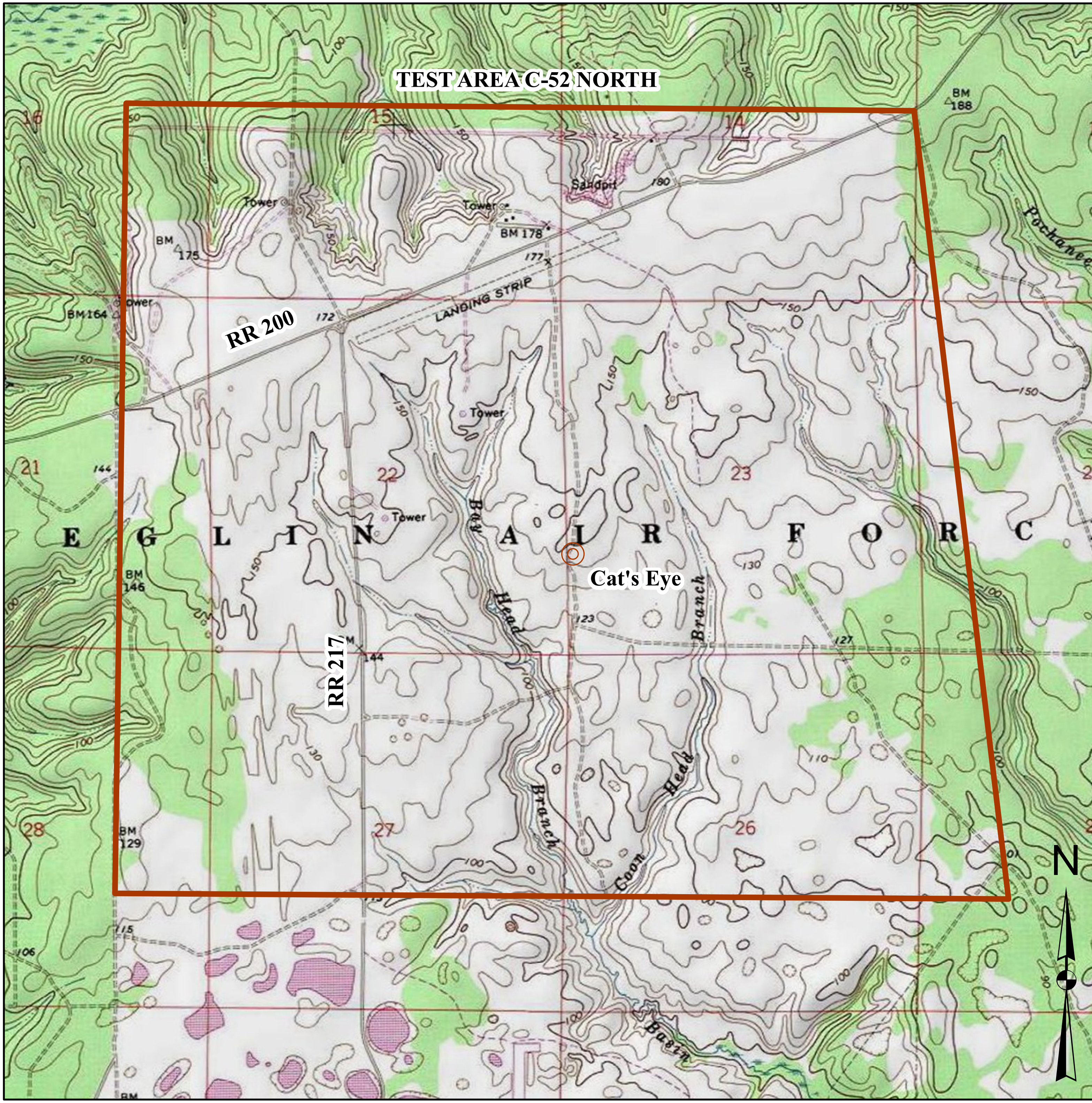


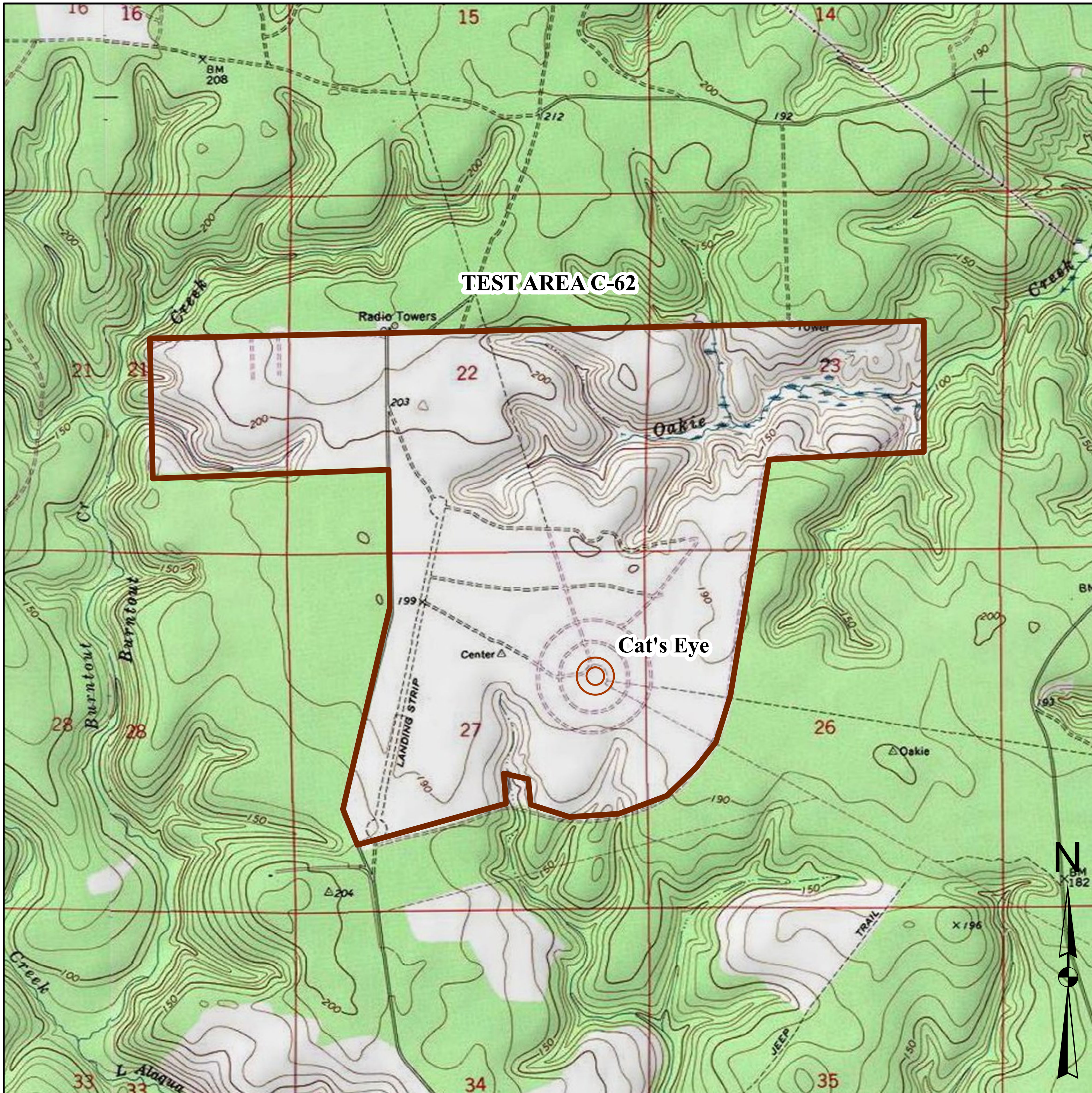
96TH CIVIL ENGINEER GROUP

USGS Topo Maps
(January 2020)

