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FINAL  
APPLICATION FOR  
RCRA PART B SUBPART X PERMIT  
OPEN BURNING/OPEN DETONATION (OB/OD)  
AT  
EGLIN AIR FORCE BASE, FLORIDA

*Prepared for:*

U.S. Air Force  
Eglin Air Force Base  
Florida

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## **HOW TO READ THIS APPLICATION**

This revised application for a RCRA Part B Subpart X Permit for designated Open Burning/Open Detonation (OB/OD) units at Eglin Air Force Base (EAFB) is prepared to incorporate responses to EPA and State of Florida review comments on the original submission by EAFB in June 1989. The following information is presented to guide the reader in reviewing this application.

The format and structure correspond with the USEPA "Checklist for Technical Review of RCRA Part B Permit Application for Subpart X Units." As such, the application is broken into three major sections.

- Section I: Part A Application form and accompanying data.
- Sections II and III: RCRA Part B Application submittal.

Since OB/OD are military-specific activities, a glossary of terms and list of acronyms and abbreviations is provided at the beginning of the report.

As stated, the body of the application directly corresponds to the USEPA checklist. The following page illustrates the hierarchy of headings, with examples.

*Section Heading*

**SECTION III  
SPECIFIC INFORMATION REQUIREMENTS**

There are three major sections in this application.

*Major Heading*

**III.A PROCESS INFORMATION**

Other example major headings are Contingency Plan, Personnel Training.

*Secondary  
Heading*

**III.A1 OPEN BURNING (OB) IN CONTAMINANT  
DEVICES [40 CFR 270.23 and 270.32]**

The heading above is considered a third-order heading. Where applicable, headings will show the USEPA regulation citation.

*Checklist Items,  
Subsidiary  
Headings*

**III.A1.1 Containment Device Description [40 CFR 270.23(a)]**

These headings are as defined by the checklist.

**III.A1.1.1 Physical Characteristics, Construction Materials...  
[40 CFR 270.23(a)(1)]**

Headings are as defined by the checklist

## **GLOSSARY OF TERMS**

<b>AMMUNITION</b>	A contrivance charged with explosives, propellants, pyrotechnics, and/or initiating compositions which is used for military purposes.
<b>BLOW-IN-PLACE</b>	Common EOD term that refers to destroying a munition where found.
<b>COMPOSITE</b>	A propellant consisting of two or more propellant energetic constituents.
<b>DECIBEL</b>	A unit of air overpressure commonly used to measure air blast.
<b>DEFLAGRATION</b>	A rapid chemical reaction in which the output of heat is sufficient to enable the reaction to proceed and be accelerated without input of heat from another source. It is a surface phenomenon with the reaction products flowing away from the unreacted material along the surface at subsonic velocity. Confinement of the reaction increases pressure, the rate of reaction, and temperature; and may cause transition into detonation. Thus, the effect of a true deflagration under confinement is an explosion.
<b>DEMILITARIZATION</b>	The rendering of propellants, explosives, pyrotechnics, ammunition, and other ordnance items harmless and ineffective for military use.
<b>DETONATION</b>	A violent chemical reaction within a chemical compound or mechanical mixture involving heat and pressure. The reaction proceeds through the reacted material toward the unreacted material at a supersonic velocity. A detonation, which occurs on or near the surface of the ground, normally forms a crater.
<b>DOUBLE-BASE PROPELLANT</b>	A propellant composition whose principal explosive ingredients are nitroglycerin and nitrocellulose.
<b>DUD FIRED</b>	Any munition that fails to function as designed.
<b>END ITEM</b>	An item manufactured for a specific purpose, such as a detonator, practice bomb, 20mm target practice ammunition, etc. This does not include any intermediate stage produce or manufacturing waste.

ENERGETIC MATERIAL(S)	Any chemical compound(s) or mixture(s) of substances which, when initiated, result in the rapid evolution of energy. Such materials include propellants, explosives, pyrotechnics, and some of their ingredients, precursors, and by-products.
EXPLOSION	A chemical reaction of any chemical compound or mechanical mixture which, when initiated, undergoes very rapid combustion or decomposition. Large volumes of highly heated gases are released, which exert pressures on the surrounding medium. Depending on the rate of energy release, an explosion can be categorized either as a deflagration or a detonation.
EXPLOSIVE	Any chemical compound, mixture, or device which, when subjected to suitable initiating impulses or agents such as flame, spark, heat, impact, or friction (whether applied mechanically or electrically), will undergo chemical and physical transformations at speeds varying from extremely rapid to virtually instantaneous, resulting in sudden and rapid development of very high pressure in the surrounding medium. The term applies to materials that either detonate or deflagrate.
EXPLOSIVE DEMOLITION	Destroying an item through the use of explosive material.
FACILITY	Used generally as any TSD unit or government installation or activity.
GRAIN	A unit of weight measurement where 7,000 grains are equivalent to one 16-ounce pound (0.45 kilograms).
HIGH EXPLOSIVE	An explosive in which the transformation from its original composition and form, once initiated, proceeds with virtually instantaneous and continuous speed throughout the total mass, accompanied by the rapid evolution of heat and a large volume of gas, causing very high pressure and a widespread shattering effect.
INITIATION	The act of causing an explosive material to detonate or deflagrate.
MAGAZINE	Any building, structure, or container, other than a building used in the manufacture of energetic materials, which has been approved for the storage of these materials.



MUNITIONS RESIDUE	The inert remains of a munition after it has functioned as designed or has been subjected to demilitarization procedures.
OB/OD UNIT	A continuous area of land containing one or more OB/OD sites or subunits.
OPEN BURNING	The burning of materials in the open air, either on the ground surface or in a containment device, without significant control of the combustion and in such a manner that the products of combustion are emitted directly into the ambient air without passing through a device intended to control gaseous or particulate emissions.
OPEN DETONATION	The detonation of materials placed on or under the ground in such a manner that the products of detonation are emitted directly into the ambient air... (See Open Burning above).
ORDNANCE	Military material, such as combat weapons of all kinds, including ammunition and equipment required for their use.
OXIDIZER OR OXIDIZING MATERIAL	A substance, such as nitrate, that readily yields oxygen or other oxidizing substances to stimulate the combustion of organic matter or other fuel.
PROPELLANT	A high energy material that normally functions by deflagration and is used for propulsion purposes. Specifically, it is an explosive charge for propelling a bullet, shell, or the like; also a fuel, either solid or liquid, for propelling a rocket or missile.
PRACTICE	Items configured to contain only an explosive pyrotechnic or chemical "spotting charge" to provide visual evidence of delivery effectiveness.
PYROTECHNIC	Any combustible or explosive compositions or manufactured articles designed and prepared for the purpose of producing audible or visible (smoke or light) effects.
REWORK	Work performed on ammunition, missiles, rockets, or other ordnance to restore these items to a completely serviceable condition; it usually involves the replacement of unserviceable or outmoded parts.
SHELF LIFE	The length of time of storage during which an energetic material retains adequate performance characteristics.

SHOCK WAVE	A transient pressure pulse that propagates at supersonic velocity.
SINGLE-BASE PROPELLANT	A propellant composition whose principal explosive ingredient is nitrocellulose.
STANDARD OPERATING PROCEDURE (SOP)	A document which prescribes operator instruction in a definite course of action for processing a work unit. An SOP includes specifications, safety instructions, and performance standards (i.e., environmental and engineering).
SUBSONIC	Less than the speed of sound.
SUPERSONIC	Greater than the speed of sound.
UNIT	Specific TSD facility.
WASTE MUNITIONS	Consists of waste ordnance and waste PEP.
WASTE PEP	Consists of propellants, explosives, or pyrotechnics (PEP) and other such energetic or hazardous materials which do not or cannot be refined to meet the required military specifications. Such wastes consist of off-specification and scrap materials which are generated from primary production, loading, rework, demilitarization, and resource recovery operations.

## ACRONYMS AND ABBREVIATIONS

ACC	Air Combat Command
ACL	Alternative Concentration Limit
AFB	Air Force Base
AFDTC	Air Force Development Test Center
AFOSH	Air Force Occupational Safety and Health
AFR	Air Force Regulation
AFTO	Air Force Technical Order
AMC	Air Mobility Command
BCF	Bioconcentration Factor
BEEF	Base Environmental Emergency Force
BGS	Below Ground Surface
CAD/PAD	Cartridge Actuated Devices/Power Actuated Devices
CERCLA	Comprehensive Environmental Response, Compensations, and Liability Act of 1980 (Superfund)
CES/CEV	Civil Engineering Squadron/Environmental
CFR	Code of Federal Regulations
COPC	Chemical of Potential Concern, <del>Compound of Concern</del>
CSF	Cancer Slope Factor
CSG	Combat Support Group
DNT	Dinitrotoluene (either 2,4- or 2,6-)
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EAFB	Eglin Air Force Base
EOD	Explosive Ordnance Disposal
EP	Extraction Procedure
EPA	EPA Environmental Protection Agency
EQ	Ecotoxicity Quotient
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FOI	Flight Operating Instruction
ft	feet
g	Grain
HBTC	Health-Based Target Concentrations
HEAST	Health Effect Assessment Summary Table
HERD	High Explosive Research and Development
HI	Hazard Index

HMX	Cyclotetramethylenetetranitramine
HQ	Hazard Quotient
HSWA	Hazardous and Solid Waste Amendments to RCRA
HW	Hazardous Waste
ID	Identification
in	inch
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
JQS	Job Qualifications Standard
LEPC	Local Emergency Planning Commission
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter
mi	mile
MSL	Mean Sea Level
MW	molecular weight
NAAQS	National Ambient Air Quality Standards
NAVSCOLEOD	Naval School Explosive Ordnance Disposal
NCOIC	Non-Commissioned Officer in Charge
NEW	Net Explosive Weight
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
OB	Open Burning
OB/OD	Open Burning/Open Detonation
OD	Open Detonation
OSC	On-Scene Commander
OSHA	Occupational Safety and Health Administration
PCS	Permanent Change of Station
PEP	Propellants, Explosives, and Pyrotechnics
PETN	Pentaerythritol Tetranitrate
ppm	Parts per Million
QA	Quality Assurance
QC	Quality Control
RCO	Range Control Officer
RCRA	Resource Conservation and Recovery Act
RDX	Cyclotrimethylenetrinitramine

RFA	RCRA Facility Assessment
RICS	Products of Incomplete Combustion
RI/FS	Remedial Investigation/Feasibility Study (CERCLA)
ROCC	Range Operations Control Center
RQ	Reportable Quantity
SLAMS	State and Local Air Monitoring Stations
SOI	Squadron Operating Instruction
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Containment, and Countermeasures
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TD	Test Directive
TDS	Total Dissolved Solids
TNT	2,4,6-Trinitrotoluene
TO	Technical Order
TPH	Total Petroleum Hydrocarbons
TSDF	Treatment, Storage, and Disposal Facility
TSS	Total Suspended Solids
$\mu\text{g/L}$	Micrograms per Liter
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance

CERTIFICATION FOR NEW  
SUBMITTALS

[FORM 17-730.900(2)(d)]

~~[TO BE PROVIDED]~~

[PREVIOUSLY SUBMITTED]

## **PART A APPLICATION**

## **I.A PART A APPLICATION**

A RCRA Part A permit application for Open Burning and Open Detonation (OB/OD) of explosive wastes at Eglin Air Force Base (EAFB) was submitted to EPA Region IV and Florida Department of Environmental Protection (FDEP) in June 1989. A new Part A application is not provided with this submission. Review comments from EPA and FDEP were received (FDEP Letter, 11 February 1993) on the EAFB initial submittal to address RCRA Subpart X considerations. Four comments specifically pertaining to the Part A application were provided to EAFB. Information provided in this revised Part B Subpart X application addresses review comments as discussed below.

### **I.A1 DESCRIPTION OF ACTIVITIES [40 CFR 270.13(a)(m)]**

OB/OD of military munitions and explosives-contaminated items is performed at two designated locations at EAFB. OB activities are performed at a designated location on Range C-62. OD activities are performed at designated locations on Range C-62 and C-52N. A detailed description of OB/OD activities is provided in Sections III.A1 and III.A3 of this application. Photographic exposures (Nos. 1-6) depict the OB/OD units.

### **I.A2 FACILITY LOCATION [40 CFR 270.13(b)(1)]**

OB/OD activities are performed at designated locations on active bombing ranges C-52N and C-62. Detailed topographic maps showing all site improvements and required information are provided in Section II.A2 of this application.

### **I.A3 PROCESS DESCRIPTIONS [40 CFR 270.13(i)]**

A detailed discussion of OB and OD processes performed at EAFB is provided in Sections III.A1 and III.A3 of this application.

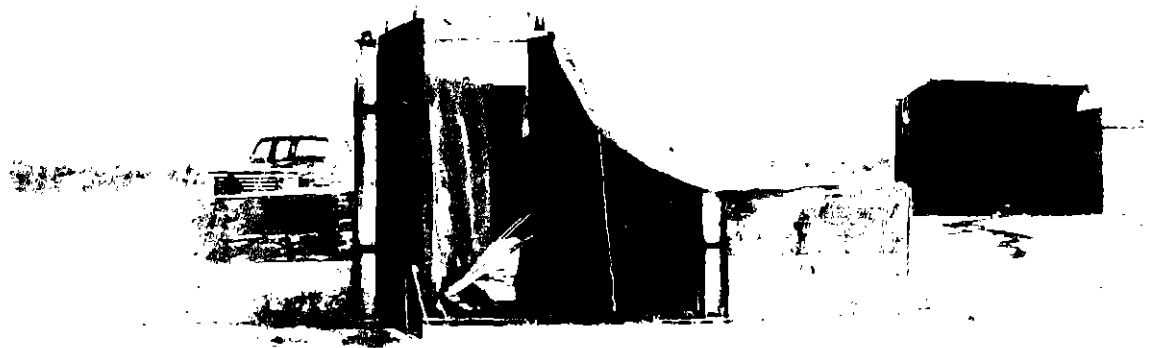
### **I.A4 LISTING OF PERMITS OR APPROVALS [40 CFR 270.13(x)]**

The OB/OD facility is an existing unit. This is a revised application to address Subpart X considerations. A summary list of ~~all other~~ current environmental permits for EAFB is included as Appendix A.





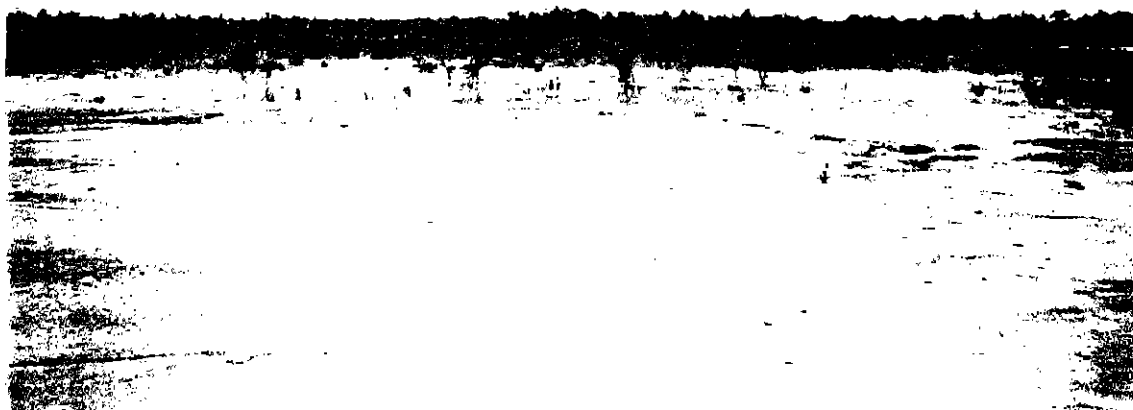
Exposure No. 1, Eglin Air Force Base Range C-62 Open Burning Facility #8763, burn kettle with ramp.



Exposure No. 2, Eglin Air Force Base Range C-62 Open Burning Facility #8764, burn kettle with loading dock (left), and Facility #8763. Burn Kettle with ramp (right).



Exposure No. 3, Eglin Air Force Base Range C-62 open burning dunnage.



Exposure No. 4, Eglin Air Force Base Range C-62 panoramic view of area surrounding open burning/open detonation operations



Exposure No. 5, Eglin Air Force Base Range C-52N open detonation area.



Exposure No. 6, Eglin Air Force Base Range C-62 open detonation area.

## **PART B GENERAL INFORMATION REQUIREMENTS**

## **II.A FACILITY DESCRIPTION**

### **II.A1 GENERAL DESCRIPTION [40 CFR 270.14(b)(1)]**

#### **II.A1.1 Applicability of Part B to this Facility [40 CFR 264.1]**

The EAFB OB/OD units are defined to be miscellaneous units treating reactive hazardous wastes. Therefore, the majority of the regulations contained in the general performance standards of 40 CFR 264, Subparts A through G, apply to operations at these hazardous waste units. Regulations specifically governing miscellaneous units, contained in Subpart X, also apply to the OB/OD units; however, note that the financial requirements of Subpart H do not apply to EAFB because it is a military installation.

#### **II.A1.2 Managed Wastes Generated Onsite and Offsite**

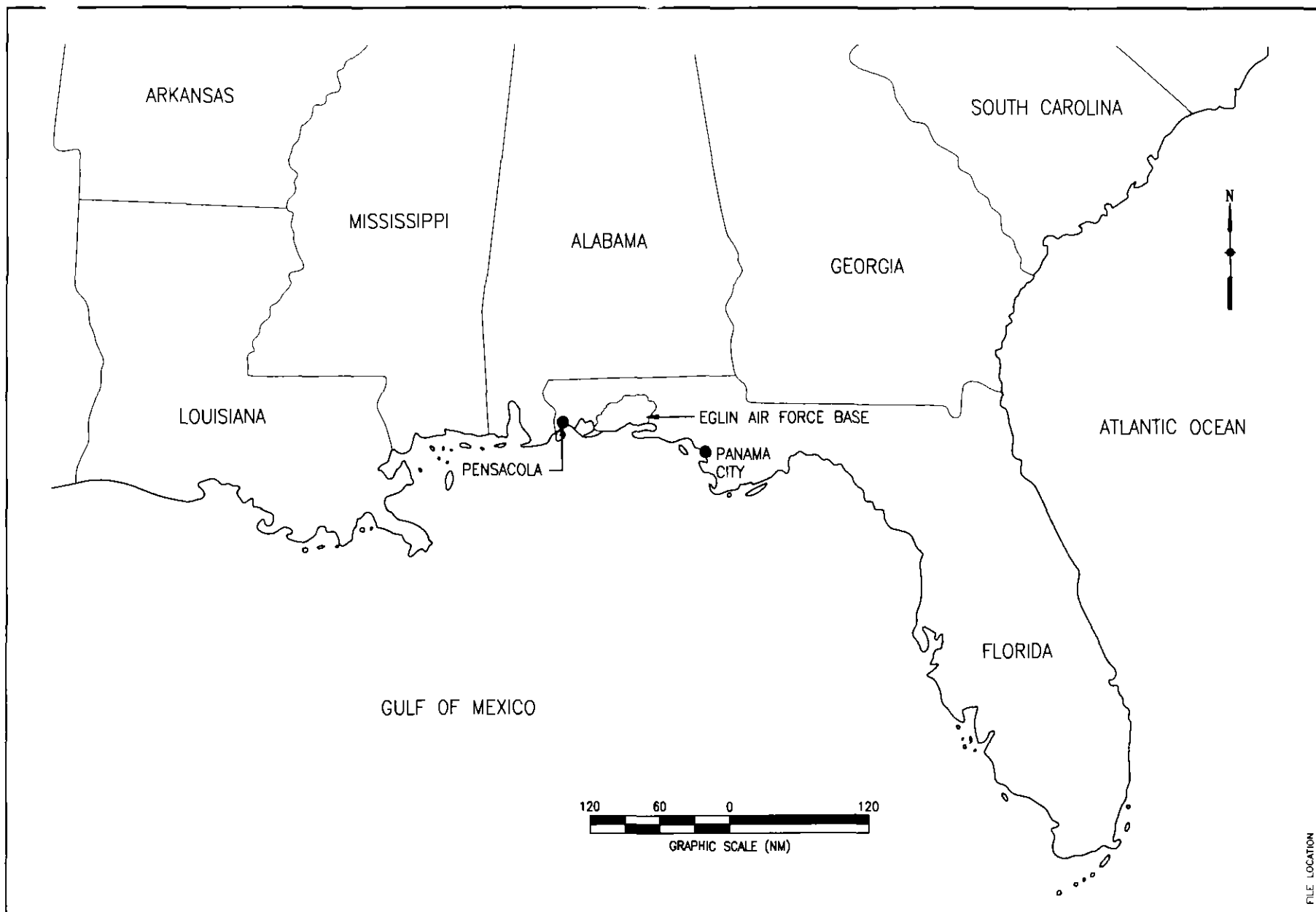
The wastes treated at the EAFB OB/OD units are generated by EAFB and other government agencies with valid support agreements with EAFB. The EAFB OB/OD units do not treat any non-DOD waste munitions generated from off-base locations or discovered at off-base locations. EAFB Explosive Ordnance Disposal (EOD) staff do, however, provide technical assistance to others for off-base disposal of unexploded ordnance (UXO) items and commercial explosives for emergency assistance.

#### **II.A1.3 Location**

EAFB is located in Okaloosa, Walton, and Santa Rosa counties, north of Fort Walton Beach, Florida, and east of the city of Pensacola, Florida (Figures II-1 and II-2). EAFB consists of a land area covering more than 720 mi<sup>2</sup> (Figure II-3) and an associated joint-use airspace and water area covering 86,500 mi<sup>2</sup> in the Gulf of Mexico. This combination makes EAFB the largest Air Force base in the free world.

#### **II.A1.4 Owner or Operator's Name**

EAFB is a federal installation that is currently home to the U.S. Air Force Development Test Center (AFDTC). Other major activities based at EAFB include an Air Combat Command (ACC) fighter wing, two Air Force Special Operations Command squadrons, and an Air Mobility Command (AMC) airlift detachment. Major tenant organizations include the U.S.



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FLORIDA

LOCATION MAP

DESIGNED BY  
DPM

DRAWN BY  
FDM

DATE  
4-4-94

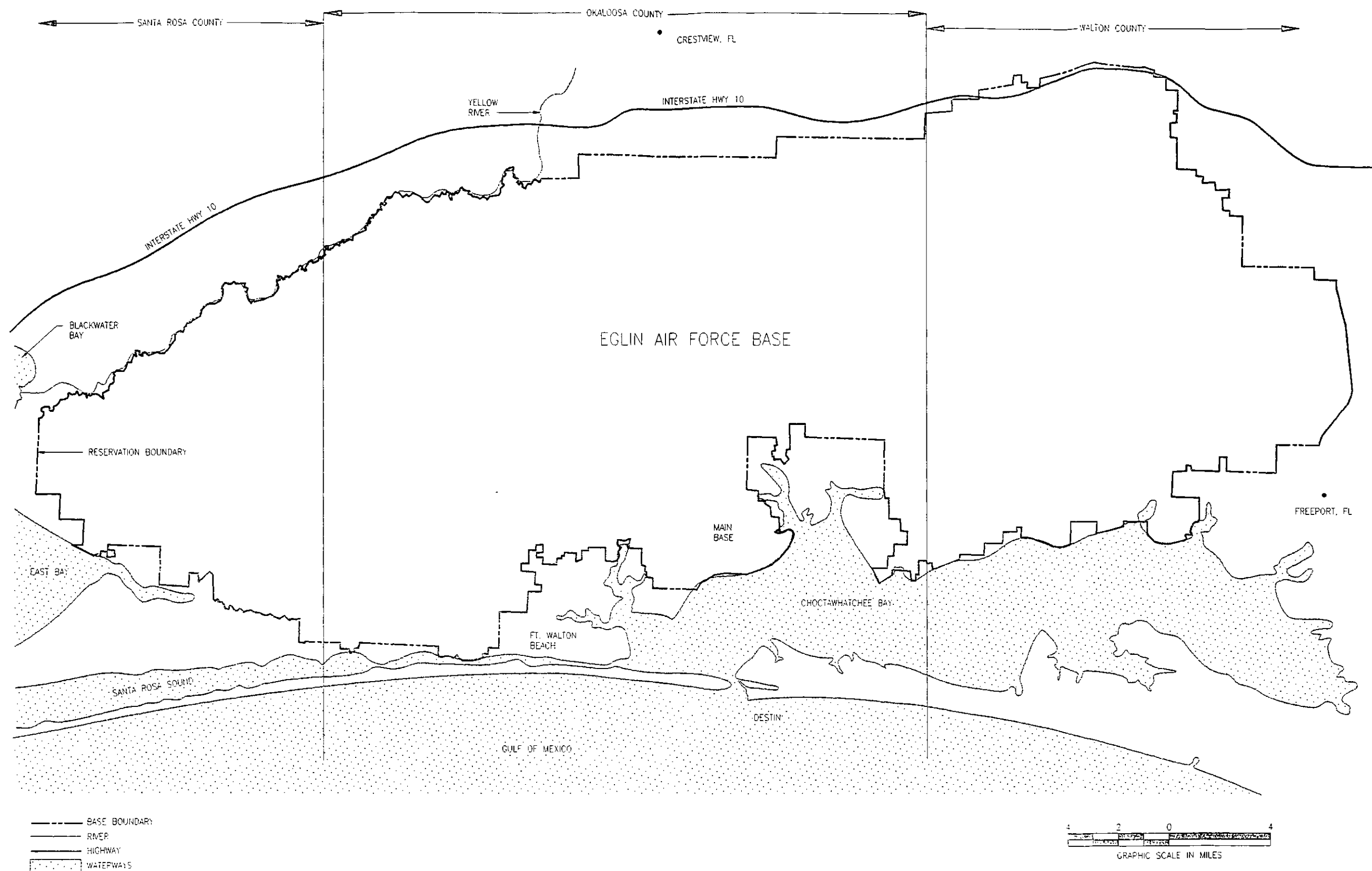
PROJECT NO.  
11206.70

CHECKED BY  
GEJ

PROJECT MGR.  
GEJ

SCALE  
1"=120 NM.

FIGURE  
II-1



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FLORIDA

VICINITY MAP

DESIGNED BY DPM	DRAWN BY FDM	DATE 8-30-93	PROJECT NO. 11206.70	FILE NAME VICINITY
CHECKED BY GEJ	PROJECT MGR. GEJ	SCALE 1 IN. = 4 MI.	FIGURE NO. II-2	SHEET NO. -





Navy Explosive Ordnance Disposal School and a Federal Bureau of Prisons medium security facility.

#### **II.A1.5 Type of Waste Management Activities Conducted**

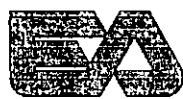
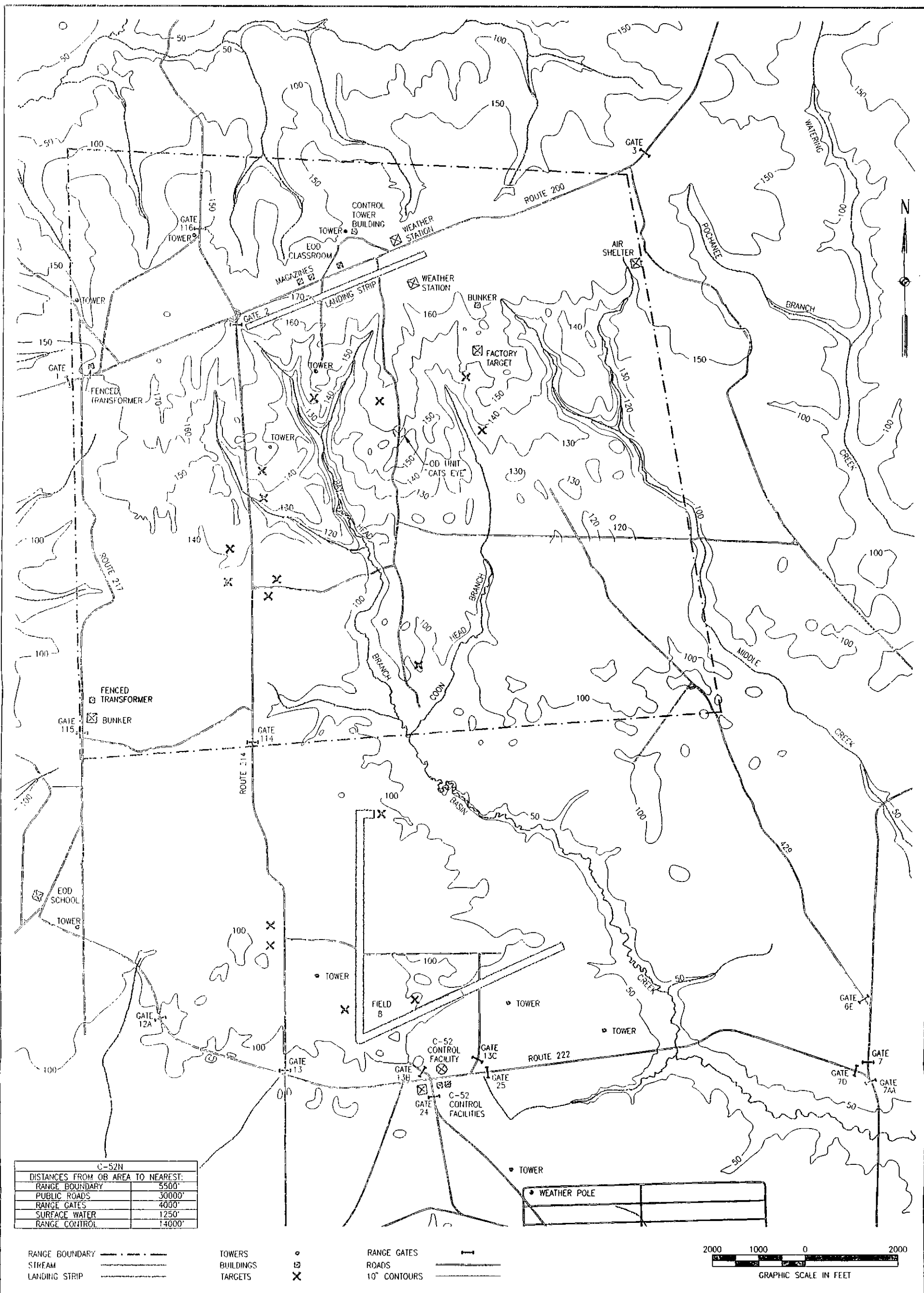
The only wastes treated onsite are explosive and explosive-contaminated wastes.

Unserviceable or outdated ammunition (up to 40 mm), flares, and assorted cartridge actuated devices/power actuated devices (CAD/PAD) are burned at the Range C-62 OB unit. Larger bombs, large caliber projectiles, mines, rockets, bulk explosives, and fuzes are detonated at Range C-62. Experimental explosives designated for disposal by the High Explosives Research and Development (HERD) facility are detonated at Ranges C-52N and C-62. The OB/OD units are the only locations at EAFB where waste explosives are treated.

Section II.B1.2 discusses types of primary explosive components associated with treated waste explosives and their parent and probable degradation products. Criteria for determining applicability of OB/OD and potential alternative disposal methods are addressed in Section III.A1.

#### **II.A1.6 Type of Treatment Unit**

The OB/OD units pertinent to this application are located on two active bombing/training ranges, C-52N and C-62, in the eastern half of the base (Figure II-3). EAFB does not have a dedicated EOD range used exclusively for EOD as is common at other Air Force bases. Range C-52N consists of approximately 2.5 mi (east/west) x 2.25 mi (north/south) of cleared land, bordered by the other contiguous C-52 ranges (E, W, A and C) on the east, west, and south sides, respectively. The entire complement of C-52 ranges lies approximately 11 mi east of Eglin Main Base and 2 mi north of Choctawhatchee Bay. Range C-52N is mainly used as an Air-to-Ground bombing, gunnery, and rocketry range and contains the site known as the "cat's eye" target (TT-8), which is also used for OD (Figure II-4). Range C-62 is located in Walton County in the northeast corner of the base, approximately 2 mi west and south of the base boundary (Figure II-5). The range consists of 1,290 acres actively used for Air-to-Ground bombing, gunnery, and rocketry practice. Both an OB and OD unit are located in the southern end of the range approximately 1,000 ft from the range boundary. The OD units consist of cleared land and utilize craters formed from past detonation activities. The OB activities take place in burn kettles constructed for munitions disposal. A detailed description of OB and OD facilities is presented in Sections III.A1 and III.A3.

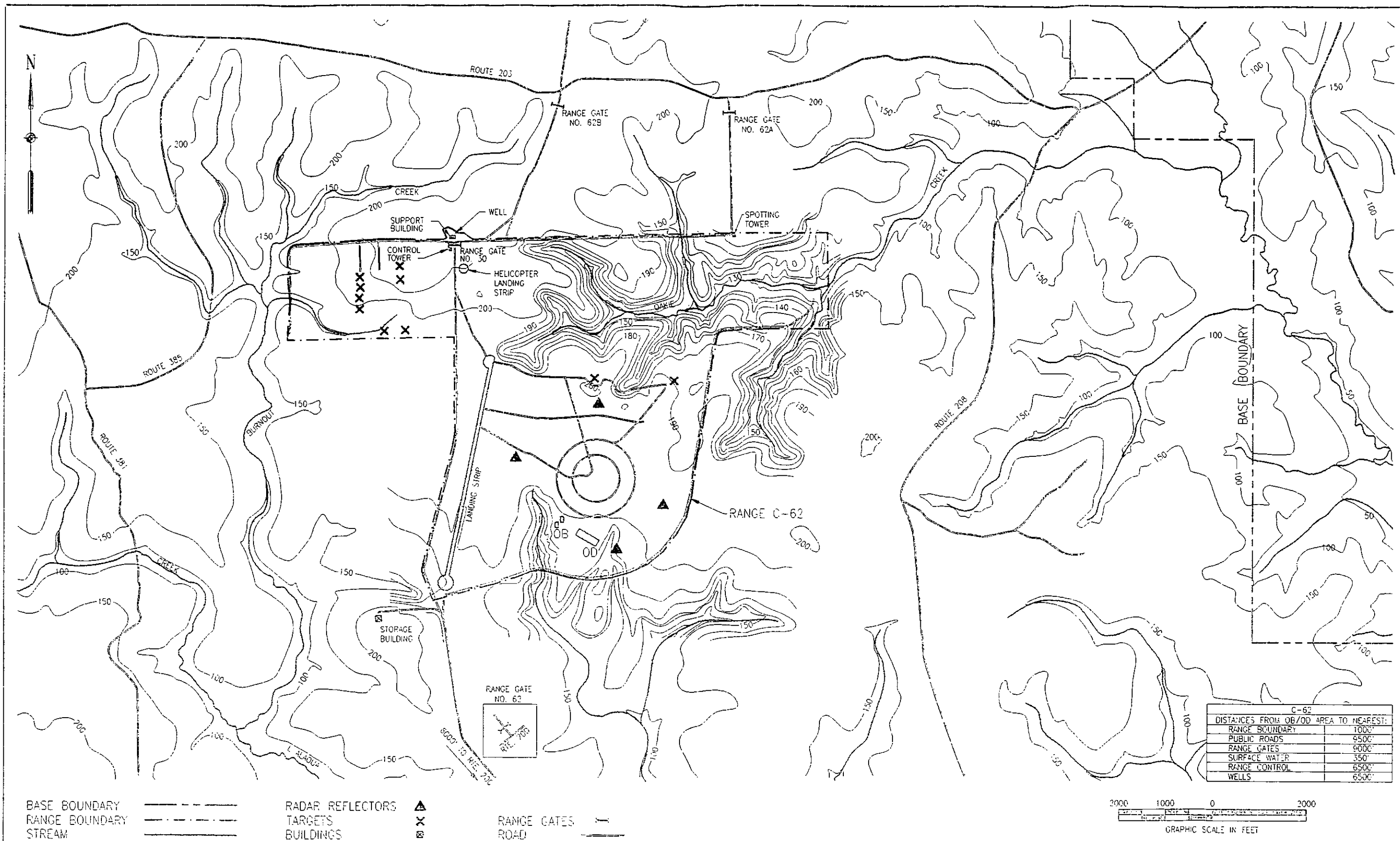


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RANGE C-52 NORTH  
"CATS EYE"  
OPEN DETONATION UNIT  
SITE MAP

PROJECT MGR. GEJ	DESIGNED BY DPM	DRAWN BY FDM	CHECKED BY GEJ	DATE 4-4-94	SCALE 1"=2000'	PROJECT NO. 11206.70	FILE NAME CATS-EYE	FIGURE NO. II-4	SHEET NO. -
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WALTON COUNTY, FLORIDA

RANGE C-62  
OB/OD UNITS  
SITE MAP

DESIGNED BY DPM	DRAWN BY FDM	DATE 4-4-94	PROJECT NO. 11206.70	FILE NAME SITE-MAP
CHECKED BY GEJ	PROJECT MGR. GEJ	SCALE 1"=2000'	FIGURE NO. II-5	SHEET NO. -

### II.A1.7 Engineering Drawings

The OB treatment units located on Range C-62 consist of steel burn kettles constructed by the Lemanco Manufacturing Company, Inc. of Gadsen, Alabama. Engineering drawings of the burn kettles are presented in Appendix B. Figure II-6 provides cross-sectional "as-built" details of the burn kettles. Figure II-7 is a plan view of the Range C-62 OB area.

There are no structures for the OD treatment units; therefore, no engineering drawings are presented.

### II.A1.8 Specification of all Wastes that have been Managed at the Treatment Unit

Wastes treated by OB include small arms ammunition, medium caliber target practice cartridges (20-40 mm), flares, and CAD/PAD. These items are classified as hazardous due to reactivity waste characteristics.

Wastes treated by OD at Range C-62 include conventional bombs, large caliber projectiles, mines, rockets, fuzes, and bulk explosives. These items are also classified as hazardous due to reactivity.

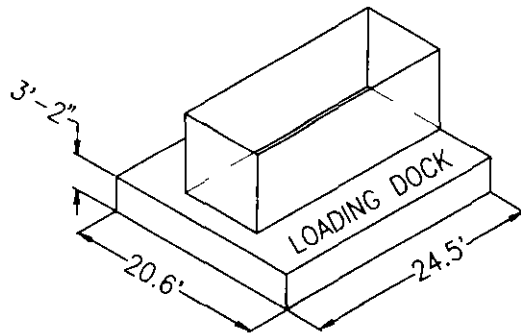
Wastes treated by OD at Ranges C-52N and C-62 include experimental explosives designed and generated by the HERD. These items are primarily classified as hazardous due to reactivity. All HERD items treated by OD at EAFB are manifested by HERD and classified prior to acceptance for OD.

A generator requesting disposal of munitions items by either OB or OD must use AF Form 191, Ammunition Disposition Request. EAFB EOD personnel review the AF Form 191s to determine which materials can be accepted for OB or OD, in accordance with procedures described in Sections III.A1 and III.A3. Only munitions, explosives, and explosives-contaminated items are accepted for disposal.

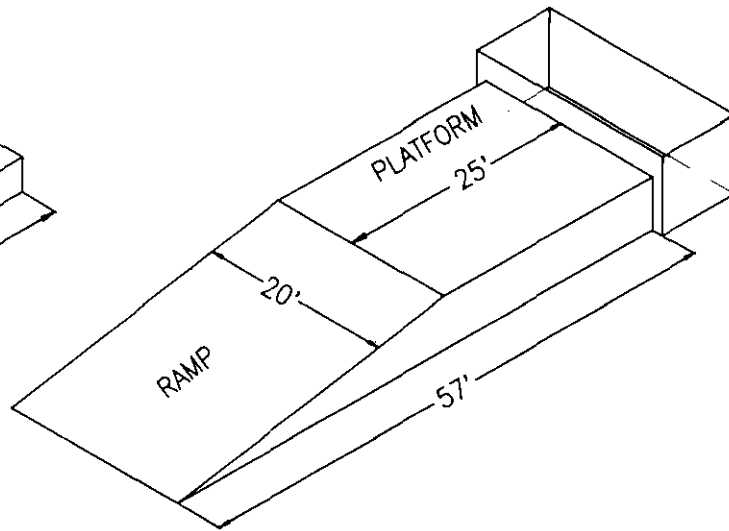
### II.A1.9 Wind Rose

Annual and seasonal wind roses from Station 722210 at EAFB ~~is~~ are provided as Figures II-8A through II-8E ~~H-8~~. Discussion of climatological/meteorological considerations on OB/OD operations and potential receptors is provided in Section III.C.

KETTLE # 8764

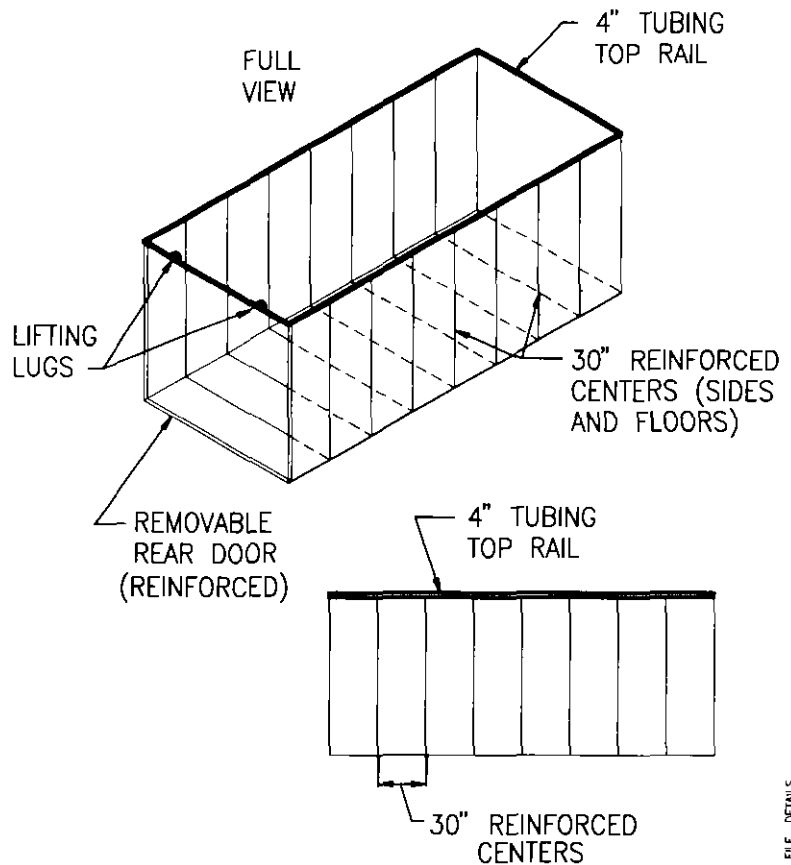
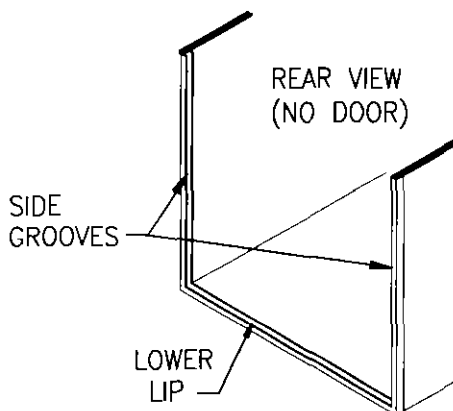


KETTLE # 8763



# KETTLE SPECIFICATIONS

LENGTH	20'-4"
WIDTH	8'-8"
HEIGHT	8'-4"
THICKNESS	.5"



FILE: DETAILS



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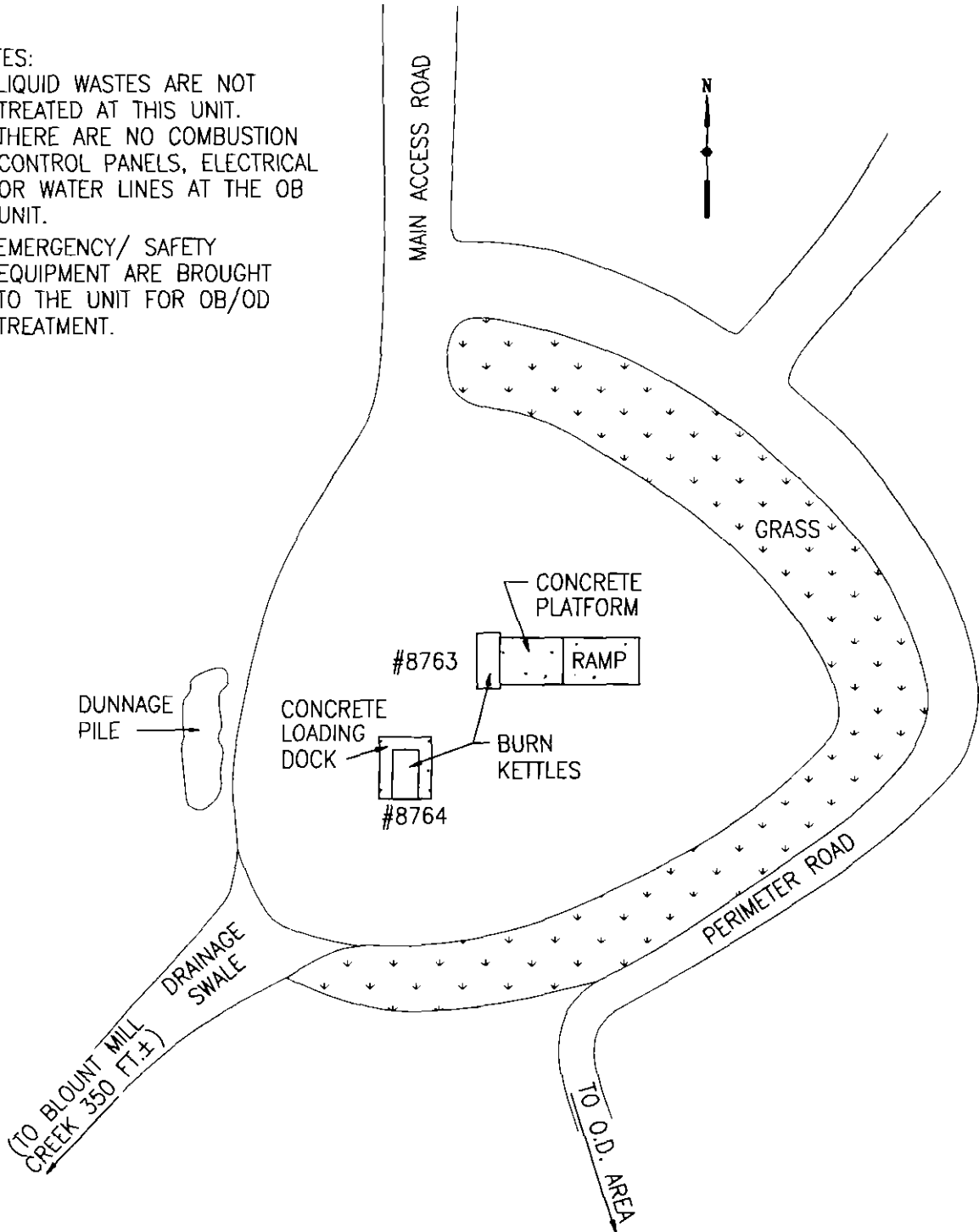
EGLIN AIR FORCE BASE  
RANGE C-62  
WALTON COUNTY, FLORIDA

BURN KETTLE DETAILS  
AND CROSS SECTIONS

PROJECT MGR GEJ	DESIGNED BY DPM	DRAWN BY FDM	CHECKED BY GEJ	SCALE 1"=20'	DATE 4-4-94	PROJECT NO 11206.70	FIGURE 11-6
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NOTES:

1. LIQUID WASTES ARE NOT TREATED AT THIS UNIT.
2. THERE ARE NO COMBUSTION CONTROL PANELS, ELECTRICAL OR WATER LINES AT THE OB UNIT.
3. EMERGENCY/ SAFETY EQUIPMENT ARE BROUGHT TO THE UNIT FOR OB/OD TREATMENT.



FILE MAP



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RANGE C-62  
WALTON COUNTY, FLORIDA

BURN KETTLE  
PLAN VIEW

PROJECT MGR GEJ	DESIGNED BY DPM	DRAWN BY FDM	CHECKED BY GEJ	SCALE 1"=50'	DATE 4-4-94	PROJECT NO 11206.70	FIGURE II-7
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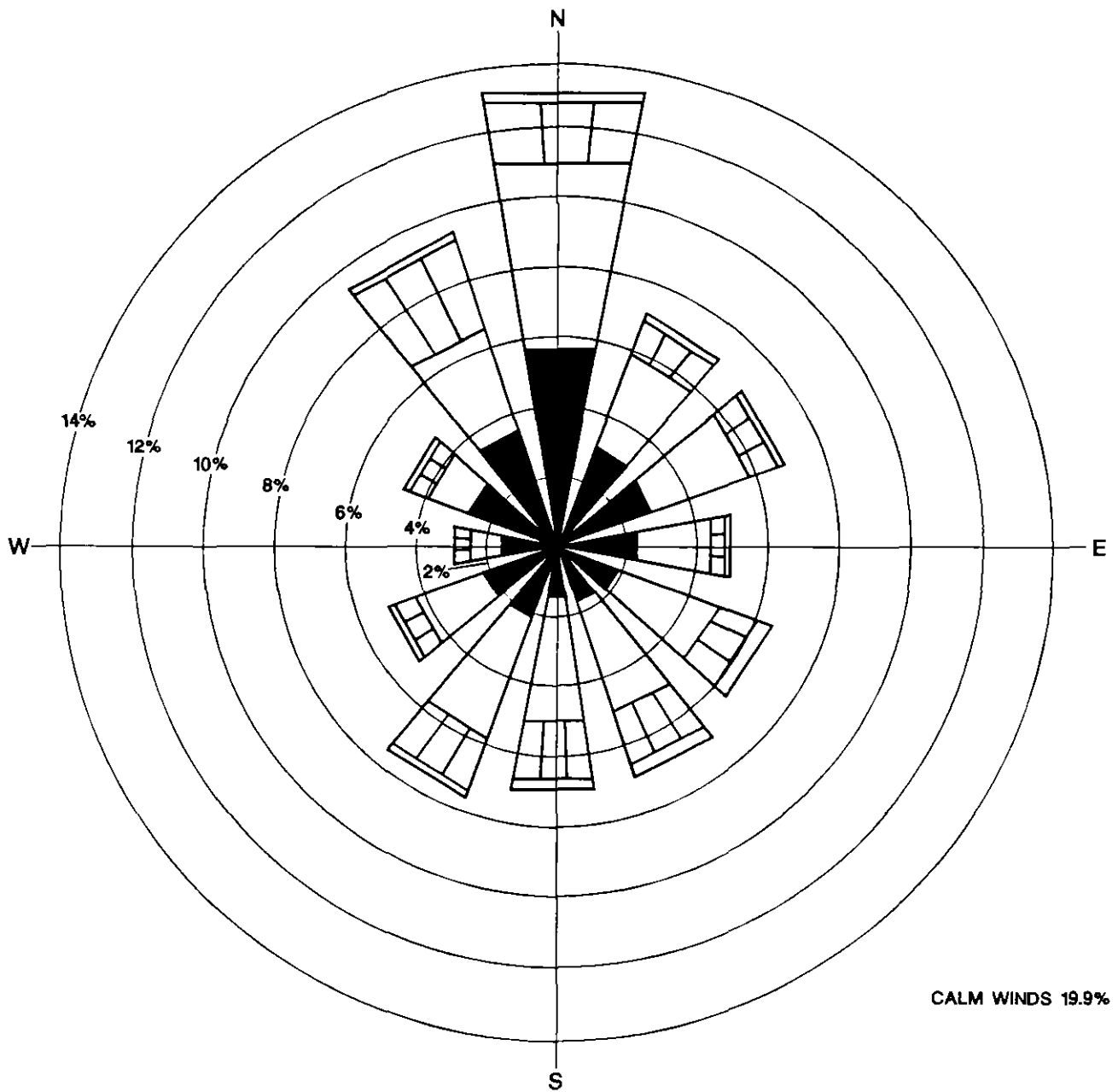
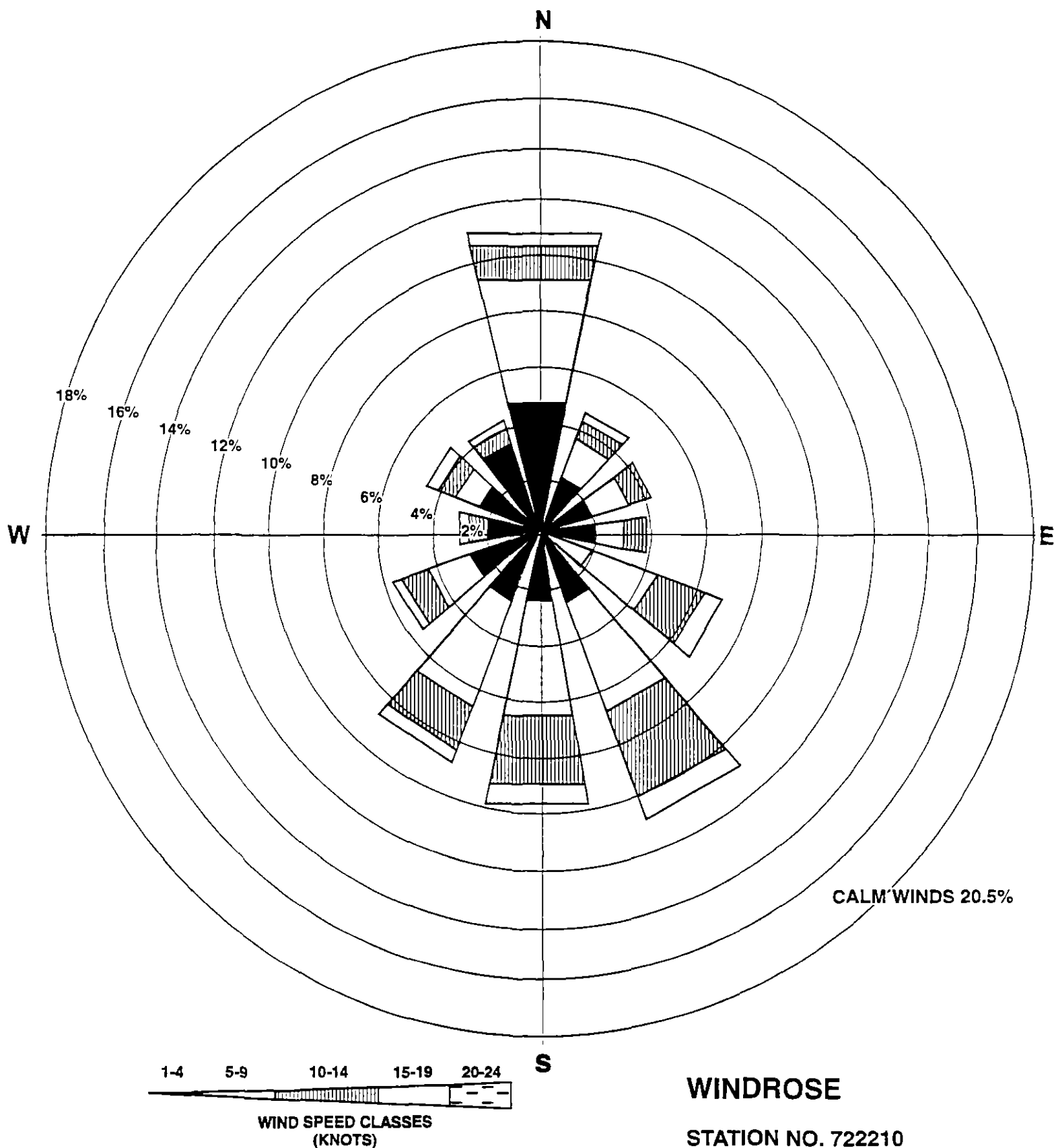


Figure II-8A Annual Windrose for Eglin AFB, Valparaiso, Florida.

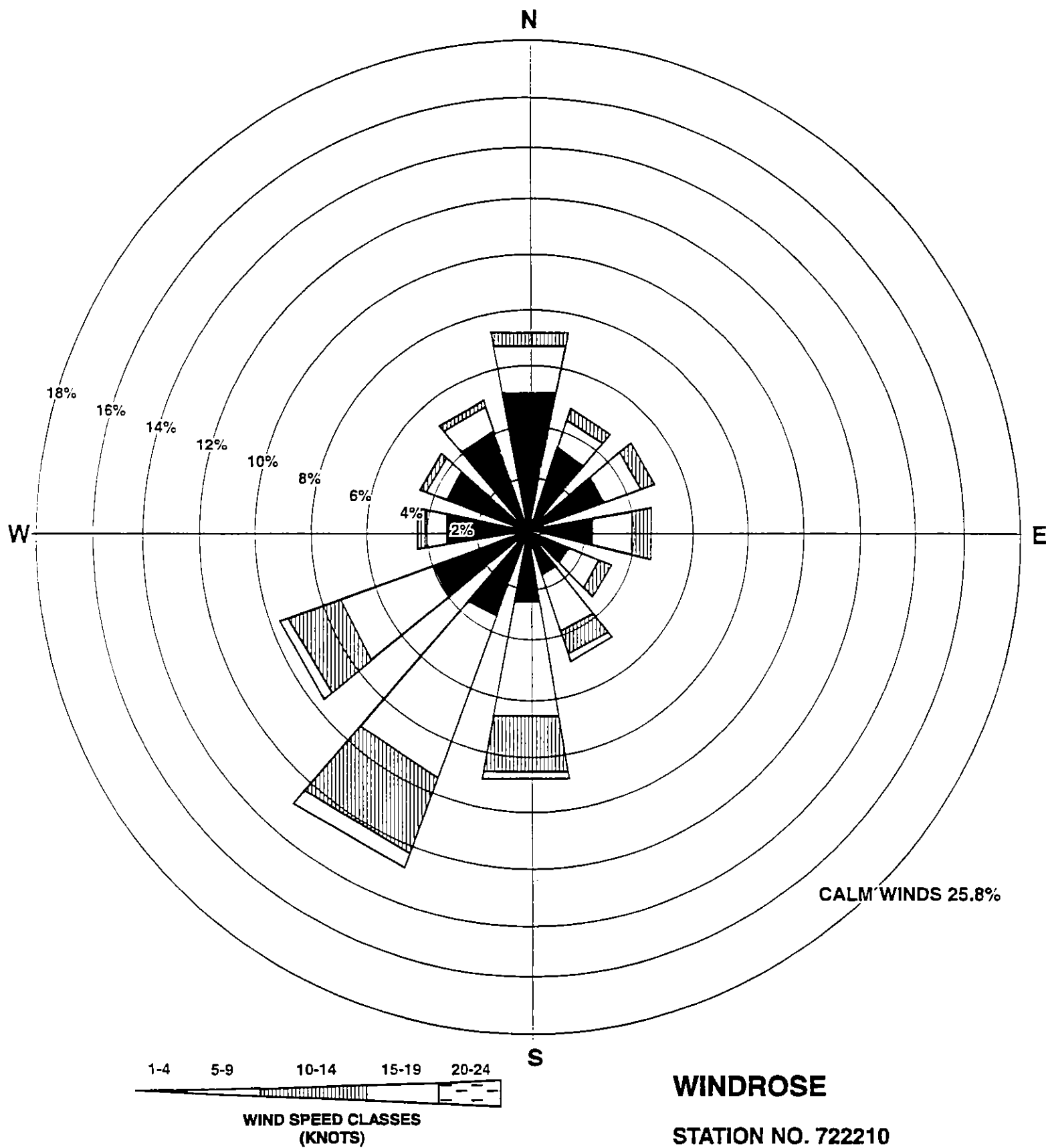






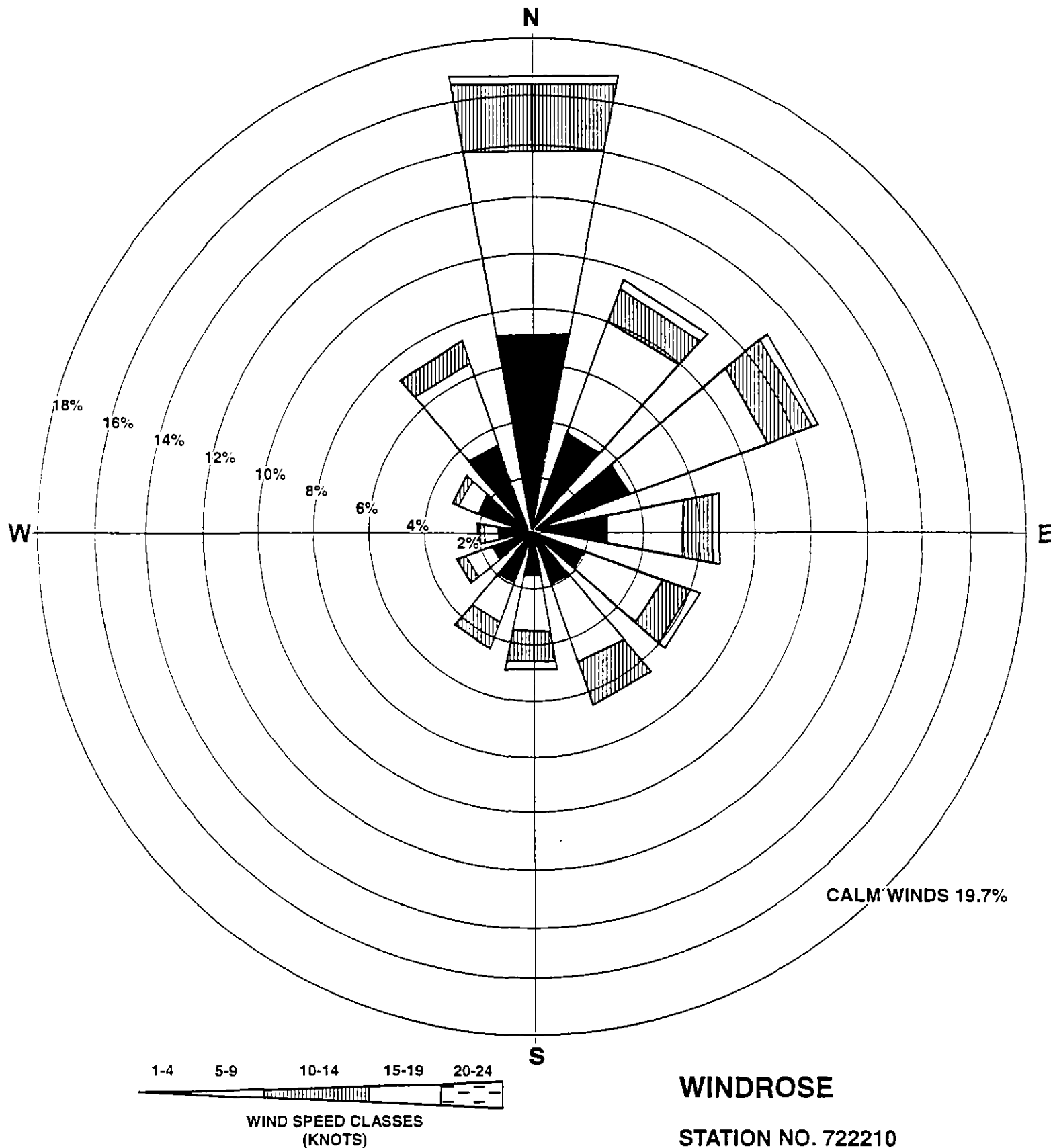
NOTES:  
 DIAGRAM OF THE FREQUENCY OF  
 OCCURRENCE FOR EACH WIND  
 DIRECTION. WIND DIRECTION IS THE  
 DIRECTION FROM WHICH THE WIND IS  
 BLOWING.

Figure II-8C Seasonal Windrose (Spring) for Eglin AFB, Valparaiso, Florida.



NOTES:  
DIAGRAM OF THE FREQUENCY OF  
OCCURRENCE FOR EACH WIND  
DIRECTION. WIND DIRECTION IS THE  
DIRECTION FROM WHICH THE WIND IS  
BLOWING.

Figure II-8D Seasonal Windrose (Summer) for Eglin AFB, Valparaiso, Florida.



NOTES:  
DIAGRAM OF THE FREQUENCY OF  
OCCURRENCE FOR EACH WIND  
DIRECTION. WIND DIRECTION IS THE  
DIRECTION FROM WHICH THE WIND IS  
BLOWING.

## WINDROSE

STATION NO. 722210  
EGLIN AFB/VALPARAISO, FL  
PERIOD: 1983-1992  
SEASON: FALL

Figure II-8E Seasonal Windrose (Fall) for Eglin AFB, Valparaiso, Florida.

### II.A1.10 General Dimensions and Structural Description

The OB activities are conducted in rectangular steel burn kettles placed on cleared areas. The kettles (Figure II-6) are approximately 8 ft wide x 8 ft high and are 20 ft long. The sides and bottom are constructed of 1/2 in. steel plate welded along the interior with a reinforced 4 x 3 x 1/4 in. rectangular tubing as a top rail. The kettles are reinforced 1/2-in.-thick steel with a 4 in. x 5.4# structural channel on 30-in. centers and a 6 in. I-beam on the ends with hinged rear doors. Kettle No. 8763 is accessed by a 57-ft-long concrete loading ramp against which the kettle rests. Kettle No. 8764 is accessed by a 3-ft-high and 6-ft-wide reinforced clay loading dock. Figure II-7 illustrates the placement and design of the burn kettles.

