOAA, 2004). The average annual snowfall for the Albuquerque area is 11.0 in. (NOAA, 2004). At the lower elevations, snow rarely remains on the ground for more than 24 hours. However, snow cover in the mountains is common from mid-November to early spring. The precipitation pattern at the EOD Range is not appreciably different from the valley and mesa areas, described above.

H.1.3.2 Winds

The average annual wind speed for the Albuquerque area is 8.9 miles per hour (mph) (NOAA, 2004). Sustained winds of 12 mph or less occur approximately 80% of the time at the Albuquerque International Sunport, while sustained winds greater than 25 mph have a frequency less than 3% (NOAA, 1990). Winds blow most frequently from the north in winter and from the south along the river valley in summer. Winds are generally stronger in the late winter and early spring months, and occasionally dusty days occur due to blowing soils. At the EOD Range, winds occur from all directions, with prevailing winds from the east. Wind speeds are generally less than 8 mph (see Map A-1 in Appendix A of this revised Part B permit renewal application).

A network of eight meteorological monitoring towers located near KAFB was established in the 1960s and 1970s to monitor weather conditions. Ten years of monitoring data from this network indicate that the prevailing winds at KAFB are from the east, but winter winds at the 100-ft elevation are from the north. Rapid nighttime ground cooling after sunset on cloudless or near-cloudless nights produces strong temperature inversions. This rapid cooling effect generates drainage winds (katabatic winds) out of the mountains, which are strongest at the mouths of the larger canyons (Olsen et al., 1970).

A solar-powered meteorological tower is located near the personnel bunker at the EOD Range. Before conducting a treatment operation, a measurement of wind speed is obtained to ensure that the operational limits for wind speed are not exceeded.

H.1.4 Air Quality

There are many sources of air pollutants within Bernalillo County, including vehicle exhaust, wood-burning fireplaces and stoves, industrial and commercial sites, and top soil disturbance.

These pollutant sources contribute to the county's wintertime "brown cloud," when pollutant levels can be concentrated and remain suspended for extended periods of time before being dispersed by favorable wind currents (City of Albuquerque Environmental Health Department [EHD], 2004).

Ambient air quality in Bernalillo County is regulated by the Albuquerque/Bernalillo County Air Quality Control Board (ABC/AQCB). The ABC/AQCB also monitors Bernalillo County compliance with federal and state air quality regulations. Compliance with the more stringent National Ambient Air Quality Standards mandated by the EPA for ozone and particulate matter currently presents a challenge in the county, because recent data have shown the potential to exceed the new standards (EHD, 2004).

The Air Pollution Control Division of the EHD maintains an ambient air monitoring network, which monitors pollutant levels for all of the criteria pollutants (i.e., ozone, particulate matter [PM_{10}], carbon monoxide [CO], and oxides of nitrogen [NO_x]). One of the indicators used to measure the overall air quality in Bernalillo County is data from the Air Quality Index (AQI) for the following four criteria air pollutants: CO, ozone, coarse particulate matter (PM_{10} – particulate matter equal to or less than 10 microns), and fine particulate matter ($PM_{2.5}$ – particulate matter equal to or less than 2.5 microns) (EHD, 2004). The AQI is used nationwide by the EPA and other air agencies as a means of reporting general air quality conditions to the public on a daily basis. AQI values are calculated from ambient air monitoring data and categorized into health-related classes, with higher AQI values denoting greater potential health risk. Data from one of the ambient air monitoring sites within the county's network are published in the local daily newspapers. The data suggest that the overall air quality of Bernalillo County is generally "Good" to "Moderate" (EHD, 2004). Data obtained from the EHD also suggest that the minor quantity of emissions from the EOD Range makes little or no direct contribution to air pollution in Bernalillo County.

The Air Pollution Control Division also manages the annual No-Burn Program from October through February (EHD, 2004). This program has contributed to the decrease of wintertime CO and PM levels and will be further developed to focus on decreasing "brown cloud" days based on visibility standards. Treatment at the OB unit at the EOD Range at KAFB was not conducted on "No Burn" days, and open burn permits were obtained or maintained for all OB operations at the EOD Range (until all treatment activity was terminated in 2010.)

H.1.5 Vegetation and Wildlife

The vegetation and wildlife of KAFB are described in this section, with an emphasis on threatened, endangered, and sensitive species and habitats.

H.1.5.1 Vegetation

KAFB is located at the juncture of four major North American physiogeographic and biotic provinces: the Great Basin; the Rocky Mountains; the Great Plains; and the Chihuahuan Desert. The biotic communities, or biomes, within KAFB exhibit influences from each of these provinces, with the Great Basin influence generally dominating.

Based on Brown's (1982) hierarchical system for the classification of biomes in the southwestern United States (U.S.), four vegetation formations are recognized at KAFB: grassland; woodland; riparian scrubland; and riparian woodland. The grassland type is present at the EOD Range.

Grassland vegetation covers the lower alluvial slopes and flat terrace surfaces of the western half of KAFB. Soils supporting grassland vegetation are typically sandy loams to gravelly sandy loams, with slopes of less than 5%. These soils include the Latene, Wink, Madurez, Tijeras, Embudo, and Tome (USDA, 1977). The latter is found in the southwestern quadrant of KAFB, where small drainages from the Manzano Mountains reach the flat internal basins near the McCormick Ranch, causing sediment deposition along broad fans. These sandy soils form dunes stabilized by grasses and shrubs.

The influences of three biomes are evident in the grasslands at KAFB: the Great Basin Grassland Biome; the Semidesert Grassland Biome; and the Plains Grassland Biome. The influence of the Great Basin Grassland Biome predominates in the grassland community. Galleta (*Hilaria jamesii*) is the dominant grass species in the KAFB area that is associated with the Great Basin Grassland Biome. Others include sand dropseed (*Sporobolus cryptandrus*), ring muhly (*Muhlenbergia torreyi*), and Indian ricegrass (*Oryzopsis hymenoides*).

The influence of the Semidesert Grassland Biome is typified by the presence of black grama (*Bouteloua eriopoda*). This grass species is commonly found as a subdominant or codominant species with galleta and is, in places, the dominant grass, sometimes forming near

monocultures. Other grasses associated with this biome are mesa dropseed (*Sporobolus flexuosus*), bush muhly (*Muhlenbergia porteri*), and fluffgrass (*Tridens pulchellus*). The Semidesert Grassland Biome is climatically classified within the Warm-Temperate Climatic Zone. The other biotic communities at KAFB are classified in the Cold-Temperate Climatic Zone. For this reason, species associated with the Semidesert Grassland Biome are more frequent on sites with a warmer, drier microclimate, such as south-facing slopes, calcareous soils, and sites exposed to high winds.

The third component influencing the grassland vegetation at KAFB is the Plains Grassland Biome, which is centered in the Great Plains. Although none of the species associated with this biome reach dominance in the grassland communities, some of the important species with affinities to this biome include little bluestem (*Andropogon scoparius*), side-oats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), and soapweed yucca (*Yucca glauca*).

Several of these species are also common in the Great Basin Grassland Biome. Species associated with the Plains Grassland Biome are more common on sites with cooler, moister microclimates, such as those protected from the influences of sun or wind by virtue of slope and direction of exposure.

Where the soil has not been disturbed by construction, the grassland vegetation on KAFB is generally in excellent condition and is relatively free of shrubs and subshrubs. This is due to the long period of protection from grazing within the KAFB boundaries. Periodic burns, both natural and human-caused, are evident in the grassland areas. These fires are fueled and carried by the accumulated dead grass material from previous years and are probably important in maintaining the dominance of grasses over woody plants. The dominant shrub species in the grasslands are sand sagebrush (*Artemisia filifolia*) and four-wing saltbush (*Atriplex canescens*), both of which are widespread in the western U.S.

H.1.5.2 Wildlife

Wildlife communities, which include amphibians, reptiles, birds (both breeding and migratory), and mammals, are dependent on the quality and quantity of available habitat that meets the needs of individual wildlife species in the community. The basic requirements of any wildlife species are food, water, and shelter. Each individual species has specific habitat requirements for these three basic factors, as well as behaviorally-controlled requirements, such as corridors

of travel, breeding sites, and freedom from human intrusion. The wildlife communities at KAFB are typical of the equivalent woodland and grassland habitat types in central New Mexico.

The poor availability of water has probably been a limiting factor to the wildlife communities in this area. The lack of permanent water sources is particularly prevalent in the grasslands where wildlife populations appear smaller and less diverse than the forage production could potentially support. In the Manzano Mountains, some springs have been lost to some or all species of wildlife through development. This loss is mitigated by the installation of wildlife guzzlers.

The following provides general descriptions of the wildlife known or expected to occur in grassland wildlife communities on KAFB. These descriptions are based on species lists presented in Brown (1982), Fischer (1990), Biggs (1991a, 1991b), and Sullivan (1991).

Amphibians of the grasslands are limited to those species that are adapted to long periods of dormancy during dry conditions and rapid breeding cycles when ephemeral water is available. These include the western spadefoot (*Spea hammondi*), plains spadefoot (*S. bombifrons*), Woodhouse's toad (*Bufo woodhousei*), and Great Plains toad (*B. cognatus*). Common reptiles in the grasslands include the western box turtle (*Terrapene ornata*), many-lined skink (*Eumeces multivirgatus*), Great Plains skink (*E. obsoletus*), whiptail lizard (*Cnemidophorus* spp.), side-blotched lizard (*Uta stansburiana*), short-horned lizard (*Phrynosoma douglassi*), lesser earless lizard (*Holbrookia maculata*), bullsnake (*Pituophis melanoleucus*), coachwhip (*Masticophis flagellum*), western diamondback rattlesnake (*Crotalus atrox*), and western rattlesnake (*C. viridis*).

Raptors use the grassland areas for hunting throughout the year, but the lack of nesting sites (e.g., trees and cliffs) limits the use of this habitat type for breeding. Manmade structures may occasionally be used by some species for nesting. Raptor species known or expected to occur in the grassland type are northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*B. swainsoni*), ferruginous hawk (*B. regalis*), American kestrel (*Falco sparverius*), prairie falcon (*F. mexicanus*), barn owl (*Tyto alba*), long-eared owl (*Asio otus*), great horned owl (*Bubo virginianus*), and burrowing owl (*Athene cunicularia*). Turkey vultures (*Cathartes aura*) are common scavengers in this habitat.

Other common grassland birds are the scaled quail (*Callipepla squamata*), mourning dove (*Zenaida macroura*), greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), crissal thrasher (*Toxostoma dorsale*), loggerhead shrike (*Lanius ludovicianus*), lark sparrow (*Chondestes grammacus*), black-throated sparrow (*Amphispiza bilineata*), western meadowlark (*Sturnella neglecta*), brown-headed cowbird (*Molothrus ater*), and house finch (*Carpodacus mexicanus*).