0 1,000 2,000 4,000 Feet

FIGURE 1
TOPOGRAPHIC MAP
OF RANGE C-52N

Open Burn / Open Detonation
(OB/OD) Unit
Eglin AFB, Florida



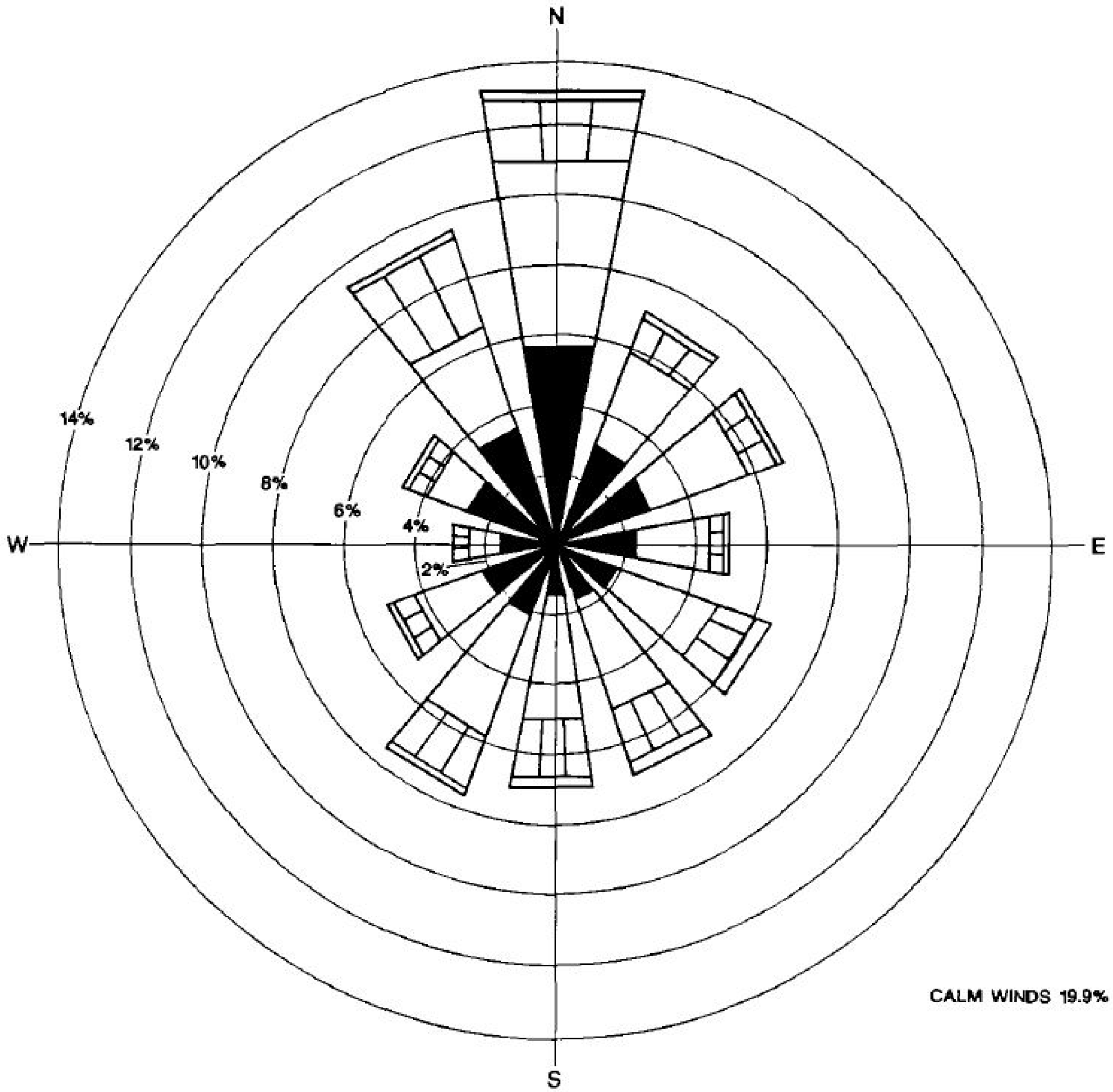
96TH CIVIL ENGINEER GROUP

USGS Topo Maps
January 2020

0 1,000 2,000 4,000 Feet

FIGURE 2
TOPOGRAPHIC MAP
OF RANGE C-62

Open Burn / Open Detonation
(OB/OD) Unit
Eglin AFB, Florida



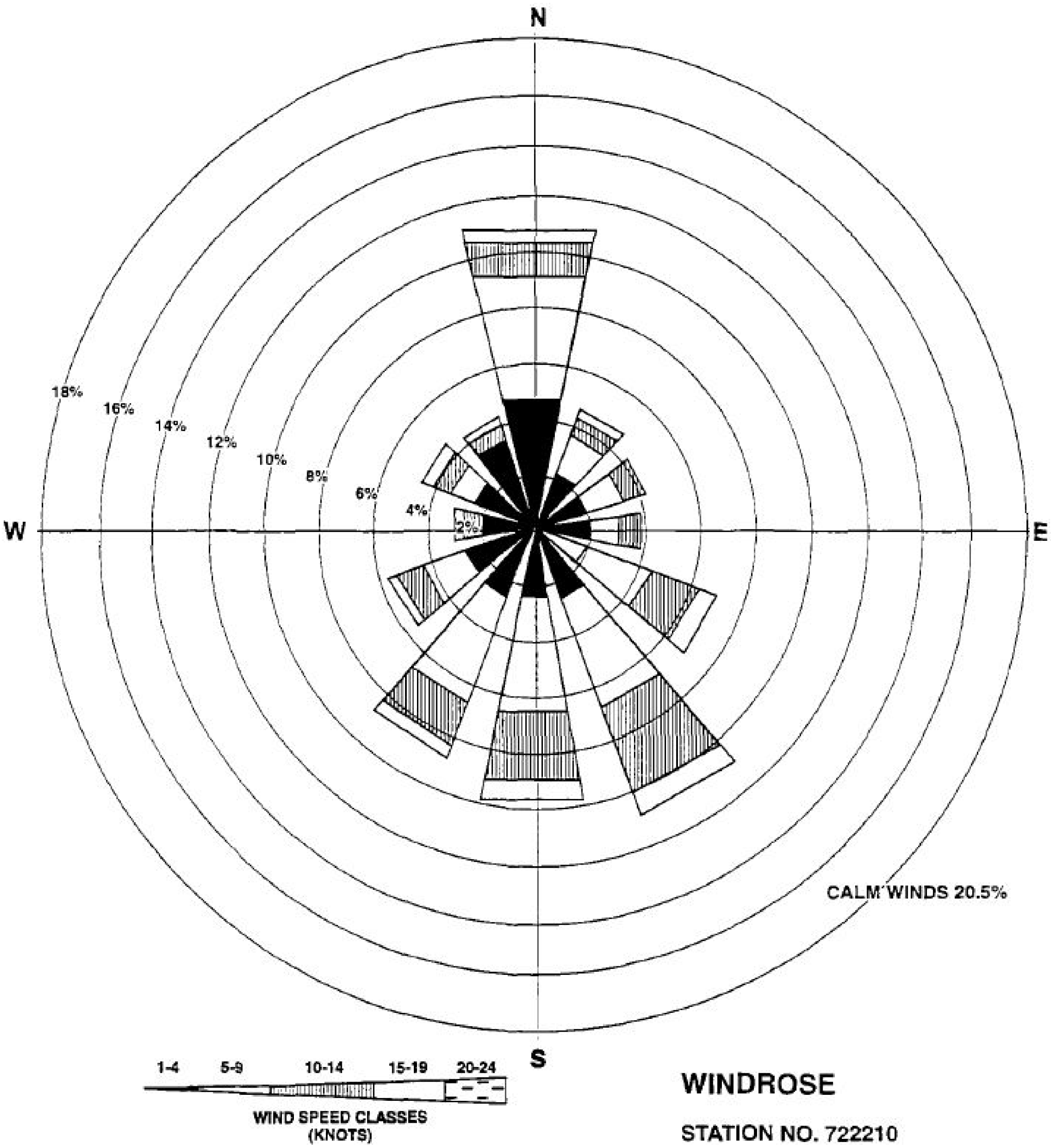
WINDROSE

STATION NO. 722210

National Weather Service
Station # 722210
Eglin AFB / Valparaiso

FIGURE 3
ANNUAL WINDROSE

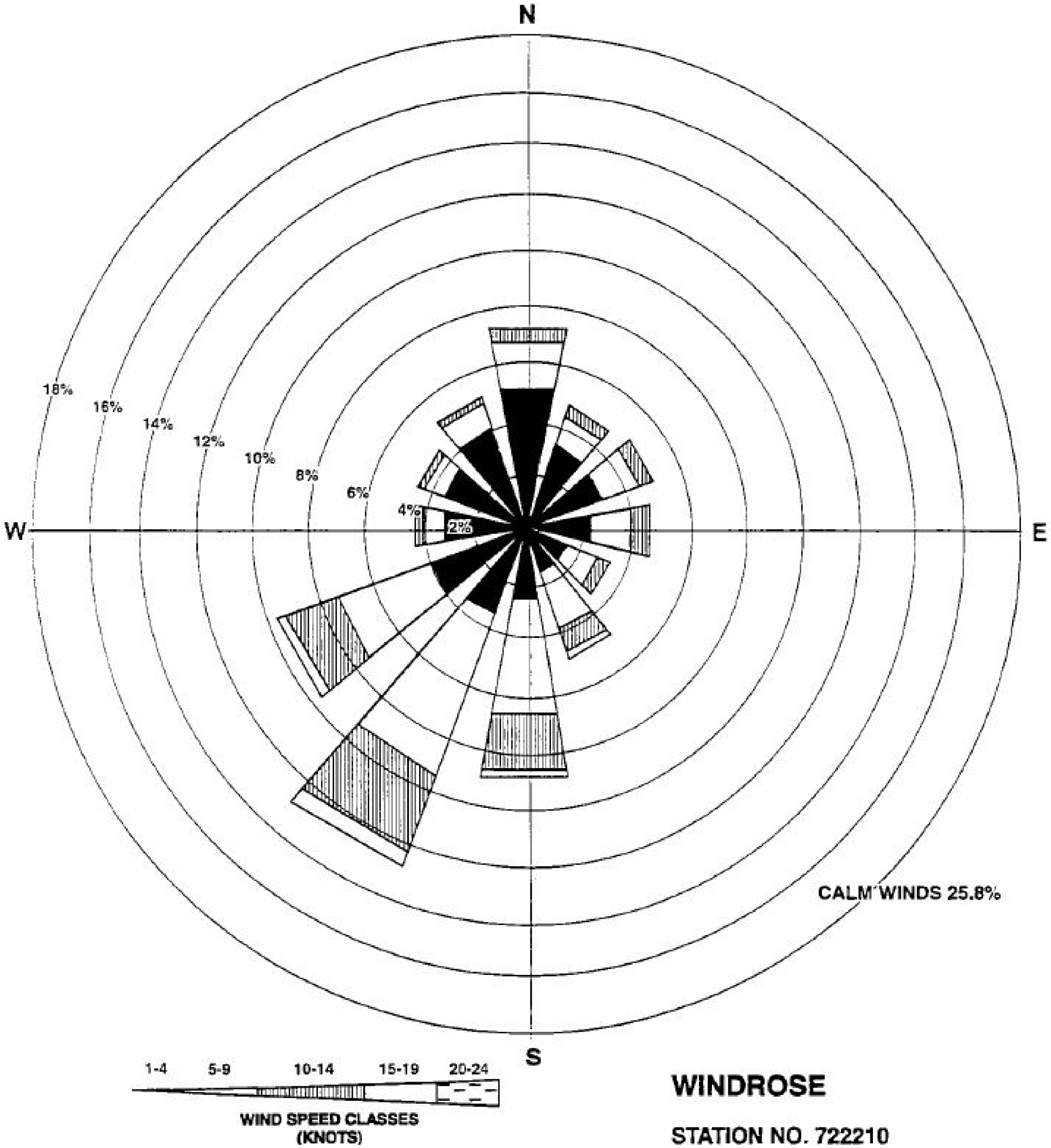
Eglin AFB, Florida



National Weather Service
Station # 722210
Eglin AFB / Valparaiso

FIGURE 4
SPRING WINDROSE

Eglin AFB, Florida

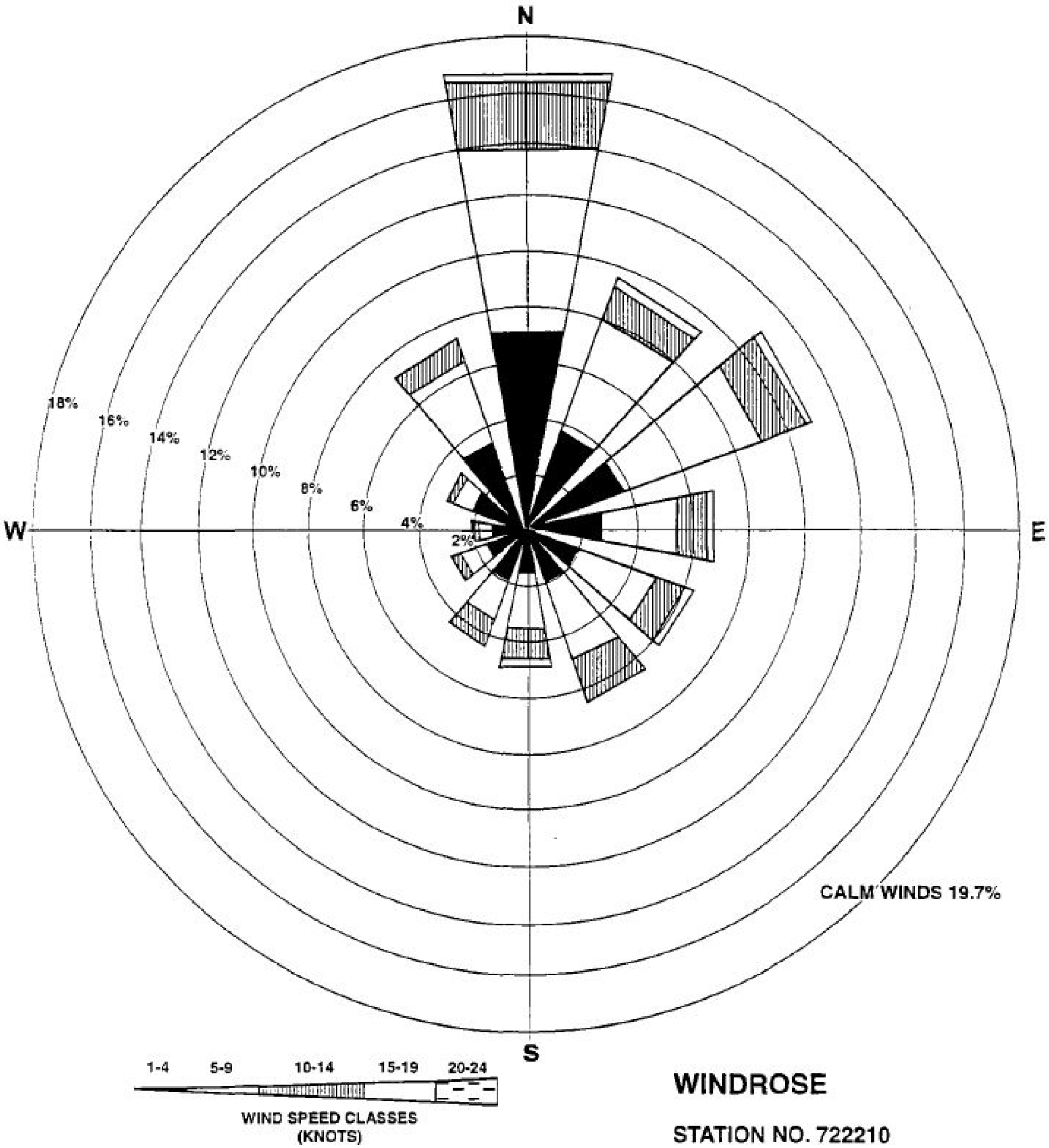


National Weather Service
Station # 722210
Eglin AFB / Valparaiso

FIGURE 5

SUMMER WINDROSE

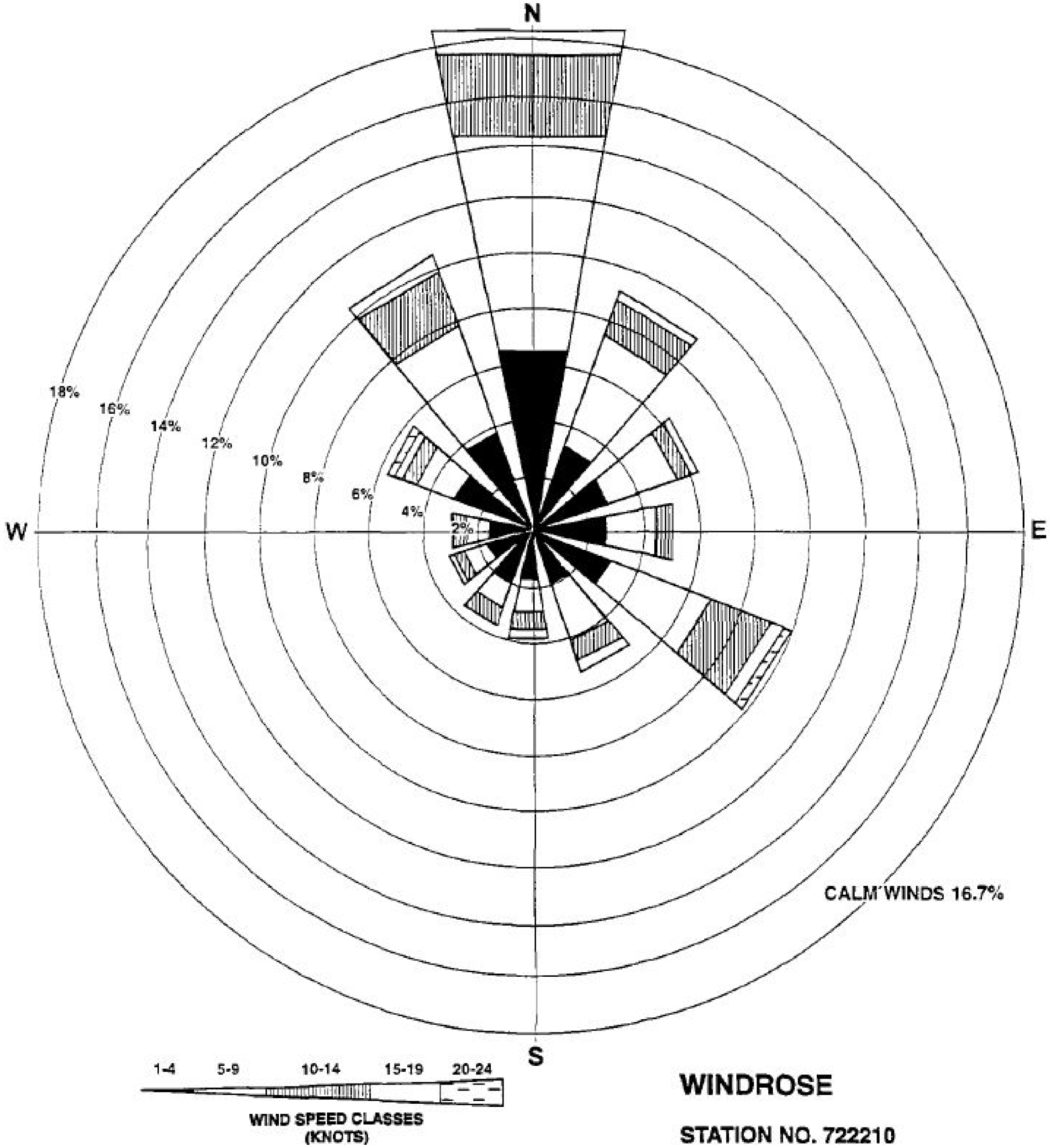
Eglin AFB, Florida



National Weather Service
Station # 722210
Eglin AFB / Valparaiso

FIGURE 6
FALL WINDROSE

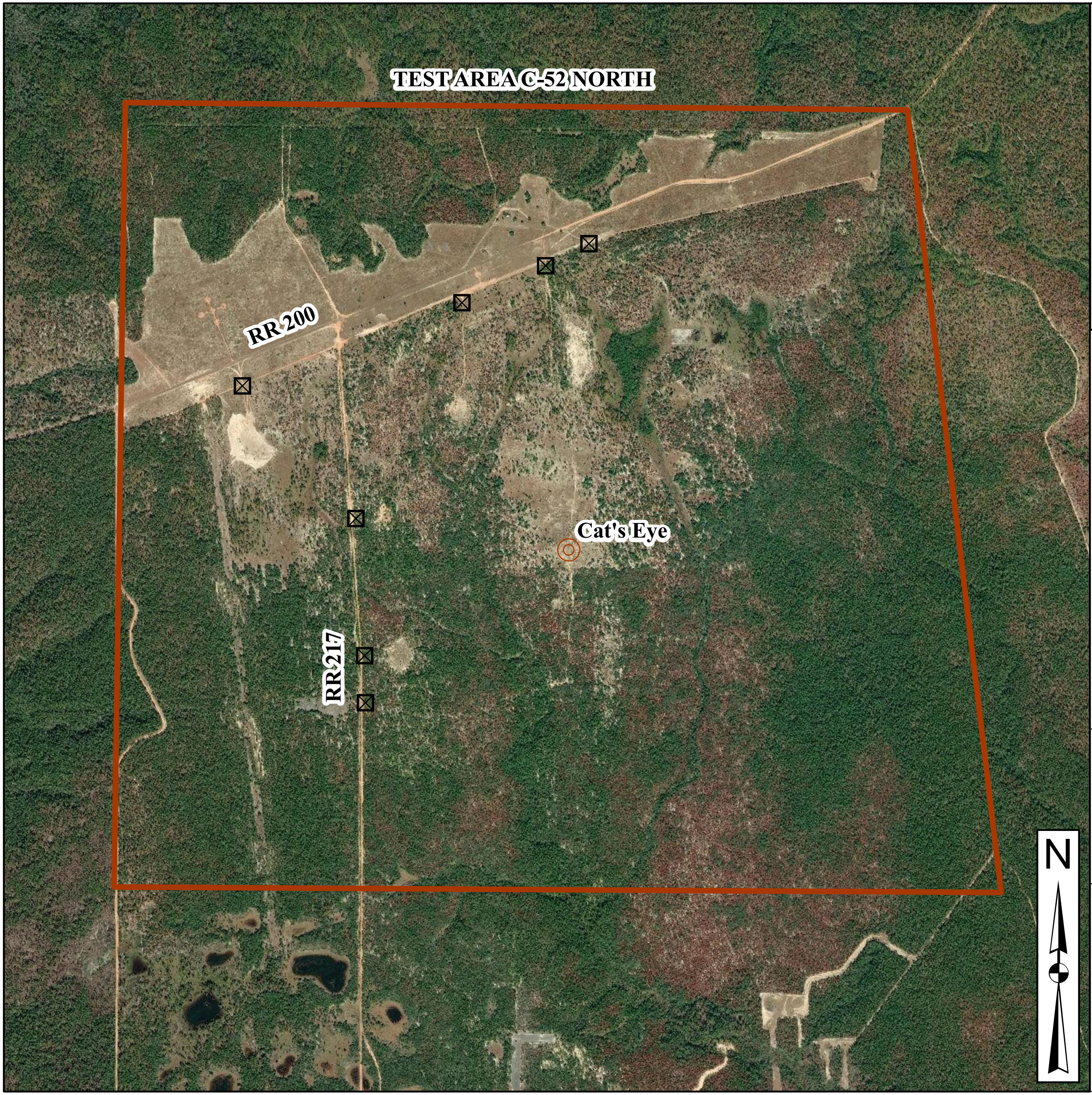
Eglin AFB, Florida



National Weather Service
Station # 722210
Eglin AFB / Valparaiso

FIGURE 7
WINTER WINDROSE

Eglin AFB, Florida



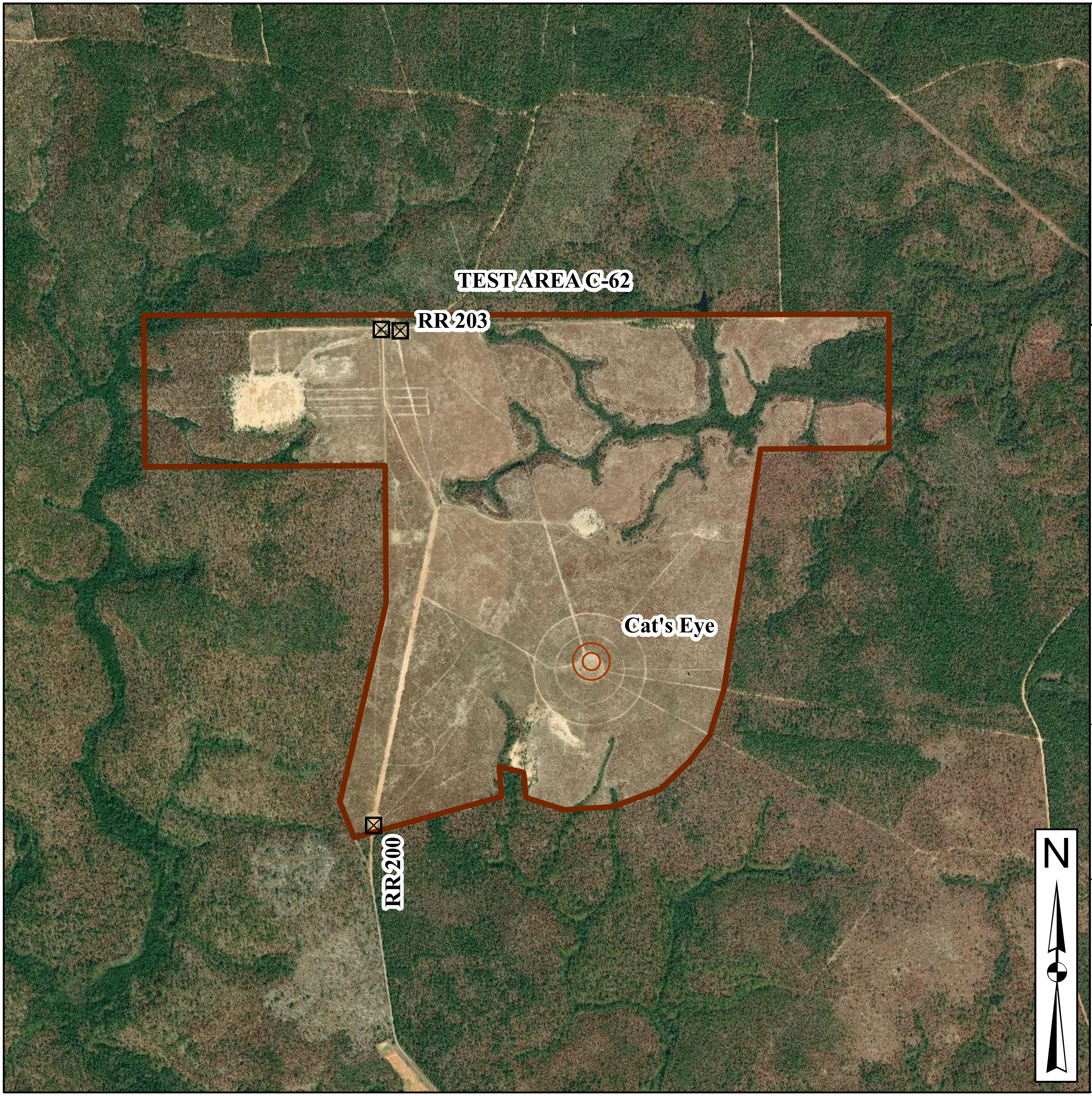
Gate

DigitalGlobe's WorldView 4 Satellite
(Taken December 5, 2018)

0 1,000 2,000 4,000
Feet

FIGURE 8
ROADS AND GATES
RANGE C-52N

Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



96TH CIVIL ENGINEER GROUP

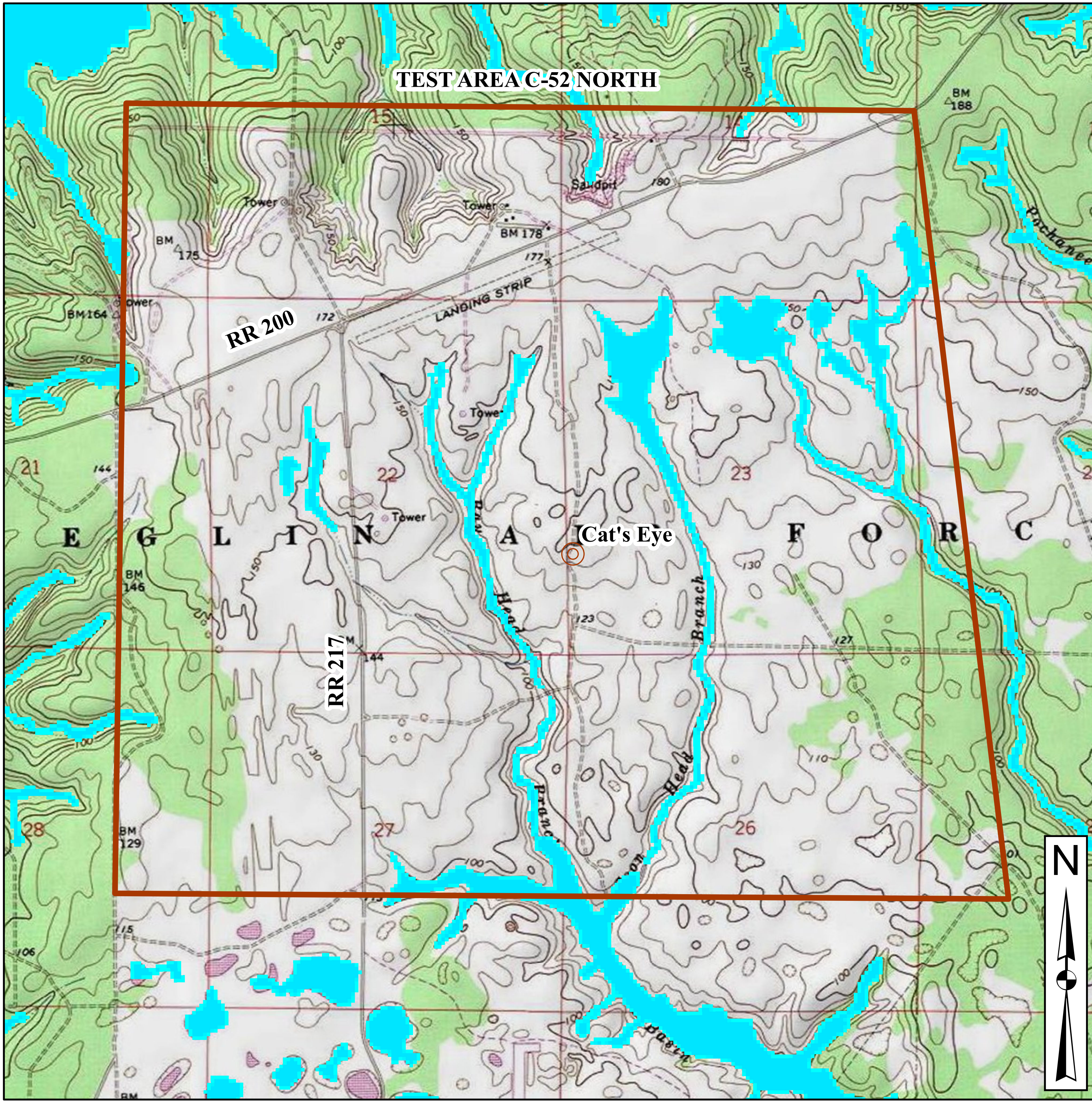
☒ Gate

DigitalGlobe's WorldView 4 Satellite
(Taken December 18, 2018)