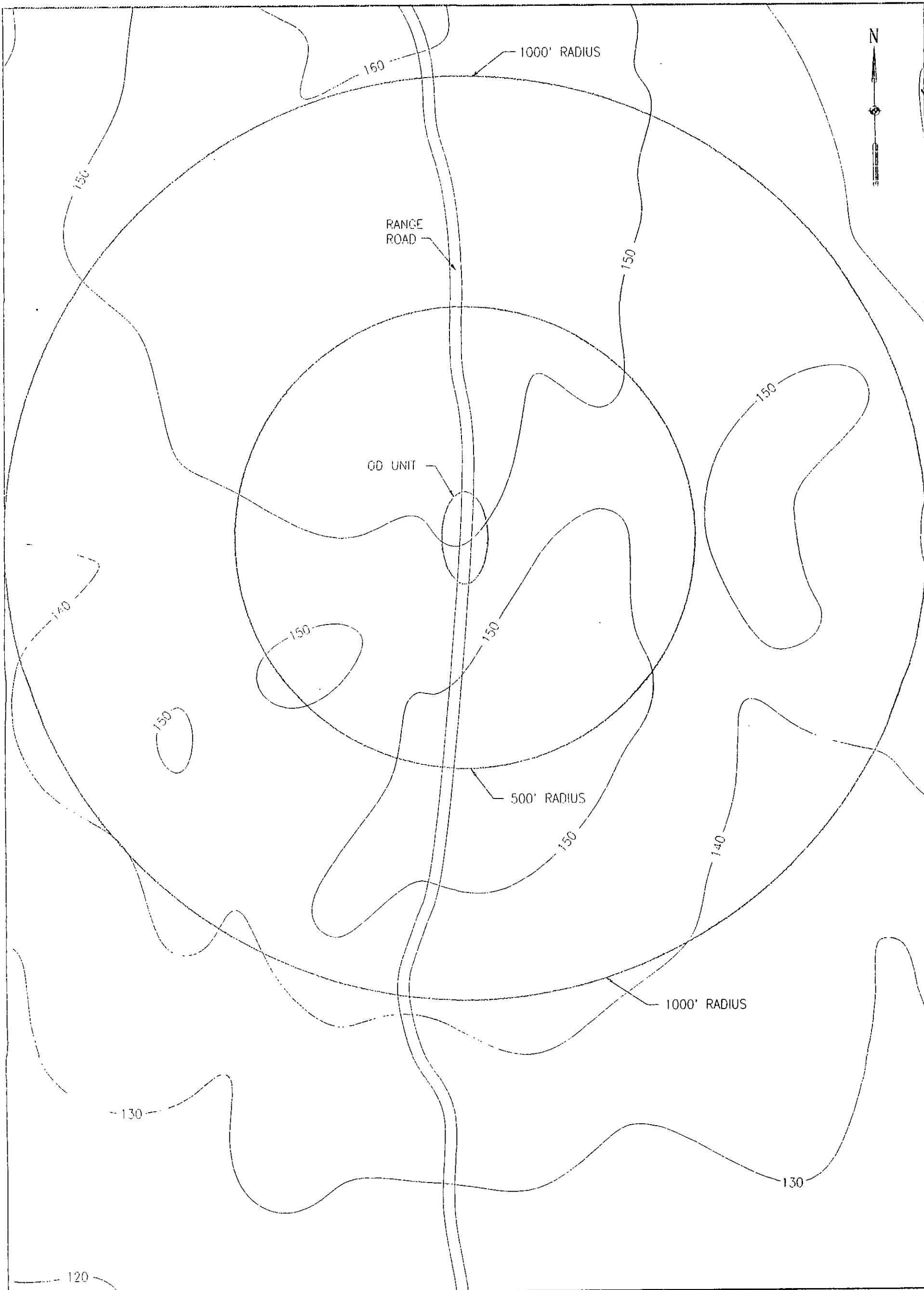
OD activities do not utilize any type of treatment units. Detonation occurs in existing craters on a cleared 100 x 200 ft area of land. The existing craters, artifacts from previous detonations, vary in dimension from 6 x 6 x 3 ft deep to 20 x 50 x 6 ft deep, based on the number and size of ordnance items to be detonated.

## II.A2 TOPOGRAPHIC DESCRIPTION [40 CFR 270.14(b)(19)]

In order to present location and topographic information, as well as the location of other required items regarding the OB/OD units in Ranges C-52N and C-62, a series of maps are presented in this section. EAFB is generally topographically situated higher along the northern base boundaries and falls off to sea level at the southern boundary along Choctawhatchee Bay.

### II.A2.1 Topography of Ranges C-62 and C-52N

Range C-52N, as illustrated in Figure II-4, climbs from approximately 100 ft mean sea level (MSL) along the north and east borders of the range to an elevation of 150 ft MSL in the middle of the range at the headwaters of the Bay Head and Coon Head branches of Basin Creek. The OD unit is located in the middle of the range between these two branches of Basin Creek. The western boundary, the location of Middle Creek's headwaters, is also at an elevation of 150 ft MSL. The range generally slopes downward to the south, reaching an elevation of 100 ft MSL at its southern boundary. From the southern boundary, elevation continuously decreases to sea level at Choctawhatchee Bay, 2 mi to the south. The areal extent of active mission use on Range C-52N is illustrated in Figure II-9, with a radius of 1,000 ft surrounding the OD unit. The OD unit is a 200 x 100 ft area consisting of a number



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RANGE C-52N  
"CATS-EYE"  
OD UNIT  
1000' RADIUS

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO.	FILE NAME	FIGURE NO.	SHEET NO.
GEJ	DPM	FDM	GEJ	4-4-94	1"=200'	11206.70	C52-0B0D	II-9	-

of explosion craters at an elevation of 150 ft MSL. The craters, artifacts from previous detonations, vary in dimension from 6 x 6 x 3 ft deep to 20 x 50 x 6 ft deep, based on the number and size of ordnance items to be detonated. The headwaters of the Bay Head and Coon Head branches of Middle Creek are, respectively, 1,500 ft west and 1,250 ft east of the OD area. The "cat's eye" area (TT-8), where the OD is performed, is also used as a target during air-to-ground strafing runs.

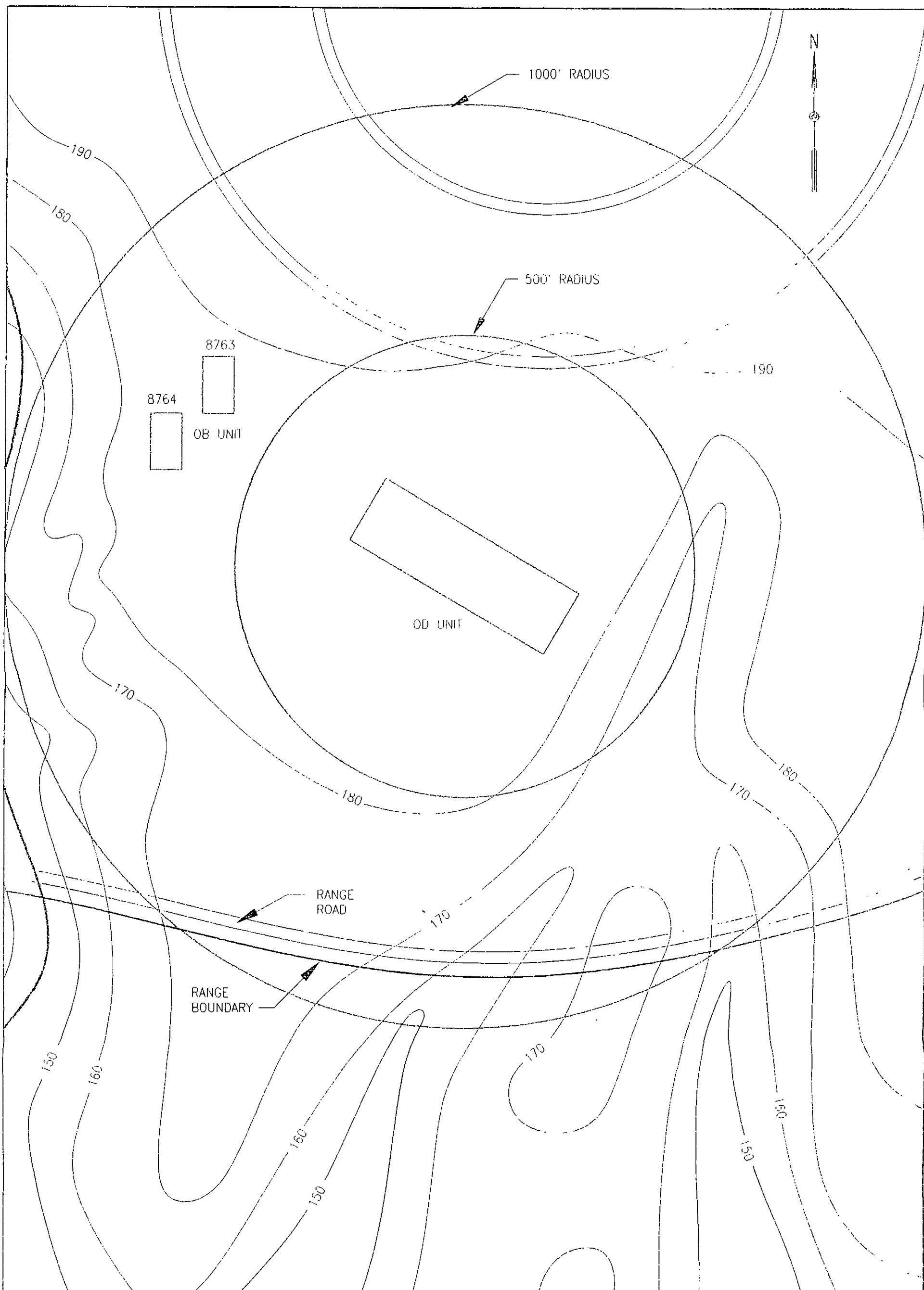
Range C-62, as shown in Figure II-5, is located on a flat cleared area approximately 195 ft above MSL. The areas of the range containing surface waters have an elevation ranging from 125 to 150 ft MSL, which increases to 200 ft in some areas but generally levels off at an elevation of 195 ft MSL. The maps presented in Figures II-10 and II-11 illustrate the general topography of the OB/OD areas and the immediate surrounding vicinity within 1,000 ft of the OD and OB areas, respectively. As illustrated, the zone immediately surrounding the OB/OD areas is an undeveloped and cleared area, aside from the presence of a bombing target and radar reflector used during target practice. The headwaters of the Blount Mill Creek is located within this 1,000-ft zone. OB and OD units at Ranges C-52N and C-62 are beyond the 100-year flood plain as shown on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map-Okaloosa County, Panel No. 120317-0200 C, 1986.

#### II.A2.2 Map Scale and Date

Each map presented in this application section includes a scale and date. Individual scales range from 1 in. equals 50 ft to 1 in. equals 2,000 ft.

#### II.A2.3 100-Year Flood Plain Area

Both Range C-52N and Range C-62 are located at least two-thirds of a mile from the limits of all 100-year flood plains as shown on FEMA Flood Insurance Rate Map-Okaloosa County, Panel No. 120317-0200 C, 1986. Additionally, Figures II-12 and II-13, surface water maps for Ranges C-52N and C-62, respectively, illustrate limits of all 100-year floodplains with respect to locations of the OB/OD units. Both OB/OD units are also well beyond the limits of Category 1, 2, or 3 storm surge contours as shown on Tri-State Hurricane Evacuation Study maps.

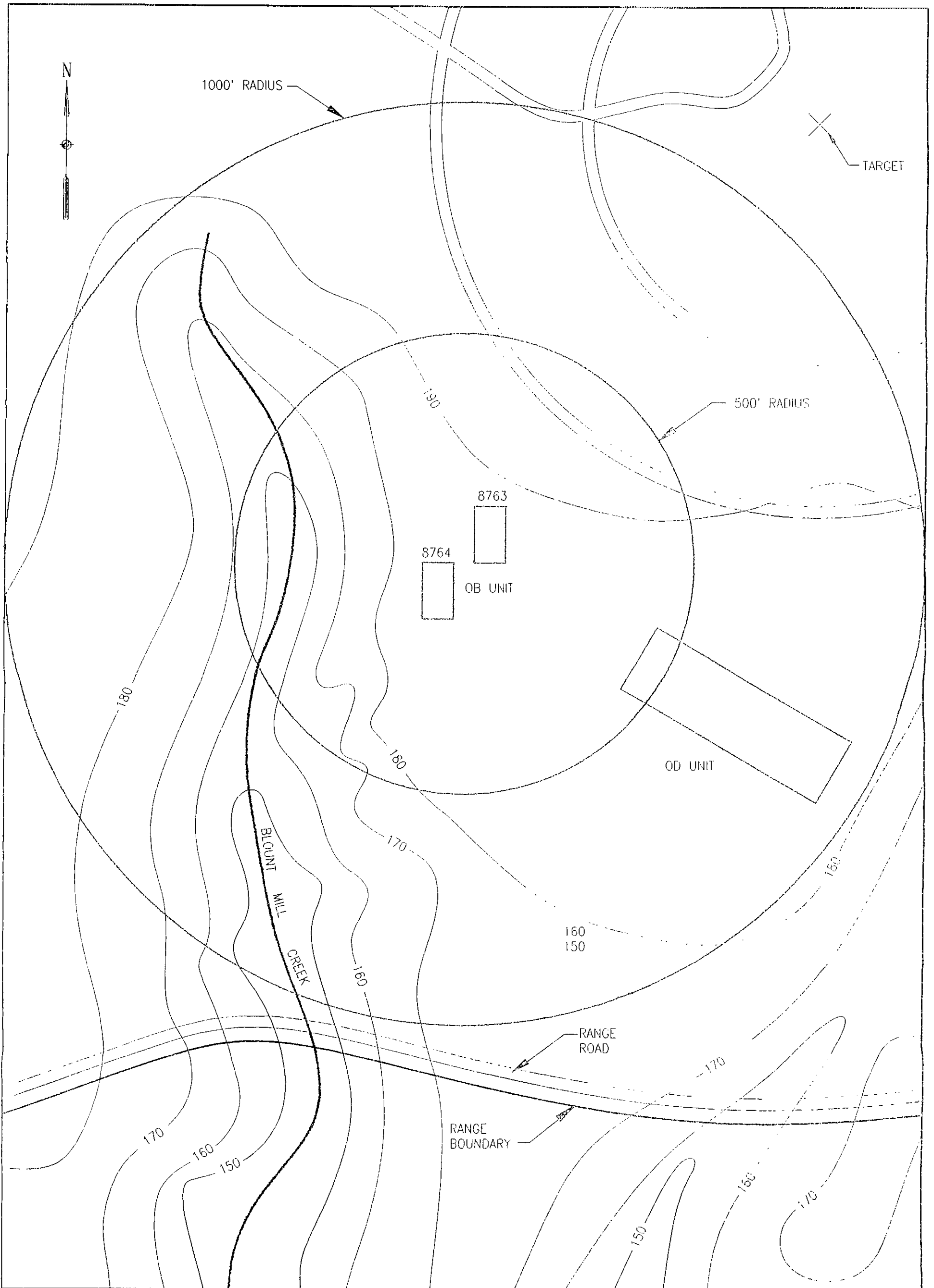


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RANGE C-62  
WALTON COUNTY, FLORIDA

RANGE C-62  
OD UNIT  
1000' RADIUS

PROJECT MGR. GEJ	DESIGNED BY DPM	DRAWN BY FDM	CHECKED BY GEJ	DATE 4-4-94	SCALE 1"=200'	PROJECT NO. 11206.70	FILE NAME C62-00	FIGURE NO II-10	SHEET NO -
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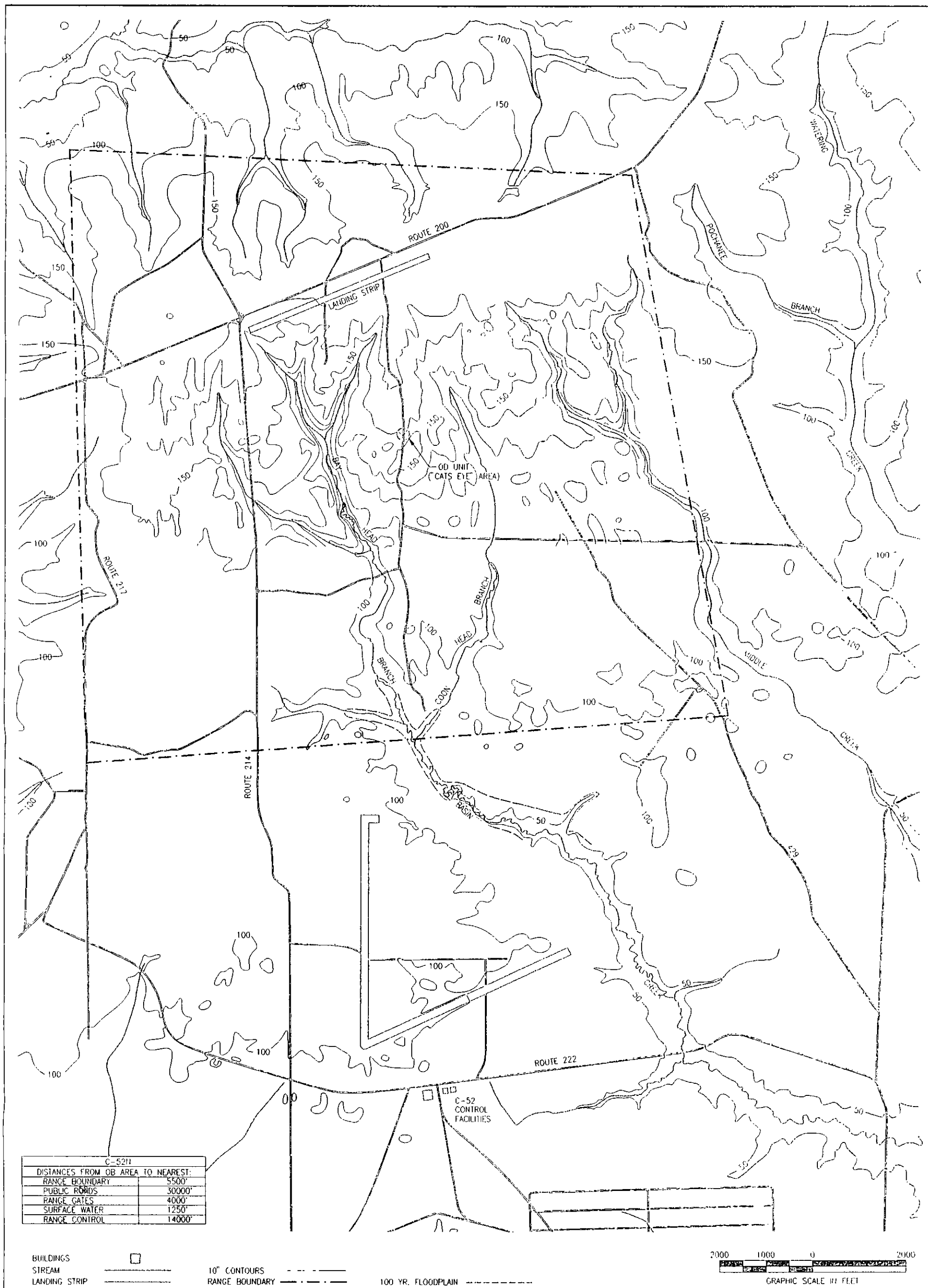
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EGLIN AIR FORCE BASE  
RANGE C-62  
WALTON COUNTY, FLORIDA

RANGE C-62  
OB UNIT  
1000' RADIUS

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO.	FILE NAME	FIGURE NO.	SHEET NO.
GEJ	DPM	FDM	GEJ	4-4-94	1"=200'	11206.70	C62-OB	II-11	-



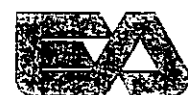
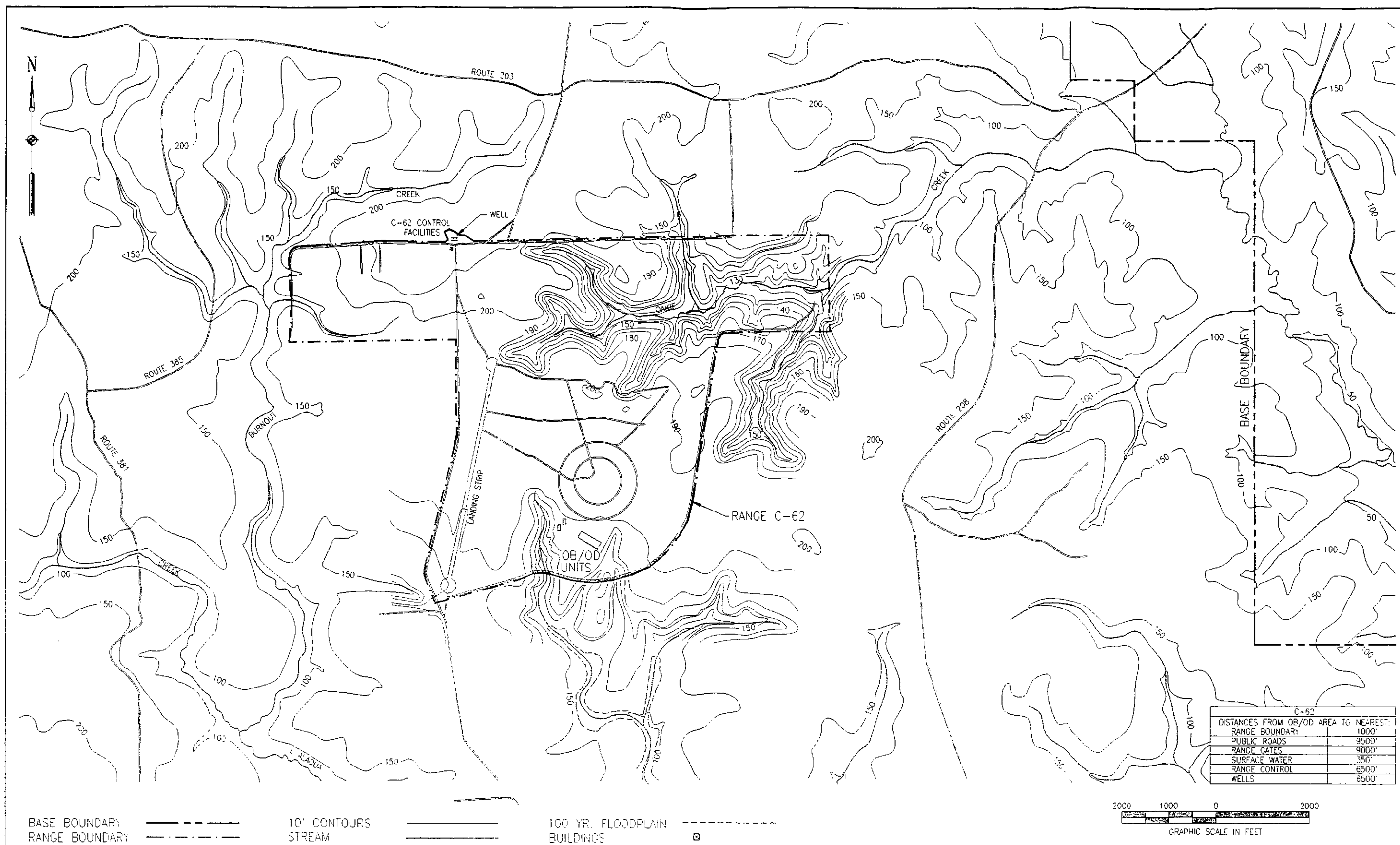


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 WALTON COUNTY, FLORIDA

RANGE C-52 NORTH  
 SURFACE WATER MAP

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO.	FILE NAME	FIGURE NO	SHEET NO
GEJ	DPM	FDM	GEJ	4-4-94	1"=2000'	11206.70	C52-SWM	II-12	-



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RANGE C-62  
 SURFACE WATER MAP

DESIGNED BY DPM	DRAWN BY FDM	DATE 4-4-94	PROJECT NO 11206 70	FILE NAME C62-SWM
CHECKED BY GEJ	PROJECT MGR GEJ	SCALE 1"=2000'	FIGURE NO II-13	SHEET NO -

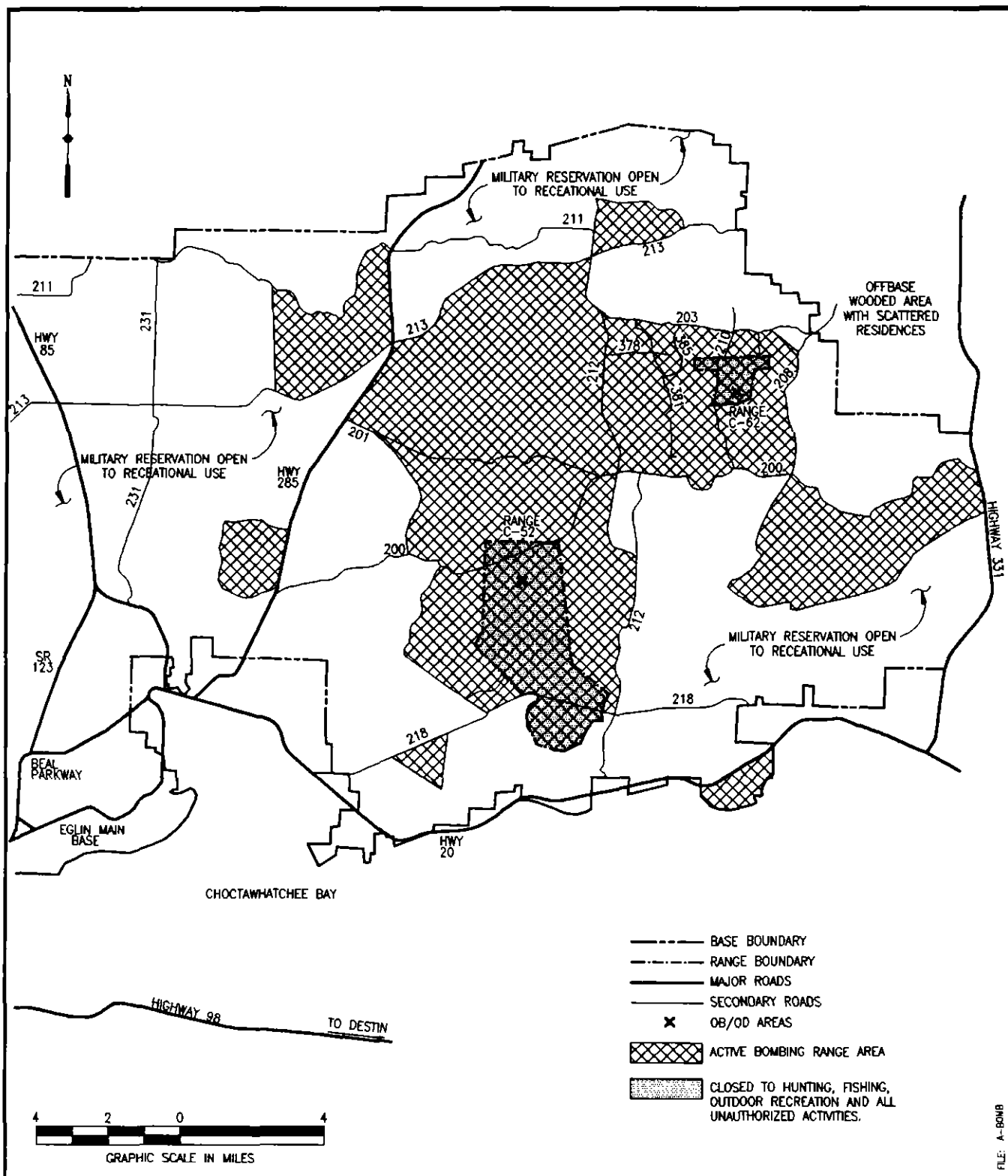
#### II.A2.4 Surface Waters

As illustrated in Figure II-12, there are a number of creeks that are located within the boundaries of Range C-52N. Approximately eight small branches of Rocky Creek, which flows to the south through Range C-52W, drain out of the northern and eastern boundaries of Range C-52N. The OD area on Range C-52N is located in between the Bay Head and Coon Head Branches of Basin Creek. The OD area is approximately 1,500 ft from the Bay Head Branch and 1,250 ft from the Coon Head Branch. Basin Creek runs in a southeasterly direction emptying into the Basin Bayou and Choctawhatchee Bay about 7 mi away. The headwaters of Middle Creek originate in the northeastern corner of Range C-52N, flowing south into Basin Creek, approximately 2 mi south of the range.

As illustrated in Figure II-13, three creeks of the Alaqua drainage system are located on Range C-62. The headwaters of Blount Mill Creek originate in the southern portion of the range and are located closest to the OB/OD area, approximately 350 ft from the OB units. The creek flows south through base property into Alaqua Creek, which eventually empties at the south border of the base into Choctawhatchee Bay. The headwaters of Oakie Creek begin in a swampy area in the northeast portion of Range C-62. Oakie Creek flows east for 1.5 mi and then flows southward into Alaqua Creek down to Choctawhatchee Bay. The northwest branch of Range C-62 drains into a tributary of Burnout Creek, which runs south into Little Alaqua Creek. From Little Alaqua Creek, water flows southeast into Brier Creek, which eventually joins with Alaqua Creek in flowing south to Choctawhatchee Bay.

#### II.A2.5 Surrounding Land Uses

Both ranges are located in restricted areas within EAFB, with all surrounding lands closed to unauthorized uses. Range C-62 (Figure II-5) is bordered to the west and south by an area restricted for use as a ricochet area. The nearest roads are Reservation Route 208 to the east and Reservation Route 203 to the north. Both routes are located approximately 3,000 ft from the range boundaries and are restricted during mission activities. Range C-52N (Figure II-4) is surrounded on the east, west, and south by the other C-52 ranges, which are all restricted areas and used for similar training purposes. The area to the north is a restricted area for 7 mi and is mostly uninhabited, aside from other ranges. Figure II-4A presents a scale map showing the existing land uses surrounding Range C-62 and Range C-52N.



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SURROUNDING LAND USE  
(RANGES C-62 AND C-52N)

PROJECT MGR GEJ	DESIGNED BY DPM	DRAWN BY JCA	CHECKED BY GEJ	SCALE 1 IN. = 4 MI.	DATE 5-11-95	PROJECT NO 11206.70	FIGURE II - 4A
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## II.A2.6 Map Orientation

A north arrow is located on each of the maps presented.

## II.A2.7 Legal Boundaries

The boundaries of Ranges C-62 and C-52N within EAFB, as well as EAFB reservation boundaries are shown in Figure II-3.

## II.A2.8 Access Control

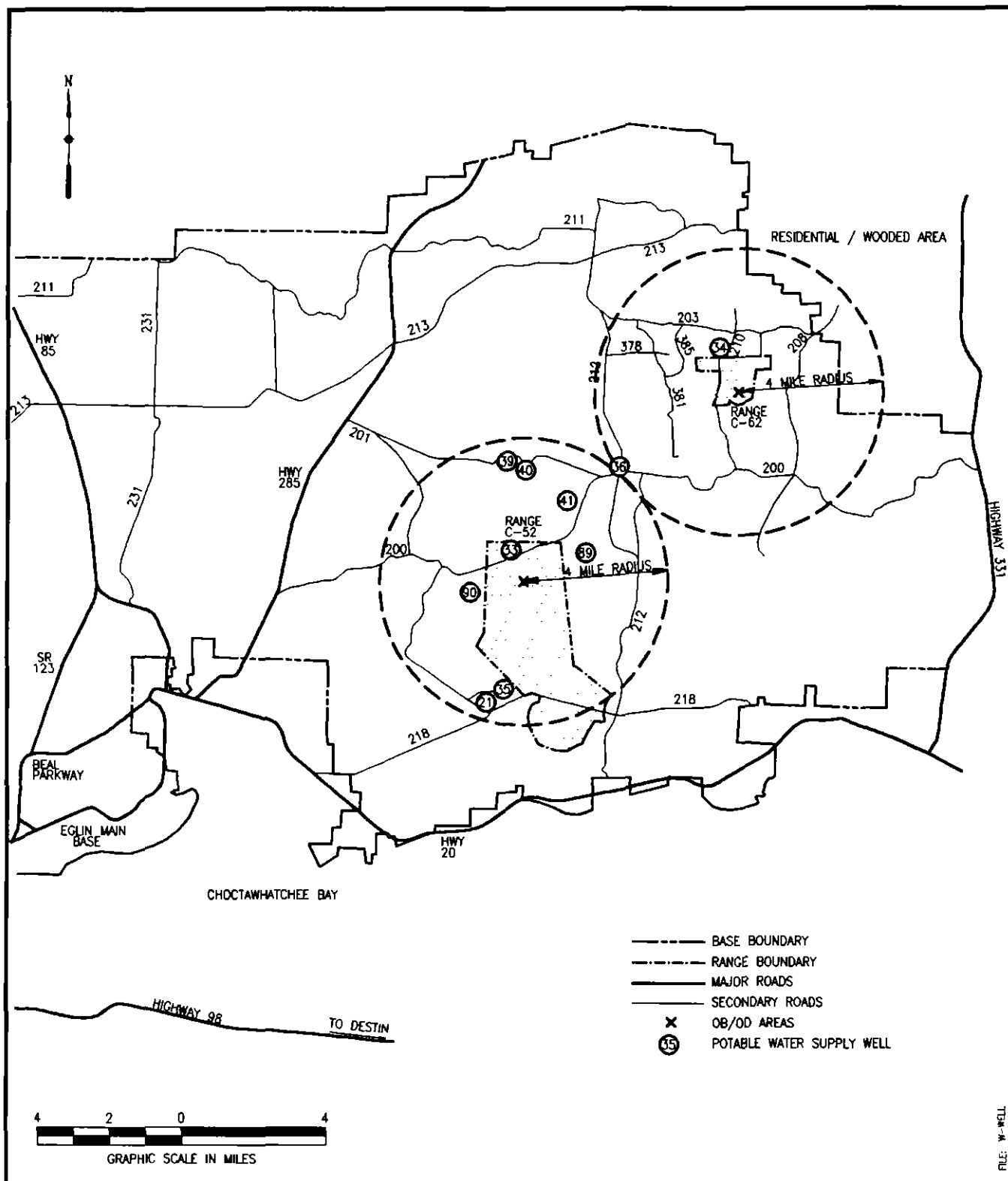
There are varying degrees of security requirements and procedures at EAFB to control access to the restricted areas within the base. Security and access control are discussed in detail in Section II.C1, Security Procedures and Equipment. Vehicular access to both ranges is restricted for any unauthorized use during mission activities by range gates at all entry and surrounding roads at both ranges. The ranges are surrounded by uninhabited lands, which are also considered restricted areas. Non-vehicular access is restricted through dense forest on all sides of both ranges.

## II.A2.9 Injection and Withdrawal Wells

There are no active withdrawal wells or injection wells within 1,000 ft of any of the OB/OD units. Range C-62 has a potable drinking water supply well screened within the Floridan aquifer at a depth of 254 ft and completed to a depth of 620 ft. This well is located at the control facility, approximately 1 mi north of the OB/OD units (Figure II-5). All wells within 4 mi of either range are screened in the Floridan (deep) aquifer, which is separated from the surficial aquifer by a 150- to 200-ft-thick Pensacola clay layer, as discussed in Section III.B2. Figure II-5A presents the potable water supply wells in a 4-mi radius of both Ranges.

## II.A2.10 Buildings and Other Structures

All structures within Range C-52N are identified on the map presented in Figure II-4. A 4,000-ft landing strip is located 3,000 ft north of the OD unit. The range is occupied by various targets, including bunkers, and other military targets for range practice. A control tower and a weather station are located 4,500 and 3,000 ft north of the OD unit, respectively. The main control facility for the C-52 ranges is located 14,000 ft south of the OD unit. The



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EGLIN AIR FORCE BASE POTABLE  
WATER SUPPLY WELLS (4-MILE RADIUS  
RANGES C-62 AND C-52N)

PROJECT MGR  
GEJ

DESIGNED BY  
DPM

DRAWN BY  
JCA

CHECKED BY  
GEJ

SCALE  
1 IN. = 4 MI.

DATE  
5-11-95

PROJECT NO  
11206.70

FIGURE  
II - 5A

OD unit is accessed by a dirt road running from Route 200 to the OD unit. Trucks containing munitions approach from either the west on Route 200 or from the south on Route 219, which joins Route 200 on the range. There are no structures on Range C-52N associated with OD activities; all structures are associated with other bombing/training missions.

All structures within Range C-62 are identified on the map presented in Figure II-5. A 5,000 x 70 ft clay landing strip is located along the western boundary of the range. A number of clay/dirt roads cross the range. Various targets for bombing, gunnery, and rocketry practice are located throughout the range. A control tower and support building are located along the north border of the range, approximately 1 mi north of the OB/OD units. A spotting tower is located along the northeast border of the range, approximately 1 mi northeast of the OB/OD units. Burn kettles (OB units) and detonation areas (OD units) are identified on the map. The burn kettles, numbered 8763 and 8764, are accessed, respectively, by a 57-ft concrete ramp and a 6-ft-wide reinforced clay loading dock. Trucks containing munitions approach from either Route 200 from the south through Range Gate No. 62 or from Route 203 to the east. Once on the range, munitions are unloaded in the OB/OD units following EOD procedures, in accordance with EAFB Squadron Operating Instruction (SOI) 136-18 (Appendix C). There are no buildings outside of the range for at least 2 mi.

Appendix D provides additional information related to active bombing/training activities at Range C-52N and Range C-62.

#### II.A2.11 Drainage and Flood Control Barriers

No constructed barriers for drainage or flood control exist on either OD unit. The burn kettles are self-contained units which prevent unintentional leakage from occurring. Before and after each burn, the integrity of the kettles is checked and appropriate repairs are made, as defined in Eglin AFB SOI 136-18.

#### II.A2.12 Location of Treatment Units and Decontamination Areas and Additional Information on the Topographic Map

The locations of active treatment units are shown in Figure II-5 for Range C-62 and Figure II-4 for Range C-52N. There are no inactive units in these areas.

#### II.A2.12.1 Distance to Property Boundaries

Figure II-3 illustrates the property boundaries in relation to the OB/OD units on Range C-62. The nearest property boundary is approximately 2.8 mi east of the OB/OD units. On Range C-52N (Figure II-3), the OD unit is approximately 6 mi north of the reservation boundary.

#### II.A2.12.2 Distances to Buildings Onsite and Offsite.

The closest onsite structure on Range C-52N (Figure II-4) is a tower located 1,250 ft northwest of the OD units, near the headwaters of the Bay Head Branch of Basin Creek. The closest onsite building is the C-52 range control facility located approximately 2.5 mi to the south. The closest offsite building is beyond the reservation boundaries more than 6 mi south of the OD units.

The closest onsite building on Range C-62 is the control tower and support facility approximately 1 mi north of the OB/OD units (Figure II-5). The closest offsite building is beyond the reservation boundary, more than 2.8 mi away.

#### II.A2.12.3 Distances to Public Roadways

All public-access roadways discussed herein are roads which are not considered restricted and are not controlled by range gates during mission activities. However, these roads are government-owned property and are part of the EAFB military reservation. The nearest public roadway for Range C-52N (Figure II-4) is Reservation Route 220, which is approximately 5.5 mi west of the OD unit. The OB/OD units on Range C-62 (Figure II-5) is approximately 2 mi south of Route 210, the nearest public-access roadway.

#### II.A2.12.4 Distance to Passenger Railroad

The nearest railroad is the Eglin Railroad, which runs approximately 7 mi northwest of the C-62 OB/OD units and 5.5 mi west of the C-52 OD unit. The railroad merges with the Louisville and Nashville Railroad at the northern boundary of the base (no map references).



#### II.A2.12.5 Distance to Closest Receptor [40 CFR 270.23(e)]

The closest human receptors for Range C-62 (Figure II-5) are Air Force personnel at the control tower 1 mi north of the OB/OD units. The closest non-base receptors would be motorists traveling along Reservation Route 210. For C-52N (Figure II-4), the closest receptor is a spotting tower approximately 1 mi northwest of the OD unit. The closest non-transient receptor would be off-base residents located approximately 2.8 mi from Range C-62, OB/OD units and 6 mi from Range C-52N, OD unit.

#### II.A2.13 Additional Information on the Topographic Map [40 CFR 270.14(c)(3)]

##### II.A2.13.1 Uppermost Aquifer and Hydraulically Connected Aquifers Beneath Facility Property [40 CFR 270.14(c)(2)]

The uppermost aquifer (as described in detail in Section III.B2) in the vicinity of both the OB and OD units is the surficial sand and gravel aquifer (encountered at  $\pm 50$  ft below ground surface). At Range C-52N, the aquifer thickness is approximately 70 ft and at Range C-62 the aquifer thickness is approximately 100 ft. There are no wells within a 4-mi radius of either unit screened within the surficial aquifer. The surficial sand and gravel aquifer is underlain by the Pensacola clay—a thick, low permeability confining unit (160 ft thick at C-62; 250 ft thick at C-52N). The Floridan aquifer underlies the Pensacola clay but is not hydraulically connected to the surficial aquifer due to the thickness and low permeability of the Pensacola clay.

##### II.A2.13.2 Ground-Water Flow Direction [40 CFR 270.14(c)(2)]

Information to confirm the actual direction of ground-water flow has not yet been collected. Ground water in the surficial clay zone of the sand and gravel aquifer at Range C-52N is expected to flow laterally from the water table surface in a southerly direction toward the confluence of the Bay Head Branch and the Coon Head Branch. Deflection of the flow to the southeast or southwest toward the eastern and western flanks of these branches can be anticipated based on local topography.

Based on the topography of the land surface at the Range C-62 OB/OD units, it is expected that ground water in the surficial aquifer flows in a southerly to southwesterly direction toward the head waters of Blount Mill Creek.

#### II.A2.13.3 Waste Management Areas [40 CFR 270.14(c)(3)]

There are no other waste management areas in the vicinity of the OB/OD units. All other EAFB waste management units are addressed in EAFB RCRA Part B Permit Application dated October 1985.

#### II.A2.13.4 Property Boundaries [40 CFR 270.14(c)(3)]

Figure II-3 shows EAFB reservation boundaries and surrounding areas. Figure II-3 also shows boundaries of Ranges C-52N and C-62 within the EAFB reservation area.

#### II.A2.13.5 Point of Compliance Location [40 CFR 270.14(c)(3)]

See Section II.G, Proposed Ground Water Monitoring Program, for proposed point of compliance locations.

#### II.A2.13.6 Location of any Ground Water Monitoring Wells [40 CFR 270.14(c)(3)]

There are no ground water monitoring wells currently installed to monitor operations at either range. Ground-water monitoring wells will be installed at the Range C-62 OB unit. One-time, direct-push, ground-water samples will be collected from both of the OD units. The planned ground-water sampling program is discussed in Section II.G.

#### II.A2.13.7 Extent of Ground Water Contaminant Plume [40 CFR 270.14(c)(4)(i)]

There are no identified ground-water plumes in the area of either range.

#### II.A2.13.8 Location of Unsaturated Zone Monitoring [40 CFR 270.23(e)]

At the present time, there is no unsaturated zone monitoring program. Surficial and subsurface soil samples will be collected as part of a ground-water characterization program described in Section II.G.

## II.A3 DESCRIPTION OF TREATMENT UNITS [40 CFR 270.23(a)(2)]

### II.A3.1 Location

Range C-62 is located in the northeast corner of the reservation area, approximately 2.8 mi south and west of the reservation boundary and approximately 20 mi east of the main base. The OB/OD units at Range C-62 is situated along the range's south border. The OD unit at Range C-52N is located approximately 12 mi to the east of the main base, and 6 mi north of Choctawhatchee Bay. The OD unit at Range C-52N is located in the middle of the range between the Bay Head and Coon Head branches of Basin Creek. Figures II-4 and II-5 provide details of site facilities and of the surrounding vicinity.

### II.A3.2 Design

Two discrete hazardous waste treatment operations are performed at Ranges C-62 and C-52N, open burning and open detonation. No devices have been designed or engineered for use in the OD operations. A containment device has been engineered for OB operations. As described in Section III.A1 of this application, the burn kettles used for these activities were designed to meet the following objectives:

- Prevent incorporation of soil into the wastes and materials being burned.
- Containerize fuels used in OB operations to prevent releases to the environment.
- Minimize the ejection of materials or wastes from the device onto the ground.
- Retain a large quantity of the heat generated during the burn.
- Retain the minor detonations which might occur when munitions are burned.

The device used for these operations is a manufactured steel burn kettle approximately 8 ft high, 8 ft wide, and 20 ft long (Figure II-6 and Appendix B).

No explosives, blasting caps, safety/emergency equipment, or waste are stored on the site. All materials are brought to the treatment areas at the time OB/OD missions are conducted.

### II.A3.3 Operation

OB/OD operations are detailed in the SOIs described in Sections III.A1 and III.A3. A brief summary of these activities is provided below.

During OB operations, low explosive wastes are placed into the unit after the doors are closed. Approximately 50-100 gallons of diesel fuel along with dunnage (wood and fiberboard) is placed in the OB unit as an initiating mechanism and remotely ignited. The fuel is consumed in the burn, and following a cool down (12-24 hours), the residual scrap is removed and analyzed for TCLP toxicity prior to disposal.

Intact ordnance items identified in the residue that were not detonated or not fully treated during OB will be retreated. The remainder of the residue is removed from the burn unit and packaged in 55-gal drums. The drums are sampled, sealed, and marked with the date of the operation and AFTO Form 358 unit control number. The residue samples of the burned material are processed through EAFB Bioenvironmental for reactivity and TCLP toxicity hazard analysis in accordance with the waste residue management plan (Appendix E). If the results of analyses indicate properties of non-reactivity and non-toxicity under TCLP, the drums are buried in an approved burial site. Eglin AFB is in the process of establishing a RCRA non-hazardous disposal area for burial of OB ash. If the results of analyses determine that the residue still exhibits reactivity, it is retreated until the test sample confirms the residue is no longer hazardous prior to burial.

Explosive ordnance identified by TO 11A-1-42 as requiring disposal by open detonation is transported to a specific open detonation unit on an active bombing range. These ordnance items are placed in existing bomb craters which serve as detonation pits. The net explosive weight limitation for any one open detonation is limited to 3,000 lbs. Once all personnel, except for the EOD Disposal Team, have withdrawn from the treatment area, the EOD Team prepares the ordnance or explosive waste by placing plastic explosive material, such as C-4, in accordance with TO 11A-1-42 or USAF Technical Order (TO) 60-series, "Explosive Ordnance Disposal Procedures." A copy of the current version of TO 11A-1-42 is provided as Appendix F. The C-4 is primed with redundant blasting caps and initiated by time fuse or radio control device. EOD personnel withdraw to the Range Control Facility, which is located

on the periphery of the bombing range and well outside the danger radius of the detonation prior to initiation of the detonation. Immediately after thermal treatment by detonation, the residue is examined to ascertain that all explosive material has been successfully treated. If any explosive material remains, it is again affixed with the C-4 explosive and detonated.

#### II.A3.4 Maintenance

Inspection, monitoring, and maintenance provision for the OB and OD facilities are specified in SOI 136-18 (Appendix C) and are discussed in Section III.A1 and III.A3 of this application.

#### II.A3.5 Monitoring

Inspection, monitoring, and maintenance provisions for the OB and OD facilities are specified in SOI 136-18 (Appendix C) and are discussed in Section III.A1 and III.A3 of this application.

#### II.A3.6 Inspection

Inspection, monitoring, and maintenance provisions for the OB and OD facilities are specified in SOI 136-18 (Appendix C) and are discussed in Section III.A1 and III.A3 of this application.

#### II.A3.7 Closure

EAFB intends to operate the OB/OD units until they are no longer required, which is expected to be until the Air Force ceases operation at the base. During final closure, each unit will be closed by treating the final volume of hazardous waste, treating the explosive residues generated during the last treatment, and removing all metals from the surface for disposal as scrap or in accordance with applicable regulations. Sampling will be conducted, and upon removal of contaminated materials, the pits will be backfilled and regraded. The burn kettles will be decontaminated and recycled or disposed of in accordance with applicable regulations.

Closure and post-closure for the OB and OD units are discussed in Section II.F.

## II.A4 FACILITY LOCATION INFORMATION [40 CFR 270.14 and 40 CFR 264.18]

Range C-62 is located in the northeast corner of the reservation area, approximately 2.8 mi to the south and west of the base boundary, with the OB/OD units situated along the range's south border. Range C-52N is located approximately 12 mi to the east of the main base, 6 mi north of Choctawhatchee Bay. The OD unit is located in the middle of the range between the Bay Head and Coon Head branches of Basin Creek.

### II.A4a. Seismic Requirements [40 CFR 270.14(b)(11)(i),(ii) and 40 CFR 264.18(a)]

All of Florida is excluded from Appendix VI of 40 CFR 264 facility listing. Furthermore, seismic facility requirements are applicable only to new facilities. Accordingly, seismic considerations do not apply to the EAFB OB/OD units.

### II.A4b. Flood Plain Requirements [40 CFR 270.14 (b)(11)(iii),(iv) and 40 CFR 264.18(b)]

Figures II-12 and II-13 show that neither the OB nor either of the two OD units are located within the 100-year floodplain as shown on FEMA Flood Insurance Rate Map-Okaloosa County, Panel No. 120317-0200 C, 1986 (Appendix Q). Therefore, flood plain considerations do not apply to the EAFB OB/OD units.

## II.A5 TRAFFIC PATTERNS [40 CFR 270.14]

### II.A5.1 Estimate of Number and Types of Vehicles Around the Facility

Range C-62 is located in a remote, restricted, access-controlled area with one major road running through the range along the western border, from Reservation Route 200 to the south and north to Reservation Route 203. Three range gates are used to control access to the range. Two gates are located just south of Route 203 while the third is located just above the Route 200 turnoff (Figure II-5). The range is intersected by a number of clay/dirt roads which provide access to target areas and OB/OD units. The C-52N range is located in the middle of the other C-52 ranges and is also a restricted access controlled area. Route 200 runs west to east along the northern end of the range while Route 214 runs from the southern boundary of the range and intersects with Route 200. There are seven range gates which control access to

Range C-52N, as illustrated in Figure II-4. Between 30-50 vehicles per day are estimated to use the range roads in the vicinity of Ranges C-52N and C-62.

#### II.A5.2 Information about Waste Transfer or Pick Up Stations

No waste transfer or pick up stations are located on the ranges. All wastes are transported from ordnance storage facilities directly to the ranges for treatment. Access to the OB units on Range C-62 is illustrated in Figure II-5, with a ramp and loading dock providing the means of waste transfer from vehicle to burn kettle. The explosives transportation routes for the C-52N and C-62 ranges, including primary and alternate routes, are presented in Figure II-14.

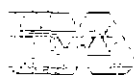
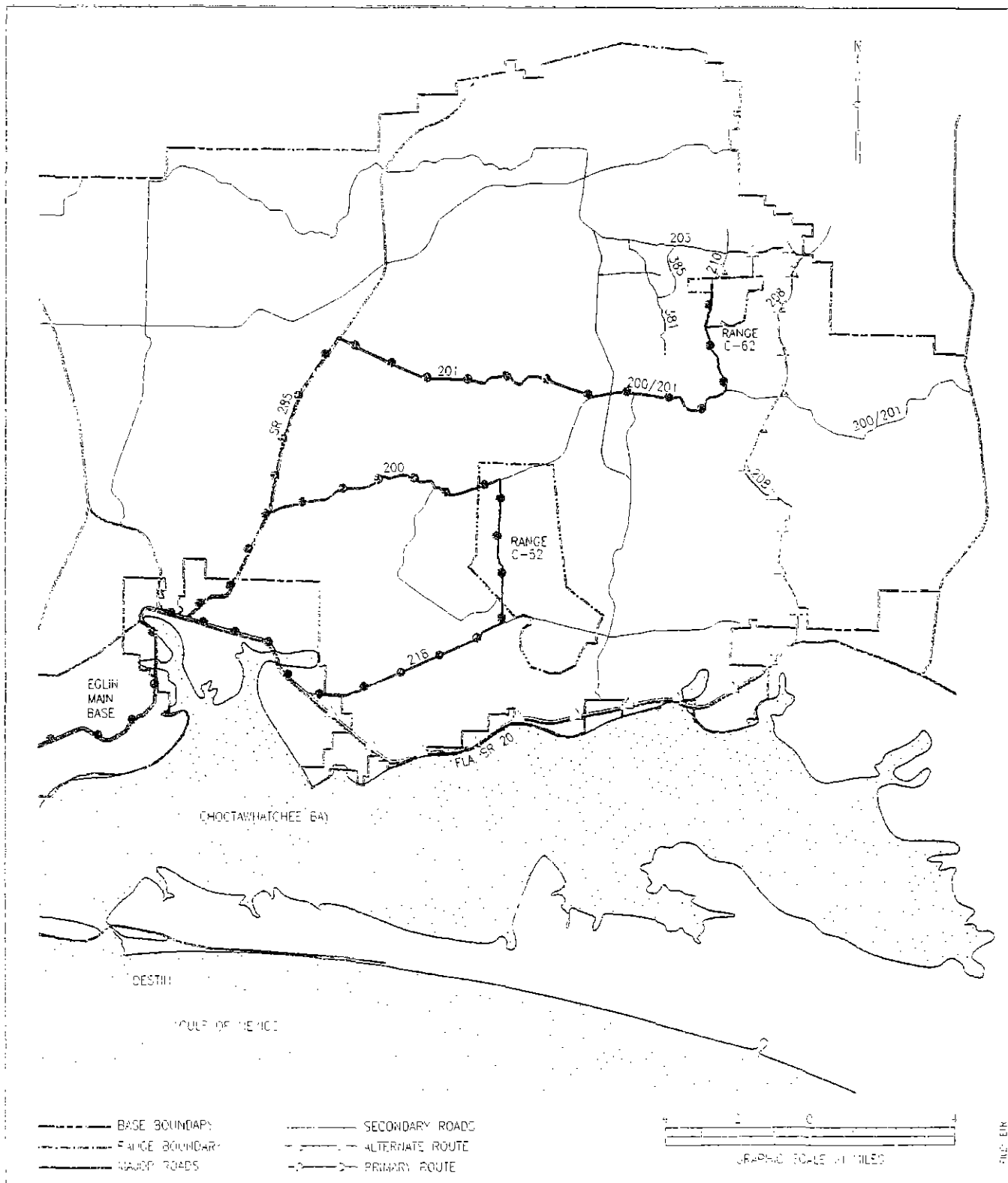
Munitions loading, unloading, and transportation are common on EAFB and SOI 136-9 "Transportation & Handling of Munitions/Explosives" contains the procedures to ensure safety during these operations (Appendix C).

#### II.A5.3 Quantity of Waste Moved per Movement per Vehicle

During munitions transport, only one vehicle is used to transport the explosive waste unless a waste compatibility problem exists. The vehicle size will be a function of the physical size of the ordnance items. The total quantity of waste moved per movement per vehicle will vary from 500 to 10,000 lb NEW for OB/OD operations. It is not possible to specify the total NEW for a single vehicle since 3,000 lb NEW could be represented by three 1,000 lb bombs or approximately 565,000 rounds of 30 mm cartridges. Total NEW, therefore, is a function of ordnance to be treated. For OB, the NEW of a load will typically be less and range from approximately 500 lb to 3,000 lb NEW. The total quantity of waste moved per movement per vehicle will vary from 500 lb to 10,000 lb NEW. The allowable range limitation on the net explosive weight (NEW) of unserviceable munitions accommodated by each OD unit at one time is 3,000 pounds NEW.

#### II.A5.4 Traffic Control Signs and Persons

Entry to ranges is controlled by the Eglin Range Control Officer (RCO) and Range Operations Control Center (ROCC) and requires special clearance. Warning signs are posted at each entry point to the active bombing/training ranges where the OB/OD units are located.



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EXPLOSIVE TRANSPORT  
ROUTES

DESIGNED BY GEJ	DESIGNED BY DPM	DESIGNED BY FDM	PROJECTED BY GEJ	SCALE 1 IN = 4 MI.	DATE 1-4-84	FILE NO. 1006.70	FIGURE II-14
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#### II.A5.5 Road Surface Composition and Load Bearing Capacity

Explosives transport routes within the main base and along the public highways are asphalt paved roads. Public-access and range-access roads used as explosives transport routes within the reservation area are hard-surface clay/gravel roads. Information on engineering design standards, construction data, and load-bearing capacity of EAFB roads is presented in Section B-4 of the August 1985 RCRA Part B Application for EAFB.

## **II.B WASTE CHARACTERISTICS**

### **II.B1 PHYSICAL AND CHEMICAL CHARACTERISTICS OF WASTES AND RESIDUES [40 CFR 270.14(b)(2) and 40 CFR 264.13(a)]**

Inventories of military ordnance items are maintained at various military installations, including EAFB. These items include unserviceable or serviceable excess munitions that are physically intact. If the unserviceable items cannot be reworked, they must be demilitarized or rendered harmless. Demilitarization of both unserviceable and serviceable excess munitions at EAFB is accomplished through treatment by OB/OD. Discussion of waste minimization techniques and alternatives is presented in Section III.A1.

Items from holding areas at EAFB are transported to the OB/OD units for scheduled OB/OD treatment. There is no storage of ordnance items on either of the two ranges, C-52N and C-62, prior to scheduled OB/OD treatment. Items scheduled for OB/OD treatment are processed without delay once they have reached the designated treatment unit.

The chemical and physical nature of typical ordnance items treated and the Waste Analysis Plan for sampling, testing, and evaluating these items is submitted in accordance with the requirements of 40 CFR 270.14(b)(2).

Regulatory requirements for wastes in containers (40 CFR 270.15), wastes in tanks (40 CFR 270.17), wastes in waste piles (40 CFR 270.18), wastes in incinerators (40 CFR 270.19), wastes in land treatment facilities (40 CFR 270.20), wastes in landfills (40 CFR 270.21), and wastes at facilities with process vents (40 CFR 270.24) are not applicable because none of these types of treatment units are present at the EAFB OB/OD designated areas.

#### **II.B1.1 Volume and Composition of Wastes [40 CFR 270.14(b)(2) and 40 CFR 264.13(a)]**

The volume and physical and chemical composition of typical wastes treated at the EAFB OB/OD units are addressed in Section II.B1.2, Wastes in Miscellaneous Units.

#### **II.B1.2 Wastes in Miscellaneous Units [40 CFR 270.23]**

Wastes that are to be treated at the EAFB OB/OD treatment units will generally be classified as hazardous by the reactivity characteristic of the explosive chemical constituents. Munitions

treated by OB/OD units include serviceable and unserviceable munitions. Serviceable munitions consist of munitions used in military training exercises and specialized weapons testing. These munitions include (but are not limited to) igniters, cartridges, rounds, flares, rockets, smoke canisters, bombs, propellants, and pyrotechnics. Wastes generated by the HERD facility consist of (but are not limited to) research and development (R & D) experimental explosives and traditional explosives ~~such as TNT, Comp B, Octol, and Tritonal~~. R & D explosives include AFX 1100, AFX 453, AFX 931, PBXN 109, AFX 931-M, and TNT/SNQ. Table II-1 presents a list of basic compositions for standard energetic materials in general use, as well as HERD-generated experimental explosives. Table II-1 represents the typical components that make up specific munitions items that may be treated at ~~Eglin~~ EAFB.

The munitions that are treated by OB/OD generally are composed of a variety of reactive chemical fill materials along with associated metal casings, projectiles, and primer components. The metal components account for a majority of the mass of the munitions. The reactive materials are usually less than 20 percent of the gross munitions weight. A number of energetic compounds are present in the munitions. These compounds fall into four general classes including pyrotechnic compositions, propellants, priming compositions, and high explosives. Propellants, pyrotechnic, and priming compositions are materials that react by deflagration. The high explosive reactions are manifested in the form of detonations. When the munitions are treated in the OB/OD units, various combustion and detonation products are formed.

The propellant mixtures are typically classified as single-base or double-base. Single-base propellants consist mainly of nitrocellulose. Double-base propellants are mixtures of nitrocellulose and nitroglycerin. A number of miscellaneous chemical compounds are added to the propellant charge to control the deflagration characteristics or to promote stability during storage. These additives incorporated into the propellant fuels generally account for 3 percent of the mixture and are oxidized during the deflagration reaction. The amounts of oxidized additive reaction products, including unreacted additives, is considered minimal as compared to the overall OB/OD reaction products generated. Therefore, the impacts of chemical additive oxidation were considered less significant than those from the reaction of primary constituents found in propellants. For this reason, they will not be considered as part of this permit application. All of the components of military propellants are in solid form and contain no free liquids. Confirmatory surface soil sampling in the area of ejected debris will be conducted as part of the detection monitoring program (Section II.G). This sampling will

TABLE II-1 WASTE ANALYSIS DATA: BASIC EXPLOSIVE COMPONENTS AND COMPOSITIONS

Reactive Material Name	Explosive Type	Constituents <sup>(a)</sup>	General/Typical Concentration (Percentage by Total Weight)	Comment
TNTO II, III, IV	High Explosive	TNT NTO Aluminum Polywax 500, 600, 650 D2 wax Petra wax Pax wax Indramic wax	30% 40% 20% (percentage of wax varies depending upon which type of TNTO)	Trinitrotoluene 3-Nitro-1,2,4-Triazol-5-One
Octol 75/25	High Explosive	HMX TNT	75% 25%	Octahydro-1,3,5,6-Tetranitro-1,3,5,7-tetrazocine
PBXN 109	High Explosive	RDX-I RDX-V MDX-81 Alum R45 HT DOA AO2246 FEAA IPDI	57.5% 6.5% 20% 7.26% 7.26% 0.26% 0.10% 0.0015% 1.12%	Hexahydro-1,3,5-trinitro-s-triazine  Aluminum Powder Polybutadiene, Linear/Hydroxyl Terminated Dioctyl Adipate Di (2-Hydroxyethyl) Dimethyl Hydantoin Antioxidant (T-Butylphenol-type) Ferric Acetylacetonate Isophorone Diisocyanate
Composition B (Comp B)	High Explosive	TNT RDX Anti-crack wax	40% 60%	Cyclonite O&P-Nitrotoluene
PETN	High Explosive	Pentaerythritol Tetranitrate		
Tritonal	High Explosive	TNT Aluminum	80% 20%	
AFX 453	High Explosive	HBNQ MENQ 1401 Aluminum Aluminum Nitrate TDO	60% 13% 15% 11.5% 0.5%	High Bulk Nitroguanidine Methyl Nitroguanidine  N-Tallow-1,3-Diaminopropane
TNT/SNQ	High Explosive	TNT SNQ	50% 50%	Spherical Nitroguanidine

(a) Includes stabilizer and additives.

Table II-1 (Cont.)

Reactive Material Name	Explosive Type	Constituents <sup>(a)</sup>	General/Typical Concentration (Percentage by Total Weight)	Comment
Pentolite	High Explosive	PETN TNT	50% 50%	
PBX(AF)-108M	High Explosive	RDX-I RDX-V R45 HT DOA DHE AO2246 FEAA IPDI	62% 20% 8.168% 8.168% 0.293% 0.113% 0.0017% 1.26%	
Comp A-5	High Explosive	RDX Stearic Acid	98.5% 1.5%	
AFX 1100	High Explosive	TNT Polywax 655 Tritonal Aluminum	66% 16% 18%	
Comp Polywax 655	Propellant	Polywax 655 NC Lecithin	84% 14% 2%	
Comp Polywax 600	Propellant	Polywax 600 NC Lecithin	96% 2% 2%	
PBXN 110	High Explosive	R45 HT IDP Ethyl 702 Lecithin FEAA HMX-II HMX-III IPDI	5.365% 5.365% 0.05% 0.75% 0.002% 22% 66% 0.51%	Ethyl Antioxidant 702
Fine Grain Comp B-3	High Explosive	TNT RDX-V RDX-I	40% 15% 45%	

(a) Includes stabilizer and additives.

Table II-1 (Cont.)

Reactive Material Name	Explosive Type	Constituents <sup>(a)</sup>	General/Typical Concentration (Percentage by Total Weight)	Comment
AFX 931-M	High Explosive	R45HT DOA DHE FEAA AO2246 H-5 Aluminum RDX-I RDX-V Ammonium Perchlorate IPDI	7.26% 7.26% 0.26% 0.0015% 0.10% 15% 16% 16% 37% 1.12%	
TNAZ				1,3,3-Trinitro Azetidine
Propellant (exact composition varies by use and types)	Propellant	Nitrocellulose Nitroglycerin	52-98% 2-43% Traces of other chemicals to retard burn	
Propellant (20 mm, 30 mm, 40 mm target practice)	Propellant	Nitrocellulose/nitroglycerin Charcoal Sulfur Graphite	75% 12.5% 12.5% Trace	
Black Powder	Igniter/Propellant	Potassium (or sodium) nitrate Charcoal Sulfur	75% 15% 10%	
Illumination mixture	Pyrotechnic	Sodium nitrate Magnesium Polymeric binder	36-40% 53-56% 4-8%	
Tetryl	High Explosive			
C-4	High Explosive	RDX Polyisobutylene Binder	91% 2% 7%	

(a) Includes stabilizer and additives.

Table II-1 (Cont.)

Reactive Material Name	Explosive Type	Constituents <sup>(a)</sup>	General/Typical Concentration (Percentage by Total Weight)	Comment
Incendiary mix	Pyrotechnic	Ammonium perchlorate Aluminum Calcium stearate Other	35% 52% 1.9% 9.7%	
PBX	High Explosive	RDX Polymer	91-94% 6-9%	
M1 Propellant	Propellant	Nitrocellulose Dinitrotoluene Dibutylphthalate Diphenylamine	84% 10% 5% 1%	
M2 Propellant	Propellant	Nitrocellulose Nitroglycerin Ethyl Centralite Barium Nitrate Potassium Nitrate Graphite	77.45% 19.50% .60% 1.40% .75% .30%	
M5 Propellant	Propellant	Nitrocellulose Nitroglycerin Ethyl Centralite Barium Nitrate Potassium Nitrate Graphite	81.95% 15.00% .60% 1.40% .75% .30%	
M6 Propellant	Propellant	Nitrocellulose Dinitrotoluene Dibutylphthalate	87% 10% 3%	
M10 Propellant	Propellant	Nitrocellulose Dinitrotoluene Potassium Sulfate	98% 1% 1%	
M12 Propellant	Propellant	Nitrocellulose Diphenylamine Potassium Sulfate Tin	97.7% .8% .75% .75%	

(a) Includes stabilizer and additives.

Table II-1 (Cont.)

Reactive Material Name	Explosive Type	Constituents <sup>(a)</sup>	General/Typical Concentration (Percentage by Total Weight)	Comment
M15 Propellant	Propellant	Nitrocellulose Nitroglycerin Nitroguanidine Ethyl Centralite Cryolite	20% 19% 54.7% 6% .3%	
M17 Propellant	Propellant	Nitrocellulose Nitroglycerin Nitroguanidine Barium Nitrate Cryolite	22% 21.5% 54.7% .1% .3%	
T23 Propellant	Propellant	Nitrocellulose Nitroglycerin Ethyl Centralite Barium Nitrate Potassium Nitrate Graphite	67.25% .25% 6% .75% .7% .3%	
M8 Propellant	Propellant	Nitrocellulose Nitroglycerin Diethylphthalate Ethyl Centralite Potassium Nitrate	52.15% 43% 3% .6% 1.25%	
M9 Propellant	Propellant	Nitrocellulose Nitroglycerin Diethylphthalate Ethyl Centralite Cryolite Potassium Nitrate	54.85% 40% 3% .6% .3% 1.25%	
M7 Propellant	Propellant	Nitrocellulose Nitroglycerin Ethyl Centralite Potassium Perchlorate Carbon Black	54.6% 35.5% .9% .3% 1.2%	

(a) Includes stabilizer and additives.



Table II-1 (Cont.)

Reactive Material Name	Explosive Type	Constituents <sup>(a)</sup>	General/Typical Concentration (Percentage by Total Weight)	Comment
M13 Propellant	Propellant	Nitrocellulose Nitroglycerin Diphenylamine Ethyl Centralite Potassium Sulfate	57.3% 40% .2% 1% 1.5%	
M16 Propellant	Propellant	Nitrocellulose Nitroglycerin Dinitrotoluene Ethyl Centralite Potassium Sulfate Carbon Black	55.5% 27.5% 10.5% 4% 1.5% .5%	
T2 Propellant	Propellant	Nitrocellulose Nitroglycerin Dinitrotoluene Ethyl Centralite Lead Stearate	57.5% 30% 2.5% 8% .5%	
T8 Propellant	Propellant	Nitrocellulose Nitroglycerin Dinitrotoluene Ethyl Centralite Lead Stearate Triacetin	58% 22.5% 2.5% 8% .5% 8.5%	
Photoflash	Incendiary	Laminac Lupersol, DDM Iron Oxide	96.8% 3% .2%	
TPA Incendiary	Incendiary	Triethylaluminum		
Lead Azide	Primer/Detonator	Nitrogen Lead	28.8% 71.2%	
Lead Styphnate	Primer	Carbon Hydrogen Nitrogen Oxygen Lead	15.4% .65% 9% 30.8% 44.2%	

(a) Includes stabilizer and additives.