The mammal community in the grasslands is dominated by rodents and lagomorphs (rabbits and hares). These include desert cottontail (*Sylvilagus auduboni*), black-tailed jack rabbit (*Lepus californicus*), spotted ground squirrel (*Spermophilus spilosoma*), Gunnison's prairie dog (*Cynomys gunnisoni*), Botta's pocket gopher (*Thomomys bottae*), silky pocket mouse (*Perognathus flavus*), Ord's kangaroo rat (*Dipodomys ordii*), banner-tailed kangaroo rat (*D. spectabilis*), Merriam's kangaroo rat (*D. merriami*), western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Peromyscus maniculatus*), white-footed mouse (*P. leucopus*), and northern grasshopper mouse (*Onychomys leucogaster*).

Mammalian predators in the grassland community include the coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), long-tailed weasel (*Mustela frenata*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), and bobcat (*Lynx rufus*). Although the black-footed ferret (*Mustela nigripes*) once may have occurred in this area, this species is not on the federal endangered species list for New Mexico (U.S. Fish and Wildlife Service, 2004). No large prairie dog "towns," upon which the ferret depends, remain on KAFB, although some small prairie dog colonies are present.

Mule deer (*Odocoileus hemionus*) are the only large herbivores that use the grasslands. However, since this species is primarily a browser and not a grazer, mule deer are infrequent users of the grasslands.

H.1.6 Threatened, Endangered, and Sensitive Species and Habitats

There are no federally-listed threatened or endangered species known to occur within KAFB. State-listed threatened and endangered wildlife species that occur or potentially occur are the peregrine falcon (*Falco peregrinus*), willow flycatcher (*Empidonax traillii*), gray vireo (*Vireo vicinior*), and Baird's sparrow (*Ammodramus bairdii*) (New Mexico Department of Game and

Fish, 2002). The gray vireo was observed in Sol se Mete Canyon in October 1991 (Sullivan, 1991). It is not known whether this species breeds in the area. No records of the other species exist for this area. There are no state-listed endangered plants at KAFB (19 NMAC 21.2, 2001)

H.2 EXPOSURE INFORMATION

A study conducted by SNL/NM in 1991 was designed and carried out to measure the detonation and combustion products of selected explosives and propellants currently held in the U.S. military disposal inventory (SNL/NM, 1991b). Experiments involved detonation or combustion of approximate half-pound quantities in an enclosed chamber of known volume. Major and minor combustion product yields were determined by extensive sampling of the chamber contents with a complete spectrum of analytical instrumentation and post-sampling analytical techniques. Product yields were determined by several methods that included a carbon balance method. Results from trinitrotoluene (TNT), double base, and composite propellant detonation and combustion experiments were similar in that most (>98%) of the fuel carbon was completely oxidized to carbon dioxide.

In the case of TNT detonation, secondary combustion of detonation products with entrained ambient air in the fireball appears to be an important mechanism that influences the overall process efficiency. Other major species produced in both detonation and combustion included nitric oxide and elemental carbon. Detonation of combustion product yields by the carbon balance method were compared to a reference method and resulted in agreement within 20% of gaseous species and 50% for particulate species.

A similar but more extensive study conducted at the U.S. Army Dugway Proving Grounds gave similar results. Studies conducted indicated that volatile organic compounds and semivolatile organic compounds were destroyed and that metals were left in trace amounts (parts per billion or parts per trillion). The study was conducted at Dugway Proving Ground in Utah over a ten-year span (Johnson, 1992).

Tables B-2 and B-3 in Appendix B of this Part B permit renewal application identify the hazardous wastes that were likely treated at the OB and OD units, respectively. Any organic compounds that were present in these wastes were destroyed during treatment, as demonstrated in the Dugway Proving Ground study (Johnson, 1992). The metals that may have remained are in very small quantities (parts per billion or parts per trillion). The relative mobility

of the Resource Conservation and Recovery Act (RCRA) toxicity characteristic metals and of beryllium, nickel, and zinc is described in Section H.2.2.

H.2.1 Exposure Pathways and Receptors

There are no permanent natural surface waters within the KAFB boundary; therefore, surface water is not considered an exposure pathway. [During its operation] the active portion of the EOD Range was cleared of vegetation and fenced to keep wildlife from intruding. In addition, wildlife was not common at the EOD Range. Therefore, wildlife and vegetation are not considered as receptors from past treatment activities.

Because the EOD Range is located in a remote, sparsely-populated area and access is controlled, human receptors were limited to occupational workers. Appendix I of this Part B permit renewal application addresses soil monitoring while the OD unit was active. Appendix F of this Part B Permit renewal application contains the recently submitted Closure Plan and potential cleanup and monitoring [proposed] in order to assure that contaminants have not been released to the surface soil at levels that could endanger human health or the environment.

H.2.2 Mobility of Metals

Metals have the potential to survive treatment and remain in the environment. The following is a discussion of the mobility of RCRA toxicity characteristic metals and other metals in soils. The RCRA toxicity characteristic metals include arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. The other metals discussed are beryllium, nickel, and zinc. It should be noted, however, that beryllium is not a constituent of any of the hazardous wastes treated at the EOD Range.

H.2.2.1 Arsenic

The common range for arsenic in soils is 1-50 parts per million (ppm) (Lindsay, 1979). Arsenic (V) species are dominant in oxidizing conditions and occupy a large stability field. All of the dominant arsenic (V) and arsenic (III) species are anions. Studies of arsenic retention by soil have shown that adsorption is controlled to a large degree by the content of extractable amorphous and cryptocrystalline hydrous oxides of iron and aluminum (Jacobs et al., 1979; Wauchope, 1975; Livesey and Huang, 1981). Modest adsorption of arsenic (V) under oxidizing conditions on clays and iron and aluminum oxyhydroxides may exist at the EOD Range. Therefore, the mobility of arsenic at the EOD Range is considered to be low.

H.2.2.2 Barium and Silver

Barium and silver concentrations are expected to be controlled by ion-exchange reactions. Barium is more strongly adsorbed than strontium, calcium, and magnesium by most layer lattice clays and soil hydrous oxides. Barium retention is controlled, to a large extent, by the cation-exchange capacity of soil. Concentrations of barium are generally low in natural water and are controlled by sorption and precipitation of barite. The common ranges for barium and silver in soils is 100-3,000 and 0.01-5 ppm, respectively (Lindsay, 1979). If barium replaces other alkaline earth cations, barium sorption should be relatively significant. Therefore, if barium and silver are present, they are not expected to be mobile in the environment at the EOD Range.

H.2.2.3 Beryllium

The common range for beryllium in soils is 0.1-40 ppm (Lindsay, 1979). Beryllium adsorption in soils has not been well investigated. Although several investigators have studied adsorption of this element in a cursory manner, it was not the sole topic of their investigations. Preliminary evidence indicates that beryllium adsorption of soils and some layer lattice silicates is pH dependent, and that adsorbed beryllium is not effectively replaced by barium, calcium, and magnesium (Romney and Childress, 1981). Beryllium present in a simulated solid waste leachate was more strongly attenuated in column studies with 11 soils from seven prominent soil orders (Alesii et al., 1980; Korte et al., 1976). Of the RCRA toxicity characteristic metals, only lead exhibited less mobility than beryllium. Therefore, at the EOD Range, mobility of beryllium is considered to be very low.

H.2.2.4 Cadmium

Adsorption/desorption reactions control cadmium concentrations. The common range for cadmium in soils is 0.01-0.70 ppm (Lindsay, 1979). At higher cadmium concentrations ($>10^{-5}$ moles per kilogram), nonspecific adsorption is likely the controlling mechanism. Metallic (copper, lead, zinc) and alkaline earth (calcium, magnesium) cations reduce cadmium adsorption by competition for available specific adsorption and cation exchange sites. The presence of ligands such as chloride ions and sulfate ions may decrease cadmium adsorption, while sulfur trioxide has shown to increase adsorption. Cadmium sorption varies with differing sodium chloride solutions, which reflects weak adsorption of cadmium chloride complexes relative to free cadmium ions. It also reflects increasing competition of sodium ions for cadmium ion sorption sites on clay as sodium chloride concentrations increase (Langmuir, 1997).

Santillan-Medrano and Jurinak (1975) observed that the activity of cadmium in cadmium-amended soils was lowest in calcareous soils. The adsorption of cadmium by soil or subsoil materials may, to a large degree, be an exchange reaction with calcium or magnesium. However, cadmium appears to be selected over calcium (Milberg et al., 1978). Specific adsorption to calcite (McBride, 1980) and hydrous oxides of aluminum and iron (Kinniburgh et al. 1977; Forbes et al., 1976; Benjamin and Leckie, 1981) does occur and may be the most important adsorption mechanism at low environmental concentrations of cadmium. Competition between cations for adsorption sites strongly influences the adsorption behavior of cadmium. The presence of calcium, magnesium, and trace metal cations reduces the adsorption of cadmium by soils (Cavallaro and McBride, 1978; Singh, 1979), clay minerals (Stuanes, 1976; Bittell and Miller, 1964; Farrah and Pickering, 1977), and iron oxides (Balistrieri and Murray, 1982; Benjamin and Leckie, 1980). When surface coverage is high, cadmium retention in soil and sediment is controlled by ion exchange (Navrot et al., 1978; McBride et al., 1981) in which cadmium ions compete with exchangeable calcium ions (Ca^{2+}) and magnesium ions (Mg^{2+}). At the EOD Range, modest adsorption is expected, although less cadmium sorption may occur with arsenic on montmorillonite clay, which occurs infrequently. Adsorption to calcite favors sorption in alkaline soils. Therefore, the mobility of cadmium is considered very low at the EOD Range.

H.2.2.5 Chromium

The common range for chromium in soils is 1-1,000 ppm (Lindsay, 1979). The adsorptive behavior of chromium (VI) in soil is not well documented. Several column attenuation studies qualitatively indicate that chromate is relatively mobile through soil and that soil materials high in hydrous oxides of iron and manganese are more effective adsorbents. Soil minerals with high isoelectric points, iron oxides in general, and clay minerals to a lesser extent adsorb chromium (VI) at low to medium pH levels (pH 2 to 7) (Leckie et al., 1980; Davis and Leckie, 1978; MacNaughton, 1977; Mayer and Schick, 1981; Griffin et al., 1977). Chromium (VI) adsorbs weakly on silicon dioxide (SiO_2), which has a negative surface charge at all but the lowest pH values, and strongly on aluminum oxide (Al_2O_3), which carries a positive charge over a greater pH range (MacNaughton, 1977; Davis and Leckie, 1978). Chromium (VI) is present as an anionic complex in solution. Sorption is generally modest on substrates with zero-point-of-change (solid surfaces with a net positive charge at normal soil pH). Therefore, the mobility of chromium (VI) in the soils at the EOD Range is considered to be low.