0 1,000 2,000 4,000 Feet

FIGURE 9
ROADS AND GATES
RANGE C-62

Open Burn / Open Detonation
(OB/OD) Unit
Eglin AFB, Florida



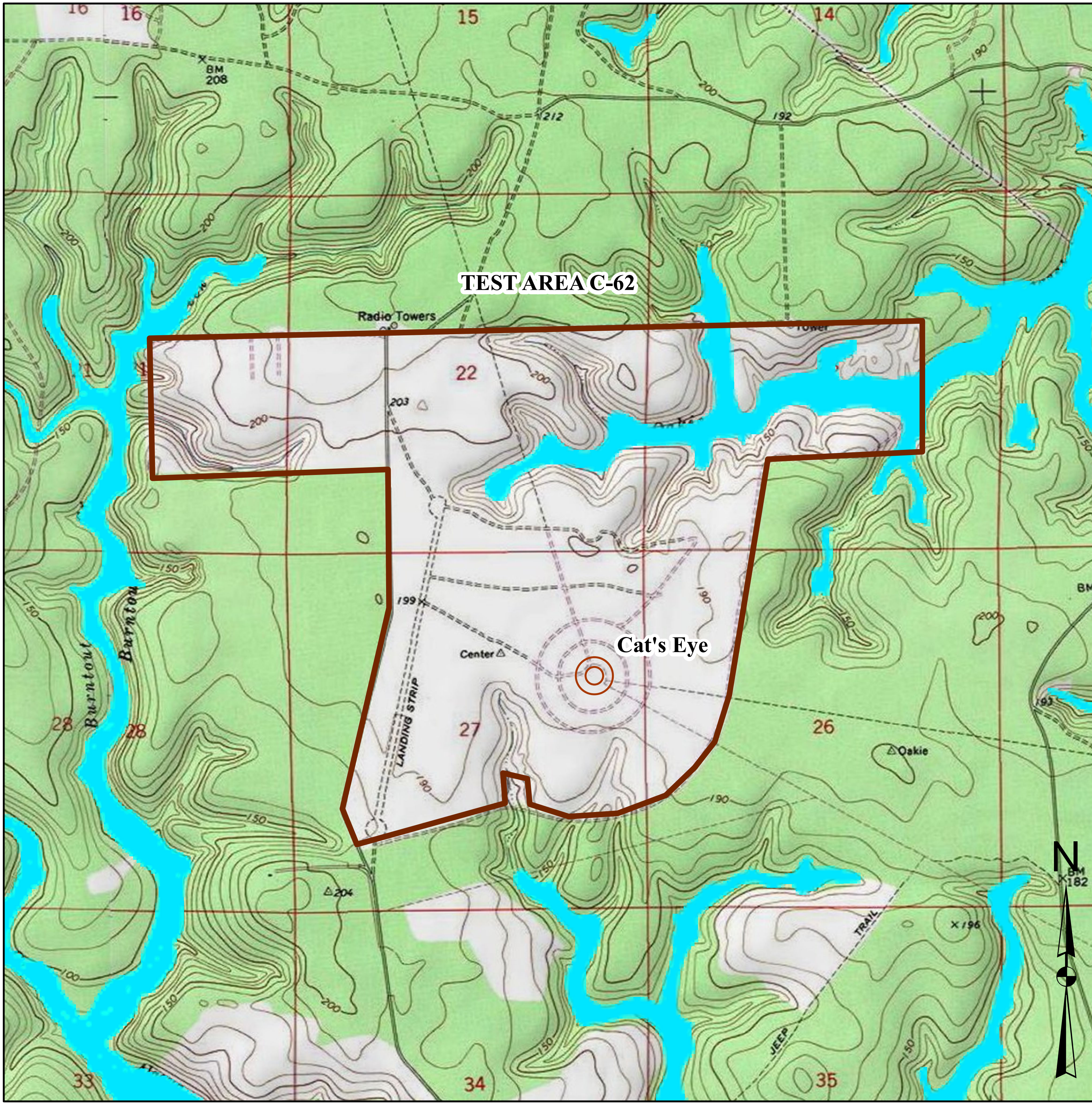
FEMA 100-Year Floodplain

Map Panels:
12131 C0380G
12131 C0385G
12131 C0390G
12131 C0395G

All effective September 29, 2010

FIGURE 10
FLOOD MAP
C-52N

Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



96TH CIVIL ENGINEER GROUP

FEMA 100-Year Floodplain

Map Panel 12131 C0265G

Effective September 29, 2010

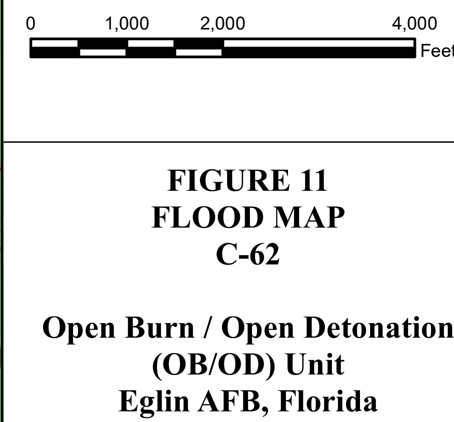
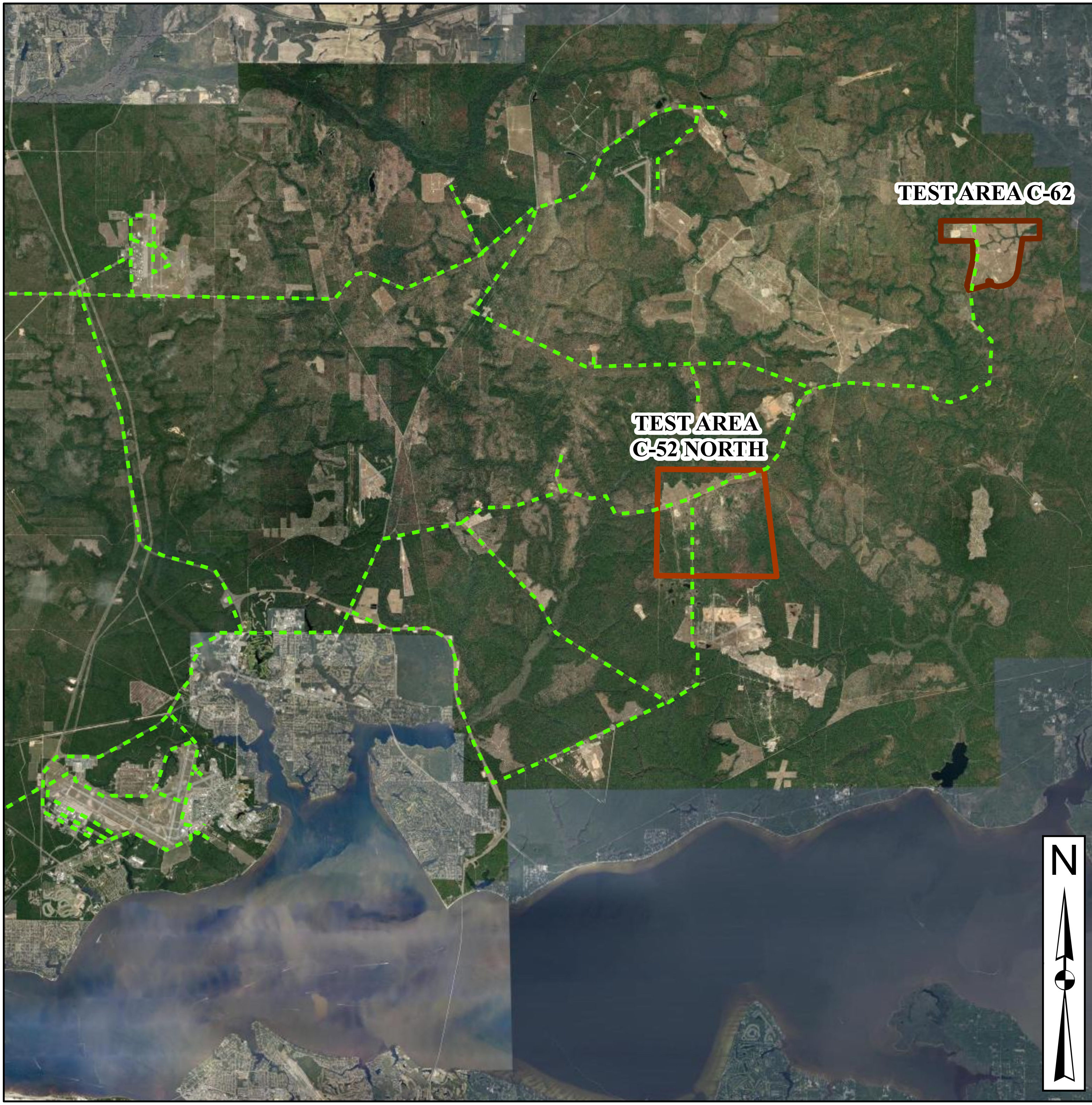


FIGURE 11
FLOOD MAP
C-62

Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



96TH CIVIL ENGINEER GROUP

DigitalGlobe's WorldView 4 Satellite
(Taken December 18, 2018)

FIGURE 12
EXPLOSIVE
TRANSPORTATION ROUTE

Open Burn / Open Detonation
(OB/OD) Unit
Eglin AFB, Florida

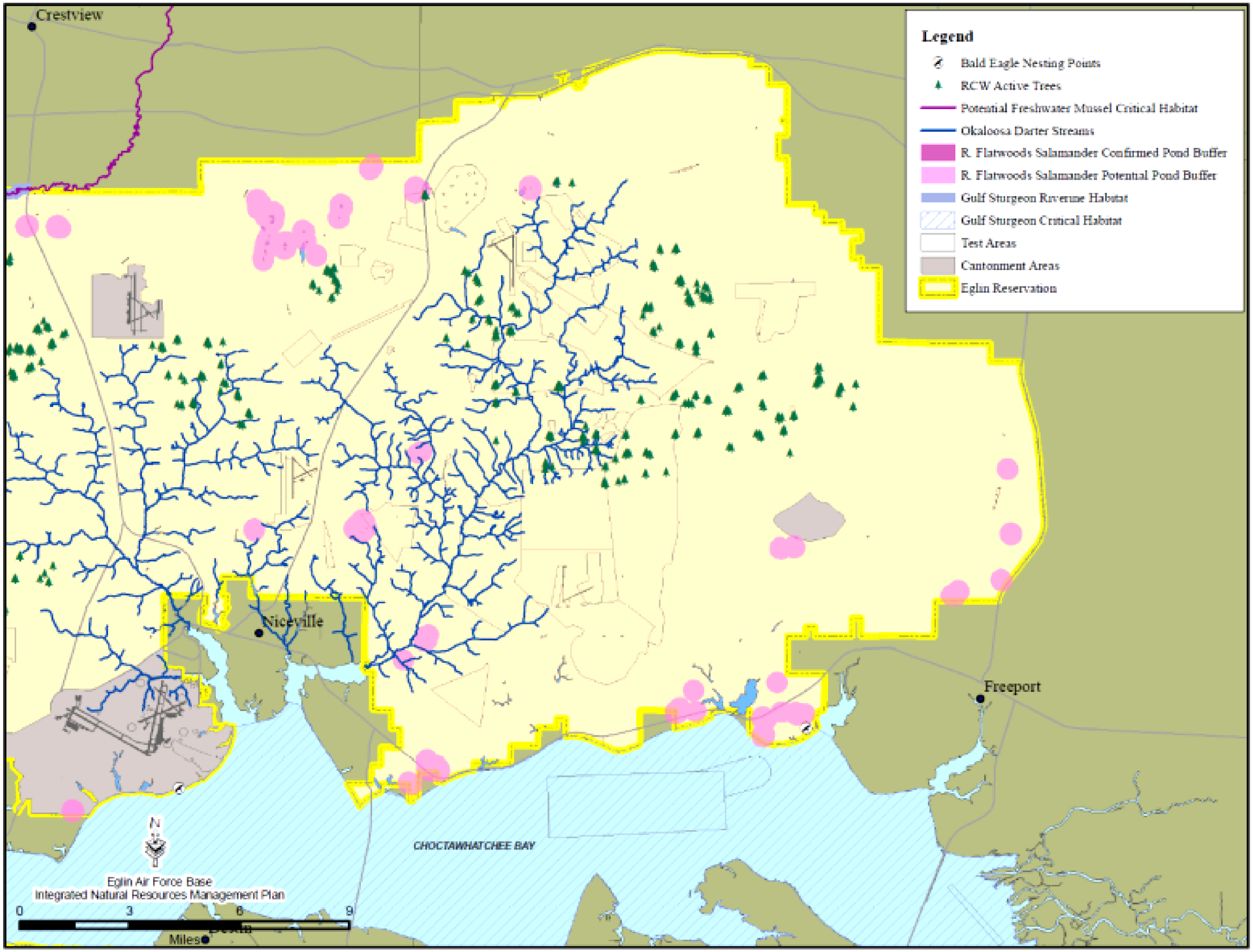


FIGURE 13
OKALOOSA DARTER
STREAMS

Eglin AFB, Florida

Egline AFB Integrated Natural
Resources Management Plan

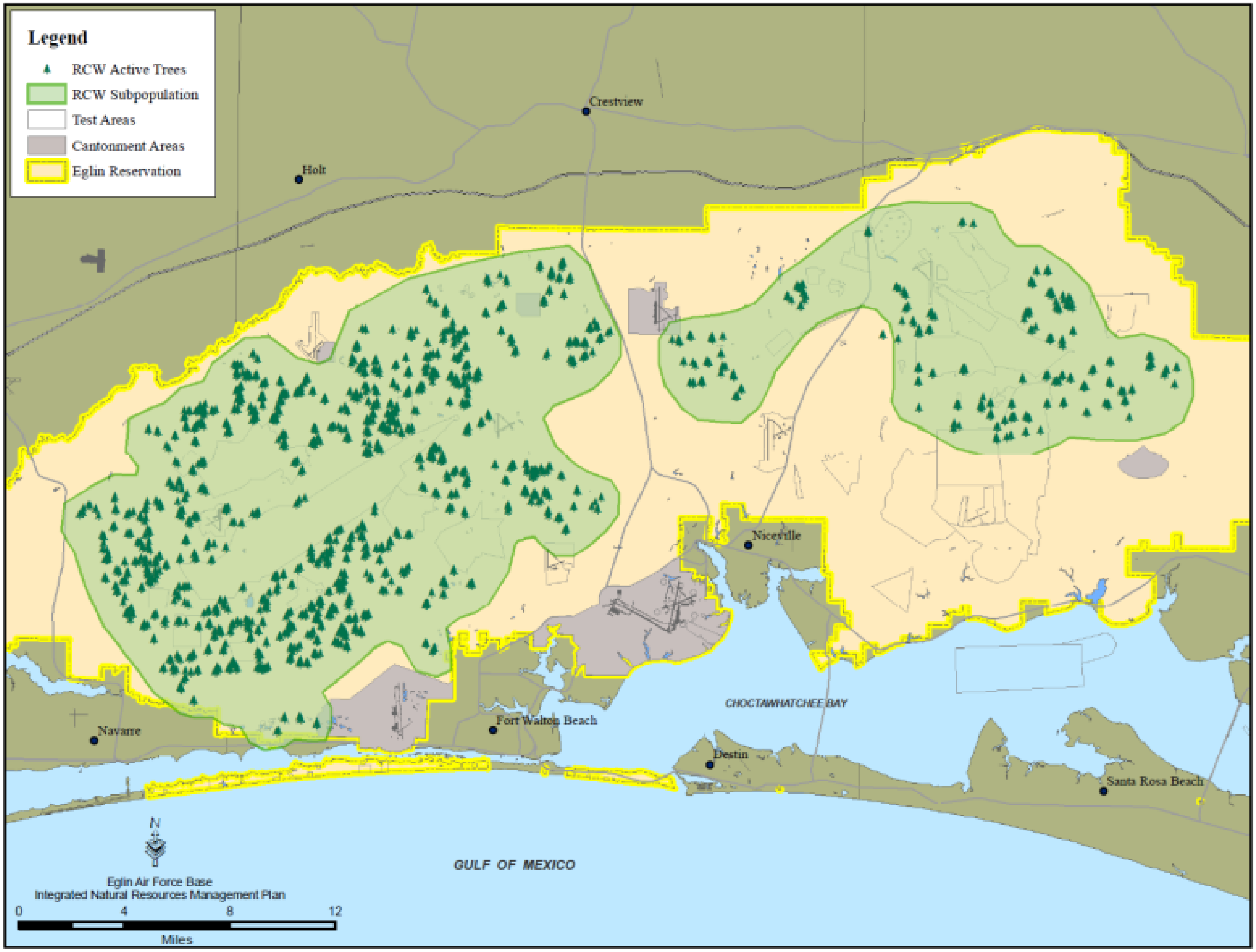


FIGURE 14
RED-COCKADED WOODPECKER
ACTIVE TREES

Eglin AFB, Florida

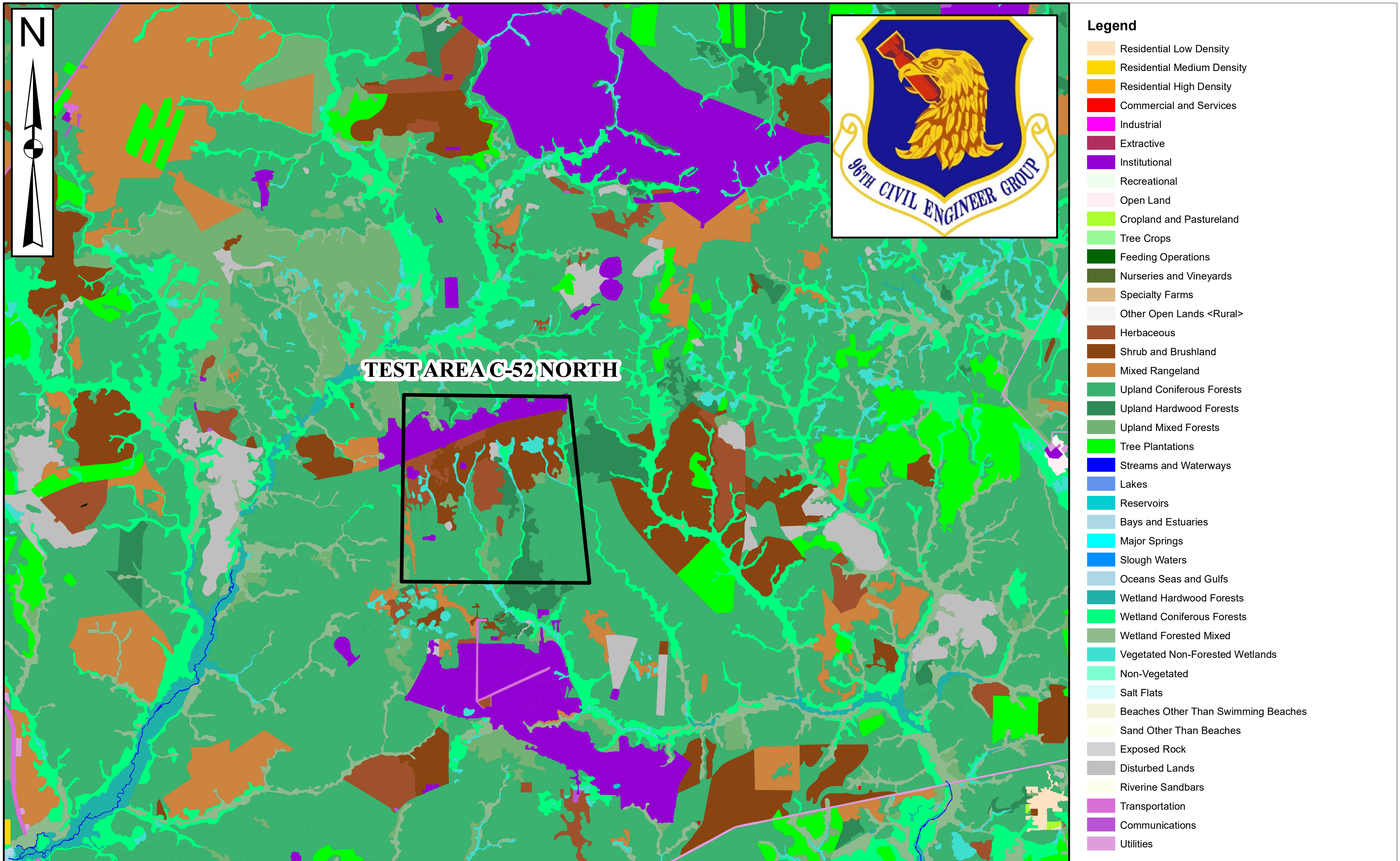
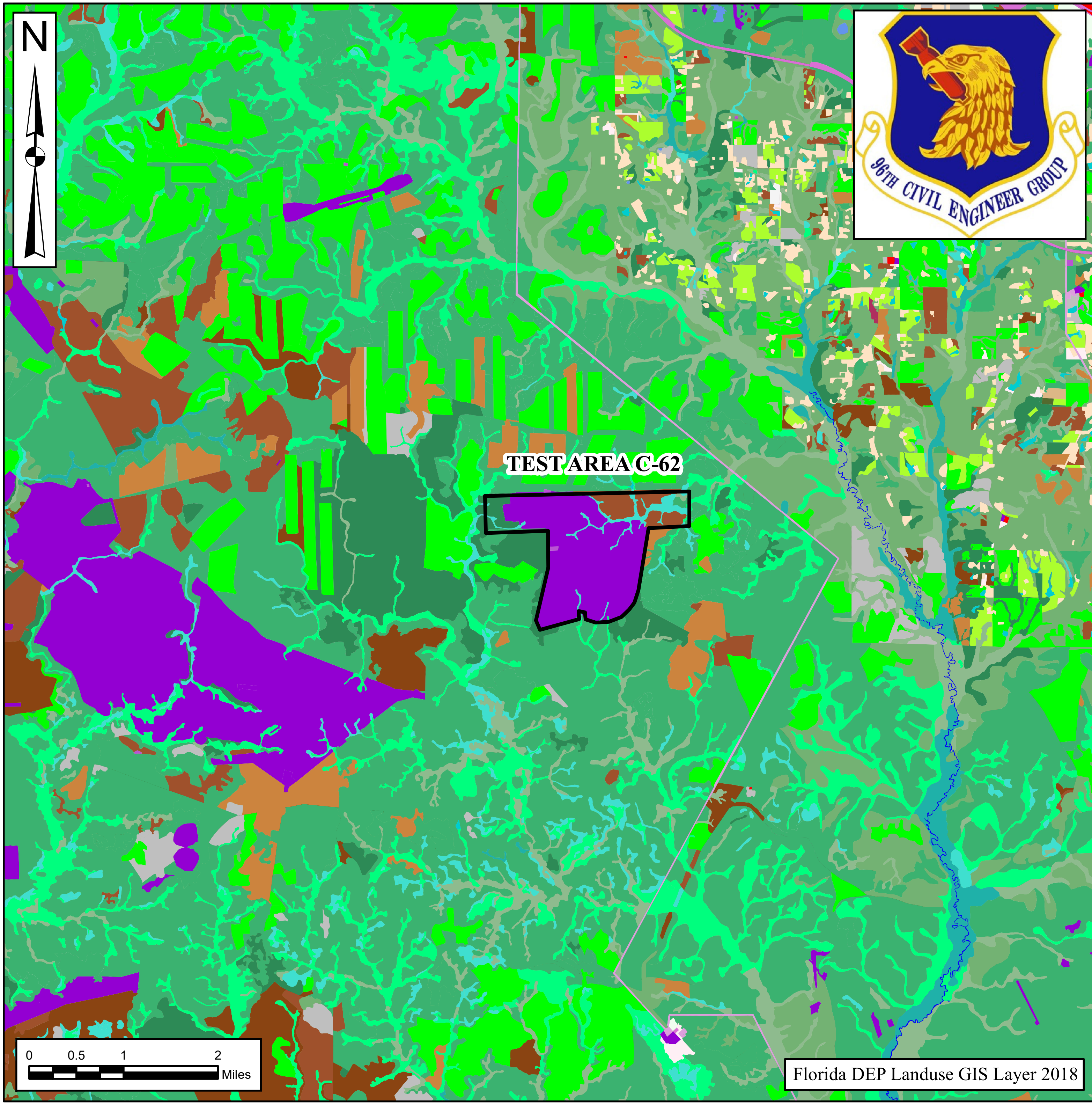