Table II-1 (Cont.)

Reactive Material Name	Explosive Type	Constituents <sup>(a)</sup>	General/Typical Concentration (Percentage by Total Weight)	Comment
Amatol	High Explosive	Ammonium Nitrate TNT	80% 20%	
Ammonium Nitrate	Incendiary	Nitrogen Hydrogen Oxygen	35% 5% 60%	
Composition A3	High Explosive	RDX Wax	91% 9%	
Explosive A4	High Explosive	RDX Wax	97% 3%	
Explosive D	High Explosive	Carbon Hydrogen Nitrogen Oxygen	29.3% 2.4% 22.7% 45.6%	Ammonium Picrate
Haleite	Explosive	Carbon Hydrogen Nitrogen Oxygen	16% 4% 37.3% 42.7%	EDNA Ethylene-Dinitramine
HBX-1.3 & 6	High Explosive	RDX TNT Aluminum Densitizer Comp D2 CACL	39.6% 37.8% 17.1% 5% .5%	
Pentolite 10/90	High Explosive	PETN TNT	10% 90%	
Picratol	High Explosive	Explosive D TNT	52% 48%	
Tetrytol	High Explosive	Tetryl TNT		
Torpex	High Explosive	RDX TNT Aluminum	42% 40% 18%	

(a) Includes stabilizer and additives.

Table II-1 (Cont.)

Reactive Material Name	Explosive Type	Constituents <sup>(a)</sup>	General/Typical Concentration (Percentage by Total Weight)	Comment
Nitroglycerin	High Explosive/ Propellant	Carbon Hydrogen Nitrogen Oxygen	15.9% 2.2% 18.5% 63.4%	
Nitroguanidine (Picrate)	High Explosive/ Propellant	Carbon Hydrogen Nitrogen Oxygen	11.5% 3.9% 53.8% 30.8%	Picrate
Military Dynamite - Medium Velocity	High Explosive	RDX TNT Starch SAE No. 10 Oil Polysobutylene	75% 15% 5% 4% 1%	
Military/Dynamite - Low Velocity	High Explosive	RDX/DYE TNT Triphenylmethyl-Thritol Binder* Cellulose Acetate	17.5% 67.8% 8.6% 4.1% 2%	* The binder is vistac No. 1 consisting of polybutene and dioctyl sebacate.

(a) Includes stabilizer and additives.

show if miscellaneous chemical additives from past disposal actions have survived and accumulated in the vicinity of the units.

The pyrotechnic compositions are mixtures of compounds which are designed to emit smoke or light. These munitions primarily consist of a mixture of fuel and oxidizer compounds. The fuels are one of a variety of metal powders including magnesium, aluminum, titanium, or zirconium. Typical oxidizers consist of metal nitrates, ammonium or metal perchlorates, and chlorates, or metal peroxides. Secondary constituents which are also present in pyrotechnic mixtures are binders, ignition agents, retardants, and colorants. A variety of chemical compounds are present in these additives. Typical minor components include black powder, chlorinated organics, waxes, sugar, asphalt, polyvinyl chloride, and vegetable oils. Pyrotechnic compositions contain no free liquids. The thermal treatment of pyrotechnics results in gaseous combustion products and solid particulates.

Priming compositions are mixtures that are very sensitive to shock or friction and are used to provide a source of ignition for pyrotechnics, propellants, or explosives. Primers are a mixture of fuel, oxidizer, and explosive compounds. Typical fuels are antimony sulfide and lead thiocyanate; oxidizers include barium nitrate and potassium chlorate. The primary explosives are lead azide and lead styphanate.

High explosives are typically nitrated organic materials which generate large quantities of gaseous reaction products as a result of detonation. The most common high explosives are trinitrotoluene (TNT), cyclotrimethylenetrinitramine (RDX), trinitrophenylmethylnitramine (tetryl), cyclotretramethylenetetranitramine (HMX), and various mixtures thereof. Minor additives to high explosive ordnance include waxes and aluminum powder. All constituents are in the solid form.

While a general description of the types of munitions to be treated at the OB/OD units has been described above, the variety and variability of the energetic materials contained in military ordnance is extensive. Similarly, it is not likely that exact quantities of various compounds can be predicted for those ordnance items that may require treatment in the future. For these reasons, this application presents a representative list of ordnance items which may be burned or detonated at the OB/OD units at EAFB and their chemical composition. Although the list of potentially treated ordnance items is not exhaustive, the list of compounds contained in these ordnance items as shown in Table II-1 is meant to encompass compounds that would potentially be encountered in the waste munitions.

Table II-1 presents a list of reactive materials potentially subject to RCRA designation as hazardous waste by the reactive characteristic that are typically treated by OB/OD at EAFB. This list includes the types of waste energetic materials generated by the HERD facility that would be treated by the EOD personnel at the OB/OD units. A representative list of types of ordnance items that could be treated and the reactive contents of the ordnance is presented in Table II-2. Table II-2 is provided for illustration purposes only and is not to be construed as a comprehensive inventory of ordnance items that could be treated at Eglin AFB. Table II-2 represents a single OB/OD event that occurred in 1993. The intent of Table II-2 is to show how the explosive components identified in Table II-1 may be combined to make ordnance items.

Obsolete and off-specification items are assumed to have the same characteristics as currently acceptable items. Explosive content by weight and type may vary by model. All items contained in these tables are reactive (D003) hazardous wastes and/or toxic due to barium (D005), 2,4-dinitrotoluene (D030), or lead (D008).

Although Tables II-1 and II-2 present various types of ordnance items, these lists do not reflect all items that may potentially be burned or detonated at EAFB during the period that this RCRA permit applies. However, the compounds and elements presented in the ordnance compositions (Table II-1) are intended to be the complete list of waste munitions treated at the EAFB OB/OD areas. Ordnance and explosives degradation products primarily consist of metals, metal oxides, sulfur and nitrogen compounds, and particulates. The Department of Defense has conducted ordnance destruction testing at Dugway Proving Ground, Utah, using the "Bangbox." Bangbox data were used in developing the POLU13G air emissions model, which predicts the degradation products of OB/OD activities. (POLU13G is an EPA-accepted model that is used in Section III.C of this application to establish air emissions for purposes of performing exposure risk assessments.) Tables summarizing POLU13G model output of probable degradation products for OB/OD activities at Eglin AFB are provided in Section III.C6a.3. Section III.B1 presents the Environmental Performance Standards that are adhered to at EAFB.

A document related to explosives chemistry [an EPA Office of Research and Development document entitled, *State-of-the-Art Military Explosives and Propellant Production Industry* (Volume III) discussing the chemistry of military explosives, dated October 1976] is provided as Appendix F-2 for additional background informational purposes.

TABLE II-2 REPRESENTATIVE ORDNANCE BURNED/DETONATED AT EAFB

Ordnance Name	No. <sup>(a)</sup> Treated per mo.	NEW (lbs.) per Round	No. of Rounds	OB	OD	Basic Energetic Composition	Casing Composition	Composition Reference
Cartridge, Impulse, BBU-35/B	11	0.0008	240	✓		Nitrocellulose Propellant - EBW	Aluminum	T.O. 11A-1-46
Cartridge, Impulse, BBU-36/B	20	0.0002	2160	✓		Nitrocellulose Propellant - EBW	Aluminum	T.O. 11A-1-46
Initiator	2	0.0008	N/A	✓		Propellant - Percussion Primer	Aluminum	T.O. 11A-1-46
Cartridge, Impulse	1	0.0529	1	✓		Nitrocellulose Propellant - EBW	Aluminum	T.O. 11A-1-46
Cartridge, Impulse, ARD446-1	94	0.0276	4	✓		Nitrocellulose Propellant - EBW	Aluminum	T.O. 11A-1-46
Cartridge, Canopy Remover (Cartridge, Impulse)	1	0.0529	1	✓		Propellant - EBW	Aluminum	T.O. 11A-1-46
MT86 Canopy Remover (Cartridge Remover)	1	0.0302	N/A	✓		Propellant - Percussion Primer	Aluminum - Steel	T.O. 11A-1-46
M187 ARD 446-7 (Cartridge, Impulse, ARD 446-1)	8	0.0276	4	✓		Nitrocellulose Propellant	Aluminum	T.O. 11A-1-46
Catapult Rocket	1				✓	Propellant/Cartridge Percussion (Propellant) Primer	Aluminum - Steel	T.O. 11A-1-46
Flare, MJU-7 A/B	2	0.6278	15	✓	✓	Magnesium/Teflon	Aluminum	T.O. 11A-1-46
Squib, BBU-35 (Cartridge, Impulse, BBU-35/B)	697	0.0008	240	✓		Nitrocellulose Propellant	Aluminum	T.O. 11A-1-46
Squib, BBU-36 (Cartridge, Impulse, BBU-36/B)	22	0.0022	2160	✓		Nitrocellulose Propellant	Aluminum	T.O. 11A-1-46
Cartridge, 0.50-cal.	400	0.0336	200	✓		SB-Nitrocellulose	Brass/Aluminum/Tin	T.O. 11A-1-46
Flare IR, MJU-10/B	20	2.0	24	✓	✓	Magnesium/Teflon	Aluminum	T.O. 11A-1-46
Cartridge, 20mm, TP-T	3	0.0861	250	✓		Nitrocellulose - Nitroglycerin Double-Base	Steel - Aluminum Brass	T.O. 11A-1-46 and Ellsworth AFB

(a) Based on Inventory List ADR Support Request dated 14 July 1993 for the month of August 1993.

TABLE II-2 (Cont.)

Ordnance Name	No. <sup>(a)</sup> Treated per mo.	NEW (lbs.) per Round	No. of Rounds	OB	OD	Basic Energetic Composition	Casing Composition	Composition Reference
Cartridge, 20mm, TP	460	0.0861	250	✓		Nitrocellulose - Nitroglycerin Double-Base	Steel - Aluminum Brass	T.O. 11A-1-46 and Ellsworth AFB
BBU-35 (Cartridge, Impulse, BBU-35/B)	534	0.0008	240	✓		Nitrocellulose Propellant	Aluminum	T.O. 11A-1-46 and Ellsworth AFB
Simulator, Flare, MJU-7(T-1)/B	846	0.0783	60	✓	✓	Diethylaminoazobenzene/Potassium - Chlorate	Aluminum or Plastic	T.O. 11A-1-46
Cartridge, Impulse, MK23 MOD0	125	0.0002	4	✓		Nitrocellulose Propellant	Aluminum	T.O. 11A-1-46
Cartridge, Drogue Gun (Cartridge Assembly)	11P7-21-7 2	0.0019	1	✓		Propellant	Aluminum	T.O. 11A-1-46
Cartridge, Actuated (Cartridge Assembly Item)	11P3 Series 1	0.0004	1	✓		Propellant	Steel	T.O. 11A-1-46
Canopy Remover	1			✓		Propellant - EBW	Aluminum	T.O. 11A-1-46
Cartridge, Mortar	11P3 Series 1	0.0140	1	✓		Propellant	Steel - Aluminum	T.O. 11A-1-46
Cartridge, 0.38-cal.	7200	0.0006	2400	✓		SB - Nitrocellulose	Brass/Aluminum	T.O. 11A-1-46
Drogue (FLSC Holder Assembly)	11P21-1-7 4	0.0011	N/A	✓		Flexible Linear Shaped Charge	Steel	T.O. 11A-1-46
Cartridge, Fire Extinguisher	11P-18-147 7	0.0008	1	✓		Propellant Zea EBWs	Brass	T.O. 11A-1-46
Initiator (various)	11P3 Series 38	0.0069	1	✓		Propellant - Percussion Primer	Aluminum	T.O. 11A-1-46

## II.B2 COPY OF THE WASTE ANALYSIS PLAN [40 CFR 270.14(b)(3) and 40 CFR 264.13(b) and (c)]

EOD personnel are familiar with the destruction methods of OB/OD of waste munitions items. The procedures for the determination of whether ordnance items are destroyed by OB or OD including the disposal methodology is documented in detail in the Technical Manual, "General Instructions for Disposal of Conventional Munitions" (TO 11A-1-42), as well as other Air Force technical documents. A copy of TO 11A-1-42 is provided in Appendix F-1. Since the treatment of waste munitions items is specified in Air Force technical documents and detailed physical and chemical parameters are documented at other Air Force installations with similar OB/OD operations, detailed waste analyses are not applicable for the input waste streams to be treated at EAFB. The existing published data for the munitions of concern meet the general waste analyses requirements.

Since the composition of the waste munition items are known at the time the waste items are treated, waste analyses of these items is not applicable. However, the waste analyses of munitions residues generated from the OB treatment of waste munitions is considered applicable.

### II.B2.1 Parameters for Which Each Hazardous Waste Will be Analyzed [40 CFR 264.13(b)(1)]

Ash generated from OB activities will be sampled and analyzed for reactivity characteristics initially. Subsequent to reactivity characterization, TCLP toxicity tests for metals and 2,4-dinitrotoluene (2,4-DNT) will be conducted. These test parameters will further characterize the munitions residue and determine whether further action is required for nonhazardous and hazardous wastes.

Other residues generated at the OB/OD area consist of:

- Metallic items not containing partially burned/detonated energetic materials
- Metallic fragments containing partially burned/detonated energetic materials



These items are visually inspected to determine the presence of energetic materials. Chemical analyses are not needed to make this determination. If no energetic material are visible within the OB containment unit after the completion of the burn, residues are removed and placed in sealed 55-gal drums or larger containers. The waste is sampled and analyzed for reactivity and TCLP test for metals. The waste is classified into hazardous or non-hazardous based upon the analytical results.

#### II.B2.2 Rationale for Parameters [40 CFR 264.13(b)(1)]

Since the ash generated from OB treatment may retain some of its reactivity characteristics from the originating waste munitions item treated, ash will be analyzed for reactivity to verify complete destruction of the waste munitions item.

Since many ordnance items treated by OB/OD have metal casings and may contain heavy metals and explosive fillers, consideration of potential toxicity associated with metals or explosives is warranted. The TCLP toxicity test for metals and 2,4-dinitrotoluene will determine if munitions can potentially leach metals and/or 2,4-DNT into ground water and thus cause munitions residue to be classified as hazardous wastes.

Other hazardous waste characteristics do not apply to this waste. The ash may only meet the definition as ignitable non-liquid hazardous waste if it also failed the reactivity screening test. Since any sample failing the reactivity screening test is retreated, addressing the ignitability of the sample is not required. The corrosivity characteristic is not applicable because the ash is not a liquid.

#### II.B2.3 Methods Used to Test the Parameters [40 CFR 264.13(b)(2)]

All analyses will be performed using the following EPA-approved SW-846 procedures.

- Reactivity-7.3.3.2/7.3.4.2
- TCLP Arsenic-1311, 6010, 3010
- TCLP Barium-1311, 6010, 3010
- TCLP Cadmium-1311, 6010, 3010
- TCLP Chromium-1311, 6010, 3010

- TCLP Lead-1311, 6010, 3010
- TCLP Mercury-1311, 7470
- TCLP Selenium-1311, 7000, 3020
- TCLP Silver-1311, 6010, 3010
- TCLP 2,4-DNT-extraction method 8310

#### II.B2.4 Methods Used to Obtain Representative Samples of the Waste Being Analyzed [40 CFR 264.13(b)(3) and 40 CFR 261 Appendix I]

If no energetic materials are visible within the OB containment unit after the completion of the burn, residues are removed from the unit and placed in sealed 55-gal drums or larger containers. The ash residue from each burn event is not combined with residue from other OB events. Prior to sampling and analyses, the ash is thoroughly mixed within the ash management container using a metal shovel. A representative sample of the ash is then removed and transferred to sample jars for the reactivity and TCLP analyses.

#### II.B2.5 Frequency of Revisions or Repetition of Analysis [40 CFR 264.13(b)(4)]

For each burn event generating ash, a minimum of three separate aliquots of mixed ash will be composited for analysis. One composite sample from each burn event will be analyzed for reactivity, TCLP metals, and TCLP 2,4-DNT. Ash from each burn will be tested using these procedures because the highly variable nature of munitions burned at the OB units could result in considerable variation in ash composition.

#### II.B2.6 Facilities Managing Wastes Generated Offsite [40 CFR 264.13(c)]

All waste munition items treated at the OB/OD units at EAFB for which RCRA permitting is applicable have been generated at EAFB or any DOD installation in the United States with valid support agreements with EAFB. The only non-DOD wastes generated offsite that are managed at EAFB Ranges C-62 and C-52N are those highly unstable items which require emergency treatment to prevent "an imminent and substantial threat of discharge of hazardous waste." Management of these latter wastes is not subject to the RCRA regulations of this section as specified in 40 CFR 264.1(g)(8). At no time will treatment at the EAFB OB/OD units be allowed for non-DOD offsite wastes or energetic materials not meeting this specific exemption.

**II.B2.7 Additional Waste Analysis for Demonstrating Compliance with Requirement of Ignitable, Reactive, or Incompatible Waste Management (Safe Handling) Methods [40 CFR 264.13(b)(6) and 40 CFR 264.17]**

No additional analyses must be performed to ensure that potentially reactive wastes are managed using safe handling methods.

## **II.C PROCEDURES TO PREVENT HAZARDS**

### **II.C1 SECURITY PROCEDURES AND EQUIPMENT [40 CFR 270.14(b)(4) and 40 CFR 264.14]**

#### **II.C1.1 Demonstration that Unknown or Unauthorized Contact with Waste is Not Harmful [40 CFR 14(a)(1)]**

EAFB is not requesting a waiver to the security procedures. Unauthorized contact with the waste treated at the OB/OD unit will not happen because the wastes will only be located at the OB/OD units during attended operations, and only EOD staff will be located at the OB/OD units during OD/OB activities. Therefore, this section is not applicable.

#### **II.C1.2 Demonstration that Disturbance of Waste or Equipment Will Not Cause Violation of 40 CFR 264 [40 CFR 14(a)(2)]**

EAFB is not requesting a waiver to the security procedures. Unauthorized contact with the waste treated at the OB/OD unit will not happen because the wastes will only be located at the OB/OD units during attended operations, and only EOD staff will be at the OB/OD units during OD/OB activities. Therefore, this section is not applicable.

#### **II.C1.3 Description of a 24-hour Surveillance System [40 CFR 264.14(b)(1)]**

Access to the main base at EAFB is limited to authorized personnel with proper identification and is controlled by on-base security 24 hours per day. The main base may be entered from three locations: the west gate at the intersection of Eglin Boulevard (Florida Route 85) and Lewis Turner Parkway (Florida Route 189); the east gate at John Sims Parkway immediately south of Addie R. Lewis Middle School; and the 33FW gate (ACC Base Gate) on Florida Route 85 approximately 1 mi north of the Air Force Armament Museum. Twenty-four hour security is provided through a guardhouse, fence, and lockable gates. The gates remain locked when the guardhouse is unmanned. Visitors to the main base are required to obtain passes from the control center at the east gate and must be sponsored onto the base by a base employee.

Access to the OB/OD units is controlled through range gates that are blocked during the entire period that OB/OD activities are being conducted, including the 12- to 24-hour period after completion of OB. Since both OB and OD units are located on active bombing ranges, access

to the treatment areas is also restricted during any active bombing/training missions. The range gates are not blocked during periods when OB/OD or active training missions are not ongoing; however, the range gates are clearly marked as entrances to active bombing ranges with the notation "WARNING: MISSION IN PROGRESS. DO NOT ENTER".

Restriction of access to the OB/OD ranges is further described below.

#### II.C1.4 Description of the Artificial or Natural Barrier [40 CFR 264.14(b)(2)(i)]

The aircraft bombing/gunnery training ranges where OB/OD activities are conducted are completely surrounded by dense forests for several miles, creating a natural barrier that prevents unauthorized entry. Vehicular access is controlled by gates at all entrance points to the ranges. Once materials for the OB/OD mission have been transported onto the range, the gates are blocked until the mission has been completed and the wastes have been removed. After the OB/OD mission is completed, potential hazardous sources (including burn residue and non-exploded ordnance items) are removed from the unit and a potential hazardous exposure condition requiring security provisions no longer exists.

#### II.C1.5 Method to Control Entry and Number of Personnel in the Treatment Area [40 CFR 264.14(b)(2)(ii)]

The OB/OD treatment areas are located on active bombing/gunnery training ranges in restricted areas. Personnel access to these ranges is severely limited, due to the potential for encountering unexploded munitions or bombing/training missions in progress. Entry through range gates onto active bombing/training ranges is controlled by the Eglin RCO and ROCC and requires special clearance.

All OB/OD operations are scheduled missions conducted by trained EOD personnel, and the number of personnel is restricted to those who have been briefed on the specific mission. A minimum of two EOD technicians are always present during range operations, and there is at least one EOD technician present for each five workers or support personnel engaged in clearance and recovery operations. During attended operations, the mission team chief coordinates with the RCO, ROCC, and EOD Operations Center to ensure that all nonessential personnel and vehicles are cleared from the range and that all range gates allowing access to the treatment area are blocked prior to starting the mission. In many instances, EOD vehicles are parked at the blocked gates, prohibiting further access. Once the burn/detonation has been

prepared, personnel and equipment withdraw to the safe distance established by the munitions being treated and prescribed by the team chief (always at least 2,000 ft). Prior to termination of operation (at least 12 hours and in many instances up to 24 hours after a burn), EOD technicians will thoroughly check the area for incomplete detonation/kickouts or remaining live explosives. The range gates will remain blocked until after the 12- to 24-hour period subsequent to completion of the burn.

#### II.C1.6 Sign Posted at Each Entrance with Legend "Danger-Unauthorized Personnel Keep Out" [40 CFR 264.14(c)]

Signs stating "WARNING: MISSION IN PROGRESS. DO NOT ENTER" are posted at each entry point (range gate) to the OB/OD ranges. Additional signs stating "WARNING: EGLIN AIR FORCE BASE CLOSED AREA. POSTED. DO NOT ENTER" are posted throughout the reservation in non-range areas that are closed to recreational activity. These signs are printed in English and are legible at a distance of at least 25 ft.

### II.C2 INSPECTION SCHEDULE

#### II.C2.1 Copy of Inspection Schedule [40 CFR 270.14(b)(5) and 40 CFR 264.15]

An Air Force External Environmental Compliance Assessment and Management Program Evaluation (ECAMP) is conducted every 36 months, which includes inspection of the bombing/training ranges. Internal ECAMP inspections are conducted annually.

Inspections of safety, emergency, and operating equipment of the particular OB/OD treatment area in use for an EOD mission occur both before and after operations at the site as specified in SOI 136-18. SOI 136-18 details information on EOD procedures, personnel safety and responsibilities, and emergency procedures (Appendix C). The pre-OB/OD and post OB/OD inspections are critical to identify/correct deficiencies which may interfere with the safe progress of the treatment process or threaten human health or the environment.

#### II.C2.2 Types of Problems to be Checked [40 CFR 264.15(b)(3)]

Table II-3 outlines the checklist for pre-operation and post-operation inspections, including specific items to be inspected, potential problems for each item, and frequency of inspection.

TABLE II-3 INSPECTION PROCEDURES AND FREQUENCY

Area/Equipment	Specific Item	Types of Problems	Frequency of Inspection
Security Devices	Signs	Illegible or missing	Before/after each use
	Gates	Locks missing or vandalized	Before/after each use
Communication Equipment	Radios	Battery failure	Before/after each use
Safety and Emergency <sup>(a)</sup> Equipment	Fire Extinguishers	In need of recharging, or missing	Before/after each use
	Absorbents	Unavailable, saturated	Before/after each use
	First Aid Equipment and Supplies	Items out of stock or Inoperative	Before/after each use
	Leather gloves, hightop boots, face shields, protective glasses	Holes, normal wear and tear Cracks, scratches, broken strap	Weekly and as used
	Portable eyewash	Water pressure, leaking, drainage	Weekly
Mobile Equipment <sup>(b)</sup>	Routine maintenance	Oil change, fuel	Weekly and as used
	Brakes	Worn pads, rotors	Per FL State inspection schedule
	Tires	Worn	Per use
	Hydraulics	Leaking	Weekly
	Trailer Hitches	Loose, missing safety chains	Before each use
	Lights-Running/Emergency	Burned out	Per FL State inspection schedule
	Horns/Sirens	Inoperative	Per use
	Engine	Inoperative	Per FL State inspection schedule
	On-board emergency equipment	Items out of stock or inoperative	Per use
OB/OD Areas	Access Roadways	Holes, Obstructions	Weekly
	Gate areas	Debris, Overgrown vegetation	Before/after each use
	Periphery	Overgrown vegetation	Before/after each use
	Burn kettles	Cracking, warping, evidence of standing water or water leakage, evidence of burn residue	Before/after each use
	OD Area	Overgrown vegetation, high ground water, unexploded ordnance items	Before/after each use
	OB/OD Surrounding Areas	Kickouts or other untreated wastes, water leakage form OB burn kettles, precipitation runon/runoff	Before/after each use
	Munitions	Not listed for destruction	As received

Notes: (a) This equipment is not present at the site but is brought to the site at the time an OB/OD mission is conducted.  
 (b) Inspection reporting for mobile equipment in accordance with AF Form 1850.

A list of on-board emergency equipment for EOD vehicles is presented in Table II-6. Table II-7 lists the on-board emergency equipment for mobile emergency vehicles.

#### II.C2.3 Frequency of Inspections of Equipment and Process [40 CFR 264.15(b)(4)]

The frequency of inspection of equipment and process is specified in Table II-3. As previously stated, OB/OD units will be inspected immediately before and following each use (after the cool down period), in addition to regular range inspections performed in conjunction with active bombing/training use of the ranges.

#### II.C2.4 Inspection Recordkeeping [40 CFR 264.15(d)]

Inspection log sheets contain information such as name of inspector, area/location inspected, specific item inspected, condition of item, problems observed, date and time of inspection, and date corrective action was taken. Table II-4 shows the inspection log sheets to be utilized. Inspection log sheets will be retained at the EAFB EOD office (Building No. 914) for 3 years from the date of inspection. An AF Form 1850 inspection form for mobile equipment is also completed and kept on file.

#### II.C2.5 Schedule of Remedial Action [40 CFR 264.15(c)]

If inspections reveal that non-emergency maintenance is needed, then EOD personnel will initiate action(s) to preclude further damage and reduce the need for emergency repairs. Where a hazard is imminent or has already occurred, remedial action will be taken immediately. Appropriate authorities will be notified according to the EOD Facility Contingency Plan (Section II.D). In the event of an emergency involving the release of hazardous constituents to the environment, efforts will be directed towards containing the hazard, removing it, and subsequently decontaminating the affected area as outlined in the Contingency Plan.

#### II.C2.6 Daily Inspection for Leaks, Spills, and Fugitive Emissions, and All Emergency Shutdown Controls and System Alarms [40 CFR 265.377(a)(3)]

No stacks, emission control devices, or associated equipment are present on either of the OB/OD units on days when OB/OD missions are conducted. Pre-operation and post-operation inspections will be conducted as described above. This includes inspection for leaks and spills



TABLE II-4 INSPECTION LOG

AREA/LOCATION	DATE/TIME				NAME OF INSPECTOR	SIGNATURE OF EOD NCOIC
					SIGNATURE OF INSPECTOR	
SECURITY DEVICES (before/after each use)	SAT	UNSAT	NA	NI	PROBLEMS OBSERVED	DATE CORRECTIVE ACTION TAKEN/ DESCRIPTION OF ACTION TAKEN
Security of Gates						
Warning Signs						
Evidence of Tampering						
Evidence of Damage						
Other						
COMMUNICATION EQUIPMENT (as used)						
Radios						
Other						
SAFETY/EMERGENCY EQUIPMENT (before/after use)						
Fire Extinguishers						
Absorbents/spill kits						
First Aid Equipment/Supplies						
Leather Gloves, hightop boots, face shields, protective glasses						

• LEGEND SAT-satisfactory UNSAT-unsatisfactory NA-not applicable NI-not inspected

TABLE II-4 (Cont.)

AREA/LOCATION	DATE/TIME				NAME OF INSPECTOR	SIGNATURE OF EOD NCOIC
					SIGNATURE OF INSPECTOR	
<b>MOBILE EQUIPMENT (per use)</b>	<b>SAT</b>	<b>UNSAT</b>	<b>NA</b>	<b>NI</b>	<b>PROBLEMS OBSERVED</b>	<b>DATE CORRECTIVE ACTION TAKEN</b>
Routine maintenance						
Brakes						
Tires						
Hydraulics						
Trailer Hitches						
Emergency Lights						
Horns/Sirens						
Engine						
On-Board Emergency Equipment						
Other						
<b>OB/OD AREAS (before/after each use)</b>						
Burn Kettles						
Detonation Pit						
Deterioration of Roadway						
Gate Areas						
Other						

• LEGEND SAT-satisfactory UNSAT-unsatisfactory NA-not applicable NI-not inspected

ITEMS TO BE CHECKED <i>(continued)</i>		
16. OTHER <i>(specify)</i>		
17. OTHER <i>(specify)</i>		
18. OTHER <i>(specify)</i>		
19. OTHER <i>(specify)</i>		
OPERATOR'S SIGNATURE SIGNIFIES ACCOMPLISHMENT OF CHECKS		
DAY	DAY	DAY
1	11	21
2	12	22
3	13	23
4	14	24
5	15	25
6	16	26
7	17	27
8	18	28
9	19	29
10	20	30
		31
MONTHLY TIRE PRESSURE CHECK		
TIRE PRESSURE GAUGED <i>(COLD)</i> AND ADJUSTED TO:		
FRONT _____ LBS		REAR _____ LBS
OPERATOR'S SIGNATURE		DATE PERFORMED

OPERATOR'S INSPECTION GUIDE AND TROUBLE REPORT (GENERAL PURPOSE VEHICLES)		DATE <i>(MO/YR)</i>
VEHICLE TYPE		REGISTRATION NUMBER
USING ORGANIZATION	LOCATION	PHONE NUMBER
NAME OF VEHICLE CONTROL OFFICER		GRADE
		PHONE NUMBER
ITEMS TO BE CHECKED WEEKLY INSPECTIONS CAN BE DONE MORE FREQUENTLY AS DIRECTED BY MAJCOM <i>(Operator's signature required on reverse)</i>		
1. CLEAN VEHICLE <i>(exterior and interior)</i>		
2. DAMAGE <i>(exterior and interior, missing parts)</i>		
3. TIRES <i>(visually check for damage/abnormalities)</i>		
4. LEAKS <i>(visually check fuel/oil/coolant)</i>		
5. ENGINE OIL AND COOLANT <i>(visually check fluid levels)<sup>1</sup></i>		
6. BATTERY <i>(visually check fluid level/hold-down secure/cleanliness)</i>		
7. DRIVE BELTS <i>(visually check for fraying or cracking)</i>		
8. LIGHTS <i>(visually check all for proper operation)</i>		
9. SAFETY DEVICES <i>(seatbelts/harness, headrests, warning lights, etc.)</i>		
10. INSTRUMENTS/HORN/WINDSHIELD WIPERS <i>(functionally check for operation)</i>		
11. BRAKES/STEERING <i>(functionally check responsive/effective/smooth)</i>		
12. UNUSUAL OCCURRENCES <i>(noise/vibration/odor/erratic instruments/etc.)</i>		
13. OTHER <i>(specify)</i>		
14. OTHER <i>(specify)</i>		
15. OTHER <i>(specify)</i>		
<sup>1</sup> Check engine oil following each refueling.		

of fuel oil at the OB range and inspection of structural integrity of OB kettles. In addition, when wastes are loaded, transported, and off-loaded, the loading and off-loading points and the transportation routes will be inspected for spilled or discarded wastes each day that these activities are conducted.

## **II.C3 PREPAREDNESS AND PREVENTION [40 CFR 270.14(b)(6) and 40 CFR 264(Subpart C)]**

### **II.C3.1 Description and Location of Internal Communications and Alarm System to Instruct Facility Personnel [40 CFR 264.32(a)]**

EAFB is not requesting a waiver of the preparedness and prevention requirements for the OB/OD treatment areas. Individuals performing OB/OD operations maintain visual contact at all times. Communications at the OB/OD treatment areas are maintained by voice or hand-held two-way radio. Communication between EOD personnel and the RCO, ROCC, and EOD Operations are by hand-held two way radio. Telephones are also available at the RCO and ROCC.

### **II.C3.2 Device (telephone, radio) to Summon Emergency Assistance from Outside the Facility [40 CFR 264.32(b)]**

In the event of an emergency, portable two-way radios or the truck radio will be utilized to summon assistance from the on-base emergency response personnel. The radios will have sufficient range to easily contact the ROCC, who will be available at all times during OB/OD operations. As stated in the EOD Facility Contingency Plan (Section II.D.), the On-Scene Commander (OSC) will be responsible for contacting the RCO and the ROCC, who will notify the AFDTC Command Post by radio or telephone (904-882-3278). The OSC will have the authority to summon the required on-base assistance. Telephone numbers for the on-base emergency response team are listed in Table II-5. In the event that local community emergency services are required, the OSC will notify the AFDTC Command Post, which will authorize the AFDTC Disaster Preparedness Division to contact the appropriate outside organizations.

TABLE II-5 EMERGENCY RESPONSE TEAM

Organization	Telephone No. (Duty Hours)
On-Scene Commander	(904)882-3278 (ECCP)
Medical Representative	(904)882-7227
Fire Department	911
Bioenvironmental Engineering	(904)882-5787
Security Police	(904)882-2502
Public Affairs	(904)882-3931
Civil Engineering Disaster Preparedness Flight Environmental Management Flight Liquid Fuels Maintenance CE Spill Response Team	(904)882-3177 (24 hours)
Explosive Ordnance Disposal	(904)882-3278 (ECCP)
Safety	(904)882-5204
Staff Judge Advocate	(904)882-4611
Chaplain	(904)882-2111
MWRS/Mortuary Officer	(904)882-3278 (ECCP)
Airfield Management	(904)882-3278 (ECCP)
Photographer	(904)882-2861
Transportation	(904)882-4581

### II.C3.3 Access to Communication or Alarm Control [40 CFR 264.34]

There will always be at least two EOD personnel present for any OB/OD operation. Each individual present will be equipped with a hand-held radio for emergency communication. In addition, visual contact with other personnel will be maintained.

### II.C3.4 Description of Fire Control, Spill, and Decontamination Equipment [40 CFR 264.32(c)]

The fire control, spill, and decontamination equipment available at the OB/OD treatment areas and base-wide is described in Section II.D1.4. On-board emergency equipment for EOD vehicles is listed in Table II-6. On-board equipment for mobile emergency vehicles is listed in Table II-7. The locations of spill response kits is provided in Table II-8. During OB/OD operations, EOD vehicles containing fire extinguishers, absorbents, and other emergency equipment are located in the proximity of the treatment area.

It is not necessary to maintain spill control equipment at the treatment area during OB/OD activities because all materials to be treated are non-liquid and remain in their containers (bomb cases, shells, boxes) until actual burn/detonation. The only potential for a liquid spill would be virgin diesel fuel used to ignite the OB. The procedures outlined in AFDTOPPLAN 19-1 "AFDTC Oil and Hazardous Substance Contingency Plan" (Appendix G) provide information on actions that would be required to protect human health and the environment in case of a spill involving virgin diesel fuel.

### II.C3.5 Documentation of Water Volume and Pressure Required to Operate Equipment Listed Above [40 CFR 264.32(d)]

In most scenarios, onsite fire extinguishers would be used for fire control. The fire extinguishers maintained on the range during the OB/OD mission will be used to control the emergency until the on-base fire department arrives. No fire-fighting equipment maintained on the ranges contains or uses water; therefore, water of a substantial volume or pressure is not required. If Eglin AFB Natural Resources Fire Response equipment is necessary, a 250-gal initial attack truck capable of dispensing water or foam or a crawler tractor with a fire plow will be dispatched to the OB/OD treatment area. There is a water supply well at Range C-62 with a discharge rate of 25 gpm. There is also a water supply well at Range C-52N with a discharge rate of 15 gpm. In the event of an emergency, these wells could provide water for fire control equipment.

TABLE II-6 OB/OD RANGE EMERGENCY EQUIPMENT

TEAM LOCKER			
Compass	1 EA		
Maglight	1 EA		
48 QT Cooler	1 EA		
Water Jug	2 EA		
Spectra Camera	1 EA		
Q Beam	1 EA		
Long Handle Shovel	1 EA		
Short Handle Shovel	1 EA		
Machete	1 EA		
EOD TRUCK			
Tow Chain	1 EA		
Tie Down Strap	2 EA		
Explosive Tarp	1 EA		
Entrenching Tool	1 EA		
First Aid Kit	1 EA		
Range Map	1 EA		
MOI Book	1 EA		
Jack	1 EA		
Lug Wrench	1 EA		
Hazard Road Markers	3 EA		
Fire Extinguisher	2 EA		
TRUCK TOOL BOX			
Cold Chisel Med	1 EA	Wirebrush	1 EA
Diagonal Cutters	1 EA	Safetywire	1 EA
Flashlight	1 EA	Prybar	1 EA
Hacksaw Frame	1 EA	Allen Set	1 EA
Hacksaw Blades	5 EA	Vice Grips 10-in.	1 EA
Ball Peen Hammer	1 EA	Channellocks 10-in.	1 EA
Crescent Wrench 10-in.	1 EA	Electrical Tape	1 RL
Inspection Mirror	1 EA	Monofilament Tape	1 RL
Pipe Wrench 14-in.	1 EA	Flagging Tape Red	1 RL
Screwdriver Standard lg	1 EA	Flagging Tape Yellow	1 RL
Screwdriver Standard med	1 EA	D Cell Battery	4 EA
Screwdriver Phillips lg	1 EA	Tinsnips	1 EA
Screwdriver Phillips med	1 EA	10 ft Tape Measure	1 EA

TABLE II-7 EMERGENCY RESPONSE EQUIPMENT LIST (TYPICAL)

1 55-gallon open-head drum (or 85-gallon recovery drum)
4 pairs of neoprene gloves (small, medium, large)
2 pairs of unvented goggles
2 respirators and pesticide cartridges
2 aprons chemical resistant
2 pairs of rubber boots
2 pairs of 100% cotton coveralls (small, medium, large)
1 dust pan
1 shop brush
1 square-point "D" handle shovel
1 dozen 2 mil polyethylene bags w/ties
1 18-in.-pushbroom, synthetic fibers
1 gal liquid detergent
3 gal household bleach
80 lbs absorbent material
1 bung wrench
1 drum spigot (self-closing and lever)
1 1-3/8-in.-open-end wrench
1 manual drum pump
30 ft. 1/2-in.-polyethylene tubing or 25-ft-garden hose
1 bung 2-1/2
1 bung 3/4-in.
1 first aid kit
Blank hazardous waste labels
Absorbent Pads



TABLE II-8 SPILL RESPONSE KIT LOCATIONS

Organization	Location
Base Master Kit	Bldg. 696
Climatic Lab	Bldg. 435
Fuels Management	Bldg. 110
DRMO	Bldg. 524
Disaster Control Group Duke Field	Bldg. 3031
Disaster Control Group Santa Rosa Island, Site A-10	Bldg. 9223
ACC Fighter Wing	TAC Ramp (59th AMN Area)

#### II.C3.6 Testing and Maintenance Schedule and Procedures for the Above Mentioned Equipment [40 CFR 264.33]

All of the communications, alarm, fire protection, spill control, and decontamination equipment will be maintained, checked, and inspected on a regular basis to ensure proper operation. The schedule, procedures, and recordkeeping requirements for these inspections are discussed in Section II.C2, as shown in Table II-3.

#### II.C3.7 Documentation of Adequate Aisle Space [40 CFR 264.35]

OB/OD operations are conducted in cleared, outdoor range areas. Materials designated for OB/OD treatment are not stored or stockpiled at the treatment area prior to conducting treatment activities. Aisle space is not applicable.

#### II.C3.8 Documentation of Arrangements with Police, Fire Department, Emergency Response Teams, and Local Hospitals [40 CFR 264.37]

EAFB has cooperative agreements with local emergency response services. Documentation of arrangements with local police and fire departments, emergency response teams, and hospitals is addressed in Section II.D1.2.

### II.C4 GENERAL HAZARD PREVENTION [40 CFR 270.14(b)(8)]

#### II.C4.1 Identification of Possible Loading and Unloading Hazards and Documentation of Steps Taken to Minimize or Eliminate the Possibility of These Hazards [40 CFR 270.14(b)(8)(i)]

Munitions loading, unloading, and transportation are common on EAFB. SOI 136-9, "Transportation & Handling of Munitions/Explosives," contains the procedures that ensure safety for these operations. In addition, specific routes for transporting explosives are contained in Air Force Development Test Center Regulation (AFDTCR) 127-5. All EOD personnel receive training in explosives handling and transportation. When using multiple vehicles on a mission, only one vehicle transports explosives unless a compatibility problem exists. The team plans the transportation route to ensure proper explosive routes and range roads are available and open, and allows for sufficient time to arrive at the range at least 15 minutes ahead of schedule. Once the OB/OD mission is complete, munitions residue are inspected to ensure that treatment is complete before being transported for disposal.

#### II.C4.2 Description of Mechanisms to Prevent Runoff and Flooding [40 CFR 270.14(b)(8)(ii)]

Engineered runoff and runoff controls in and around the treatment units are infeasible. OB/OD operations are not conducted in weather conditions that would cause runoff during the operations. The OB kettles provide containment to prevent significant dispersal of fragments and residual ash. After a minimum 12-hour waiting period following cessation of open burning operations, residue that has been rendered non-hazardous is containerized and removed from the treatment area. Therefore, waste will not be carried away as runoff during future weather conditions. Flooding would be unlikely at the OB/OD treatment areas; however, should flooding occur, OB/OD missions would be suspended until the range had been restored to an operable condition.

Due to the nature of detonation, OD operations are conducted on the ground in shallow pits without any form of engineering controls that would serve to prohibit runoff and runoff from entering or leaving the treatment area.

#### II.C4.3 Description of Mechanisms to Prevent Contamination of Water Supplies [40 CFR 270.14(b)(8)(iii)]

The Floridan aquifer is the only water supply source in the area and is not likely to be impacted due to the presence of the 150- to 200-ft-thick Pensacola clay confining layer that overlies it. There are no surface water intakes within 15 mi of Range C-52N or C-62. The protection of ground water is discussed in Section II.G, and the protection of surface water is discussed in Section II.H.

#### II.C4.4 Identification of Equipment Failure and Power Outage Hazards and Description of Procedures to Mitigate Effects of Equipment Failure and Power Outages [40 CFR 270.14(b)(8)(iv)]

Previously scheduled OB/OD missions would not commence if a power outage or unfavorable weather conditions existed. Once a mission is in progress, the OB/OD equipment does not require a permanently installed outside source of electric power and is not directly affected by a power failure. EOD activities are manually prepared and initiated, and, as such, are not potentially impacted by equipment failure or power outage. As previously stated, all EOD personnel are equipped with hand-held two-way radios that can summon emergency assistance. These radios are also available during waste transport in case of a vehicular breakdown.

#### II.C4.5 Personnel Protection Procedures [40 CFR 270.14(b)(8)(v)]

During all OB/OD operations, each member of the EOD team wears appropriate protective clothing as prescribed by OSHA training and EOD training. The EOD team chief is responsible for ensuring that the required protective equipment is available, that personnel are familiar with the use of the equipment, and that use of such equipment is enforced as necessary. Clothing for ignition/detonation operations includes long sleeves, hightop boots, and leather gloves. Clothing for burning operations includes long sleeves, hightop boots, and leather gloves.

During OB/OD operations, EOD personnel withdraw to a minimum distance of 2,000 ft from the OB/OD treatment area before initiating operations, as specified in SOI 136-18. Personnel are afforded ample time to reach a safe distance prior to detonation. The signal for detonation is given by the EOD team chief after all personnel in the vicinity are protected by substantial cover or have reached a safe distance. The operation is usually observed from the Range Control Building at the range.

#### II.C4.6 Procedures to Minimize Releases to the Atmosphere [40 CFR 270.14(b)(8)(vi)]

Disposal by open burning is not conducted when wind velocity is less than 3 mi per hour or greater than 15 mi per hour. Release to the atmosphere is unavoidable during OB/OD operations. Procedures to assess the air quality and the effect of OB/OD operations on the atmosphere are described in Section III.C.

#### II.C5 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF WASTES [40 CFR 264.7(a) and 40 CFR 270.14(b)(9)]

##### II.C5.1 Description of Procedures to Prevent Accidental Ignition or Reaction of Wastes [40 CFR 264.17(a) and (b)]

Due to the explosive nature of the wastes being treated at the OB/OD treatment areas, safety is the primary concern when planning OB/OD missions. SOI 136-18 describes safety provisions for OB/OD operations. EOD personnel are trained in waste compatibility and characteristics, and each team is briefed on the specific wastes to be treated and handling precautions prior to the beginning of each mission. Waste munitions are physically kept separate from initiating

sources. Waste munitions are delivered to the range on a different truck than the one carrying the initiating devices. Upon delivery to the range, the waste munitions and initiating devices are placed in separate holding areas. During the pre-operational safety briefing, the smoking and non-smoking areas are clearly defined. No smoking is allowed during handling of explosives.

Munitions become wastes when an ammunition disposal request (ADR) form is filed. If the munitions are reactive they are classified as hazardous wastes in accordance with RCRA. Waste munitions are properly segregated and stored in designated hazardous waste storage areas of the ammunition supply facility and at the High Explosive Research and Development facility in accordance with provisions of the existing RCRA Part B permit for EAFB. Munitions for disposal are transported by the generator to the EAFB OB or OD unit where treatment/disposal is initiated.

#### II.C5.2 Documentation of Adequacy of Procedures [40 CFR 264.17(c)]

EOD personnel are trained in procedures to prevent accidental ignition or reaction of wastes, and records of personnel training are maintained by the EOD office. The hazardous characteristics of all wastes to be treated are fully documented on the appropriate Air Force and EPA forms prior to acceptance for OB/OD treatment. Wastes are not stored at the OB/OD units prior to treatment. An OB/OD mission is initiated only if the proper forms have been filed that document the nature of the waste and procedures for its treatment. Once treatment is complete, the residue is analyzed before disposal, and the analysis is kept on file at the EOD office.

## **II.D CONTINGENCY PLAN**

### **II.D1 COPY OF CONTINGENCY PLAN [40 CFR 270.14(b)(7)]**

OB/OD units are designated areas for disposal of serviceable and unserviceable munitions and wastes generated at the EAFB HERD facility. Waste explosives are categorized as hazardous because of their reactive properties. SOI 136-18 has been prepared for all EOD personnel assigned to 646 CEG/CED (formerly the 46th Equipment Maintenance Squadron/MAEE) to provide procedures for safe and efficient disposal.

The purpose of this Contingency Plan is to describe response actions to be taken by EOD personnel in the event of an unplanned fire, explosion, or any sudden or non-sudden release of hazardous wastes or constituents which could threaten human health or the environment. Specifically, this plan identifies the emergency response actions for unplanned incidents at the OB/OD units located in Range C-52N and Range C-62 at EAFB, owned by the United States Air Force and operated by EOD personnel (Figure II-3). The plan also identifies emergency response actions for transportation activities associated with EOD OB/OD operations. This plan implements provisions of AFDTC OPLAN 19-1 (the basewide contingency plan). A copy of AFDTC OPLAN 19-1 is provided in Appendix G.

This Contingency Plan will be continually reviewed and revised if any of the following occur:

- a. The facility permit is revised.
- b. The plan fails in an emergency.
- c. The facility changes in a way that materially increases the potential for fires, explosions, or releases, or changes the response necessary in an emergency.
- d. The list of emergency coordinators changes.
- e. The list of emergency equipment changes.

EAFB 646 CEG/CEV (Environmental Engineering) will have responsibility for updating the Contingency Plan and ensuring that updated copies are distributed to AFDTC/Command Post and tenant organizations and to local response teams which may be called upon to provide emergency services.

#### II.D1.1 Actions to Take in Case of Emergency [40 CFR 264.52(a) and 264.56]

Figure II-15 provides a flow chart of emergency response actions for EAFB OB/OD operations. Furthermore, range control personnel at both Ranges C-52N and C-62 are in constant radio communication with EOD teams and provide overall coordination and control of range activities.

#### II.D1.2 Arrangements with Local Authorities [40 CFR 264.52(c)]

In the event of an emergency at either of the two OB/OD units, on-base police, fire department, and medical support personnel will provide necessary coverage. The on-scene coordinator in charge of OB/OD activities has a two-way radio for immediate contact with base emergency response personnel. The coordination and exercises of the response teams are dictated by AFDTC OPLAN 19-1 (Appendix G). These agencies are tasked to conduct personnel training to ensure that their response capabilities for an emergency at the OB/OD is effective.

Cooperative agreements (Appendix P) have been arranged with local communities through the Okaloosa County Civil Defense Organization. The parties to these agreements are listed in Table II-9. At the direction of the AFDTC Command Post, the AFDTC Disaster Preparedness Division will contact the required community organizations (a) in the event that emergency services are required from these communities or (b) if these communities need to be evacuated. Table II-10 lists other local, state, and federal agencies which may be contacted in the event of an OB/OD operations emergency.

#### II.D1.3 Names, Addresses, and Phone Numbers of Emergency Coordinators [40 CFR 264.52(d) and 40 CFR 264.55]

The emergency coordinator, which is equivalent to the military terminology of On-Scene Commander (OSC), at the OB/OD units will be the non-commissioned officer in charge (NCOIC) present at the range during OB/OD operations. In the event of an emergency

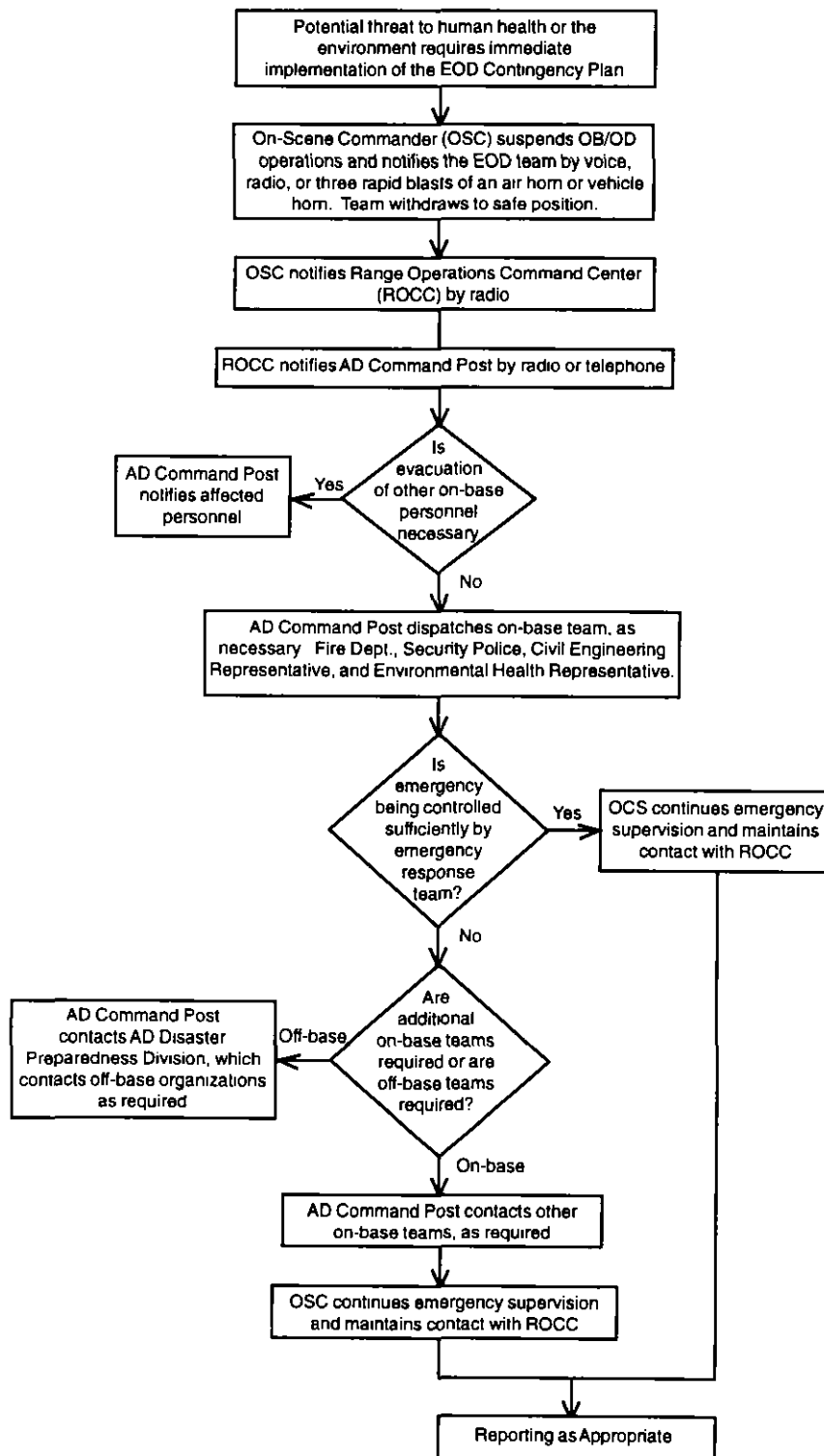


Figure II-15. Emergency Response Action.





TABLE II-9 LOCAL AGENCIES WHO HAVE COOPERATIVE SUPPORT AGREEMENTS WITH EAFB FOR EMERGENCY RESPONSE

Local Hospitals	
Fort Walton Beach Medical Centers	
Municipalities Fire Departments	
Fort Walton Beach Destin Ocean City - Wright Valparaiso Shalimar Crestview Freeport DeFuniak Springs Okaloosa Island North Bay Niceville Mary Esther	

TABLE II-10 LOCAL, STATE, AND FEDERAL EMERGENCY CONTACTS

Florida Marine Patrol	904-243-3596 (Fort Walton Beach) 904-438-4903 (Pensacola)
U.S. Coast Guard Eighth District Sixth Coastal Region New Orleans, LA	504-589-6296 (0800 to 1600) 504-589-6225 (during non-duty hours)
Region IV Environmental Protection Agency Atlanta, GA	404-526-5062 (Coastal waters) 404-881-4062 (inland waters)
Destin Coast Guard	904-837-3771
Florida Department of Environmental Protection	904-932-5323
Eglin Federal Prison	904-882-8522
EPA National Response Center	1-800-424-8802

situation at the OB/OD unit, the discoverer will immediately sound a vocal and/or radio warning to any endangered personnel and notify the OSC. The OSC will evaluate the potential for endangerment to human health and/or the environment. Since the OSC will be thoroughly familiar with the Contingency Plan, all operations and activities at the range, the location and characteristics of wastes handled, the location of applicable records, and the facility layout, he/she will have the authority to notify the appropriate on-base authorities and mobilize an appropriate response team. In case of emergency, he/she is the primary point of contact and is responsible for activation of a response team. All NCOICs coordinating OB/OD activities are qualified to act as emergency coordinators (OSC). The 646 CEG/CEV Spill Response Manager (904-882-2878) is the only other person qualified to act as emergency coordinator when explosives are involved. As an active military installation, EAFB has provisions to assure that at least one emergency coordinator will be available at all times. Names of specific individuals are not provided with this application. A current list of personnel qualified to act as OSC is maintained by the AFDTC Command Post (904-882-3278). As personnel transfer, only personnel trained in explosives response will be designated as emergency coordinators.

#### II.D1.4 Location and Description at Emergency Equipment at the Facility [40 CFR 264.53(e)]

An up-to-date emergency equipment list including equipment description, location, and capabilities is provided in Tables II-6 through II-8. Emergency equipment is inspected prior to any operation commencing and following the completion of all operations. Immediate response equipment is brought to the OB/OD areas during any operation. Larger emergency response equipment is located at the base fire response centers.

#### II.D1.5 Evacuation Plan for Facility Personnel [40 CFR 264.52]

There is only a limited number of personnel on the ranges during OB/OD operations. In most emergency situations, the safest place for people is the control building on the range. This structure is a concrete block two-story building which provides cover from explosive debris for detonations and open burns up to the range limit. At Ranges C-52N and C-62 the control building is more than 5,000 ft from the site of OB or OD operations. Both OB and OD operations are initiated at the control buildings. Therefore, evacuation beyond the limits of the control building would not be anticipated.

In the unlikely event that evacuation beyond the control building is required, personnel will evacuate using the EOD vehicle, or on foot, to designated rally points identified prior to the start of the OB/OD mission. Locations of rally points will be based on the safe distances specified in Attachment 1 to SOI 136-18 (Appendix B).

#### II.D1.6 Location and Distribution of the Contingency Plan [40 CFR 270.14(b)(7) and 40 CFR 264.53]

Copies of this plan will be maintained at the Range Operations Control Center (ROCC), the EOD Operations Center, as well as the following locations:

- Environmental Protection Office (904)882-2878
- AFDTC Command Post (904)882-3278
- High Explosives R & D Facility (904)882-9533
- Base Fire Department (904)882-5856
- Bioenvironmental Engineering (904)882-5787
- Security Police Squadron (904)882-2502
- AFDTC Disaster Preparedness Division (904)882-3177
- Base Hospital (904)882-7227
- Natural Resources Fire Response (904)882-4164

Copies have also been sent to the following local agencies:

- U.S. EPA Region IV
- Florida Department of Environmental Protection (FDEP)
- U.S. Coast Guard Station-Destin, Florida

Additional copies are available for other interested local agencies who are parties to cooperative support agreements with EAFB as shown in Table III-9.

The plan will be reviewed annually and amended as required. A revised copy will be provided to the above locations following any amendments to the plan.

## II.D2 EMERGENCY PROCEDURES [40 CFR 264.56(a)]

### II.D2.1 Immediate Procedures for Emergency Coordinator to Alert All Facility Personnel in Case of Emergency and Notify State and Local Agencies if Help Is Needed [40 CFR 264.56(a)]

The following emergencies at the OB/OD units could result in the release of hazardous materials or constituents that would potentially threaten human health or the environment and would require immediate implementation of the Contingency Plan:

- a. An uncontrolled fire
- b. An uncontrolled explosion
- c. An unplanned sudden or non-sudden release of hazardous materials or constituents
- d. Severe weather conditions

In these instances, the OSC will suspend OB/OD operations. He/she will alert onsite EOD staff by vocal or radio commands. After notifying onsite staff, he/she will notify the RCO and ROCC by radio, who will then notify the AFDTC Command Post by radio or telephone. The on-base Fire Department (904-882-5856), as well as Security Police, Civil Engineering Representative, and Bioenvironmental Engineering Representative, as necessary, will report immediately to the range to take initial actions. Other members of the on-base Emergency Response Team, listed in Table II-5, will be dispatched by the AFDTC Command Post as deemed necessary by the OSC. Emergency response team personnel have been trained to ensure that their response capabilities for an emergency at the OB/OD range are effective. The OSC will maintain contact with the AFDTC Command Post through the ROCC throughout the emergency. Should the need for local community emergency services arise, the AFDTC Command Post will advise the AFDTC Disaster Preparedness Division to contact the appropriate groups with which cooperative agreements have been arranged.

Immediate emergency notification procedures for the OB/OD operations are described above. The OSC will direct the personnel in the immediate OB/OD area to withdraw to a safe position, usually the range control tower or safe area. Once the OSC and the Emergency Response Team have evaluated the risk to other base personnel, the OSC will advise the

AFDTC Command Post through the ROCC, which will notify the affected personnel. All personnel are trained in evacuation procedures and means of exit from their respective work areas.

**II.D2.2 Plans for the Emergency Coordinator to Identify the Character, Source, Amount and Areal Extent of Any Explosion, Fire, or Release  
[40 CFR 254.56(b)]**

In the event of an OB/OD unit emergency, the OSC will identify the character, source, amount, and areal extent of released materials. This may be accomplished by observation, by review of facility records and manifests, or by chemical analysis.

SOI 136-18 specifies quantity limits and documentation procedures for the munitions and explosives being rendered harmless. Thus, documentation in the form of a test directive (TD), technical order (TO), and/or AF Form 191 will have been placed on file preceding each OB/OD mission. In addition, wastes must be listed on an approved AF Form 191, Ammunition Disposition Request, and hazardous wastes must be accompanied by an EPA Form 8700-22, Uniform Hazardous Waste Manifest and DRMS Form 1851 (Land Disposal Regulations). The OSC will use all available documentation when determining the characteristics and hazards of the emergency.

**II.D2.3 Means for Assessment of Possible Hazards to Human Health or the Environment from Explosion, Fire, Release [40 CFR 264.56(c)]**

The OSC will assess possible direct and indirect hazards to human health and the environment that may result from a spill, release, explosion, or fire at the OB/OD units. The following criteria will be used for these assessments:

- a. The nature and magnitude of the explosion, fire, or release.
- b. Weather conditions, including wind direction and speed (the Base Weather Forecaster, Detachment 10, 2nd Weather Squadron, can be reached at 904-882-5323).
- c. The possibility of additional explosions, fires, or releases.
- d. The proximity of personnel to the explosion, fire, or release.

- e. Potential sensitive receptors in the environment, including the air, soil, surface water, and ground water.
- f. The effects of the emergency measures on personnel and the environment (i.e., the effects of any gases or surface water runoff generated by the use of water or fire suppression chemical agents to control fires or explosions).

#### II.D2.4 Procedures to be Followed by Emergency Coordinator in Case of a Threat to Human Health or Environment Outside the Facility [40 CFR 264.56(d)]

If the OSC determines that the threat to human health or the environment will extend beyond the OB/OD areas, he/she will follow the procedures outlined in Section II.D2.1 for notifying other on-base personnel. The remote location of the ranges and the security on the base make it unlikely that off-base communities will be affected by most emergencies. However, should the OSC determine that human health or the environment off-base are threatened, he/she will advise the AFDTC Disaster Preparedness Division to contact the local authorities to coordinate evacuation as required. In addition, the FDEP or the National Response Center (800-424-8802) must be contacted and a followup report filed. This report must include:

- a. Name and telephone number of reporting individual.
- b. Name and address of facility.
- c. Time and type of incident.
- d. Name and quantity of materials involved, to the extent known.
- e. Extent of injuries.
- f. Possible hazards to human health or the environment outside the facility.

#### **II.D2.5 Procedures to be Followed by Emergency Coordinator to Prevent Fires, Explosion, or Release from Occurring, Recurring, or Spreading to Other Hazardous Wastes at the Facility [40 CFR 264.56(e)]**

During an emergency at the OB/OD areas, the OSC will take all reasonable measures necessary to ensure that explosions, fires, and releases do not occur, recur, or spread. In all cases, the OSC will evaluate the risk to personnel and the response time for emergency services. If it is safe to do so, EOD personnel will secure the area from unauthorized personnel and will attempt to maintain control of the situation until emergency personnel arrive.

The only potential spills at the OB/OD areas would consist of virgin diesel fuel used to ignite the OB. If this occurs, the OSC will eliminate potential fire hazards and keep open flame and heat-producing devices away from the spill. In addition, he/she will establish an area of isolation, the size of which will depend upon the size of the spill and the chemicals involved. If the spill results in the formation of a toxic vapor cloud (by reaction with surrounding materials or by outbreak of fire), then further evacuation efforts will be enforced. For a diesel fuel spill, shovels will be used to construct a dike around the spill to contain lateral movement. As much free liquid as possible will be returned to the container. Any contaminated sand will be excavated and placed in impervious recovery containers for transportation to an approved disposal location.

#### **II.D2.6 Storage, Treatment, and Disposal of Released Material [40 CFR 264.56]**

Immediately following an incident, the OSC will make arrangements for the treatment and disposal of recovered waste, waste residues, and any contaminated materials. It is often considered unsafe to transfer or containerize spilled explosives. If conditions allow, the explosive or burnable material will be either open-detonated or open-burned in place. If the OSC determines that it is safe to move any spilled material, it will be transferred to the OB/OD units and open-detonated or open-burned in accordance with SOI 136-18.

#### **II.D2.7 Monitor for Leaks, Pressure Buildup, Gas Generation, or Ruptures of Released Material [40 CFR 26.56]**

The OB/OD units do not use any equipment that would require monitoring for leaks, pressure buildup, or gas generation. All equipment that is located at the treatment area is inspected before and after any OB/OD operations.



#### II.D2.8 Procedures for Preventing Handling of Incompatible Wastes until Cleanup is Complete [40 CFR 264.56]

The OSC will ensure that no waste that might be incompatible with the released materials is treated until cleanup procedures are complete. This decision is made based on the chemical and physical characteristics of the waste. Additional information on the physical and chemical characteristics of the wastes and residues may be found in Section II.B, Waste Characteristics.

#### II.D2.9 Decontamination Procedures [40 CFR 264.56]

Following an emergency response, the OSC will ensure that all equipment is decontaminated as necessary. Equipment decontamination will be accomplished in accordance with the OPLAN 19-1 (Appendix G). Prior to EOD operations resuming, any emergency equipment used during an emergency response will be clean and ready for its intended use. Verification of equipment decontamination will be the responsibility of the OSC.

#### II.D2.10 Notification of EPA and State and Local Authorities before Resuming Operations [40 CFR 264.56]

*Base Authorities.* Air Force Regulation 127-4, Investigating and Reporting U.S. Air Force Mishaps, provides SOPs for reporting explosives mishaps. In the event of a mishap on the EOD Range, a USAF Hazard Report, AF Form 457, is completed and sent to the Safety Flight Office.

The fire protection unit retains a computer log of all emergency response. The fire department utilizes DD Form 2324, Department of Defense (DOD) Fire Incident Report, as a summary of fire emergencies. The reports must be prepared and submitted according to directions provided in DOD 6055.7-M, Fire Incident Reporting Manual.

*Regional and Federal Notification.* In the event that any incident occurs which requires implementation of the contingency plan, EPA Region IV Administrator and FDEP must be notified before resuming operations in the areas affected by the emergency.

Depending on the nature of the incident, other agencies may require notification. If the incident is a threat to human health or the environment, the National Spill Response Center must be notified at (800)424-8802. U.S. Fish and Wildlife requires notification of an emergency release if the possibility exists for potential impacts to endangered species.