H.2.2.6 Lead

Adsorption/desorption phenomena appear to control lead concentrations. Lead adsorption has also been measured as a function of pH, where sorption increases with pH (Langmuir, 1997). Lead phosphates in noncalcareous sediments and lead carbonate in calcareous and alkaline soils/sediments have been reported to be solubility-controlling solids. The common range for lead in soils is 2-200 ppm (Lindsay, 1979). Except at high lead concentrations where ion exchange predominates, competing ions appear to have little effect on lead adsorption. Lead is strongly retained by soils and model adsorbents, by ion exchange, and specific adsorption. The soil properties which most often correlate with lead adsorption are soil organic matter and clay content (Singh and Sekhon, 1977; Soldatini et al, 1976; Riffaldi et al., 1976; Abd-Elfattah and Wada, 1981). Although their apparent binding energies do not vary appreciably, the adsorption capacity of individual soil constituents decreases in the following order: manganese oxides, iron oxides, organic matter, and clay minerals. At the EOD Range, lead sorption is relatively strong, probably an order of magnitude greater than beryllium, cadmium, and arsenic. Therefore, mobility of lead in soil at the EOD Range is very low.

H.2.2.7 Mercury

The commonly reported range for mercury in soils is 0.01-0.3 ppm (Lindsay, 1979). Under oxidizing conditions where mercury compounds are fairly soluble, the primary attenuation mechanism of mercury is expected to be adsorption/desorption. Hydrous oxides of iron and manganese appear to be the most important adsorbents when mercury is present in low concentration. Mercury exhibits significant mobility in column studies using simulated solid waste leachate and 11 soils from seven prominent soil orders (Korte et al., 1976). The mobility in all soils was greater than that observed for lead and beryllium. At the EOD Range, mercury adsorption may be significant with a low mobility in the soil.

H.2.2.8 Selenium

The common range for selenium in soils is 0.1-2 ppm (Lindsay, 1979). Most of the selenium species in the pH range from 4 to 10 exist as anions. Although some studies indicate precipitation may occur, no definitive information on solubility-controlling solids is available. Selenium retention in soil has not been studied extensively. Limited studies indicate that in spite of their anionic nature, selenite and selenate ay be adsorbed significantly by some soils. Experimental evidence suggests that cryptocrystalline and amorphous forms of SiO_2, Al_2O_3, and iron oxide control selenium adsorption (John et al., 1976; Singh et al., 1981). Selenium exists

as negatively-charged species in solution. However, moderate sorption is observed. Therefore, at the EOD Range, the mobility of selenium would be considered low.

H.2.2.9 Nickel

The relative importance of ion exchange and specific adsorption of nickel has not been established. Nickel is strongly and, possibly, irreversibly adsorbed by alkaline soils. Cations, such as Ca^{2+} and Mg^{2+}, have been reported to reduce nickel adsorption through competition for nickel adsorption sites. The adsorptive behavior of nickel in soil has not been investigated extensively. Limited studies suggest that nickel may be strongly adsorbed by soil (Wangen et al., 1982, Bowman et al., 1981). The specific adsorption affinity is less than that of lead and zinc (McKenzie, 1980; Murray, 1975), but may exceed that of cadmium (Wangen et al., 1982). Iron and manganese oxides and, to a lesser extent, clay minerals are the most important adsorbents. Nickel adsorption is pH dependent on silica (Theis and Richter, 1980), iron oxides (Theis and Richter, 1980; McKenzie, 1980), and manganese oxides (McKenzie, 1980; Murray, 1975).

The common range for nickel in soils is 5-500 ppm (Lindsay, 1979). In the absence of strong complexing ligands, the adsorption edge ranges from pH 5.5 to 8.5, depending on the adsorbent and experimental conditions. Increasing ionic strength with sodium chloride, sodium chlorate, sodium nitrate, calcium chloride, calcium chlorate, or calcium nitrate reduces nickel adsorption by clays (Mattigod et al., 1979) and soils (Bowman et al., 1981; Doner et al., 1982). Cationic competition for adsorption sites and decreasing solution activity of nickel ions are possible explanations for this phenomenon. A greater reduction in adsorption is observed when Ca^{2+} is the major cation, suggesting it is a more effective competitor with nickel. Similarities in apparent adsorption chemistry suggest that zinc and cadmium may compete with nickel for specific adsorption sites on some oxides of iron and aluminum (Benjamin and Leckie, 1980). Limited studies indicate that the kinetics of nickel desorption from near-neutral and basic soils may be slow (Bowman et al., 1981). This partially irreversible adsorption may indicate formation of an insoluble nickel solid phase, which may further limit the transport of nickel in the subsurface environment. Therefore, the mobility of nickel at the EOD Range is considered to be very low.

H.2.2.10 Zinc

The common range for zinc in soils is 10-300 ppm (Lindsay, 1979). Most of the available adsorption/desorption data were obtained with high zinc concentrations; therefore, these studies

are not directly applicable where zinc in low concentrations is expected. At low concentrations, zinc is specifically adsorbed by iron, aluminum, and manganese oxides. The presence of competing cationic constituents may, under some conditions, reduce the specific adsorption and ion exchange capacity of zinc in soil. Divalent alkaline earths (Mg^{2+}, Ca^{2+}) in high concentrations (0.10^{-3} moles per liter [M]) compete with zinc for ion-exchange sites in soils (Shukla et al., 1980), on clay minerals (Farrah and Pickering, 1977; Stuanes, 1976), and for specific adsorption sites on iron oxides (Balistrieri and Murray, 1982).

Ion-exchange selectivity measurements, however, indicate that zinc is strongly preferred over calcium by clay minerals when calcium is present in lower concentrations ($<10^{-4}$ M) (Wada and Kakuto, 1980). Zinc, lead, and cadmium in comparable concentrations (10^{-6} M) do not compete for specific adsorption sites on goethite (Balistrieri and Murray, 1982) or amorphous iron oxyhydroxides (Benjamin and Leckie, 1981), suggesting that preferential adsorption sites exist on these solids for each metal. Though zinc is strongly adsorbed, zinc and cadmium may compete for the same adsorption site in limonite and Al_2O_3 (Benjamin and Leckie, 1980). Therefore, at the EOD Range where low concentrations are expected, the mobility of zinc in the soil is considered low.

Based on the above, the mobility of metals in the soil at the EOD Range is expected to be low to very low. Annual soil monitoring was performed (while the OD unit was active) to assure that contaminants were not released to the surface soil at levels that could endanger human health or the environment. If, upon closure (addressed in Appendix F) sampling and analysis of the soil indicates the presence of hazardous constituents above the most current published New Mexico Environment Department (NMED) and EPA industrial soil screening levels (SSLs), the inner fenced area of the EOD Range will either be graded to remove the contamination or a risk assessment will be conducted to demonstrate that any contaminants remaining do not pose a potential unacceptable risk to human health and the environment.

H.3 ENVIRONMENTAL PERFORMANCE STANDARDS

In accordance with 20.4.1 NMAC §264.601, a miscellaneous unit must be located, designed, constructed, operated, maintained, and closed in a manner that will ensure protection of human health and the environment. The following sections present the conditions and measures that promote protection by preventing or minimizing the potential for releases to the groundwater or subsurface environment; surface water, wetlands, or soil; or air that may have adverse effects

on human health and the environment. The OB and OD units at the EOD Range were located, designed, and operated in such a manner as to meet these requirements. The treatment restrictions and the operating procedures implemented at the EOD Range (during its operation) all helped to minimize the potential for releases to the environment.

H.3.1 Protection of Groundwater (Previous)

Two situations presented the potential for the release of hazardous waste to the hydrogeologic environment at the EOD Range (during its operation.) They were:

- Transfer of hazardous waste to the OB or OD unit at the EOD Range, and
- Run-on or runoff of potentially contaminated precipitation.

After waste was transferred to the OB or OD unit, treatment was conducted promptly. No waste was allowed to remain for extended periods of time in either unit, and if any reactive waste remained after a treatment, it was treated again (the same or next day) to ensure that the characteristic of reactivity was removed completely. The hazardous wastes treated at the OB and OD units were mostly in solid form. However, on occasion, hazardous waste in liquid form was accepted for treatment; if any spill occurred during waste transfer to the appropriate unit, the spilled material and potentially contaminated media was contained, removed, and transferred to the appropriate unit for treatment. Therefore, any potential spills would not impact the environment. Any precipitation that may have inadvertently accumulated in the OB unit steel container likely evaporated or was burned off during treatment events. Ash and other residues resulting from treatment in the OB unit were removed within three working days and managed properly, based on knowledge of process or sampling and analysis data.

Exposure of humans or other environmental receptors to hazardous waste or hazardous constituents via the groundwater was unlikely. This conclusion is supported by the following considerations:

- Mostly solid-form hazardous wastes were treated in the OB and OD units, and any spills of liquid-form hazardous wastes werw cleaned up promptly.
- The maximum volume of hazardous waste to be treated during any burn or detonation event was limited to 1,500 pounds (lbs.) net explosive weight (NEW).
- The OB unit consisted of a steel container situated on a concrete pad and surrounded on three sides by concrete walls. The unit had a retractable cover to prevent

precipitation from entering the unit, and the concrete pad was bermed at one end to prevent runoff.

- The crater rims resulting from treatment at the OD unit prevented run-on into the craters, thus minimizing the potential for downward migration.

- Residues resulting from treatment were removed, to the extent possible, after each treatment event.

- Depth to groundwater in the vicinity of the EOD Range is approximately 80 to 143 ft below the ground surface.

- The nearest well location (the School House Mesa Well) is just north of the EOD Range; however, water from this well is not potable. The nearest potable water-supply well at KAFB is approximately four miiles north-northwest of the EOD Range.

- The average annual precipitation is low (9.5 in.), limiting the potential for contaminant migration through the vadose zone to groundwater.

- Evapotranspiration in the area has been estimated at 95% of the annual rainfall (Thomson and Smith, 1985), again limiting the potential for contaminant migration to groundwater.

- The mobility of metals in the soil at the EOD Range is expected to be low to very low, which also limits the potential for migration of contaminants to groundwater.

These factors support the conclusion that the potential for adverse effects on human health and the environment due to migration of hazardous waste or hazardous constituents to the groundwater or subsurface environment were not likely.

H.3.2 Protection of Surface Water, Wetlands, and Soil Surface (Previous)

Exposure of humans or other environmental receptors to hazardous waste or hazardous constituents via surface water, wetlands, or the soil surface is unlikely. This conclusion is supported by the following considerations:

- Mostly solid-form hazardous wastes were treated in the OB and OD units, and any spills of liquid-form hazardous wastes were cleaned up promptly.