FIGURE 15
LAND USE
C-52N

Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



Legend

- Residential Low Density
- Residential Medium Density
- Residential High Density
- Commercial and Services
- Industrial
- Extractive
- Institutional
- Recreational
- Open Land
- Cropland and Pastureland
- Tree Crops
- Feeding Operations
- Nurseries and Vineyards
- Specialty Farms
- Other Open Lands <Rural>
- Herbaceous
- Shrub and Brushland
- Mixed Rangeland
- Upland Coniferous Forests
- Upland Hardwood Forests
- Upland Mixed Forests
- Tree Plantations
- Streams and Waterways
- Lakes
- Reservoirs
- Bays and Estuaries
- Major Springs
- Slough Waters
- Oceans Seas and Gulfs
- Wetland Hardwood Forests
- Wetland Coniferous Forests
- Wetland Forested Mixed
- Vegetated Non-Forested Wetlands
- Non-Vegetated
- Salt Flats
- Beaches Other Than Swimming Beaches
- Sand Other Than Beaches
- Exposed Rock
- Disturbed Lands
- Riverine Sandbars
- Transportation
- Communications
- Utilities

FIGURE 16
LAND USE
C-62

Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida

96TH CIVIL ENGINEER GROUP

Monitoring Well

Estimated Groundwater Flow Direction

120 Groundwater Elevation Contour (ft NGVD)

DigitalGlobe's WorldView 2 Satellite
(Taken January 29, 2017)

Groundwater measurements taken
May, 2018

0 75 150 300
Feet

FIGURE 17
GROUNDWATER FLOW
C-52N

Open Burn / Open Detonation
(OB/OD) Unit
Eglin AFB, Florida

96TH CIVIL ENGINEER GROUP

Monitoring Well

170 Groundwater Elevation Contour (ft NGVD)

Estimated Groundwater Flow Direction

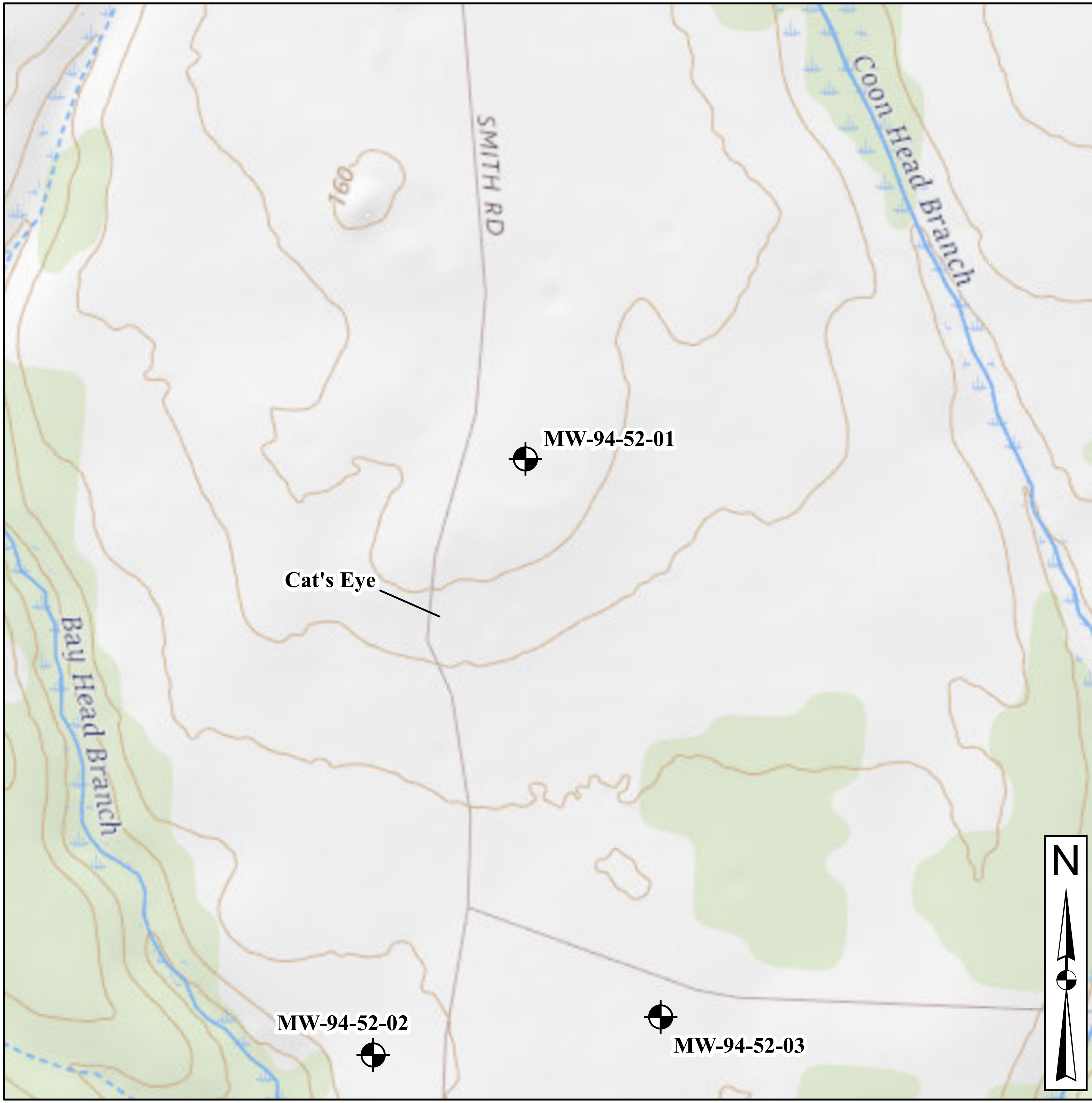
DigitalGlobe's WorldView 2 Satellite (Taken January 29, 2017)

Groundwater measurements taken May, 2018

0 87.5 175 350 Feet

FIGURE 18
GROUNDWATER FLOW
C-62

Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



96TH CIVIL ENGINEER GROUP

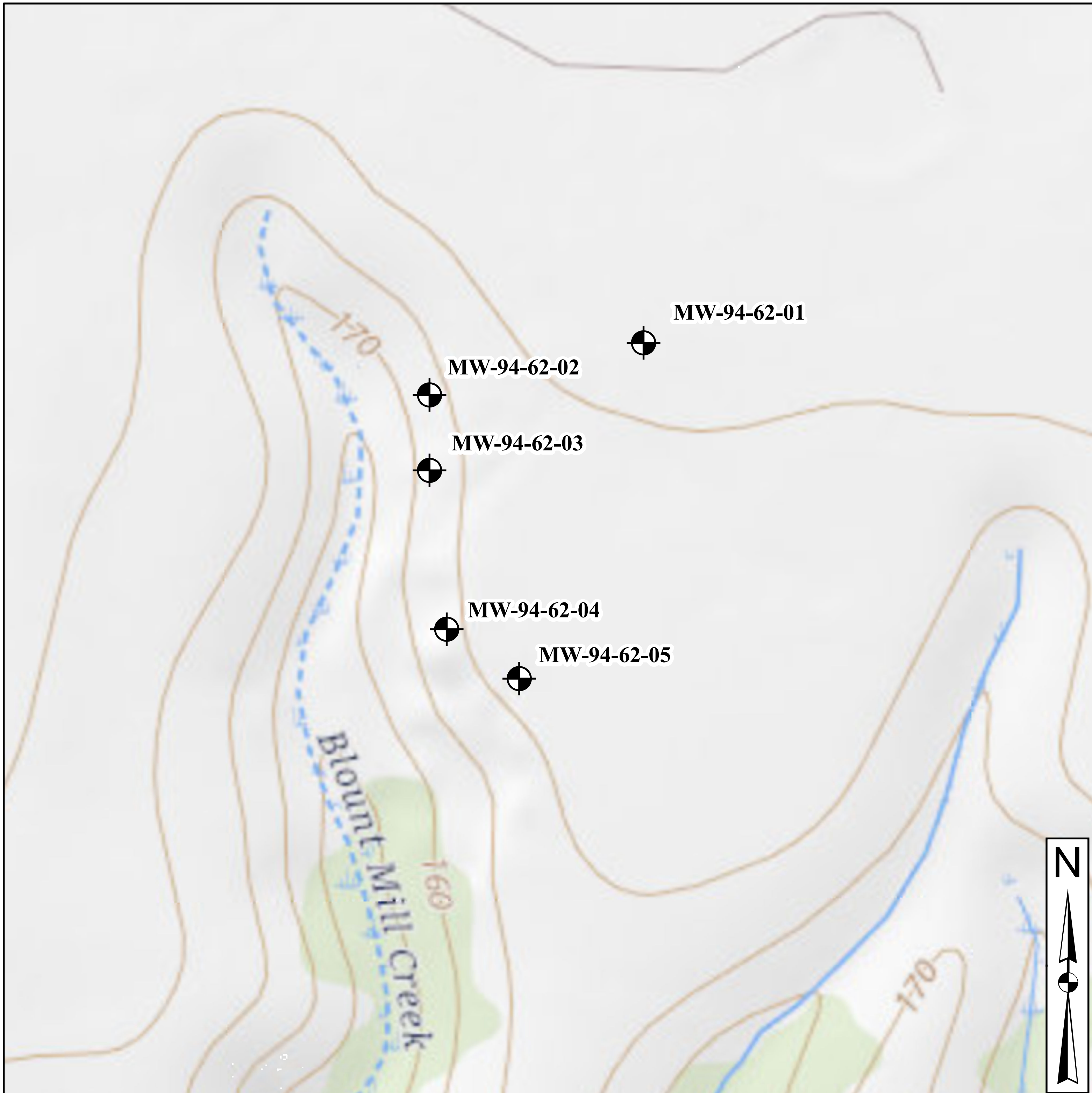
Monitoring Well

USGS Topo
2020

0 125 250 500
Feet

FIGURE 19
DETAILED WELL LOCATIONS C-52N

Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



Monitoring Well

USGS Topo
2020

0 160 320 640
Feet

FIGURE 20
DETAILED WELL LOCATIONS C-62

Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida

TABLE 1 WASTE ANALYSIS DATA: BASIC EXPLOSIVE COMPONENTS AND COMPOSITIONS

Reactive Material Name	Explosive Type	Constituents*	General/Typical Concentration (Percentage by Total Weight)	Comment
		* Includes stabilizer and additives		
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 waxes varies depending upon which type of TNTO)	Trinitrotoluene 3-Nitri-1,2,4-Triazol-5-0ne
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-1 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% 11.50% 0.50%	High Bulk Nitroguanidine Methyl Nitroguanidine N-Tallow-1,3-Diaminopropane
TNT/SNQ	High Explosive	TNT SNQ	50% 50%	 Spherical Nitroguanidine
Pentolite	High Explosive	PETN TNT	50% 50%	
PBX(AF)-108M	High Explosive	RDX-I RDX-V R45 HT DOA DHE AO2246	62% 20% 8.168% 8.168% 0.293% 0.113%	

TABLE 1 WASTE ANALYSIS DATA: BASIC EXPLOSIVE COMPONENTS AND COMPOSITIONS

Reactive Material Name	Explosive Type	Constituents*	General/Typical Concentration (Percentage by Total Weight)	Comment
		FEAA IPDI	0.0017% 1.26%	
Comp A-5	High Explosive	RDX Stearic Acid	98.5% 1.50%	
AFX 1100	High Explosive	TNT Polywax 655 Tritonal Aluminum	66% 16% 18%	
Comp Polywax 655	Propellant	Polywax655 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%	
AFX 931-M	High Explosive	R45HT DOA DHE FEAA A02246 H-5 Aluminum RDX-I RDX-V Ammonium Perchlorate IPDI	7.26% 7.26% 0.26% 0.00% 0.10% 15.00% 16.00% 16.00% 37.00% 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	Propellant	Nitrocellulose/nitroglycerin Charcoal Sulfur	75% 12.50% 12.50%	

TABLE 1 WASTE ANALYSIS DATA: BASIC EXPLOSIVE COMPONENTS AND COMPOSITIONS

Reactive Material Name	Explosive Type	Constituents*	General/Typical Concentration (Percentage by Total Weight)	Comment
		Graphite	Trace	
Black Powder	Igniter/Propellant	Potassium (or sodium) nitrate	75%	
		Charcoal	15%	
		Sulfur	10%	
Illumination mixture	Pyrotechnic	Sodium nitrate	36-40%	
		Magnesium	53-56%	
		Polymeric binder	4-8%	
Tetryl	High Explosive			
C-4	High Explosive	RDX	91%	
		Polyisobutylene	2%	
		Binder	7%	
Incendiary mix	Pyrotechnic	Ammonium perchlorate	35%	
		Aluminum	52%	
		Calcium stearate	1.90%	
		Other	9.70%	
PBX	High Explosive	RDX	91-94%	
		Polymer	6-9%	
MI Propellant	Propellant	Nitrocellulose	84%	
		Dinitrotoluene	10%	
		Dibutylphthalate	5%	
		Diphenylamine	1%	
M2 Propellant	Propellant	Nitrocellulose	77.45%	
		Nitroglycerin	19.50%	
		Ethyl Centralite	0.60%	
		Barium Nitrate	1.40%	
		Potassium Nitrate	0.75%	
		Graphite	0.30%	
M5 Propellant	Propellant	Nitrocellulose	81.95%	
		Nitroglycerin	15%	
		Ethyl Centralite	0.60%	
		Barium Nitrate	1.40%	
		Potassium Nitrate	0.75%	
		Graphite	0.30%	
M6 Propellant	Propellant	Nitrocellulose	87%	
		Dinitrotoluene	10%	
		Dibutylphthalate	3%	
M10 Propellant	Propellant	Nitrocellulose	98%	
		Dinitrotoluene	1%	
		Potassium Sulfate	1%	
M12 Propellant	Propellant	Nitrocellulose	97.70%	
		Diphenylarnine	0.80%	

TABLE 1 WASTE ANALYSIS DATA: BASIC EXPLOSIVE COMPONENTS AND COMPOSITIONS

Reactive Material Name	Explosive Type	Constituents*	General/Typical Concentration (Percentage by Total Weight)	Comment
		Potassium Sulfate	0.75%	
		Tin	0.75%	
M15 Propellant	Propellant	Nitrocellulose	20%	
		Nitroglycerin	19%	
		Nitroguanidine	54.70%	
		Ethyl Centralite	6%	
		Cryolite	0.30%	
M17 Propellant	Propellant	Nitrocellulose	22%	
		Nitroglycerin	21.50%	
		Nitroguanidine	54.70%	
		Barium Nitrate	0.10%	
		Cryolite	0.30%	
T23 Propellant	Propellant	Nitrocellulose	67.25%	
		Nitroglycerin	0.25%	
		Ethyl Centralite	6%	
		Barium Nitrate	0.75%	
		Potassium Nitrate	0.70%	
		Graphite	0.30%	
M8 Propellant	Propellant	Nitrocellulose	52.15%	
		Nitroglycerin	43%	
		Diethylphthalate	3%	
		Ethyl Centralite	0.60%	
		Potassium Nitrate	1.25%	
M9 Propellant	Propellant	Nitrocellulose	54.85%	
		Nitroglycerin	40%	
		Diethylphthalate	3%	
		Ethyl Centralite	0.60%	
		Cryolite	0.30%	
		Potassium Nitrate	1.25%	
M7 Propellant	Propellant	Nitrocellulose	54.60%	
		Nitroglycerin	35.50%	
		Ethyl Centralite	0.90%	
		Potassium Perchlorate	0.30%	
		Carbon Black	1.20%	
M13 Propellant	Propellant	Nitrocellulose	57.30%	
		Nitroglycerin	40.00%	
		Diphenylamine	0.20%	
		Ethyl Centralite	1.00%	
		Potassium Sulfate	1.50%	
M16 Propellant	Propellant	Nitrocellulose	55.50%	
		Nitroglycerin	27.50%	

TABLE 1 WASTE ANALYSIS DATA: BASIC EXPLOSIVE COMPONENTS AND COMPOSITIONS

Reactive Material Name	Explosive Type	Constituents*	General/Typical Concentration (Percentage by Total Weight)	Comment
		Dinitrotoluene Ethyl Centralite Potassium Sulfate Carbon Black	10.50% 4.00% 1.50% 0.50%	
T2 Propellant	Propellant	Nitrocellulose Nitroglycerin Dinitrotoluene Ethyl Centralite Lead Stearate	57.50% 30.00% 2.50% 8.00% 0.50%	
T8 Propellant	Propellant	Nitrocellulose Nitroglycerin Dinitrotoluene Ethyl Centralite Lead Stearate Triacetin	58.00% 22.50% 2.50% 8.00% 0.50% 8.50%	
Photoflash	Incendiary	Laminac Lupersol, DDM Iron Oxide	96.80% 3.00% 0.20%	
TPA Incendiary	Incendiary	Triethylalurninum		
Lead Azide	Primer/Detonator	Nitrogen Lead	28.80% 71.20%	
Lead Styphnate	Primer	Carbon Hydrogen Nitrogen Oxygen Lead	15.40% 0.65% 9.00% 30.80% 44.20%	
Amatol	High Explosive	Ammonium Nitrate TNT	80.00% 20.00%	
Ammonium Nitrate	Incendiary	Nitrogen Hydrogen Oxygen	35.00% 5.00% 60.00%	
Composition A3	High Explosive	RDX Wax	91.00% 9.00%	
Explosive A4	High Explosive	RDX Wax	97.00% 3.00%	
Explosive D	High Explosive	Carbon Hydrogen Nitrogen Oxygen	29.30% 2.40% 22.70% 45.60%	Ammonium Picrate
Haleite	Explosive	Carbon Hydrogen	16.00% 4.00%	EDNA Ethylene-Dinitramine

TABLE 1 WASTE ANALYSIS DATA: BASIC EXPLOSIVE COMPONENTS AND COMPOSITIONS

Reactive Material Name	Explosive Type	Constituents*	General/Typical Concentration (Percentage by Total Weight)	Comment
		Nitrogen Oxygen	37.30% 42.70%	
HBX-1.3 & 6	High Explosive	RDX TNT Aluminum Densitizer Comp D2 CACL	39.60% 37.80% 17.10% 5.00% 0.50%	
Pentolite 10/90	High Explosive	PETN TNT	10.00% 90.00%	
Picratol	High Explosive	Explosive D TNT	52.00% 48.00%	
Tetrytol	High Explosive	Tetryl TNT		
Torpex	High Explosive	RDX TNT Aluminum	42.00% 40.00% 18.00%	
Nitroglycerin	High Explosive/ Propellant	Carbon Hydrogen Nitrogen Oxygen	15.90% 2.20% 18.50% 63.40%	
Nitroguanidine (Picrate)	High Explosive/ Propellant	Carbon Hydrogen Nitrogen Oxygen	11.50% 3.90% 53.80% 30.80%	Picrate
Military Dynamite - Mediu Velocity	High Explosive	RDX TNT Starch SAE No. 10 Oil Polysobutylene	75.00% 15.00% 5.00% 4.00% 1.00%	
Military/Dynamite - Low Velocity	High Explosive	RDX/DYE TNT Tripentaery-Thritol Binder Cellulose Acetate	17.50% 67.80% 8.60% 4.10% 2.00%	Binder is vistac No.1 consisting of polybutene and diioctyl seba