### II.D2.11 Recordkeeping and Reporting Procedures

Every OB/OD mission is conducted according to SOI 136-18, which provides specific recordkeeping procedures. A copy of the appropriate guidance associated with the wastes to be treated by the particular OB or OD mission is handcarried to the OB/OD treatment area on all missions, kept in a plastic folder, and inventoried prior to departure from the range. Upon return from the mission, a mission slip is filed, and any unusual incidents are initially reported at that time. For hazardous waste, appropriate forms are filed, updated, and kept on file for a minimum of 5 years. Any emergency event that requires implementation of the Contingency Plan will be reported in writing within 15 days to FDEP and the U.S. EPA Regional Administrator. This report will include:

- a. Name, address, and telephone number of the owner or operator.
- b. Name, address, and telephone number of the facility.
- c. Date, time, and type of incident.
- d. Name and quantity of materials involved.
- e. The extent of injuries, if any.
- f. An assessment of actual or potential hazards to human health or the environment.
- g. Estimated quantity and disposition of recovered material that resulted from the incident.

## **II.E PERSONNEL TRAINING**

### **II.E1 OUTLINE OF TRAINING PROGRAM [40 CFR 270.14(b)(12)]**

At EAFB, all facility personnel handling hazardous waste must successfully complete a program of classroom instruction and on-the-job training in order to prepare them to operate and maintain the OB/OD units. This policy ensures compliance with RCRA requirements. All Department of Defense explosive ordnance personnel must attend the U.S. Naval School, Explosive Ordnance Disposal (NAVSCOLEOD). This school is the Department of Defense proponent for training of all military personnel in the EOD career field. Subsequent to this training, EOD personnel continue with on-the-job training under close supervision from senior EOD personnel.

Further training of EOD personnel at EAFB follows the Air Force's standard training approach. This approach is based on ensuring personnel are trained to safely and effectively accomplish their job. The training is documented through the Air Force's Computer Automated Management System (CAMS). This training approach is composed of formal classroom, unit conducted, and on-the-job training. For EOD personnel, formal training consists of, as a minimum, successful completion of high school or equivalent program, basic and advanced individual training, and completion of Phase I and II of the Naval EOD School. EOD supervisors have successfully completed additional formal Skill Level -7 training, and Air Force advanced and supervisory career development courses. Unit and on-the-job training is implemented under the philosophy that unit managers and supervisors are responsible for continuous training and development of their subordinates. Under the Air Force's Command Standard Training Program (CSTP), as implemented for Eglin EOD personnel by Air Force Material Command Regulation AFMCR 136-7, supervisors either receive necessary additional training or are augmented by installation support personnel to train their subordinates.

Under this system, the Eglin's Chief of Hazardous Waste Management provides oversight of the EOD Hazardous and Toxic Waste (HTW) training. The EOD Branch Chief and selected EOD supervisors attend an annual training session conducted by the Environmental Management Office. In addition, EOD supervisors have attended such training as Georgia Technical Institute's 29 CFR 1910.120(e)(2) 40-hour Hazardous Management Control and Response Course. In turn, the EOD Branch Chief has developed a hazardous material training program for this unit. These lesson plans were reviewed and approved by the Chief of Hazardous Waste Management.

## II.E2 DESCRIPTION OF HOW TRAINING WILL BE DESIGNED TO MEET ACTUAL JOB TASKS [40 CFR 270.16(a), (b), and (c)]

### II.E2.1 Job Titles and Duties [40 CFR 264.16(d)(1) and (2)]

EOD supervisory personnel are directly responsible for the proper handling of explosive ordnance. These personnel are generally senior enlisted personnel with many years of experience and formally tested capabilities. Air Force supervisors will have either -7 or -9 Skill Level experience identifiers (highest attainable). This equates to more than 10 years of EOD and supervisory experience. Specific individuals are not named because military personnel are subject to reassignment; however, military personnel job qualifications and assignments are carefully regulated and monitored to ensure replacement personnel meet job qualifications. Senior supervisory personnel also act as emergency coordinators for EOD incidents. Consequently, appropriate information about these individuals will be on rosters maintained at respective command posts. The duties, responsibilities, and qualifications of these positions are as shown on Table II-11.

### II.E2.2 Relevant Training to Job Position [40 CFR 264.16(a)(1)]

All EOD personnel receive formal institutional training on the handling, rendering safe, and disposing of explosives and explosive ordnance and maintaining the equipment necessary to conduct these operations in all types of environments and conditions. This training is conducted at NAVSCOLEOD. This curriculum has been reviewed by the Department of the Air Force, Office of the Civil Engineer, who has determined that this training meets the requirements of 29 CFR 1910.120(o). In addition, each person operating the RCRA OB/OD units has received, as a minimum, an initial 24 hours of training and the 4-hour annual refresher RCRA training. These training sessions are outlined in Appendix H. Table II-12 identifies EOD personnel requirements for initial and periodic training.

## II.E3 TRAINING FOR EMERGENCY RESPONSE [40 CFR 264.16(a)(3)]

NAVSCOLEOD training program ensures that EOD personnel receive extensive emergency response training. The CSTP requires that units continue refresher training to maintain EOD proficiency. Each EOD member is required to read and be familiar with the publications listed in Appendix H. These publications, such as the TO-60 series, "Explosive Ordnance Disposal Procedures," TO 11A-1-42, "General Instruction for Disposal of Conventional Munitions," and SOI 136-18, "Munitions, Recovery and Disposal," are used during monthly training and during the planning and conduct of all disposal operations.

TABLE II-11 EOD PERSONNEL JOB DESCRIPTIONS

JOB TITLE	JOB DESCRIPTION	JOB EXPERIENCE
<p>EOD Branch Chief</p> <p>EOD Superintendent*</p> <p>Skill Level -9</p>	<p>Manages the EOD program at EAFB. Responsible to the installation commander for the resourcing, training, and operation of the EOD Branch. Is the technical authority on all EOD matters at EAFB.</p> <ul style="list-style-type: none"> <li>a. Plans and organizes explosive ordnance disposal activities.</li> <li>b. Directs explosive ordnance activities to include checking methods and techniques employed in detecting, identifying, recovering, and destroying explosive ordnance. Ensures compliance with safety regulations and practices.</li> <li>c. Inspects and evaluates explosive ordnance activities.</li> </ul>	<p>Qualifications mandatory as an Explosive Ordnance Disposal Technician and in directing functions such as detecting, identifying, rendering safe, recovering and destroying explosives, incendiary, or nuclear ordnance.</p>
<p>EOD Team Chief</p> <p>EOD Technician*</p> <p>(minimum Skill Level -7)</p>	<p>Supervises EOD Team and is directly responsible to the Branch Chief for planning and execution of EOD operations by the EOD Team.</p> <ul style="list-style-type: none"> <li>a. Organizes and conducts explosive ordnance disposal activities.</li> <li>b. Performs explosive ordnance disposal functions. Disposes of unserviceable explosive ordnance by burning or detonating.</li> <li>c. Performs as a specialized member of disaster preparedness teams.</li> </ul>	<p>Qualification is mandatory as an Explosive Ordnance Disposal Specialist and in performing or supervising functions such as rendering safe, removing, or destroying dangerous or unserviceable explosive ordnance.</p>

TABLE II-11 (Cont.)

JOB TITLE	JOB DESCRIPTION	JOB EXPERIENCE
<p>EOD Team Member</p> <p>EOD Specialist*</p> <p>Skill Level -5</p>	<p>a. Performs explosive ordnance disposal functions to include detecting and identifying unexploded ordnance, determining safe distances to evacuate personnel and material, perform/render safe procedures, removing safe explosive ordnance, dispose of explosive ordnance rendered exceptionally hazardous by damage or deterioration; dispose of unserviceable explosive ordnance by burning or detonating; fabricates and uses explosive charges; and neutralizes and disposes of improvised explosive devices.</p> <p>b. Performs as a specialized member of disaster preparedness teams.</p>	<p>Completion of Phase I and II, U.S. Naval School, Explosive Ordnance Disposal, Indian Head, Maryland is mandatory. Experience is mandatory in performing functions such as rendering safe, removing, or destroying hazardous or unserviceable U.S. explosive ordnance. Experience is desired in performing similar functions on foreign munitions and in decontamination activities.</p>

\* Job title, description, and experience are established by Air Force Regulation 39-1.

TABLE II-12 EOD PERSONNEL TRAINING

INITIAL TRAINING	PERIODIC TRAINING
<p>EOD School, Phases I and II  Conducted by U.S Naval School, Explosive Ordnance Disposal  Duration: 6 months</p>	<p><u>Annual:</u></p> <ol style="list-style-type: none"> <li>Installation Hazardous Waste Refresher Training, 4 hours</li> <li>RCRA refresher training on EOD Hazardous Waste Storage and Disposal, 2 hours.</li> <li>RCRA refresher training on Training For Safe Transportation Of Hazardous Materials, 2 hours.</li> <li>Refresher training on explosive ordnance maintained or employed at Eglin, 216 hours.</li> <li>Refresher training on explosive ordnance found during range clearing at Eglin, 40 hours.</li> <li>Refresher training on aircraft support at Eglin, 30 hours.</li> <li>Refresher training on implementation of contingency plan, 8 hours.</li> </ol>
<p>Installation Hazardous Waste Training  Conducted by Office of Environmental Management  Eglin AFB, FL  Duration: 8 hours</p>	<p><u>Semiannual:</u> Classroom or practical exercises on maintenance and use of assigned specialized EOD tool sets, photographic equipment, radiological and chemical protective clothing, 30 hours.</p>
<p>Explosive Ordnance Disposal Hazardous Waste Storage and Disposal  Conducted by EOD Branch, 46th Equipment Maintenance Squadron, Eglin Air Force Base, FL  Duration: 20 hours, followed by post test</p>	<p><u>Monthly:</u> Refresher training on application of EOD procedures and techniques, and review of new technical data and updated procedures, 6 hours. Required by Department of the Air Force to maintain EOD certification.</p>
<p>Training For Safe Transportation Of Hazardous Materials  Conducted by EOD Branch, 46th Equipment Maintenance Squadron, Eglin Air Force Base, FL  Duration: 2 hours</p>	
<p>On-the-job training for all Skill Level-3 personnel.  Standardized self-paced career development course  Duration: 18 months, and required to pass Skill Level-5 Air Force</p>	

Individuals involved in emergency response must also have a thorough understanding of the Contingency Plan as described in Section II.D. as well as EAFB SOI 136-18 (EOD procedures) and OPLAN.

#### II.E4 TRAINING RECORDS DOCUMENTATION [40 CFR 264.16(d)(4) and (e), and 270.14(b)(12)]

The Air Force maintains a standardized individual training records system. Training records are automated and maintained on the installation's CAMS and CSTP. Each EOD person's individual training record is maintained on this system. Copies of the EOD personnel training records are also kept at the EOD office. The Environmental Management Office routinely monitors this system to ensure currency of EOD personnel HTW training. A sample copy of a current EOD Technician's Record is located in Appendix H.

Additionally, the EOD Branch maintains an attendance roster on the Branch's Hazardous Waste Storage and Disposal Training. A sample is located in Appendix H.

##### II.E4.1 Training Content, Frequency, and Techniques [40 CFR 264.16(c) and (d)(3)]

The training program employed for EOD personnel handling explosive ordnance disposal and potentially hazardous waste combines supervised on-the-job training and formal classroom training. Eglin EOD personnel undergo a rigorous annual training program mandated by AFMCR 136-7. A synopsis of initial and periodic training that EAFB EOD personnel undergo is presented in Table II-12.

- (1) NAVSCOLEOD training program outline is contained in Appendix H.
- (2) An outline of the EOD Branch RCRA training program presented to EOD personnel is contained in Appendix H.

##### II.E4.2 Training Director [40 CFR 264.16(a)(2)]

NAVSCOLEOD is the Department of Defense proponent for explosive ordnance disposal training. Its curriculum and training staff undergo continuous updating and professional development. Selection of the school's staff is a rigorous process and all services are represented on its instructor staff. Records of all graduates are maintained at this school.



At EAFB, the Chief of Hazardous Waste Management, Office of Environmental Management is responsible for providing HTW installation training support. The Chief of Hazardous Waste Management provides initial and refresher training courses for the installation's organization managers and other selected staff members. This training is conducted by mid-level managers from this office. These instructors are graduates of train-the-trainer courses and attend annual RCRA training.

The Superintendent of the EOD Branch is the training director for EOD personnel. He, along with at least two other Senior EOD Supervisors, has attended the installation's annual OSHA and RCRA Hazardous Waste training. In addition, these personnel have successfully completed the 40 hour HAZMAT Waste training in accordance with 29 CFR 1910.120(e). A sample copy of a current course completion certificate is located in Appendix H. All of these personnel are Skill Level -7 or 9 experienced personnel. The Senior Branch Supervisors provide the hazardous material training for the remainder of the branch.

## II.F CLOSURE AND POST-CLOSURE PLAN

### II.F.1 CLOSURE PLAN DOCUMENTATION [40 CFR 270.14(b)(13)]

The purpose of this closure plan is to describe the procedures and methods by which the OB/OD units at EAFB will be closed in accordance with Resource Conservation and Recovery Act of 1976 (RCRA) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA). This plan describes the OB/OD units, decontamination and sampling procedures, health and safety requirements during closure, and approximate closure schedule.

The units used for thermal treatment of RCRA-regulated explosive wastes include two burn kettles designed for OB of low explosive waste munitions and one OD unit located on active bombing Range C-62. A second OD unit is located on active bombing Range C-52N. These ranges are shown on Figure II-3. OB/OD operations have been conducted at EAFB since 1950. An average of 100,000 separate items of approximately 15,000 pounds total net explosive weight were treated annually at the OB/OD units between 1989 to present.

Prior to 1989, OB operations were conducted on the ground within a pit. Two new burn kettles were installed in May 1989. Each unit consists of one 8 x 8 x 20 ft reinforced plate steel container. Sides and bottom are constructed of 1/2-in. steel plate continuously welded on the interior with a reinforced 4 x 3 x 1/4 in. rectangular tubing top rail. Side walls and bottom are reinforced with 4 in. x 5.4 lbs structural channel on 30-in. centers. Both units are equipped with hinged rear doors. The doors are 1/2 in. steel plate with 4-in. x 5.4 lbs structural channel reinforcement. Each burn kettle weighs 15,400 lbs. Both kettles were placed on top of a 6-mil polyethylene liner with 2 ft of compacted soil cover. Low explosive wastes are placed into the kettle after the doors are closed. Approximately 50 to 100 gal of diesel fuel along with dunnage (wood and fiberboard) is placed in the OB unit and remotely ignited. The fuel is consumed in the burn and, following a cool down period, the residual ash is removed and visually inspected. Any energetic material found in the ash are retreated. The residual ash removed from the OB unit is characterized and disposed of as described in the OB/OD Waste Residue Management Plan (Appendix E). ~~The fuel is consumed in the burn and, following a cool down period, the residual ash is removed and disposed of as non-hazardous material.~~

High explosive wastes are treated by OD operations. Both OD units are cleared areas, approximately 100 x 200 ft, where explosive materials are placed on open ground and

remotely detonated. C4 plastic explosives are used to initiate and augment the detonation as required.

#### II.F1.1 Description of Partial or Final Closure Procedures [40 CFR 264.112(b)(1) and (2)]

EAFB intends to operate the OB/OD units until they are no longer required, which is expected to be until the Air Force Base ceases operation. All OB/OD units will be closed at the same time; therefore, no partial closure activities are contemplated. During final closure, each unit will be closed by treating the final volume of hazardous waste, treating the explosive residues generated during the last treatment, and removing all metal from the surface for disposal as scrap or in accordance with applicable regulations. Sampling will be conducted as outlined in this closure plan. If any contamination is identified, it will be removed and disposed of in an approved location. After sampling and contamination removal, the pits will be backfilled and regraded. In addition, the burn kettles will be decontaminated and recycled or disposed of in accordance with applicable regulations.

#### II.F1.2 Description of Maximum Unclosed Portion During the Active Life of the Facility [40 CFR 264.112(b)(2)]

During the active life of the facility, the OB/OD units will not be closed. The OB units consists of two burn kettles located on Range C-62 (Figure II-5), and the OD facilities consist of two 100 x 200 ft cleared areas, one each on Ranges C-62 and C-52N (Figures II-4 and II-5).

#### II.F1.3 Estimate of Maximum Waste Inventory in Storage and Treatment During Facility Life [40 CFR 264.112(b)(3)]

The maximum inventory of hazardous waste at the OB/OD units is based on the allowable range limitation on the net explosive weight (NEW) of unserviceable munitions. The maximum amount of unserviceable munitions accommodated by the OB/OD units at one time is 3,000 pounds NEW per OB/OD event. No wastes are stored or stockpiled at the OB/OD units at any time. Wastes are brought to the OB/OD units at the time that OB/OD activities will be performed. Once the munitions are brought to the OB/OD units, they are treated until they are rendered non-hazardous. Disposal is accomplished either through the Defense Reutilization and Marketing Office (DRMO) recycling program or transport to an approved disposal area.

During closure, any remaining hazardous waste at the OB/OD units would be treated and disposed of, as described above.

#### II.F1.4 Description of Procedures for Removal or Decontamination of Hazardous Waste Residues, Equipment, Structures, and Soils [40 CFR 264.112(b)(4) and 40 CFR 264.114]

Closure of the OB/OD units will be based on the most effective and practical treatment available at the time of closure. It will consist of removing and/or decontaminating all structures, soil, and other materials contaminated with hazardous waste or hazardous constituents. The closure process will be phased to provide for the most effective use of labor and equipment to accomplish the task. Critical decisions will be made throughout the process regarding subsequent steps, based on analysis conducted during closure to determine the extent of contamination and effectiveness of closure procedures.

The first phase of the closure activities will consist of identification and removal of metallic debris and UXO materials. Metallic materials will be forwarded to the DRMO for proper handling, storage, and recycling. UXO will be collected for final treatment by burning or detonation.

The second phase of the closure process includes removal of residues from the OB kettles, sampling, and decontamination, if required. As required by OB operating procedures, the residue from the final burn will be sampled to determine if it is hazardous waste or contains hazardous waste constituents. Hazardous waste will be retreated, and non-hazardous waste will be containerized in a 55-gal drum, labeled, and buried in an approved burial site.

Once the residues are removed, the burn kettles will be decontaminated in one of two possible methods described below. The final determination will likely be made at the time of closure.

1. *Flashing.* This method uses the appropriate fuel and oxidizer to cause the temperature of the containment device to exceed the auto ignition or decomposition temperature of the wastes that have been burned in the unit. The process is utilized by explosives handlers to decontaminate equipment used to haul or store explosive materials.
2. *Washing.* This method consists of decontaminating the burn kettle by first washing with a detergent followed by steam cleaning. After

decontamination, the wastewater generated is placed in appropriate sized drums and disposed of in accordance with regulatory requirements.

Following decontamination, the burn kettles will be sampled with surface wipe testing and analyzed for the parameters listed in Table II-13 to assure that the decontamination was effective. The analytical suite in Table II-13 is considered to appropriately address OB/OD degradation products based on results of surface soil and ground-water testing at the OB/OD units (see Section II.G). The kettles will then be recycled as scrap steel through the DRMO.

The third phase of the closure will investigate potential contamination of soil and ground water. Since a regular monitoring plan will be in effect, any contamination at the OB/OD units will have been previously identified. To ensure that RCRA considerations are adequately addressed, one sample from one well at each range is being analyzed for the full Appendix IX list during the first year, third quarter ground-water sampling event. Sampling of ground water and surface soil will be conducted according to the procedures described below at three separate intervals during the closure period: immediately preceding closure procedures, during closure, and after closure procedures have been completed.

#### II.F1.4.1 Location of Disposal Facility (Equipment, Structures, and Soil when removed)

As stated previously, decontamination will render the wastes non-hazardous; thus, the burn kettles, related structures, and soil will be handled through the DRMO for recycling or appropriate disposal.

#### II.F1.4.2 Methods for Sampling and Testing Surrounding Soils

Methods for sampling and testing site soils will be as described in Section II.G and the SAP provided in Appendix I.

#### II.F1.4.3 Criteria for Determining Decontamination Levels

Determination of appropriateness of decontamination of physical structures will be through assessment of analytical results of wipe tests for the parameters listed in Tables II-13.

TABLE II-13 ANALYTICAL PARAMETERS FOR CLOSURE

Parameter	Analytical Method
Reactivity	7.3.3.2/7.3.4.2
TCLP Arsenic	1311, 6010, 3010
TCLP Barium	1311, 6010, 3010
TCLP Cadmium	1311, 6010, 3010
TCLP Chromium	1311, 6010, 3010
TCLP Lead	1311, 6010, 3010
TCLP Mercury	1311, 7470
TCLP Selenium	1311, 7000, 3020
TCLP Silver	1311, 6010, 3010
TCLP 2,4-DNT	8310
Explosives	8330
TPH	418.1

## **II.F1.5 Description of Additional Activities Performed During Closure [40 CFR 264.112(b)(5)]**

### **II.F1.5.1 Ground-Water Monitoring**

A final round of ground-water sampling/analysis for the full suite of parameters identified in Section II.G6.4 will be performed. Section II.G discusses the ground-water monitoring program for EAFB in more detail. The SAP provides detailed description of methodology and procedures for ground-water monitoring.

### **II.F1.5.2 Leachate Collection**

No leachate is anticipated at the OB/OD units; therefore, this section is not applicable.

### **II.F1.5.3 Run-on and Run-off Control**

During closure activities at the OB/OD units, any rinse water used in decontamination will be containerized and disposed of according to the procedures described in the SAP (Appendix I).

## **II.F1.6 Description of Closure Schedule [40 CFR 264.112(b)(6) and 40 CFR 264.113]**

### **II.F1.6.1 Total Time to Close Each Unit**

Notification of intent to close the OB/OD units will be sent to FDEP and the Regional USEPA Administrator 180 days before beginning final closure. Final closure will be supervised and certified by an independent registered professional engineer. Upon receipt of the final volume of hazardous waste, onsite treatment will be completed within 120 days, and final closure will be completed within 270 days.

### **II.F1.6.2 Timetable of Closure Activities**

The timetable for closure activities of the OB/OD units is outlined in Table II-14.

TABLE II-14 TIMETABLE OF CLOSURE ACTIVITIES

Task	Days from Initiation of Closure
<b>Phase 1</b>	
Notify FDEP and USEPA Regional Administration of intent to initiate final closure procedures for OB/OD units	0 to 30
Receive final volume of hazardous waste	0 to 10
Initiate treatment of final volume of hazardous waste	10 to 50
Complete treatment of final volume of hazardous waste	50 to 90
Initiate closure	90
Recover and remove all metal	50 to 90
If more time is required for closure, request extension	60 to 90
<b>Phase 2</b>	
Decontaminate, sample, and dispose of burn kettles	50 to 120
<b>Phase 3</b>	
Sample and analyze soil and ground water surrounding units in accordance with sampling plan	120 to 180
<b>Phase 4</b>	
Remove contaminated soils if required	180 to 240
Confirmatory sampling of units if required	180 to 240
Fill and regrade treatment units	240 to 269
Complete closure and submit closure certification to FDEP and USEPA Regional Administration	270

Note: Minor variances from this timetable may be made as required to accommodate closure requirements. These variances will comply with regulatory requirements.



#### II.F1.7 Estimate of Year of Closure [40 CFR 264.112(b)(7)]

As stated previously, it is anticipated that OB/OD operations will be ongoing as long as EAFB remains in use. EAFB is an integral part of the defense system of the United States, and it is not anticipated that closure will occur. For purposes of this permit, the estimated year of closure is ~~2043~~ 2045, or 50 years from the date of this application.

#### II.F1.8 Extension of Closure Time [40 CFR 264.113(a) and (b)]

No extension for closure time of the OB/OD units is anticipated. If it is determined that (1) final closure will take longer than 270 days, (2) final closure will be incompatible with the continued operation of EAFB, or (3) other personnel will recommence operation within one year, a modification to the closure plan permit will be requested. The request for modification will be submitted to the USEPA Regional Administrator and FDEP at least 30 days prior to the end of the 270-day period and after receiving the final volume of hazardous waste.

The request will demonstrate the reasons for requesting an extension. In addition, it will demonstrate that the OB/OD units will continue to be operated in compliance with all applicable permit requirements and that all steps to prevent threats to human health and the environment will be taken.

#### II.F2 COPY OF POST-CLOSURE PLAN [40 CFR 264.117, 40 CFR 264.118, and 40 CFR 264.603]

In the event that the OB/OD units need to be closed, it is anticipated that the decontamination and soil removal procedures described above will result in clean closure. In the event that clean closure is not achieved, the closure plan will be amended to include criteria to ensure that any waste constituents remaining at closure will not cause adverse effects to human health or the environment.

##### II.F2.1 Post-Closure Care Mechanisms [40 CFR 264.603]

If the OB/OD units have contaminated soil or ground water that cannot be completely removed or decontaminated during closure, post-closure care mechanisms will ensure that human health and the environment are protected. Ground-water monitoring, reporting, and other related post-closure care requirements as specified in 40 CFR 264.117 through .120 will apply.

Requirements of 40 CFR 264.117-120 applicable only to landfills (i.e., leachate collection systems and impermeable cover liners) are not relevant to OB/OD activities and will not apply. The ground water and surface soil monitoring programs that were conducted during the active life of the areas would continue into post-closure.

## **II.F2.2 Description of Maintenance, Monitoring, Inspection, and Frequencies [40 CFR 264.118(b)(1) and (2)]**

### **II.F2.2.1 Waste-Fabricated Structures**

No structures are anticipated on the OB/OD units following closure; therefore, this section is not applicable.

### **II.F2.2.2 Facility Monitoring Equipment**

In the event that post-closure monitoring is required, the monitoring program described in Sections II.F1.4.2 and II.F1.5.1 will be continued for a period of 30 years after certification of closure. The monitoring equipment will be inspected immediately prior to and following sampling.

## **II.F2.3 Identification and Location of Person Responsible for Storage and Updating Facility Copy of Post-Closure Plan During Post-Closure Period [40 CFR 264.118(b)(3)]**

As previously stated, it is anticipated that the OB/OD units will remain active as long as EAFB remains active. If the OB/OD units are closed and EAFB remains active, the CEG/CEV office at EAFB will be responsible for maintaining and amending the post-closure plan. If EAFB is closed, post-closure plan maintenance will be the responsibility of the Base Closure Office of the United States Air Force.

## **II.F2.4 Procedure for Updating all other Copies of Post-Closure Plan [40 CFR 264.118(b)(2)]**

In the event that post-closure monitoring is required, the person who has responsibility for storing and updating the post-closure plan will also have responsibility for updating all other copies of the post-closure plan.

**II.F3 COPY OF MOST RECENT CLOSURE AND POST-CLOSURE COST ESTIMATES  
[40 CFR 264.142, 40 CFR 264.144, and 40 CFR 270.14(b)(15) and (16)]**

Since U.S. Government installations are exempt from these requirements, they are not addressed in this application.

**II.F4 COPY OF DOCUMENTS USED AS FINANCIAL ASSURANCE MECHANISMS  
[40 CFR 264.143, 40 CFR 264.145, and 40 CFR 264.146]**

Since U.S. Government installations are exempt from these requirements, they are not addressed in this application.

**II.F5 DOCUMENTATION OF NOTICE OF DEED [40 CFR 270.14(b)(14) and 264.119]**

Clean closure is expected at the OB/OD units at EAFB; therefore, a notation on the deed would not be necessary. If clean closure is not achieved, the appropriate land use and property deed notifications will be filed.

**II.F6 COPY OF INSURANCE POLICY [40 CFR 264.147]**

Since U.S. Government installations are exempt from these requirements, they are not addressed in this application.

## II.G PROTECTION OF GROUND WATER

### II.G1 UNIT IS A REGULATED UNIT [40 CFR 270.14(c), 270.23(b), and 264.90(a)(2)]

The OB/OD units at Range C-62 and the OD unit at Range C-52N at EAFB are regulated solid waste management units. Since secondary containment of the OB units is not provided, ground-water monitoring is proposed to characterize surficial aquifer water quality.

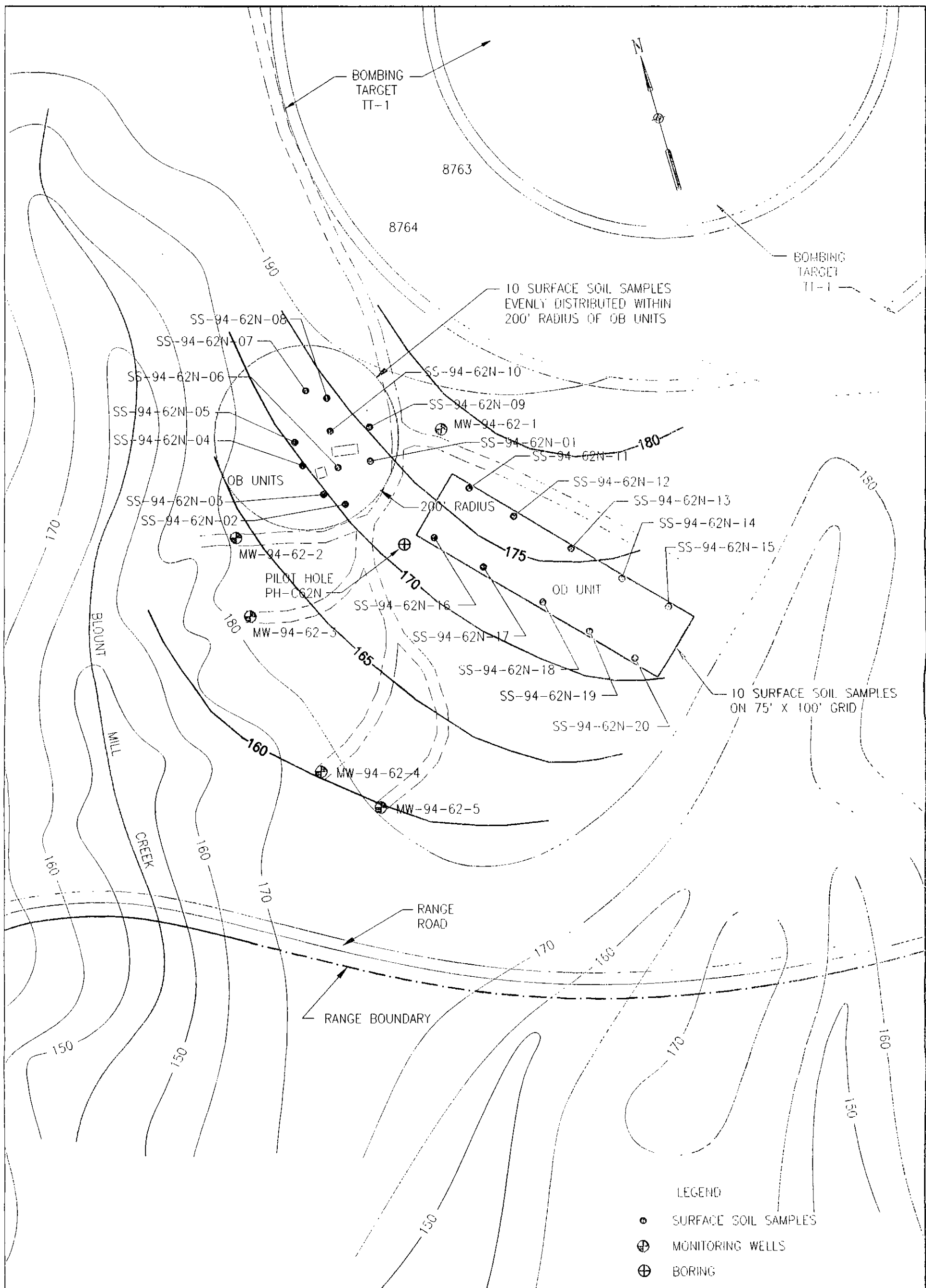
### II.G2 EXISTING GROUND-WATER MONITORING DATA [40 CFR 270.14(c)(1) and 40 CFR 270.23]

~~No ground-water monitoring data are available for the Range C-62 OB or OD units or for the Range C-52N OD unit.~~ Ground-water monitoring wells were drilled and installed in November 1994. Five ground-water monitoring wells were installed at Range C-62 (Figure II-16). Three wells were installed at Range C-52N (Figure II-17). An initial round of ground-water sampling and analysis was performed in November/December 1994. Samples were analyzed for metals, TCL semivolatile organics, explosives, total petroleum hydrocarbons (TPH), cyanide, reactivity, sulfides, total Kjeldahl nitrogen, ammonia nitrogen, and an anion suite. A second round of ground-water sampling and analysis was performed in March 1995. Samples were analyzed for the same parameter suite except total and dissolved metals analyses were performed. Results of the two rounds of ground-water sampling performed to date are presented in Data Summary Reports included as Appendices L-2 and L-3.

Results of the initial sampling round indicated no concentrations of any analytes above EPA MCLs or Florida guidance concentrations for ground-water quality from the Range C-62 monitoring well samples. Concentrations of cadmium, chromium, arsenic, and mercury were reported above MCLs from one or more of the well samples at Range C-52N. Concentrations of iron and aluminum exceeded secondary MCLs (reflective of taste and odor considerations in public water supplies) in one more of the well samples at both ranges. These data were considered to be of questionable relevance to site conditions since purging prior to sampling was not performed long enough to stabilize indicator parameters.

Results of the second round of sampling confirmed that there were no concentrations of analytes above EPA MCLs or Florida guidance concentrations for ground-water quality from the Range C-62 samples. Furthermore, the only elevated analyte from the Range C-52N

Figs. II-16 & II-17

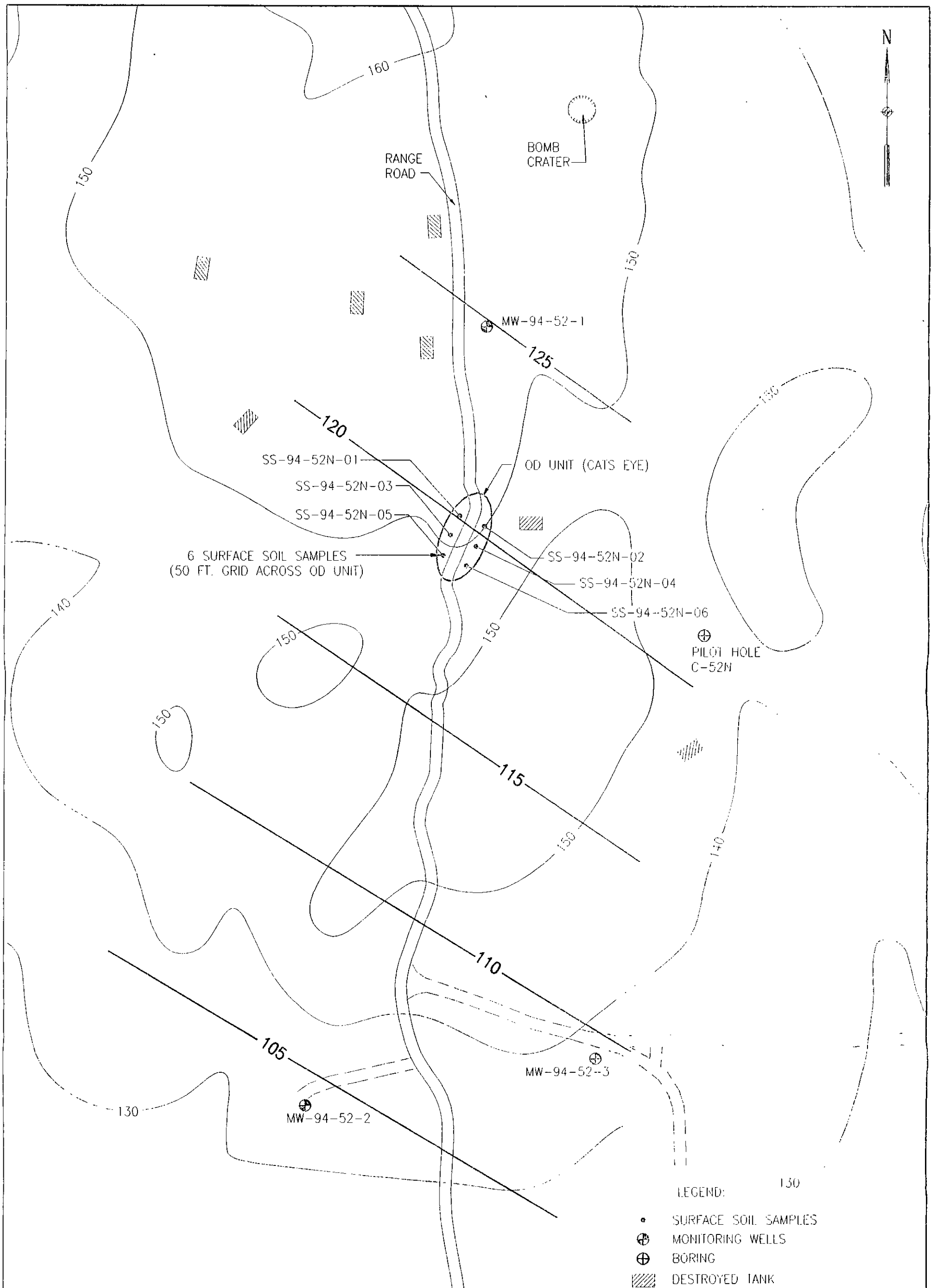


EA ENGINEERING,  
SCIENCE, AND  
TECHNOLOGY, INC.

EGLIN AIR FORCE BASE  
RANGE C-62  
WALTON COUNTY, FLORIDA

RANGE C-62 OB/OD UNITS  
GROUND WATER CONTOURS  
AND SAMPLING LOCATIONS

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO.	FILE NAME	FIGURE NO.	SHEET NO.
TAL	DPM	FDV	GEJ	5-4-95	1"=200'	11206.27	4-2	II-16	-



LEGEND:

- SURFACE SOIL SAMPLES
- ⊕ MONITORING WELLS
- ⊕ BORING
- ▨ DESTROYED TANK



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SCIENCE, AND  
TECHNOLOGY, INC.

EGLIN AIR FORCE BASE  
WALTON COUNTY, FLORIDA

RANGE C-52N OD UNIT  
GROUND WATER CONTOURS  
AND SAMPLING LOCATIONS

PROJECT MGR TAL	DESIGNED BY DPM	DRAWN BY FDV	CHECKED BY GEJ	DATE 5-4-95	SCALE 1"=200'	PROJECT NO. 11206.27	FILE NAME 4-1	FIGURE NO. II-17	SHEET NO. -
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samples was chromium in the 94-52-01 sample (unfiltered or total fraction) at 145  $\mu\text{g/L}$  (MCL for chromium is 100  $\mu\text{g/L}$ ). However, the corresponding filtered (dissolved fraction) sample concentration for chromium was reported below the detection limit and the first quarter chromium concentration in the total aliquot of this sample was 75.5  $\mu\text{g/L}$  (below MCL). General regional ground-water quality information is discussed in Section III.B3.

#### II.G3 IDENTIFICATION OF UPPER-MOST AQUIFER AND AQUIFERS HYDRAULICALLY INTERCONNECTED BENEATH THE FACILITY PROPERTY [40 CFR 270.14(c)(2) and 270.23]

The uppermost aquifer (as described in detail in Section III.B2) in the vicinity of both the OB and OD units is the surficial ~~sand and gravel~~ aquifer (encountered at  $\pm 50$  30 ft below ground surface). At Range C-52N, the aquifer thickness is approximately 70 60 ft (based on pilot hole drilling in November 1994). At Range C-62, the aquifer thickness is approximately 100 ft. (Pensacola clay was encountered at 104.5 ft in C-62 pilot hole.) There are no wells screened within the surficial aquifer within a 4-mi radius of either OB/OD unit other than the monitoring wells installed for this permit application. The surficial ~~sand and gravel~~ aquifer is underlain by the Pensacola clay—a thick, low permeability confining layer (estimated 160 ft thick at C-62; 250 ft thick at C-52N). The Floridan aquifer underlies the Pensacola clay but is not hydraulically connected to the surficial aquifer due to the thickness and low permeability of the Pensacola clay.

#### II.G4 GROUND-WATER FLOW, DIRECTION, RATE, AND SOURCE OF INFORMATION [40 CFR 270.14(c)(2) and 270.23]

Ground water in the surficial ~~zone of the sand and gravel~~ aquifer at Range C-52N is expected to flow laterally from the water table surface in a southerly direction toward the confluence of the Bay Head Branch and the Coon Head Branch. Deflection of the flow to the southeast or southwest toward the eastern and western flanks of these branches can be anticipated based on local topography.

Based on the topography of the land surface at the Range C-62 OB/OD units, it is expected that ground water in the surficial aquifer flows in a southerly to southwesterly direction toward the headwaters of Blount Mill Creek. Ground-water surface contours were mapped based on the November/December 1994 sampling event (Figures II-16 and II-17). These data confirm that the local ground-water flow direction of both Ranges C-52N and C-62 is to the southwest. More detailed discussion, including source references, is provided in Section III.B3.



**II.G5 DESCRIPTION OF ANY PLUME OF CONTAMINATION THAT HAS ENTERED THE GROUND WATER FROM A REGULATED UNIT [40 CFR 270.14(c)(4) and 40 CFR 270.23]**

No contaminant plume has been identified at the site ~~and there are no known concentrations of~~ based on the initial two rounds of ground-water data. Analysis for the full suite of hazardous constituents listed in Appendix IX of 40 CFR 264 will be performed in conjunction with the third quarter ground-water sampling event. Based upon site history/use and the results of the first two rounds of ground-water data, it is not expected that hazardous constituents from the Appendix IX list will be reported above detection limits in the third quarter sampling results.

**II.G6 PROPOSED GROUND-WATER MONITORING PROGRAM AND SOIL MONITORING PROGRAM [40 CFR 270.14(c)(5), 264.97, 264.600, and 270.23]**

A detailed Sampling and Analysis Plan (SAP); developed in accordance with EPA Region IV Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual dated April 1986 (Region IV SOP), the EPA RCRA Ground-Water Monitoring Technical Enforcement Guidance Document dated September 1986 (TEGD), ~~and~~ the EPA Handbook of Suggested Practices for Design and Installation of Ground-Water Monitoring Wells dated March 1991 (EPA Suggested Practices Manual), and the Quality Assurance Project Plan (QAP) required by the State of Florida DEP in conjunction with the state laboratory certification program; is provided as Appendix I. Data Summary Reports of the analytical results from the first two quarterly sampling events of the soil and ground-water sampling program are provided as Appendices L-2 and L-3. This section of the RCRA Part B Subpart X application briefly summarizes relevant information from the SAP and QAP, and from the Data Summary Reports for the first two rounds of detection monitoring data.

Since ground-water and soil monitoring ~~have~~ were not ~~been~~ conducted at the OB/OD units prior to the initial permit application, this monitoring program ~~has been~~ was prepared to assess potential contribution to soil and ground-water contamination that may have resulted from OB/OD unit operations. The data obtained during this phase ~~will~~ provide the baseline environmental quality information for the OB/OD units. The presence of any of the energetic compounds in the downgradient monitoring wells ~~points~~ will suggest the presence of ground-water contamination, as none of these compounds occur naturally. The presence of explosives-breakdown products or metals above background levels may also indicate potential ground-water impacts associated with OB/OD activities. If any of these compounds are detected in downgradient monitoring wells ~~points~~, ~~an~~ additional samples will be collected from

the potentially contaminated well, and analyzed to verify these results. If a second positive result is obtained, additional characterization of the treatment area ~~will~~ may be required.

~~Since the OB/OD units at EAFB are located on active bombing/training ranges, it is unlikely that ground-water monitoring will be able to distinguish between contamination associated with OB/OD activities and contamination associated with active bombing/training mission uses of the ranges (if contamination is encountered). Consequently, compliance monitoring under RCRA for the OB/OD units is not appropriate. If the detection monitoring program described in this application identifies evidence of ground-water contamination, additional site characterization to consider potential OB/OD as well as other range use contribution will be initiated under the USAF Installation Restoration Program (IRP). EAFB's projected IRP activities within the next 5 years include provisions for assessment of sites at Range C-52N and Range C-62, including the C-62 OB/OD area. Since potential for contamination associated with OB/OD activities is likely to be much less than potential for contamination associated with active range uses, it is more appropriate to address long-term characterization/remediation at both ranges under IRP than under the RCRA provisions for the OB/OD units.~~

If no energetic compounds are detected in the downgradient monitoring wells ~~points~~, or if one of these compounds is only detected in one sample, analytical results obtained from the baseline monitoring program, along with the results from the first three sampling events of the detection monitoring program, will be evaluated to determine if there is statistically significant evidence of contamination for any indicator parameter. Results of the initial two rounds of ground-water data indicate that no energetic compounds were detected in downgradient monitoring well samples. Detection monitoring will continue as long as there is no statistically significant evidence of ground-water contamination. If there is statistically significant evidence of ground-water contamination, a compliance monitoring program will be developed and implemented. The monitoring program ~~will~~ includes monitoring wells at both OB/OD units. ~~Well points will be used as close-in sample locations.~~ The monitoring wells ~~will be~~ have been positioned far enough away from the OD units to insure for as much survivability as possible ~~and~~ yet still close enough to the OB/OD units to be indicative of ~~any~~ ground-water contamination from the OB/OD units.

## II.G6.1 Description of Well Design and Location [40 CFR 264.97, 40 CFR 264.600, and 40 CFR 270.23]

Ground-water monitoring ~~will be~~ has been implemented at each of the three OB/OD units at EAFB: Range C-62 OB, Range C-62 OD, and Range C-52N OD. Ground-water sampling points ~~will be~~ have been installed and sampled (two rounds to date) in accordance with 40 CFR Part 264 Subpart F. In recognition of the fact that these units are located on active bombing/training ranges, provisions ~~will be~~ were made in well design and location to minimize potential adverse impacts associated with training activities. Prior to well installation and soil sample collection, a geophysical surveying of the OD pit, burn area, and adjacent areas ~~will be~~ was conducted to detect buried metallic objects which may be indicative of UXO. Reconnaissance surveying ~~will be~~ was performed using electromagnetic induction (EM-31 and EM-34). Where ~~E~~electrical anomalies defined with the EM techniques ~~will be followed with high-resolution profiling using Ground Penetrating Radar~~ were observed, well locations were offset. Geophysical anomalies that would indicate the potential presence of UXO ~~would be~~ were brought to the attention of EOD experts. Soil sample locations ~~will be~~ were positioned to avoid potential safety hazards identified with these geophysical tools. Downhole magnetometry ~~will be~~ was used during drilling to provide further UXO protection. A description of ~~planned~~ monitoring programs for each of the three units follows.

### II.G6.1.1 Range C-62 OB/OD Unit

~~In order to more accurately characterize ground-water flow direction at the specific OB unit, three 2-in. diameter PVC observation wells will initially be drilled and installed as shown in Figure II-16 based on surface topography. One observation well will be drilled and installed in an assumed upgradient position (based on regional geohydrological data as discussed in Section III.B2). Three other two will be in assumed downgradient positions. Water level data from the three wells, in conjunction with surveyed surface elevations, will be used to estimate ground-water flow direction at the OB unit.~~

~~After the ground-water flow direction at the site is established, additional ground-water monitoring wells and well point locations will be drilled and installed for water quality monitoring purposes. Three temporary well points (one upgradient and two downgradient) will then be installed in a triangle array around the OD unit to characterize conditions at the OD source. A total of five permanent monitoring wells will then be installed, including one~~

~~upgradient and four downgradient of the OB and OD units. One of the downgradient wells will be installed at the control building (more than 2 mi from the OB units) to characterize "background" conditions, one well will be drilled upgradient of the OB units in the outer ring of the bombing target TT-1, one well will be drilled downgradient of the OB units in the established direction of ground-water flow, and another well will be drilled approximately 100 ft further downgradient from the third well.~~

~~Downgradient wells will be located far enough away from OD units to minimize potential adverse impacts to well integrity associated with explosives. Direct push well points will be used to collect water samples that will be analyzed in the field concurrently with sampling/analysis of monitoring wells.~~

In order to accurately characterize ground-water flow direction at the specific OB unit, five monitoring wells were drilled and installed. Out of the total five permanent monitoring wells, one well was installed in the assumed upgradient and the other four in the assumed downgradient of the OB/OD units, as shown in Figure II-16. The assumed upgradient well (MW-94-62-1) to the OB units was drilled in the outer ring of the bombing target TT-1. The downgradient wells were drilled south, southwest, and southeast of the OB units in the assumed downgradient. Anticipated well depths were 40 ft BGS. Actual depths ranged from 36 to 40 ft BGS. Provisions were made that if the assumed upgradient and downgradient failed to provide enough data to characterize the ground-water flow and quality, it would have been necessary to install additional monitoring wells. Based on the water level data from the November/December 1994 sampling event and the analytical results of the first two rounds of ground-water sampling, it is determined that additional wells are not necessary.

Wells ~~will be~~ were drilled using continuous-flight hollow stem augers and ~~will be~~ were constructed of 2-in. PVC Schedule 40. No PVC solvent ~~will be~~ was used. Well screens ~~will be~~ were factory slotted with a slot width of 0.010 in. All well screens ~~will be~~ were approximately 10 ft long.

Soil samples ~~will be~~ were collected every 5 ft for lithological purposes. All borings ~~will be~~ were logged in the field by a geologist and ~~will be~~ were classified in accordance with the Unified Soil Classification System (ASTM D2488-84). Boring logs are included in the First Quarter Data Summary Report (Appendix L-2 of the application). Ground water ~~is~~ was expected to be encountered at approximately 50-60 ft ~~below ground surface~~ BGS. Ground water was encountered between 20 and 30 ft BGS at Range C-52N and between 9 and 20 ft

BGS at Range C-62. Borings ~~will be~~ were drilled at least 10 ft below the depth at which the water table is encountered.

Since the OB units at Range C-62 ~~is~~ are located in an active bombing/training area, provisions ~~will need to be~~ were made to assure that the wells are not adversely impacted by ongoing site activities. These provisions are discussed in the SAP (Appendix I).

#### II.G6.1.2 Range C-52N

~~Ground-water flow in the immediate vicinity of the OD unit will be characterized by drilling three 2 in. PVC observation wells in a triangular array around the OD unit as shown in Figure II-17 to characterize the localized direction of shallow ground-water flow. One observation well will be drilled and installed in an assumed upgradient position. The remaining two will be in assumed downgradient positions.~~

~~In addition to OD activities, the OD unit location at Range C-52N is used as the "cat's eye" air-to-ground strafing/bombing target. Ground-water monitoring wells could not be expected to remain intact at this area.~~

~~To characterize ground-water quality in the surficial aquifer, three temporary well point samples will then be installed in a triangular array at the OD unit to characterize conditions at the OD source using a cone penetrometer as discussed for the Range C-62 OD unit above (Figure II-17). Samples will be collected and analyzed as discussed later in this section and in detail in the SAP. Three permanent monitoring wells will then be installed with one upgradient and two downgradient, as shown in Figure II-17, to characterize ground-water quality impacts related to the OD unit. Surficial soil sampling will be conducted to assess potential contaminant sources as described in Section II.G6.2. If results of surficial soil sampling indicate potential sources of ground-water contamination, subsequent rounds of cone penetrometer well sampling may be required.~~

The ground-water flow direction at the specific OD unit was characterized by drilling and installing three monitoring wells as shown in Figure II-17. One monitoring well (MW-94-52-1) was installed north of the OD unit and was assumed to be upgradient. The other two wells (MW-94-52-2 and MW-94-52-3) were drilled southwest and southeast of the OD unit, respectively, and were assumed downgradient. The anticipated well depths were estimated at 60 ft BGS. The actual well depths ranged from 40 to 46 ft BGS. Provisions were

made that if the assumed upgradient and downgradient failed to provide enough data to characterize the ground-water flow or quality, it would have been necessary to install additional monitoring wells. Based on the water level data from the November/December 1994 sampling event and the analytical results of the first two rounds of ground-water sampling, it is determined that additional wells are not necessary.

### II.G6.1.3 Floridan Aquifer

No monitoring wells are proposed to characterize conditions in the Floridan aquifer at either Range C-52N or Range C-62. This aquifer is separated from the surficial aquifer by a 150-250 ft low permeability clay confining layer (Pensacola clay). Furthermore, potential contaminants associated with OB/OD activities (explosives and metals) are relatively immobile and would not have a high potential for subsurface migration.

### II.G6.2 Sample Collection [40 CFR 264.97(d)(1), 40 CFR 264.600, and 40 CFR 270.23]

#### Ground Water

Ground-water samples from monitoring wells ~~will be~~ were collected in accordance with Section 4.2 of the TEGD and Section 4 of the Region IV SOP as described in the SAP. Samples ~~will be~~ were analyzed for the parameters listed in Table II-15 and II-16 for the C-62 and C-52N units, respectively. Wells ~~will be~~ were purged in accordance with Section 4.7.5 of the Region IV SOP until at least three well volumes ~~are~~ were removed. A problem with respect to purging was noted during the initial round of ground-water sampling. While the three well volumes were purged, as per Region IV SOP, stabilization of indicator parameters (i.e., turbidity, temperature, pH) was not achieved and the resultant samples reported elevated turbidity and total suspended solids (TSS). Those conditions have likely compromised the representativeness of the initial round of ground-water data and may represent higher than actual concentrations of metals in the ground-water samples. Dedicated bailers ~~will be~~ were used for each monitoring well. Purge water ~~will be~~ was containerized until ground-water analyses ~~are~~ were available. If results indicated that contamination ~~is~~ was not detected, purge water ~~may be~~ was discharged directly to the ground. If results indicated concentrations in excess of health-based risk levels, offsite treatment/disposal ~~will be~~ was required. ~~Ground-water samples from direct-push temporary well points will be collected as described in the SAP. Samples will be analyzed for the parameters listed in Table II-17.~~

TABLE II-15 GROUND-WATER SAMPLES, METHODS, PRESERVATION, AND HOLDING TIMES FOR RANGE C-62, OB/OD UNITS

Parameter	Analytical Methods	No. Field Locations	Field Duplicates	Field Blanks	Rinsate <sup>(3)(4)</sup> Blanks	Trip <sup>(5)</sup> Blanks	Total Samples	Preservation	Holding Time
Filtered Metals <sup>(1)</sup>	<del>1311/6010</del> 3010/6010	5	1	1	0	0	7	HNO <sub>3</sub> to pH < 2 Cool to 4°C	6 months (28 dys mercury)
Total Metals <sup>(2)</sup>	6010	5	1	1	0	0	7	Cool to 4°C HNO <sub>3</sub> pH < 2	6 months (28 dys mercury)
Sulfides	<del>9030</del> 376.1	5	1	1	0	0	7	NaOH pH > 9 Cool to 4°C	7 dys
Sulfates	<del>9035/9036/9038</del> 375.4	5	1	1	0	0	7	Cool to 4°C	28 dys
Nitrates	<del>9200</del> 353.2	5	1	1	0	0	7	Cool to 4°C	48 hrs
Nitrites	<del>300.0</del> 353.2	5	1	1	0	0	7	Cool to 4°C	48 hrs
Ammonia	<del>Modified 353.2</del> 350.1	5	1	1	0	0	7	H <sub>2</sub> SO <sub>4</sub> to pH > 2 Cool to 4°C	28 dys
Total Kjeldahl Nitrogen	<del>351.3</del> 351.2	5	1	1	0	0	7	H <sub>2</sub> SO <sub>4</sub> to pH > 2 Cool to 4°C	28 dys
Cyanide	<del>9010/9012</del> 335.3	5	1	1	0	0	7	NaOH pH > 12 Cool to 4°C	7 dys
Explosives <sup>(6)</sup>	8330	5	1	1	0	0	7	Cool to 4°C	7 dys extraction 40 dys extract
Full TCL Semivolatiles	EPA Method 8270 including library search	5	1	1	0	0	7	Cool to 4°C	7 dys extraction 40 dys extract
TSS	160.2	5	1	1	0	0	7	Cool to 4°C	7 dys
TDS	160.1	5	1	1	0	0	7	Cool to 4°C	7 dys
TPH	418.1	5	1	1	0	0	1	HCl to pH < 2 Cool to 4°C	28 dys

**Notes:**

1. Metals include ~~arsenic and selenium by method 7000~~; barium, cadmium, chromium, silver, aluminum, copper, iron, ~~lead~~, magnesium, strontium, ~~phosphorus~~, calcium, potassium, and tin by Method 6010 ~~and~~, mercury by 7470, ~~arsenic by 7060, and selenium by 7740.~~
2. Metals for total analysis will be identical to metals for filtered analysis.
3. Samples will be collected from groundwater monitoring wells using dedicated bailers.
4. Since dedicated bailers will be used, rinsate blanks are not needed.
5. Trip blanks are for volatile organics analysis only.
6. Explosives includes DNT, HMX, nitroglycerine, PETN, RDX, TNT, tetryl, and nitroguanidine.

TABLE II-16 GROUND-WATER SAMPLES, METHODS, PRESERVATION, AND HOLDING TIMES FOR RANGE C-52N  
OD UNIT

Parameter	Analytical Methods	No. Field Locations	Field Duplicates	Field Blanks	Rinsate <sup>(3)(4)</sup> Blanks	Trip <sup>(5)</sup> Blanks	Total Samples	Preservation	Holding Time
Filtered Metals <sup>(1)</sup>	<del>1311/6010</del> 3010/6010	3	1	1	0	0	5	HNO <sub>3</sub> to pH < 2 Cool to 4°C	6 months (28 dys mercury)
Total Metals <sup>(2)</sup>	6010	3	1	1	0	0	5	Cool to 4°C HNO <sub>3</sub> pH < 2	6 months (28 dys mercury)
Sulfides	<del>9030</del> 376.1	3	1	1	0	0	5	NaOH pH > 9 Cool to 4°C	7 dys
Sulfates	<del>9035/9036/9038</del> 375.4	3	1	1	0	0	5	Cool to 4°C	28 dys
Nitrates	<del>9200</del> 353.2	3	1	1	0	0	5	Cool to 4°C	48 hrs
Nitrites	<del>300-0</del> 353.2	3	1	1	0	0	5	Cool to 4°C	48 hrs
Ammonia	<del>Modified 353.2</del> 350.1	3	1	1	0	0	5	H <sub>2</sub> SO <sub>4</sub> to pH > 2 Cool to 4°C	28 dys
Total Kjeldahl Nitrogen	<del>351.3</del> 351.2	3	1	1	0	0	5	H <sub>2</sub> SO <sub>4</sub> to pH > 2 Cool to 4°C	28 dys
Cyanide	<del>9010/9012</del> 335.3	3	1	1	0	0	5	NaOH pH > 12 Cool to 4°C	7 dys
Explosives <sup>(6)</sup>	8330	3	1	1	0	0	5	Cool to 4°C	7 dys extraction 40 dys extract
Full TCL Semivolatiles	EPA Method 8270 including library search	3	1	1	0	0	5	Cool to 4°C	14 dys extraction 40 dys extract
TSS	160.2	3	1	1	0	0	5	Cool to 4°C	7 dys
TDS	160.1	3	1	1	0	0	5	Cool to 4°C	7 dys
TPH	418.1	3	1	1	0	0	5	HCl to pH < 2 Cool to 4°C	28 dys

**Notes:**

1. Metals include ~~arsenic and selenium by method 7000;~~ barium, cadmium, chromium, silver, aluminum, copper, iron, lead, magnesium, strontium, ~~phosphorus~~, calcium, potassium, and tin by Method 6010 ~~and~~, mercury by 7470, arsenic by 7060, and selenium by 7740.
2. Metals for total analysis will be identical to metals for filtered analysis.
3. Samples will be collected from well points through cone penetrometer ring.
4. Since dedicated bailers will be used, rinsate blanks are not needed.
5. Trip blanks are for volatile organics analysis only.
6. Explosives includes DNT, HMX, nitroglycerine, PETN, RDX, TNT, tetryl, and nitroguanidine.



### Subsurface Soil

Subsurface soil samples for chemical analysis ~~will be~~ were collected from soil borings drilled at the Range C-62 OB/OD units and at the Range C-52N OD unit for monitoring well installation (~~MW 94-62-1, MW 94-62-2, and MW 94-62-3~~) and from the borings drilled for observation wells at the Range C-52N OD unit (~~OW 94-52-1, OW 94-52-2, and OW 94-52-3~~). Samples ~~will be~~ were collected at 5-ft intervals for lithological characterization. All samples ~~will be~~ were field screened using a direct reading photo-ionization detector (PID) and an x-ray fluorescence (XRF) meter. Results ~~will be~~ were reported on the soil boring logs. A total of ~~three~~ two subsurface samples per boring ~~will be~~ were submitted for chemical analysis for the parameters specified in Tables II-18 and II-19. One sample per boring ~~will be~~ was collected from the surface interval (0-2 ft) and the other sample was collected at the ground-water interface, ~~one sample per boring will be collected from the final 2-ft interval at the boring, and a third sample per boring will be from the location exhibiting the highest combination of elevated PID and XRF readings.~~ Drill cuttings ~~will be~~ were containerized pending results of chemical analyses. Detailed procedures for collecting and analyzing subsurface soil samples in accordance with the Region IV SOP and the TEGD are provided in the SAP.

### Surface Soil

Surface soil samples ~~will be~~ were collected from ten locations at the Range C-62 OB unit, ten locations from the Range C-62 OD unit, and six locations from the Range C-52N OD unit. The approximate locations of surface soil samples are shown in Figures II-16 and II-17. These samples ~~will be~~ were collected from the upper 6 in. of soil and ~~will be~~ were analyzed for the parameters listed in Table II-20, in accordance with provisions of the Region IV SOP, and the TEGD as specified in the SAP. Those data ~~will be~~ were used to assess potential human and environmental exposure for direct contact with surface soil (see Section III.D).

#### II.G6.3 Sample Preservation and Shipment [40 CFR 264.97(d)(2), 40 CFR 264.600, and 40 CFR 270.23]

Samples ~~will be~~ were collected in a manner that ~~will~~ minimized aeration. Each sample ~~will be~~ was carefully labeled so it ~~can~~ could be identified by laboratory personnel. The sample label ~~will~~ included the project number, sample location, matrix, sample number, time and date, and sampler's initials. All samples ~~will be~~ were identified with nonwater-soluble ink on a standard

TABLE H-17 TEMPORARY WELL POINT GROUND-WATER SAMPLES, METHODS, PRESERVATION, AND HOLDING TIMES FOR RANGE C-52N, OD UNIT AND RANGE C-62 OD UNIT

Parameter	Analytical Methods	No. Field Locations	Field Duplicates	Field Blanks	Rinse <sup>(1)(2)</sup> Blanks	Trip <sup>(3)</sup> Blanks	Total Samples	Preservation	Holding Time
Total Metals	XRF	6	+	+	0	0	8	Cool to 4°C	In Field
Sulfides	9030	6	+	+	0	0	8	NaOH pH > 9- Cool to 4°C	7-dys
Sulfates	9035/9036/9038	6	+	+	0	0	8	Cool to 4°C	28-dys
Nitrates	9200	6	+	+	0	0	8	Cool to 4°C	48-hrs
Nitrites	900-0	6	+	+	0	0	8	Cool to 4°C	48-hrs
Ammonia	Modified 353-2	6	+	+	0	0	8	H <sub>2</sub> SO <sub>4</sub> to pH > 2 Cool to 4°C	28-dys
Total Kjeldahl Nitrogen	351-3	6	+	+	0	0	8	H <sub>2</sub> SO <sub>4</sub> to pH > 2 Cool to 4°C	28-dys
Cyanide	9010/9012	6	+	+	0	0	8	NaOH pH > 12- Cool to 4°C	7-dys
Explosives (TNT)	Immunoassay	6	+	+	0	0	8	Cool to 4°C	In Field
TSS	160-2	6	+	+	0	0	8	Cool to 4°C	7-dys
TDS	160-1	6	+	+	0	0	8	Cool to 4°C	7-dys

Notes:

1. Samples will be collected from well points through cone penetrometer ring.
2. Since dedicated bailers will be used, rinse blanks are not needed.
3. Trip blanks are for volatile organics analysis only.

TABLE II-18 SAMPLES, METHODS, PRESERVATION, AND HOLDING TIMES FOR RANGE C-62 OB/OD UNITS AREA  
(SUBSURFACE SOIL SAMPLES)

Parameter	Analytical Method(s)	No. Field <sup>(3)(4)</sup> Locations	Field Duplicates	Field <sup>(3)(4)</sup> Blanks	Rinsate Blanks	Trip <sup>(4)(5)</sup> Blanks	Total Samples	Preservation	Holding Time
TCLP <sup>(1)</sup>	4311/6010	15	2	1	1	0	19	Cool to 4°C	14 dys extraction 6 mos extract
Total Metals <sup>(1)(2)</sup>	6010	10 15	1 2	1	1	0	13 19	Cool to 4°C	6 months
Sulfides	376.1 9030	10 15	1 2	1	1	0	13 19	Cool to 4°C	7 dys
Sulfates	375.4 9035/9036/9038	10 15	1 2	1	1	0	13 19	Cool to 4°C	28 dys
Nitrates	353.2 9200	10 15	1 2	1	1	0	13 19	Cool to 4°C	48 hrs
Nitrites	353.2 300.0	10 15	1 2	1	1	0	13 19	Cool to 4°C	48 hrs
Ammonia	350.1 Modified 353.2	10 15	1 2	1	1	0	13 19	Cool to 4°C	28 dys
Total Kjeldahl Nitrogen	351.2 351.3	10 15	1 2	1	1	0	13 19	Cool to 4°C	28 dys
Cyanide	335.3 9010/9012	10 15	1 2	1	1	0	13 19	Cool to 4°C	7 dys
Explosives <sup>(2)(3)</sup>	8330	10 15	1 2	1	1	0	13 19	Cool to 4°C	7 dys extraction 40 dys extract
Full TCL Semivolatiles	EPA Method 8270, including library search	10 15	1 2	1	1	0	13 19	Cool to 4°C	14 dys extraction 40 dys extract
TPH	EPA 418.1	10 15	1 2	1	1	0	13 19	Cool to 4°C	28 dys
Reactivity	Paras 7.3.3/7.3.4	10 15	1 2	1	1	0	13 19	Cool to 4°C	28 dys

Notes:

1. ~~TCLP metals includes arsenic, barium, cadmium, chromium, lead, and silver by 6010; selenium by 7000, and mercury by 7470.~~

1. 2- Total metals includes ~~arsenic~~, barium, cadmium, chromium, lead, silver, aluminum, copper, iron, magnesium, strontium, ~~phosphorus~~, calcium, potassium, tin by 6010; ~~antimony and selenium by 7740 7000, and mercury by 7470, and arsenic by 7060.~~

2. 3- Explosives includes DNT, HMX, nitroglycerine, PETN, RDX, TNT, tetryl, and nitroguanidine.

3. 4- Field blank for Range C-62 OB/OD units will be on water used for decontamination.

4. 5- Trip blanks are for volatile organics only.