- The maximum volume of hazardous waste to be treated during any burn or detonation event was limited to 1,500 lbs. NEW.

- The nearest major surface water body (the Rio Grande) is located approximately 10 miles west of the EOD Range.

- The OB unit consisted of a steel container situated on a concrete pad and surrounded

on three sides by concrete walls. The unit had a retractable cover to prevent precipitation from entering the unit and to prevent ash residue from being blown onto the soil surface, and the concrete pad was bermed at one end to prevent runoff.

- The earthen berm surrounding the OD unit helped prevent run-on into the unit and runoff from the unit into the surrounding area.
- There are no permanent natural surface water bodies within the KAFB boundary.
- The nearest spring or wetland is approximately one mi. northwest of the EOD Range.
- The mobility of metals in the soil at the EOD Range is expected to be low to very low, and soil monitoring of the OD unit was conducted annually.

These factors support the conclusion that the potential for adverse effects on human health and the environment due to migration of hazardous waste or hazardous constituents in surface water, wetlands, or on the soil surface is not likely.

H.3.3 Protection of the Atmosphere (Previous)

Exposure of humans or other environmental receptors to hazardous waste or hazardous constituents via the air was unlikely. This conclusion is supported by the following considerations:

- The maximum volume of hazardous waste treated during any burn or detonation event was limited to 1,500 lbs. NEW.
- The OB unit's steel container contained the ash residue, and its retractable cover helped to minimize wind dispersal of ash residue until the residue was removed from the unit.
- The concrete walls surrounding the OB unit reduced the effects of wind on the OB operation and also helped to limit ash dispersal.
- Treatment was conducted in a remote, sparsely-populated area within the KAFB boundary.
- Treatment operations were not conducted during adverse atmospheric conditions.
- Treatment at the OB unit was not conducted if wind speeds exceed 15 mph.
- Treatment at the OB unit was not conducted on "No Burn" days.
- Treatment at the OD unit was not conducted when wind speeds exceed 20 mph.

The principal byproducts of decomposition of the hazardous wastes treated at the EOD Range

were ash (carbon), produced from burning solids (e.g., wood), and gases. The gases consisted primarily of nitrogen, water vapor, carbon dioxide, CO, sulfur dioxide, diatomic oxygen, and traces of NO_x.

The OB and OD units at the EOD Range were subject to the regulations of the ABC/AQCB. Open burning of the hazardous wastes treated at the OB unit was allowed under ABC/AQCB if transportation posed unnecessary safety risks. The OB unit at the EOD Range operated in accordance with open burn permits granted by the City of Albuquerque. Treatment was restricted to the conditions imposed by the applicable City of Albuquerque open burn permit.

H.3.4 Monitoring, Inspection, and Reporting

The following section describes KAFB activities that are undertaken to satisfy the regulatory requirements in 20.4.1 NMAC §264.602.

H.3.4.1 Monitoring

KAFB collects data from routine environmental surveillance activities on an ongoing basis. The results of the activities are provided in annual environmental monitoring reports. Contamination attributable to the EOD Range has not been detected during environmental monitoring activities at KAFB.

At the OD unit, the hazardous waste in its original form was destroyed and, therefore, rendered nonhazardous; however, potentially contaminated treatment residues could remain. To assure that contaminants were not released to the surface soils at the OD unit at levels that could endanger human health or the environment, KAFB will continue to implement the Soil Monitoring Plan, included as Appendix I of this Part B permit renewal application. Due to high evapotranspiration rates (estimated at 95% of annual rainfall [Thomson and Smith, 1985]) and the low mobility of toxicity characteristic metals in the soils at the EOD Range (as discussed in Section H.2.2), contamination (if present) is not expected to be found at depth. If contamination is detected at levels above background or above the most current published NMED and EPA industrial SSLs, this information will be provided to the Secretary of the NMED.

H.3.4.2 Inspection (Previous)

As required in 20.4.1 NMAC §§264.15 and 264.33, the OB and OD units and the EOD Range were inspected on a regular basis to assure their integrity, maintenance, and safe operation.

Since the termination of all treatment activity in 2010, inspections are conducted on a monthly basis. The focus of these monthly inspections is to identify security deficiencies (signs of deterioration of security fencing and gates) deterioration of warning signs, or other conditions that might cause a hazard to unauthorized visitors or wildlife in the vicinity. Appendix C of this Part B permit renewal application describes the inspection program at the EOD Range.

H.3.4.3 Recordkeeping and Reporting (Previous)

Since all treatment activity was terminated at the KAFB EOD Range over 2 years ago, many of the Records and Reports referenced below will be archive documents maintained at either the EOD office in building 20413 or the Base Environmental Management Branch in building 20685. The following operating records and documents associated with the OB and OD units at the EOD Range are maintained at the EOD Shop:

- Operating log that described the type and quantity of each hazardous waste received and treated in the OB and OD units at the EOD Range, and the date the hazardous waste was burned or detonated,
- Inspection logs for the last three years,
- A copy of the current Contingency Plan,
- Training records for EOD personnel, and
- A copy of the Hazardous Waste Facility permit.

The following operating records and documents associated with the OB and OD units at the EOD Range are maintained at the Environmental Management Branch Office:

- Records of monitoring, testing, analytical data, and any corrective actions taken to prevent or mitigate releases of hazardous waste to the environment,
- Waste characterization information and data,
- A copy of the Waste Analysis Plan,
- Reports of any incidents that required activation of the Contingency Plan,
- Correspondence and other documents from agencies that affect the EOD Range, and
- Disposal requests and Land Disposal Restriction certifications for hazardous waste treated on site or transported to an off-site permitted facility for subsequent treatment and/or disposal.

Other recordkeeping requirements applicable to the OB and OD units included the biennial report, unmanifested waste report, and additional reports, as discussed below.

Biennial Report (Previous)

KAFB has not conducted any waste treatment activity at the EOD Range OB and OD Units since 2010. Therefore, submission of a Biennial Report is no longer relevant. E.g. – “KAFB will

prepare and submit a biennial report to the NMED by March 1 of each even-numbered year, in accordance with 20.4.1 NMAC §264.75. The report will be prepared to cover facility activities during the previous calendar year and will include:

- The EPA identification number, name, and address of the facility;
- The calendar years covered by the report;
- Description and quantity of each hazardous waste the facility received during the year;
- The method of treatment, storage, or disposal for each hazardous waste;
- For generators who treat, store, or dispose of hazardous waste on site, a description of the efforts undertaken during the year to reduce the volume and toxicity of waste generated;
- For generators who treat, store, or dispose of hazardous waste on site, a description of the changes in volume and toxicity of waste actually achieved during the year in comparison to previous years to the extent such information is available for the years prior to 1984; and
- The certification signed by KAFB representatives.

Unmanifested Waste Report (Previous)

Hazardous waste from off-site sources has not been accepted at KAFB since cessation of all treatment activity in 2010. Therefore, submission of the Unmanifested Waste Report to the NMED for the potential outside waste sources (as listed in Table B-1 in Appendix B of this Part B permit renewal application) as described in 20.4.1 NMAC §264.76, is no longer relevant.

Additional Reports (Previous)

In accordance with the requirements of 20.4.1 NMAC §264.77, KAFB would have also reported the below events to the NMED. No such events occurred prior to cessation of treatment activities on the EOD Range, at KAFB, so these are also no longer relevant:

- Releases and unanticipated fires and explosions that require implementation of the Contingency Plan, as specified in 20.4.1 NMAC §264.56(j);
- Facility closures, as specified in 20.4.1 NMAC §264.115; and
- As otherwise required by 20.4.1 NMAC, Subpart V, Part 264, Subpart F.

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APPENDIX I

SOIL MONITORING PLAN

APPENDIX I

SOIL MONITORING PLAN (Previous)

The Kirtland Air Force Base (KAFB) open detonation (OD) unit at the Explosive Ordnance Disposal (EOD) Range is permitted as a Subpart X miscellaneous unit. However, all treatment activity at this location was terminated in August 2010. The unit was previously used to treat explosive and explosive-contaminated hazardous waste to remove the hazardous characteristics of reactivity and ignitability. Nonhazardous wastes (e.g., contraband, firearms) were also treated at the OD unit as a service in support of the various agencies listed in Table B-1 of Appendix B in this Part B permit renewal application. KAFB performed soil monitoring at the OD unit (while it was active) to assure that contaminants were not released to the surface soil at levels that could endanger human health or the environment. During the operational life of the OD unit, soil sampling and analysis was performed on an annual basis in accordance with the procedures described in this Soil Monitoring Plan. Background levels previously used for this Soil Monitoring Plan are contained in “Background Concentrations of Constituents of Concern to the Sandia National Laboratories/New Mexico Environmental Restoration Project and the Kirtland Air Force Base Installation Restoration Program” (IT Corporation, 1996).

I.1 SAMPLING AND ANALYSIS PROCEDURES (Previous)

This section describes procedures and methods previously followed (while unit was active) for sampling and analyzing surface soil samples at the KAFB OD unit. While the procedures and methods are specific, other applicable procedures or methods provided in the most current version of "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (*SW-846*) (U.S. Environmental Protection Agency [EPA], 1986 and approved updates) may have been used when conditions or experience showed the alternate method(s) to be more appropriate. All sampling procedures actually used were annotated in the field logbook. Sampling was performed in accordance with procedures given in "Samplers and Sampling Procedures for Hazardous Waste Streams" (EPA, 1980), or *SW-846*.

I.1.1 Sampling Frequency (Previous)

Surface soil samples were collected annually at the OD unit (through termination of treatment activities in 2010), typically during the summer months. The annual sampling took place within the 72 hours following treatment events at the OD unit and before any backfilling, excavation, or grading was performed at the site. When no OD treatment events took place within a given

year, annual sampling was not conducted for that annual period. The New Mexico Environment Department (NMED) was notified if this circumstance occurred.

I.1.2 Sampling Locations (Previous)

Four surface soil samples were collected from the 0- to 6-inch depth and analyzed for the parameters listed in Table I-1. The sampling location strategy depended on the physical characteristics of the site. If only one crater was present during the sampling event, then four soil samples were taken from the walls of the crater at each of the four compass directions. If more than one crater was present, a grid (with a minimum of 100 possible locations) that encompassed all of the craters was established, and four random sample locations within the grid would be selected for the sampling event. If no craters were present, then a 500-foot (ft) by 500-ft grid would be established at the center of the cleared area comprising the OD unit, and four soil sample locations were randomly selected from within the grid. One advantage of this sampling strategy was that a large portion of the site was evaluated over time as sampling grids and craters (and thus sampling locations) were positioned at different locations. In addition, this overall strategy resulted in collection of samples that are representative of the site.