TABLE 2 PHYSIOCOCHEMICAL PROPERTIES OF THE POTENTIAL CHEMICALS OF CONCERN

CHEMICAL NAME LISTED IN COMPOSITION LISTS (CHEMCIAL FOR WHICH PROPERTIES ARE LISTED)	Physical State (S, L, G)	MW*	Water Solubility (mg/L)	K_{OC}	log K_{OW}	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 30 deg C, unless shown)	Half Life (days) Air, Soil, Water
Acetylene	G	26	100961/100961 @ 18 C			-847 @ 760 mm	-80.8	40 @ 18.8 C	
Aluminum and Compounds (Aluminum)	S	27							
Amino-4,6-dinitrotoluene, 2-		206							
Ammonia	L, G	17	340,000 mg/L @ 20 C	3.1		-33.36	-77.7	10 @ 25 C	
Ammonium chloride	S	54	28.3% (wt/wt) @ 26 C			520	336	1 @ 160.4 C	
Ammonium nitrate	S	80	871 g @ 100 C			210	169.6		
Antimony and Compounds (Antimony)	S	122	INSOLUBLE			1635	630	1 @ 886 C	
Asphaltum (Asphalt)	S		INSOLUBLE			>700			
Barium and Comoounds (Barium)	S	137				1640	726	10 @ 1049 C	
Calcium and Compounds (Calcium Cyanide)	S	92	SOLUBLE				640		
Carbon Black (Carbon, Activated)	S	12	INSOLUBLE			4200			
Carbon Dioxide	G	44							
Carbon Monoxide	G	28	33 mL/L @ 0 C			-191.5	-206	.>1 ATM @ 20 C	
Carbon tetrachloride	L	153.24	1160 mg/L @ 25 C	110	2.62-2.83	76.54	-23	91.3	Air: >330, Water: EVAP: 2 min - 7
Cellulose									
Charcoal	S		INSOLUBLE			4200	>3500		
Copper and Compounds (Copper)	S	64	INSOLUBLE			2595	1083	1 @ 1628 C	
Diazodinitrophenol									

*Molecular Weight

TABLE 2 PHYSIOCOCHEMICAL PROPERTIES OF THE POTENTIAL CHEMICALS OF CONCERN

CHEMICAL NAME LISTED IN COMPOSITION LISTS (CHEMCIAL FOR WHICH PROPERTIES ARE LISTED)	Physical State (S, L, G)	MW*	Water Solubility (mg/L)	K_{OC}	log K_{OW}	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 30 deg C, unless shown)	Half Life (days) Air, Soil, Water
Dibutyl phthalate (Di-n-butyl phthalate)	L	278	13 mg/L @ 25 C	170,000	4.9	340	-36	0.0097	Air: 18 hours, Soil: 66-98% degrad. In 28 weeks, Water: 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 @ 25 C	Air: 14.15 hours
Dinitrotoluene, 2,4-	L, S	182	300 mg/L @ 20 C	201 & 290	1.98	300	71	2.17E-4 @ 25 C	Air: 8 hours, Soil: 436 days, Water: 3.7 in pond water
Dinitrotoluene, 2,6-	S	182		201 & 290	1.72	295	66	5.67E-4 @ 25 C	Air: 8 hours, Water: 12 min in sunlit river water
Diphenylamine	S	169	57.6 mg/L	470	3.6	302	53	1 @ 108.3 C	
Ethyl centralite (Diethylcarbanide, N,N'-)									
Ethylene dimethacrylate									
Ethylene oxide	G	44	SOLUBLE	16	-0.3	10.7	-112.5	1,095	Air: 1 week, Water: hours to 2
Graphite									
Gum arabic (Acaola)	L, S	600,000	SOLUBLE						
HMX		296							
Hexachlorobenzene	S	295	0.035 mg/L	4-5	5.31	323-326	231	1.1e-5 @ 25 C	Air: 2 years, Soil: 1530 days
Hydrochloric acid	L	36.46	561,000 mg/L in hot water						
Hydrogen cyanide	G, L	27.03	SOLUBLE		1.07	25.6	-13.4	630	Air: 334
Hydrogem sulfide	G	34	4.130 mg/L @ 20 C			-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 @ 1000 C	
Linseed Oil	L					>316			

TABLE 2 PHYSIOCOCHEMICAL PROPERTIES OF THE POTENTIAL CHEMICALS OF CONCERN

CHEMICAL NAME LISTED IN COMPOSITION LISTS (CHEMCIAL FOR WHICH PROPERTIES ARE LISTED)	Physical State (S, L, G)	MW*	Water Solubility (mg/L)	K_{OC}	log K_{OW}	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 30 deg C, unless shown)	Half Life (days) Air, Soil, Water
Magnesium and Compounds (Magnesium)	S	24	Slightly Soluble in Hot Water			1100	651		
Methane	G	16							
Methyl centralite (Dimethylcarbanide, N, N'-)									
Monomethylene nitrate (Methylene nitrate)									
Nitrate		62							
Nitric oxide	G	30	7.34 cc/100cc H2O @ 0 C			-151.7	-163.6	26,000	
Nitrobenzene	L, S	123.11	1,780 mg/L		1.85	210.8	5.7	1.5e-1 @ 25 C	Air: 125 days, Water: 3.8 days in pond water
Nitrocellulose	L, S								
Nitrogen dioxide	G	46				21.15	-9.3	400 @ 80 C	
Nitroglycerine	L, S	227	1800 mg/L @ 25 C			60mm HG	13	0.0025	Water: 3,000 days from volatilization
Nitroguanidine	S		Soluble in Hot Water						
Nitrostarch									
Ozone	G	48	49 cc/100 cc @ 0 C			-111.9	-192.7		
PETN	S	316	43 mg/L @ 25 C			180 @ 50mm HG	140		
Phosphorus	S	31							
Picric acid (Trinitrophenol,2,4,6-)		229							
Polyleobutylene									
Polyvinyl chloride	S	60K-							
Potassium and compounds (potassium cyanide)	S	65					634		

TABLE 2 PHYSIOCOCHEMICAL PROPERTIES OF THE POTENTIAL CHEMICALS OF CONCERN

CHEMICAL NAME LISTED IN COMPOSITION LISTS (CHEMCIAL FOR WHICH PROPERTIES ARE LISTED)	Physical State (S, L, G)	MW*	Water Solubility (mg/L)	K_{OC}	log K_{OW}	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 30 deg C, unless shown)	Half Life (days) Air, Soil, Water
Propane	G	44	62.4 mg/L @ 25 C	450-460	2.36	-42.1	-189.7	760 @ 25 C	Air: 8-13.4 days, Water: 2.3 days in model pond
RDX (Cyclonite)	S	222	INSOLUBLE	42-536	0.87	205-206		4E-9 @ 25 C	Air: 1.5 hours, Water: 11.6% loss/hydrolysis/112 days/seawater
Red Phosphorus	S	31				290	590		
Silver	S	108	INSOLUBLE			2000	980.5		
Sodium and compounds (sodium cyanide)	S	49	820 mg/L @ 35 C			1496	563.7	1 @ 817 C	
Strontium and compunds (strontium)	S	96				1366	757	10 @ 898 C	
Sulfate		96							
Sulfur	S	32	INSOLUBLE			444.6	112.8-120	4E-6 @ 30.4 C	
Sulfur dioxide	G	64	95,000 mg/L @ 25 C			-10	-72.7	3.2	
TNA (Tetranitroaniline, 2,3,4,6-)		274		1600					
TNPH (Trinitrophenethane)	S	229	12,820 mg/L @ 25 C				122-123	<1 Torr @ 20 C	
Tetracene									
Tetryl	S	267	200 mg/L @ 20 C	406		187	130-132	5.7E-9 @ 25 C	Air: 11 days, Water: 33 days @ 25 C & pH 8.1 in
Tin and Compounds (Tin)	S	119	INSOLUBLE			2507	231.9	1 @ 1,492 C	
Trinitrobenzene, 1,3,5-	S	213	350 mg/L	104 & 178	1.1	315	122.5	3E-6 @ 25 C	Air: 35 years
Trinitrotoluene, 2,4,6-	S	227.13	100 mg/L @ 25 C		1.6	240	80.1	5.5E-6 @ 25 C	Air: 110 days, Water: 119 days from model river
White Phosphorus	S	31							
Zirconium and compounds (Zirconium)	S	91	INSOLUBLE			3577	1857		

TABLE 3
Water Quality Summary - May 2019
Range C-52N
Eglin Air Force Base, Florida

	FDEP Permit # 006176-009-HO				MW-94-52-01	MW-94-52-02	MW-94-52-03	MW-94-52-02-DUP	C-52N EB
	Parameter	Method	Unit	GCTL	Sampled May 17, 2019				Equipment Blank
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	---
	Top of Casing	---	feet NGVD	---	156.73	115.54	125.34	115.54	---
	Water level (Day of sampling)	EPA SOP	feet BTOC	---	35.46	14.18	19.93	14.18	---
	Water elevation	calculation	feet NGVD	---	121.27	101.36	105.41	101.36	---
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	---
	Well Inside Diameter	---	inches	---	4	4	4	4	---
	Well depth	EPA SOP	feet BTOC	---	45.15	39.36	39.71	39.36	---
FIELD PARAMETERS	Color	observation	---	---	lt. brown tint	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	4.53	4.40	4.08	4.40	---
	Specific Conductance (field)	120.1	mS/cm	---	0.013	0.015	0.015	0.015	---
	Temperature	170.1	˚C	---	24.34	21.44	21.49	21.44	---
	Dissolved oxygen	360.1	3	---	6.74	3.80	5.19	3.80	---
	Turbidity	180.1	NTU	---	8.10	1.85	0.51	1.85	---
	Purging rate	---	gpm	---	0.20	0.10	0.10	0.10	---
GENERAL PERAMETERS	Nitrogen, Nitrate	EPA 300.0	mg/L	10	*0.047*	*0.017*	0.012	*0.015*	0.012
	Nitrogen, Nitrite	EPA 300.0	mg/L	1	0.021	0.021	0.021	0.021	0.021
	Final pH (lab)	150.1	standard units	6.5-8.5	5.5	5.6	5.4	5.7	5.6
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.20	0.20	0.20	0.20	0.20
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.7	0.088	0.089	0.089	0.089	0.09
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.160	0.160	0.160	0.160	0.16
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.6	0.084	0.084	0.084	0.084	0.085
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.2	0.064	0.064	0.065	0.064	0.065
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	*0.17*	0.051	0.051	0.051	0.051
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.085	0.085	0.086	0.085	0.087
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.19	0.19	0.20	0.19	0.20
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	*0.14*	0.058	0.058	0.058	0.058
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.20	0.20	0.20	0.20	0.20
	HMX	SW846 8330	µg/L	350	0.087	0.087	0.088	0.088	0.089
	RDX	SW846 8330	µg/L	10	0.58	0.160	0.160	0.160	0.16

Notes:

Grayscale indicates value less than or equal to method detection limit (MDL)
Italics indicate result between MDL and reporting limit (RL)
Underlined results are estimated low
Redscale indicates an exceedance of GCTL
GCTLs are from current FDEP Permit # 0006176-009-HO
Laboratory: Test America, Pensacola, FL and Denver, CO
MS/MSD volume collected

POC: Point of Compliance
GCTL: Groundwater Cleanup Target Level
NGVD: National Geodetic Vertical Datum
EPA: Environmental Protection Agency
SOP: Standard Operation Procedure
mS/cm: millisiemens per centimeter
˚C: degree Celsius

mg/L: milligrams per liter
mV: millivolts
NTU: Nephelometric Turbidity Unit
gpm: gallons per minute
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and total xylenes

TABLE 4
Water Quality Summary - May 2019
Range C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-009-HO				MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-62-02-DUP	C-62 EB	C-62 TD
	Parameter	Method	Unit	GCTL	Sampled May 14, 2019						Equipment Blank	
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	POC	POC	---	---
	Top of Casing	---	feet NGVD	---	188.22	173.55	172.36	178.50	177.81	173.55	---	---
	Water level (Day of Sampling)	EPA SOP	feet BTOC	---	14.22	10.10	10.90	18.84	19.37	10.10	---	---
	Water elevation	calculation	feet NGVD	---	174.00	163.45	161.46	159.66	158.44	163.45	---	---
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	Okay	Okay	---	---
	Well Inside Diameter	---	inches	---	4	4	4	4	4	4	---	---
	Well depth	EPA SOP	feet BTOC	---	34.25	38.90	39.63	38.90	39.41	38.90	---	---
FIELD PARAMETERS	Color	observation	---	---	clear	clear	clear	clear	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	4.04	4.38	4.35	5.69	4.44	4.38	---	---
	Specific Conductance (field)	120.1	mS/cm	---	0.008	0.012	0.012	0.024 **	0.016 **	0.012	---	---
	Temperature	170.1	˚C	---	22.54	22.65	22.28	22.20	22.46	22.65	---	---
	Dissolved oxygen	360.1	mg/L	---	7.56	7.25	6.85	7.62	7.93	7.25	---	---
	Turbidity	180.1	NTU	---	0.45	1.96	1.57	2.44	1.51	1.96	---	---
	Purging rate	---	gpm	---	0.10	0.10	0.10	0.10	0.10	0.10	---	---
GENERAL PARAMETERS	Nitrogen, Nitrate	EPA 300.0	mg/L	10	0.012	0.15	*0.10*	0.64	0.42	0.16	0.012	---
	Nitrogen, Nitrite	EPA 300.0	mg/L	1	0.021	0.021	0.021	0.021	0.021	0.021	0.021	---
	Final pH (lab)	150.1	standard units	6.5-8.5	5.5	5.9	6.3	6.7	5.7	5.3	5.5	
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.20	0.20	0.21	0.21	0.20	0.20	0.22	---
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.70	0.088	0.089	0.095	0.094	0.09	0.089	0.098	---
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.160	0.160	0.17	0.170	0.16	0.16	0.18	---
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.60	0.083	0.084	0.089	0.088	0.085	0.084	0.093	---
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.20	0.064	0.065	0.069	0.068	0.066	0.064	0.072	---
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.05	0.051	0.054	0.054	0.052	0.40	0.056	---
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.085	0.086	0.091	0.090	0.087	0.085	0.095	---
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.190	0.20	0.21	0.210	0.20	0.19	0.22	---
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.057	0.40	0.062	0.061	0.059	0.38	0.064	---
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.20	0.20	0.21	0.21	0.20	0.20	0.22	---
	HMX	SW846 8330	µg/L	350	0.087	0.14	0.15	39	91	0.55	0.097	---
	RDX	SW846 8330	µg/L	10	*0.17*	2.90	3.90	**26**	**52**	2.90	0.18	---
BTEX	Benzene	SW846 8260B	µg/L	1	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	Ethylbenzene	SW846 8260B	µg/L	30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Toluene	SW846 8260B	µg/L	40	0.41	0.41	0.50	0.41	0.41	0.41	0.41	0.41
	Total Xylenes	SW846 8260B	µg/L	20	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60

Notes:
Grayscale indicates value less than or equal to method detection limit (MDL)
Italics indicate result between MDL and reporting limit (RL)
Underlined results are estimated low
Redscale indicates an exceedance of GCTL
GCTLs are from current FDEP Permit # 0006176-009-HO
Laboratory: Test America, Pensacola, FL and Denver, CO
MS/MSD volume collected

POC: Point of Compliance
GCTL: Groundwater Cleanup Target Level
NGVD: National Geodetic Vertical Datum
EPA: Environmental Protection Agency
SOP: Standard Operation Procedure
mS/cm: millisiemens per centimeter
˚C: degree Celsius

mg/L: milligrams per liter
mV: millivolts
NTU: Nephelometric Turbidity Unit
gpm: gallons per minute
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and total xylenes

** In the process of calibrating the two YSI meters used to obtain groundwater parameters, one unit was calibrated to a value in which the decimal point was omitted for the value for specific conductance. The value of 1409 was entered during calibration, rather than 1.409, resulting in the reported values during sampling being multiplied by 1,000 (ex. 16 v. 0.016).

CONTINGENCY PLAN
FOR
OPEN BURN/OPEN DETONATION ACTIVITIES
AT RANGE C-52 NORTH AND RANGE C-62
EGLIN AIR FORCE BASE, FLORIDA

Prepared by
LRS Federal, LLC
8221 Ritchie Highway, Suite 300
Pasadena, MD 21122
(410) 544-3570
www.lrsfederal.com

February 2020

This page intentionally left blank.

Record of Review and Amendments

This Contingency Plan must be reviewed annually and amended as required.

Name of Reviewer	Title/Organization	Date of Review	Changes Made

This page intentionally left blank.

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

Abbreviations and Acronyms

CFR	Code of Federal Regulations
CPR	Cardiopulmonary Resuscitation
DRF	Disaster Response Force
EAFB	Eglin Air Force Base
EMS	Emergency Medical Services
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FOI	Flight Operating Instruction
Gpm	Gallons per minute
HAZMAT	Hazardous Materials
IC	Incident Commander
IEMP 10-2	Installation Emergency Management Plan 10-2
IRF	Initial Response Force
JTTOCC	Joint Test and Training Operations Control Center
LRS	LRS Federal, LLC
NRC	National Response Center
OB	Open Burn
OD	Open Detonation
OB/OD	Open Burn/Open Detonation
OSC	On-Scene Commander
POLs	Petroleum, Oils, and Lubricants
RCO	Range Control Officer
ROCC	Range Operations Control Center
RQ	Reportable Quantity
RR	Range Road
SPCC	Spill Prevention, Control, and Countermeasures
SRT	Spill Response Team
TBKP	Transportable Burn Kettle Processor
TSDF	Treatment, Storage, and Disposal Facility

This page intentionally left blank.

1.0 Introduction

1.1 Scope of Work

According to 40 Code of Federal Regulations (CFR) §264.51, Purpose and Implementation of Contingency Plan:

- Each owner or operator of a hazardous waste treatment, storage, and disposal facility (TSDF) must have a Contingency Plan for his facility. The Contingency Plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water.
- The provisions of the Plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

This Contingency Plan is intended to meet the requirements of:

- 40 CFR §264.51, Purpose and Implementation of Contingency Plan
- 40 CFR §264.52, Content of Contingency Plan
- 40 CFR §264.53, Copies of Contingency Plan
- 40 CFR §264.54, Amendment of Contingency Plan
- 40 CFR §264.55, Emergency Coordinator
- 40 CFR §264.56, Emergency Procedures

This Contingency Plan is also intended to meet the requirements of:

- 40 CFR Part 264 Subpart C – Preparedness and Prevention

This Open Burn/Open Detonation (OB/OD) Contingency Plan is specific only to the open burn (OB) and open detonation (OD) activities that occur only at Range C-52 North and Range C-62 at Eglin Air Force Base (EAFB), Florida.

The Contingency Plan must be submitted to the Regional Administrator with Part B of the permit application under 40 CFR Part 270 and after modification or approval, will become a condition of any permit issued.

This work was performed under Contract by LRS Federal, LLC (LRS), at the request of EAFB.

This Contingency Plan for Open Burn/Open Detonation Activities at Range C-52 North and Range C-62, EAFB, will be referred to throughout this document as the "OB/OD Contingency Plan" or "Plan". Any other plan referenced in this document will be clearly identified and referenced.

1.2 Plan Organization

The order of this Contingency Plan conforms to the order in which the requirements are presented in 40 CFR §264.30 through 264.37, and §264.52 through §264.56. Each subsequent Chapter in this plan is begun with the regulatory reference that requires the ensuing text. This is to expedite review by regulators and other auditors and to educate OB/OD personnel as to the regulations and its effects on the Plan.

This page intentionally left blank.

2.0 Preparedness and Prevention

40 CFR §264.31: Facilities must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment.

40 CFR §264.32 Required equipment.

All facilities must be equipped with the following, unless it can be demonstrated to the Regional Administrator that none of the hazards posed by waste handled at the facility could require a particular kind of equipment specified below:

(a) *An internal communications or alarm system capable of providing immediate emergency instruction (voice or signal) to facility personnel;*

(b) *A device, such as a telephone (immediately available at the scene of operations) or a hand-held two-way radio, capable of summoning emergency assistance from local police departments, fire departments, or State or local emergency response teams;*

(c) *Portable fire extinguishers, fire control equipment (including special extinguishing equipment, such as that using foam, inert gas, or dry chemicals), spill control equipment, and decontamination equipment; and*

(d) *Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or automatic sprinklers, or water spray systems.*

40 CFR §264.33 Testing and Maintenance of equipment.

All facility communications or alarm systems, fire protection equipment, spill control equipment, and decontamination equipment, where required, must be tested and maintained as necessary to assure its proper operation in time of emergency.