**TABLE II-19 SAMPLES, METHODS, PRESERVATION, AND HOLDING TIMES FOR RANGE C-52N C-62 OD UNIT  
(SUBSURFACE SOIL SAMPLES)**

Parameter	Analytical Method(s)	No. Field <sup>(1)</sup> Locations	Field Duplicates	Field <sup>(2)</sup> Blanks	Rinsate Blanks	Trip <sup>(3)(5)</sup> Blanks	Total Samples	Preservation	Holding Time
TCLP <sup>(4)</sup>	1311/6010	9	+	+	+	0	12	Cool to 4°C	14 dys extraction 6 mos extract
Total Metals <sup>(1)(2)</sup>	6010	6 9	1	0 +	1	0	8 +2	Cool to 4°C	6 months
Sulfides	376.1 9030	6 9	1	0 +	1	0	8 +2	Cool to 4°C	7 dys
Sulfates	375.4 9035/9036/9038	6 9	1	0 +	1	0	8 +2	Cool to 4°C	28 dys
Nitrates	353.2 9200	6 9	1	0 +	1	0	8 +2	Cool to 4°C	48 hrs
Nitrites	353.2 300-0	6 9	1	0 +	1	0	8 +2	Cool to 4°C	48 hrs
Ammonia	350.1 Modified 353-2	6 9	1	0 +	1	0	8 +2	Cool to 4°C	28 dys
Total Kjeldahl Nitrogen	351.2 351-3	6 9	1	0 +	1	0	8 +2	Cool to 4°C	28 dys
Cyanide	335.3 9010/9012	6 9	1	0 +	1	0	8 +2	Cool to 4°C	7 dys
Explosives <sup>(2)(5)</sup>	8330 8310 or USATHAMA	6 9	1	0 +	1	0	8 +2	Cool to 4°C	7 dys extraction 40 dys extract
Full TCL Semivolatiles	EPA Method 8270, including library search	6 9	1	0 +	1	0	8 +2	Cool to 4°C	14 dys extraction 40 dys extract
TPH	EPA 418.1	6 9	1	0 +	1	0	8 +2	Cool to 4°C	28 dys
Reactivity	Paras 7.3.3/7.3.4	6 9	1	0 +	1	0	8 +2	Cool to 4°C	28 dys

**Notes:**

1. ~~TCLP metals includes arsenic, barium, cadmium, chromium, lead, and silver by 6010; selenium by 7000, and mercury by 7470.~~

1. 2- Total metals includes ~~arsenic~~, barium, cadmium, chromium, lead, silver, aluminum, copper, iron, magnesium, strontium, ~~phosphorus~~, calcium, potassium, tin by 6010; ~~antimony~~ and selenium by 7740 ~~7000~~, and mercury by 7470, and arsenic by 7060.

2. 3- Explosives includes DNT, HMX, nitroglycerine, PETN, RDX, TNT, tetryl, and nitroguanidine.

4. ~~Field blank for Range C-62 OB/OD units will be on water used for decontamination.~~

3. 5- Trip blanks are for volatile organics only.

**TABLE II-20 SAMPLES, METHODS, PRESERVATION, AND HOLDING TIMES FOR RANGE C-62 AND C-52N  
OD UNITS (SURFACE SOIL SAMPLES)**

Parameter	Analytical Method(s)	No. Field <sup>(1)(*)</sup> Locations	Field <sup>(3)(*)</sup> Duplicates	Field Blanks	Rinsate <sup>(4)(*)</sup> Blanks	Trip <sup>(5)(*)</sup> Blanks	Total Samples	Preservation	Holding Time
TCLP <sup>(*)</sup>	1311/6010	20/6	2/1	0	0	0	29	Cool to 4°C	14 dys extraction 6 mos extract
Total Metals <sup>(1)(*)</sup>	6010	20/6	2/1	0	0	0	29	Cool to 4°C	6 months
Sulfides	376.1 9030	20/6	2/1	0	0	0	29	Cool to 4°C	7 dys
Sulfates	375.4 9035/9036/9038	20/6	2/1	0	0	0	29	Cool to 4°C	28 dys
Nitrates	353.2 9200	20/6	2/1	0	0	0	29	Cool to 4°C	48 hrs
Nitrites	353.2 300.0	20/6	2/1	0	0	0	29	Cool to 4°C	48 hrs
Ammonia	350.1 Modified 353.2	20/6	2/1	0	0	0	29	Cool to 4°C	28 dys
Total Kjeldahl Nitrogen	351.2 351.3	20/6	2/1	0	0	0	29	Cool to 4°C	28 dys
Cyanide	335.3 9010/9012	20/6	2/1	0	0	0	29	Cool to 4°C	7 dys
Explosives <sup>(2)(*)</sup>	8330 8310 or USATHAMA	20/6	2/1	0	0	0	29	Cool to 4°C	7 dys extraction 40 dys extract
Full TCL Semivolatiles Dibutylphthalate	8270	20/6	2/1	0	0	0	29	Cool to 4°C	14 dys extraction 40 dys extract
Diphenyl amine	8090/8270	20/6	2/1	0	0	0	29	Cool to 4°C	14 dys extraction 40 dys extract
Hexachlorbenzene	8270	20/6	2/1	0	0	0	29	Cool to 4°C	14 dys extraction 40 dys extract
TPH	EPA 418.1	20/6	2/1	0	0	0	29	Cool to 4°C	28 dys
Reactivity	Paras 7.3.3/7.3.4	20/6	2/1	0	0	0	29	Cool to 4°C	28 dys

**Notes:**

1. TCLP metals includes arsenic, barium, cadmium, chromium, lead, and silver by 6010; selenium by 7000, and mercury by 7470.

1. 2- Total metals includes arsenic, barium, cadmium, chromium, lead, silver, aluminum, copper, iron, magnesium, strontium, phosphorus, calcium, potassium, tin by 6010; antimony and selenium by 7740 7000, and mercury by 7470, and arsenic by 7060.

2. 3- Explosives includes DNT, HMX, nitroglycerine, PETN, RDX, TNT, tetryl, and nitroguanidine.

3. 4- Number of samples presented includes surface samples for Range C-62 and Range C-52N, respectively.

4. 5- Rinsate blanks are not required for surface samples. Dedicated sample scoops will be used for each location.

5. 6- Trip blanks are for volatile organics only.

preprinted and prenumbered label immediately after collection. Information concerning preservation methods, matrix, and sample location ~~will~~ was also ~~be~~ included on the label.

Samples ~~will be~~ were shipped in hard-sided plastic ice chests and ~~will be~~ were kept at 4°C from time of sample collection until analysis. Sample containers ~~will be~~ were supplied by the laboratory designated to perform analytical work. Coolers ~~will be~~ were secured with tape and tamper-proof chain-of-custody seals. The samples ~~will be~~ were delivered overnight under chain-of-custody control to the analytical laboratory.

#### II.G6.4 Sampling and Analysis Procedures [40 CFR 264.97(d)(3), 40 CFR 264.600, and 40 CFR 270.23]

Tables II-15 through II-20 show the number and type of samples, analytical procedures, containers, preservation, and sample holding times for sampling at the EAFB OB/OD units, as follows:

<u>Table Reference</u>	<u>Activity</u>
II-15	Range C-62 ground water ( <del>monitoring wells</del> )
II-16	Range C-52N ground water ( <del>monitoring wells</del> )
<del>II-17</del>	<del>Range C-62 and C-52N ground water (temp. well points)</del>
II-18	Range C-62 subsurface soil
II-19	Range C-52N subsurface soil
II-20	Range C-62 and C-52N surface soil

#### II.G6.5 Determination of the Ground-water Surface Elevation Each Time Ground Water is Sampled [40 CFR 270.23(e)]

All water-level measurements at the various wells will be obtained each time ground water is sampled using an electric water level meter. The water level will be accurate to within 0.01 in. The tape will be rinsed with deionized water, wiped with a fresh cloth, and allowed to air dry between consecutive water-level measurements.

The relative elevation difference between surface water and the wells will be determined to  $\pm 0.50$  ft at the time of sampling using a surveyor's level and adjacent well casing elevations for control. These measurements will be used to generate a ground-water monitoring program.

#### II.G6.6 Vadose Zone Monitoring [40 CFR 270.23(e) and 40 CFR 270.32(b)(2)]

Vadose zone monitoring will be of little value at the treatment areas because unconsolidated materials consist of high permeability sand and gravel. The limited capillary fringe in these materials results in an insignificant quantity of moisture stored in the vadose zone. Therefore, vadose zone monitoring is not included in the proposed ground-water monitoring program.

#### II.G6.7 Field Measurements, Well Evacuation [40 CFR 270.23(e)]

Field measurements will include depth to water table, identification of LNAPL or DNAPL, dissolved oxygen, pH, temperature, conductivity, and turbidity. Procedures will be in accordance with Region IV SOP and the TEGD as described in the SAP.

Well evacuation (purging) is addressed in Section II.G6.2, Sample Collection.

#### II.G6.8 Sample Preparation [40 CFR 270.23(e)]

~~Ground-water samples collected for dissolved contaminants will be filtered using a peristaltic pump and an in-line 0.45- $\mu$ m filter.~~ Samples collected for metals analysis will be preserved in nitric acid to maintain a low pH environment. While it is understood that FDEP only accepts total metals data for comparison purposes, filtered samples (dissolved metals) will also be collected for completeness. Ground-water samples for dissolved analyses will be filtered in the field using a peristaltic pump and an in-line 0.45- $\mu$ m filter and then preserved to a pH <2. The SAP discusses these procedures in greater detail. Other sample preparation techniques are discussed earlier in this section.

#### II.G6.9 Analytical Procedures [40 CFR 270.23(e)]

Analytical procedures are listed in Tables II-15 through II-20.

#### II.G6.10 QA/QC Procedures [40 CFR 270.23(e)]

QA/QC procedures will be implemented to verify that sample collection and handling processes have not affected the quality of the field samples. Equipment and field blanks, designed to provide a check on field and laboratory procedures, will be collected once every 3 days per matrix. Trip blanks will be collected when samples for volatile organic analysis are

collected, if required. Duplicate samples will be collected from each of the three areas. One duplicate sample per matrix will be collected from each area. Laboratory QA/QC samples (including matrix spikes and matrix spike duplicates) will be analyzed in accordance with analytical method reporting requirements.

~~A Quality Assurance Project Plan (QAPP) will be~~ QAP was submitted to Region IV EPA and FDEP in August 1994 prior to the initiation of the baseline sampling program for soil and ground water. ~~The QAPP will be consistent with the Sampling and Analysis Plan (SAP) dated March 1994 provided as Appendix I to this permit application. Upon approval of the sampling program specified in the SAP, a QAPP will be~~ was developed commensurate with the data quality objectives and the quality assurance requirements of SW-846.

~~The QAPP proposed for the baseline sampling program will be~~ was developed based on EPA Level III project requirements. This level ~~is proposed~~ was used for the baseline monitoring plan because the plan will produce results for the purpose of evaluating and selecting basic options. It is a preliminary assessment of a generally unexplored area that may lead to further work, such as detection monitoring, and possibly compliance monitoring. The QAPP Table of Contents is provided as Table II-21.

#### II.G6.11 Data Evaluation and Reporting [40 CFR 270.23(e)]

Upon completion of field efforts and the subsequent laboratory analysis of environmental samples, a reports will be prepared for the final description of the status of observed contamination in areas of concern. The data collected from the SAP will be evaluated and summarized in the report that will be submitted to FDEP and USEPA Region IV Administrators. The reports will document the sampling locations, sampling methods, QA/QC procedures, and results of the analyses. In addition, the reports will interpret the sampling data in terms of characterization. Detailed summaries of each of the field investigative techniques, including soil sampling, monitor well installation, and monitoring well sampling will be provided. Final data will be presented in graphic format whenever possible, and all patterns and trends in the data will be identified and computer contoured. Data Summary Reports for the baseline and second quarter sampling event are provided as Appendices L-2 and L-3 to this application.



TABLE II-21 QUALITY ASSURANCE PROJECT PLAN (QAPP) TABLE OF CONTENTS

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TABLE II-21 (Cont.)

- 6.2.1 Field Activities
- 6.2.2 Laboratory Activities

6.3 Quality Assurance Reports

NOTES:

1. QAPP shall be prepared by entity with approved Florida DEP Comprehensive Quality Assurance Program (CompQAP).
2. QAPP shall be prepared in accordance with Section 5.0 of DER Manual for Preparing Quality Assurance Plans (DER-QA-001/90) dated 30 September 1992.

#### II.G6.12 Chain-of-Custody Control [40 CFR 264.97(d)(4), 40 CFR 264.600, and 40 CFR 270.23]

The chain-of-custody provisions are detailed in the SAP, and will conform to EPA requirements as specified in Section 4.4 of the TEGD and Section 3 of the Region IV SOP.

#### II.G7 DETECTION MONITORING PROGRAM INFORMATION [40 CFR 270.14(c)(6), 40 CFR 264.98, 40 CFR 264.60, and 40 CFR 270.23]

The baseline ground-water monitoring program ~~at the EOD Range~~ for the OB/OD units was described in the previous section, "Proposed Ground-Water Monitoring Program." All facets of the baseline monitoring program, ~~with the exception of analytical parameters, will be~~ are used in the detection monitoring program during the first year of site monitoring. Analytical results obtained from the baseline monitoring program (first quarter), along with the results from the first three sampling events of the detection monitoring program (second, third, and fourth quarters), will be evaluated to determine if there is statistically significant evidence of contamination for any indicator parameter. After the first four quarters of full analytical characterization, the analytical suite for detection monitoring will be reduced to a listing of indicator parameters (see Section II.G7.1). Detection monitoring will continue as long as there is no statistically significant evidence of ground-water contamination. If statistically significant evidence of ground-water contamination is detected, additional characterization of the affected ranges will be performed ~~under IRP~~.

##### II.G7.1 Indicator Parameters [40 CFR 270.14(c)(6)(i), 40 CFR 264.98(a)(i), 40 CFR 264.600, and 40 CFR 270.23]

Indicator parameters for the detection monitoring program are ~~barium, lead, sulfides, sulfates, nitrites, nitrates, ammonia, total Kjeldahl nitrogen, and Total Petroleum Hydrocarbons (TPH)~~ identical to those proposed for the baseline (first quarter) sampling event as shown in Tables II-15 through II-20. The metallic species (~~barium and lead~~) are the ~~two~~ hazardous constituents ~~metals~~ most commonly found in the wastes and materials treated at the OB/OD units. Less frequently encountered metallic species are not expected to behave differently from barium and lead in the subsurface environment. Therefore, the presence of either of these metals will be indicative of the presence of other metals contained in the OB/OD wastes and materials.

Sulfur compounds are included in many of the Eglin OB/OD ordnance items, with combustion and degradation products consisting of numerous compounds containing sulfide or sulfate. Therefore, analyses of these analytes will be indicative of the presence of combustion products, or products of incomplete combustion (PICs) in the ground water.

Nitrogen species are included as indicator parameters as the vast majority of energetic mixtures contained in the wastes treated at the OB/OD units include nitrogen-bearing compounds. If unburned PEP compounds and/or PICs are present, numerous nitrogen-rich compounds may be present in the ground water. Many of these compounds do not have standard analytical procedures. Therefore, analysis of these nitrogen analytes (summing to total nitrogen), can be indicative of the presence of unburned or partially combusted explosive compounds. Although some PEP compounds do not contain nitrogen, they are treated at the OB/OD units much less frequently than nitrogen-containing compounds. Additionally, their behavior in the subsurface environment is not expected to be different from the behavior of nitrogen-containing compounds. Therefore, use of nitrogen analytes can also be indicative of the presence of PICs resulting from energetic compounds not containing nitrogen.

The last indicator analyte, TPH, is indicative of the presence of petroleum contamination potentially resulting if a release of virgin diesel fuel were to occur.

#### II.G7.2 Hazardous Constituents [40 CFR 270.14(c)(6)(i), 40 CFR 265.600, and 40 CFR 270.23]

A list of hazardous constituents potentially present in the ground water as a result of Eglin OB/OD operations is contained in Tables II-15 ~~through~~ and II-17 16. Note that many of the RCRA Appendix IX hazardous constituents are not contained in these tables because they are not included in the wastes and materials present at the OB/OD units, and their detection in the vicinity of the OB/OD units is therefore not anticipated. However, to confirm that RCRA Appendix IX analytes are not present, Appendix IX sampling will be performed during the third round of ground-water sampling under the first year of the ground-water detection monitoring program. Tables II-15 ~~through~~ II-17 16 also contain several compounds, principally found in energetic mixtures, which are not hazardous constituents.

### II.G7.3 Proposed Ground-Water Monitoring System [40 CFR 270.14(c)(6)(ii), 40 CFR 264.600, and 40 CFR 270.23]

The ~~proposed~~ ground-water monitoring system for the OB/OD units at Eglin AFB is described in Section II.G6.1. Well ~~and well-point~~ locations at OB/OD areas are shown in Figures II-16 and II-17.

### II.G7.4 Background Values for Each Proposed Monitoring Parameter or Constituent [40 CFR 270.14(c)(6)(iii), 40 CFR 264.600, and 40 CFR 270.23]

Background values have not yet been determined ~~because ground-water monitoring at the OD/OD areas has not yet been performed.~~ Background concentrations will be calculated statistically following completion of four sampling events at the upgradient wells.

### II.G7.5 Description of Proposed Sampling, Analysis, and Statistical Comparison Procedures [40 CFR 270.14(c)(6)(iv), 40 CFR 264.600, and 40 CFR 270.23]

The sampling and analytical procedures described in Section II.G6 apply to the detection monitoring program, ~~with the exception of the use of indicator analytes rather than a broader analytical suite.~~ Samples will be collected from each of the ~~three~~ monitoring wells/~~well-points~~ and analyzed for the indicator analytes for three consecutive quarters. Duplicate analyses at a frequency of 10 percent will be performed. Equipment blanks, trip blanks, and other field and laboratory QA/QC checks will be collected and analyzed as specified in the QAP and SAP. These data, along with data collected in the baseline monitoring program (first quarter), will be evaluated statistically using a parametric analysis of variance (ANOVA), as described in 40 CFR 264.97(h)(1). This statistical test will be conducted separately for each indicator compound in each monitoring well ~~point~~. If there is no statistically significant evidence of ground-water contamination after the third detection monitoring sampling event (fourth sampling event in total), the sampling frequency will be reduced to semiannual. This statistical evaluation will be performed after each subsequent detection monitoring event.

If the occasion exists where, statistically, evidence of ground-water contamination is determined, the following actions will be taken:

- The USEPA Region IV Regional Administrator and the FDEP Administrator will be notified after completion of the statistical

evaluation, including details concerning which analytes have shown statistically significant evidence of contamination.

- All wells/~~well points~~ will be resampled after completion of the statistical evaluation, with samples analyzed for all parameters contained in Table II-15.
- If any analyte is detected in a downgradient monitoring well ~~point~~, EAFB reserves the right to resample and repeat the analyses to verify the analytical results.
- Additional site characterization ~~under IRP~~ will be initiated to assess potential ground-water contamination at the OB/OD units.

#### II.G7.6 Recordkeeping Of Ground-Water Analytical Data [40 CFR 264.98(c) and (g)]

All ground-water monitoring data, obtained in accordance with the detection monitoring program requirements (described below), will be maintained in the form necessary for the determination of statistical significance. The records will be maintained for a period of 5 years.

#### II.G8 COMPLIANCE MONITORING PROGRAM [40 CFR 270.14(c)(7) and 40 CFR 264.99]

~~Since the OB/OD units at EAFB are located on active bombing/training ranges, it is unlikely that ground-water monitoring will be able to distinguish between contamination associated with OB/OD activities and contamination associated with active bombing/training mission uses of the ranges (if contamination is encountered). Consequently, compliance monitoring under RCRA for the OB/OD units is not appropriate.~~ If the detection monitoring program described in this application identifies evidence of ground-water contamination, additional site characterization to consider potential OB/OD as well as other range use contribution will be initiated under the USAF Installation Restoration Program (IRP) or other USAF programs in accordance with applicable RCRA provisions. EAFB's projected IRP activities within the next 5 years include provisions for assessment of sites at Range C-52N and Range C-62, including the C-62 OB/OD unit. Compliance monitoring and/or corrective action, as appropriate, under applicable RCRA provisions will be implemented. If compliance monitoring is necessary, the scope of the compliance monitoring program will be discussed with FDEP and EPA prior to

implementation. ~~Since potential for contamination associated with OB/OD activities is likely to be much less than potential for contamination associated with active range uses, it is more appropriate to address long-term characterization/remediation at both ranges under IRP than under the RCRA provisions for the OB/OD units.~~

**II.G9 CORRECTIVE ACTION PROGRAM OR DATA SHOWING THAT THE EXISTING LEVELS ARE NOT HARMFUL [40 CFR 270.14(c)(8) and 40 CFR 264.100]**

A corrective action program is not anticipated to be required under RCRA. If detection monitoring indicates potential ground-water contamination at either of the OB/OD units, additional site characterization to address potential contribution from OB/OD units as well as potential contribution from active bombing/training mission site uses, will be implemented and remedial action implemented, as appropriate under the USAF IRP or other USAF programs in accordance with applicable provisions of RCRA.

## **II.H PROTECTION OF SURFACE WATER**

### **II.H1 VOLUME, PHYSICAL, AND CHEMICAL CHARACTERISTICS OF THE WASTE**

[40 CFR 264.601]

Section III.B1 addresses the volume and physical and chemical characteristics of the waste in units.

### **II.H2 PREVENTION OF MIGRATION OF WASTES TO SURFACE WATER**

[40 CFR 264.601]

OB operations are conducted in a containment device that prevents significant dispersal of any fragments and residual ash. After completion of the burn, the residue is collected and removed from the containment device.

OD activities are not contained by any physical structures; however, OD activities are performed in shallow depressions created by previous detonation or bombing activities, and the inherent nature of OD results in nearly complete destruction of waste materials.

Materials to be treated by OB/OD remain in containers (bomb cases, shells) until actual detonation. The physical characteristics (non-liquid) of the wastes treated at the OB/OD areas prevents them from being a spill concern.

In addition, the natural porosity of the surficial sand/gravel soil is such that the surface and subsurface promote drainage. Run-on or run-off controls would likely provide little additional deterrence to run-on or run-off.

#### **II.H2.1 Hydrologic Characteristics and Topography [40 CFR 264.601]**

The hydrologic characteristics of the unit and the surrounding area, including the topography of the land around the unit, are described in Section II.B.

#### **II.H2.2 Precipitation Patterns [40 CFR 264.601]**

Refer to Section III.C for the precipitation patterns for the OB/OD units and the surrounding area.



### II.H2.3 Ground-Water Flow [40 CFR 264.601]

In general, ground water flows southwesterly in the immediate vicinity of OB/OD units at both Ranges C-52N and C-62. The quantity, quality, and direction of ground-water flow is discussed in Section III.B3.

### II.H2.4 Proximity of Units to Surface Waters [40 CFR 264.601]

The nearest surface waterbody to the Range C-62 OB unit is the headwaters at Blount Mill Creek—320 ft west of the burn kettles. Blount Mill Creek is also the nearest surface water body to the Range C-62 unit—800 ft southwest of the OD unit. The C-52N OD unit is equidistant between Bay Head Beach and Coon Head Beach ( $\pm 1,600$  ft) which join together to form Basin Creek approximately 2.5 mi south of the site. Based on the relatively flat surface topography at both ranges, the distance to surface waters, and the high permeability of surface soil, downgradient transport to surface water is unlikely.

Section III.B4 provides information on water and surface soil quality standards, data, and uses.

### II.H2.5 Land Use [40 CFR 264.601]

The patterns of land use in the region are described in Section II.A.

### II.H2.6 Potential Human Exposure to Waste Constituents [40 CFR 264.601]

The potential health risks caused by human exposure to waste constituents are described in Section III.D.

### II.H2.7 Potential Damage to the Environment and Physical Structures [40 CFR 264.601]

The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents is discussed in Section III.D.

## **II.I OTHER APPLICABLE REGULATIONS**

### **II.I1 WILD AND SCENIC RIVERS ACT [40 CFR 270.3(a)]**

This Act does not apply to the OB/OD operations because there are no wild and scenic rivers affected by this facility.

### **II.I2 NATIONAL HISTORIC PRESERVATION ACT [40 CFR 270.3(b)]**

There are no structures on Ranges C-52N or C-62 which are listed or eligible for the National Register of Historic Places. Extrapolation from investigations in other similar environmental zones on EAFB indicate that there is a very low probability of the presence of cultural resources. The type of activities (i.e., bombing) which have been carried out in the last 50 years could have resulted in severe impact to cultural resources and their integrity. This action will occur only in previously disturbed areas.

### **II.I3 ENDANGERED SPECIES ACT [40 CFR 270.3(c)]**

Forty-five plant and sixty-two animal rare/endangered species are known to thrive in Walton County (Appendix J). A partial list of the rare/endangered species found in Walton County include the white-top pitcher-plant, orange azaleas, the red-cockaded woodpecker, the southeastern American kestrel, the American alligator, the Eastern indigo snake, pine barrens tree frog, and the leatherback sea turtle. Locally, the red-cockaded woodpecker range is encountered approximately 6 mi south of Range C-62, along Little Alaqua and Alaqua Creeks. The pine barrens tree frog is found in seepage slopes and seepage stream habitats. The pine barrens tree frog in the vicinity of Range C-62 encompasses the upper half of the Blount Mill Creek Watershed. Other threatened or endangered species which may inhabit areas within 4 mi of Range C-52N include the Eastern indigo snake, the Arctic peregrine falcon, and the Florida black bear.

No critical habitats of any endangered/threatened species are known to exist on or within 0.5 mi of the OB/OD units.

#### II.I4 COASTAL ZONE MANAGEMENT ACT [40 CFR 270.3(d)]

The Coastal Zone Management Act does not apply because both OB/OD units are not within areas regulated under this law.

#### II.I5 THE FISH AND WILDLIFE COORDINATION ACT [40 CFR 270.3(e)]

This act does not apply to the OB/OD units because the impoundment, diversion, or other control or modification of any body of water is not proposed.

#### II.I6 UNIT IS CLASSIFIED AS A "MISCELLANEOUS UNIT" [40 CFR 264.600]

The treatment units are considered as "Miscellaneous Units" under Subpart X of the RCRA regulations.

#### II.I7 UNIT IS CLASSIFIED AS A PROCESS VENT [40 CFR 263.600]

This is not applicable because there are no process units with vents for these treatment units.

#### II.I8 UNIT IS SUBJECT TO EQUIPMENT LEAKS [40 CFR 264.1050]

The only potentially applicable treatment unit equipment is the OB burn kettle. A description of its operation (including inspections) is in Section II.A3, Description of Treatment Units.

### **III.A PROCESS INFORMATION**

Applicability as a "Miscellaneous Unit" [40 CFR 264.600 and 270.23 56 FR 720002 (2/21/92) and 52 FR 469252 (12/10/87)]

Activities performed at the OB/OD units at EAFB consist of treatment in "miscellaneous units," as defined in 40 CFR 260.10 in the RCRA regulations. Specifically, the units do not meet the definition of containers, tanks, surface impoundments, piles, land treatment units, landfills, incinerators, boilers, industrial furnaces, underground injection wells, or units eligible for research, development and demonstration permits. Additionally, the preamble to the Subpart X regulations specifically states that the miscellaneous unit regulations are applicable to OB/OD activities for propellants, explosives and pyrotechnics (PEP).

#### **III.A1 OPEN BURNING (OB) IN CONTAINMENT DEVICES WHERE UNIT DOES NOT INCORPORATE SOIL AS PART OF THE UNIT [40 CFR 270.23 AND 270.32]**

##### **III.A1.1 Appropriateness of Treatment Methods [40 CFR 270.32(b)]**

Open burning or open detonation is the most physically safe means available to dispose of explosive waste or developmental munitions. The Department of Transportation (DOT) forbids transport of these materials on public highways. Other explosive items that require local disposal are munitions that have been subjected to testing or have exceeded their shelf or service life. Many of these items must be destroyed at an OB/OD unit since they cannot be safely moved. When munitions that are DOD inventory items (in use by combat forces) exceed their shelf or storage life, they are normally transported to demilitarization facilities for disposal. Munitions and explosives are not transported to a central point for disposal when the safety of the items does not allow.

Open burning or open detonation is appropriate as the most physically safe means to dispose of research, development or test munitions and explosives. Treatment through chemical disposal may result in a greater pollution potential due to the increase in waste volume. The chemicals most commonly used to dispose of military explosives are sodium hydroxide and sodium sulfide solutions. Thirty to forty parts of solution are required for each part of explosive by weight. For example, an MK 84 bomb, a typical munition that might be treated at the OD unit, containing approximately 1,000 lb of tritonal (a TNT-based explosive) would require approximately 30,000-40,000 lb of sodium sulfide solution to dispose of the explosive. This

solution must then be shipped to an appropriate permitted facility for disposal. Burning or detonation of the MK 84 generates water, carbon dioxide, nitrogen oxide, oxygen, and nitrogen when burned or detonated in open air. These products have a lesser potential adverse environmental impact than 30,000 lbs of contaminated sodium sulfide.

The Department of Defense Ordnance Executive Environmental Steering Committee has prepared an OB/OD Justification Document that addresses appropriateness of OB/OD for explosives treatment at EAFB (Appendix K). This document addresses several programs that are, or will be, implemented by military installations to reduce, recycle, and safely treat explosive ordnance. Alternatives to OB/OD for explosive ordnance identified in the DOD justification document include the following:

- Separator and disassembly technologies
- Destruction by incineration
- Waste minimization
- Recycling
- Foreign military sales

EAFB has adopted waste minimization as an alternative technology to OB/OD. In an effort to reduce and prevent munitions from being unserviceable, the following policies have been adopted:

- Rocket motors with suspected cracks in the propellant are x-rayed to determine serviceability prior to disposal.
- Items exceeding service or shelf life may be extended or restricted to training use only.
- Many types of aircraft crew ejection items are returned to manufacturer for reconditioning after service life expires.
- Explosive items receive periodic inspections and maintenance to determine serviceability prior to disposal.

- Items may be restricted from issue to specific units, activities or geographical areas by reason of their limited usefulness or short service life expectancy, rather than being destroyed.
- Items are continually screened and placed in priority issue when they are within two years of shelf life expiration or serviceable life has begun.
- Certain munitions undergo tests, alteration, modification, conversion or disassembly to prevent them from becoming unserviceable.
- Some munitions have been suspended from normal use, except emergency combat use, instead of being destroyed.

The current OB/OD treatment technologies are very safe for handlers. In the process of refining OB/OD procedures throughout DOD, numerous SOPs have been developed which specifically ensure the safety of handlers. In fact, one of the key limitations to implementing alternative technologies is that the quality of worker safety provisions is not verified.

### III.A1.2 Containment Device Description [40 CFR 270.23(a)]

#### III.A1.2.1 Physical Characteristics, Construction Materials, and Dimensions of the Unit [40 CFR 270.23(a)(1)]

All OB operations treating reactive hazardous wastes occur in metal containment structures (reinforced steel burn kettles). The burn kettles used for these activities were designed to meet the following objectives:

- Prevent incorporation of soil into the materials being burned.
- Contain fuels used in OB operations to prevent releases to the environment.
- Minimize the ejection of materials from the device onto the ground.
- Retain a large quantity of the heat generated during the burn.

- Retain the minor detonations which might occur when munitions are burned.

Two new burn kettles were installed in May 1989. Each unit consists of one 8-ft x 8-ft x 20-ft container. Sides and bottom are constructed of 1/2-in. steel plate continuously welded on the interior with a reinforced 4-in. x 3-in. x 1/4-in. rectangular tubing top rail. Side walls and bottom are reinforced with 4 in. x 5.4# structural channel on 30-in. centers. Both are equipped with hinged rear doors. The doors are 1/2 in. plate with a 4 in. x 5.4# structural channel reinforcement. A 6-in. steel dam is welded at the door opening to the burn kettle where wastes are placed to provide additional containment of virgin fuel oil used to initiate burning.

The integrity of the existing burn kettles is expected to deteriorate with time, necessitating renovation or replacement of the device. Replacement devices may not necessarily consist of burn kettles, as presently used. Although specific designs or dimensions of future containment devices cannot be identified at this time, all devices will meet the containment objectives provided above. Additionally, the dimensions of the existing device will be typical of future devices.

#### III.A1.2.2 Engineering Drawings of the Fabricated Device [40 CFR 270.23(a)(2)]

Figure II-6 provides details and cross sections of the OB units used at EAFB. Figure II-7 shows the plan view of the OB area. Additional manufacturer's information on the burn kettles is provided in Appendix B.

#### III.A1.2.3 Lining Material Within Device [40 CFR 270.23(a)(1) and (2)]

No lining materials are present in the existing burn kettles, although a steel dam has been welded in place at the kettle outlet to provide additional containment of virgin fuel oil used to initiate burning.

#### III.A1.2.4 Lining Material Below Device [40 CFR 270.23(a)(1) and (2)]

Each burn kettle is underlain by 2 ft of compacted soil cover and a 10 x 25-ft, 6-mil Kevlar reinforced polyethylene liner that was installed in 1992.

### III.A1.3 Leak Detection Provisions [40 CFR 270.23(a)(1) and (2)]

Following residue collection and wash down at the end of each burn event, each burn kettle is inspected to ensure there are no holes, cracks, or other weaknesses in the structure of the device, thus detecting any leaks that may have occurred. This same inspection procedure is performed before the device is refilled prior to subsequent OB events. These activities prevent wastes or materials placed within the device from leaking, and therefore prevent releases to the environment.

A ground-water monitoring program will also be implemented to provide additional leak detection capability. The ground-water monitoring program is described in Section II.G.

### III.A1.4 Precipitation Cover [40 CFR 270.23(a)(1) and (2)]

All ash is removed from the burn kettle and the kettles are cleaned subsequent to OB treatment. Wash-down water is collected and analyzed prior to disposal. The kettles are then covered with a nylon tarpaulin between OB events to prevent precipitation from collecting. Liquid that is collected during an OB event and does not evaporate will be handled according to the results of ash analysis and disposed accordingly. If the ash exhibits hazardous characteristics, liquid and ash will be sent to an off-site RCRA-permitted disposal facility. If the ash does not exhibit hazardous characteristics, liquid will be left in the kettle and allowed to evaporate. Ash will be disposed in a permitted landfill. In the event that too much liquid collects in the kettles to evaporate, it will be collected and discharged to the sanitary sewer after ash sampling. Rain water that collects in between uses is discharged directly to the ground through a valve at the rear of each kettle. Per March 1992 analytical results of TCLP for burn residue from kettles (Appendix L), results indicated that residue did not exhibit characteristics of toxicity under RCRA.

### III.A1.5 Control of Releases of Ashes and Residues During OB (Integrity of Containment Devices) [40 CFR 270.23(a)(1)(2)]

Some of the wastes treated in the containment device may have a tendency to be ejected from the device during certain circumstances. To minimize ejection of partially burned wastes, all materials and wastes are placed at least 2 ft below the top of the containment device. Since this does not completely prevent the ejection of wastes from the containment device, EOD staff perform post-burn surface clearance to identify, collect, and properly manage any untreated



wastes that may have been ejected. Post-burn clearance activities are conducted no earlier than 12 hours after completion of an OB event to ensure that the area is safe to approach. To facilitate location and collection of ejected wastes following completion of each burn event, a cleared area (approximately 175 ft in diameter) is maintained around the OB burn kettles. The ground surface is relatively level and consists of white sand. Ejected wastes can easily be identified and collected, as appropriate. Ash and other residues are removed from the containment device the day after the burn is completed. This action further minimizes the potential for release of ash.

A final procedure to prevent release of residues from the OB containment device is to regularly monitor the integrity of the device and repair it if there is a concern over its integrity. Following residue collection at the end of each burn event, the device is inspected to detect holes, cracks, or other weaknesses in the structure of the device. This same inspection procedure is performed before the device is refilled prior to subsequent OB events.

#### III.A1.6 Methods to Control Deterioration of Fabricated Devices [40 CFR 270.23(a)(1) and (2)]

Deterioration of containment devices is not controlled; however, the device is routinely inspected for deterioration and maintained if deterioration is evident. At that time, the device is inspected to detect holes, cracks, or other weaknesses in the structure of the device. The same inspection procedure is performed prior to subsequent OB events. If a weak spot or hole is observed, a new 1/2-in. steel plate will be welded over the problem area. Welding will only occur when no energetic materials are present at Range C-62.

#### III.A1.7 Prevention of Accumulation of Precipitation [40 CFR 270.23(a)(1) and (2)]

Although attempts are made not to schedule burn activities during and immediately preceding rainfall events, measurable precipitation may occur in the vicinity of the OB/OD units on any day of the year. Additionally, it is impossible to predict with complete certainty if measurable precipitation will occur after the burn and before the containment device can be approached. Therefore, measures are taken to minimize the accumulation of precipitation in the OB containment device, since complete prevention of accumulation of precipitation is nearly impossible.

The following measures are implemented to minimize accumulation of precipitation. After the containment device can be safely approached following completion of the burn (not later than 24 hours after the burn was initiated), EOD personnel inspect and collect the residues contained within the device. The containment device is then washed down and washwater is collected, analyzed, and disposed. A nylon tarpulin is then used to cover the containment device between uses.

#### **III.A1.8 Handling of Precipitation Accumulated in Fabricated Devices [40 CFR 270.23(a)(1) and (2)]**

After the containment device can be safely approached following completion of the burn (not later than 24 hours after the burn was initiated), EOD personnel inspect and collect the residues contained within the device. The containment device is then washed and washdown water is collected and analyzed prior to disposal. It is then covered with a nylon tarpulin to minimize collection of precipitation between uses.

If precipitation collects in the burn kettle between uses, it is discharged through the drain valve at the end of each kettle. Results of post-OB TCLP chemical analysis of ash in March 1992 indicated that all parameters were below reporting limits (Appendix L) for samples collected from the C-62 burn kettles 3 days after OB treatment. Additional waste residue sampling is planned for the future, as discussed in Section II.G.

#### **III.A1.9 Controls to Prevent Wind Dispersion of Ash and Other Residue [40 CFR 270.23(a)(1) and (2)]**

The design of the containment device, and procedures for placement of wastes and materials within the device, are such that the ejection of residues from the device during the burn is minimized. Additionally, following completion of the burn, ash and other residue is routinely only several inches deep (well below the top of the containment device). Furthermore, ash is removed from the device soon after the burn is completed and never later than the day after the burn (12-24 hours after completion), further minimizing the opportunity for ash to be dispersed by the wind.

#### **III.A1.10 Inspection, Monitoring, and Maintenance Plan [40 CFR 270.23(a)(2)]**

Routine inspection of the OB burn kettles is discussed in Section III.A1.6. More specific inspection procedures for the OB/OD units are described in Section II.C2 of this application.

The OB containment device is not approached for at least 12 hours after a burn is conducted to ensure the burn is completed and residue has cooled. Not later than 24 hours after the burn occurs, residue management and inspection procedures are implemented. Residues within the containment device are inspected to ensure all items have been successfully burned. Items remaining in the containment device that still contain energetic material are treated by open detonation on the same day.

### III.A1.11 Ash and Residue Management [40 CFR 270.23(a)(2)]

The following OB residue management procedures, described in the EAFB OB/OD Residue Management Plan (Appendix E), are implemented as soon as the containment device can be approached.

- *Ash Contained in the Containment Device*—separated from metallic fragments, collected, analyzed for reactivity and TCLP metals, containerized, and disposed of properly based on the results of the analytical testing.
- *Large Metallic Fragments Not Containing Energetic Materials, Located in the Containment Device*—separated from the ash, collected, and accumulated for shipment to the Defense Reutilization Marketing Office (DRMO) to facilitate recycle.
- *Metallic Fragments Containing Energetic Materials Located in the Containment Device*—treated by detonation on the day they are located.
- *Metallic Fragments Containing Energetic Materials Ejected from the Containment Device*—treated by detonation the day they are located.
- *Large Metallic Fragments Not Containing Energetic Materials Ejected from the Containment Device*—collected, accumulated for shipment to the DRMO to facilitate recycle.

### III.A1.12 Copy of Standard Operating Procedures (SOPs) [40 CFR 270.23(a)(2)]

A significant number of U.S. Air Force and EAFB SOPs have been developed to effectively perform both OB and OD operations. A brief summary of the principal SOPs follows:

#### 1. Squadron Operating Instruction (SOI) 136-18: Range Operations

This document is an 11-page outline for all procedures conducted on the range. A copy of SOI 136-18 is provided as Appendix C. This document, in turn, references other documents which are Air Force-wide documents (not included as an appendix to this application):

<del>AFR</del> <del>127-100</del> :	AFMAN 91-201:	Explosives Safety Standards
<del>AFR</del> <del>205-1</del> :	AFI 31-401:	Information Security Program
<del>AFDTCR</del> <del>55-2</del> :	AFI 13-201:	Mission Scheduling and Control
AFMCR 136-7:		Explosives Ordnance Disposal
AFDTCR 136-6:		Armament Technical Data Requirements
AFDTCR 91-2:		Maintenance of Land Test Areas
AFDTCR 127-1:		Range Safety
TO 00-5-1:		AF Technical Order System
TO 11A-1-42:		General Instructions for Disposal of Conventional Munitions
TO 11A-1-66:		General Instructions, Demolition
TO 60A-1-22:		General EOD Safety Precautions
TO 60A-1-1-31:		Explosive Ordnance Disposal (EOD) Procedures

#### 2. Air Force Development Test Center (AFDTC) Regulation 127-5, Designation of Explosives Loading/Unloading and Arm/Dearm Areas and Explosives Laden Vehicle Routes (Appendix C).

This document establishes designated loading/unloading and arming/dearming areas on EAFB. It also identifies authorized explosive-laden vehicle routes.

#### 3. Technical Order 11A-1-42, General Instructions for Disposal of Conventional Munitions (Appendix F).

This is a comprehensive USAF-wide document which details procedures for disposal/demolition of a wide variety of munitions. Chapter headings of significance for this application are:

- Safety and Accident Prevention
- Description of Demolition Materials
- Methods of Disposal
- Firings Systems Procedures
- Treatment of Chemical Agent Casualties
- Munitions Disposal Procedures
- Missile Explosive Components
- Rocket Motors and Warheads
- Aircraft Egress Items

4. Technical Order 11-A-1-46, Fire Fighting Guidance, Transportation, and Storage Management Data and Ammunition Complete Round Chart [not included as an Appendix to this application].

This document presents tables of munitions data, consisting of item, stock number, cross reference number, net explosive weight, and munitions description.

5. ~~AF Regulation 127-100~~ AF Manual 91-201, Explosives Safety Standards [not included as an Appendix to this application].

This document is USAF-wide and contains mechanical details of explosive safety. This document describes general handling of explosives and is not specifically oriented to EOD operations.

6. Technical Order 60A-1-1-31, Explosive Ordnance Disposal (EOD) Procedures [not included as an Appendix to this application].

This manual describes the type and nature of the materials and equipment used to conduct EOD disposal procedures. This document covers general instructions for explosive ordnance disposal and is not releasable. Most of the operational material is covered in TO 11A-1-42. Other areas covered in this document

include operations which are not included in this permit application, including emergency operations, training, etc.

### III.A2 OB ON THE GROUND SURFACE WHERE UNIT INCORPORATES THE SOIL AS PART OF THE UNIT [40 CFR 270.23 AND 270.23]

This section is not applicable to this application. All OB activities at EAFB occur within a containment device which prevents the incorporation of soil as part of the unit. These activities are addressed in Section III.A1.

### III.A3 OPEN DETONATION (OD) [40 CFR 270.23 AND 270.32]

#### III.A3.1 Appropriateness of Treatment Technology [40 CFR 270.32(b)]

The first portion of Section III.A1 provided a rationale for utilizing OB technology as the most appropriate treatment technology for energetic reactive hazardous wastes. This discussion is also applicable to OD activities. Given the large net explosive weight contained in many of the ordnance items routinely detonated at the EAFB OD unit, the potential for use of alternative technologies is even more limited than in OB.

#### III.A3.2 Description of OD Unit [40 CFR 270.32(b)]

##### III.A3.2.1 Physical Characteristics, Materials of Construction, and Dimensions of the Unit [40 CFR 270.23(a)(2)]

All OD operations occur at locations directly on the ground surface (designated areas at Range C-52N and Range C-62). Craters, which are artifacts from previous detonations (either OD or mission related), are used for OD events. Crater dimensions vary based upon the number and size of ordnance items to be detonated and range from 6 ft by 6 ft by 3 ft deep to 20 ft by 50 ft by 6 ft deep. There are no constructed items associated with OD. At Range C-52N, OD activities are conducted at the "Cat's Eye" (TT-8) target, which has been used for aircraft bombing/training missions for many years. A description of Range C-52N is provided in Appendix D. OD activities at Range C-62 are conducted at a cleared area south of bombing pylon TT-1, which is located on an active bombing/training range. A description of Range C-62 is also provided in Appendix D.

### III.A3.2.2 Engineering Plans and Drawings of the OD Unit [40 CFR 270.23(a)(2)]

Engineering plans or drawings of the OD unit are not applicable, since there are no man-made devices or structures at either location. General site plans of the areas showing the OD units are contained in Figures II-4 and II-5.

### III.A3.3 Inspection, Monitoring, and Maintenance Plan [40 CFR 270.23(a)(2)]

As there are no engineered facets of the OD system, and no movable parts, inspection and monitoring are very effective and quite simplified. Soon after the OD unit can be safely approached following completion of a detonation (generally within 1 hour of the detonation), the OD unit is inspected for any items which may remain after detonation. Items still containing energetic materials are detonated that day. Large metallic items not containing energetic materials are transported to DRMO for recycle/resale.

### III.A3.4 Ash and Residue Management [40 CFR 270.23(a)(2)]

The EAFB OB/OD Residue Management Plan, contained in Appendix E, has been specifically prepared to address management of ash and other residues resulting from OB/OD operations. The following OD residue management procedures, described in the Management Plan, are implemented as soon as the OD unit can be approached, generally within 1 hour of completion of the detonation:

- *Metallic Fragments Containing Energetic Materials*—collected and detonated the day they are located.
- *Large Metallic Fragments Not Containing Energetic Materials*—collected and accumulated for shipment to the DRMO to facilitate recycle.

Negligible quantities of ash are generated from OD operations. Therefore, the residue management procedures described above strictly address only metallic residues (principally metal fragments) which may remain after the detonation.

### III.A3.5 Run-On and Run-Off Management [40 CFR 270.23(a)(2)]

Both of the OD units are located on cleared areas of active bombing ranges on highly permeable materials. Furthermore, there is limited topographic relief across both treatment areas. Therefore, management of run-on and run-off at the OD units is not necessary.

### III.A3.6 Copy of SOPs [40 CFR 270.23(a)(2)]

The last portion of Section III.A1 of this application, Copy of SOPs, contains a summary of several SOPs which address operations both at OB and OD activities. It also references specific SOPs contained in Appendix C.

### III.A4 GEOLOGIC REPOSITORIES - PLACEMENT OF CONTAINERIZED HAZARDOUS WASTE OR BULK NON-LIQUID HAZARDOUS WASTE IN GEOLOGIC REPOSITORIES SUCH AS UNDERGROUND SALT FORMATIONS, MINES, OR CAVES [52 FR 46952 (12/10/87)]

This section is not applicable since EAFB wastes are not managed in geologic repositories.

### II.A5 DEACTIVATED MISSILE SILOS [52 FR 46952 (12/10/87)]

This section is not applicable since EAFB wastes are not managed in deactivated missile silos.

### III.A6 CERTAIN THERMAL TREATMENT UNITS OTHER THAN INCINERATORS

- Molten salt pyrolysis [52 FR 46952 (12/10/87)]
- Calcination [52 FR 46952 (12/10/87)]
- Wet-air oxidation [52 FR 46952 (12/10/87)]
- Microwave destruction [52 FR 46952 (12/10/87)]
- Carbon regeneration [52 FR 720001 (2/21/91)]
- Sludge dryers [52 FR 720102 (2/21/91)]

None of the six checklist items in this section are applicable since EAFB wastes are not managed in any of the above thermal treatment units.



**III.A7 CERTAIN CHEMICAL, PHYSICAL, AND BIOLOGICAL TREATMENT UNITS**  
**[52 FR 46952 (12/10/87)]**

This section is not applicable since EAFB wastes are not managed in chemical, physical, or biological treatment units.

### **III.B ENVIRONMENTAL PERFORMANCE STANDARDS**

#### **III.B1 QUANTITY AND PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE WASTE AND PRODUCTS OF COMBUSTION [40 CFR 264.601(a)(1), (b)(1), and 40 CFR 270.23]**

##### **III.B1.1 EPA Waste Code [40 CFR 270.23(e)]**

The majority of the wastes treated at the EAFB OB/OD units are hazardous due to their reactivity (D003) characteristics. Residue of ordnance items treated at the site may potentially be toxic, as characterized by TCLP, due to barium (D005), 2,4-dinitrotoluene (D030), and/or lead (D008) content.

##### **III.B1.2 Amount Burned at the Unit [40 CFR 264.601(a)(1) and 40 CFR 270.23]**

There are two burn kettles for which this RCRA permit application applies. Both of these burn kettles are located on Range C-62. As an example, an estimated 30,000 rounds of 20 mm/30 mm projectiles are burned at one time in one of these burn kettles. The numbers and types of specific munitions items comprising a single burn event are highly variable. Table II-2 provides a representative listing of munitions items and Appendix F-1 is a list of munitions that are treated in an OB event. The amount of material (including dunnage) to be burned is stacked to a maximum stack height of 6 ft. Approximately 50-100 gal of virgin diesel fuel and 2-3 ft of dunnage is placed in the burn kettle prior to adding the munitions to be burned.

##### **III.B1.3 Waste Composition Data [40 CFR 264.601(a)(1) and 40 CFR 270.23]**

Wastes that may be treated during the permit life are identified in Section II.B1 of this application. These wastes consist of an extensive list of ordnance items and energetic compounds provided in Tables II-1 and II-2.

Air pollutant emissions from OB/OD treatment consist primarily of combustion products and metal oxides and salts. The most prevalent combustion products include:

- carbon dioxide
- carbon monoxide
- nitrogen oxides
- ammonia
- sulfur oxides
- hydrogen sulfide
- water

Metals emissions can include oxides and/or salts (carbonates, chlorides, sulfates) of one or more of the following metals:

- aluminum
- antimony
- barium
- calcium
- copper
- iron
- lead
- magnesium
- potassium
- silver
- sodium
- strontium
- uranium
- zinc

In general, emissions of the metals and sulfur compounds are dependent upon ordnance composition as well as quantity treated, whereas emissions of the other combustion products are principally a function of the quantity and method of treatment.

In addition to the above contaminants, emissions of particulate matter can occur from OB/OD treatment. In particular, OD results in the ejection of soil particles into the air, a small percentage of which remains suspended and disperses with the plume. Particulate emissions from OB are principally associated with the diesel fuel and dunnage used to ensure complete treatment. Diesel fuel and dunnage also result in emissions of unburned hydrocarbons.

Air pollutant emissions from OB/OD treatment were quantified using established computer modeling procedures and mass balance techniques developed by DOD for detonation of military munitions, in conjunction with published air pollutant emission factors (Appendix M). These procedures, in general, predicted that all waste constituents would be completely reacted to form the combustion products and metal compounds listed above. In reality, treatment may not be 100 percent complete, and trace amounts of products of incomplete combustion (typically volatile and semivolatile organics) may be present in the plume. Also, untreated ordnance may sometimes be ejected from the OB containment unit and from OD, generally in

the form of relatively large pieces of non-explosive debris or shell casings and other fragments.

The following subsections describe the important physical and chemical properties of the wastes and combustion products at EAFB. Table III-1 summarizes the important physicochemical properties of the selected inorganic and organic chemicals of concern for EAFB, including molecular weight (MW), organic partition coefficient ( $K_{oc}$ ), log octanol-water partition coefficient ( $K_{ow}$ ), boiling and melting point, vapor pressure, and chemical degradation half-life. There are a number of physical and chemical processes that may be important in affecting the concentration of a chemical in the environment. These properties control the movement and persistence of a chemical in the various environmental media and are important for evaluating the exposure pathways for human and environmental receptors. These properties, such as solubility, Henry's law constant, and partition coefficients, strongly influence the chemical behavior of the contaminants and their susceptibilities to degradation induced by physical and biological agents. A brief description of the relevance of these properties to potential chemical release, transport, and fate is given below. Chemical-specific discussions are presented in more detail in Section III.D2.

#### III.B1.4 Solubility in Water [40 CFR 264.601(a)(1) and 40 CFR 270.23]

Water solubility is the maximum concentration of a chemical that dissolves in water at a specific temperature and pH (USEPA 1986). Solubility of an inorganic species can vary widely, depending on temperature, pH, Eh (redox potential), and the types and concentrations of complexing species present. As shown in Table III-1, solubilities range from insoluble (i.e., antimony, carbon black, iron) to 561,000 ppm solubility (i.e., hydrochloric acid), with most common organics falling between 1 and 100,000 ppm. Water solubility is a critical property affecting environmental fate. Highly soluble chemicals can be rapidly leached from wastes and contaminated soil and are generally mobile in ground water. Solubility is one of the controlling factors affecting leachate strength and migration of chemicals from waste sites (along with sorption potential, soil type, and water infiltration). Water solubility is especially important in the evaluation of aquatic exposure pathways. Solubility affects "leachability" into both ground water and surface water, and highly soluble compounds are usually less strongly adsorbed (thus more mobile) in both ground and surface water.

TABLE III-1 PHYSICOCHEMICAL PROPERTIES OF THE POTENTIAL CHEMICALS OF CONCERN AT THE EGLIN AIR FORCE BASE OB/OD AREAS

CHEMICAL NAME LISTED IN COMPOSITION/COMBUSTION LISTS	CHEMICAL FOR WHICH PROPERTIES ARE LISTED	Physical State (S,L,G)	MW	Water Solubility (mg/L)	Koc	log Kow	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 20 deg C, unless shown)	Half-life (days)		
										Air	Soil	Water
Acetylene	Acetylene	G	26	100961/100961 @ 18C			-847 @ 760mm	-80.8	40 @ 18.8C			
Aluminum and compounds	Aluminum	S	27									
Amino-4,6-dinitrotoluene, 2-	Amino-4,6-dinitrotoluene, 2-		206									
Ammonia	Ammonia	L,G	17	340,000 mg/L @ 20C	3.1		-33.36	-77.7	10 @ 25C			
Ammonium chloride	Ammonium chloride	S	54	28.3% (wt/wt) @ 26C			520	336	1 @ 160.4C			
Ammonium nitrate	Ammonium nitrate	S	80	871 g @ 100C			210	169.6				
Antimony and compounds	Antimony	S	122	INSOLUBLE			1635	630	1 @ 886c			
Asphaltum	Asphalt	S		INSOLUBLE			>700					
Barium and compounds	Barium	S	137				1640	726	10 @ 1049C			
Calcium and compounds	Calcium cyanide	S	92	SOLUBLE				640				
Carbon black	Carbon, activated	S	12	INSOLUBLE			4200					
Carbon dioxide	Carbon dioxide	G	44									
Carbon monoxide	Carbon monoxide	G	28	33 mL/L @ 0C			-191.5	-206	>1 ATM @ 20C			
Carbon tetrachloride	Carbon tetrachloride	L	153.24	1,160 mg/L @ 25C	110	2.62-2.83	76.54	-23	91.3	>330		EVAP: 2 min - 7 hrs
Cellulose	Cellulose											
Charcoal	Charcoal	S		INSOLUBLE			4200	>3500				
Copper and compounds	Copper	S	64	INSOLUBLE			2595	1083	1 @ 1628C			
Diazodinitrophenol	Diazodinitrophenol											
Dibutyl phthalate	Di-n-butyl phthalate	L	278	13 mg/L @ 25C	170,000	4.9	340	-36	0.0097	18hrs	66-98% degrad. in 28 wks.	33% degrad. seawater in 14 days
Dinitrobenzene, 1,3-	Dinitrobenzene, m-	S	168	500 mg/L	1.39	1.49	300	89	5.13E-6 @ 25C	14.15 hrs		
Dinitrotoluene, 2,4-	Dinitrotoluene, 2,4-	L,S	182	300 mg/L @ 20C	201 & 290	1.98	300	71	2.17E-4 @ 25C	8 hrs	436 days	3.7 in pond water
Dinitrotoluene, 2,6-	Dinitrotoluene, 2,6-	S	182		201 & 290	1.72	295	66	5.67E-4 @ 25C	8 hrs		12 min in sunlit river water
Diphenylamine	Diphenylamine	S	169	57.6 mg/L	470	3.6	302	53	1 @ 108.3C			
Ethyl centralite	Diethylcarbanide, N,N'-											
Ethylene dimethacrylate	Ethylene dimethacrylate											
Ethylene oxide	Ethylene oxide	G	44	SOLUBLE	16	-0.3	10.7	-112.5	1,095	1 week		Hours to 2 weeks
Graphite	Graphite											
Gum arabic	Acacia	L,S	600,000	SOLUBLE								
HMX	HMX		296									
Hexachlorobenzene	Hexachlorobenzene	S	295	0.035 mg/L	4-5	5.31	323-326	231	1.1E-5 @ 25C	2 yrs	1530 days	
Hydrochloric acid	Hydrochloric acid	L	36.46	561,000 mg/L in hot water					400 @ -95.3C			
Hydrogen cyanide	Hydrogen cyanide	G,L	27.03	SOLUBLE		1.07	25.6	-13.4	630	334		
Hydrogen sulfide	Hydrogen sulfide	G	34	4,130 mg/L @ 20C			-60.33	-95.49	1 @ -60.4			
Iron and compounds	Ferric oxide	S	160	INSOLUBLE				1595				
Lead and compounds	Lead	S	207	INSOLUBLE			1740	327.4	1.77 @ 1,000C			

TABLE III-1. (Cont.)

CHEMICAL NAME LISTED IN COMPOSITION/COMBUSTION LISTS	CHEMICAL FOR WHICH PROPERTIES ARE LISTED	Physical State (S,L,G)	MW	Water Solubility (mg/L)	Koc	log Kow	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 20 deg C, unless shown)	Half-life (days)		
										Air	Soil	Water
Linseed oil	Linseed oil	L					> 316					
Magnesium and compounds	Magnesium	S	24	SLIGHTLY SOLUBLE IN HOT WATER			1100	651				
Methane	Methane	G	16			1.09	-161.4	-182.6	40 @ -86.3			
Methyl centralite	Dimethylcarbanide, N,N'-											
Monomethylene nitrate	Methylene nitrate											
Nitrate	Nitrate		62									
Nitric oxide	Nitric oxide	G	30	7.34cc/100cc H <sub>2</sub> O @ 0C			-151.7	-163.6	26,000			
Nitrobenzene	Nitrobenzene	L,S	123.11	1,780 mg/L		1.85	210.8	5.7	1.5e-1 @ 25C	125 days		3.8 days in pond
Nitrocellulose	Nitrocellulose	L,S										
Nitrogen dioxide	Nitrogen dioxide	G	46				21.15	-9.3	400 @ 80c			
Nitroglycerine	Nitroglycerine	L,S	227	1,800 mg/L @ 25C			260 60mm HG	13	0.0025			3,000 days from volatilization
Nitroguanidine	Nitroguanidine	S		SOLUBLE IN HOT WATER								
Nitrostarch	Nitrostarch											
Ozone	Ozone	G	48	49cc/100cc @ 0C			-111.9	-192.7				
PETN	PETN	S	316	43 mg/L @ 25C			180 @ 50mm HG	140				
Phosphorus	Phosphorus	S	31									
Picric acid	Trinitrophenol, 2,4,6-		229									
Polyisobutylene	Polyisobutylene											
Polyvinyl chloride	Polyvinyl chloride	S	60K-150K									
Potassium and compounds	Potassium cyanide	S	65					634				
Propane	Propane	G	44	62.4 mg/L @ 25C	450-460	2.36	-42.1	-189.7	760 @ 25C	8-13.4 days		2.3 days in model pond
RDX (cyclonite)	RDX	S	222	INSOLUBLE	42-536	0.87	205-206		4E-9 @ 25C	1.5 hrs		11.6% loss/hydrolysis/112 days/seawater
Red phosphorus	Red phosphorus	S	31				290	590				
Silver	Silver	S	108	INSOLUBLE			2000	980.5				
Sodium and compounds	Sodium cyanide	S	49	820 mg/L @ 35C			1496	563.7	1 @ 817C			
Strontium and compounds	Strontium	S	96				1366	757	10 @ 898C			
Sulfate	Sulfate		96									
Sulfur	Sulfur	S	32	INSOLUBLE			444.6	112.8-120	4E.6 @ 30.4C			
Sulfur dioxide	Sulfur dioxide	G	64	95,000 mg/L @ 25C			-10	-72.7	3.2			
TNA	Tetranitroaniline, 2,3,4,6-		274		1600							
TNPH	Trinitrophenethane	S	229	12,820 mg/L @ 25C				122-123	<1 Torr @ 20C			
Tetracene	Tetracene											
Tetryl	Tetryl	S	267	200 mg/L @ 20C	406		187	130-132	5.7E-9 @ 25C	11 days		33 days @ 25C & pH 8.1 in seawater
Tin and compounds	Tin	S	119	INSOLUBLE			2507	231.9	1 @ 1,492C			
Trinitrobenzene, 1,3,5-	Trinitrobenzene, 1,3,5-	S	213	350 mg/L	104 & 178	1.1	315	122.5	3E-6 @ 25C	35 yrs		
Trinitrotoluene, 2,4,6-	Trinitrotoluene, 2,4,6-	S	227.13	100 mg/L @ 25C		1.6	240	80.1	5.5E-6 @ 25C	110 days		119 days from model river
White phosphorus	White phosphorus	S	31									
Zirconium and compounds	Zirconium	S	91	INSOLUBLE			3577	1857				

### III.B1.5 Mobility in Soil [40 CFR 264.601(a)(1) and 40 CFR 270.23]

$K_{oc}$  is a measure of the tendency for chemicals to be adsorbed by soil and sediment and is expressed as the ratio of milligrams of chemical adsorbed per kilogram organic carbon to the milligrams of chemical dissolved per liter of solution (USEPA 1986).  $K_{oc}$  is directly related to soil and sediment sorption, both of which are significant chemical fate processes. For inorganics, such as metals, some other parameter such as the distribution coefficient for a specific soil type ( $K_d$ ) or the maximum exchangeable mass may be a better measure of relative adsorption potential.  $K_{oc}$  is chemical-specific and is a significant environmental fate determinant for all exposure pathways, especially aqueous pathways. For surface water pathways, the  $K_{oc}$  indicates the relative amount of sediment adsorption in surface water. Once a chemical enters surface water, a high  $K_{oc}$  may be of concern because it indicates a tendency to accumulate in the environment due to adsorption onto sediments. This can subsequently result in the potential for bioaccumulation in the aquatic food chain. For example, the  $K_{oc}$  values in Table III-1 suggest that ethylene oxide and hexachlorobenzene would be relatively less adsorbed by soil and sediment as compared to the other nitroaromatics, such as 2,4-dinitrotoluene and 2,6-dinitrotoluene.

### III.B1.6 Physical State and Molecular Properties [40 CFR 264.601(a)(1) and 40 CFR 270.23]

The molecular weight (MW) of a compound is the relative weight of a molecule of a substance as compared to the weight of a molecule of another substance taken as a standard (USEPA 1986). The MW for the chemicals of concern at EAFB OB/OD units range from 12 for carbon black to 600,000 for gum arabic. Another property that affects the mobility of constituents burned or detonated at EAFB is vapor pressure. Vapor pressure is a relative measure of the volatility of a chemical in its pure state, where vapor pressure of liquids range from 0.001 to 760 millimeters of mercury (mm Hg), and solids range to  $10^{-7}$  mm Hg (USEPA 1986).

### III.B1.7 Mobility in Ground Water [40 CFR 264.601(a)(1) and 40 CFR 270.23]

The mobility of a chemical in ground water is a function of several chemical-specific properties, including  $K_{oc}$ , water solubility, and  $K_{ow}$ .  $K_{oc}$  and water solubility were described previously.  $K_{ow}$  is a measure of a chemical's solubility in octanol and water at equilibrium conditions (USEPA 1986).  $K_{ow}$  is used as an indication of the propensity of an organic

chemical for bioconcentration by aquatic organisms. As illustrated in Table III-1, none of the chemicals have high  $K_{ow}$  values, indicating that a majority of chemicals would not be preferentially distributed to soil/sediment or tissue (i.e., adipose tissue). For ground water, low  $K_{ow}$  values indicate faster leaching from the waste source materials into an aquifer and relatively rapid transport through the aquifer.

#### III.B1.8 Sorption Properties of Waste Material Relative to Environmental Media [40 CFR 264.601(a)(1) and 40 CFR 270.23]

The adsorption of nitroaromatic and metal compounds in sands at the OB/OD units is not expected to be significant. Because the nitroaromatics or metals are not expected to significantly adsorb to sands at the EAFB OB/OD units and are somewhat soluble in water, the potential exists for this class of compounds to percolate through the sands into the surficial aquifer.

#### III.B1.9 Biodegradability, Bioconcentration, and Biotransformation Relative to Environmental Media [40 CFR 264.601(a)(1) and 40 CFR 270.23]

A number of organic chemicals can be degraded by micro-organisms. The rate of biodegradation tends to increase with decreasing molecular weight as well as going from anaerobic to aerobic conditions (Rand and Petrocelli 1985). In addition, the rate of biodegradation may be enhanced by the presence of other hydrocarbons. Biodegradation processes described for nitroaromatics (e.g., 2,4,6-trinitrotoluene and 2,4-dinitrotoluene) that would be expected to be generally similar for other nitroaromatics in that the reduction of a nitro group to an amino group would serve as a major transformation route. A more detailed analysis of biodegradation of chemicals of concern is presented in Section III.D2.

#### III.B1.10 Photodegradation Rates of Waste [40 CFR 264.601(a)(1) and 40 CFR 270.23]

Photolysis is the dominant transformation process affecting nitroaromatics in surface environmental systems receiving direct solar radiation (Spanggord et al. 1980). Photolysis rates are estimated to be 10 to 1,000 times faster than biotransformation rates in natural waters. The compound 2,4-dinitrotoluene is photolyzed more rapidly at higher pH. Like 2,4-dinitrotoluene, 2,6-dinitrotoluene is photolyzed more rapidly with higher pH. It is not clearly known whether these photoproducts, including those of 2,4-dinitrotoluene, are less toxic or more toxic than the parent compound.



Based on the physicochemical properties reported for nitroaromatics and reports of several investigators, photolysis would be expected to play the most significant role in removing nitroaromatic compounds and their transformation products from ecosystems at the earth's surface. Although numerous microorganisms are known to biodegrade nitroaromatic compounds, the process would be generally slower than photolysis. Volatilization could synergistically enhance the loss and transformation of nitroaromatic residues induced by solar radiation. Section III.D2 provides a more detailed explanation for the classes of chemicals burned or detonated at EAFB.

### III.B2 HYDROGEOLOGIC CHARACTERISTICS OF THE SITE [40 CFR 270.23(b), 40 CFR 264.601(a)(2), and (b)(3)]

Rainfall is the principal source of water that drives the hydrologic cycle in northwest Florida. Some of this water percolates through the ground surface to recharge the ground water, some is lost to the atmosphere through evapotranspiration, and some is directed as streamflow to surface creeks and streams. Streamflow can be either direct runoff or base runoff. Direct runoff occurs in less permeable streambeds which prevent infiltration, producing a more highly developed surface drainage system. Base runoff occurs in permeable streambeds where infiltration is rapid, resulting in low direct runoff and recharge to aquifer systems.