Each sample location was located by reference to a surveyed grid datum, prominent site features, or from a stated reference point. Sample locations were recorded in the field logbook, drawn on a rough diagram depicting the OD unit.

I.1.3 Sample Collection (Previous)

Qualified personnel collected surface soil samples in accordance with United States Air Force operational procedures and guidelines, *SW-846*, American Society for Testing and Materials procedures, or other NMED-approved methods. Prior to collecting surface soil samples, sampling personnel were to scrape aside loose materials (e.g., rocks, litter) from the sampling location. Personnel collected soil samples using clean metal or plastic scoops, trowels, or similar equipment. Non-sparking equipment was used whenever required by EOD personnel for worker safety. Excess soil generated from each surface soil sampling location was used to backfill the sample hole.

All sample collection activities conformed to KAFB OD unit operating and *SW-846* procedures, which included:

- Schedule with EOD Range Control;
- Obtain clearance from an EOD Technician/Specialist at the location of each sample;
- Don clean gloves before collecting each individual sample;
- Use clean sampling equipment to collect soil samples. (Note: An unused, disposable sampler may be presumed clean if still in a factory-sealed wrapper. Reusable samplers will be scraped to remove any loose material, washed with a detergent and water solution, rinsed several times with tap water, rinsed with deionized water, drained of excess water, and air-dried or wiped dry.);
- Collect grab samples from the 0- to 6-inch depth. Samples collected for analysis of white phosphorous must follow the special sample collection procedures in *SW-846* Method 7580 to ensure that multiple representative samples of the soil are obtained, carefully homogenized, and subsampled.
- Place each sample in a clean, unused container appropriate for the required analysis;
- Cap the container, attach a label and seal, preserve as required, record in field logbook, complete the request-for-analysis and chain-of-custody forms, and deliver the samples to an EPA-certified laboratory for analysis;
- Clear each sample for shipment to the analytical laboratory by an EOD Technician or Specialist; and
- Check out with EOD Range Control.

I.1.3.1 Sample Containers and Preservatives (Previous)

Samples were placed in appropriate containers, compatible with the intended analysis. All containers were to be new and certified clean to ensure the integrity of samples taken. Samples were properly prepared and preserved to maintain sample integrity. Table I-1 lists the proper container, preservative, and holding time for each chemical parameter of interest, and these requirements were followed for all samples collected.

I.1.3.2 Sample Handling, Documentation, and Custody Procedures (Previous)

Each sample was labeled, sealed, and accompanied by a chain-of-custody and a request-for-analysis form. A chain-of-custody form was used to track samples from collection through analysis to ensure that analytical results could be attributed to specific sampling activities or specific areas. A chain-of-custody form typically included:

- Sample number,
- Signature of sample collector,
- Date and time of sample collection,
- Location at which sample was collected,
- Type of sample (e.g., soil),
- Signature of persons who have samples in their possession, and
- Dates and times of possession.

This form was initiated at the point of sample collection and remained with the sample during transfer to the analytical laboratory. The form was to be completed upon receipt at the laboratory and the original or a copy returned to the KAFB Environmental Management (EM) Branch Office for inclusion in facility records. The chain-of-custody form included a request-for-analysis form that listed all analyses to be performed for the identified samples and all special instructions related to sample management or analysis. Potential hazards posed by the samples were listed on the request-for-analysis form.

Sample containers were sealed with a gummed paper seal or tag attached to the container in such a way that the seal had to be broken in order to open the container. Seals and sample tags were completed with a waterproof pen or affixed to the sample container using transparent waterproof tape. The sample label was necessary to prevent misidentification of samples and included: a unique sample number; name or initials of sample collector; sample collection date and time; sample location; and sample type, depth, and description.

A field logbook was kept and contained information pertinent to field surveys and sampling. Since sampling situations varied widely, no rigid rule covered the extent of information required to be entered in the logbook. The general guideline was to record sufficient information so that someone could reconstruct the sampling situation without relying on the collector's memory. Entries in the logbook generally included:

- Purpose of sample,
- Sample locations (coordinates referenced to staked field points, if soil sample),
- Name and business address of person making log entry,
- Volume of sample,
- Description of sampling methodology and equipment used,
- Date and time of sample collection,
- Sample destination and transporter's name (e.g., name of laboratory, Postal Service),
- Map or photograph of the sampling site, if any,
- Field observations (e.g., ambient temperature, sky conditions, past 24-hour precipitation),
- Collector's sample identification number(s), and
- Signature of person responsible for the log entry.

Documentation of sample acceptance at the analytical laboratory was provided to the EM Branch Office following sample screening and completion of analysis. This documentation normally consisted of signed copies of the chain-of-custody form, or documentation (e.g., a letter or memo) detailing the field sample numbers accepted. The analytical laboratory was required to follow standard procedures for minimizing cross contamination of samples and securing sample custody within the laboratory.

I.1.3.3 Sample Shipping (Previous)

Samples were packaged and shipped to an EPA-certified commercial laboratory in accordance with U.S. Department of Transportation shipping requirements. The type of packaging depended on the protection levels necessary for the particular sample [to provide] appropriate preservation during handling, shipping, and storage. The packaging requirements varied with sample type, media, hazardous substances present, analysis required, and handling and storage conditions.

I.1.4 Sample Analysis (Previous)

Samples were analyzed only at EPA-certified commercial laboratories. Test methods for analysis of all samples were to be performed according to procedures documented in *SW-846* or other approved methods. The hazardous wastes treated in the OD unit at the EOD Range were treated to remove the characteristics of reactivity and ignitability, and some contained toxicity characteristic metals (D004 through D011) and the toxicity characteristic organic compounds listed in Section XIV of the Part A in this permit renewal application. However, the organic compounds were destroyed during treatment. To verify, the soil samples were analyzed for the parameters listed in Table I-1; these analyses provided an accurate record of any increases in constituent concentrations over time. Analytical results were reported whether above or below method detection limits and, when necessary, flagged with appropriate qualification codes.

Minimum calibration, operation, quality control (bias, precision, blank, and matrix effects), and requirements for laboratory analyses were to be performed as listed in the individual analytical methods of *SW-846*. All laboratory analyst notebooks, logsheets, instrument printouts, charts, and calculations relevant to analyses of these samples was identified and are to remain accessible through accepted Closure by the NMED. This information may be requested for independent review and validation.

I.2 INVESTIGATION-DERIVED WASTE (Previous)

The investigation-derived wastes (IDW) generated during surface soil sampling activities at the OD unit included decontamination water and personnel protective equipment (PPE). IDW generated during the soil sampling activities associated with this Soil Monitoring Plan was characterized using the results of the surface soil sample analyses. Decontamination water and PPE generated at the time of sampling was managed according to those results. Solvents were not to be used in order to minimize waste that could not be disposed of in the sanitary sewer.

Those IDW generated at the OD unit during soil sampling activities was managed as follows:

- IDW was stored in appropriate containers, compatible with wastes, in good condition.
- Waste containers remained under the control of the sampling personnel.
- IDW was stored in containers that remained closed, except when adding/removing wastes.
- Containers of free liquid were provided with secondary containment. Free liquids were generated only during decontamination of sampling equipment.
- Containers were managed in such a way as to prevent ruptures and leaks.
- Waste containers were labeled as IDW pending the receipt of analytical results.
- Labels were filled out appropriately and marked using a permanent marker or pen. Information on the labels included waste source, suspected contaminants, contents, date on which accumulation and storage began, and a contact name.

The IDW was transported to and managed at the analytical laboratory. If analytical results indicated the IDW was hazardous, the analytical laboratory determined the appropriate treatment, storage, and disposal methods.

I.3 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROGRAM (Previous)

Because important decisions were based on the data collected as part of this Soil Monitoring Plan, a program to ensure reliability of the data was essential. Data reliability was ensured by documenting sample management so that analyses were traceable to specific areas of potential contamination, and by following a QA/QC program that mandatede documentation of the precision and accuracy of laboratory analyses.

Field QC activities included collection of QC samples in addition to field documentation requirements. For each sampling event, one duplicate field QC sample was collected. Table I-2 summarizes field QC sample requirements.

Duplicate samples were collected to monitor the performance of the data collection process. Because only disposable sampling equipment was used, collection of equipment rinsate blanks was not required. Field duplicate samples were collected at a frequency of one per sampling day. These duplicate samples were identified and treated as separate samples. Acceptance criteria for QA/QC sample analyses was compatible with the most recent version of *SW-846* or other applicable EPA guidance.

The analytical laboratory was required to operate under a QA Program Plan (QAPP) that met the requirements of *SW-846*. QC procedures in the analytical laboratory are guided by the laboratory's QAPP. Laboratory QC samples are required to establish the accuracy and precision of analytical data in order to determine the quality of the data. Table I-3 lists laboratory QC requirements.

The laboratory used the following criteria for data validation:

- Completeness of data deliverable,
- Collection, extraction, and analysis holding times,
- Blank data,
- Laboratory control sample results,
- Matrix spike/matrix spike duplicate results
- Laboratory duplicate sample results, and
- Overall data assessment and usability.

I.4 HUMAN RISK SCREENING (Previous)

Sample results for metals were compared with background levels listed in "Background Concentrations of Constituents of Concern to the Sandia National Laboratories/New Mexico Environmental Restoration Project and the Kirtland Air Force Base Installation Restoration Program" (IT Corporation, 1996). If a sample result exceeded the applicable background level, the result was then compared to the most current, published EPA Region 6 and NMED soil screening level (SSL) for an industrial scenario. Analytical results for explosives were compared to the SSLs. The most current, published EPA Region 6 and NMED SSLs for industrial scenarios (while the OD unit was in operation) are presented in Table I-4 for the various constituents of concern at the OD unit (EPA, 2004; NMED, 2005).

Any exceedances of SSLs were to be reported in writing to the NMED as soon as reasonably possible. Since sampling results never exceeded the SSLs, while the OD unit was active, this action was never necessitated.

I.5 REPORTING (Previous)

Since the EOD Range treatment units have not been active for over two years, this reporting of sampling results is no longer relevant. While active, KAFB submitted annual reports to the NMED. Two identical copies of each annual report were provided and included the following:

- A summary cover letter,
- Copies of the laboratory reports associated with the sampling event, including the analytical results for each sample,
- A summary of any constituents detected at concentrations exceeding background levels or SSLs at a 0.01 confidence level,
- A summary of field and laboratory QC sample results, and
- A figure showing the location of the sampling grid (if any), craters (if any), and all sample locations.

I.6 REFERENCES (Previous to termination of all treatment activity in 2010)

EPA, 2004, "Human Health Medium-Specific Screening Levels," U.S. Environmental Protection Agency, Region 6, 1445 Ross Avenue, Dallas, TX, December 21, 2004.