40 CFR §264.34 Access to communications or alarm system.

(a) Whenever hazardous waste is being poured, mixed, spread, or otherwise handled, all personnel involved in the operation must have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another employee, unless the Regional Administrator has ruled that such a device is not required under § 264.32.

(b) If there is ever just one employee on the premises while the facility is operating, he must have immediate access to a device, such as a telephone (immediately available at the scene of operation) or a hand-held two-way radio, capable of summoning external emergency

assistance, unless the Regional Administrator has ruled that such a device is not required under § 264.32.

40 CFR §264.35 Required aisle space.
The owner or operator must maintain aisle space to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency, unless it can be demonstrated to the Regional Administrator that aisle space is not needed for any of these purposes.

The OB/OD facilities are designed and operated to minimize the possibility of fire, explosion, or any unplanned release of hazardous waste which could threaten human health or the environment. OB activities were conducted in rectangular steel burn kettles within a Transportable Burn Kettle Processor (TBKP). The TBKP was mounted on a flat bed, semi-truck bed. The burn kettles and TBKP were removed in November 2000.

OD activities do not utilize any type of equipment or 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 (40 CFR 264.31).

There will always be at least two Explosive Ordnance Disposal (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. Communications at the OB/OD treatment areas are maintained by voice or hand- held two-way radio. Communication between EOD personnel and the Range Control Officer (RCO), Range Operating Control Center (ROCC), and EOD Operations are by hand-held two-way radio. Telephones are also available at the RCO and ROCC (40 CFR 364.34).

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 Response Actions, the On-Scene Commander (OSC) will be responsible for contacting the RCO and the ROCC, who will notify the Command Post by radio or telephone. The OSC will have the authority to summon the required on-base assistance.

The fire control, spill, and decontamination equipment are available at the OB/OD treatment areas and base-wide during OB/OD operations. EOD vehicles containing fire extinguishers, absorbents, and other emergency equipment are located in proximity to 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.

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 EAFB 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 gallons per minute (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 (40 CFR 264.32).

All of the communications, alarm, fire protection, spill control, and decontamination equipment will be maintained, checked, and inspected on a regular schedule, and before each OB/OD event, to ensure proper operation (40 CFR 264.33).

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 (40 CFR 364.35).

2.1 Weather Preventions

OB/OD operations proceed following an acceptable weather report. No operations will take place if there is a forecast for a major storm or lightning within five (5) nautical miles. In case of bad weather, operations will be rescheduled. No preparations for OB/OD sites are required for major storms or hurricanes. Since there is no equipment at the site, and all remnants are cleared following the previous operation, there is nothing to secure.

2.2 Preventing Hazards in Unloading Operations

Munitions loading, unloading, and transportation are common on EAFB. Defense Transportation Regulation 4500.09, "Transportation & Traffic Management," contains the procedures that ensure safety for these operations. In addition, there are specific routes for transporting explosives on EAFB. 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, allowing for sufficient time to arrive at the range at least 15 minutes ahead of schedule. Once on the range, munitions are unloaded in the OB/OD units following EOD procedures, in accordance with EOD Flight Operating Instruction (FOI) 32-3001 (attached to this Contingency Plan as Appendix A). Upon OB/OD mission completion, residue is inspected to ensure that treatment is complete before being transported for disposal.

2.3 Preventing Water Supply Contamination

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 160 to 250-ft-thick Pensacola clay confining layer, which effectively isolates the sand and gravel aquifer from the underlying Floridian aquifer. The Floridan aquifer averages 1,000 feet thick, and freshwater can extend to a depth of 2,000 feet below land surface. There are no surface water intakes or potable water wells intakes near Range C-52N or C-62.

2.4 Types and Quantity of Wastes

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 High Explosive Research & Development facility consist of (but are not limited to) research and development experimental explosives and traditional explosives.

The variety and variability of the energetic materials contained in military ordnance is extensive. 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, a representative list of potentially treated ordnance items which may be burned or detonated at the OB/OD units at EAFB and their chemical composition is included with the renewal permit application.

EOD personnel are uniquely and specifically trained in the OB/OD treatment of the potential chemical compositions. Each shipment to the OB/OD facility may contain a wide variety and quantity of hazardous materials. The manifest identifies the type and quantity. The disposal experts are performing the treatment of these munitions. Therefore, local responders would comply with EAFB Command instructions when providing any emergency response or assistance.

3.0 Response Actions

40 CFR §264.51 Purpose and implementation of contingency plan.

(a) Each owner or operator must have a contingency plan for his facility. The contingency plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water.

(b) The provisions of the plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

40 CFR §264.52(a): The contingency plan must describe the actions facility personnel must take to comply with §§ 264.51 and 264.56 in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility.

Sec. 264.56 Emergency procedures.

(a) Whenever there is an imminent or actual emergency situation, the emergency coordinator (or his designee when the emergency coordinator is on call) must immediately:

(1) Activate internal facility alarms or communication systems, where applicable, to notify all facility personnel; and
(2) Notify appropriate State or local agencies with designated response roles if their help is needed.

(b) Whenever there is a release, fire, or explosion, the emergency coordinator must immediately identify the character, exact source, amount, and areal extent of any released materials. He may do this by observation or review of facility records or manifests, and, if necessary, by chemical analysis.

(c) Concurrently, the emergency coordinator must assess possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment must consider both direct and indirect effects of the release, fire, or explosion (e.g., the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any hazardous surface water run-off from water or chemical agents used to control fire and heat-induced explosions).

(d) If the emergency coordinator determines that the facility has had a release, fire, or explosion which could threaten human health, or the environment, outside the facility, he must report his findings as follows:

(1) If his assessment indicates that evacuation of local areas may be advisable, he must immediately notify appropriate local authorities. He must be available to help appropriate officials decide whether local areas should be evacuated; and

(2) He must immediately notify either the government official designated as the on-scene coordinator for that geographical area, or the National Response Center (using their 24-hour toll free number 800/424-8802). The report must include:

(i) Name and telephone number of reporter;

(ii) Name and address of facility;

(iii) Time and type of incident (e.g., release, fire);

(iv) Name and quantity of material(s) involved, to the extent known;

(v) The extent of injuries, if any; and

(vi) The possible hazards to human health, or the environment, outside the facility.

(e) During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the facility. These measures must include, where applicable, stopping processes and operations, collecting and containing release waste, and removing or isolating containers.

(f) If the facility stops operations in response to a fire, explosion, or release, the emergency coordinator must monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, wherever this is appropriate.

(g) Immediately after an emergency, the emergency coordinator must provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

(h) The emergency coordinator must ensure that, in the affected area(s) of the facility:

(1) No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and

(2) All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

(i) The owner or operator must note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Within 15 days after the incident, he must submit a written report on the incident to the Regional Administrator. The report must include:

(1) Name, address, and telephone number of the owner or operator;

(2) Name, address, and telephone number of the facility;

(3) Date, time, and type of incident (e.g., fire, explosion);

(4) Name and quantity of material(s) involved;

(5) The extent of injuries, if any;

(6) An assessment of actual or potential hazards to human health or the environment, where this is applicable; and

(7) Estimated quantity and disposition of recovered material that resulted from the incident.

3.1 Response Options for Fires

The sequences of actions to take in the event of a fire are detailed below. Section 3.1.1 details the actions to take during explosive operations and Section 3.1.2 details the actions to take during situations other than explosive operations. Given the nature of open detonation operations which occur at EAFB in the natural environment, on a remote active bombing range, response actions to fire are a normal part of operations designed to minimize hazards to human life, health, environment and property and are not an emergency incident when controlled and contained within EAFB. These response actions do not constitute an implementation of the contingency plan but are included within to provide a complete picture of operations. EAFB routinely conducts prescribed burns to improve habitat and reduce fuel capacity of natural vegetation on the range. EAFB maintains a robust wildland fire fighting capability to conduct prescribed burns and respond to mission or nature-initiated fires.

3.1.1 Response Actions for Fires during Explosive Operations

In the event of a fire due to explosive operations, the EOD Team will not fight the fire. A fire of this nature could result in a high order detonation if residual explosives or munitions items are present.

Fires sometimes occur after a planned detonation and would not necessarily be an emergency, involve personal injury, or threaten the environment. In these cases, the EOD Team Chief will cancel all explosive operations for the remainder of the day, notify EOD Control, the Joint Test and Training Operations Control Center (JTTOCC), and Jackson Guard Fire Management Section which is the responsible office for wildland fire control. EOD Control will reschedule the explosive operations for another day and all remaining munitions will be taken back to the Weapons Storage Area.

<u>EOD Unit Actions</u>

The EOD Team Chief is responsible for implementing the response actions that can be performed by the EOD Team. He may delegate the responsibility for some of the actions. The following procedures will be followed by the EOD Unit for fires occurring down range due to explosive operations:

1. The person who discovers the fire will immediately sound a vocal and/or radio warning to any endangered personnel and notify the operations EOD Team Chief. (If the EOD Team Chief is injured then the next senior EOD Technician will become the EOD Team Chief.)
2. The EOD Team Chief will order all OB/OD operations to cease.
3. The EOD Team Chief will instruct all personnel to stay up wind and to *not* fight the fire.
4. The EOD Team Chief will immediately evaluate the potential for endangerment to human health and/or the environment.
5. The EOD Team Chief will direct immediate first aid and buddy care procedures for any injured personnel, ***if safe to do so***. Emergency medical technicians are on site for each mission and will respond to injuries. In addition, first aid kits are located in each of the EOD truck tool kits.
6. EOD personnel will check for explosive hazards, hazardous materials (HAZMAT); hazardous waste; or petroleum, oils, and lubricants (POL's) in the area and evacuate all unnecessary personnel to the previously determined range safe area.

7. Secure the site and any unused explosives for later detonations or storage.
8. The EOD Team Chief will immediately notify supporting agencies, including EOD Operations on the Primary EOD radio net, Range Control on the JTTOCC radio net or the appropriate range controller on the frequency in use at the location of the emergency where assistance is needed. Inform the agencies of the time of the fire, location of the fire, and size of the fire.
9. If appropriate, coordinate Life Flight evacuation of injured personnel through Range Control or EOD Operations.
10. Isolate containers or other equipment at risk ***only if safe to do so***.
11. Monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, as appropriate.
12. EOD Operations will provide additional EOD personnel for mission completion if personnel are injured, for communication with base agencies, or for site stabilization, as needed.
13. All operations scheduled for the day following the fire will be terminated and scheduled for another day.
14. Contact EOD Control and schedule a Z Clearance for the following day, preferably 12 hours after the fire was extinguished, to investigate the OB/OD disposal area for explosive residue and munitions that may have been kicked out from the blast. A Z Clearance is a special designation/approval by the JTTOCC for personnel entering a closed range area, for a specified period of time, for official business.
15. The EOD Team Chief will note in the operating record the time, date, and details of any emergency incident (injury to personnel, uncontrolled fire that goes beyond EAFB range boundary or destroys occupied structures) that requires implementing this Contingency Plan. Within 15 days after the emergency incident, he must submit a written report on the incident to the Florida Department of Environmental Protection (FDEP) project manager, through environmental management. The report must include:
    - Name, address, e-mail and telephone number of the owner or operator
    - Name, address, e-mail and telephone number of the facility
    - Environmental Protection Agency (EPA) Identification Number: FL8570024366
    - Date, time, and type of incident (e.g., uncontrolled fire, unplanned explosion, injury to personnel)
    - Name, identification and quantity of material(s) involved
    - The extent of injuries, if any
    - An assessment of actual or potential hazards to human health or the environment, where this is applicable
    - Estimated quantity and disposition of recovered material that resulted from the incident
    - A description and cause of the noncompliance, if any
    - If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate and prevent recurrence of the noncompliance, if any
16. The EOD Unit will perform a quality control inspection to ensure that, in the affected area(s) of the facility:
    - No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and

- All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed

Contingency Plan Response Actions

The following emergency incident procedures will be taken by organizations other than the EOD Unit in accordance with the EAFB Installation Emergency Management Plan 10-2 (IEMP 10-2) if the fire is uncontrollable or involves injured personnel.

1. If evacuation of other on-base personnel is appropriate, the EAFB Command Post will notify affected personnel by radio, television, telephone, or giant voice. The giant voice is an audible mass notification system used across EAFB for emergency situations.
2. EAFB Command Post will dispatch the on-base Initial Response Force (IRF) with approval from the Wing Commander. The team will include the Fire Department, Security Police, Civil Engineering Representative, and/or Environmental Health Representative. Once the IRF arrives on scene, the EOD Team Chief will relinquish all Incident Commander (IC) responsibilities to the Senior Fire Department representative or the IRF Commander.
   - If the IRF is able to control the fire (including allowing the fire to burn itself out), the IC will continue to supervise the response and conditions and maintain contact with the JTTOCC.
   - If the IRF is not able to control the emergency, the EAFB Command Post will implement the notification and response procedures of the IEMP 10-2 by recalling the Disaster Response Force (DRF) who will proceed to the site. The response may involve the entire DRF or portions thereof, depending upon the magnitude and severity of the fire. The DRF will determine what off-base assistance is required, if any, and contact these organizations. Local emergency response resources are detailed in Section 4 of this Plan.
   - The IC will determine when the DRF and other response teams may leave the site.
3. The Environmental Restoration Program (ERP) will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

3.1.2 Response Actions for Fires Not Involving Explosives

In the event of a fire not associated with explosive operations, the EOD Team will fight the fire in a limited capacity if safe to do so, and coordinate with the Jackson Guard Fire Management Section. A fire on the range complex could quickly get out of control and result in the immediate response of the Jackson Guard Fire Management Section which is responsible for control of wildland fires.

EOD Unit Actions

The EOD Team Chief is responsible for implementing the response actions that can be performed by the EOD Team. He may delegate the responsibility for some of the actions. The following procedures will be taken by the EOD Unit for fires occurring due to situations other than explosive operations:

1. The person who discovers the fire will immediately sound a vocal and/or radio warning to any endangered personnel and notify the operations EOD Team Chief. (If the EOD Team Chief is injured than the next senior EOD Technician will become the EOD Team Chief.)
2. The EOD Team Chief will order all OB/OD operations to cease.
3. The EOD Team Chief will immediately evaluate the potential for endangerment to human health and/or the environment.
4. Evacuate all nonessential personnel to the previously determined range safe area. Account for everyone involved in the operation.
5. The EOD Team Chief will assign personnel who will fight the fire, if safe to do so, and note the time any munitions become engulfed in flames.

NOTE: Do not fight fires involving 1.1 munitions (i.e., any munitions that are considered High Explosives, Primary Explosives, etc.) engulfed in flames unless attempting a rescue.

6. The EOD Team Chief will direct immediate first aid and buddy care procedures for any injured personnel, ***if safe to do so***. Emergency medical technicians are on site for each mission and will respond to injuries. In addition, first aid kits are located in each of the EOD truck tool kits.
7. The EOD Team Chief will notify supporting agencies, including EOD Operations on the Primary EOD radio net, Range Control on the JTTOCC radio net or the appropriate range controller on the frequency in use at the location of the emergency where assistance is needed or the location of the fire and whether it is contained. Inform the agencies of the time of the fire, location of the fire, and size of the fire.
8. EOD personnel will check for explosive hazards, hazardous materials, hazardous waste, or POLs in the area.
9. The EOD Team Chief will assign personnel to secure the site of unused explosives.
10. If appropriate, coordinate Life Flight evacuation of injured personnel through Range Control or EOD Operations.
11. Isolate containers or other equipment at risk ***only if safe to do so***.
12. Monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, as appropriate.
13. EOD Operations will provide additional EOD personnel for mission completion if personnel are injured, for communication with base agencies, or for site stabilization, as needed.
14. The EOD Team Chief will assign someone to direct responding personnel to the scene.
15. If a contractor is involved in the fire, notify the Contracting Office at ext. (850) 882-0193.
16. If the fire did not involve the immediate area where explosive operations take place and no personal injuries occurred, the remaining scheduled explosive operations may continue.
17. If the fire did involve the immediate area where explosive operations take place and/or personal injuries occurred, all remaining explosive operations will cease and be rescheduled for another day.
18. The EOD Team Chief will note in the operating record the time, date, and details of any emergency incident (injury to personnel, uncontrolled fire that goes beyond EAFB boundary or destroys occupied structures) that requires implementing this Contingency Plan. Within 15

days after the incident, he must submit a written report on the incident to the FDEP project manager, through Environmental Management. The report must include:

- Name, address, e-mail and telephone number of the owner or operator
- Name, address, e-mail and telephone number of the facility
- EPA Identification Number: FL8570024366
- Date, time, and type of incident (e.g., uncontrolled fire, unplanned explosion, injury to personnel)
- Name, identification and quantity of material(s) involved
- The extent of injuries, if any
- An assessment of actual or potential hazards to human health or the environment, where this is applicable
- Estimated quantity and disposition of recovered material that resulted from the incident
- A description and cause of the noncompliance, if any
- If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate and prevent recurrence of the noncompliance, if any

19. The EOD Unit will perform a quality control inspection to ensure that, in the affected area(s) of the facility:
    - No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and
    - All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed

Contingency Plan Response Actions

The following emergency incident procedures will be taken by organizations other than the EOD Unit in accordance with the IEMP 10-2 if the fire is uncontrollable or involves injured personnel.

1. If evacuation of other on-base personnel is appropriate, the EAFB Command Post will notify affected personnel by radio, television, telephone, or giant voice.
2. EAFB Command Post will dispatch the IRF only if facilities are involved or personnel are injured, with approval from the Wing Commander. The team will include the Fire Department, Security Police, Civil Engineering Representative, and/or Environmental Health Representative. Once the IRF arrives on scene, the EOD Team Chief will relinquish all IC responsibilities to the Senior Fire Department representative or the IRF Commander.
    - If the IRF is able to control the emergency, the OSC will continue to supervise the response and conditions and maintain contact with the JTTOCC.
    - If the IRF is not able to control the fire, the EAFB Command Post will implement the notification and response procedures of the IEMP 10-2 by recalling the DRF who will proceed to the site. The response may involve the entire DRF or portions thereof, depending upon the magnitude and severity of the fire. The DRF will determine what off-base assistance is required and contact these organizations.
    - The IC will determine when the DRF and other response teams may leave the site.
3. The ERP will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

3.2 Response Actions for an Unanticipated Detonation

Unanticipated detonations are a very serious matter and could involve injury or death of on-site personnel, therefore, all EOD personnel will be cardiopulmonary resuscitation (CPR) and First Aid trained and certified. Emergency Medical Technicians are also on-site for each OB/OD event. During an unanticipated detonation, the key to saving lives is decisive, immediate response by all uninjured personnel. The following procedures will assist in the proper actions to take, although it should be known that each situation is unique and could require a different sequence of events.

Note: It is critical that the immediate area be surveyed for hazards that could injure other personnel on site. If the situation requires that all personnel evacuate immediately due to the high probability of another detonation, the EOD Team Chief must make the decision to care for immobilized injured personnel or evacuate immediately. If injured personnel can be moved and there are enough personnel on site to move them, then they should be moved quickly to a safe area.

<u>EOD Unit Actions</u>

The EOD Team Chief is responsible for implementing the response actions that can be performed by the EOD Team. He may delegate the responsibility for some of the actions. The following procedures will be followed by the EOD Unit for an unanticipated detonation:

1. The person who discovers the unanticipated detonation will immediately sound a vocal and/or radio warning to any endangered personnel and notify the operations EOD Team Chief. (If the EOD Team Chief is injured than the next senior EOD Technician will become the EOD Team Chief.)
2. The EOD Team Chief will order all OB/OD operations to cease.
3. The EOD Team Chief will instruct all personnel to stay up wind of any fires that may have been initiated by the detonation.
4. The EOD Team Chief will immediately evaluate the potential for endangerment to human health and/or the environment.
5. The EOD Team Chief will direct immediate first aid and buddy care procedures for injured personnel, ***if safe to do so***. Emergency Medical Technicians will administer aid. In addition, first aid kits are located in each of the EOD truck tool kits.
6. The EOD Team Chief will notify supporting agencies, including EOD Operations on the Primary EOD radio net, JTTOCC radio net, or the appropriate range controller on the frequency in use at the location of the emergency where assistance is needed. Inform the agencies of the time of the unanticipated detonation and of any injured personnel, fire location if any and size of the fire.
7. EOD personnel will check for explosive hazards, hazardous materials, hazardous waste, or POLs in the area and evacuate all unnecessary personnel to the previously determined range safe area.
8. Secure the site and any unused explosives for later investigation or storage.
9. If appropriate, coordinate Life Flight evacuation of injured personnel through Range Control or EOD Operations.
10. Isolate containers or other equipment at risk ***only if safe to do so***.
11. Monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, as appropriate.