Three major drainage basins on the EAFB Reservation in Walton County are associated with the Rocky, Basin, and Alaqua creeks. These creeks carry surface water in a generally southern direction with discharge into Choctawhatchee Bay (Figure III-1). The Basin drainage system comprised of the Bay Head Branch and Coon Head Branch carries runoff from the Range C-52N OD unit. The Alaqua drainage system carries runoff from 12 streambeds which originate in the vicinity of the Range C-62 OB/OD units.

Approximately 1,500 ft of sediment, ranging in age from Middle Eocene to Holocene, compose the system of aquifers and confining beds in Walton County. This stratigraphic sequence is divided into six hydrogeologic units which, in descending order, are the sand and gravel aquifer, the Pensacola Clay confining bed, the upper part of the Floridan aquifer, the Bucatunna Clay confining bed, the lower part of the Floridan aquifer, and the Claiborne confining bed (Hayes and Barr 1983; Figure III-2). Most of the water used in the Walton County area is derived from ground-water sources with approximately 95 percent from the upper limestone of the Floridan aquifer and 5 percent from the sand and gravel aquifer (Barr et al. 1985).

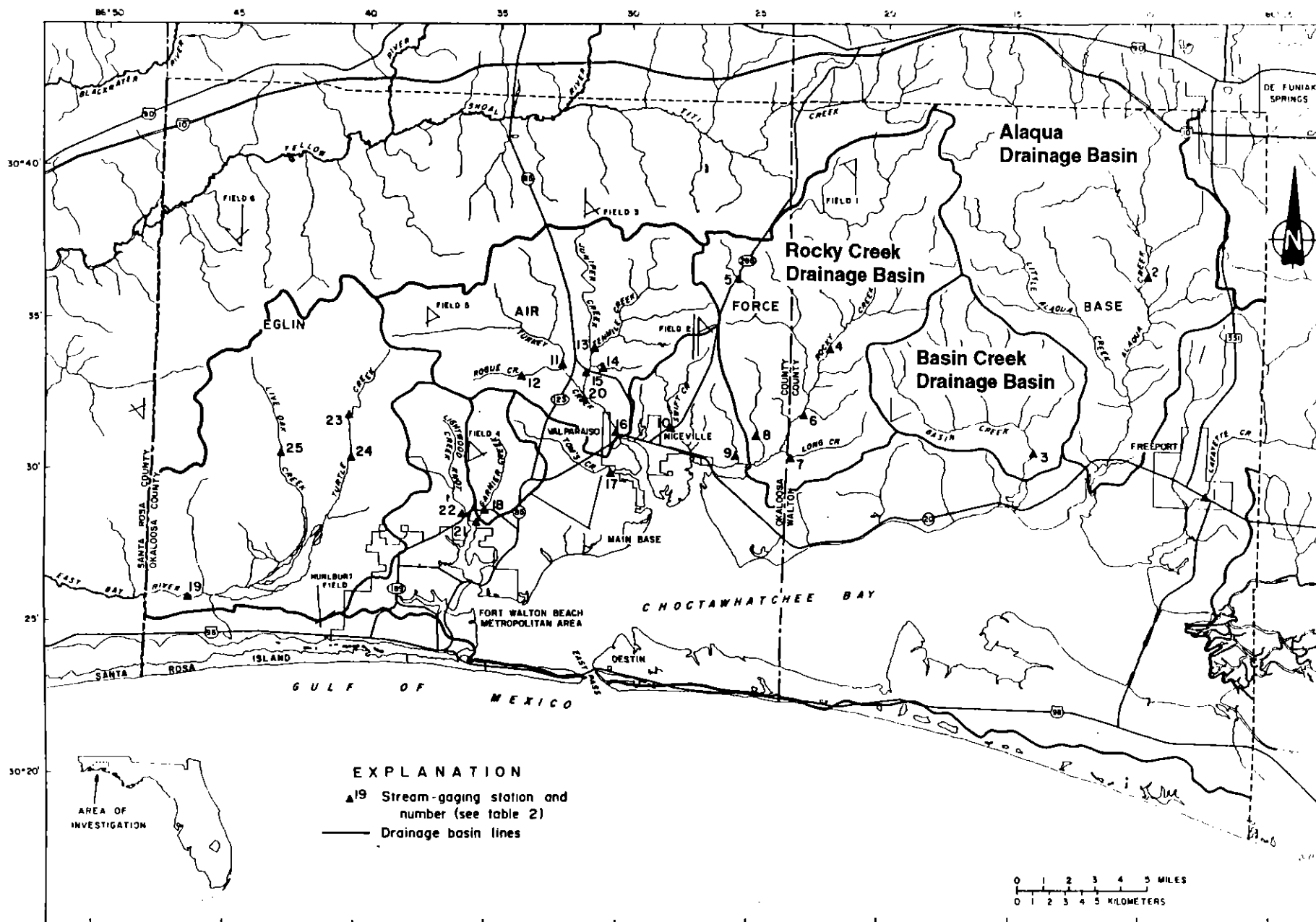


Figure III-1. General surface water map.

# GENERALIZED STRATIGRAPHIC COLUMN

		HYDROGEOLOGIC UNIT		
AGE	LITHOLOGY			GEOLOGIC UNIT
LATE MIOCENE TO RECENT	SAND, LIGHT BROWN TO LIGHT GRAY, FINE TO VERY COARSE GRAINED, LITTLE INTERBEDDED GRAVEL, CLAYEY SAND, AND CLAY		SURFICIAL AQUIFER	TERRACE DEPOSITS & CITRONELLE FORMATION
MIOCENE	CLAY, GRAY, SANDY MICACEOUS		PENSACOLA CLAY CONFINING UNIT	PENSACOLA CLAY
LATE OGLIOCENE AND EARLY MIOCENE	LIMESTONE AND DOLOMITE, LIGHT GRAY		UPPER FLORIDAN AQUIFER	TAMPA FORMATION & CHICKASAWHAY FORMATION
MIDDLE OGLIOCENE	CLAY, GRAY, SOFT, SILTY TO SANDY, FOSSILIFEROUS		BUCATUNNA CLAY CONFINING UNIT	BACATUNNA CLAY
LATE EOCENE	LIMESTONE, WHITE, VERY FOSSILIFEROUS		LOWER FLORIDAN AQUIFER	OCALA GROUP
MIDDLE EOCENE	CALCAREOUS SHALE AND SHALY LIMESTONE		CLAIBORNE CONFINING UNIT	CLAIBORNE GROUP

REFERENCE: MARSH, 1966; BARR, 1981



EA ENGINEERING,  
SCIENCE, AND  
TECHNOLOGY, INC.

FILE NAME:

DATE:

10-7-92

LAYERS USED:

PROJECT #:

11206.25

Figure III-2. Regional Stratigraphic Column.

### Regional Geology

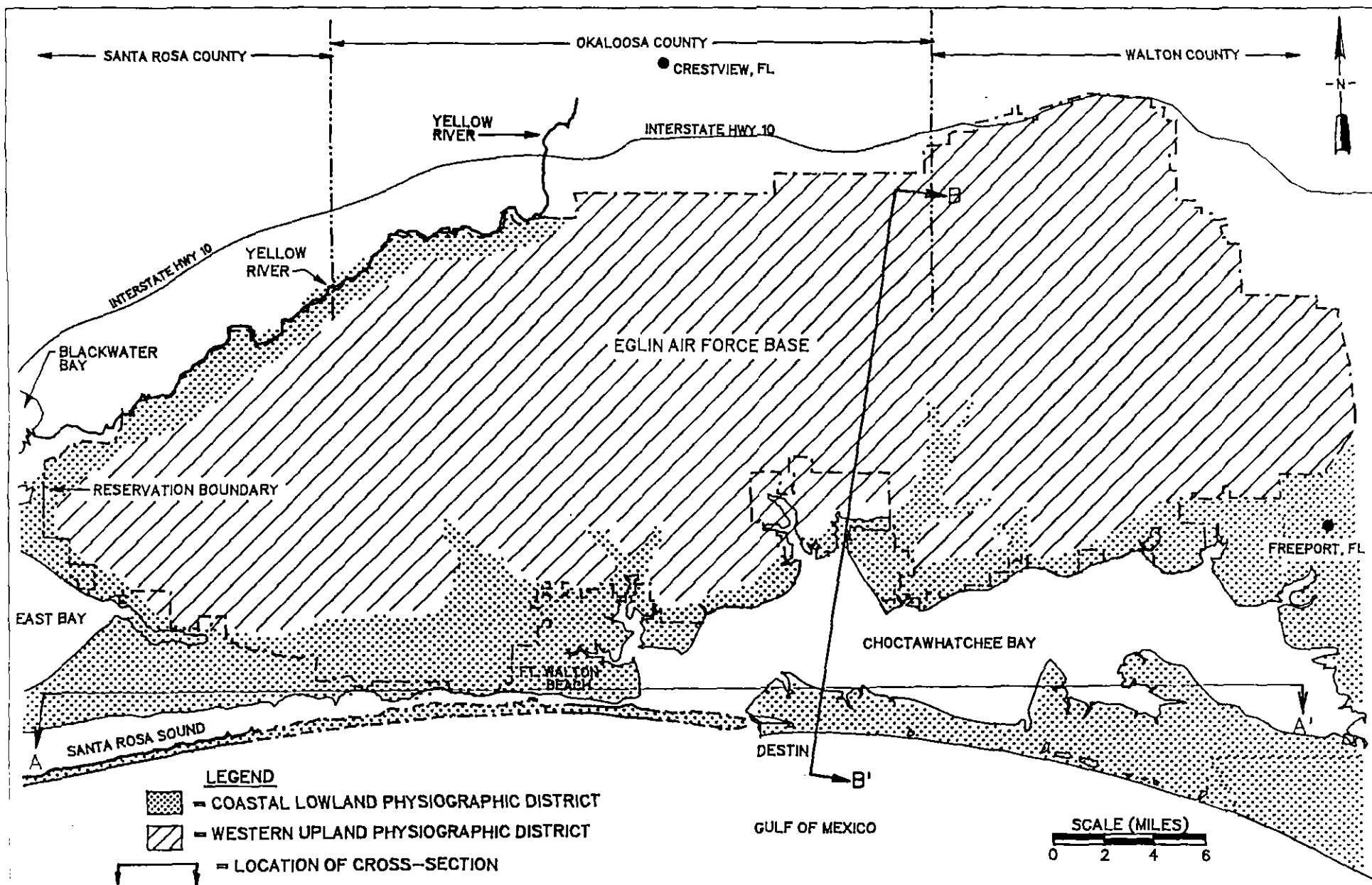
EAFB is located in the Gulf Coast Geosyncline, a regional depositional basin which has been receiving sediments since the Jurassic Period (approximately 200 million years ago). The sediments of the Gulf Coast Geosyncline are approximately 12,000 ft thick at EAFB. The formation underlying the base tends to dip and thicken to the southwest. The older, deeply buried sediments of the geosyncline consist of evaporites, carbonates, sandstones, and shales of Jurassic through early Eocene age.

The early Eocene sediments are overlain by low permeability shales and limestones of the Claiborne Group (Figure III-2). The unit is, in turn, overlain by the Ocala Group, a light grey, permeable, fossiliferous limestone (Barr et al. 1981). The top of the Ocala Group is an unconformity on which the middle Oligocene Buccatunna Clay, a dark grey, soft, silty or sandy clay, was deposited. The Buccatunna Clay is overlain by Oligocene and lower Miocene limestones of the Chickawawhay and Tampa Formations. These formations consist of grey, vesicular limestone and dolomite, the pores and fractures have been enlarged through solution (Barr et al. 1981). The Tampa Formation is overlain by the Pensacola Clay. The Pensacola Clay is a dark grey, hard, micaceous, sandy clay characterized by very low permeability. The Pensacola Clay increases in thickness to the southwest.

The uppermost geologic units at EAFB are surficial sands and gravels of the Plio-Pleistocene Citronelle Formation and Pleistocene terrace deposits. The units unconformably overlie the Pensacola Clay. The Citronelle Formation is a white to tan sand with discontinuous beds of clay, clayey sand, and gravel. The Citronelle is overlain by marine terrace deposits. The terrace deposits consist of fine to coarse, well-sorted, white to tan sand. These deposits cannot always be clearly distinguished from the underlying Citronelle Formation but are generally better sorted with less gravel and very little clay. The thicknesses of both surficial formations are highly variable due to erosion ranging from approximately 50 to 200 ft thick and generally increasing in thickness to the southwest. A cross-section location map and cross-sections A-A' and B-B' showing the regional geology of EAFB are provided in Figures III-3 through III-5.

### Regional Hydrogeology

Three significant hydrogeologic units occur on EAFB: the surficial sand and gravel aquifer, the Pensacola Clay confining layer, and the Floridan aquifer. The sand and gravel aquifer consists of the Citronelle Formation and overlying terrace deposits. Ground water occurs in



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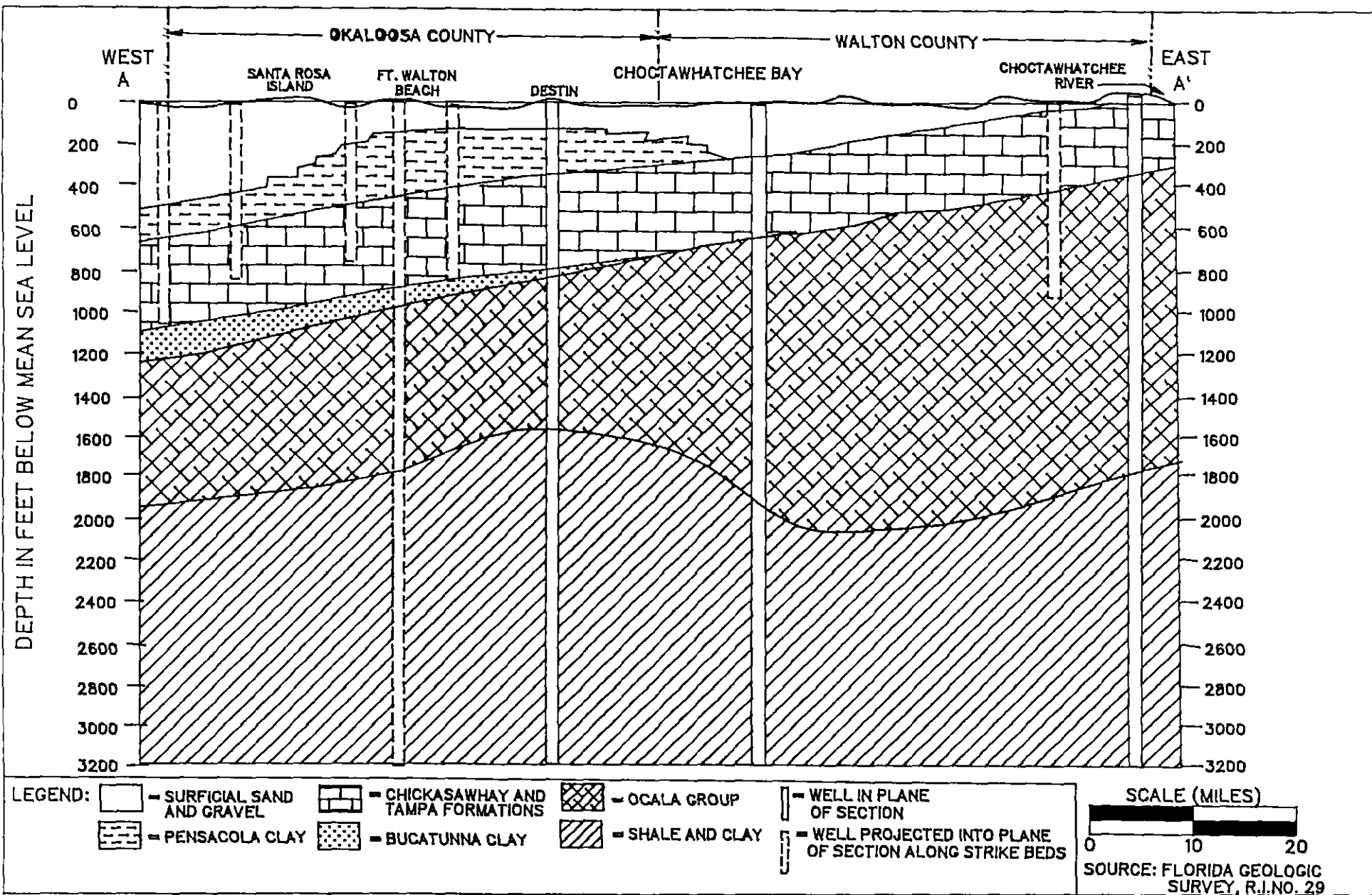
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11206.25-0403

FILE:

EGLIN3

**Figure III-3. Physiographic Provinces Showing Locations of Cross-sections. Eglin Air Force Base, Valparaiso, Florida.**



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XSECTA

LAYERS USED:

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DATE:

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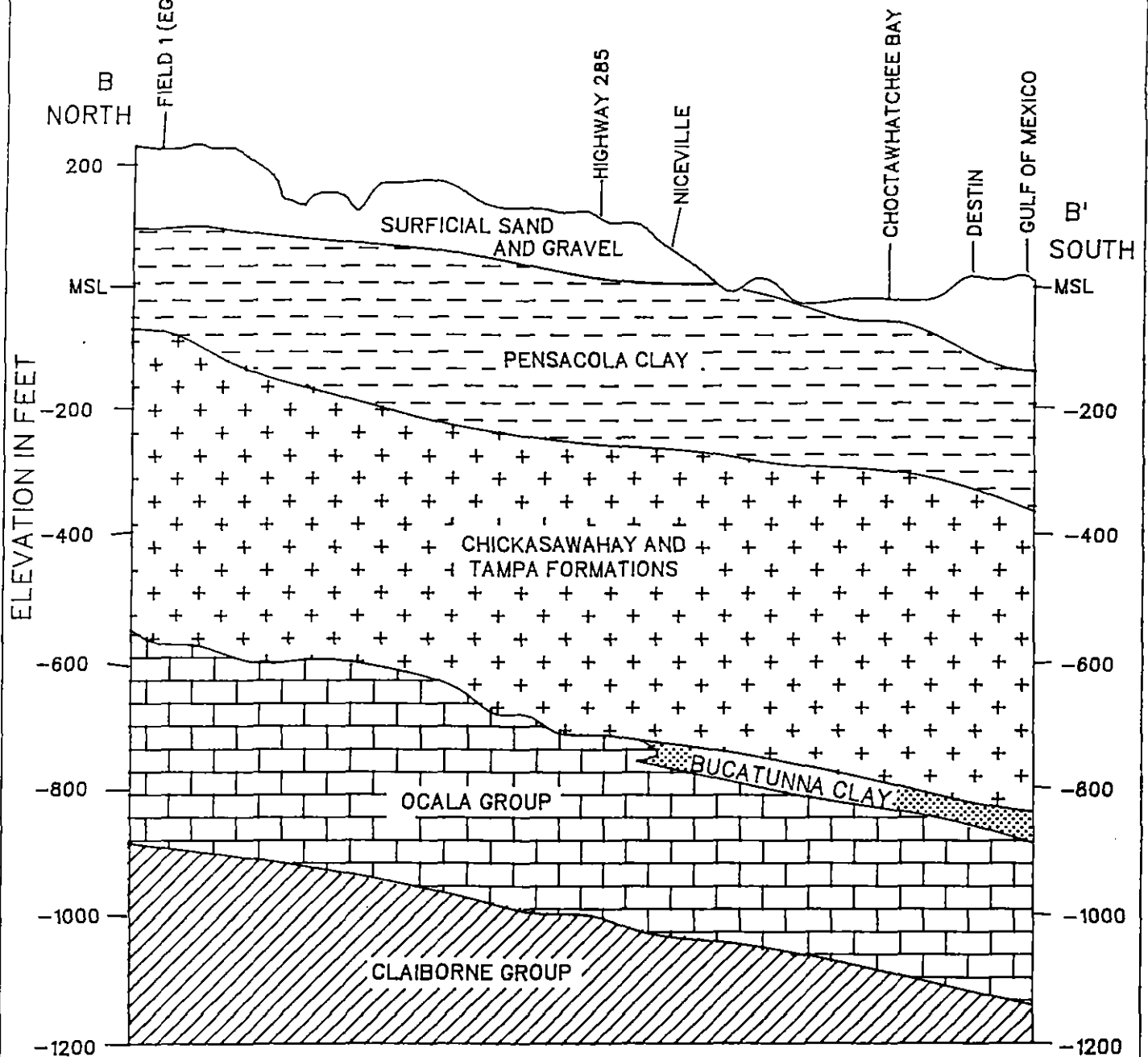
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**Figure III-4. Regional Geologic Cross-section A-A'.  
Eglin Air Force Base, Valparaiso, Florida.**

# EGLIN AIR FORCE BASE

## NORTH-SOUTH GEOLOGIC CROSS SECTION



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Figure III-5. Regional Geologic Cross-section  
B-B'. Eglin Air Force Base, Valparaiso, Florida.

this aquifer under unconfined or water table conditions. The water table generally forms a subdued replica of surface topography and is deepest below the higher elevations. The thickness of the sand and gravel aquifer varies from approximately 70 ft beneath the Range C-52N to approximately 100 ft at Range C-62, as extrapolated from an isopach map provided by Hayes and Barr (1983; Figure III-6). The sand and gravel aquifer is subdivided into three hydrologic zones: a surficial zone (water table), an intermediate zone of relatively low permeability, and a main producing zone (artesian).

Regionally, ground-water flow is toward the larger streams or toward Choctawhatchee Bay. The transmissivity of the sand and gravel aquifer is quite variable due to variations in lithology and thickness. Regionally, the transmissivity of the aquifer appears to increase to the southwest. Potential well yields up to 1,000 gallons per minute (gpm) are possible but generally fall in the range of 200 to 400 gpm (Barr et al. 1981).

The Pensacola Clay is a thick, low permeability confining unit. It effectively hydraulically isolates the sand and gravel aquifer from the underlying Floridan aquifer. Barr et al. (1981) estimated the leakance of the confining unit as between  $10^{-6}$ /day and  $10^{-8}$ /day, reflecting the thickness and very low permeability of the unit. The thickness of the Pensacola Clay at the Range C-52N OB/OD units is approximately 250 ft. The Pensacola Clay is approximately 160 ft thick at the Range C-62 test area (Barr et al. 1985; Figure III-7).

The Floridan aquifer underlies the Pensacola Clay confining unit and is the primary source of potable water in much of northwest Florida. The aquifer is composed of permeable limestones of the Tampa and Chicasawhay Formations and the Ocala Limestone. Where the Buccatunna Clay is present, it separates the aquifer into an upper unit (Tampa/Chicasawhay Formations) and a lower unit (Ocala Limestone). The bottom of the Floridan aquifer is defined by low permeability beds of the Claiborne Group.

The Floridan aquifer is recharged in the uplands of northwest Florida where the Pensacola Clay is thinner, more permeable, or absent. Regionally, ground-water flow in the Floridan aquifer is to the south discharging to the Gulf of Mexico. The transmissivity of the aquifer is quite high but decreases to a maximum of 35,000 ft<sup>2</sup>/day near the coast (Barr et al. 1981). The potentiometric surface of the Floridan aquifer is up to 100 ft below the water level in the shallow sand and gravel aquifer.



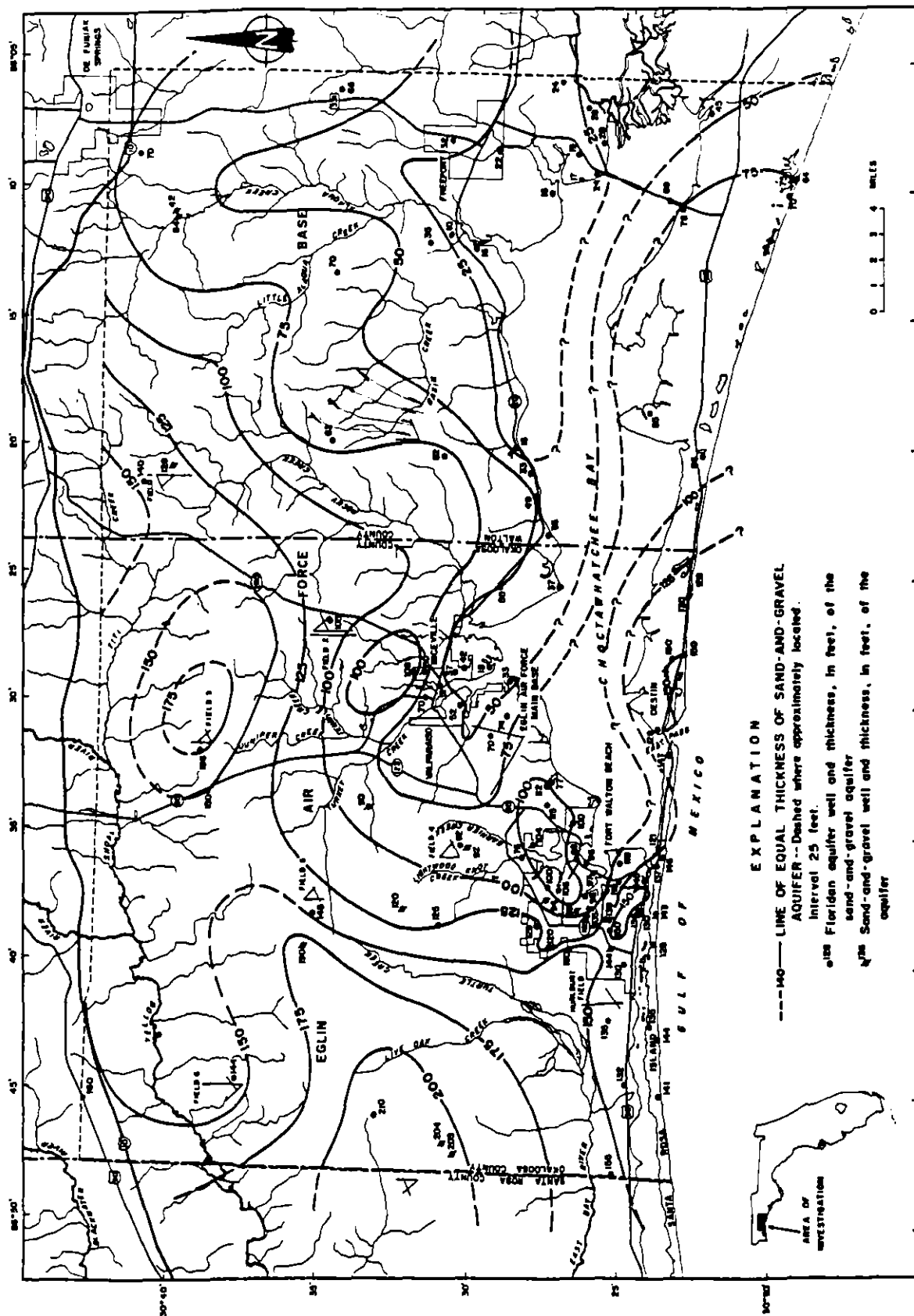


Figure III-6. Thickness of the sand and gravel aquifer (Hayes and Barr, 1983). Eglin Air Force Base Valparaiso, Florida.

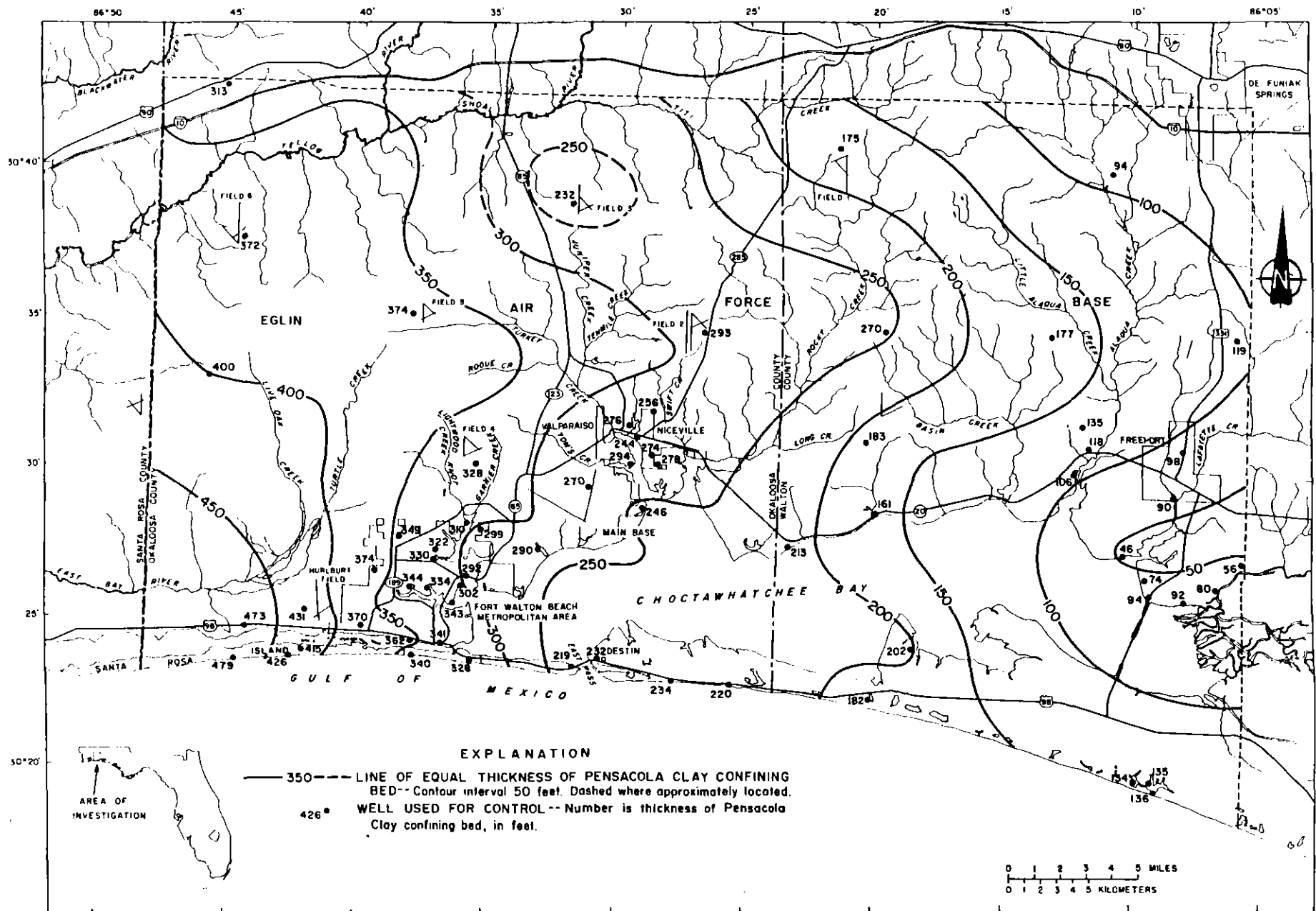


Figure III-7. Thickness of the Pensacola Clay confining bed (Barr and others, 1981). Eglin Air Force Base Valparaiso, Florida.

### III.B2.1 Depth to the Water Beneath the Unit [40 CFR 264.601(a)(2) and 40 CFR 270.23(b)]

The sand and gravel aquifer consists of the Citronelle Formation and overlying terrace deposits. Ground water occurs in this aquifer under unconfined (water table) conditions. The water table generally forms a subdued replica of surface topography and is deepest under the higher elevations.

The ground surface elevation at the Range C-52N OB/OD units ranges from approximately 125 to 150 ft above mean sea level (MSL; U.S. Geological Survey, Niceville SE Quadrangle 1970). Based on surface topography, the depth to the surficial aquifer is estimated to range from 25 to 50 ft below ground surface (bgs), or at an elevation of approximately 100 ft MSL.

The ground surface elevation at Range C-62 in the vicinity of the burn kettles is approximately 195 ft MSL (U.S. Geological Survey, De Funiak Springs West, Fla Quadrangle 1973). The depth to ground water is estimated to be from 50 to 60 ft bgs, or at elevations ranging from 140 to 150 ft MSL, based on surface topography.

### III.B2.2 Estimate of Net Recharge Rate [40 CFR 601(a)(2) and 40 CFR 270.23(b)]

Ground water in the sand and gravel aquifer is recharged by precipitation and base runoff from streams. Recharge to the Floridan aquifer is by rainfall in the northern parts of Okaloosa and Walton Counties and in southern Alabama where the aquifer is at or near the surface (Trapp et al. 1977).

Although there are no available data to quantify annual recharge, precipitation data for a 52-year period measured at EAFB are presented in Section III.C. Although these data provide an overestimation of annual aquifer recharge, they do address the quantity of water available for recharge.

### III.B2.3 Description of Uppermost Aquifer [40 CFR 264.6019(a)(2) and 40 CFR 270.23(b)]

As discussed previously, both Range C-52N and Range C-62 are underlain by a surficial sand and gravel aquifer, which overlies the Pensacola clay confining layer and the Floridan aquifer. The surficial sand and gravel aquifer consists of the Citronelle formation and overlying terrace deposits. Depth to the surficial aquifer is estimated to range from 25 to 50 ft

below ground surface. Information related to ground-water quality at the uppermost aquifer is presented in Section III.B3.2. Ground-water flow and rate for the uppermost aquifer are discussed in Section III.B3.3.

#### III.B2.4 Description of Soil Types and Depth Range of Each Soil [40 CFR 264.601(a)(2), and 40 CFR 270.23(b)]

According to the United States Department of Agriculture, Soil Conservation Service (1989), soil covering most of the land surface across Ranges C-52N and C-62 are Lakeland sands with 0-5 percent slopes. These sands are excessively drained and nearly level to gently sloping. The slopes are mostly smooth to concave but are convex in places. The Lakeland sand belongs to the Lakeland series and was formed in thick, sandy marine sediment on nearly level to steep uplands. Lakeland sands with 5-12 percent slopes are exposed on the upland side slopes leading to drainageways or depressions. This is characteristic of the sloped surface leading to Blount Mill Creek west of the OB/OD unit at Range C-62.

Typically, the surface layer of the Lakeland sand (0-5 percent slopes) is dark grayish-brown sand 4 in. thick. The underlying material is sand. It is yellowish-brown to a depth of 7 in., brownish-yellow to a depth of 60 in., and light yellowish-brown to a depth of at least 80 in. The Lakeland sand has low available water capacity and high permeability. Organic matter content is very low to low. Rainfall percolates rapidly through these sands in protected areas and there is little runoff.

Soil in the northeastern quadrant of Range C-62 associated with the Oakie Creek drainage system are Troup sands principally with 8-12 percent slopes. Troup sands are well-drained and strongly sloping. The surface soil layer is grayish-brown sand 2 in. thick. The subsurface layer is yellowish-brown to yellowish-red loamy sand to a depth of 62 in. The subsoil is red sandy loam to a depth of at least 80 in. The available water capacity of Troup sand is low in the surface and subsurface layers and moderate in the subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Organic matter content is low to very low.

Soil associated with the Bay Head and Coon Head drainage systems in the vicinity of the Range C-52N OD unit and, to a limited extent, in the Oakie Creek drainage system in Range C-62 OB/OD units are of the Dorovan-Pamlico association, frequently flooded. These soils are nearly level and very poorly drained. The Dorovan member is typically a black muck to a

depth of at least 60 in. The Pamlico member is typically a dark reddish-brown muck 2 in. thick. It is underlain by a very dark grayish-brown sand to a depth of at least 80 in. The permeability of these sands is moderate with very high available water capacity.

### III.B2.5 Topography of the Unit Area

EAFB is located in the Gulf Coastal Plain physiographic province. This province is characterized by relatively low topographic relief, predominantly sandy soil, and a gradual slope toward the Gulf of Mexico. Physiographic divisions within the Gulf Coastal Plain at EAFB include the Western Highlands and Coastal Lowlands. The Western Highlands occur at elevations of approximately 50 ft MSL and underlie most of EAFB. The Coastal Lowlands occur between 0 and 25 ft MSL and include coastal areas, flood plains of larger rivers, and coastal barrier islands (Figure III-1).

The Western Highlands are characterized by flat to rolling uplands with elevations reaching 250 ft MSL. The Coastal Lowlands are characterized by flat, poorly drained topography near the coast and in the flood plains of major rivers. The Western Highlands are separated from the Coastal Lowlands by the scarp of the Pamlico Terrace. This scarp forms a clearly defined break in slope at approximately 25 ft MSL at Eglin Main Base.

The surface elevation at both the OB unit at Range C-62 and the OD unit at Range C-62 is approximately 195 ft MSL. The surface elevation of the OB unit at Range C-52 is approximately 150 ft MSL. Both OB/OD units are located on primarily level ground surfaces in the immediate treatment areas while sloping off in the vicinity of surface drainage features. More detailed information is discussed in Section II.A2.

### III.B3 PROTECTION OF GROUND WATER AND SUBSURFACE ENVIRONMENT [40 CFR 264.601(a) and 40 CFR 270.23(b)(c)]

#### III.B3.1 Potential for Migration through Soil, Liners, and Containing Structures [40 CFR 264.601(a)(1)]

During an open burning event, burn kettles have been designed to provide containment of original wastes and diesel fuel and the residual ash. Migration of this material is not expected to occur because there is no discharge of waste from the structures. The burn kettles and containment dams are visually inspected before and after each burn to determine their integrity, and assure that materials have not been released. Furthermore, each burn kettle is

underlain by a 6 mil Kevlar-reinforced polyethylene liner with 2 ft of soil cover between the kettle and the liner.

Open detonation activities are not conducted within any particular structures. During a detonation, most of the items to be disposed of are metal scrap, which may remain in and around the resulting pit created by the detonation. Post-treatment inspections are conducted to remove any unexploded ordnance or large size debris.

A ground-water monitoring and soil characterization program is being implemented to assess potential migration through soil, liners, and containing structures (Section II.G). If results indicate that additional containment is required, process modifications will be implemented.

### III.B3.2 Ground-Water Quality and Possible Sources of Contamination [40 CFR 264.601(a)(3)]

Water from the sand and gravel aquifer in Okaloosa and Walton counties generally meets state and federal requirements for drinking water (Hayes and Barr 1983). The pH of water from the surficial zone ranged from 5.7 to 7.7 and from 4.5 to 6.9 in the main producing zone. Iron concentrations in the surficial zone varied from 0.02 to 4.3 mg/L and from 0.01 to 3.7 mg/L in the main producing zone. A summation of the Hayes and Barr (1983) data is provided in Table III-2.

Available ground-water quality data for EAFB include a sampling of EAFB Well No. 90 on 27 November 1972. This well is located approximately 1.8 mi west southwest of the Range C-52N OB/OD units and is screened in the Floridan Aquifer. These data, provided in Figure III-8, indicate that the water quality complied with applicable drinking water standards.

Based on the nature of Ranges C-62 and C-52N, the only potential sources of ground-water contamination at both ranges are related to unexploded ordnance items and military research and development activities. Both areas are active bombing ranges, so active training missions may contribute to potential surface soil, water, and/or ground-water contamination. This is particularly true for Range C-52N, which is primarily a bombing range and is only used at infrequent intervals for OD activities. The ground-water sampling program described in Section II.G. will provide additional data to assess current ground-water quality conditions at the OB/OD units.

TABLE III-2 WATER QUALITY DATA FOR THE SAND AND GRAVEL AQUIFER (HAYES AND BARR 1983). EGLIN AFB VALPARAISO, FLORIDA

	Surficial Zone			Main Producing zone		
	Range	Mean	Standard deviation	Range	Mean	Standard Deviation
Bicarbonate (HCO <sub>3</sub> )	10-114	48	31	0-20	7	4
Calcium (Ca)	1.6-32	15	9.8	0-6.6	1.5	1.4
Chloride (Cl)	2.5-154	22	29	0-15	4.4	3.4
Dissolved solids (residue at 180°C)	16-428	106	83	6-106	29	18
Fluoride (F)	0-0.5	0.2	0.1	0-1.5	0.1	0.2
Hardness (total as CaCO <sub>3</sub> )	7-105	50	32	1-23	7	5
Iron (Fe)	0.02-4.3	0.7	1.23	0.01-3.7	0.54	0.80
Magnesium (Mg)	0.4-5.7	2.7	2.9	0-2.1	0.7	0.5
Nitrate (NO <sub>3</sub> )	0-20	1.7	4.6	0-8.8	1.4	2.4
pH (units)	5.7-7.7	--	--	4.5-6.9	--	--
Potassium (K)	0-4.8	1.2	1.1	0-2.6	0.4	0.4
Silica (SiO <sub>2</sub> )	2.8-22	7.3	4.4	0.5-14	5.1	2.6
Sodium (Na)	1.7-80	13	15	0.8-15	3.3	2.7
Sulfate (SO <sub>4</sub> )	0-64	11	15	0-14	2.0	3.0

# PENSACOLA TESTING LABORATORIES

300 THORNHILL ROAD  
FORT WALTON BEACH, FL  
PHONE CH 2-9450

## REPORT OF WATER ANALYSIS APPROXIMATE WATER ANALYSIS (Volumetric)

Figure III-8. Water Quality Data.

Lab. No. 0924  
Report No. 0797  
Date 11-29-72  
Client's Requisition No. \_\_\_\_\_  
Our Order No. \_\_\_\_\_

For: THOMPSON DRILLING COMPANY  
Address: 100 RICKEY AVE., FT. WALTON BEACH, FLA.


Municipality EGLIN AIR FORCE BASE Date Collected 11-27-72  
Source of Sample TEST AREA - 51 Date Analysed 11-28-72  
Remarks SAMPLE SUBMITTED BY CLIENT. MEETS STANDARDS FOR DRINKING WATER.

### SUMMARY OF ANALYSIS

	P.P.M.		P.P.M.
Total Dissolved Solids @ <u>22</u> °C	<u>220</u>	Color	<u>0</u>
Total Hardness (versenate)	<u>80</u>	Odor	<u>0</u>
Alkalinity, as CaCO <sub>3</sub>	<u>96</u>	*Carbon Dioxide, as CO <sub>2</sub>	<u>2</u>
Carbonate Hardness	<u>0</u>	*Bicarbonate, as CaCO <sub>3</sub>	<u>95.8</u>
Non-carbonate, HCO <sub>3</sub>	<u>117</u>	*Carbonate, as CaCO <sub>3</sub>	<u>.2</u>
Iron, Fe	<u>.1</u>	*Hydroxide, as CaCO <sub>3</sub>	<u>0</u>
Sulfate, SO <sub>4</sub>	<u>.25</u>	Temperature at Collection, °F	<u>72</u>
Chloride Cl	<u>5</u>	pH (Field)	<u>--</u>
Calcium, Ca	<u>56</u>	pH (Laboratory)	<u>8.0</u>
Magnesium, Mg	<u>0</u>	*pHs	<u>9.4</u>
Fluoride, F	<u>--</u>	Phosphate, P205	<u>--</u>

Stability Index (2 pHs-pH) 10.6  
Corrosive X Non-Corrosive \_\_\_\_\_ Scale-Forming NON  
Appearance CLEAR

Delivered to: 5 - Thompson Drilling Co.

By: 

PAUL MALONE  
CHEMIST



### III.B3.3 Ground-Water Flow and Rate [40 CFR 264.601(a)(4) and (b)(5)]

#### Sand and Gravel Aquifer

The specific capacity of a well is the rate of discharge of water from the well divided by the drawdown of the water level in the well. According to data presented by Hayes and Barr (1983), specific capacities for 15 wells open to the main producing zone of the sand and gravel aquifer in southern Okaloosa county ranged from 1.3 to 125 (gal/min)/ft but were generally less than 15 (gal/min)/ft. Estimated potential yield is the product of specific capacity and maximum available drawdown, or the static water level in a well drawn down to the top of the main producing zone. The estimated potential yields of these 15 wells ranged from about 100 to more than 10,000 gal/min but generally fell within the range of 200 to 400 gal/min.

Ground water in the surficial zone of the sand and gravel aquifer at Range C-52N is expected to flow laterally from the water table surface in a southerly direction toward the confluence of the Bay Head Branch and the Coon Head Branch. Deflection of the flow to the southeast or southwest toward the eastern and western flanks of these branches can be anticipated based on local topography.

Based on the topography of the land surface at the Range C-62 OB/OD units, it is expected that ground water in the surficial aquifer flows in a southerly to southwesterly direction toward the headwaters of Blount Mill Creek.

#### Floridan Aquifer

The upper limestone of the Floridan aquifer is the source of most of the water used in Walton and Okaloosa counties. Data presented by Barr et al. (1985) for the Walton-Okaloosa County area indicated that well yields from the upper limestone of the Floridan aquifer ranged from less than 50 to approximately 850 gal/min. Specific capacities for these wells ranged from approximately 1 to 143 (gal/min)/ft.

Data provided by EAFB for EAFB Well No. 34, located on the northern boundary of Range C-62, showed an initial static water level of 126 ft bgs with a drawdown of 10 ft at a discharge rate of 125 gpm. Well No. 34 was constructed in 1966 to a total depth of 620 ft bgs in the Floridan aquifer. Eglin Well No. 89 located at Building 8720 on Range C-52N was constructed to a total depth of 390 ft bgs in 1988. The original static water level was 161 ft

bgs. Test data indicated a well capacity of 15 gpm and a specific capacity of 7.5 gal/ft. EAFB Well No. 88, also located at Building 8720 at Range C-52N, was taken out of service in 1980. Test data indicated a total depth of 452 ft bgs, an initial static water level of 137 ft, and a drawdown of 4 ft when pumping at 40 gpm. Specific capacity for this well was 10 gal/ft.

The potentiometric surface of the upper limestone of the Floridan aquifer has declined by as much as 160 ft in southern Okaloosa County in the past 40 years in response to pumping (Hayes et al. 1985). Prior to 1947 the potentiometric surface was controlled mainly by the hydraulic properties of the aquifer, the confining beds, and natural recharge and discharge. The potentiometric surface at that time sloped to the south at a gradient of 3-4 ft/mi and discharged into the Gulf of Mexico and possibly Choctawhatchee Bay (Hayes et al. 1985). Since 1947, pumping has induced regional depressions in the potentiometric surface and has produced a decline of the potentiometric surface in Walton County of 20 to approximately 60 ft (Trapp et al. 1977).

#### III.B3.4 Proximity to and Withdrawal Rates of Current and Potential Ground Water Users [40 CFR 264.601(a)(5)]

##### Range C-52N OD Unit

EAFB records indicate a total of nine potable water supply wells exist within a 4-mi radius of the Range C-52N OD unit (Figure ~~HH-9~~ II-5A). EAFB Well No. 33 is located approximately 4,800 ft northwest of the detonation area at Building 8722. This well is 410 ft deep (screened in the Floridan aquifer) and was installed in 1969. EAFB Well No. 90, installed in 1962, supplies water to the motor pool at Building 8861 in Range D-51 and is located approximately 1.8 miles southwest of the OD unit. The total depth of this well is 400 ft bgs with screening in the Floridan aquifer.

The remaining seven potable water supply wells are located within a 2- to 4-mi radius of the C-52N OD unit. EAFB Well No. 21 is located approximately 3.9 mi south-southwest of the site at Windham Tower. This well was installed in 1971 to a total depth of 380 ft bgs. EAFB Well No. 35, installed in 1964, is located in the C-1 test area at Building 8776, approximately 3.5 mi south-southwest of the OD unit. The well was installed in 1964 to a total depth of 382 ft bgs in the Floridan aquifer. EAFB Well No. 36 is located approximately 4 mi northeast of the detonation area at Building 8951. The total depth of this well is 411 ft bgs. EAFB Well No. 39 is located at Building 9460 in test area C-80W approximately 3.4 mi north of the OD

unit. This well was installed in 1969 to a total depth of 560 ft bgs. EAFB Well No. 40 is located approximately 3.3 mi north of the OD unit at Building 9461 in test area C-80A. It was installed to a total depth of 470 ft in 1967. EAFB Well No. 41 was installed in 1972 at Building 9469 in the C-80B test area. The total depth of the well is 510 ft bgs. EAFB Well No. 89, located at Building 8720 in Range C-52N, was installed in 1988 in the Floridan aquifer to a depth of 390 ft bgs. All of the above wells are screened in the Floridan Aquifer.

Engineering-Science (1992) reported that no private potable wells are found within 4 mi of the Range C-52N OD unit.

#### Range C-62 OB/OD Units

A review of EAFB records indicates two potable water supply wells exist within a 4-mi radius of the Range C-62 burn kettles (Figure III-9 II-5A). EAFB Well No. 34 is located on the northern boundary of Range C-62 at Auxiliary Generator Building 8759. It is situated approximately 1 mi north-northeast of the burn kettles. This well was installed in 1987 to a total depth of 620 ft bgs in the Floridan aquifer. It provides potable water and sanitation water for approximately 20 persons in the C-62 complex. EAFB Well No. 36 is located in the Laser Field at Building 8951, approximately 3.7 mi southwest of the OB/OD area. This well was installed in 1988 to a total depth of 411 ft bgs with screening in the Floridan aquifer.

Engineering-Science (1992) reported a total of 53 private potable wells within a 4-mi radius of the Range C-62 OB/OD units. Fourteen of these wells were identified within 2 and 3 mi of the OB/OD units with total depths ranging from 190 to 400 ft bgs. Thirty-nine wells were located within 3-4 mi of the OB/OD units with total depths ranging from 190 to 400 ft bgs. These wells are generally located north and east of Range C-62. None of these wells are screened within the surficial sand and gravel aquifer.

#### III.B3.5 Potential for Damaging Unsaturated Zone [40 CFR 264.601(b)(8)]

Due to the permeability of the surficial aquifer and the surface soil immediately underlying the OB/OD units at Range C-62 and OD units at Range C-52N, if containment provisions are not enforced, or if UXO items are not removed, infiltration of metal or explosive compounds into the unsaturated zone could occur. Furthermore, migration to the ground water is also possible due to the high permeability of subsurface soil. However, since metals and explosive

compounds are relatively immobile and relatively insoluble, migration/transport beyond the immediate vicinity of the OB/OD units is unlikely.

A soil sampling program to confirm that OB/OD operations are not damaging the unsaturated zone will be implemented, as discussed in Section II.G.

### III.B3.6 Land Use Patterns in the Area [40 CFR 264.601(a)(6) and (b)(9)]

Land use at Ranges C-52N and C-62 is military/federal and the ranges are restricted to access by unauthorized personnel. These areas are closed to hunting, fishing, and other outdoor recreation activities.

Areas surrounding both ranges are primarily EAFB reservation lands (3-mi radius from OB/OD units and 6-mi radius from OD unit at Range C-52N). Other Air Force bombing/training land uses beyond the reservation boundary are primarily forestry and mining with few residences. Hunting and fishing are permitted on much of the EAFB reservation lands, but are not permitted at Ranges C-62 or C-52N and much of the area surrounding both of these ranges. Numerous range roads traverse the military reservation property (Figure II-3). These roads are accessible to non-military personnel, although range gates are located throughout the reservation at the entrances to each of the active bombing/training ranges and are blocked during training missions or OB/OD activities. These roads are also blocked at designated locations and monitored by security police and other personnel, as required.

### III.B3.7 Potential for Deposition or Migration of Waste Constituents into Subsurface Physical Structures and into Root Zone of Food Chain Crops or Other Vegetation [40 CFR 264.601(a)(7)]

Ranges C-52N and C-62 are entirely cleared, grassy plains. No food chain crops are cultivated for human consumption in these areas. Typical canopy vegetation includes *Quercus laevis* (turkey oak), *Quercus incana* (blue-jack oak), and *Diospyros virginiana* (persimmon) in the drier, cleared areas and *Magnolia virginiana* (sweet bay), *Cliftonia monophylla* (titi), and *Cyrilla racemiflora* (little leaf titi) along stream margins. The shrub layers consist of species not normally considered as canopy vegetation but which have not attained tree stature. The ground cover is diverse although species of *Graminae* (grasses) and *Asteroceae* (composites) predominate (Air Force Development Test Center 1991).

At Range C-62, it is possible that metal debris fragments remaining after OD activities are completed may contribute to downgradient metals transported through the soil. Any UXO remaining after OB activities is collected by EOD teams for subsequent destruction and would therefore not be available for transport. Residue from OB activities should not represent a potential contaminant source because OB activities are contained within the burn kettles. Based on the low mobility and solubility of metals in the environment, and the non-vegetated nature at the OB and OD units, migration of wastes into root zones is not likely. In order to further substantiate the movement and dispersion of emissions from OB/OD operations at Eglin AFB, the base will provide photographic documentation of future OB/OD events within 6 months of permit issuance. EAFB will also conduct air monitoring as described in Appendix O, Air Monitoring Plan.

#### III.B3.8 Effects of Explosion on Geologic Units and Ground-Water Flow Under the Unit [40 CFR 270.23(e), 40 CFR 264.601(a)(1), and (b)(2)]

There are no ground vibrations associated with open burning operations. Open detonation operations can cause a shock wave in air (Section III.F1). Some of this shock wave may be transmitted to the ground; however, since bedrock is encountered at more than 500 ft below ground surface, surficial ground vibration is anticipated to have negligible effects on the bedrock.

#### III.B3.9 Potential Impacts on Human Health [40 CFR 264.601(a)(8) and (b)(10)]

The uppermost aquifer is not used as a drinking water source in the vicinity of either Range C-52N or C-62. There are seven wells within a 2- to 4-mi radius of Range C-52 and two wells within a 4-mi radius of C-62; however, all of these are screened within the deeper Floridan aquifer, which is separated from the surficial aquifer by the 100-200-ft thick Pensacola clay containing layer. There are 53 private, potable wells within 4 mi of Range C-62 OB/OD units, but all are screened within the deeper Floridan aquifer. There are no known water supply wells screened in the surficial aquifer within a 4-mi radius of either range. The distance to the closest residence (which represents human receptors at potential risk of maximum exposure) is 2.8 mi at Range C-62 and 6 mi at Range C-52N.

### **III.B3.10 Potential for Drainage to Flora, Fauna, and Physical Structures Due to Exposure [40 CFR 263.01(a)(9) and (b)(1)]**

Contaminants discharged through OB/OD operations as either particulates, fragments, or UXO could potentially result in surface debris which could represent potential exposure scenarios for grazing herbivores and/or birds. Benthic organisms, fish, and other aquatic receptors in the surface waterbodies could be exposed to metals or explosives that have migrated from the source area. It is not possible to assess potential exposure at this time until data related to ground water and surface soil is available. A program to collect surface soil quality data is discussed in Section II.G.

### **III.B4 PROTECTION OF SURFACE WATER, WETLANDS, AND SURFACE SOIL [40 CFR 264.601(b), 270.3(b) and (c)]**

#### **III.B4.1 Effectiveness and Reliability at Containing, Confining, and Collecting Systems, and Structures in Preventing Migration [40 CFR 264.601(b)(2)]**

OB operations are conducted in contained burn kettles that prevent dispersal of fragments and residual ash. OB procedures, described in Section III.A1, have been developed to prevent migration of wastes to surface water and the soil surface. Furthermore, the high permeability of surface soil limits potential for runoff to surface water.

OD operations are not controlled, but occur in relatively flat areas at Ranges C-52N and C-62. OD operations destroy most of the items to be treated, however, metal fragments and debris resulting from the detonation may be scattered in and around the vicinity of the detonation pit. Fragments and debris resulting from OD operations would be available for potential migration/transport through the high permeability soil. Contaminants associated with deteriorated wastes (metals and explosives), however, are relatively immobile and insoluble, and would not be expected to migrate significantly from the treatment area.

As discussed in Section II.G., a monitoring program including soil and ground-water sampling will be implemented to further assess effectiveness and reliability of OB/OD operations in preventing migration.

### III.B4.2 Precipitation Patterns [40 CFR 264.601(b)(4)]

Walton County has a humid, semitropical climate. Winters are mild, with occasional frost from November through February. Convective weather systems occur frequently during the summer months and are responsible for the high average rainfall from June through September (Barr et al. 1985).

Average annual rainfall measured at Eglin Main Base for a 52-year period (1940 through 1992) ranged from 31.41 in. in 1954 to 101.36 in. in 1975. Average monthly rainfall ranges from 3.54 in. in October to 7.67 in. in July for this period (pers. comm., Mr. Ed Keppel, Meteorologist-Weather Flight, EAFB, 6 August 1993). Monthly precipitation data are provided in Table III-3.

### III.B4.3 Proximity of the Units to Surface Waters [40 CFR 264.601(b)(6)]

The Range C-52N OD unit is equidistant between two surface waterbodies (Figure II-4). Bay Head Branch is located approximately 1,600 ft west of the OD unit and Coon Head Branch is located approximately 1,700 ft to the east. The branches flow in southerly directions and join to form Basin Creek approximately 2.5 mi south of the OD unit. Basin Creek flows southeasterly and then easterly to its confluence with Basin Bayou approximately 7 mi southeast of the OD unit. Basin Bayou discharges to Choctawhatchee Bay. The land surface at the OB/OD units slopes gently to the east, south, and west. Stormwater runoff is conveyed along the ground surface toward the two branches.

Range C-62 is drained by the intermittent headwaters of Blount Mill Creek, located approximately 320 ft west of the burn kettles (Figure II-5). The ground surface slopes gently to the southwest from the burn kettles, conveying surface runoff toward the creek. Blount Mill Creek flows south-southeasterly approximately 2.5 mi to its confluence with Little Alaqua Creek. Little Alaqua Creek, in turn, discharges into Alaqua Creek approximately 8.5 mi southeast of the Range C-62 OB/OD units. Alaqua Creek flows into Alaqua Bayou and Choctawhatchee Bay.

TABLE III-3 MONTHLY AVERAGE TEMPERATURE, PRECIPITATION, AND  
RELATIVE HUMIDITY—EGLIN AFB, FLORIDA

MONTH	AVERAGE TEMPERATURE (°F)			PRECIPITATION (in.)	RELATIVE HUMIDITY (%)	
	MAX.	MIN.	MEAN	MEAN	0700 CST	1300 CST
Jan	59	46	53	4.71	78.6	58.2
Feb	63	49	57	4.28	80.8	58.7
Mar	71	57	64	5.35	84.5	54.3
Apr	78	63	71	4.01	76.6	49.5
May	84	70	77	3.83	76.1	54.2
Jun	90	76	83	5.87	78.5	58.3
Jul	91	78	84	7.59	79.2	59.8
Aug	90	77	84	7.30	82.8	61.2
Sep	88	73	81	7.13	79.9	56.4
Oct	80	62	71	3.44	79.7	52.5
Nov	70	56	63	3.64	84.5	57.7
Dec	64	50	57	4.88	84.6	60.8
Annual	78	64	71	62.03	79.7	56.7



#### III.B4.4 Water and Surface Soil Quality Standards Data and Uses [40 CFR 264.601(b)(7) and (8)]

Water quality data have been collected by the U.S. Geological Survey and the Northwest Florida Water Management District at surface water stations downstream of Ranges C-52N and C-62 (Wagner et al. 1980). The station "Basin Creek near Portland" is downstream of the Range C-52N unit and the "Alaqua Creek near DeFuniak Springs" station is downstream of the eastern side of Range C-62 (Figure III-9).

The Basin Creek near Portland station is located approximately 5 mi downstream of Range C-52N. Water quality data collected in 1969 and 1970 showed the following concentrations of dissolved constituents: magnesium, 0.4 mg/L; potassium, 0.2 and 0.3 mg/L; silica, 3.2 and 3.3 mg/L; sodium, 1.4 and 1.9 mg/L; and sulfate, 0.2 and 0.8 mg/L. Hardness as  $\text{CaCO}_3$  was measured at 3 and 2 mg/L. Water temperature recorded in 1969, 1970, and 1977 ranged from 19.0°C in May 1969 to 27.5°C in July 1977. pH varied from 5.5 in May 1969 to 5.6 in May 1970. Specific conductance varied from 19  $\mu\text{mhos}$  in May 1969 and May 1970 to 60  $\mu\text{mhos}$  in July 1977. Available surface water data for this station are provided in Table III-4.

The Alaqua Creek near DeFuniak Springs station is located approximately 2.5 mi downstream of the east side of Range C-62 and has a discharge area of approximately 65.6  $\text{mi}^2$ . Water quality data collected annually from 1966 through 1970 showed the following dissolved constituents in surface water: magnesium, 0.2 to 0.3 mg/L; potassium, 0.2 to 2.1 mg/L; silica, 3.6 to 5.6 mg/L; sodium, 1.0 to 1.4 mg/L; strontium, 0  $\mu\text{g/L}$ ; and sulfate, 0.0 to 1.2 mg/L. Hardness, as  $\text{CaCO}_3$  ranged from 0 to 2 mg/L. Water temperature was recorded annually from 1966 to 1974 and ranged from 8.0°C in December 1973 to 23.5°C in July 1974. pH for the period 1966 to 1970 ranged from 5.1 in May 1967 to 6.2 in May 1970. Specific conductance for this period ranged from 12  $\mu\text{mhos}$  in May 1967 and May 1970 to 22  $\mu\text{mhos}$  in May 1969. Available surface water data for this station are provided in Table III-5.

Limited surface soil sampling was performed after OB/OD operations in March 1992. Samples were analyzed from three locations at the Range C-52N OD unit and two locations at the Range C-62 OD unit. Samples were analyzed for TCLP metals and organics. Results indicate that no samples exhibited TCLP concentrations in excess of reporting limits Appendix L. Additional surface soil sampling is proposed, as discussed in Section II.G.



**TABLE III-4 SURFACE WATER QUALITY FOR BASIN CREEK PORTLAND STATION, EGLIN AFB, VALPARAISO, FLORIDA**

[illegible][illegible]

TABLE III-5 SURFACE WATER QUALITY FOR ALAQUA CREEK NEAR FUNIAK DEFUNIAK SPRINGS STATION, EGLIN AFB, VALPARAISO, FLORIDA

[illegible][illegible]

### **III.B4.5 Assessment of Surface Water Migration Potential [40 CFR 264.601(b)(9) (11)]**

Due to the inherent nature of detonation, OD operations are conducted on the ground in shallow pits in the test areas. OB operations are conducted in containment devices which prevent significant dispersal of fragments and residual ash to the surrounding environs. After completion of a burn, the residue is collected and removed from the containment device. The container is then washed and wash-down water is collected and analyzed prior to disposal. Additional sampling of rain water that may accumulate within the container after it has been washed is therefore unnecessary. After cleaning, the burn kettles are covered with a nylon tarpaulin to minimize rainfall collection between uses. Water collected in the burn kettles from rainfall between OB/OD events is drained to the land surface prior to subsequent burns.

Migration of contaminants by surface water depends on overland flow transport of contaminants to ephemeral streams. The intermittent nature of the streams in the vicinity of the OB/OD units, the permeable nature of the surface soil, and the tendency for detonation wastes to be immobile in soil and water all serve to minimize surface water migration potential away from the vicinity of the OB/OD units.

### III.C AIR QUALITY ASSESSMENTS

#### III.C1 VOLUME AND PHYSICAL CHARACTERISTICS OF THE WASTE IN THE UNIT [40 CFR 270.23(b) and 264.601(c)(1)]

EOD operations at EAFB involve ~~open burning~~ OB and ~~open detonation~~ OD of waste ordnance materials and developmental munitions. Thermal treatment of these waste items, excluding emergency EOD operations which are handled on a case-by-case basis, is conducted on active bombing Ranges C-52N and C-62 within the EAFB reservation. Wastes currently treated by OB/OD include serviceable and unserviceable munitions, wastes generated at Eglin's HERD facility, and wastes generated by EOD operations. Serviceable munitions treated by OB/OD consist of munitions used in military training exercises and specialized weapons testing. These munitions include, but are not limited to igniters, cartridges, rounds, flares, rockets, smoke canisters, bombs, propellants, and pyrotechnics. Wastes generated by the HERD facility include research and development explosives, experimental explosives, and traditional explosives ~~such as TNT, Composition B, and Tritonal~~. Research and development explosives include ~~AFX-1100, AFX-453, AFX-931, PBXN-109~~ AFX 1100, AFX 453, AFX 931, AFX 931-M, PBXN 109, and TNT/SNQ. More detailed information on the volume and physical characteristics of wastes handled by OB/OD is provided in Sections II.B and III.B1. Operations are conducted on an as needed basis approximately once a month. EOD personnel have indicated that approximately 10,000 ~~pounds~~ lbs combined net explosive weight (NEW) ~~NEW~~ of waste explosives ~~are~~ have historically been open burned on an annual basis, while approximately 5,000 ~~pounds~~ lbs combined NEW per year ~~are~~ have historically been open detonated.

Range C-62 is located in the central portion of Walton County, approximately 20 mi northeast of the Eglin Main Base. Specifically, Range C-62 is located on the south side of Range Route 317, approximately three-tenths of a mile from the intersection of Range Routes 210 and 317 (Figure II-5). Range C-62, including the OB/OD units, has been cleared of trees and underbrush. The OB/OD units, which encompasses less than 1 acre, slopes slightly to the southwest towards the head of a tributary of Blount Mill Creek. Low explosive waste disposal is performed in two 8 x 8 x 20 ft metal burn kettles. In order to ensure thorough and complete combustion of the explosive waste, a minimum of 3 ft of dunnage and approximately 100 gal of virgin diesel fuel is used as an initiating mechanism. Dunnage consists primarily of scrap wood and pallets. High explosive wastes are treated by open detonation at Range C-62 in a cleared area. Explosive materials are placed on the open ground and are remotely detonated using the plastic explosive C-4.

Range C-52N is approximately 17 mi northeast of the main base complex of EAFB in the west central portion of Walton County. Specifically, this open detonation unit is located in the northwest corner of the range near the north end of an old runway between Range Routes 214 and 217. The ground surface in the vicinity of the OD unit is fairly flat and slopes gradually toward Choctawhatchee Bay, located approximately 6 mi to the south. As at the Range C-62 OD unit, explosive materials are placed on the open ground and remotely detonated using C-4. Specific details of these operations, to include a characterization of the specific wastes disposed of at these units are presented in Section III.C6.

Air pollutant emissions resulting from OB/OD operations were calculated using ~~established computer modeling (POLU13G)~~ the POLU13G computer model and mass balance techniques in conjunction with published emission factors. A detailed discussion of these emission estimates are presented in Section III.C6.

Air pollutant emissions resulting from OB/OD operations are expected to be transported and dispersed beyond the immediate vicinity of the EOD ranges. Downwind concentrations were predicted using standard EPA modeling techniques. These techniques and modeling results are presented in Section III.C6 and Appendix M.

### III.C2 EFFECTIVENESS AND RELIABILITY OF SYSTEMS AND STRUCTURES TO REDUCE OR PREVENT EMISSIONS [40 CFR 264.601(c)(2) and 270.23(d)]

Prior to actual OB/OD of waste explosives, emissions are limited to volatilization of the petroleum products in diesel fuel used to ignite waste materials. Since these fuels are stored in tightly sealed containers, volatile organic compound (VOC) emissions are minimized, and are insignificant when compared with the total emissions from OB/OD.