EPA, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

EPA, 1980, "Samplers and Sampling Procedures for Hazardous Waste Streams," EPA-600/2-80-018, U.S. Environmental Protection Agency, Municipal Environmental Research Laboratory, Cincinnati, OH.

IT Corporation, 1996, "Background Concentrations of Constituents of Concern to the Sandia National Laboratories/New Mexico Environmental Restoration Project and the Kirtland Air Force Base Installation Restoration Program," prepared for Sandia National Laboratories/New Mexico Environmental Restoration Department 7585, Albuquerque, NM.

NMED, 2005, "Technical Background Document for Development of Soil Screening Levels," Revision 3.0, New Mexico Environment Department Hazardous Waste Bureau and Ground Water Quality Bureau and Voluntary Remediation Program, August 2005.

Table I-1
Analytical Parameters, Methods, Sample, and Holding Times

Parameter	Analytical Method[a]	Container Type and Preservative	Holding Time
Total Metals: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Mercury, Nickel, Potassium, Selenium, Silver, Thallium, Zinc	6010B or 7000 Series	500 grams (g) in wide-mouth plastic (WM-P) or glass (G) For chromium and mercury, cool to 4°C	180 days For chromium, one month to extraction, 4 days after extraction until analyzed For mercury, 28 days
High Explosives: 1,3,5-Trinitrobenzene; 1,3-Dinitrobenzene; TNT (2,4,6-Trinitrotoluene); 2,4-Dinitrotoluene; 2,6-Dinitrotoluene; 2-Amino-4,6- Dinitrotoluene; 4-Amino-2,6- Dinitrotoluene; HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7- tetrazocine); 2-Nitrotoluene; Nitrobenzene; 3-Nitrotoluene; 4-Nitrotoluene; Tetryl; RDX (Hexahydro-1,3,5-trinitro-1,3,5- triazine) White phosphorous	8330	250 ml G, cool to 4°C	Samples extracted within 14 days and extracts analyzed within 40 days following extraction
PETN and nitroglycerin	7580	100 g WM-G; cool to 4°C, store in the dark	Indefinite if preserved appropriately and container is kept tightly sealed
	8321A (Modified)	Same as HEs	Same as HEs
Perchlorate	8321A (Modified)	Same as HEs	Same as HEs
Sulfides	9030B and 9034	Fill with 2N zinc acetate until moistened, headspace free; cool to 4°C	Distillates not analyzed immediately should be stored in a sealed flask at 4°C
Total Petroleum Hydrocarbons	8015B	125 ml WM-G with Teflon-lined lid, cool to 4°C	Same as HEs
Total Organic Carbon	9060A	100 g WM-P or G, HCl or H_2SO_4 to pH of 2 Cool to 4ºC, store in the dark	Minimal time preferred
pH	9045D	100 g WM[b]-P[d] or G[c], no preservative	Analyze as soon as possible

[a] Equivalent methods may be used.

Table I-2
Summary of Field Quality Control Samples

Quality Control Sample Type	Sample Matrix	Applicable Analyses	Frequency	Purpose	Acceptance Criteria	Corrective[a] Action
Field duplicate matrix type	Soil	All	One sample per day per	Document precision of the sampling process	Analytical method criteria, if applicable	Advisory--no action required

[a] U.S. Environmental Protection Agency Functional Guidelines for Data Validation may apply.
[b] For metals and high explosives, sample must exhibit the contaminant at a level 5 times the quantitation level to be considered detectable.

Table I-3
Summary of Laboratory Quality Control Procedures by Analytical Method

Parameter	EPA *SW-846*[b] Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Metals	6010B, 7000 Series	Surrogate compounds	Each sample and blank	60–150% recovery	Advisory only--no action
		Instrument calibration	Daily, or each setup	10% of true value	Repeat calibration
		Initial/continuing calibration	After daily instrument calibration, after every 10 samples, end of analytical run	10% of expected value	Terminate analysis, correct problem, recalibrate
		Initial/continuing calibration blank	After daily instrument calibration, after every 10 samples, end of analytical run	Within 3 times the IDL	Terminate analysis, correct problem; recalibrate and reanalyze previous 10 samples
		Preparation blank	Each batch of digested samples	< contract-required detection limits	Redigest and reanalyze all associated samples per method criteria
		Interference check sample (ICS)	Each run or twice per 8-hour shift	20% of true value	Correct problem; recalibrate and reanalyze all samples since last ICS
		Matrix spike (MS)/MS Duplicate sample analysis	Once per field batch per matrix	0–20% relative percent difference when < five times detection limit; detection limit otherwise	Flag data

Parameter	EPA *SW-846*[b] Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Metals (Continued)	6010B, 7000 Series	Laboratory control sample (LCS)	Once per field batch or each digest group	80–120% percent recovery (except silver, antimony)	Correct problem; redigest and reanalyze all samples since last LCS
Serial dilution analysis matrix			Once per field batch per	10% original determination	Flag data
Instrument detection limit			Quarterly	As determined	Not applicable
Interelement corrections			Annually	As determined	Not applicable
Linear range analysis			Quarterly	5% of true value	Reanalyze
High explosives and Perchlorate	8330, 8321A (Modified)	Initial calibration	At beginning of each 12-hour shift during which analysis is performed	Linearity of initial calibration curve is an RSD of ≤20%; nonlinear curves a coefficient of determination ≥0.99; retention times (RT) within absolute RT windows	Repeat calibration
		Mid-point calibration	Midpoint of the run of 10 samples	Mean response factor must agree within ±15% of initial calibration response factor controlled	Correct problem or prepare new standard curve do not cause peak misidentifications
		Instrument recalibration	When performance changes and acceptance criteria cannot be achieved	Mean response factor must agree within ±15% of initial calibration response factor	Re-calibrate
		Acetonitrile, methanol, and water blanks	Prior to preparation of stock solutions	Absence of contamination, regulatory limit, or less than	If blanks contaminated, use different batch

High explosives and Perchlorate	8330, 8321A (Modified)	Method blanks	One for each group of up to 20 samples	Less than laboratory's MDL, less than 5% 5% sample result for same analyte, whichever is greater	Locate/reduce contamination source of and reanalyze samples
		Reference samples	Once per batch	Average recoveries and standard deviations of recoveries meet performance data for determinative method; or use recoveries of 70-130%	Locate/correct source of problem per analyte; repeat test for analyte(s) of interest
		Matrix spike (MS)/MS duplicate/laboratory control samples (LCS)	Once per batch of up to 20 samples	Per method, or LCS of 70-130%	Determine if matrix effect or laboratory performance problem
		Surrogate recoveries	After analysis of 15-20 field samples	Control limits approximate a 99% confidence interval around mean recovery; warning limits approximate a 95% confidence interval	Reanalyze samples or extract and analyze new sample aliquots, including MS and LCS
PETN and nitroglycerin	8321A (Modified)	Not specified	Not specified	Not specified	Not specified

Parameter	EPA *SW-846*[b] Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Sulfides	9030B & 9034	Reagent blank	Once per batch of up to 20 samples	Not specified	Not specified
		Check standards	Once per batch of up to 20 samples	Acceptable recovery depends on level and matrix	Not specified
		Matrix spike	Once per batch of up to 20 samples	Not specified	Low recovery indicates acid-insoluble sulfides
White phosphorous	7580	Initial five-point calibration	Beginning of each 12-hour shift during which samples will be analyzed	RSD must be ≤15%	Re-calibrate
		Mid-point calibration	Following every 10th extract	%D must be ≤15%	Re-calibrate
		Method blank	Once per batch of up to 20 samples	Absence of detectable P_4	Re-extract and reanalyze
		MS/MS duplicate	Once per batch of up to 20 samples	Recoveries in the range of 75-125% and RPD ≤ 25%	Not specified
Total organic carbon	9060A	Blanks	Once per sample batch	Not specified	Not specified
		Check standards	Once per 15 samples	Not specified	Not specified
		MS duplicate	Once per 10 samples	Not specified	Not specified
pH	9045D	Initial two-point calibration	Prior to use instrument use	Readings within 0.5 pH units of buffer solution value	Not specified

Parameter	EPA *SW-846*[b] Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Total Petroleum Hydrocarbons	8015B	Instrument performance: mass calibration/ion abundance pattern	Every 12 hours of analysis time	Per method	Repeat until acceptance criteria satisfied
Initial calibration: instrument sensitivity and linearity of response			Five concentration levels; after each instrument performance, check prior to sample analysis	Relative response factors (RRF) within method limits	Repeat calibration
Continuing calibration time			Every 12 hours of analysis	Average RRFs <25% difference	Repeat calibration
Internal standards samples, and blanks			All calibration standards,	Extracted ion current profile (EICP); D -50 to +100% Retention time shifts <0.50 minutes	Correct malfunction; reanalyze sample per method criteria
Method blank			Every 12 hours of analysis time	<5 times quantitation limit for methylene chloride, acetone, 2-butanone; all other compounds < or = to quantitation limit	Determine source of contamination, and document corrective action; reextract and reanalyze samples
System monitoring compounds			Every method blank, sample, matrix spike, matrix spike duplicate; matrix specific, per method limits	Check instrument and calculations; reanalyze per method criteria	

[a] Source: "U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Inorganic and Organic Analysis" (EPA, 1990). Not all listed procedures may be applicable to *SW-846* protocols.

[b] U.S. Environmental Protection Agency, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.