12. EOD Operations will provide additional EOD personnel for mission completion, communication with base agencies, or site stabilization, as needed.
13. An EOD Team from the EAFB EOD Unit will respond on site to eliminate all hazards associated with explosives or munitions.
14. The EOD Team Chief will note in the operating record the time, date, and details of any emergency incident that requires implementing this Contingency Plan. Within 15 days after the incident, he must submit a written report on the incident to the FDEP project manager, through Environmental Management. The report must include:
    - Name, address, e-mail and telephone number of the owner or operator
    - Name, address, e-mail and telephone number of the facility
    - EPA Identification Number: FL8570024366
    - Date, time, and type of incident (e.g., uncontrolled fire, unplanned explosion, injury to personnel)
    - Name, identification and quantity of material(s) involved
    - The extent of injuries, if any
    - An assessment of actual or potential hazards to human health or the environment, where this is applicable
    - Estimated quantity and disposition of recovered material that resulted from the incident
    - A description and cause of the noncompliance, if any
    - If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate and prevent recurrence of the noncompliance, if any
15. The EOD Unit will perform a quality control inspection to ensure that, in the affected area(s) of the facility:
    - No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and
    - All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed

Contingency Plan Response Actions

The following emergency incident procedures will be taken by organizations other than the EOD Unit in accordance with the IEMP 10-2 if the unanticipated detonation results in uncontrollable fire or involves injured personnel.

1. If evacuation of other on-base personnel is appropriate, the EAFB Command Post will notify affected personnel by radio, television, telephone, or giant voice.
2. EAFB Command Post will dispatch the IRF only if facilities are involved or personnel are injured, with approval from the Wing Commander. The team will include the Fire Department, Security Police, Civil Engineering Representative, and/or Environmental Health Representative. Once the IRF arrives on scene, the EOD Team Chief will relinquish all IC responsibilities to the Senior Fire Department representative or the IRF Commander.
    - If the IRF is able to control the emergency, the OSC will continue to supervise the response and conditions and maintain contact with the JTTOCC.
    - If the IRF is not able to control the fire, the EAFB Command Post will implement the notification and response procedures of the IEMP 10-2 by recalling the DRF who will proceed to the site. The response may involve the entire DRF or portions thereof,

depending upon the magnitude and severity of the incident. The DRF will determine what off-base assistance is required and contact these organizations.

- The IC will determine when the DRF and other response teams may leave the site.

3. The ERP will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

3.3 Response Actions for Releases of Hazardous Materials and Hazardous Waste

Florida Administrative Code (FAC) 62-150.300 requires any owner or operator who has knowledge of any release of a hazardous substance from a facility in a quantity equal to or exceeding the Reportable Quantity (RQ) in any 24-hour period to notify FDEP by calling the State Warning Point number, (800) 320-0519 or (850) 413-9911, within 1 business day of discovery of the release.

The National Response Center (NRC) must also be notified at (800) 424-8802 when a hazardous substance is released to the environment in an amount that equals or exceeds its RQ. Information reported to the NRC should include the following:

- Your name, location, organization, and telephone number
- Name and address of the party responsible for the incident; or name of the carrier or vessel, the railcar/truck number, or other identifying information
- Date and time of the incident
- Location of the incident
- Source and cause of the release or spill
- Types of material(s) released or spilled
- Quantity of materials released or spilled
- Medium (e.g. land, water) affected by release or spill
- Danger or threat posed by the release or spill
- Number and types of injuries or fatalities (if any)
- Weather conditions at the incident location
- Whether an evacuation has occurred
- Other agencies notified or about to be notified
- Any other information that may help emergency personnel respond to the incident

The RQ of waste for hazardous materials varies dependent upon the material released. A listing of RQ’s is located in Appendix A to 49 CFR §172.101- List of Hazardous Substances and Reportable Quantities.

The Environmental Compliance Office will make all local, state and federal regulatory agency notifications.

3.3.1 Response Actions for Spills Greater than the Reportable Quantity

The EOD Unit will take the following actions immediately upon discovery of a release of more than the RQ of hazardous materials or hazardous waste:

1. As soon as a discharge or spill of a hazardous material or hazardous waste is discovered or suspected in a quantity greater than the RQ, report it to EAFB Command Post by dialing **882-4020**. Information reported should include the following:
   - Name, address and telephone number of person making report
   - Exact location of spill
   - Time spill occurred
   - Number of injured personnel and nature of injuries
   - Name of material spilled or released
   - Estimated quantity spilled or released
   - Rate of discharge, if applicable
   - Source of spilled material
   - Cause of release, if known
   - Containment/clean-up actions
2. After the spill has been reported, attempt to stop the spill at its source, only if it is safe to do so.
3. Wait for the appropriate response organizations to respond. The level of response will depend on the nature of the emergency (see Table 3-1 below). Further responses to spills of more than the RQ of hazardous materials or hazardous wastes will be directed by EAFB Plan 32-6, *Hazardous Material Emergency Planning and Response.*

Table 3-1. Levels of HAZMAT Response

Response Level	Description	Contact
I	An incident which can be controlled, cleaned up, and disposed of by the using organizations. The incident is confined to a small area. Only evacuation of the immediate area is required.	Fire Department Environmental Management
II	An incident beyond the using organization's capabilities involving a greater hazard or larger area which could be a potential threat to life or property and which may require a limited evacuation of the area.	Fire Department Emergency Medical Service (EMS) Security Forces HAZMAT Team Spill Response Team (SRT) Bioenvironmental Engineering Environmental Management Disaster Preparedness
III	An incident involving a severe hazard or large area which poses an extreme threat to life and property and will probably require a large scale evacuation; or an incident requiring the expertise or resources of county, state, federal, or private agencies.	All Level II agencies, plus: Disaster Response Force

3.3.2 Response Actions for Spills Less than the Reportable Quantity

Any minor release (less than the RQ) of hazardous materials or hazardous waste will be handled by the EOD Team on-site using the portable spill kit.

The EOD Team will stop the source and contain the spill, if safe to do so, then remove the spill residue and related waste.

All spills/releases and accidental discharges of POL/HAZMAT/HAZWASTE, regardless of the quantity, must be reported by the responsible organization using a Spill Discharge Report. These may be submitted either electronically, via fax (850) 882-7675 or hand delivered to Environmental Compliance, Building 592, within 4 duty hours of the spill occurrence.

3.4 Response Actions for Spills of Petroleum, Oil and Lubricants

Responses to all spills of POL's, including gasoline, oil, used oil, and diesel fuel, will be directed by the EAFB Spill Prevention, Control, and Countermeasures (SPCC) Plan or IEMP 10-2, as appropriate.

Since the Transportable Burn Kettle Processors are not currently in use, nor on-site, the likelihood of a response action required by the SPCC or IEMP is substantially reduced. The only POL on-site during the OD operations is the gasoline or diesel fuel within the EOD vehicles.

4.0 Coordination with Other Plans

40 CFR §264.52(b) If the owner or operator has already prepared a Spill Prevention, Control, and Countermeasures (SPCC) Plan in accordance with part 112 of this chapter, or some other emergency or contingency plan, he need only amend that plan to incorporate hazardous waste management provisions that are sufficient to comply with the requirements of this part.

This OB/OD Contingency Plan is specific to OB/OD operations at Range C-52 North and C-62. The SPCC Plan for EAFB is referenced where appropriate in this document. However, the SPCC Plan does not specifically address the emergency actions that are required for OB/OD operations. Therefore, this Contingency Plan has been created as a stand-alone document.

Other emergency response plans, spill prevention plans, etc., that are referenced in this document and may be needed in the event of an emergency include the following:

- EAFB Plan 32-6, *Hazardous Material Emergency Planning and Response*
- EAFB SPCC Plan
    - *Includes Appendix A of 49 CFR §172.101-List of Hazardous Substances and Reportable Quantities*
- EAFB IEMP 10-2
- EOD Flight Operating Instruction (FOI) 32-3001 *Explosive Ordnance Disposal Program*

A CD with these electronic plans is enclosed for reference.

In the event of an emergency, the most recent plan applicable to the emergency should be used.

This page intentionally left blank.

5.0 Cooperative Agreements

40 CFR §264.52(c): The plan must describe arrangements agreed to by local police departments, fire departments, hospitals, contractors, and State and local emergency response teams to coordinate emergency services, pursuant to Sec. 264.37.

EAFB has cooperative agreements with local communities. At the direction of the EAFB Command Post, the DRF will contact the required community organizations in the event that emergency services are required from these communities, or if these communities need to be evacuated. Some of the resources available through these arrangements are listed in Table 4-1.

However, no specific arrangements are required in support of OB/OD activity, as EAFB is best equipped to respond to any emergency at the sites of the OB/OD activities, and is therefore the primary authority. EAFB capability includes explosive ordinance disposal, structural and wildland fire fighting, security forces and medical personnel to include a hospital, environmental management staff, air lift support, and command and control operations. In addition, the scope and remote, secured location of the OB/OD activity occurs such that it does not threaten the distant surrounding community.

Table 5-1. Local Emergency Response Resources

Name	Type of Assistance Available
Fort Walton Beach Medical Centers	Emergency medical services (EMS)
Fort Walton Beach Fire Department	Firefighting, HAZMAT response, EMS
Destin Fire Department	Firefighting, HAZMAT response, EMS
Ocean City-Wright Fire Department	Firefighting, HAZMAT response, EMS
Valparaiso Fire Department	Firefighting, HAZMAT response, EMS
Shalimar Fire Department	Firefighting, HAZMAT response, EMS
Crestview Fire Department	Firefighting, HAZMAT response, EMS
Freeport Fire Department	Firefighting, HAZMAT response, EMS
DeFuniak Springs Fire Department	Firefighting, HAZMAT response, EMS
Okaloosa Island Fire Department	Firefighting, HAZMAT response, EMS
North Bay Fire Department	Firefighting, HAZMAT response, EMS
Niceville Fire Department	Firefighting, HAZMAT response, EMS
Mary Esther Fire Department	Firefighting, HAZMAT response, EMS
FDEP State Watch Office (1-800-320-0519)	Notification of wastewater spills

This page intentionally left blank.

6.0 Emergency Coordinators

40 CFR §264.52 (d): The plan must list names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinator (see § 264.55), and this list must be kept up to date. Where more than one person is listed, one must be named as primary emergency coordinator and others must be listed in the order in which they will assume responsibility as alternates. For new facilities, this information must be supplied to the Regional Administrator at the time of certification, rather than at the time of permit application.

40 CFR §264.55, Emergency coordinator: At all times, there must be at least one employee either on the facility premises or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures. This emergency coordinator must be thoroughly familiar with all aspects of the facility's contingency plan, all operations and activities at the facility, the location and characteristics of waste handled the location of all records within the facility, and the facility layout. In addition, this person must have the authority to commit the resources needed to carry out the contingency plan.

The IC is designated as the emergency coordinator for the purposes of 40 CFR §264.52(d). The IC will be the EOD Team Chief present at the range during OB/OD activities. All EOD Team Chiefs coordinating OB/OD activities are qualified to act as the emergency coordinator in the capacity of an IC until other emergency responders arrive.

During all OB/OD operations, the EOD Team Chief will be at either Range C-52 North or C-62 (wherever operations are taking place) with the responsibility for coordinating all emergency response measures. The EOD Team Chief is required to be thoroughly familiar with all aspects of this OB/OD Contingency Plan, all operations and activities at the OB/OD ranges, the location and characteristics of waste handled at the OB/OD ranges, the location of all records associated with OB/OD operations, and the range layouts. The EOD Team Chief has the authority to commit the resources needed to carry out this OB/OD Contingency Plan.

Emergency Coordinators are identified by position equivalent to name because EOD OB/OD operations are conducted by military personnel that are subject to frequent rotation due to frequent deployments in support of the worldwide military mission. These positions will be manned at any time EOD is conducting OB/OD operations. When operations are not being conducted there is no material on-site and therefore no risk of fire, explosion, or injury from the permitted TSDF. Emergency Coordinators/contacts are identified in Table 5-1.

Table 6-1. Emergency Coordinators & Contacts

Date of Revision: __February, 2020______

Name	Telephone Number	Address
EOD Operations (Primary)	**(850) 882-3225**	Building 1334, EAFB
EAFB Command Post (Alternate 1)	(850) 883-4020	Building 1, EAFB
JTTOCC (Alternate 2)	(850) 882-5800	Building 104, EAFB

This page intentionally left blank.

7.0 Emergency Equipment

40 CFR §264.52(e): The plan must include a list of all emergency equipment at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems (internal and external), and decontamination equipment), where this equipment is required. This list must be kept up to date. In addition, the plan must include the location and a physical description of each item on the list, and a brief outline of its capabilities.

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 operations. Larger response equipment is located at the base fire response centers.

Table 7-1 lists the emergency response equipment that is brought to the site of OB/OD operations. Attachment 5 of *FOI 32-3001 Explosive Ordnance Disposal Program* (included as Appendix A) is a site inspection log for the OB/OD sites. This log includes safety and emergency equipment. Additional emergency response equipment is available from other sources and can be obtained, as necessary.

Table 7-1. Emergency Response Equipment Available at the OB/OD Areas

Material on Hand	Unit	Quantity	Location
Fire Extinguishers	EOD	2	EOD Vehicle
Emergency Portable Spill Kit	EOD	1	EOD Vehicle
Radios	EOD	2	EOD Team
Portable Eye Wash Station	EOD	1	EOD Vehicle
Large First Aid Kit or Combat Life-Saver bag (preferred)	EOD	1	EOD Vehicle

All EOD vehicles are equipped with general safety equipment, including but not limited to; portable radios, boots, gloves, face shields, first aid kits, fire extinguishers, tie down straps, wheel chocks, and extra safety glasses.

Fire extinguishers are rated 2A:10BC and are available for any non-munition, small fires. Portable spill kits may be used for minor spills or releases, most likely a spill of diesel fuel (used as the ignitor), or an oil or gas leak from a vehicle. Radios are used between all EOD team members before, during, and after the OB/OD event. These radios are the main method of communication in an area where cellular coverage is not consistently available. The portable eye wash station is for the emergency rinse of the face and eyes due to contact with an irritant or chemical.

First aid kits contain basic medical supplies used to slow deterioration of a wound until medical professionals arrive. EOD personnel are trained in the use of life saving equipment. The Combat Life-Saver bag contains:

- ATROPINE INJECTION AQUEOUS TYPE 0.7ML SYRINGE WITH NEEDLE
- DIAZEPAM INJECTION USP 5MG/ML 2ML SYRINGE-NEEDLE UNIT AUTO INJ
- ADAPTER CATHETER TO LUER SYRINGE SHORT LOCKING 5S
- ADHESIVE TAPE SURGICAL POROUS WOVEN 3 INCHES BY 10 YARDS 4S
- AIRWAY NASOPHARYNGEAL 9MM ID 12MM OD KINK RES SMOOTH RD EDGES10S

- BANDAGE MUSLIN COMPRESSED OLIVE DRAB37X37X52" TRIANG W/SFTY PINS
- BANDAGE ELASTIC FLESH ROLLED NONSTERILE 6"X 4.5 YDS 12S
- BANDAGE GAUZE COTTON 6 PLY WHITE 4.5" WIDE 4.1 YDS LONG
- BANDAGE KIT ELASTIC
- BANDAGE ADH.75X3" FLESH/CLEAR STER DRESS AFFIXED TO PLAS ADH100S
- CATHETER IV INTROCAN SAFETY 18GAX1-1/4"LG WINGED NDL TEFLON 200S
- CATHETER-NDL UNIT IV 14GAX3.25" LUER HUB AND NDL GUARD RADPQ 50S
- DRESSING FIRST AID FIELD CAMOUFLAGED 11.5-12"W 11.5-12"LG ABS
- DRESSING OCCLUSIVE ADHESIVE CLEAR 4.75X4" 5S
- GLOVE PATIENT EXAMINING & TREATMENT SZ 10LG PURPLE 4.3MIL 100S
- HETASTARCH IN LACTATED ELECTROLYTE INJECTION, 500ML
- ADMINISTRATION SET INFUSION PUMP VENTED/UNVENTED
- LUBRICANT SURGICAL 5 GRAM 144S
- ORAL REHYDRATION SALTS USP 27.9GM FOIL PACKET 125 PER PACKAGE
- PAD ISOPROPYL ALCOHOL IMPREGNATED NONWVN COTTON/RAYON WHITE 200S
- PAD POVIDONE-IODINE IMPRE STER COTTON/RAYON 2X1.375" BROWN 100S
- SCISSORS BANDAGE 7.25" LG ANG TO HDL 1.50" CUT LG BLUNT PTS CRS
- SPLINT UNIVERSAL ALUM 36"O/A LG 4.25"W GRAY & OLIVE DRAB REUSE
- SYRINGE AND NEEDLE HYPODERMIC SAFETY 3ML 23GA STER DISP 25S
- TOURNIQUET NONPNEUMATIC ADULT 14X1" BLD TAKING DSGN RUBBER O/A
- TOURNIQUET COMBAT APPLICATION ONE-HANDED
- TUBE DRAINAGE SURGICAL PENROSE 1"X18" RUBBER RADIOPAGUE STER 6S

8.0 Evacuation Plan

40 CFR §264.52 (f) The plan must include an evacuation plan for facility personnel where there is a possibility that evacuation could be necessary. This plan must describe signal(s) to be used to begin evacuation, evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).

A limited number of personnel required to perform the daily operation are allowed on the OB/OD ranges during OB/OD activities. A minimum of two EOD technicians (one 7-skill level and one 5-skill level) will support range, demolition, and recovery missions. Limit the maximum number of participants to a number consistent with a safe and efficient operation. Minimum EOD technician to non-EOD technician (workers/test support personnel) ratio during range clearance operations is 1:5. 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-52 North and C-62, the control building is more than 5,000 feet from the site of OB/OD operations. Therefore, evacuation beyond the limits of the control building would not be anticipated.

The person who discovers the emergency situation will immediately sound a vocal and/or radio warning to any endangered personnel and notify the operations EOD Team Chief. (If the EOD Team Chief is injured, then the next senior EOD Technician will become the EOD Team Chief.)

In the unlikely event that evacuation beyond the control building is required, personnel will evacuate using the EOD vehicle, or on foot, to pre-designated rally points identified prior to the start of each OB/OD mission. Locations of rally points will be based on the safe distances specified in Attachment 7 of *FOI 32-3001 Explosive Ordnance Disposal Program* (included as Appendix A).

See Figure 1 for the evacuation routes for each area, which are also used as the Explosive Transportation Routes. The figure identifies the nearest control building to each range area. Most of the range roads (RR) are dirt, so the identified roads are the most passable routes. For Range C-52N, evacuation can occur by heading north on RR214, then west on RR200, and then north or south on FL285. For Range C-52N, evacuation can also occur by heading south on RR214, then west northwest on RR219, then west to RR200, and then north or south on FL285. For Range C-62, evacuation occurs by heading north on RR210 (near the range control building), to RR 203, then west to RR212, and then north to RR213/Bob Sikes Road, then west to FL285.

If evacuation of other on-base personnel is appropriate, the EAFB Command Post will notify affected personnel by radio, television, telephone, or giant voice.

This page intentionally left blank.

9.0 Location and Distribution of the Contingency Plan

40 CFR §264.53 Copies of contingency plan. A copy of the contingency plan and all revisions to the plan must be:

(a) Maintained at the facility; and
(b) Submitted to all local police departments, fire departments, hospitals, and State and local emergency response teams that may be called upon to provide emergency services.

Copies of this Contingency Plan will be maintained at the locations identified in Table 9-1. Copies can be provided to other interested local agencies who are parties to cooperative agreements with EAFB. Since EAFB provides its own fire, emergency medical and disaster response force there are no plans to call upon local civil authorities for OB/OD emergencies. If local civil authorities need to be engaged it will be through the EAFB IEMP 10-2.

Table 9-1. Locations of the Contingency Plan at EAFB

Organization	Physical Location	Telephone Number
EOD Operations Center	*Building 1334*	850-882-3225
Environmental Management Office	*Building 592* *https://em.eglin.af.mil/emc/ems/library/*	850-882-7670
EAFB Command Post	*Building 1*	850-833-4020

This page intentionally left blank.