No emission control systems or equipment are utilized for OB/OD operations. However, fugitive emissions due to wind entrainment of OB/OD ash is significantly reduced because burning is confined to the two steel burn kettles.

### III.C3 OPERATING CONDITIONS OF UNIT (CASE BY CASE) [40 CFR 264.601(c)(3)]

The conditions under which OB/OD operations may be initiated are based on a series of safety, environmental, and meteorological factors. Munition disposal operations on the Eglin

Range Complex (OB/OD units at both ranges) are limited to a maximum of 3,000 ~~pounds~~ lbs combined ~~net explosive weight (NEW)~~ per detonation. Prior to detonating charges, a check with EOD Operations is made to confirm favorable weather conditions. Meteorological data collected at EAFB will be used to determine if conditions are favorable for OB/OD operations. A portable meteorological station will be brought to the treatment area on the day of the operations to measure site-specific conditions. EOD operations are limited to taking place when wind speeds are greater than 3 mph and less than or equal to 15 mph. Disposal operations are not conducted during an electrical storm or when such a storm is approaching within 3 mi. In addition, detonation operations that require the use of an electric firing system will not be conducted during sand, dust, or snow storms. Disposal operations are restricted to daylight hours.

All unserviceable munitions disposed of by EOD must first be listed on an approved AF Form 191, *Ammunition Disposition Request (ADR)*. Munition items not listed on the AF Form 191, or quantities in excess of the pre-approved ADR amounts, will be refused for processing at the OB/OD units. All items designated as hazardous wastes must be manifested by the originator on an EPA Form 8700-22, *Uniform Hazardous Waste Manifest*, prior to transportation to the OB/OD unit. After processing, the Base Commander or his designee will sign the manifest, and a copy of the completed form will be retained.

After OB operations are concluded, the OB units are not to be approached until 12-24 hours after all signs of burning have ceased. Munitions residual determined to be free of hazardous waste are then transported to an approved construction/debris landfill for disposal. Items identified as still containing hazardous waste are returned for reprocessing.

#### III.C4 ATMOSPHERIC, METEOROLOGICAL, AND TOPOGRAPHIC CHARACTERISTICS OF THE UNIT AND SURROUNDING AREAS [40 CFR 264.601(c)(4)]

Ranges C-52N and C-62 are located in the west central and central portions of Walton County, Florida, respectively, approximately 30 mi east of Pensacola, Florida. The climate of the Pensacola area is moderated by the Gulf of Mexico, which tempers the cold Northerners of the winter and creates cool sea breezes during the daytime in summer.

The topography of the area surrounding Range C-52N can be characterized as fairly flat, sloping gradually to Choctawhatchee Bay, located approximately 6 mi to the south. Elevations in this area range from 100 to 180 ft above mean sea level (MSL). The elevation at the open



detonation unit is approximately 160-170 ft above MSL. Steeper terrain exists to the west and north of the unit, and elevations in these areas range from 50 to 150 ft above MSL.

The Range C-62 topography is also flat, with a gentle slope to the southwest, in the direction of the head of a tributary of Blount Mill Creek. Elevations in the general vicinity of the Range C-62 range from 150 to 200 ft above MSL. The elevation of OB/OD units is approximately 190 ft above MSL.

The EAFB/Valparaiso weather station (No. 722210) is located on the main base in the south central portion of EAFB, approximately 4 mi southwest of Niceville, Florida. Station elevation is 85 ft above MSL. The general topography in the area surrounding the weather station is flat. The weather station is approximately 13 mi southwest of Range C-52N and 22 mi southwest of Range C-62.

Meteorological data collected at the EAFB/Valparaiso weather station are expected to be fairly representative of the meteorological conditions at OB/OD units. Topography in the region is generally flat, and similar trends in temperature, winds, humidity, and precipitation are expected. Some differences in wind speed and direction are expected at Ranges C-52N and C-62 from the weather station due to terrain and localized effects. However, the wind data collected at the EAFB/Valparaiso weather station is adequate for evaluating conditions at the OB/OD units.

#### III.C4.1 Frequency of Inversions [40 CFR 264.601(c)(4)]

Inversion frequency for the EAFB area tends to be moderate, with increased occurrence during the winter months. Hosler (1961) reported that inversions or isothermal conditions based below 500 ft occurred in the Florida panhandle area approximately 25 percent of the time during the summer, and 35 percent of the time during the winter months. However, the light coastal breezes aid in the dispersion of pollutants. The most unfavorable meteorological conditions for pollutant dispersal occur during the months of July and August, when the winds are calmest, and average wind speeds are below 3.6 knots (4 mph).

#### III.C4.2 Lake and Pond Evaporation [40 CFR 264.601(c)(4)]

The nearest weather station which measures pan evaporation is located approximately 40 mi northwest of Eglin AFB OB/OD units and 10 mi northeast of Pensacola, Florida in Milton,

Florida. The average annual pan evaporation for the period of 1983-92 was 57.7 in., and the average monthly evaporation was 4.8 in. Evaporation was greatest during the months of May and June, averaging 6.9 in. per month, and least during December and January, averaging 2.3 in. per month.

#### III.C4.3 Annual and 24-hour Rainfall Data [40 CFR 264.601(c)(4)]

Rainfall is usually well distributed throughout the year, with the highest amounts falling during July and August. The recorded annual average precipitation at EAFB averaged a little over 62 in. The wettest month is July with an average of 7.59 in., and the driest is October with 3.44 in. Rain falls an average of 121 days per year, and 44 of these days have total rainfall greater than or equal to 0.5 in. The greatest 24-hour precipitation total ever recorded was 10 in. The average monthly rainfall recorded at the EAFB/Valparaiso weather station is presented in Table III-3.

#### III.C4.4 Seasonal Temperatures [40 CFR 264.601(c)(4)]

Temperatures recorded at EAFB during 1981-1991 indicated that the mean monthly temperatures varied from a low of 53°F in January to a high of 84 during the months of July and August. The annual average temperature was 71°F. The average daily maximum, minimum, and mean temperatures observed at EAFB is presented in Table III-3.

#### III.C4.5 Relative Humidity [40 CFR 264.601(c)(4)]

Due to its proximity to the Gulf of Mexico, the relative humidity is usually high, and typically ranges from 50-80 percent throughout the year. The average relative humidity observed at EAFB at 0700 and 1300 hours local time is presented in Table III-3.

#### III.C4.6 Wind Rose [40 CFR 264.601(c)(4)]

Wind data recorded at EAFB indicate that, on an annual basis, winds are predominantly from the north, and are less than 9 knots (10 mph) in velocity. Mean annual windspeed is approximately 4.8 knots (5.5 mph). Winds are generally from the north and are strongest during the fall and winter months. During the spring and summer, however, winds are lighter in velocity and are generally out of the south. Data regarding wind speed and direction for the EAFB/Valparaiso, ~~Florida~~ weather station is presented in Table III-6A through Table III-6E.

**TABLE III-6A ANNUAL AVERAGE WIND SPEED AND DIRECTION—EGLIN AFB,  
FLORIDA**

		WIND SPEED IN KNOTS									
ALL DIRECTION (Degrees)		1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	50-64
(N)	350-010	5.8	5.3	1.9	.2						
	020-040	3.0	2.9	.9	.1						
	050-070	2.8	3.0	.8	.1						
(E)	080-100	2.2	2.2	.6	.1						
	110-130	1.8	3.0	1.3	.2						
	140-160	1.7	3.3	1.8	.3						
(S)	170-190	1.6	3.5	1.8	.2						
	200-220	2.2	3.6	1.7	.1						
	230-250	2.2	2.1	.8	.1						
(W)	260-280	1.6	.9	.3	.0						
	290-310	2.6	1.3	.5	.1						
	320-340	3.6	2.8	1.1	.1						
	CALM	19.9									
	TOTALS	51.0	33.9	13.5	1.6						

**TABLE III-6B WINTER AVERAGE WIND SPEED AND DIRECTION—EGLIN AFB, FLORIDA**

		WIND SPEED IN KNOTS									
ALL DIRECTION (Degrees)		1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	50-64
(N)	350-010	6.4	8.0	3.3	0.6						
	020-040	3.2	4.2	1.4	0.1						
	050-070	2.7	3.0	0.6	0.1						
(E)	080-100	2.6	2.3	0.5	0.0						
	110-130	2.8	4.1	1.8	0.2	0.1					
	140-160	1.6	2.5	1.3	0.2						
(S)	170-190	1.2	1.9	0.8	0.1						
	200-220	1.5	1.7	0.6	0.0						
	230-250	1.3	1.2	0.6	0.1						
(W)	260-280	1.3	1.0	0.4	0.0						
	290-310	2.8	1.8	0.9	0.2	0.1					
	320-340	3.9	4.0	2.0	0.3						
CALM	16.7										
TOTALS	48.0	35.7	14.2	1.9	0.2						

**TABLE III-6C SPRING AVERAGE WIND SPEED AND DIRECTION—EGLIN AFB,  
FLORIDA**

		WIND SPEED IN KNOTS									
ALL DIRECTION (Degrees)		1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	50-64
(N)	350-010	4.7	4.9	1.7	0.1						
	020-040	1.8	2.1	0.6	0.1						
	050-070	1.7	1.8	0.6							
(E)	080-100	1.7	1.7	0.5							
	110-130	1.7	2.9	1.8	0.4						
	140-160	2.1	4.9	3.3	0.9						
(S)	170-190	2.0	4.6	2.8	0.5						
	200-220	2.3	4.6	1.9	0.3						
	230-250	2.1	2.4	1.2	0.1						
(W)	260-280	1.6	0.9	0.3							
	290-310	2.2	1.5	0.7	0.2						
	320-340	3.5		1.6	0.2						
CALM		20.5									
TOTALS		47.9	32.3	17.0	2.8						

**TABLE III-6D SUMMER AVERAGE WIND SPEED AND DIRECTION—EGLIN AFB,  
FLORIDA**

		WIND SPEED IN KNOTS									
ALL DIRECTION (Degrees)		1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	50-64
(N)	350-010	5.0	1.7	0.3							
	020-040	3.1	1.3	0.2							
	050-070	2.9	2.0	0.4							
(E)	080-100	2.1	2.0	0.5							
	110-130	1.4	1.7	0.4							
	140-160	1.4	2.6	0.9	0.1						
(S)	170-190	2.1	4.5	2.3	0.1						
	200-220	3.4	6.1	3.0	0.2						
	230-250	4.0	3.6	1.1	0.1						
(W)	260-280	2.7	1.2	0.3							
	290-310	3.2	1.0	0.1							
	320-340	3.8	1.3	0.1							
CALM		25.8									
TOTALS		60.9	29.0	9.6	0.5						

**TABLE III-6E FALL AVERAGE WIND SPEED AND DIRECTION—EGLIN AFB,  
FLORIDA**

		WIND SPEED IN KNOTS									
ALL DIRECTION (Degrees)		1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	50-64
(N)	350-010	7.1	6.9	2.4	0.2						
	020-040	3.8	4.2	1.7	0.1						
	050-070	3.8	5.0	1.8	0.1						
(E)	080-100	2.5	3.1	0.9	0.1						
	110-130	1.6	3.2	1.3	0.1						
	140-160	1.7	3.2	1.3	0.2						
(S)	170-190	1.1	2.8	1.1	0.1						
	200-220	1.5	2.1	0.8							
	230-250	1.2	1.0	0.2							
(W)	260-280	1.0	0.5	0.1							
	290-310	1.8	0.9	0.2							
	320-340	3.6	3.0	1.0							
CALM		19.7									
TOTALS		50.4	35.9	12.8	0.9						

Annual and seasonal wind roses showing the frequency of wind direction as a function of wind speed for EAFB is are presented in Figures II-8A through II-8E.

### III.C5 Existing Air Quality (Toxic Pollutants) and Other Sources of Contamination [40 CFR 264.601(c)(5)]

The EAFB/Pensacola area does not experience serious air pollution problems due to its close proximity to the Gulf Coast and lack of heavy industry.

FDEP operates a number of ambient air quality monitoring stations in the Pensacola/Fort Walton Beach areas. These State and Local Air Monitoring Stations (SLAMS) monitor criteria air pollutants for which National Ambient Air Quality Standards (NAAQS) have been established. The State of Florida has incorporated these same air quality standards into their regulations except for SO<sub>2</sub>, which is more stringent. Florida's ambient air quality standards are presented in Table III-7. The SLAMS data for these areas indicate that EAFB is located within an attainment area for all established criteria pollutants. Although the data indicated three 1-hour values greater than 0.125 ppm in Florida during 1992, the O<sub>3</sub> standard was not violated at these monitoring stations since the number of calendar days with concentrations greater than or equal to 0.125 ppm was not greater than one. Only one of these monitoring stations (Ellyson Industrial Park, Pensacola) was located in the EAFB area. Specific pollutant concentration data for Pensacola and Fort Walton Beach is presented in Table III-8.

No monitoring is routinely performed at the present time for toxic air pollutants. However, due to the lack of industrial sources in the area and relative remoteness of the OB/OD units, the background levels of ambient toxic contaminants is expected to be minimal.

### III.C6 POTENTIAL IMPACTS TO HUMAN HEALTH AND THE ENVIRONMENT [40 CFR 264.601(c)(6)]

#### III.C6a Screening Assessment [40 CFR 264.601(c) and 264.602]

##### III.C6a.1 Types and Quantities of Wastes [40 CFR 264.601(c)(1)]

A listing of the components of munitions items potentially treated at Eglin AFB is provided in Table II-1. Furthermore, a representative listing of munitions items that were treated during an OB/OD event at Eglin AFB in August 1993 is provided as Table II-2. Using these lists, in conjunction with discussions with Eglin AFB EOD personnel, representative "worst case"



**TABLE III-7 ~~STATE AND FEDERAL~~ FLORIDA AMBIENT AIR QUALITY  
STANDARDS<sup>(a)</sup>**

Pollutant	Averaging Time	Standard	
		Primary	Secondary
SO <sub>2</sub>	Annual Arith. Mean 24 hrs 3 hrs	60 µg/m <sup>3(b)</sup> 260 µg/m <sup>3(b)</sup>	1,300 µg/m <sup>3</sup>
Particulate Matter (PM <sub>10</sub> )	Annual Arith. Mean 24 hrs	50 µg/m <sup>3</sup> 150 µg/m <sup>3</sup>	50 µg/m <sup>3</sup> 150 µg/m <sup>3</sup>
CO	8 hrs 1 hr	9 ppm 35 ppm	—
O <sub>3</sub>	1 hr	0.12 ppm	0.12 ppm
NO <sub>2</sub>	Annual Arith. Mean	100 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>
Pb	Quarterly Arith. Mean	1.5 µg/m <sup>3</sup>	1.5 µg/m <sup>3</sup>

- (a) \* ~~National~~ State standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once a year.
- (b) These values reflect Florida's more stringent SO<sub>2</sub> standards. National standards for annual and 24 hour concentrations are 80 µg/m<sup>3</sup> and 365 µg/m<sup>3</sup>, respectively.

TABLE III-8 1992 AMBIENT AIR QUALITY DATA FOR THE EAFB AREA<sup>(a)</sup>

Pollutant	Monitoring Station Location	Ambient Concentration ( $\mu\text{g}/\text{m}^3$ )			
		1 hr Max	3 hr Max	24 hr Max	Annual Arith. Mean
SO <sub>2</sub>	Ellyson Industrial Park, Pensacola	---	1016	184	19
NO <sub>2</sub>	Brunson RMT, Pensacola	---	---	---	14
O <sub>3</sub>	Ellyson Industrial Park, Pensacola	.126 <sup>(b)</sup>	---	---	---
PM <sub>10</sub>	First St. SE and Church Avenue, Fort Walton Beach	---	---	58	22

(a) Source of Data: Florida Department of Environmental Protection.

(b) Units are ppm.

treatment scenarios were developed in order to characterize potential adverse impacts associated with their treatment.

Recognizing that the universe of munitions/ordnance/explosive items that could potentially be treated by OB/OD at ~~Eglin~~ EAFB is too extensive to address each individual item or combination of items individually, the approach of using conservative "worst case" scenarios was adhered to. Under this approach, a total of ~~nine~~ 14 scenarios (~~three~~ six for OB and ~~six~~ eight for OD) were developed as described below. The waste treatment scenarios were used as input data for subsequent air emissions and dispersion modeling (as described in Section III.C6a.3) and risk assessment (as described in Section III.D). Since these scenarios were developed to predict "worst case" conditions, if air dispersion modeling of these scenarios does not demonstrate adverse environmental impacts, then adverse impacts should not be anticipated under other potential waste treatment scenarios.

Recognizing that actual monitored data are always preferable to ~~modeled data~~ predicted impacts, an air monitoring program has been developed (Appendix O). The monitoring program identifies sampling locations at the receptor locations used in the air dispersion modeling, as well as sampling procedures, and frequency/duration of air monitoring events. These data will likely represent ~~Eglin~~ EAFB's basis of permit compliance with respect to air pollutant discharge. The modeled data presented in this permit application will not likely drive determinations of ~~Eglin~~ EAFB's RCRA compliance/non-compliance, but are presented in this application to demonstrate that the process (as operated) should satisfy compliance objectives with respect to air quality. Consequently, although the POLU13G modeling effort does not address every specific ordnance or munitions item that could be treated, nor every possible explosive or propellant mixture, the OB/~~and~~ OD scenarios that were developed ~~were~~ and structured to consider "worst case" conditions, ~~as~~ are described in the following paragraphs. We recognize that this approach does not consider all of the potential items that may be treated, but we also recognize that actual air monitoring associated with specific OB/~~and~~ OD events will provide a more accurate database that will facilitate FDEP and EPA efforts to initially assess and subsequently monitor ~~Eglin~~ EAFB's RCRA permit compliance status.

#### Open Detonation Treatment Scenarios

OD at ~~Eglin~~ EAFB occurs at OD units on ~~both~~ Ranges C-52N and C-62. OD is used for treatment of bombs, rockets, bulk explosives, and large caliber ordnance items. Table II-1

identifies the components of military munitions (i.e., high explosives, propellants, etc.) that result in classification of these items as RCRA reactive wastes for purposes of disposal.

The initial OD assessment focused on the explosive components that could make up any of the munitions/ordnance items treated by OD. Specifically, it considered the high explosive component. A total of ~~five~~ eight scenarios for OD were evaluated—~~three~~ five conventional and ~~two~~ three research and development (Table III-9):

- Composition B
- Tritonal
- Octol
- MK82 Bombs
- Pentolite
- PBXN 109
- AFX 453
- AFX 931-M

TNT and RDX are the two most commonly used high explosive formulations in military munitions. Therefore, it was determined that POLU13G modeling should consider one explosive mix primarily consisting of TNT (~~Tritonal~~ Tritonal), one of primarily RDX (PBXN 109), and one with an approximately even mix of the two (Composition B). The other high explosive that is frequently used is HMX. Consequently, Octol (an explosive mix primarily containing HMX) was also considered. ~~In addition to TNT, RDX, and HMX-based explosives, one other composition (AFX 453) was also modeled to consider impacts of detonation of nitroguanidine-based explosives.~~ To consider the impacts due to the detonation of nitroguanidine-based explosives, AFX 453 was also modeled using POLU13G. Pentolite was chosen due to its high PETN content. AFX 931-M contains higher concentrations of ammonium perchlorate, RDX, and aluminum.

~~These five~~ The first five scenarios considered detonation of 3,000 lbs combined NEW at the Range C-62 OD unit. The last three scenarios performed at Range C-52N consider detonation of 700 lbs of combined NEW. OD was assumed to be complete within 1 hour, and only one detonation occurred on any given day.

In addition to assessing OD of representative high explosives, it was determined to be beneficial to examine OD of a typical complete ordnance item. ~~MK-82~~ MK82 bombs were

TABLE III-9 COMPOSITION DATA OF MUNITIONS/EXPLOSIVES USED IN  
POLU13G EMISSION MODELING

Munition/Explosive	Treatment Method	Composition	Percent by Weight (%)
Impulse Cartridge	Open Burning	Nitrocellulose Nitroglycerin	62.0 38.0
20 mm Cartridge (M55)	Open Burning	Nitrocellulose Tetryl Nitroglycerin Barium Peroxide Magnesium Calcium Carbonate Diphenylamine	68.47 14.25 6.94 6.18 2.65 0.88 0.63
Composition B	Open Detonation	RDX TNT	60.0 40.0
Tritonal	Open Detonation	TNT Aluminum	80.0 20.0
PBXN 109	Open Detonation	RDX Aluminum Powder R-45 Diethyl Adipate IPDI DHE AO-2246	64.0 20.0 7.26 7.26 1.12 0.26 0.10
AFX 453	Open Detonation	Nitroguanidine Aluminum Aluminum Nitrate TDO	73.0 15.0 11.5 0.5
20-mm Cartridge <sup>(a)</sup> (M97A2)	Open Burning	Nitrocellulose Nitroglycerin Diphenylamine Tetryl Lead Azide Aluminum	56.03 5.65 0.56 30.86 0.49 5.19
LUU-2 Flares <sup>(a)</sup>	Open Burning	Sodium Nitrate Magnesium	40.0 56.0
Octol	Open Detonation	HMX TNT	75.0 25.0
MK82 Bombs	Open Detonation	TNT Aluminum	80.0 20.0

TABLE III-9 (Cont.)

Munition/Explosive	Treatment Method	Composition	Percent by Weight (%)
Pentolite	Open Detonation	PETN TNT	50.0 50.0
AFX 931-M	Open Detonation	R45HT DOA DHE AO-2246 H-5 Aluminum RDX-I RDX-V Ammonium Perchlorate IPDI	7.26 7.26 0.26 0.10 15.0 16.0 16.0 37.0 1.12
M1 Propellant	Open Burning	Nitrocellulose Dinitrotoluene Dibutylphthalate Diphenylamine	84.0 10.0 5.0 1.0
M8 Propellant	Open Burning	Nitrocellulose Nitroglycerin Diethylphthalate Ethyl Centralite Potassium Nitrate	52.15 43.0 3.0 0.60 1.25
M15 Propellant	Open Burning	Nitrocellulose Nitroglycerin Nitroguanidine Ethyl Centralite Cryolite	20.0 19.0 54.7 6.0 0.3

(a) These two items are burned concurrently in one scenario.

selected (Table III-9). The ~~MK-82~~ MK82 bomb is filled with ~~Tritonal~~ Tritonal explosive and also includes primer and propellant. For POLU13G modeling purposes, 15 ~~MK-82~~ MK82 bombs (total combined NEW = ~~2,880~~ 2,884 lbs) were detonated and impacts modeled.

There are other explosive compositions and other mixes of the compositions that could have been selected for POLU13G modeling. Since the intent of modeling is strictly to project performance, and furthermore, since results of the dispersion modeling indicated that air concentrations (as predicted by modeling) would be orders of magnitude below risk-based levels for air, it is considered that this assessment is appropriate to predict OD performance, recognizing that actual air monitoring during OD events will ultimately determine permit compliance status.

### Open Burning Scenarios

OB at ~~Eglin~~ EAFB occurs only at the OB unit at Range C-62. Table II-2 presented in the permit application is representative of waste munitions items that could be treated by OB. (This table also includes items to be treated by OD). It should not be considered an exhaustive list of munitions items that may be treated at ~~Eglin~~ EAFB by OB, but is presented for informational purposes only. It is useful, however, in assessing the types of munitions items that could be treated.

For purposes of POLU13G modeling "worst case" conditions, ~~three~~ six OB scenarios were developed:

- 600 impulse cartridges (total combined NEW = 36.12 lbs)
- 40,000 ~~rounds~~ M55 20 mm cartridges  
(total combined NEW = 3,172 lbs)
- 15,000 ~~rounds~~ ~~M9792~~ M97A2 20 mm cartridges and 30 80 LUU-2  
flares (total combined NEW = ~~3,063~~ 3,337 lbs)
- M1 Propellant (total combined NEW = 3,000 lbs)
- M8 Propellant (total combined NEW = 3,000 lbs)

- M15 Propellant (total combined NEW = 3,000 lbs)

~~These~~ The first three items were considered representative of the typical load (historically they have represented a large percentage of the waste treated by OB) as well as representative of "worst case" conditions. (They include propellant, explosive, casing, and additives.) The number of items per scenario was developed based on the physical size of the munitions item and the size constraints of the available space within the OB burn kettles. Since different types of cartridges were chosen for these three scenarios, it is felt that this approach is both representative and conservative. The second three scenarios include three propellants commonly found in OB items. It was felt that modeling "bulk" amounts of these three propellants would, therefore, represent worst case emissions for the remainder of OB items.

For purposes of POLU13G modeling, 100 gal of virgin diesel fuel was assumed, except for the bulk propellant runs. Each burn was considered essentially completed within 1 hour (for emissions purposes), and only one burn could occur on a given day.

As with the OD scenario, actual air monitoring data will be used to assess compliance status; consequently, additional POLU13G modeling of other potential waste items is not considered to be necessary.

#### III.C6a.2 Number of Fabricated Devices, Burn Areas, or Detonation Pits Involved in a Burn or Detonation Event and the Number of Events Per Day [40 CFR 264.601(c)(3)]

As described previously, a total of two ~~open-detonation~~ OD units (one each at Ranges C-62 and C-52N) and one ~~open-burning~~ OB unit (Range C-62) are operated by ~~Eglin~~ EAFB. The ~~open-burning~~ OB unit at Range C-62 consists of two 8 x 8 x 20 ft metal burn kettles. In a given ~~open-burning~~ OB event, only one of the two burn kettles is utilized on a given day. One OD event may include multiple detonations, with each detonation limited to 3,000 lbs combined NEW or less, and detonations staggered by at least 10 minutes. Only one OB/OD event occurs at EAFB on a given day.



III.C6a.3 Total Amounts of Each Pollutant Emitted Per Event and the Total Combined Amounts of Pollutants Emitted Per Year  
[40 CFR 264.601 (c)(1)]

A screening assessment was conducted to estimate potential air quality impacts with the treatment of waste munitions at the EAFB EOD ranges. OB and OD results in the generation of numerous combustion products. In addition, OB/OD can result in other pollutant emissions, specifically metals and particulate emissions from soil ejected during OD and diesel fuel combustion emissions associated with OB. The potential impacts to human health and the environment associated with OB/OD operations were assessed by means of conservative screening techniques.

Combustion products (including metal oxides and salts) from OB/OD operations were predicted using the U.S. Navy POLU13G model. This model allows the input of diesel fuel and therefore predicts emissions resulting from routine OB operations where diesel fuel and munitions are mixed prior to the burn. Appendix M contains POLU13G model background and ~~model~~ input information ~~for the POLU13G model~~. Particulate emissions for OD treatment were estimated based on a method developed by the Defense Nuclear Agency (DNA).

Ambient air quality impacts at locations of potential human and ecological exposure were predicted by use of acceptable U.S. EPA and FDEP ~~screening~~ dispersion modeling screening techniques. A worst case analysis was performed to ensure the acceptability of EOD Range operations. For dispersion modeling purposes, ~~open burning~~ OB can be characterized as a "continuous" type release because of the 4-8 hour duration of the OB event. ~~Open detonation~~ OD, in contrast, is best characterized as an instantaneous of "puff" type release. Therefore, two distinct and different dispersion models for continuous and semi-instantaneous emissions were used. Impacts from OB operations were addressed with the EPA Industrial Source Complex Short Term model (ISCST2). OD operations were addressed with the EPA INPUFF model version 2.2.

Potential impacts to human health and the environment were evaluated by comparing worst-case screening dispersion modeling results with appropriate National Ambient Air Quality Standards (NAAQS) and FDEP air toxics no threat levels, and by conducting risk ~~analysis~~ analyses.

### OB/OD Operation Emissions

Combustion products from OB/OD operations are produced from high-temperature chemical reactions occurring during the detonation and burning processes. The products of such reactions are generally a function of the treatment operation (OB or OD) and the chemical composition of the waste being treated. In addition, particulate emissions associated with soil ejection during OD and other pollutant emissions associated with combustion of diesel fuel during OB procedures can occur.

### Combustion Products

The U.S. Navy (Baroody and Tominack 1993) has developed POLU13G, a numerical computer model, (~~POLU13G~~) to simulate high-temperature chemical reactions and predict the air pollution products from OB/OD operations. The POLU13G model includes a file of thermodynamic data for numerous potential combustion products. The model selects the compounds to consider in the combustion calculations based on the elemental composition of the materials being burned or detonated. ~~If the material burned or detonated contains the elements carbon, hydrogen, oxygen, or nitrogen, the program also considers these specific elements as possible emissions products.~~ The total number of combustion products and products of incomplete combustion considered for each calculation is listed in the model output.

When used for OB, the POLU13G model calculates emissions based on the material first being mixed with air and then burned from the combustion product. The necessary thermodynamic data for the material's ingredients and air, the weight ratio of material/air, and two pressure values of 1,000 and 14.7 pounds per square inch (psi) are read into the model as input data. The flame temperature, ~~models of~~ gaseous combustion products, entropy, and other pertinent data are calculated for the material/air ratios at a pressure of 1,000 psi. The computer procedure goes through a similar routine as it did at 1,000 psi to recalculate the combustion products, flame temperature, and other variables that changed due to thermal expansion. The products calculated at 14.7 psi are reported as the emission products in the model output.

When used for OD, the POLU13G model calculated emissions based on the material first being detonated. The detonation products are then mixed with air and reacted to form the emission products. Identical input data are used for both the OB and OD operations.

Since the exact material/air ratio for which complete oxidation occurs is unknown for a given material, the POLU13G model predicts products of combustion at various material/air ratios and presents these results in the output. These output data show the trend in composition of the emission products as the material-to-air ratio varies. For purposes of validating a previous edition of the POLU13G model, a limited amount of onsite air monitoring was performed at the Dugway Proving Ground, Utah, on 22 May 1986. During this testing, two indicator gases, carbon monoxide and hydrogen chloride were sampled using a helicopter during the ~~open burning~~ OB of 7,500 lbs combined NEW of Navy waste propellant. Results indicated that under most ~~open burning~~ OB operations, sufficient oxygen was available for essentially complete combustion of the waste propellant. Further calculations performed as part of the study indicated that sufficient air was available for complete combustion for a majority of the Navy propellants, and that this complete oxidation occurred at waste/air ratios of between 40/60 and 30/70. It is reasonable to assume that the types of materials disposed of by Eglin AFB are similar to these Navy waste materials. Actual monitoring indicated that results fell between the 40/60 and 30/70 waste/air ratios for carbon monoxide and 20/80 and 10/90 ratios for hydrogen chloride predicted by the POLU model. Therefore, for purposes of assuming a reasonable worst-case scenario, a waste/air ratio of 40/60 was assumed for all POLU13G model runs.

Results of the POLU13G model runs for the ~~nine~~ 14 specific ordnance destruction scenarios evaluated are presented in Appendix M. Air emissions predicted by the POLU13G model include traditional combustion products (e.g., CO,  $\Theta_3$ ,  $\text{NO}_x$ ), various metals and metal oxides, as well as other air toxics. A listing of the predicted reaction products is presented in Table III-10.

Field studies conducted at the Dugway Proving Ground, Utah during extensive testing performed for the U.S. Army Armament, Munitions, and Chemical Command (AMCCOM) in 1989-1990 demonstrate that particulate emissions or elemental carbon from the OB of propellant are minimal since complete oxidation of the carbon present in the explosive material to carbon dioxide, carbon monoxide, and organic carbon occurs. The results of the POLU13G model presented in Appendix M also predict this. The same AMCCOM study indicated that more significant amounts of elemental carbon or soot resulted from OD.

TABLE III-10 OB/OD REACTION PRODUCTS PREDICTED BY POLU13G

Acetaldehyde ( $C_2H_4O$ )	Cyanogen Fluoride (CNF)
Acetylene ( $C_2H_2$ )	Difluoroacetylene ( $C_2F_2$ )
Aluminum (Al)	Difluorodiazine, cis ( $F_2N_2$ )
Aluminum Carbide ( $Al_4C_3$ )	Difluoromethane ( $CH_2F_2$ )
Aluminum Dioxhyrite ( $AlHO_2$ )	Diimide ( $H_2N_2$ )
Aluminum Fluoride ( $AlF_3$ )	Dinitrogen Pentoxide ( $N_2O_5$ )
Aluminum Monohydride (AlH)	Ethane ( $C_2H_6$ )
Aluminum Monoxide ( $Al_2O_2$ )	Ethene ( $C_2H_4$ )
Aluminum Nitride (AlN)	Fluorine (F)
Aluminum Oxide ( $Al_2O_3$ )	Fluorine Monoxide (FO)
Aluminum Radicals (AlC, <del>AlH</del> , AlO, <del><math>Al_2O</math></del> , AlHO, <del><math>AlHO_2</math></del> , <del><math>AlO_2</math></del> , and <del><math>Al_2O_2</math></del> , <del><math>Al_2F_6</math></del> , AlF <sub>2</sub> , AlOF, and AlF)	Fluorine Nitrate ( $NO_3F$ )
Aluminum Suboxide ( $Al_2O$ )	Fluorine Radicals ( $F_2$ )
Aluminum Trifluoride ( $Al_2F_6$ )	Fluoroform ( $CHF_3$ )
Amidogen ( $H_2N$ )	Fluoromethane ( $CH_3F$ )
Ammonia ( $NH_3$ )	Formaldehyde ( $CH_2O$ )
Ammonium Chloride ( $NH_4Cl$ )	Formyl (CHO)
Barium (Ba)	Hexafluoroethane ( $C_2F_6$ )
Barium Oxide ( $BaO$ )	Hydrazine ( $N_2H_4$ )
Butane ( $C_4H_{10}$ )	Hydrochloric Acid (HCl)
1-Butene ( $C_4H_8$ )	Hydrogen (H and $H_2$ )
Calcium (Ca)	Hydrogen Cyanide (CNH)
Calcium Oxide ( $CaO$ )	Hydrogen Fluoride (HF)
Calcium Radicals (CaH and CaHO)	Hydrogen Isocyanate (CHNO)
Carbon (C)	Hydrogen Peroxide ( $H_2O_2$ )
Carbon Difluoride ( $CF_2$ )	Hydrogen Radicals ( <del><math>HO_2</math></del> and $H_3O$ and HOF)
Carbon Dioxide ( $CO_2$ )	Hydroperoxyl ( $HO_2$ )
Carbon Fluoride (CF)	Hydroxide (HO)
Carbon Monoxide (CO)	Imidogen (HN)
Carbon Radicals ( $C_2$ , $C_3$ , $C_4$ , $C_5$ , <del><math>CH_2</math></del> , <del><math>CH</math></del> , <del>CHO</del> , <del><math>CH_3</math></del> , <del>CNH</del> , CNO, $CN_2$ , $C_2H$ , $C_2O$ , $C_2N$ , <del><math>C_3O_2</math></del> , and <del><math>C_4N_2</math></del> CHOF)	Lead (Pb)
Carbon Subnitride ( $C_4N_2$ )	Lead Dioxide ( $PbO_2$ )
Carbon Suboxide ( $C_3O_2$ )	Lead Monoxide (PbO)
Carbon Tetrachloride ( $CCl_4$ )	Lead Oxide, red ( $Pb_3O_4$ )
Carbon Tetrafluoride ( $CF_4$ )	Lead Radicals (PbH and $Pb_2$ )
Carbonyl Chloride ( $COCl_2$ )	Magnesium (Mg)
Carbonyl Fluoride ( $COF_2$ )	Magnesium Carbonate ( $MgCO_3$ )
Chlorine Dioxide ( $O_2Cl$ )	Magnesium Nitride ( $Mg_3N_2$ )
Cyanide (CN)	Magnesium Nitride (MgN)
Cyanogen ( $C_2N_2$ )	Magnesium Oxide (MgO)
	Magnesium Radicals ( <del><math>Mg_3N_2</math></del> , $Mg_2C_3$ , $MgH_2O_2$ , $MgC_2$ , $MgHO$ , <del><math>MgN</math></del> , $MgH_2$ , $MgH$ , and $MgAl_2O$ , and $MgAl_2O_4$ )

TABLE III-10 (Cont.)

Methane ( $\text{CH}_4$ )	Potassium Carbonate ( $\text{K}_2\text{CO}_3$ )
Methyl ( $\text{CH}_3$ )	Potassium Cyanide ( $\text{KCN}$ )
Methylene ( $\text{CH}_2$ )	Potassium Hydride ( $\text{KH}$ )
Methyldiyne ( $\text{CH}$ )	Potassium Hydroxide ( $\text{KHO}$ )
Monofluorocetylene ( $\text{C}_2\text{HF}$ )	Potassium Oxide ( $\text{K}_2\text{O}$ )
Monofluoromethylene ( $\text{CHF}$ )	Potassium Peroxide ( $\text{K}_2\text{O}_2$ )
Nitrate ( $\text{NO}_3$ )	Propane ( $\text{C}_3\text{H}_8$ )
Nitric Acid ( $\text{HNO}_3$ )	Propene ( $\text{C}_3\text{H}_6$ )
Nitric Oxide ( $\text{NO}$ )	Sodium ( $\text{Na}$ )
Nitrogen ( $\text{N}$ and $\text{N}_2$ )	Sodium Aluminate ( $\text{NaAlO}_2$ )
Nitrogen Difluoride ( $\text{F}_2\text{N}$ )	Sodium Carbonate ( $\text{Na}_2\text{CO}_3$ )
Nitrogen Dioxide ( $\text{NO}_2$ )	Sodium Cyanide ( $\text{NaCN}$ )
Nitrogen Fluoride ( $\text{NF}_3$ )	Sodium Dioxide ( $\text{NaO}_2$ )
Nitrogen Monofluoride ( $\text{FN}$ )	Sodium Fluoride ( $\text{NaF}$ )
Nitrogen Tetroxide ( $\text{N}_2\text{O}_4$ )	Sodium Hydroxide ( <del><math>\text{NaOH}</math></del> ) ( $\text{NaHO}$ )
Nitrogen Trioxide ( $\text{N}_2\text{O}_3$ )	Sodium Monoxide ( $\text{Na}_2\text{O}$ )
Nitrogen Radicals ( <del><math>\text{N}_2\text{H}_2</math>, <math>\text{N}_3</math>, <math>\text{NH}</math>, <math>\text{NH}_2</math>, <math>\text{NHO}</math>, and <math>\text{N}_2\text{O}_5</math></del> )	Sodium Peroxide ( $\text{Na}_2\text{O}_2$ )
Nitrosyl Fluoride ( $\text{NOF}$ )	Sodium Radicals ( $\text{Na}_2\text{C}_2\text{N}$ , $\text{Na}_2\text{H}_2\text{O}$ , $\text{NaO}$ , $\text{NaH}$ , $\text{Na}_2\text{F}_2$ , $\text{Na}_2\text{C}_2\text{N}_2$ , $\text{Na}_2\text{H}_2\text{O}_2$ , $\text{Na}_2$ , $\text{Na}_3\text{AlF}_6$ , and $\text{NaAlF}_4$ )
Nitrous Acid ( $\text{HNO}_2$ )	Sulfur Dioxide ( $\text{SO}_2$ )
<del>Nitrogen Dioxide (<math>\text{N}_2\text{O}_4</math>)</del>	Tetrafluoroethylene ( $\text{C}_2\text{F}_4$ )
Nitrous Oxide ( $\text{N}_2\text{O}$ )	Tetrafluorohydrazine ( $\text{F}_4\text{N}_2$ )
Nitroxyl ( $\text{HNO}$ )	Trichloromethane ( $\text{CHCl}_3$ )
Nitryl Fluoride ( $\text{FNO}_2$ )	Trifluoroacetonitrile ( $\text{C}_2\text{F}_3\text{N}$ )
Oxygen ( $\text{O}$ and $\text{O}_2$ )	Trifluoramine Oxide ( $\text{F}_3\text{NO}$ )
Oxygen Fluoride ( $\text{OF}_2$ )	Trifluoromethyl ( $\text{CF}_3$ )
Oxygen Radical ( $\text{O}_2\text{F}$ )	Trifluoromethyl Hypofluorite ( $\text{CF}_4\text{O}$ )
Ozone ( $\text{O}_3$ )	Water ( $\text{H}_2\text{O}$ )
Paticulates ( $\text{PM}$ )	
Potassium ( $\text{K}$ )	

### Particulate Emissions from OD

Since the POLU13G model does not predict significant particulate emissions in the form of elemental carbon (C), a study by Gould and Tempo (1981) was used to augment particulate emission factors for OD. OD operations result in the ejection of soil materials into the air, some of which remains suspended and forms a dust cloud. Most of the larger soil particles fall back to the ground in the immediate vicinity of the detonation.

A standard methodology based on high-explosive field tests conducted by the Defense Nuclear Agency (DNA) was used to estimate particulate emission factors for OD operations (Gould and Tempo 1981). The method relates particulate emissions directly to the size of the detonation (i.e., net explosive weight), and can be summarized as follows:

$$E = \frac{VDF}{W}$$

where

- E = emission factor for particulate matter (pounds of airborne particulates per pound of material to be detonated)
- V = expected apparent crater volume (ft<sup>3</sup>)
- D = density of soil [assumed to be 100 lb/ft<sup>3</sup> for sand]
- F = fraction of soil particles which remains suspended ( $\leq 30\mu$ ); [assumed to be 0.015]
- W = net explosive weight of the energetic material to be treated by OD (pounds of TNT-equivalent)

The expected crater volume was estimated based on the following equations (Gould and Tempo 1981):

$$V = V'W' \exp[-5.2H(V'W')^{-0.33}]$$

where:

- V' = cratering efficiency for a zero height of burst  
 [assume 4,000 6,000 ft<sup>3</sup>/ton for moist sand]

H = height of burst above ground level (feet)  
W' = net explosive weight (tons of TNT-equivalent)

The fraction of soil particles that remains suspended (F) was determined from data presented in *Combined Obscuration Model for Battlefield-Induced Contaminants-COMBIC, Volume 11* (Hoock et al. 1987). Based on this study, the small-particle fraction of the crater mass ranges from approximately 1.0 to 2.0 percent for wet to dry sand types, respectively. Therefore, a mean value of 1.5 percent was used.

The calculated particulate emission factor for OD operations at EAFB, using these methods, is 3-0 4.5 lbs of airborne particulates per pound of material detonated. The actual emission rate for a given OD event can be predicted by multiplying the normalized EF by the appropriate NEW.

#### Total Emissions from OB/OD Operations

~~The output from the POLU13G OB/OD model includes a variety of predicted emissions products weights on a gram emissions product per 100 grams of munition/explosive destroyed basis. These results were compared to the EPA NAAQS and Florida Air Toxics No-Threat Levels to develop a list of potential compounds of concern (COCs). The results of this comparison is presented as Table III-11. These data were then used for quantitative risk characterization, as discussed in Section III.D. The results of the POLU13G emissions modeling for the nine scenarios described above are presented in Tables III-12 through III-20. Emissions on both a daily and annual basis are presented.~~

The POLU13G model was used to calculate total pollutant emissions from OB/OD operations. In order to do this, the POLU13G model selects the compounds to consider in the combustion calculations based on the elemental composition of material being burned or detonated. POLU13G modeling output consists of the combustion products and products of incomplete combustion, and is in units of grams of emissions per 100 grams of munition/explosive destroyed. This listing of POLU13G combustion (both complete and incomplete) products was compared to both Florida Air Toxics No-Threat Levels and EPA NAAQS pollutants. Table III-11 provides a listing of all POLU13G products which were matched with those on either of the previously mentioned lists. These data were then used for quantitative risk characterization as discussed in Section III.D. Using the POLU13G output for each of the 14 OB/OD scenarios described previously, the total product emitted in pounds per day/event was

TABLE III-11

**POTENTIAL CHEMICALS OF POTENTIAL CONCERN (COPCs) AS  
PREDICTED THROUGH POLU13G MODELING**

Acetaldehyde  
Acetylene  
Aluminum  
Aluminum Oxide  
Ammonia  
Ammonium Chloride  
Barium  
Butane  
Calcium Oxide  
Carbon Monoxide  
Carbon Tetrachloride  
Carbonyl Chloride  
Carbonyl Fluoride  
Chlorine Dioxide  
Cyanide  
Cyanogen  
Formaldehyde  
Hydrazine  
Hydrochloric Acid  
Hydrogen Cyanide  
Hydrogen Fluoride  
Hydrogen Peroxide  
Lead Compounds  
Magnesium Oxide  
Nitric Acid  
Nitric Oxide  
Nitrogen Dioxide  
Ozone  
Particulates  
Potassium Cyanide  
Potassium Hydroxide  
Propane  
Sodium Hydroxide  
Sulfur Dioxide  
Trichloromethane (Chloroform)

Note: Based on OB/OD scenarios as described in Appendix M.



calculated for each COPC listed in Table III-11. The total amounts of COPCs emitted during either OB/OD are provided in Tables III-12 through III-25. Provided in Section III.C6b is a detailed assessment of how OB/OD pollutant concentrations ( $\mu\text{g}/\text{m}^3$ ) were determined.

~~Table III-21 represents the estimated total annual emissions of chemicals of concern for EAFB at Ranges C-52N and C-62 as calculated by modeling.~~ In addition, POLU13G output for each of the 14 OB/OD scenarios were used to calculate annual estimated emissions of COPCs. This information for EAFB at Ranges C-52N and C-62 is provided in Table III-26. Since the types and amounts of ammunition/explosives treated at the two treatment areas varies on an annual basis, this table was developed assuming a representative explosive waste distribution based on the "worst case" treatment scenarios. This distribution is as follows:

#### Open Burning

- ~~830~~ 1,100 Impulse Cartridges (approximately ~~50~~ 66 lbs combined NEW)
- ~~60,000~~ 52,000 M55 20 mm Cartridges (approximately ~~4,758~~ 4,124 lbs combined NEW)
- 28 30 Flares (approximately ~~560~~ 600 lbs combined NEW)
- ~~40,000~~ 34,500 ~~M9782~~ M97A2 20 mm Cartridges (approximately ~~4,632~~ 3,995 lbs combined NEW)
- 400 lbs combined NEW M1 Propellant
- 400 lbs combined NEW M8 Propellant
- 400 lbs combined NEW M15 Propellant

#### Open Detonation

- ~~846~~ 632 lbs combined NEW Composition B
- ~~846~~ 632 lbs combined NEW Tritonal
- ~~846~~ 632 lbs combined NEW AFX 453
- ~~846~~ 632 lbs combined NEW PBXN 109

TABLE III-12 TOTAL AMOUNTS OF CHEMICALS OF POTENTIAL CONCERN  
 EMITTED DURING OPEN BURNING OF IMPULSE CARTRIDGES AT  
 RANGE C-62 (as predicted by ~~air emissions modeling~~ POLU13G modeling)

Compound	Total Emitted (lbs.) per Day/Event
Acetaldehyde	0.0008
Ammonia	0.4319
Butane	0.0016
Carbon Monoxide	14.9882
Cyanide	0.0016
Cyanogen	0.0016
Formaldehyde	0.0008
Hydrazine	0.0016
Hydrogen Cyanide	0.0008
Hydrogen Peroxide	0.0008
Nitrogen Dioxide	0.0008
Ozone	0.0016
Propane	0.0008

TABLE III-13 TOTAL AMOUNTS OF ~~POTENTIAL~~ CHEMICALS OF POTENTIAL CONCERN EMITTED DURING OPEN BURNING OF M55 20MM CARTRIDGES AT RANGE C-62 (as predicted by ~~air emissions~~ POLU13G modeling)

Compound	Total Emitted (lbs.) per Day/Event
Acetaldehyde	0.0040
Acetylene	0.0040
Ammonia	0.2032
Barium	158.90
Butane	0.0079
Calcium Oxide	0.0238
Carbon Monoxide	1,329.36
Cyanide	0.0079
Cyanogen	0.0079
Hydrazine	0.0079
Hydrogen Cyanide	0.0040
Hydrogen Peroxide	0.0040
Magnesium Oxide	139.17
Nitric Acid	0.0079
Nitrogen Dioxide	0.0079
Ozone	0.0079
Propane	0.0040

TABLE III-14 TOTAL AMOUNTS OF CHEMICALS OF POTENTIAL CONCERN  
EMITTED DURING OPEN BURNING OF M97A2 20MM CARTRIDGES  
AND LUU-2 FLARES AT RANGE C-62 (as predicted by ~~air emissions~~  
POLU13G modeling)

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.0032
Acetylene	0.0032
Aluminum	0.0095
Aluminum Oxide	0.0278
Ammonia	0.0770
Butane	0.0064
Carbon Monoxide	1,379.24
Cyanide	0.0064
Cyanogen	0.0064
Formaldehyde	0.0032
Hydrazine	0.0064
Hydrogen Cyanide	0.0032
Hydrogen Peroxide	0.0032
Lead Compounds	7.5541
Magnesium Oxide	234.1619
Nitric Acid	0.0064
Nitrogen Dioxide	0.0064
Ozone	0.0064
Propane	0.0032
Sodium Hydroxide	0.0119

**TABLE III-15 TOTAL AMOUNTS OF CHEMICALS OF POTENTIAL CONCERN  
EMITTED DURING OPEN BURNING OF M1 PROPELLANT AT  
RANGE C-62 (as predicted by POLU13G modeling)**

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.003
Acetylene	0.003
Ammonia	0.003
Butane	0.006
Carbon Monoxide	180.300
Cyanide	0.006
Cyanogen	0.006
Formaldehyde	0.003
Hydrazine	0.003
Hydrogen Cyanide	0.003
Hydrogen Peroxide	0.003
Nitric Acid	0.006
Nitric Oxide	0.006
Nitrogen Dioxide	0.006
Ozone	0.006
Propane	0.003

**TABLE III-16 TOTAL AMOUNTS OF CHEMICALS OF POTENTIAL CONCERN  
EMITTED DURING OPEN BURNING OF M8 PROPELLANT AT  
RANGE C-62 (as predicted by POLU13G modeling)**

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.003
Acetylene	0.003
Ammonia	0.003
Butane	0.006
Carbon Monoxide	0.003
Cyanide	0.006
Cyanogen	0.006
Formaldehyde	0.003
Hydrazine	0.006
Hydrogen Cyanide	0.003
Hydrogen Peroxide	0.003
Nitric Acid	0.006
Nitric Oxide	0.120
Nitrogen Dioxide	0.009
Ozone	0.006
Potassium Cyanide	0.018
Potassium Hydroxide	0.042
Propane	0.003

**TABLE III-17 TOTAL AMOUNTS OF CHEMICALS OF POTENTIAL CONCERN  
EMITTED DURING OPEN BURNING OF M15 PROPELLANT AT  
RANGE C-62 (as predicted by POLU13G modeling)**

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.003
Acetylene	0.003
Aluminum	0.012
Aluminum Oxide	3.432
Ammonia	0.003
Butane	0.006
Carbon Monoxide	0.003
Carbonyl Fluoride	0.006
Cyanide	0.006
Cyanogen	0.006
Formaldehyde	0.003
Hydrazine	0.006
Hydrogen Cyanide	0.003
Hydrogen Fluoride	4.161
Hydrogen Peroxide	0.003
Nitric Acid	0.006
Nitric Oxide	0.117
Nitrogen Dioxide	0.006
Ozone	0.006
Propane	0.003
Sodium Hydroxide	0.015

TABLE III-15 18 TOTAL AMOUNTS OF ~~POTENTIAL~~ CHEMICALS OF POTENTIAL CONCERN EMITTED DURING OPEN DETONATION OF COMPOSITION B AT RANGE C-62 (as predicted by ~~air-emissions~~ POLU13G modeling)

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.0032
Acetylene	0.0032
Ammonia	0.0032
Butane	0.0064
Carbon Monoxide	0.0032
Cyanide	0.0064
Cyanogen	0.0064
Hydrazine	0.0064
Hydrogen Cyanide	0.0032
Hydrogen Peroxide	0.0032
Nitric Acid	0.0064
Nitrogen Dioxide	0.0064
Ozone	0.0064
Particulate	<del>9,000</del> 13,500
Propane	0.0032



TABLE III-46 19 TOTAL AMOUNTS OF ~~POTENTIAL~~ CHEMICALS OF POTENTIAL CONCERN EMITTED DURING OPEN DETONATION OF TRITONAL AT RANGE C-62 (as predicted by ~~air emissions~~ POLU13G modeling)

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.0032
Acetylene	0.0032
Aluminum	0.0119
Aluminum Oxide	1,134.84
Ammonia	0.0064
Butane	0.0064
Carbon Monoxide	1,121.57
Cyanide	0.0064
Cyanogen	0.0064
Hydrogen Cyanide	0.0032
Hydrogen Peroxide	0.0032
Hydrazine	0.0064
Nitrogen Dioxide	0.0064
Ozone	0.0064
Particulate	<del>9,000</del> 13,500
Propane	0.0032

TABLE III-17 20 TOTAL AMOUNTS OF ~~POTENTIAL~~ CHEMICALS OF POTENTIAL CONCERN EMITTED DURING OPEN DETONATION OF OCTOL AT RANGE C-62 (as predicted by ~~air emissions~~ POLU13G modeling)

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.0032
Acetylene	0.0032
Ammonia	0.0032
Butane	0.0064
Carbon Monoxide	0.0032
Cyanide	0.0064
Cyanogen	0.0064
Formaldehyde	0.0032
Hydrazine	0.0064
Hydrogen Cyanide	0.0032
Nitric Acid	0.0064
Nitrogen Dioxide	0.0064
Ozone	0.0064
Particulate	<del>9,000</del> 13,500
Propane	0.0032

TABLE III-48 21 TOTAL AMOUNTS OF ~~POTENTIAL~~ CHEMICALS OF POTENTIAL CONCERN EMITTED DURING OPEN DETONATION OF MK82 BOMBS WITH 2 LBS OF C-4 EXPLOSIVE AT RANGE C-62 (as predicted by ~~air emissions~~ POLU13G modeling)

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.0032
Acetylene	0.0032
Aluminum	0.0012
Aluminum Oxide	1,090.33
Ammonia	0.0056
Butane	0.0056
Carbon Monoxide	1,075.85
Cyanide	0.0056
Cyanogen	0.0056
Formaldehyde	0.0032
Hydrazine	0.0056
Hydrogen Cyanide	0.0032
Hydrogen Peroxide	0.0032
Nitrogen Dioxide	0.0056
Ozone	0.0056
Particulate	8,640 12,960
Propane	0.0032

**TABLE III-22 TOTAL AMOUNTS OF CHEMICALS OF POTENTIAL CONCERN  
EMITTED DURING OPEN DETONATION OF PENTOLITE AT  
RANGE C-62 (as predicted by POLU13G modeling)**

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.003
Acetylene	0.003
Ammonia	0.003
Butane	0.006
Carbon Monoxide	0.003
Cyanide	0.006
Cyanogen	0.006
Formaldehyde	0.003
Hydrazine	0.006
Hydrogen Cyanide	0.003
Hydrogen Peroxide	0.003
Nitric Acid	0.006
Nitric Oxide	0.006
Nitrogen Dioxide	0.006
Ozone	0.006
Particulate	13,500
Propane	0.003

TABLE III-49 23 TOTAL AMOUNTS OF ~~POTENTIAL~~ CHEMICALS OF POTENTIAL CONCERN EMITTED DURING OPEN DETONATION OF AFX 453 AT RANGE C-52N (as predicted by ~~air emissions~~ POLU13G modeling)

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.0008
Acetylene	0.0008
Aluminum	0.0008
Aluminum Oxide	210.02
Ammonia	0.0008
Butane	0.0016
Carbon Monoxide	0.0008
Cyanide	0.0016
Cyanogen	0.0016
Formaldehyde	0.0008
Hydrogen Cyanide	0.0008
Hydrogen Peroxide	0.0008
Hydrazine	0.0016
Nitric Acid	0.0016
Nitrogen Dioxide	0.0016
Ozone	0.0016
Particulate	<del>2,102</del> 3,150
Propane	0.0008

TABLE III-20 24 TOTAL AMOUNTS OF ~~POTENTIAL~~ CHEMICALS OF POTENTIAL CONCERN EMITTED DURING OPEN DETONATION OF PBXN 109 AT RANGE C-52N (as predicted by ~~air emissions~~ POLU13G modeling)

Compound	Total Emitted (lbs) per Day/Event
Acetaldehyde	0.0008
Acetylene	0.0008
Aluminum	0.0032
Aluminum Oxide	264.79
Ammonia	0.0056
Butane	0.0016
Carbon Monoxide	184.20
Cyanide	0.0016
Cyanogen	0.0016
Formaldehyde	0.0008
Hydrazine	0.0016
Hydrogen Cyanide	0.0008
Hydrogen Peroxide	0.0008
Nitric Acid	0.0016
Nitrogen Dioxide	0.0016
Ozone	0.0016
Particulate	2,102 3,150
Propane	0.0008

**TABLE III-25 TOTAL AMOUNTS OF CHEMICALS OF POTENTIAL CONCERN  
EMITTED DURING OPEN DETONATION OF AFX 931-M AT  
RANGE C-52N (as predicted by POLU13G modeling)**

Compound	Total Emitted (lbs) per Day/Event
Acetylene	0.0007
Aluminum	0.0028
Aluminum Oxide	239.2000
Ammonia	0.0007
Ammonium Chloride	0.0028
Butane	0.0014
Carbon Monoxide	0.0007
Carbon Tetrachloride	0.0035
Carbonyl Chloride	0.0021
Chlorine Dioxide	0.0014
Cyanide	0.0014
Cyanogen	0.0014
Formaldehyde	0.0007
Hydrazine	0.0014
Hydrochloric Acid	86.3000
Hydrogen Cyanide	0.0007
Hydrogen Peroxide	0.0007
Nitrogen Dioxide	0.0014
Ozone	0.0014
Particulate	3,150.0000
Propane	0.0007
Trichloromethane	0.0028

TABLE III-24 26 TOTAL AMOUNTS OF ~~POTENTIAL~~ CHEMICALS OF POTENTIAL CONCERN EMITTED AT EAFB ON AN ANNUAL BASIS (as predicted by ~~air emission~~ POLU13G modeling)

Compound	Total Emitted (lbs)	
	Open Burning	Open Detonation
Acetaldehyde	0.0125 <del>0-0127</del>	0.0047 <del>0-0056</del>
Acetylene	0.0110 <del>0-0116</del>	0.0053 <del>0-0056</del>
Aluminum	0.0154 <del>0-0165</del>	0.0088 <del>0-0085</del>
Aluminum Oxide	0.4990 <del>0-0484</del>	1,101.79 <del>1,186.67</del>
Ammonia	1.1721 <del>1-0348</del>	0.9086 <del>0-0129</del>
Ammonium Chloride	-----	0.0026
Barium	206.57 <del>238.35</del>	-----
Butane	0.0219 <del>0-0252</del>	0.0104 <del>0-0107</del>
Calcium Oxide	0.0310 <del>0-0357</del>	-----
Carbon Monoxide	3,832.12 <del>4,414.60</del>	617.76 <del>827.40</del>
Carbon Tetrachloride	-----	0.0032
Carbonyl Chloride	-----	0.0019
Carbonyl Fluoride	0.0008	-----
Chlorine Dioxide	-----	0.0013
Cyanide	0.0248 <del>0-0252</del>	0.0104 <del>0-0107</del>
Cyanogen	0.0248 <del>0-0252</del>	0.0104 <del>0-0107</del>
Formaldehyde	0.0073 <del>0-0067</del>	0.0039 <del>0-0038</del>
Hydrazine	0.0236 <del>0-0252</del>	0.0050 <del>0-0107</del>
Hydrochloric Acid	-----	77.9166
Hydrogen Cyanide	0.0125 <del>0-0127</del>	0.0053 <del>0-0056</del>
Hydrogen Fluoride	0.5548	-----
Hydrogen Peroxide	0.0125 <del>0-0127</del>	0.0046 <del>0-0047</del>
Lead Compounds	11.2991 <del>13,1441</del>	-----
Magnesium Oxide	531.16 <del>616.20</del>	-----
Nitric Acid	0.0219 <del>0-0230</del>	0.0067 <del>0-0074</del>
Nitric Oxide	0.0324	0.0013
Nitrogen Dioxide	0.0238 <del>0-0241</del>	0.0104 <del>0-0242</del>
Ozone	0.0248 <del>0-0252</del>	0.0090 <del>0-0107</del>
Particulate	-----	22,500 <del>14,980</del>
Potassium Cyanide	0.0024	-----
Potassium Hydroxide	0.0056	-----
Propane	0.0125 <del>0-0127</del>	0.0053 <del>0-0079</del>
Sodium Hydroxide	0.0204 <del>0-0207</del>	-----
Trichloromethane	-----	0.0026



- ~~770 lbs 4MK-82 Bombs~~ Three MK82 Bombs (576 lbs combined NEW)
- 846 632 lbs combined NEW Octol
- 632 lbs combined NEW Pentolite
- 632 lbs combined NEW AFX 931-M

III.C6a.4 Duration of Release (From a Few Seconds to a Few Hours)  
[40 CFR 264.601(c)(1)]

Although ~~open-detonation~~ OD is expected to release emissions almost instantaneously, the emission cloud resulting from the detonation will linger several minutes. For purposes of dispersion modeling, OD emissions were assumed to occur over a 1-hour period. In comparison, the duration of release of emissions during OB operations will vary considerably dependent on the ammunition/explosive type, amounts of combined NEW and initiator fuel (i.e., wood and diesel fuel) used in the burn, and the fuel/air ratio. A typical ~~open-burn~~ OB can last from several minutes to several hours. For purposes of dispersion modeling, it was assumed that ~~open-burning~~ OB emissions were essentially complete within a one hour timeframe.

III.C6a.5 Description of Emissions (Plume) to the Atmosphere  
[40 CFR 264.601(c)(1)]

OB emissions can be characterized as a continuous point source (i.e., emissions which occur over a given period of time). OD emissions are best characterized as a "puff" or instantaneous emission. The release heights of OB/OD operations were based on guidance information provided in the preliminary draft document entitled *Air Pathway Screening Assessments for Resource Conservation and Recovery Act Subpart X Permitting, Volume I: Technical Procedures*. A discussion of plume characteristics, to include release height and temperature, is presented below.

Emissions generated during OB/OD operations originate at ground level. During OD operations at EAFB, munitions to be destroyed are placed on open ground and remotely detonated using C-4 plastic explosive. Plume rise for OD can be quite significant, since the pressure of the gases generated during this process are initially high (thousands of pounds per square inch) and then expand to atmospheric pressure. ~~For the purposes of modeling, a~~ A release height of 553.34 m was used for air dispersion modeling of an OD ~~at~~ of 3,000 lbs combined NEW. Ordnance to be treated by OB is placed into one of two metal burn kettles along with wood and approximately ~~50-100 gallons~~ of diesel fuel ~~and wood~~. The burn is then

remotely initiated. Since OB emissions are only confined by the container itself, plume rise is relatively insignificant. For dispersion modeling purposes, a release height of 0.5 m was assumed.

Combustion flame temperatures were estimated by the POLU13G model. At the material/air ratios of 40/60 and 30/70 which were used in the ~~screening~~ analysis, the POLU13G model predicted flame temperatures of 1,200-2,100°F for OB and 1,000-1,700°F for OD. For dispersion modeling purposes, plume temperatures of 1,700°F and 71°F (ambient) were assumed for OB and OD operations, respectively. A lower temperature (71°F) was used for OD dispersion modeling since it was indicative of the temperature of the exhaust products as they are cooled through dilution with ambient air at the elevated release heights used in the dispersion model.

#### III.C6a.6 Downwind Concentrations of Each Known or Suspected Hazardous Waste Constituent Emitted, Including Carcinogenic Compounds [40 CFR 264.601(c)(6)]

Maximum ~~air quality~~ potential predicted impacts at locations of potential human exposure are presented in Appendix M. Worst case ~~modeled~~ predicted impacts are presented on a 1-, 3-, 8-, 24-hour, and annual average basis for potential COCs. Locations of maximum potential predicted impact vary for each COC. For the ~~open-burning~~ OB scenario, worst case concentrations occurred during the combustion of M55 20 mm cartridges, impulse cartridges, M97A2 20 mm cartridges and LUU-2 flares. The location of maximum potential predicted impact was the Range Support Building. For ~~open-detonation~~ OD, maximum concentrations were generated during the treatment of tritonal and Composition B (Range C-62) and PBXN 109 (Range C-52N). Location of maximum predicted potential impacts for OD at Range 62 was Range Route 208, and the Control Tower Building for Range C-52N.

#### III.C6a.7 Compare Concentrations with Existing Toxic Air Pollutant Standards [40 CFR 264.601(c)(1)]

Dispersion modeling results were compared to the FDEP Air Toxics No-Threat Levels and NAAQS. A listing of the 8-, 24-, and annual Florida no-threat levels for compounds released during OB/OD operations is presented in ~~Table III-22~~ Table III-27. NAAQS levels were previously presented in Table III-7. These comparisons indicated that barium, magnesium oxide, hydrazine and lead compounds exceeded the no-threat levels established by Florida. However, the no-threat level established by Florida refers to the soluble fraction. The

TABLE III-22 27 FLORIDA DEP NO-THREAT LEVELS FOR COMPOUNDS  
CHEMICALS OF POTENTIAL CONCERN

Compound	Ambient Concentrations ( $\mu\text{g}/\text{m}^3$ )		
	8 hr	24 hr	Annual
Acetaldehyde	1,800	432	0.45
Acetylene	--	--	--
Aluminum Dust	100	24	--
Aluminum Oxide	100	24	--
Ammonia	170	40.8	100
Ammonium Chloride	100	24	--
Barium, Soluble Compounds	5	1.2	50
Butane	38,000	9,120	--
Calcium Oxide	20	4.8	--
Carbon Monoxide	--	--	--
Carbon Tetrachloride	310	74.4	0.067
Carbonyl Chloride	4	0.96	--
Carbonyl Fluoride	54	12.96	--
Chlorine Dioxide	2.8	0.672	0.02
Cyanide	50	12	20
Cyanogen	210	50.4	30
Formaldehyde	12	2.88	0.077
Hydrazine	1.3	0.312	0.0002
Hydrochloric Acid	75	18	7
Hydrogen Cyanide	110	26.4	--
Hydrogen Fluoride	26	6.24	--
Hydrogen Peroxide	14	3.36	--
Lead Compounds	0.5	0.12	0.09

TABLE III-27 (Cont.)

Compound	Ambient Concentrations ( $\mu\text{g}/\text{m}^3$ )		
	8 hr	24 hr	Annual
Magnesium Oxide	100	24	--
Nitric Acid	52	12.48	--
Nitric Oxide	310	74.4	100
Nitrogen Dioxide	56	13.44	--
Ozone	--	--	--
Particulate	--	--	--
Potassium Cyanide	--	--	50
Potassium Hydroxide	20	4.8	--
Propane	--	--	--
Sodium Hydroxide	--	--	--
Sulfur Dioxide	--	--	--
Trichloromethane	490	117.6	0.043

POLU13G model does not speciate barium or lead emissions into soluble and non-soluble fractions. Dispersion modeling also indicates slight excursions of the 24-hour NAAQS for PM<sub>10</sub> at both the Support building and Route 208 at Range C-62 during the open detonation of Composition B and Tritonal. However, the technique used to estimate OD particulate emissions (Gould and Tempo 1981) is based on a soil particle size of 30 microns or less gathered from actual testing results which were not site-specific. Therefore, since only a fraction of this predicted concentration would be 10 microns or less in size, no violation of the PM<sub>10</sub> standard at these two locations near Range C-62 is expected.