Table I-4
List of Analytical Parameters, Background Levels, and Industrial Soil Screening Levels (SSL)

Constituent of Concern	Background Level: Surface/Subsurface[b]	EPA[c] Region 6 SSL	NMED[d] SSL
Antimony	3.9 / 3.9	450	454
Arsenic	5.6 / 7	1.8	17.7
Barium	130 / 214	79,000	78,300
Beryllium	0.65 / 0.65	2,200	2,250
Cadmium	1.6 / 0.9	560	564
Chromium (Total)	17.3 / 12.8	500	Not established
Chromium (III)	Not established	100,000	100,000
Chromium (VI)	Not established	71	3,400
Cobalt	5.2 / 5.2	2,100	20,500
Copper	Not established / 18.2	42,000	45,400
Iron	Not established	100,000	100,000
Lead	21.4 / Not established	800	800
Mercury	0.31 / <0.1	340	100,000
Nickel	11.5 / 11.5	23,000	22,500
Potassium	Not established	Not established	Not established
Selenium	<1 / <1	5,700	5,680
Silver	2.0 / <1	5,700	5,680
Thallium	<1.1 / <1.1	91	74.9
Zinc	62 / 62	100,000	100,000
1,3,5-Trinitrobenzene	NA[e]	21,000	Not established
1,3-Dinitrobenzene	NA	68	Not established
2,4,6-Trinitrotoluene	NA	64	342
2,4-Dinitrotoluene	NA	1,400	1,370
2,6-Dinitrotoluene	NA	680	Not established
2-Amino-4,6-Dinitrotoluene	NA	Not established	Not established
4-Amino-2,6-Dinitrotoluene	NA	Not established	Not established
HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	NA	34,000	34,200
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	NA	17	174
m-Nitrotoluene	NA	23,000	569
Nitrobenzene	NA	110	62.4
o-Nitrotoluene	NA	14	13.5
p-Nitrotoluene	NA	190	183
Tetryl	NA	Not established	Not established
Sulfides	NA	Not established	Not established
White phosphorous	NA	Not established	Not established
Pentaerythritol tetranitrate	NA	Not established	Not established
Nitroglycerin	NA	Not established	1,370
Perchlorate	NA	Not established	Not established
TPH	NA	Not established	Not established

[a] Levels in milligrams per kilogram. [b] 95th percentile upper tolerance limit. [c] U.S. Environmental Protection Agency.
[d] New Mexico Environment Department. [e] Not

APPENDIX J

LIST OF HAZARDOUS WASTE MANAGEMENT UNITS AND AOC's REQUIRING CORRECTIVE ACTION

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LIST OF HAZARDOUS WASTE MANAGEMENT UNITS AND AOC's REQUIRING CORRECTIVE ACTION

SWMU	KAFB No.	Site Name
6-1	LF-001	Landfill No. 1
6-2	LF-002	Landfill No. 2
6-4	LF-008	Landfill 4, 5, & 6
6-24	WP-016	Manzano Sewage Treatment Facility
6-30	RW-006	Radioactive Burial 11
10-2-A	ST-325	Corrosion Control Shop, Storm Drain, Bldg 482
10-2-B	ST-220	Paint Shop, Bldg 1001, Storm Drain
10-2-C	ST-220	Plating & Anodizing, Bldg 1001, Storm Drain
10-2-D	ST-329	Propulsion Branch Floor Drains, Bldg 336
10-2-F	ST-325	H-3/H-53, Phase Dock, Bldg 1000 Floor Drains
10-2-G	ST-331	C-130 Maintenance Shop Bldg 1009, Storm Sewer
10-2-H	ST-285	West Storm Sewer System
10-2-I	ST-286	East Storm Sewer System
10-7-V	ST-267	Oil/Water Separator, Bldg 57007
10-21-B	ST-288	Bldg 614 Septic System
	ST-289	Bldgs 617/620 Septic System
	ST-291	Bldg 617 Septic System
10-21-C	ST-294	Bldg 633 Septic System
	ST-298	Bldgs 730 & 734 Septic System
	ST-299	Bldg 751 Septic System
10-21-M	ST-309	Bldg 37504 Septic System
10-21-N	ST-310	Bldgs 37507,37508 & 37513 Septic System
	ST-322	Bldgs 37507,37508, & 37513 Septic System
10-21-O	ST-311	Plant 1 and Bldg 37501 Septic System
10-21-P	ST-312	Plant 2 and Bldg 37503 Septic System
10-21-Q	ST-313	Bldgs 37529/37530 Septic System
10-21-R	ST-293	Bldg 37570 Septic System
10-21-S	ST-314	Bldgs 48056 &48059 Septic System
10-21-T	ST-316	Bldgs 57003/57012 Septic System, CERF
	ST-340	Bldgs 57001 and 57002 Septic System, CERF
10-21-U	ST-318	Bldg 37200 Septic System
10-21-V	ST-319	Bldg 37541 Septic System
10-21-Z	ST-330	Bldg 1032 Septic System
10-21-AA	ST-333	Bldg 66001 Septic System, SOR
	ST-343	Bldgs 66000/66008 Septic System, SOR
	ST-344	Bldg 66042 Septic System, SOR
ST-70-A	ST-070	Bldg 333/334 OWS & Sediment Trap (Former ST-202 & ST-203)
ST-70-B	ST-070	Bldg 377 OWS, Tank, & Drying Rack (Former ST-210)
ST-70-C	ST-070	Bldg 381, Oil/Water Separator (Former ST-211)
ST-70-D	ST-070	Bldg 471, 2 Oil/Water Separators (Former ST-215 & ST-216)
ST-70-E	ST-070	Bldgs 481/482 Oil/Water Separator (Former ST-219)
ST-70-F	ST-070	Bldg 2637 Oil/Water Separator (Former ST-247)
ST-70-G	ST-070	Bldg 20205 Oil/Water Separator (Former ST-248)

SWMU	KAFB No.	Site Name
ST-70-H	ST-070	Bldg 20375 Oil/Water Separator (Former ST-258)
ST-70-I	ST-070	Bldg 20422 Oil/Water Separator (Former ST-260)
ST-73	ST-073	CERF Drain
CS-C751	CS-C751	Zia Park
OT-C572	OT-C572	Building 57001
OT-C573	OT-C573	Asphalt Dump Area
SS-C574	SS-C574	Building 20676 Spill Site
SS-C575	SS-C575	Transient Alert Pad
DP-88	DP-088	Trestle Site Disposal Area
WP-26	WP-026	Sewage Lagoons & Golf Course Pond
SS-102	SS-102	ARES Test Facility
RW-68	RW-068	Radium Dump/Slag Pile & Cratering Area (*Reopened*)
DP-67	DP-67	Three Mine Shafts (*Reopened*)
6-19	OT-029	EOD Range (*to be closed with the Open Burn/Open Detonation Unit)*
ST-106	ST-106	Spill At Bulk Fuels Facility
SS-111	SS-111	Bulk Fuels Facility Phase-Separated Hydrocarbon (PSH)
MBG	ST-105	Manzano Base Groundwater, TCE-Contaminated Groundwater
TAG	ST-105	Tijeras Arroyo Groundwater, TCE-Contaminated Groundwater
WYO-4	ST-105	Monitoring Well WYO-4 Area, TCE Contaminated Groundwater
EOD HILL	EOD HILL	EOD Hill (CG-570)
McCormick Ranch[a]	ST-105	Nitrate-Contaminated Groundwater

[a] The Nitrate-Contaminated Groundwater portion at ST-105 is regulated by the New Mexico Environment Department Ground Water Quality Bureau (NMED-GWQB). The TCE-contaminated groundwater at ST-105 is regulated by the NMED-Hazardous Waste Bureau (NMED-HWB).

APPENDIX K

LIST OF SWMU's AND AOC's FOR WHICH CORRECTIVE ACTION IS COMPLETE

APPENDIX K

LIST OF SWMU's AND AOC's FOR WHICH CORRECTIVE ACTION IS COMPLETE

SWMU	KAFB No.	Site Name
Class 3 Permit Modification Dated 28 August 2003		
6-7	LF-018	Landfill A
6-10	LF-009	Abandoned Landfill
6-15	LF-045	Unnamed Dump
6-16	FT-013	Kirtland Fire Training Area
8-53	ST-335	Paint Shop Floor Drain Bldg 20681
8-58	ST-321	Battery Storage Area, Bldg 57007
10-3	ST-249	Waste Oil Storage Tank Bldg 20205
ST-66	ST-066	Trestle Facility Oil/Water Separator and Pit
RW-68	RW-068	Radium Dump/Slag Pile & Cratering Area
SS-76	SS-076	Fuel Tank Burn Area
SS-83	SS-083	Skeet Range & Landfill Road
ST-326	ST-326	Waste Oil Storage Tank Bldg 20375
ST-328	ST-328	BOP Site Cesspools
Class 3 Permit Modification Dated 3 August 2005		
06-A1	RW-021	Radioactive Burial Site 7
08-49	SS-061	Bldg 20677 Fuel Shop Battery Storage Area (ST-275)
DP-067	DP-067	Three Mine Shafts
LF-056	LF-056	Landfill D
OT-086	OT-086	Former Small Arms Firing Range Disposal Pit Building 29015
RW-085	RW-085	Manzano Maintenance Building
SS-065	SS-065	Horizontal Dipole Drum Rack
SS-082	SS-082	ALECS Facility
SS-103	SS-103	Jet Engine Test Fuel Line
ST-059	ST-059	ART Drum
ST-060	ST-060	Armament Research Test (ART) Facility Drain Pit
Class 3 Permit Modification Dated 21 September 2005		
06-08	LF-015	Landfill B
06-29	LF-020	Manzano Landfill ("Manzano Dump")
06-A2-A	RW-004	Radioactive Holding Tank RB-4
06-A2-B	RW-005	Radioactive Holding Tank RB-5
06-A2-C	RW-017	Radioactive Holding Tank RB-6
06-A2-D	RW-019	Radioactive Holding Tank RB-8
06-A2-E	RW-023	Radioactive Holding Tank RB-9
08-13	ST-071	Bldg 1000/1001 Oil/Water Separator (Formerly ST-221)
09-14	ST-270	Buried Caustic Drain Line Bldg 617
09-15	ST-271	Neutralization Pit Bldg 617
09-16	ST-272	Evaporation/Infiltration Pond Bldg 617
10-21-OO	ST-355	Riding Stables Residence
10-21-S	ST-353	Building 48057 Septic Tank
10-21-S	ST-354	Sheep Grooming Septic Tank
OT-010	OT-010	Radiation Training Sites 5-8 (TS5, TS6, TS7)
RW-075	RW-075	South Tijeras Radiation Trench
SS-069	SS-069	Drum Storage Area
ST-100	ST-100	Coyote Springs Cess Pool
ST-341	ST-341	Condensate Tank Bldg 1033
WP-058	WP-058	East Laundry Bldg 20451

SWMU	KAFB No.	Site Name
Class 3 Permit Modification Dated 29 November 2005		
10-7-A	ST-204	Sediment Trap Bldg 333
	ST-205	Oil/Water Separator Bldg 333
10-7-B	ST-206	Oil/Water Separator Bldg 336
	ST-207	Oil/Water Separator Bldg 336
	ST-208	Oil/Water Separator Bldg 336
	ST-209	Catch Basin Bldg 336
10-7-C	ST-212	Oil/Water Separator Bldg 381
	ST-213	Area Drain Bldg 381
10-7-D	ST-217	Oil/Water Separator Bldg 481
10-7-E	ST-218	Oil/Water Separator Bldg 482
10-7-F	ST-222	Oil/Water Separator Bldg 1031
	ST-223	Sewage Ejector Unit Bldg 1031
	ST-224	Area Drain Bldg 1031
	ST-225	Holding Tank Bldg 1031
10-7-G	ST-226	Oil/Water Separator Bldg 1037
	ST-227	Holding Tank Building 1037
10-7-H	ST-228	Area Drain Bldg 1040
10-7-I	ST-229	Sewage Ejector Unit Bldg 1043
10-7-J	ST-230	Oil/Water Separator Bldg 1046
	ST-231	Holding Tank Bldg 1046
	ST-232	Sewage Ejector Unit Bldg 1046
	ST-233	Area Drain Bldg 1046
10-7-K	ST-234	Oil/Water Separator Bldg 1051
	ST-235	Oil/Water Separator Bldg 1051
	ST-236	Oil/Water Separator Bldg 1051
	ST-237	Area Drain Bldg 1051
10-7-L	ST-238	Oil/Water Separator Bldg 1056
	ST-239	Oil/Water Separator Bldg 1056
10-7-M	ST-240	Holding Tank Bldg 1058
10-7-N	ST-241	Oil/Water Separator Bldg 1061
10-7-O	ST-244	Oil/Water Separator Bldg 1064
	ST-245	Holding Tank Bldg 1064
10-7-P	ST-246	Oil/Water Separator Bldg 1070
10-7-Q	ST-254	Oil/Water Separator Bldg 20365
10-7-R	ST-255	Oil/Water Separator Bldg 20375
	ST-256	Oil/Water Separator Bldg 20375
	ST-257	Oil/Water Separator Bldg 20375
10-7-S	ST-259	Oil/Water Separator Bldg 20422
10-7-T	ST-263	Oil/Water Separator Bldg 23226
10-7-U	ST-264	Oil/Water Separator Bldg 30142
Class 3 Permit Modification Dated 27 February 2006		
6-14	ST-051	Sewage Effluent Line
8-5	ST-201	Oil/Water Separator, Bldg 255
8-6	WP-047	Silver Recovery Unit
8-26	ST-242	Oil/Water Separator, Bldg 1063
	ST-243	Oil/Water Separator, Bldg 1063
8-28	ST-250	Oil/Water Separator, Bldg 20338
8-29	ST-251	Oil/Water Separator, Bldg 20344
8-31	ST-252	Oil /Water Separator, Bldg 20348
	ST-253	Oil/Water Separator, Bldg 20348

SWMU	KAFB No.	Site Name
8-41	ST-274	Waste Battery Storage Area, Bldg 20423
8-47	ST-261	Oil/Water Separator, Bldg 20423
8-55	ST-262	Oil/Water Separator, CE Bldg 20698
10-1-A	ST-278	Sanitary Sewer System A
10-1-B	ST-279	Sanitary Sewer System B
10-1-C	ST-280	Sanitary Sewer System C
10-1-D	ST-281	Sanitary Sewer System D
10-1-E	ST-282	Sanitary Sewer System E
10-1-F	ST-283	Sanitary Sewer System F
10-1-G	ST-284	Sanitary Sewer System G
10-1-H	ST-327	Manzano Sanitary Sewer System
Class 3 Permit Modification Dated 2 June 2006		
AOC DP-101	DP-101	Old EOD Disposal Pits
6-31	OT-028	McCormick Range Ranch
OT-074	OT-074	Pistol Range Sites
OT-091	OT-091	South Coyote Firing Range
AOC RW-084	RW-084	Manzano Burial Site
SD-090	SD-090	JATO Rocket Motor Disposal Site
9-20	SS-062	Bldg 909 Inactive Waste Accumulation Area (SS-62) (Former ST-277)
AOC SS-081	SS-081	Detention Pond and Yard Bldg 907
ST-72	ST-072	MWSA Security Garage Oil/Water Separator Bldg 30146
AOC DP-099	DP-099	Disposal Pit Bldg 29015
FT-15	FT-015	NMERI Fire Suppression Test Area
SS-079	SS-079	Bldg 381 Spill Site
SS-078A	SS-078A	Water Tower Soils - 21650
AOC SS-089	SS-089	Transportation Yard
ST-080	ST-080	Manzano Auto Hobby Shop Bldg 30124
10-21-B	ST-273	Bldg 618 Septic System, Chemical Laser
9-4	ST-276	Waste Accumulation Area Bldg 617
ST-347	ST-347	Building 29015 Cess Pool
10-21-B	ST-351	Building 635 Septic Tank
10-21-B	ST-352	Building 613/614 Septic Tank
WP-087	WP-087	Grab Site Waste Pile
WP-339	WP-339	Contractor Yard West of Building 20423
LF-268	LF-268	Active Landfill
Class 3 Permit Modification Dated 17 July 2007		
6-11	LF-044	Fill Area SE of Sewage Lagoons
SS-77	SS-077	Abandoned Railroad Spur
6-22	OT-046	Lake Christian
6-32	FT-014	Manzano Fire Training Area
8-35	ST-214	Waste Oil Storage Tank, Bldg 471
10-2-E	SS-063	Jet Engine Test Cell (Former ST-336)
10-21-B	ST-348	Building 610 Septic Tank
	ST-349	Building 626 Septic Tank
ST-64	ST-064	COE Vehicle Maintenance Yard (Former ST-337)
SS-078-B	SS-078-B	Water Tower 21871
SS-078-C	SS-078-C	Water Tower 2474
SS-078-D	SS-078-D	ITRI WTs
LF-107	LF-107	VA Hospital Demolition Debris Landfill
ST-108	ST-108	Abandoned JP-4 Fuel Line

SWMU	KAFB No.	Site Name
Class 3 Permit Modification Dated 4 April 2008		
10-21-A	ST-287	Building 525 Septic System
10-21-B	ST-290	Building 619 Septic System
10-21-B	ST-292	Building 622 Septic System
10-21-C	ST-295	Building 638 Septic System
10-21-D	ST-296	Building 702 Septic System
10-21-D	ST-297	Building 707 Septic System
10-21-E	ST-300	Building 20199 Septic System
10-21-F	ST-301	Building 20560 Septic System
10-21-G	ST-302	Building 20599 Septic System
10-21-H	ST-303	Building 20749 Septic System
10-21-I	ST-304	Building 20797 Septic System
10-21-J	ST-305	Building 28054 Septic System
10-21-J	ST-306	Building 28050 Septic System
10-21-K	ST-307	Building 30101 Septic System
10-21-L	ST-308	Building 37511 Septic System
10-21-K	ST-315	Building 30102 Septic System
10-21-T	ST-317	Building 57011 Septic System
10-21-W	ST-320	Building 20149 Septic System
10-21-X	ST-323	Building 29042 Septic System
10-21-Y	ST-324	Building 29051 Septic System
10-21-AA	ST-342	SOR Building 66029 Septic System
10-21-AA	ST-345	SOR Building 66006 Septic System
10-21-BB	ST-346	Trestle Site Septic System
6-3	LF-007	Landfill 3
ST-356	ST-356	Skeet Range Septic Tank (Domestic Sewage)
10-21-X	ST-350	600 Area Field Office Septic Tank (Domestic Sewage)

APPENDIX L

KAFB PERFORMANCE BASED CONTRACTS

APPENDIX L

KAFB PERFORMANCE BASED CONTRACTS (PBCs)

L.1 A PBC was awarded to FPM/URS on 20 September 2013. This 10 year contract covers remediation/investigation activities at certain SWMU's/AOC's that reside on the facility. Below is a synopsis of the performance objectives:

Achieve Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI):
- CG570: EOD Hill

Achieve Response Complete (RC) for:
- ML125: Field Firing Range (action being completed under CERCLA)
- AL120: Proximity Fuze Range (action being completed under CERCLA)
- PT123: Tijeras Small Arms Range (action being completed under CERCLA)
- DA130: Arroyo Del Coyote Demolition Area (action being completed under CERCLA)
- ST105: Trichloroethylene (TCE) and Nitrate Contaminated Groundwater

Achieve Site Closure (SC) for:
- OT572: Building 57001
- OT573: Asphalt Dump Area
- SS575: Transient Alert Pad
- CS571: Zia Park
- TG100: Bomb Target (action being completed under CERCLA)
- AL120A: Proximity Fuze Range (action being completed under CERCLA)
- AL120B: Proximity Fuze Range (action being completed under CERCLA)
- PL567: UST058
- WP026: Base Sewage Lagoons & Golf Course Pond
- ST070E: Oil/Water Separator (ST-219)

Develop an Optimized Exit Strategy (OES) to achieve SC and implement the elements of the approved strategy that fall within the Period Of Performance (POP) for:
- LF001: Landfill No.1
- LF002: Landfill No. 2
- LF008: Landfill No. 4, 5 & 6 Building 5700-1

L.2 A PBC was awarded to CH2MHILL on 29 September 2011. This 5 year contract covers various clean up and sampling activities at the Open Burn and Open Detonation Units to achieve closure of the EOD range.

Specific closure activities at the Open Detonation unit include:
- Installation of four groundwater monitoring wells at the EOD range (one upgradient and three downgradient wells) and eight consecutive quarters of groundwater sampling to determine the presence or absence of groundwater contamination;
- Removing any soil or debris from the OD Unit that have contaminant concentrations which pose unacceptable risk to human health or the environment;
- Sending for treatment and disposal any solid and hazardous waste, including any treatment residues, to a permitted Treatment, Storage, or Disposal Facility (TSDF) in accordance with applicable regulatory requirements.

Final closure for the OD Unit shall be completed when:
- All solid and hazardous waste has been disposed of off-site as required by law;

- Sampling and analysis demonstrates that no unacceptable risk to human health or the environment originating from the OD Unit exists in soil or groundwater;
- A Certification of Closure and Closure Report has been submitted to the Department; and
- The Department has approved the Certification of Closure and Closure Report.

Specific closure activities at the Open Burn unit include:

- Removal of the OB structure, secondary containment curbing and equipment used at the OB Unit for hazardous waste treatment.
- Sampling of the soil underneath the base of the former OB Unit.
- Sifting of the soils beneath the OB Unit to a depth of one foot to remove scrap metal.
- Grading the area to level.
- Removing any soil or debris from the OB Unit that have contaminant concentrations which pose unacceptable risk to human health or the environment;
- Sending for treatment and disposal any solid and hazardous waste, including any treatment residues, to a permitted Treatment, Storage, or Disposal Facility (TSDF) in accordance with applicable regulatory requirements.

Final closure shall be complete when:

- All structures and equipment from the OB Unit have been removed;
- All solid and hazardous waste has been disposed of off-site as required by law;
- Sampling demonstrates that no unacceptable risk to human health or the environment exists in soil at the OB Unit;
- A Certification of Closure and Closure Report has been submitted to the Department; and
- The Department has approved the Certification of Closure and Closure Report.

L.3 A PBC was awarded to SHAW/CB&I on 30 September 2010. This 5 year contract objective is to have a remedy in place to remediate soil and groundwater fuel contamination released from the KAFB Bulk Fuels Storage Facility (BFF).

Work includes completing groundwater, and vadose zone investigation, as well as interim measures with an end goal of achieving a remedy in place by the end of the contract.