#### III.C.6a.8 Risk Analysis [40 CFR 264.601(c)(6)]

A risk analysis was performed according to EPA's *Risk Assessment Guidance for Superfund (1989)* and *RCRA Facility Investigation (RFI) Guidance (1989)*. Information concerning land use (urban or rural areas), population density, land use in nearby areas, sensitive receptors, estimate of number of exposed individuals, and calculation of lifetime cancer risk is discussed in Section III.D1.1. Detailed risk analysis for OB/OD operations is presented in Sections III.D2 and III.D3.

#### III.C6b Detailed Assessment [40 CFR 264.601(c)(6)]

Screening model results were used for the detailed assessment. Impacts from OB operations were addressed with the EPA Industrial Source Complex Short Term model (ISCST2). OD operations were addressed with the EPA INPUFF model version 2.2. Further detail regarding these models is provided in Appendix M. A discussion of the location of receptors considered for the assessment of risks to human health and ecological receptors via the air pathway is presented in Section III.D1.1. The specific receptors used for dispersion modeling purposes can be found in Appendix M. A detailed estimate of exposed population, exposure pathways (to include ingestion and dermal contact), and lifetime cancer risk is addressed in Section III.D.

#### III.C7 POTENTIAL DAMAGE TO DOMESTIC ANIMALS, WILDLIFE, CROPS, VEGETATION, AND PHYSICAL STRUCTURES [40 CFR 264.601(c)(7)]

There are no domestic animals, crops, or physical structures within 3 mi of either of the OB/OD units. Wildlife and vegetation in the vicinity of OB/OD units could be exposed to air emissions, however, site use as active bombing/training ranges minimizes potential wildlife

activity in the vicinity during active missions or OB/OD activities. It is not anticipated that OB/OD activities will result in increased risk to wildlife or vegetation beyond that which exists due to site uses for bombing/training missions (Appendix J).

### **III.D POTENTIAL PATHWAYS OF EXPOSURE AND POTENTIAL EXPOSURE MAGNITUDE**

#### **III.D0 POTENTIAL FOR THE PUBLIC TO BE EXPOSED TO HAZARDOUS WASTES [40 CFR 270.23(c)]**

Direct exposure of the public to hazardous wastes associated with the OB/OD units is not expected. OB/OD activities are conducted on remote bombing/training ranges within the reservation area of EAFB. The OB and OD units on Range C-62 are over 9,500 ft from the nearest public-access road and 2.8 mi from the reservation boundary. The OD unit at Range C-52N is over 30,000 ft from the nearest public access road and approximately 6 mi from the reservation boundary. Access during and up to 24 hours after OB/OD activities is restricted by blocked range gates (9,000 ft from the OD unit at C-52N). Although extremely unlikely, pedestrians could walk along range roads or through the woods (several miles) and contact residual wastes remaining after a burn/detonation. In addition, persons living on EAFB or in the immediate vicinity may be exposed to air emissions following an OB/OD event (see Section III.C). For a complete description of potential receptors, see Sections III.D1 and III.D2 of this permit application.

##### **III.D0.2 Amount of Time the Wastes Will Remain in the Unit Before It is Detonated or Burned [40 CFR 270.23(c)]**

No hazardous wastes are stored at the ~~EOD area~~ OB/OD units prior to treatment. Items identified for OB/OD treatment are transported to the OB/OD units from other storage areas at EAFB, and are immediately prepared for treatment via OB or OD. The total time the wastes are present at the OB/OD unit prior to the burn or detonation is the minimum time needed to place the wastes at the units and configure them to initiate treatment. Therefore, the potential for releases of hazardous waste and exposure to receptors while wastes are awaiting treatment is minimal.

##### **III.D0.3 Expected Time to Complete Burning [40 CFR 270.23(c)]**

OB events typically last 4-8 hours, and ash may remain too hot to handle for as much as 12 hours after the burn is initiated. The OB containment device is therefore not approached for at least 12 hours after a burn is initiated to ensure that the burn is completed and the residue has cooled. Not later than the calendar day after the burn occurs, the containment device is inspected, and residue management procedures are initiated.

### III.D0.4 Protection or Shelter for Personnel During Burning or Detonation

After wastes and supporting energetic materials and fuels have been placed at the OB or OD units, all EOD personnel retreat to at least 2,000 ft from the OB/OD units and up to 10,000 ft for large ordnance such as 2,000-lb bombs (SOI 136-18, Appendix C). In most cases, EOD personnel initiate OB and OD activities from range control buildings at Range C-52N or Range C-62, as appropriate. These structures have been specifically designed to protect personnel from fragments or shock waves which may be expelled during onsite detonations and bombing mission activities. Additional information related to facilities, improvements, and uses associated with Ranges C-52N and C-62 is provided in Appendix D. A description of personnel protective equipment (PPE) and emergency response provisions is provided in Sections II.C3 and II.C4.

### III.D0.5 Meteorological Conditions Under Which Burning or Detonation Will be Permitted or Restricted [40 CFR 270.23(c)]

OB/OD operations will only be conducted under the following meteorological conditions:

- daylight hours
- wind speeds greater than 3 mph and less than or equal to 15 mph
- no electrical storms within 3 mi of the EOD range
- no forecast of a major storm
- no sand, dust, or snow storms
- no inversion forecast

### III.D0.6 Length of Time After the Operation of the Unit Before Reentry of Personnel to the Burning Ground or Detonation Site Is Allowed [40 CFR 270.23(c)]

The OB containment device is not approached for at least 12 hours after a burn is initiated to ensure the burn is completed and the residue has cooled. Not later than the calendar day after the burn occurs, the containment device is inspected and residue management procedures are



initiated. The OD unit is not approached until the area is declared safe for entrance. This will generally occur within 1 hour after completion of detonation.

### III.D1 POTENTIAL HUMAN AND ENVIRONMENTAL RECEPTORS [40 CFR 270.23(c)]

OB/OD activities are conducted on active bombing/training Ranges C-52N and C-62, located in the northeastern portion of EAFB reservation. The areas of the open burn/open detonation operations at both ranges are largely cleared of vegetation and relatively flat.

#### III.D1.1 Location of Receptors Relative to the Site [40 CFR 270.23(c)]

There are no potential human receptors within 1 mi of either OB/OD units. The closest potential human receptor to Range C-62 would be motorists travelling by on EAFB Range Route 208 (approximately 2 mi east of the OB/OD units). This road runs through reservation property, and public access is allowed to access EAFB reservation lands for hunting and fishing. The area within 1.4 mi of Range C-62 is closed to hunting and fishing. Less than 50 vehicles per day are estimated to use reservation Route 208. The OB/OD unit at Range C-62 is approximately 2.8 mi from the reservation boundary. Primary land uses immediately beyond the reservation boundary include forestry, quarrying, and hunting/fishing. The population within 4 mi of the OB/OD units at Range C-62 includes 90 EAFB workers and 140 off-base residents (ES, February 1992). State highway 331 (approximately 6.5 mi east) is the closest non-reservation road to the OB/OD units.

The closest potential human receptors to Range C-52 would be motorists travelling by on EAFB range Route 200 (approximately 1.4 mi to range gate, west of the OD unit). This road runs east from state highway 285 through reservation property. Access along this road is restricted by blocked range gates during and in the intervening period following OD activities, as well as during active training missions. Access through Range C-52 is controlled by the RCO and the ROCC. The area within 2.8 mi of the C-52N OD unit is closed to hunting and fishing. Less than 30 vehicles per day are estimated to use the reservation Route 200 in the Range C-52N vicinity. The OD unit at C-52N is approximately 6 mi from the reservation boundary. State highway 20 is the closest public highway (6 mi south of the OD unit). Primary land use in the area beyond the OD unit is recreation and water sports. Population within a 4-mi radius of the OD unit is estimated at 201 residents (ES, February 1992).

EAFB housing is primarily located in the southwest corner of the base, although a base trailer park is located in the eastern corner of the main base. The closest distance from the Range C-52N OD unit to base housing is approximately 12 mi. The OB and OD units at Range C-62 are approximately 20 mi from base housing. The base housing area contains a church, school, playground, swimming pool, and golf course.

The closest public school to the OB/OD units is the Bluewater Elementary School, approximately 7 mi from Range C-52N and 15 mi from Range C-62. The closest churches are located in Niceville, Florida (7 mi from Range C-52N and 15 mi from Range C-62), and the closest private residences begin just outside the EAFB boundary approximately 6 mi from Range C-52N and 2.8 mi from Range C-62. The base hospital and a federal prison are over 12 mi from the Range C-52N OD unit and over 20 mi from the Range C-62 OB/OD units.

Habitats supporting ecological receptors surround both OB/OD units and include riparian habitats along surface water bodies and forested woodlands. Surface cover at the Range C-52N OD units is predominantly red clay/sand mix with a mixture of sand and wild grass along the periphery. The nearest wetland is situated along Basin Creek approximately 2.5 mi downstream of the OD unit. Many aquatic organisms live within the surface water pathway downstream from the OD unit. The federally designated threatened American alligator and Eastern indigo snake may be found along Basin Creek. The Florida Natural Areas Inventory lists numerous plant species considered as rare, endangered, or of special concern in Walton County. Many of these plants thrive in swampy and/or coastal habitats similar to those found on Basin Creek downstream of the OD unit. Numerous other federal and state designated species and habitats are known or are suspected to exist within the 15-mi surface water pathway downstream of the OD unit.

The ranges of many federal and state protected plant and animal species fall within the lands surrounding the OD unit. The OD unit itself is open, but heavily wooded areas occupy the majority of the region within 4 mi of the OD unit. These areas may provide habitat for a variety of plants and animals. For example, the gopher turtle, a candidate species for federal protective status, and the federally designated threatened Eastern indigo snake may inhabit areas within 4 mi of the OD unit. The federally designated endangered red-cockaded woodpecker occurs in significant numbers at EAFB, however, no known cavity trees for this protected animal have been located within 2 mi of the OD unit. Other species which may inhabit areas falling within 4 mi of the OD unit include federally designated threatened Arctic peregrine falcon and the Florida black bear, a candidate species for federal protective status.

At Range C-62, the topography in the vicinity of the OB/OD units slopes gently towards the southwest, directing runoff towards the headwaters of Blount Mill Creek. Surface cover is predominantly red clay/sand with a mixture of sand and wild grass along the outer periphery of the OB/OD units. No critical habitats of any endangered/threatened species are known to exist on or within 1/2 mi of the OB/OD units. Pine barren tree frog and red-cockaded woodpecker habitats can be found within 4 mi of the OB/OD units. Locally, the red-cockaded woodpecker range is encountered approximately 6 mi south of the OD/OB units along Little Alaqua and Alaqua Creeks. The pine barrens tree frog range within 4 mi of the site encompasses portions of the following watershed: Blount Mill Creek, Oakie Creek, Little Alaqua Creek and Alaqua Creek.

### III.D1.2 Sensitive Populations [40 CFR 270.23(c)]

There are no schools, hospitals, playgrounds, or day-care centers within 4 mi of either OB/OD units. Section III.D1.1 addresses closest distances to receptors for both OB/OD units at Range C-62 and the OD unit at Range C-52N.

### III.D2 POTENTIAL EXPOSURE PATHWAYS [40 CFR 270.23(c)]

Exposure is defined as the contact of an organism with a chemical or a physical substance. Exposure assessment provides a systematic analysis of the potential exposure mechanisms by which a receptor may be exposed to chemical or physical substances at or originating from a site. The exposure pathway analysis uses information from the site characterization and exposure setting (Sections III.B2, B3, and B4) and the environmental data and transport analyses (Section III.B1, C6, D1, and D2) to identify significant completed exposure pathways and to estimate actual or potential concentrations of the chemicals of potential concern (COPCs) at potential exposure points for each exposure pathway. Behavioral or psychological factors influencing exposure frequency and exposure levels are then presented in a series of exposure scenarios as a basis for quantifying chemical intake levels by receptor populations for each significant completed exposure pathway. The results of the exposure assessment are used in conjunction with toxicity information and ecological receptors associated with COPCs released during OB/OD operations. Thus, the objectives of exposure assessment are to:

- Identify significant exposure pathways
- Identify the potentially exposed population(s)

- Assess the degree of exposure [measure or estimate the magnitude, duration, and frequency of exposure for each receptor (or receptor group)] within the potentially exposed populations

An exposure pathway is the route that a chemical or physical substance takes from a source to an exposed population or individual (receptor), and describes the mechanism by which the receptor may be exposed to chemical or physical substances at or originating from the site.

For exposure pathway to be complete, the following five elements must be present:

1. Primary sources of chemical releases

At EAFB Ranges C-62 and C-52N, the primary sources of chemical release are particulate and vapors emitted as a result of open burn and open detonation activities.

2. Release mechanisms

Chemical and physical properties associated with the chemicals released, such as volatilization and biodegradation of volatile organics; and deposition and resuspension of energetics and emission products

3. Receiving media

At EAFB the media which may become cross-contaminated from the chemical sources (emissions and vapors deposition of particulates from air to soil) may include ambient air, soil, surface water, and foliage

4. Fate and transport in receiving material

At EAFB, the primary transport of the chemicals following burning and detonation activities is through dispersion of air particulates and volatilization. The primary fate of the released chemicals is deposition onto surrounding soil, surface water, and foliage.

## 5. Exposure points and routes of exposure

The primary exposure points at EAFB are areas where receptors may come into contact with released chemicals to include: airborne particulates and vapor emissions, surrounding soil, nearby surface water, and direct contact with deposition on foliage

To provide a conceptual understanding of the site environmental setting and associated exposure pathways, a flow diagram or conceptual site model was developed (Figure III-10) for the EAFB pathways for the purpose of screening and prioritizing health and environmental concerns associated with chemical releases at the OB/OD units.

If any of the five components are absent, the exposure pathway is considered incomplete and is not expected to contribute to exposure from the OB/OD units. A screening of potential exposure pathways was conducted such that the magnitude of exposure and characterization of risk focuses only on the completed exposure pathways and eliminates from further consideration those pathways that are incomplete. To perform a screening of completed exposure pathways, each of the five elements listed above is identified and evaluated in detail as described below.

### III.D2.1 Release Sources, Characteristics, Quantities, and Duration [40 CFR 270.23(c)]

Two release sources are associated with the EOD operations; open burning (OB) and open detonation (OD). These operations are to render unserviceable ordnance and other pyrotechnic devices harmless by either open detonation or open burning. A description of the treatment units is contained in Section III.A1 and III.A3. The quantity, and physical and chemical characteristics of the waste and products of combustion are discussed in Sections II.B and III.B1.

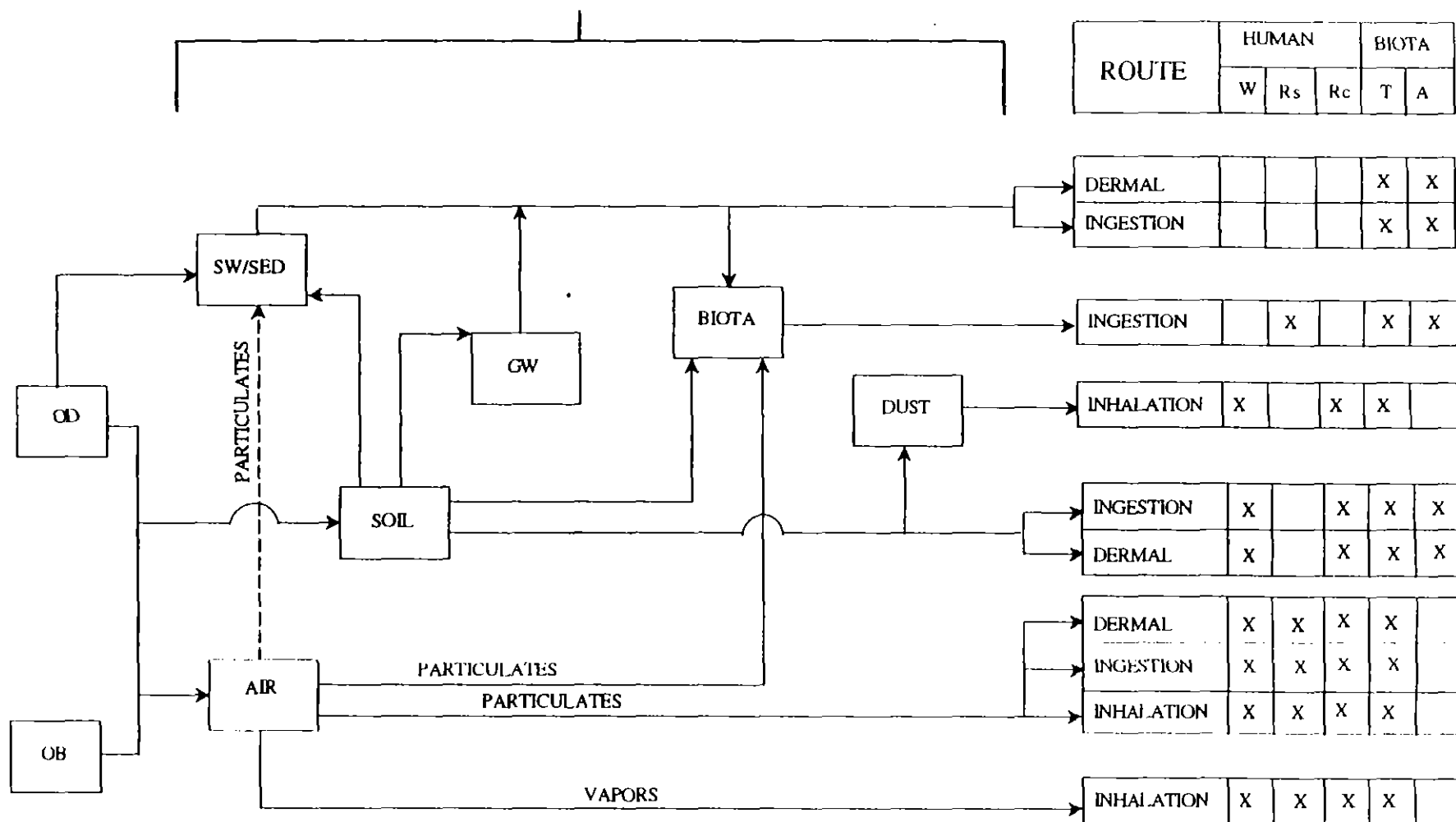
### III.D2.2 Release Mechanisms [40 CFR 270.23(c)]

COPCs may be released to the environment through OB/OD operations. Airborne Release of COPCs from open detonation operations may be through the transport of products of combustion, products of incomplete combustion, particulates, dust in the smoke plume created with the explosion of ordnance and vapors from organics. COPCs may potentially be released

## SOURCE

## EXPOSURE MEDIA

## EXPOSURE PATHWAYS



## KEY:

OD - Open Detonation  
OB - Open Burning  
SED - Sediment

GW - Groundwater  
W - Water  
Rs - Residential

Rc - Recreational  
T - Terrestrial  
A - Aquatic (marine)

Figure III-10. Conceptual Site Model for Exposure Associated with OB/OD Areas at Eglin Air Force Base.

through the spreading of unexploded ordnance and fragments of casings to the cleared area and grasslands surrounding the OB/OD units. Policing of the OD unit following open detonation operations attempts to retrieve the unexploded ordnance.

The potential release of COPCs from open burn operations would be primarily through the transport of products of combustion, products of incomplete combustion, and particulates in the smoke plume. There is also the potential for release through ash residues on the soil and the dispersion of munitions casings resulting from explosions.

### III.D2.3 Receiving Media [40 CFR 270.23(c)]

Receiving media are the environmental media that may become cross-contaminated as a result of the chemical releases of COPCs from the OB/OD operations. These environmental media include the ambient air, soil, or surface waters of the area. COPCs from open detonation may be transported directly into the air or soil. Transportation to surface waters in the site vicinity is not likely.

Potential exposure of human and non-human terrestrial receptors via the inhalation exposure pathway may occur directly through the inhalation of vapors and particulates. Particulates from OB/OD operations may also be ingested and/or be dermally absorbed as a result of direct dermal contact by both human and non-human terrestrial receptors. Direct contact may also occur as a result of deposition of particulates onto food items (biota) which can potentially be ingested by both human and non-human receptors. Deposition of particulates onto soil may potentially lead to leaching of COPCs into ground water and exposure of non-human receptors through dermal and ingestion pathways.

OB/OD products may be deposited directly on/into the soil in the form of combustion products, incomplete combustion products, unexploded ordnance, and fragments of casings. Both human and non-human receptors may potentially be exposed through both dermal contact with soil and ingestion of soil. COPCs in the soil may be resuspended in the form of dust and potentially inhaled by humans and non-human terrestrial receptors. Soil contamination resulting from OB/OD operations may potentially be passed along the food chain via ingestion of organisms by both non-human terrestrial and aquatic receptors.

### III.D2.4 Fate and Transport in Receiving Media [40 CFR 270.23(c)]

At EAFB, the primary transport of the chemicals following burning and detonation activities is through dispersion of air particulates and volatilization. The primary fate of the released chemicals is deposition onto surrounding soil and foliage. For the energetics, the primary environmental fate consists of two phenomena: loss or transformation into some other material, and movement or transport of the original material. Materials may eventually be dispersed in the atmosphere, water, soil, and sediments. For substances that evaporate into the atmosphere, the lifetime is dependent on photodissociation potential and reactivity with ozone and with hydroxyl radicals. Some environmental processes that may occur in aqueous media are: hydrolysis, photolysis, oxidation, reduction, volatilization, and degradation. Environmental fate processes in soil include adsorption, desorption, volatilization, and degradation. For soil, the adsorption-desorption process is probably the most important.

Some physicochemical properties of contaminants are useful in predicting the fate of these compounds in aquatic and terrestrial ecosystems. These properties, such as solubility, Henry's law constant, and partition coefficients, strongly influence the chemical behavior of the contaminants and their susceptibilities to degradation induced by physical and biological substances. Equations relating one parameter to another are sometimes used to derive a property value not reported and not easily accessible in the literature. This section summarizes important properties of some energetic compounds as they relate to their forms, chemical species conversion, transformation, and other fate processes in the environment.

#### III.D2.4.1 Nitroaromatic Compounds

Table III-1 presents the chemical and physical properties of the nitroaromatic and other nitrated compounds detonated and/or burned at EAFB. Generally, the nitroaromatics are slightly soluble in water and are not strongly absorbed by sediments. They differ in volatility in that the dinitrotoluenes and dinitrobenzene are relatively more volatile than the trinitroaromatic compounds such as 2,4,6-trinitrotoluene and 1,3,5-trinitrobenzene. Nitrobenzene is the most volatile. Tetryl and RDX have very low volatility. These physicochemical properties will influence to a large extent the environmental fate processes and transformation of the nitrated compounds.



### Sorption on Soil and Sediments

Several studies pertaining to the sorption of nitroaromatics on soil and sediments have been reviewed by Spanggord *et al.* (1980). The partition coefficients for 2,4,6-trinitrotoluene indicates that sediment adsorption is not a significant environmental fate process. Partition coefficients for nitrobenzene; 2,4-dinitrotoluene; 2,6-dinitrotoluene; 1,3-dinitrobenzene; and 1,3,5-trinitrobenzene suggest that adsorption on sediments may not be a significant environmental fate for these nitroaromatics as well. Values of  $K_{oc}$  in Table III-1 suggest that 1,3-dinitrobenzene and 1,3,5-trinitrobenzene would be relatively less adsorbed by soil compared to the other nitroaromatics. Nitrobenzene is not expected to be readily adsorbed because it has the strongest tendency to remain in the aqueous phase based on its high water solubility. The potential for adsorption of RDX by soil or sediments may occur more readily than the adsorption of tetryl in similar media.

The adsorption of nitroaromatic compounds in sands at the OB/OD units is not expected to be significant. The area is a high energy area with relatively coarse sands which generally have low organic content, and high permeability.

Because the nitroaromatics are not expected to be significantly adsorbed to sands at the OB/OD units and are somewhat soluble in water, the potential exists for this class of compounds to percolate through the sands into the underlying surficial aquifer.

### Volatilization from Water

A chemical dissolved in water has a tendency to escape from the liquid phase to the atmosphere. This tendency is related to the solubility and vapor pressure. As shown in Table III-1 vapor pressures of the nitroaromatics are close to 1. These data suggest that the volatilization rates of these compounds are limited by mass transport resistance in the gas phase.

According to Spanggord *et al.* (1980), volatilization of 2,4-dinitrotoluene; 1,3-dinitrobenzene; and 1,3,5-trinitrobenzene may be an important environmental fate for these compounds. Shorter half-life values for 2,6-dinitrotoluene and nitrobenzene imply that loss of these compounds by evaporation is favored compared to the other remaining nitroaromatics. Nitrobenzene has a greater tendency to volatilize because its vapor pressure is almost 20 times higher than that of 2,6-dinitrotoluene. Even in contaminated wet soil directly exposed to the

atmosphere, nitrobenzene would be expected to be readily lost by volatilization compared to 2,6-dinitrotoluene because its  $K_{oc}$  is lower and hence it would not be strongly adsorbed by soil.

### Biodegradation/Biotransformation

No hydrolysis of nitroaromatic compounds is expected under environmental conditions (Spanggord et al. 1980), except for tetryl where some hydrolysis can occur. In subsurface soil and aquatic systems, however, several species of microorganisms have been reported to biotransform 2,4,6-trinitrotoluene and dinitrotoluenes with varying degrees of efficiency.

Generally, the substrate concentration influences the population and metabolic activities of the microorganisms (Alexander 1977). A high 2,4,6-trinitrotoluene concentration can potentially inhibit and kill the microbes, whereas too low a concentration would not induce the microorganisms to adapt, which might result in slower microbial degradation.

Biodegradation of 2,4,6-trinitrotoluene can proceed both under aerobic and anaerobic conditions, although the process would be expected to be retarded in the absence of additional nutrients. It has not been conclusively demonstrated that 2,4,6-trinitrotoluene would be cleaved or completely mineralized to innocuous end products.

Unlike 2,4,6-trinitrotoluene, 2,4-dinitrotoluene can be transformed to carbon dioxide ( $CO_2$ ) and other oxidized products. Partial decomposition metabolites have been detected by some investigations; however, the exact conditions under which the end products are formed, including the eventual fate and toxicity of these metabolites, remain unclear.

Biodegradation processes described for 2,4,6-trinitrotoluene and 2,4-dinitrotoluene would be expected to be generally similar for the other nitroaromatics in that the reduction of a nitro group to an amino group would serve as a major transformation route.

### Photolysis

Photolysis is the dominant transformation process affecting nitroaromatics in the surface environmental systems receiving direct solar radiation (Spanggord et al. 1980). Photolysis rates are estimated to be 10 to 1,000 times faster than biotransformation rates in natural waters.

Based on the physicochemical properties for nitroaromatics and reports of several investigators, photolysis would be expected to be the most significant process in removing nitroaromatic compounds and their transformation products from ecosystems at earth's surface. Although numerous microorganisms are known to biodegrade nitroaromatic compounds, the process would be generally slower than photolysis. Volatilization could synergistically enhance the loss and transformation of nitroaromatic residues induced by solar radiation.

#### III.D2.4.2 Inorganic Chemicals

Inorganics that may be a component of the products detonated and burned at EAFB include: aluminum, ammonia, antimony, barium, calcium, copper, iron, lead, silver, strontium, sulfur, sulfate, tin, and associated compounds. Based on the type of disposal activities at the OB/OD unit, and the remote location of the OB/OD unit, the primary contaminant migration pathways of concern are: source to air; air to soil; soil to ground water; and ground water to surface water.

Metallic elements are not biodegradable through biological or chemical actions, and generally are considered persistent in the environment. Metals can be oxidized or reduced through the actions of microorganisms and the physical characteristics of soil. These physical or biologically mediated oxidation-reduction process can change the chemical and physical properties of various metals and therefore affect their mobility. Biomethylation of lead can greatly increase its mobility and reduce its soil-sorption potential.

Mobility of metals in the environment is generally low, with sorption being the factor most important in controlling their movement (USEPA 1979). Several environmental factors influence the mobility of inorganics including: soil type, metals are readily sorbed by clay mineral and organic matter; pH, metals are more soluble in acidic conditions; biomethylation; and chemical oxidation or reduction.

A more detailed description of the atmospheric fate of inorganics is described below:

##### III.D2.4.2.1 Copper

In the atmosphere, copper is present as dusts. Any chemical interaction of copper compounds in the atmosphere is likely to result in speciation (i.e., conversion of copper compounds into a

stable species such as CuO), not in its direct removal through decomposition as frequently occurs with organic compounds (USEPA 1984). The principal removal mechanisms for atmospheric copper are probably wet and dry deposition. The atmospheric half-life for the physical removal mechanisms is expected to depend on the particle size and particle density of atmospheric copper (USEPA 1984).

#### III.D2.4.2.2 Iron

In the atmosphere, iron is likely to be present in the particulate form or differential chemical forms that may undergo chemical or photochemical reactions, frequently with subsequent changes of oxidation states, but these processes may not be directly responsible for the removal of iron from the atmosphere (USEPA 1984). The residence time of iron in the atmosphere may be 10-20 days (USEPA 1984).

#### III.D2.4.2.3 Lead

Lead released to the atmosphere will be in the form of particulated matter and be subject to washout and gravitational settling. At extreme temperatures, some lead may volatilize and form sub-micron particles. These particles may migrate further than typical metal particulate matter. Transformations in the atmosphere to the carbonate and oxide may be expected.

#### III.D2.4.3 Gaseous Chemicals

The following is a discussion of the atmospheric fate of representative gaseous COCs at EAFB.

##### III.D2.4.3.1 Acetylene

Various plant and bacterial systems reduce and inactivate atmospheric acetylene through their nitrogen-fixing mechanisms (Clayton et al. 1981).

##### III.D2.4.3.2 Nitric Oxide

Nitric oxide is converted spontaneously in air to nitrogen dioxide. Hence, nitrogen dioxide gas is invariably present whenever nitric oxide is found in air. At concentrations below

50 ppm, this reaction is slow and frequently substantial concentration may occur with negligible quantities of  $\text{NO}_2$  (ACGIH 1991).

#### III.D2.4.3.3 Hydrogen Sulfide

**Atmospheric Fate:** The lifetime of hydrogen sulfide ( $\text{H}_2\text{S}$ ) is affected by ambient temperature and other atmospheric variable including humidity, sunshine, and presence of other pollutants. The decreased temperatures and decreased levels of hydroxide in northern regions (e.g., Alberta, Canada) in winter increase the residence time of  $\text{H}_2\text{S}$  in air (USEPA 1986).

Once released into the atmosphere,  $\text{H}_2\text{S}$  will behave like many other gaseous pollutants and be dispersed and eventually removed. Residence times in the atmosphere range from about one day to more than 40 days, depending upon season, latitude, and atmospheric conditions (NRC 1981).

#### III.D2.4.3.4 Carbon Monoxide

**Atmospheric Fate:** A photochemical model was used to quantify the sensitivity of the tropospheric oxidants of ozone ( $\text{CH}_4\text{S}$  and  $\text{OH}$ ) to changes in methane ( $\text{CH}_4$ ), carbon monoxide ( $\text{CO}$ ), and  $\text{NO}$  emissions and to perturbations in climate and stratospheric chemistry.

#### III.D2.4.3.5 Sodium Cyanide

The most likely chemical reaction for sodium cyanide in the atmosphere is heterogenous reaction with  $\text{OH}^\cdot$  radicals. Considering the half-life of the homogeneous hydrogen cyanide reaction with  $\text{OH}^\cdot$  radicals, it appears unlikely that sodium cyanide will have any significant chemical loss mechanism in the troposphere (USEPA 1984). The primary removal process for atmospheric sodium cyanide appears to be physical. Both dry deposition and wet deposition may dominate its fate in the atmosphere, although considering the aqueous solubility of sodium cyanide, the latter process appears to be more important than the former process (USEPA 1984).

#### III.D2.4.3.6 Sulfur Oxides

Of the four known gas-phase oxides (sulfur monoxide, sulfur dioxide, sulfur trioxide, and disulfur monoxide), only sulfur dioxide occurs at significant concentrations in the atmosphere. Sulfur dioxide is removed from the atmosphere by gaseous, aqueous, and surface oxidation to form acidic sulfates. Also important are physical removal pathways for  $\text{SO}_2$  by the hydroxyl radical ( $\text{OH}^\cdot$ ) is well understood. The ready solubility of  $\text{SO}_2$  in water is due principally to the formation of bisulfite and sulfite ions, which in turn are easily oxidized to form acidic sulfates by reaction with catalytic metal ions and dissolved oxidants (USEPA 1982). Sulfur dioxide reacts on the surface of a variety of airborne solid particle, such as ferric oxide, lead oxide, aluminum oxide, salt, and charcoal. Airborne particles exist in diverse sizes and compositions that can carry widely under the changing influences of source contributions and meteorological conditions. Primary particles are directly discharged from manmade or natural sources. Secondary particles form by chemical and physical reactions in the atmosphere, and most of the reactants involved are emitted to the air as gaseous pollutants. The major components of fine atmospheric particle include sulfates/carbonaceous material, ammonium, calcium, and iron as well as calcium carbonate, sea salt. Most atmospheric sulfates and nitrates are water soluble and have a tendency to adsorb moisture (USEPA 1982).

#### III.D2.4.4 Organic Chemicals

Volatile organic compounds are low molecular weight compounds typically used as solvents or present as fuel additives. Semivolatile organic compounds generally have higher molecular weights than volatile organic compounds. Volatile organics, including halogenated (i.e., carbon tetrachloride) compounds, are moderately to highly soluble. Due to the relatively high solubility of many of these compounds, the potential exists for the leaching of these compounds to ground water or transport to surface water.

Several mechanisms exist for the removal of volatile compounds from the environment. Many of these compounds readily volatilize from the surface soil and water. Potential also exists for biodegradation in soil and water.

The mobility of semivolatile organics depends on their aqueous solubility and their potential for sorption onto soil particles or naturally occurring organic matter in the soil. These compounds are less mobile than volatile compounds and also are less likely to be removed due to evaporation or volatilization.

### III.D2.5 Exposure Points

The final component of a completed exposure pathway is the point of exposure and the route of exposure by which potential receptors may come into contact with site-related COPCs. Routes of exposure (ingestion, direct contact, and inhalation) to the potentially contaminated media are determined by careful examination of the extent of environmental contamination, as well as the results of the dispersion modeling to predict the concentration of chemical in ambient air during OB and OD activities.

Based on the previous evaluation of the five components of a completed exposure pathway, the primary exposure pathway considered complete for the OB and OD treatment scenarios is the potential exposure of residents and biota to vapors and dusts generated from the OB and OD activities. Pathways of secondary importance are incidental ingestion of and dermal absorption from cross-contaminated media (i.e., soil, biota). Potential human and non-human receptors which might be exposed via transport of material through the air can be expected to be found in a larger geographic area than those which might be exposed via surface/ground water or directly contaminated soil. Due to the transport mechanisms of the chemical constituents as a result of burning and detonation operations, the inhalation exposure pathway is selected as the exposure pathway of primary concern and is expected to contribute the majority of potential health risks to potential receptors. Therefore, this pathway was selected for further quantitative evaluation.

~~Exposures may potentially occur through dermal or ingestion routes involving soil or ground water. While these pathways are expected to contribute to the overall site risks, these pathways were not included for a quantified risk analysis at this time since surface soil, or ground-water data are not available at either the OB/OD units on Range C-62 or the OD unit on Range C-52N.~~

~~While the ingestion and dermal exposure pathways to media other than air are not addressed quantitatively, to assess the relative significance of these pathways to the overall site risk, additional sampling has been proposed (Section II.G). This sampling will include collection of soil and ash residue at the source area; ground-water sampling; and evaluation of the ground-water/surface-water interface. Upon availability of the analytical results of these samples, the ingestion and dermal exposure pathways will be quantified to assess their relative significance to the overall site risk associated with the burning and detonating activities.~~

Quantitative risk assessment calculations are not presented for surface soil or ground-water exposure since analytical results from the baseline (first quarter) soil and ground-water monitoring program and second quarter ground-water monitoring program do not indicate concentrations of COPCs above specified health risk levels (i.e., MCLs and EPA Region III RBCs) for these media.

For purposes of modeling potential exposures via air, three categories of human receptors were selected: worker, recreational, and residential. Locations of receptor sites are addressed in Section III.C6a and detailed in Appendix M.

#### III.D2.6 Wetting of the Burning Area [40 CFR 270.23(c)]

There is no intentional wetting of the burn area. Wetting of the burning area would occur primarily through precipitation. See Section III.C4 for a description of atmospheric and meteorological conditions of the area.

### III.D3 POTENTIAL MAGNITUDE AND NATURE OF EXPOSURE [40 CFR 270.23(c)]

#### III.D3.1 Exposure Concentrations [40 CFR 270.23(c)]

As stated previously, potential exposure through air pathways is the primary complete exposure pathway associated with OB/OD. Quantitative air emissions and air dispersion modeling ~~(as described in Appendix M)~~ was used to calculate predicted concentrations of airborne contaminants at selected receptor locations. The locations that were used included:

- Closest public access highway
- Closest occupational exposure site (range control buildings)
- Closest hunting/fishing location
- Reservation boundary

As discussed in Section III.C., initial air emissions modeling to calculate predicted emissions resulting from OB/OD activities was performed using the POLU13G model. The POLU13G model was developed based on rigorous OB/OD testing by the Department of Defense using the "Bangbox" facility at Dugway Proving Ground, Utah. Detonations were conducted within the "Bangbox" and emissions products were quantified. These data were then used to develop and enhance the POLU13G model. The POLU13G model output addresses emissions products



provide a realistic, conservative assessment of OB/OD degradation products, and the POLU13G model is sufficiently flexible to accept a wide variety of OB/OD treatment scenarios (including all of the scenarios presented in this permit application).

Once air emissions data at the source are calculated from the POLU13G model, air dispersion modeling using ISCST (for OB) and INPUFF (for OD) was applied to calculate expected airborne concentrations at the selected receptor locations.

Descriptions of receptor locations and distances from the OB/OD units are provided in Appendix M.

### Risk Screening Methodology

A two-tiered risk screening methodology was used. The first risk screening step compared predicted air concentrations of OB/OD reaction products (which were developed from the conservative OB/OD treatment scenarios and the POLU13G modeling discussed in Section III.C) to Florida Department of Environmental Protection (FDEP) "no threat levels" for occupational exposure under the Florida State air quality regulations. The FDEP "no threat levels" are the criteria by which air emission sources in the State of Florida are regulated under the Clean Air Act. The FDEP "no threat levels" are based on the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), which for several compounds are more protective than the ACGIH TLVs by a factor of 10 ~~divided by a factor of 100~~. The ACGIH TLVs represent the maximum concentration for 8 hr, 24 hr, and annual intervals at which occupational exposure (8 hrs per day/40 hours per week) does not represent increased potential human health risks as defined by ACGIH. Consequently, since OB/OD activities occur at a much lesser frequency (8-12 events per year) for a shorter duration (1-8 hours), the Florida "no threat levels" represent a very conservative health risk-based screening tool.

The first tier screening also includes a comparison of predicted OB/OD air concentrations at receptor locations to National Ambient Air Quality Standards (NAAQS) established under the Clean Air Act. Since there are limited published NAAQS at the present time, and since OB/OD events are infrequent, this comparison generally has minimal relevance, except in the case of particulate matter (PM<sub>10</sub>), but should be included for completeness.

In recognition of the fact that OB/OD exposure frequency and duration are considerably less than the occupational exposure criteria inherent in the FDEP "no threat levels," a secondary risk screening is necessary in circumstances where the predicted airborne concentration exceeds the FDEP "no threat levels" or the NAAQS. This secondary risk screening must consider exposure frequency and duration scenarios that are both conservative and realistic. To do so, an average daily dose (ADD) was calculated as follows:

$$ADD = \frac{C_8 \times IR \times D \times F \times T}{W \times T'}$$

where:

ADD	=	Average daily dose (mg/kg · day)
C <sub>8</sub>	=	Modeled 8-hr air concentration (mg/m <sup>3</sup> )
IR	=	Average adult inhalation rate suggested by EPA (1989) (0.83 m <sup>3</sup> /hr)
D	=	Exposure duration (hrs/day)
F	=	Exposure frequency (days/yr)
T	=	Exposure period (yrs)
W	=	Average adult weight (per EPA 1989) (70 kg)
T'	=	Exposure period per EPA (1989) (30 yrs)

The calculated ADD represents the predicted exposure (dose) for the potential receptor based on a realistic conservative assessment of exposure characteristics. The ADD is then compared against health risk-based criteria such as reference doses (for noncarcinogenic impacts) and slope factors (for carcinogenic impacts) from the EPA IRIS database (EPA 1993). For compounds that do not have published reference doses or slope factors, the Florida "no threat levels" can be converted to dose units using default assumptions as follows:

$$\text{dose} = \frac{NTL \times IR \times D}{W}$$

where:

NTL	=	Florida "no threat level" (mg/m <sup>3</sup> )
IR	=	Average adult inhalation rate per EPA (0.83 m <sup>3</sup> /hr)

D = Exposure duration per EPA (24 hr/day)  
W = Average adult weight per EPA (70 kg)

For instance, if the FDEP "no threat level" was  $10 \mu\text{g}/\text{m}^3$  ( $0.010 \text{ mg}/\text{m}^3$ ), the resultant dose resulting in potential increased risk would be:

$$\begin{aligned}\text{dose} &= 0.010 \frac{\text{mg}}{\text{m}^3} \times 0.83 \frac{\text{m}^3}{\text{hr}} \times 24 \frac{\text{hr}}{\text{dy}} \times \frac{1}{70 \text{kg}} \\ &= 0.0028 \text{mg/kg} \cdot \text{day}\end{aligned}$$

### Tier 1 Risk Screening Results

For Tier 1 risk screening, the airborne concentrations at the selected receptor locations (as calculated by POLU13G and followed by ISCST or INPUFF as appropriate) were compared to the FDEP "no threat levels." Table III-23 28 summarizes the results of this screening. This table indicates observed exceedances of the FDEP "no threat levels" for the following compounds under one or more OB treatment scenarios:

- barium
- magnesium oxide
- lead
- hydrazine
- hydrogen fluoride

No compounds exceeded NAAQS for any of the OB treatment scenarios.

There were no compounds that exceeded Florida "no threat levels" for any of the OD scenarios considered. However, particulate concentrations were observed to exceed National Ambient Air Quality Standards for  $\text{PM}_{10}$ .

### Tier 2 Risk Screening

In the tier 2 risk screening, consideration of conservative realistic exposure frequency and duration was addressed. The following conditions were examined.

TABLE III-23 28 EXCEEDANCES OF FLORIDA'S NO THREAT LEVELS DURING OB/OD OPERATIONS

Range	Receptor Location Nos.	Munition/ Explosive	OB/OD	Compound	Observed Exceedance		
					8-hr	24-hr	Annual
C-62	1-9	Impulse Cartridge	OB	Hydrazine			X
C-62	1-10	M55-20 mm	OB	Barium	X	X	
C-62	1 & 8	M55-20 mm	OB	Barium			X
C-62	1-10	M55-20 mm	OB	Magnesium Oxide	X	X	
C-62	1-10	M55-20 mm	OB	Hydrazine			X
C-62	1	Comp.B	OD	Particulate		X <sup>(a)</sup>	
C-62	1	Tritonal	OD	Particulate		X <sup>(a)</sup>	
C-62	1-10	M97A2/LUU-2	OB	Magnesium Oxide	X	X	
C-62	1-10	M97A2/LUU-2	OB	Lead Compound	X	X	X
C-62	1-10	M97A2/LUU-2	OB	Hydrazine			X
C-62	1 & 8	M15 Propellant	OB	Hydrogen Fluoride		X	

(a) Observed exceedances in comparison with NAAQS for PM<sub>10</sub>.

*Support Building (Worker Exposure—Receptor 8 in Appendix M)*

This is the location with the greatest potential for human exposure since site workers will remain at this location until the OB or OD mission is essentially complete. It was assumed that a potential receptor outside of the support building (approximately 1.2 mi from the OB unit) would be exposed for 8 hrs/day during 12 burns per year over a period of 30 years. This approach is considered particularly conservative since site workers could go inside the support building during part or all of the OB activity and reduce considerably their potential exposure duration.

*Motorists on Nearest Range Road (Receptor 1 in Appendix M)*

The next closest receptor location to OB unit is motorists driving by on Range Route 208 (approximately 1.3 mi from the OB unit). It was assumed that the motorist, while driving through, would stop their vehicle, get out, and watch for approximately a 1/2-hr period during ~~one~~ all 12 burn events per year.

*Hunters/Fishermen/Recreational Use (Receptor 10 in Appendix M)*

This scenario considers potential exposure to a recreational user at the closest boundary of reservation area open to hunting/fishing. It assumes that a hunter or fishermen happens to be at that location on the day of a burn event ~~once~~ four times each year for an 8-hr period.

ADDs were calculated and compared to the risk-based criteria for 8 hr, 24 hr, and annual exposure durations as described previously. Table III-24 presents results of the Tier 2 risk screening. Table III-24 29 summarizes the results of risk screening calculations. Based on the exposure conditions described above, this location would represent greatest potential for site related risk since it assumes the highest exposure frequency and duration of the potential exposure scenarios addressed.

It is apparent from Table III-24 that, when exposure frequency and duration is considered, only one chemical of concern (lead compounds) for one treatment scenario (23,000 rounds of M97A2 20 mm cartridges and 20 LUU-2 flares) at one exposure duration (24 hours) for receptor location 8 (site worker) exceeded human health risk criteria. ~~It should be noted, however, that since receptors (site workers) would not stay at this location beyond the time required to complete the OB event (4-8 hours), the 24-hour exposure scenario would not occur. When considering a more plausible 8-hr worker exposure scenario at the support~~

TABLE III-24 29 RISK ASSESSMENT COMPARISONS FOR OB/OD SCENARIOS WITH OBSERVED EXCEEDANCES OF FLORIDA "NO THREAT LEVELS" (FNTL)

OB/OD UNIT	TREATMENT SCENARIO	CHEMICAL OF CONCERN	C <sub>A</sub> (UG/M <sup>3</sup> )	8-HR FNTL (UG/M <sup>3</sup> )	ADD (MG/KG-DY)	RISK CRITERIA (MG/KG-DY)	C <sub>24</sub> (UG/M <sup>3</sup> )	24-HR FNTL (UG/M <sup>3</sup> )	ADD (MG/KG-DY)	RISK CRITERIA (MG/KG-DY)	C <sub>A</sub> (UG/M <sup>3</sup> )	ANNUAL FNTL (UG/M <sup>3</sup> )	ADD (MG/KG-DY)	RISK CRITERIA (MG/KG-DY)
C-62 OB	IMPULSE CTG	HYDRAZINE	NE	1.3	NA	NA	NE	0.312	NA	NA	0.00056	0.0002	1.75E-09	5.69E-08
C-62 OB	M55-20MM	BARIUM	487.28	5	0.0015	0.072	278.45	1.2	0.0009	0.072	55.69	50	0.0002	0.072
C-62 OB	M55-20MM	MAGNESIUM OXIDE	426.56	100	0.0013	0.028	243.75	24	0.0008	0.007	NE	--	NA	NA
C-62 OB	M55-20MM	HYDRAZINE	NE	1.3	NA	NA	NE	0.312	NA	NA	0.0028	0.0002	8.74E-09	5.69E-08
C-62 OD	COMP B	PARTICULATE	NE	--	NA	NA	155.45	150	2.52E-06	0.043	NE	50	NA	NA
C-62 OD	TRITONAL	PARTICULATE	NE	--	NA	NA	155.45	150	2.52E-06	0.043	NE	50	NA	NA
C-62 OB	M97A2/LUU-2 (initial)	MAGNESIUM OXIDE	889.04	100	0.0028	0.028	508.02	24	0.0016	0.007	NE	--	NA	NA
C-62 OB	M97A2/LUU-2 (initial)	LEAD COMPOUNDS	28.68	0.5	8.95E-05	1.42E-04	16.39	0.12	5.11E-05	3.41E-05	3.28	0.09	1.02E-05	2.56E-05
C-62 OB	M97A2/LUU-2 (initial)	HYDRAZINE	NE	1.3	NA	NA	NE	0.312	NA	NA	0.0028	0.0002	8.74E-09	5.69E-08
C-62 OB	M97A2/LUU-2 (revised)	MAGNESIUM OXIDE	3,512.35	100	0.0110	0.028	2,007.06	24	0.0063	0.007	NE	--	NA	NA
C-62 OB	M97A2/LUU-2 (revised)	LEAD COMPOUNDS	14.44	0.5	4.51E-05	1.42E-04	8.25	0.12	2.57E-05	3.41E-05	1.65	0.09	5.15E-06	2.56E-05
C-62 OB	M97A2/LUU-2 (revised)	HYDRAZINE	NE	1.3	NA	NA	NE	0.312	NA	NA	0.0022	0.0002	6.86E-09	5.69E-08
C-62 OB	M15 Propellant	Hydrogen Fluoride	12.79	26	NA	NA	7.31	6.24	2.28E-05	1.78E-03	NE	--	NA	NA

Note: (1) NE = No Exceedances above FNTL.

(2) NA = Not Applicable.

(3) For particulates, the value entered in the FNTL column is the NAAQS for PM<sub>10</sub>.

(4) Risk criteria include converted FNTL values to dose value, except for barium where the published oral reference dose is used.

(5) All maximum concentrations for chemicals of concern occurred at Receptor 8 (Support Building) for the 8-hr, 24-hr, and annual periods, except for maximum concentrations of particulate matter which occurred at Receptor 1 (Range Route 208, the nearest range road).

~~building, the resultant ADD ( $8.95 \times 10^{-5}$  mg/kg day) is less than the health-based risk criteria ( $1.42 \times 10^{-4}$  mg/kg day) by a factor of 1.6. The calculated ADDs for all other receptor locations for all of the scenarios were less than human health risk criteria.~~

In order to reduce the potential for human health risk associated with OB activities, a revised treatment scenario for 20-mm cartridges was determined through an iterative methodology. In this scenario, the number of M97A2 20-mm cartridges was reduced to 15,000 rounds and the number of LUU-2 flares was increased to 80. Comparison of ADDs to risk-based criteria for the 8 hr, 24 hr, and annual exposure durations for this scenario did not result in exceedance of human health risk criteria. Thus, the number of rounds of M97A2 20-mm cartridges that can be treated in a single OB event without exceeding human health risk criteria is predicted to be 15,000 rounds.

~~In order to assure that the risk assessment is adequately protective of non-site workers for lead compounds at the 24-hour exposure scenario, the ADDs for motorists on the nearest range road and hunters/fishermen were calculated and compared to the risk-based criteria. Both the motorists on the nearest range road (ADD =  $2.45 \times 10^{-7}$  mg/kg day) and the hunters/fishermen (ADD =  $3.37 \times 10^{-6}$  mg/kg day) were demonstrated to exhibit ADDs that were less than the 24-hr risk based criteria for lead ( $3.41 \times 10^{-5}$  mg/kg day) by factors of approximately 140 and 10, respectively.~~

### III.D3.2 Total Risk [40 CFR 264.601 and 40 CFR 270.23(c)]

Based on the results of the tiered risk screening for airborne exposure pathways, as discussed herein, it is concluded that OB/OD activities at Eglin AFB are not anticipated to result in airborne contaminant concentrations that will exceed human health risk criteria. ~~At the present time, there is no available soil or groundwater data. Consequently, consideration of potential risk related to those pathways is not addressed. It is recognized that consideration of the soil and water pathways must be addressed and it is understood that development of quantitative risk assessment of those pathways will be required as a condition of a RCRA permit for the OB/OD units at Eglin AFB.~~

Furthermore, based on results of the baseline (first quarter) surface/subsurface soil and ground-water sampling/analysis data and the second quarter ground-water monitoring data, soil and ground-water pathways are incomplete since concentrations of COPCs do not exceed specified health risk levels (i.e., MCLs and EPA Region III RBCs) for these media.

### III.E EFFECTIVENESS OF THE TREATMENT

#### III.E1 REPORT DEMONSTRATING THE EFFECTIVENESS WITH SUPPORTING LAB OR FIELD DATA [40 CFR 270.23(d)]

To date, samples of ash residue generated at the OB treatment units at EAFB, Range C-62, have been analyzed. Between 13 February and 31 March 1992, surficial soil and OB munitions residue sampling was performed. The analytical results from these sampling events are provided in Appendix L. A brief summary and discussion of these analytical results follows.

Three surficial soil samples were taken at the OD unit on Range C-52N. These samples were analyzed for reactivity, TCLP metals (including mercury), and TCLP volatile organics. None of the parameters for TCLP metals and volatile organics were found at levels above instrument detection limits in these samples. Data from post-treatment analyses also demonstrated that OD residue samples are nonreactive.

A total of four surficial soil samples were taken at the OD unit on Range C-62. The first set of two soil samples was taken before an OD event took place and the second set of two soil samples was taken immediately subsequent to open detonation. These samples were analyzed for reactivity, TCLP metals (including mercury), and TCLP volatile and semivolatile organic compounds. None of the parameters were found at levels above instrument detection limits in all four soil samples. In addition, data from post-treatment analyses demonstrated that the OD residue samples are nonreactive.

Two samples were taken of the ash munitions residue after OB treatment from one of the burn kettles on Range C-62. These samples were analyzed for reactivity, TCLP metals (including mercury), and TCLP volatile and semivolatile organic compounds. None of the parameters were found at levels above instrument detection limits in both samples. In addition, data from post-treatment analyses demonstrated that OB residue samples are nonreactive.

Based on the analytical information collected thus far, it would appear that the effectiveness of the OB/OD treatment process is demonstrated with respect to reactivity and toxicity. Furthermore, the results of the ~~upcoming~~ ongoing sampling program (Section II.G), which ~~to~~ includes surficial and subsurface soil and ground water analytical results, ~~will indicate the presence or absence of compounds related to OB/OD operations at Ranges C-52N and C-62~~ that the OB/OD operations are not resulting in adverse impacts to soil or ground water at Ranges C-52N and C-62.



### **III.F ADDITIONAL INFORMATION**

#### **III.F1 NOISE CONSIDERATIONS [40 CFR 264.601 and 40 CFR 270.23(e)]**

Noise produced from detonations of explosives carried out for the purpose of demilitarization is not exempt from the requirements of the Noise Control Act of 1972. Human exposure to impulse noise not to exceed 145 dB or 350 Pa once per day is considered "acceptable" (USEPA 1974). For occupational exposure, the limit is 140 dB (or 200 Pa) (Code of Federal Regulations 1972). These levels do not take into consideration the alterations of impulse noise from detonations. From a detonation, the perceived level of noise at a distance would be approximately 70 dB less to the human ear (Gould and Tempo 1981). Therefore, predicted noise levels for the site would be perceived at 70 dB lower than predicted levels by the receptors. Noise is not a consideration for OB operations because little noise is produced during the burning operation. The potential for airblast and noise impacts are discussed in Appendix N.

Adverse effects to humans due to impulse noise and airblast are not anticipated at this site. EOD personnel should take appropriate precautions (current operating procedures require shelter and ear protection during detonations, OSHA-regulated). Airblast and noise levels from a 3,000-pound TNT equivalent weight detonation are not predicted to cause adverse effects at any of the receptor locations identified in Section III.F1.3.5, except that birds could be adversely affected in the near field by airblast. This potential effect is unlikely to occur due to human activity at the OD units immediately prior to detonations. The federally designated endangered red-cockaded woodpecker range is encountered approximately 6 mi south of the Range C-62 along the Little Alaqua and Alaqua Creeks. No known cavity trees for the red-cockaded woodpecker have been located within 2 mi of Range C-52N. Conclusive statements regarding the "protective" maximum number of detonations per day cannot be derived from the literature.

##### **III.F1.1 Distance of the OB/OD Unit, or Area, from Off-Plant Inhabited Buildings [40 CFR 270.23(d)]**

The OB/OD units on Range C-62 are more than 9,500 ft from the nearest public access road and 2.8 mi from the EAFB reservation boundary. The OD unit at Range C-52N is more than 30,000 ft from the nearest public access road and approximately 6 mi from the reservation

boundary. Access during and up to 24 hours after OB/OD activities is restricted by blocked range gates (9,000 ft from the OB/OD units at Range C-62 and 4,000 ft from the OD unit at Range C-52N). Additional information concerning receptor locations and distances from the OB/OD units can be found in Section II.A2. and Section III.D1.

### III.F1.2 Wind Direction [40 CFR 264.601 and 40 CFR 270.23(e)]

Based on recorded data at EAFB, wind direction is predominantly from the north with velocities less than 9 knots (10 mph). Mean annual windspeed is approximately 4.8 knots (5.5 mph). Winds are generally from the north and are strongest during the fall and winter months. During the spring and summer, however, winds are lighter in velocity and are generally out of the south. Data regarding wind speed and direction for the EAFB/Valparaiso, Florida station is present in Table III-6. A wind rose showing the frequency of wind direction as a function of wind speed for EAFB is presented as Figure II-8. OD operations are limited to taking place when wind speeds are greater than or equal to 3 mph and less than or equal to 15 mph. There are no limitations of OD operations at EAFB with respect to wind direction.

### III.F1.3 Airblast [40 CFR 264.601 and 40 CFR 270.23(e)]

Airblast (the explosion shock wave in air) and noise are factors to be considered when evaluating the potential for adverse impacts resulting from the operation of an OD unit. Airblast and noise are not associated with OB activities.

Potential effects to humans include physical damage (e.g., rupturing of eardrums or airblast physical damage), damage associated with building structural stress (e.g., flying glass from broken window), and nuisance noise. Primary effects of noise on wildlife and other animals may be primary, secondary or tertiary. Primary effects are direct physical auditory changes (e.g., eardrum rupture, temporary or permanent hearing threshold shifts, etc.). Secondary effects include factors such as stress, behavioral changes, and detrimental changes in the ability to obtain food, water or cover. Tertiary effects are declines in population, habitat destruction, species extinction, or other population, community or ecosystem level effects which result from primary and secondary effects (U.S. National Ecology Research Center 1988).

### III.F1.3.1 Airblast Maximum Levels [40 CFR 264.601 and 40 CFR 270.23(e)]

Airblast peak overpressure (Pa) and noise (dB) were conservatively estimated. Actual noise and airblast measurements will be collected as a part of the permit conditions. Estimated levels at representative receptors is presented in Tables III-25 30 through III-27 32. These predictions are most relevant to receptor locations at level terrain. Adjustments were not made for terrain/elevation variations, since the topography at both the OB/OD units on Range C-62 and the OD unit on Range C-52N is relatively level.

### III.F1.3.2 Monitoring of Airblast Effects at Several Receptors [40 CFR 264.601 and 40 CFR 270.23(e)]

Site-specific monitoring of actual airblast and noise levels at receptors during OD operations has not been conducted. Mathematical models were used to estimate approximate airblast peak over pressure and sound pressure levels associated with selected OD treatment scenarios. Estimation procedures used in this evaluation are described in Appendix N.

### III.F1.3.3 Type, Sensitivity, and Capability of Blast-Monitoring Equipment [40 CFR 264.601 and 40 CFR 270.23(e)]

Actual airblast and noise monitoring during OD operations has not been conducted at the OD units on Ranges C-52N and C-62.

### III.F1.3.4 Procedure [40 CFR 264.601 and 40 CFR 270.23(e)]

No airblast and noise monitoring has been conducted at the OD units on Ranges C-52N and C-62. Airblast peak overpressure (Pa) and noise (dB) at representative receptors have been estimated. Refer to Tables III-25 through III-27 and Appendix N for estimates and comparisons with adverse effect levels.

### III.F1.3.5 Map Showing Monitoring Receptors [40 CFR 264.601 and 40 CFR 270.23(e)]

Noise and airblast monitoring were not conducted at either the OB/OD units on Ranges C-52N and C-62. Airblast and noise levels were estimated for the following receptor locations:

TABLE III-25 30 PREDICTED AIRBLAST PEAK OVERPRESSURE (Pa) AND NOISE (dB) FOR 700 LB TNT-EQUIVALENT WEIGHT DETONATION ON RANGE C-52N (HERD detonation)

Receptor No.	Receptor Location	Distance from OD at Range C-52N (km)	Predicted Airblast Peak Overpressure (Pa)	Predicted Unweighted <sup>(a)</sup> Sound Pressure Level (dB)
1	Range Gate 1	6.7 2.04	72 267.2	131 142.5
2	Range Gate 3	8.0 2.44	59 219.4	129 140.8
3	Range Gate 6E	15.8 4.82	28 103.8	123 134.3
4	Range Gate 13	14.0 4.27	32 118.6	124 135.5
5	Range Gate 115	9.3 2.83	50 186.4	128 139.4
6	Range Gate 116	6.1 1.86	80 295.8	132 143.4
7	Control Tower Building	4.4 1.34	115 424.3	135 146.6
8	Closest Hunting/Fishing Location	4.5 4.51	112 111.7	135 135.0
9	Closest Residence	9.7 9.66	48 48.3	128 127.7

(a) Subtract 70 dB from predicted values for human receptor locations to evaluate perceived noise relative to the 140 dB standard. No predicted sound pressure levels exceed this criteria.

**TABLE III-26 31 PREDICTED AIRBLAST PEAK OVERPRESSURE (Pa) AND  
NOISE (dB) FOR 3,000 LB TNT-EQUIVALENT WEIGHT  
DETONATION ON RANGE C-52N**

Receptor Number	Receptor Location	Distance from Explosion at Range C-52N (km)	Peak Pressure Change (Pa)	Unweighted <sup>(a)</sup> Sound Pressure Level (dB)
1	Range Gate 1	<del>6.7</del> 2.04	<del>123.8</del> 457.8	<del>135.9</del> 147.2
2	Range Gate 3	<del>8.0</del> 2.44	<del>101.8</del> 376.0	<del>134.2</del> 145.5
3	Range Gate 6E	<del>15.8</del> 4.82	<del>48.2</del> 177.8	<del>127.7</del> 139.0
4	Range Gate 13	<del>14.0</del> 4.27	<del>55.0</del> 203.2	<del>128.8</del> 140.2
5	Range Gate 115	<del>9.3</del> 2.83	<del>86.3</del> 319.4	<del>132.7</del> 144.1
6	Range Gate 116	<del>6.1</del> 1.86	<del>137.2</del> 506.8	<del>136.8</del> 148.1
7	Control Tower Building	<del>4.4</del> 1.34	<del>196.6</del> 726.9	<del>139.9</del> 151.2
8	Closest Hunting/Fishing Location	<del>4.506</del> 4.51	<del>191.5</del> 191.3	139.6
9	Closest Residence	<del>9.656</del> 9.66	82.8	132.4

(a) Subtract 70 dB from predicted values for human receptor locations to evaluate perceived noise relative to the 140 dB standard. No predicted sound pressure levels exceed this criteria.

**TABLE III-27 32 PREDICTED AIRBLAST PEAK OVERPRESSURE (Pa) AND  
NOISE (dB) FOR 3,000 LB TNT-EQUIVALENT WEIGHT  
DETONATION ON RANGE C-62**

Receptor No.	Receptor Location	Distance from OD at Range C-62 (km)	Predicted Airblast Peak Overpressure (Pa)	Predicted Unweighted Sound Pressure Level (dB)
1	Route 208	1.97	476	148
2	Route 203	2.85	317	144
3	Route 381	2.86	315	144
4	Route 385	2.73	333	144
5	Range Gate 62	3.49	254	142
6	Range Gate 62A	2.85	317	144
7	Range Gate 62B	2.73	333	144
8	Support Building (Military Personnel)	2.06	453	147
9	Closest Residence	4.51	191	140
10	Closest Hunting/Fishing	2.25	410	146

(a) Subtract 70 dB from predicted values for human receptor locations to evaluate perceived noise relative to the 140 dB standard. No predicted sound pressure levels exceed this criteria.

Range C-52N

- Range Gates Nos. 1, 3, 6E, 13, 115, and 116
- Control Tower Building
- Closest Hunting/Fishing Location
- Closest Residence

Range C-62

- Route Nos. 203, 208, 381, and 385
- Range Gate Nos. 62, 62A, and 62B
- Support Building (Military Personnel)
- Closest Residence
- Closest Hunting/Fishing Location

III.F1.3.6 Range of Sizes of Explosive Charges in the Monitoring Data  
[40 CFR 264.601 and 40 CFR 270.23(e)]

For this evaluation, different net explosive weights were used to estimate airblast peak overpressure (Pa) and noise (dB) levels at the various receptors identified previously. For OD operations on Range C-52N, a net explosive weight of 700 lb with a TNT-equivalent weight factor of 1.0 was assumed. Another evaluation considered a net explosive weight of 3,000 lb with a TNT-equivalent weight factor of 1.0 at Range C-52N. For OD operations on Range C-62, a net explosive weight of 3,000 lb with a TNT-equivalent weight factor of 1.0 was assumed. A TNT-equivalent weight factor was applied since not all explosive materials produce airblast peak overpressure equivalent to TNT on a per weight basis (Gould and Tempo, 1981). Common TNT-equivalent weight factors range from 0.46 for black powder to 1.42 for Pentolite. Although airblast and noise levels at the identified receptors have not been measured, an assessment which utilizes conservative assumptions helps to ensure that conclusions based upon this assessment will be protective of human and non-human receptors.

III.F1.3.7 Atmospheric Conditions During the Monitoring  
[40 CFR 264.601 and 270.23(e)]

Actual airblast and noise monitoring during OD operations was not conducted for this site.

#### III.F1.4 Ground Vibration [40 CFR 264.601, 40 CFR 270.23(e), and 30 CFR 816.67(d)(69)]

There are no ground vibrations associated with open burning operations. Open detonation operations can cause a shock wave in air (Section III.F1). Some of this shock wave may be transmitted to the ground; however, since bedrock is encountered at more than 500 ft below ground surface, surficial ground vibration is anticipated to have negligible effects on the bedrock. Controlled detonations associated with OB/OD are expected to be less significant than mission-related activities at Ranges C-52N and C-62.

#### III.F1.5 Manner of Placing the Waste in the Unit [40 CFR 264.601 and 40 CFR 270.23(e)]

The method of placing the waste in the unit, whether OB or OD, is discussed in detail in Section II.A3, Description of the Treatment Unit(s). There does not appear to be any unique method of waste placement which significantly alters the amount of noise generation.

#### III.F1.6 Minimum Protective Distances [40 CFR 265.382 and 40 CFR 270.23(e)]

The minimum protective distances are based upon USAF EOD Operations Specifications. For OB/OD operations at EAFB, this distance is at a minimum of 2,000 ft as indicated in SOI 136-18.



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