10.0 Review and Amendment of the Contingency Plan

40 CFR §264.54 Amendment of contingency plan. The contingency plan must be reviewed, and immediately amended, if necessary, whenever:

(a) The facility permit is revised;

(b) The plan fails in an emergency;

(c) The facility changes--in its design, construction, operation, maintenance, or other circumstances--in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency;

(d) The list of emergency coordinators changes; or

(e) The list of emergency equipment changes.

This Contingency Plan will be reviewed by the EOD flight and Environmental Management annually and as required by 40 CFR §264.54 (see requirement above) and amended as required. Revised copies will be provided to the appropriate organizations as identified in Section 8 of this Plan.

Records of reviews and amendments should be documented and maintained. A form for tracking the reviews is included in the beginning of this Plan.

This page intentionally left blank.

FIGURE 1

EVACUATION ROUTES
EXPLOSIVE TRANSPORTATION ROUTES

This page intentionally left blank.

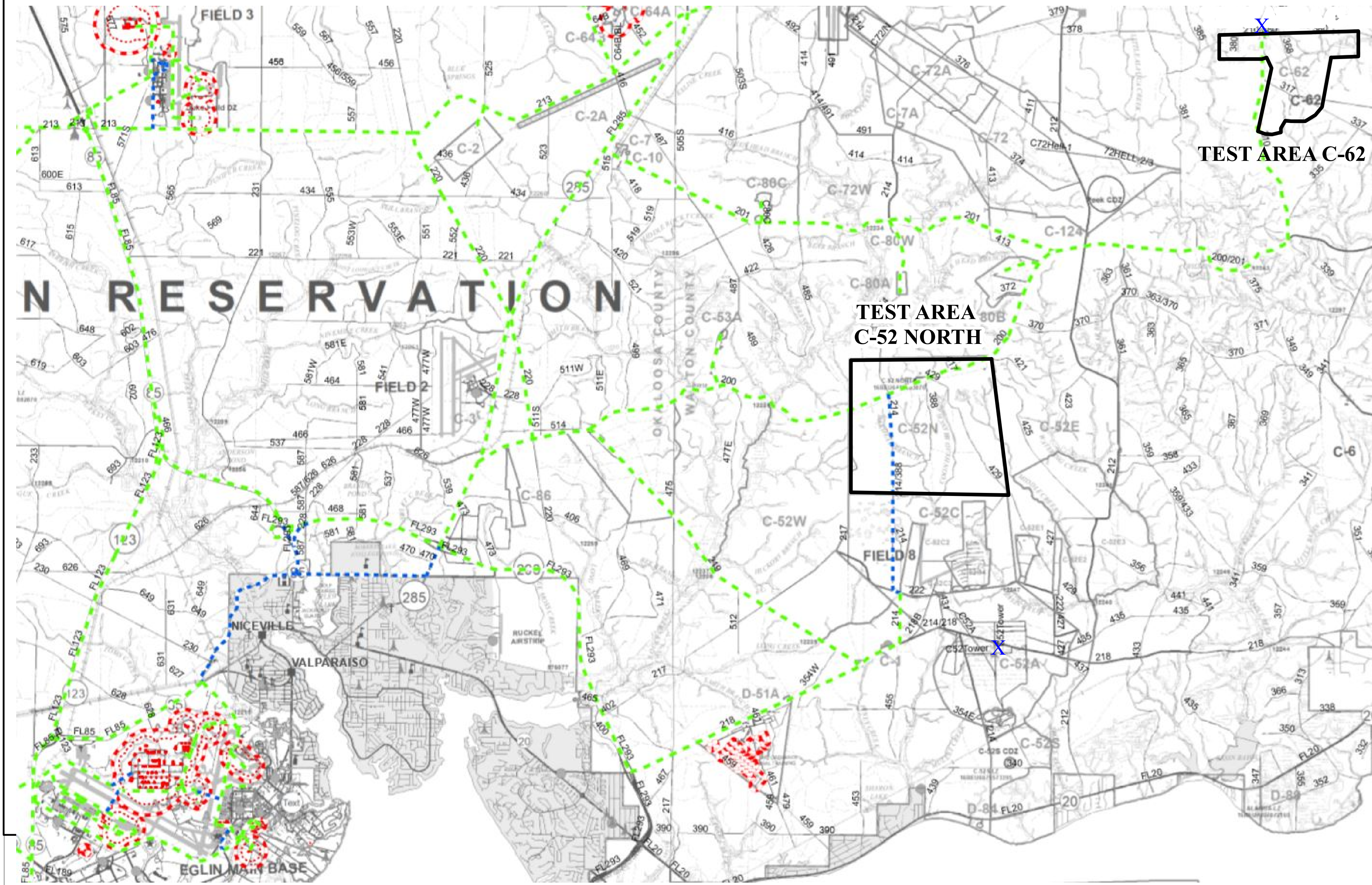


FIGURE 1
EVACUTION and EXPLOSIVE TRANSPORTATION ROUTES

X Nearest Control Building

96TH CIVIL ENGINEER GROUP

APPENDIX A

FOI 32-3001,

Explosive Ordnance Disposal Program

This page intentionally left blank.

BY ORDER OF THE COMMANDER, 96 CES

EOD FLIGHT OPERATING INSTRUCTION 32-3001

15 May 2017

Civil Engineering

EXPLOSIVE ORDANCE DISPOSAL (EOD) PROGRAM

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESIBILITY: 96 CES/CED instructions are available for downloading at S:\Files\Admin\FOI's\FOI's
RELEASIBILITY: There are no releasability restrictions on this publication.

OPR: 96 CES/CEDO

Certified by: 96 CES/CED (Maj Mattie)

Pages: 61

Supersedes: EODFOI 32-3001, 25 Mar 2016

This publication implements Air Force Policy Directive (AFPD) 32-30, *Explosive Ordnance Disposal,* Air Force Joint Instruction (AFJI) 32-3002, *Interservice Responsibility for Explosive Ordnance Disposal*, and Air Force Instruction (AFI) 32-3001, *Explosive Ordnance Disposal Program*. It establishes policy and responsibility for the management of the Eglin Air Force Base, Florida, Explosive Ordnance Disposal (EOD) program and applies to all United States Air Force EOD personnel assigned or attached to the 96th Civil Engineer Squadron, Eglin Air Force Base, Florida. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 through the appropriate chain of command. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW the Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). This publication may not be supplemented or further implemented/extended. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

SUMMARY OF CHANGES

This document has been substantially revised and needs to be completely reviewed. Major changes include hyperlinking pages in table of contents, removal of Chapter 6, COMSEC, addition of procedures to take in areas not served by lightning warnings and watches, and the addition of procedures for use of EOD Proficiency Range.

Chapter 1

RESPONSIBILITIES

1.1.Commander. The Commander, 96th Civil Engineer Squadron (CES), will:

1.1.1. Provide routine and emergency EOD support to the installation, including tenant units, support bases, and special mission taskings. Agencies needing assistance will make routine support requests directly to the EOD Flight. The primary means for requesting emergency EOD support is through the Wing Operations Center/Command Post or Emergency Operations Center. EOD will respond to other emergencies as requested by the Fire Alarm and Communications Center, Law Enforcement Desk or Central Security Control if routed from a certified Incident Commander. After hours requests for emergency support will be routed through the WOC/CP or EOC. Emergency support requirements for EOD response to an accident or incident are defined in AFJI 32-3002(I) and AFI 32-3001.

1.1.2. Provide the EOD Flight administrative and logistics support for administrative files, regulations, technical manuals, funding, facilities, and resources needed to perform the EOD mission.

1.1.3. Not assign EOD personnel to additional duties that negatively impact individual proficiency and/or team capabilities.

1.2. Flight Management. The EOD Flight Management will:

1.2.1. Ensure assigned EOD personnel are trained and qualified to provide routine and emergency EOD support as indicated in paragraph 1.1.1.

1.2.2. Ensure the EOD Operations Section publishes a stand-by roster with appropriately trained personnel.

1.2.3. Oversee compliance with this operating instruction and other applicable publications.

1.2.4. Ensure a comprehensive training program is in effect and training priorities are clearly defined. Wartime, as well as peacetime tasks must be continually taught, exercised, and evaluated to ensure the highest level of competency. EOD training will be prioritized above normal day-to-day work activities. Only EOD operations will receive a higher priority than training.

1.2.5. Notify the 96 CES Commander of any requests for assistance or response.

1.2.6. Ensure supervisors complete a post-deployment evaluation of members to ensure currency of training and document on an AF IMT 623a, *On-The-Job Training Record Continuation Sheet.* Documentation on the AF IMT 623a will also include any lapses in training.

1.2.7. Oversee the EOD Quality Assurance program and designate a NCO as the section NCOIC.

1.2.7.1. All individuals postured against a 4FPXC, 4FPXD, and 4FPXE UTC will be evaluated NLT once each calendar year on any of the following core competencies.

1.2.7.1.1. Aerospace Systems/Vehicles.

1.2.7.1.2. Conventional Ordnance (Peacetime).

1.2.7.1.3. Recovery of Airbase Denied by Ordnance.

1.2.7.1.4. Counter-IED Exercise (One Peacetime/One Contingency).

1.2.7.1.5. Weapons of Mass Destruction.

1.2.7.1.6. Nuclear Weapon Response–Broken Arrow (may be conducted via table top).

1.2.7.1.7. Chemical/ Biological Weapon (Contingency – including disposal).

1.2.7.1.8. Demolition Operation.

1.2.7.2. Evaluations listed above may be combined as long as the intent of each is met. i.e., demolition operations evaluated in conjunction with RADBO.

1.2.7.3. Personnel will be evaluated according to the roles they are postured for and/or skill level. i.e. a 4FPXC will not perform as a Team Leader or member and an individual postured against a 4FPXE will not perform as a Team Leader. **Exception**: 7-level assigned to a 4FPXE may be evaluated as a Team Leader.

1.2.7.4. Quality assurance evaluations will be conducted by a certified 7-level.

1.2.7.6. Training operations will not be counted as practical QA evaluations however QA evaluations may be counted as SORTS-reportable exercises IAW AFI 10-210, *Prime Base Engineer Emergency Force (Beef) Program*.

1.2.7.6. Only Flight Management, the Quality Assurance evaluator(s), and the individual(s) being evaluated will be present for the evaluation.

1.2.7.7. Evaluation ratings are as follows:

1.2.7.4.1. Pass. Successful accomplishment with no equipment, technical data, or personnel deficiencies that precluded completion of the operation.

1.2.7.4.2 Fail. Failures may be attributed to the entire team or to an individual(s). Any of the following constitute a failed rating:

1.2.7.4.2.1. The team commits a major safety error.

1.2.7.4.2.2. The team demonstrates a lack of professional competence to such a degree that the specific operation being evaluated could not be completed.

1.2.7.8. Re-evaluate individuals that receive a failed rating after necessary remedial training has been accomplished within 30 days. Repeat failures will result in decertification on the task that was evaluated.

1.2.7.9. Evaluations will be documented on an AF Form 2419, *Routing and Review of Quality Control Reports*, or locally produced equivalent, and filed in the flight's Quality Assurance folder.

1.3. Stand-By Team. The EOD Stand-By Team will:

1.3.1. The stand-by team will consist of a minimum of two qualified EOD personnel, one of which will be at a minimum a 7-skill level SSgt and one 5-skill level. **Exception:** a 3-skill level may be used in place of one 5-skill level as long the individual has met all stand-by requirements, has been approved by the supervisor, and is approved by flight management. A standard three person EOD Team will be utilized when dictated by the accident/incident and flight management.

1.3.2. During periods of manning shortfalls, flight management may allow, on a temporary basis, the use of a 5-skill level SSgt as team leader if all 7-skill level requirements have been met with the exception of 7-skill level school. **Note:** in this situation, the remaining team member may not be substituted with a 3-skill level as indicated in paragraph 1.3.1.. The Team Leader for off-installation responses will be a 7-skill level.

1.3.3. Be familiar with the contents of this operating instruction.

1.3.4. Perform stand-by duties, as assigned, from 0630 Friday through 0630 the following Friday.

1.3.5. Upon assumption of stand-by duties, inventory all response munitions, inventory and function check all equipment, in the EOD Bomb Squad Emergency Response Vehicle (BSERV) and flightline response vehicle, and ensure response laptop is properly functioning. Document inventory/inspection in vehicle OI books.

1.3.6. Ensure all equipment is cleaned, serviceable and returned to its proper place upon completion of stand-by duties.

1.3.7. Immediately notify Flight Management of any requests for assistance or response. The need for an On-Scene Commander and/or Legal Representative will be determined by the 96 TW/CC.

1.3.8. Ensure that all trash is emptied from the common areas in the main EOD facility daily.

1.3.9. Perform end-of-day security checks and sign SF 701, *Activity Security Checklist.* Ensure SF 702, *Security Container Check Sheets*, are properly completed.

1.3.10. Perform daily pickup and delivery of official mail to the 96 CES, when necessary.

1.3.11. Carry a cell phone with them at all times. Carry a radio when away from the shop during duty hours.

1.3.12. Monitor the EOD Operations Section when operations personnel are not available or after normal duty hours, when required for test range support missions.

1.3.13. Submit a properly formatted Explosive Ordnance Disposal Information Management System (EODIMS) report NLT 5 duty days from completion of an incident or mission.

1.4. All EOD Personnel. All EOD personnel assigned to the EOD Flight will:

1.4.1. Conduct physical fitness training Monday thru Friday for a minimum of one hour or as otherwise dictated by Flight Management. If PT is not conducted in the morning, report for duty NLT 0630.

1.4.2. Report for roll-call at 0830, Monday thru Friday, or as otherwise dictated by Flight Management.

1.4.3. The duty day begins with PT and ends at 1530.

1.4.4. Lunch will be a 90 minute period between 1100 and 1300.

1.4.5. Carry a cell phone and/or land mobile radio at all times when away from the EOD facility. If traveling in groups, only one EOD member is required to possess a means of communications.

1.4.6. Prepare training classes as assigned, by the morning of the scheduled date.

1.4.7. Notify Flight Management of any requests for assistance or response.

1.4.8. Sign in and out utilizing the sign-out board in the EOD Operations Section. This applies to vehicles and radios, as well.

1.4.9. Carry a current recall roster with them at all times.

1.4.10. Respond to the EOD shop with required clothing and equipment immediately upon notification of a recall.

1.5. Physical Fitness Training. Physical fitness training (PT) will be conducted five days a week to improve and maintain maximum individual strength, stamina, and aerobic activity, as well as, boost and maintain unit camaraderie. Flight PT will be conducted Monday through Friday at the member's discretion (see 1.4. above). Squadron PT will be conducted as directed by the squadron commander. Attachment 8 will be utilized to assist flight physical fitness training.

Chapter 2

SAFETY

2.1. General.

2.1.1. The responding EOD team must positively identify ordnance using EOD technical data prior to performing EOD procedures. If no technical data exists for the item in question, then other means will be used to identify the ordnance.

2.1.2. The team chief will ensure that all applicable safety precautions are adhered to unless those safety precautions will further endanger the EOD team or other resources.

2.1.3. EOD personnel are authorized to deviate from EOD technical orders according to AF Technical Order 00-5-1, *Air Force Technical Order System*, 10.1.2. Notify flight management immediately following a deviation.

2.1.4. All explosive locations will have a minimum of two fire extinguishers rated 2A:10BC.

2.1.5. Restrict use of modern mobile emitters from within 10 feet of any exposed EED.

2.2. Transportation. The following procedures apply when transporting explosives.

2.2.1. There is no smoking allowed within 50 feet of explosive laden vehicles.

2.2.2. Do not load or unload explosives from a motor vehicle while the engine is running, except under emergency conditions. Diesel powered vehicles may continue to run during loading and unloading of explosives except when exposed explosives are involved.

2.2.3. Blasting caps, demolition material and unserviceable (but not dangerously unserviceable) munitions may be transported by the same vehicle, provided they are segregated to the maximum extent possible.

2.2.4. Transport only the minimum amount of explosive required to perform the operation.

2.2.5. The following is the minimum equipment required to transport explosives.

2.2.5.1. One first aid kit, large. Combat Life-Saver (CLS) bag is preferred.

2.2.5.2. Two each fire extinguishers rated 2A:10BC.

2.2.5.3. Communication equipment.

2.2.5.4. Tie down straps.

2.2.5.5. Wheel chocks.

2.2.6. Prior to use, inspect all vehicles used to transport explosives utilizing the AF Form 1800. The DD Form 626, *Motor Vehicle Inspection*, and DD Form 836, *Dangerous Goods Shipping Paper and Emergency Response Information*, will be utilized when transporting explosive off the Eglin Test and Training Complex (ETTC). Ensure all loads are secured prior to movement of vehicle.

2.2.7. An armed guard is required when transporting high-risk explosives off the ETTC.

2.2.8. Explosive laden vehicles will utilize the explosive movement routes to the greatest extent possible.

2.3. Emergency Procedures. In the event of an explosive mishap, all operations will cease until further notice.

2.3.1. Injury.

2.3.1.1. Render first aid, as applicable.

2.3.1.2. Notify the Emergency Communications Center (ECC) by the most expedient means available.

2.3.1.3. Notify the 96 CES/CC, 96 TW/SE and Unit Safety Representative (USR), as soon as possible.

2.3.1.4. Complete AF Form 978, *Supervisor's Mishap Report*, as soon as possible. Route completed from through 96 CES to 96 TW/SEG.

2.3.2. Area/Vehicle Fire.

2.3.2.1. Use all available means to extinguish the fire unless explosives are directly involved.

2.3.2.2. Immediately evacuate all non-essential personnel from the area.

2.3.2.3. Notify the ECC by the most expedient means available.

2.3.2.4. Notify the 96 CES/CC, 96 TW/SE and USR, as soon as possible.

2.3.2.5. Schedule time at least 24 hours after the fire has been extinguished to check the disposal location/detonation point

2.3.3. Ensure all first aid and/or firefighting equipment is reconstituted, as soon as possible.

2.3.4. In all emergencies, security of classified and protection of high-value resources is second only in priority to saving life, limb or eyesight.

2.4. Local Lightning Watch, Warning and Advisories. When operating on the ETTC, lightning monitoring and notification is primarily the responsibility of the Test Area Range Controller. When operating at other locations, on or off the ETTC, the EOD Team Leader is responsible for consulting the supporting weather unit and monitoring for advisories, watches, and warnings. The EOD Operations Section and or the Joint Test and Training Operations Control Center (JTTOC) monitor and notify personnel of hazardous weather conditions. The 96 OSS Weather Flight or the 26th Operational Weather Squadron may be contacted for weather information. Refer to Atch 3. Refer to AFMAN 91-201, *Explosive Safety Standards*, Section 7H – *Procedures in the Event of Electrical Storms*, for further information.

2.4.1. Weather Advisory. A weather advisory is a special notice to notify operational users of environmental conditions impacting operations. Team leaders will evaluate individual advisories and determine the potential impact on planned operations and whether to proceed, delay, or cancel those operations.

2.4.2. Lightning Watch. A lightning watch will be in effect 30 minutes prior to thunderstorms being within 5 nautical miles (5.75 land miles) of the affected area. If a lightning watch is issued, the team leader and or range safety officer will initiate an orderly termination of all explosive operations.

2.4.3. Lightning Warning. A lightning warning will be issued when lightning is within 5 nautical miles of the affected area. This may be observed by roughly a 28 second count of the observed lightning flash. Personnel will seek protective shelter immediately. An acceptable distance is equivalent to K24 and is calculated as 24 times the cube root of the NEW (24 x NEW ^1/3).

2.4.4. Areas not served by lightning warnings and watches. When operating in an area not served by the Air Force-approved local lightning warning system, explosives operations must be terminated before a thunderstorm is within 10 miles.

Chapter 3

TEST DIRECTIVES

3.1. General. This chapter outlines and establishes procedures for personnel using and creating Safe Handling and Recovery Procedures (SHRP) for testing of weapons systems on Eglin Ranges.

3.1.1. The SHRP is the EOD technical information and is an integral component of the overall test directive.

3.1.2. The EOD Test Directive (TD) Section is responsible for all SHRP development.

3.1.4. The application of a SHRP is to provide EOD teams with approved 96TW EOD procedures and information similar to 60 series for developmental test items.

3.1.4. SHRPs are required to be on range with the team during operations.

3.2. Responsibilities.

3.2.1. EOD Management will review and approve/disapproves all newly developed SHRPs.

3.2.2. Test Directives Section.

3.2.2.1. Assign SHRPs to a 7-skill level or qualified 5-skill level, with leadership coordination.

3.2.2.2. Ensure SHRPs are updated when email notifications are received from Eglin Livelink (https://livelink2.eglin.af.mil).

3.2.2.3. Track all SHRPS and maintain a historical archive for use during future range clearances and/or contractor projects on Eglin ranges through Livelink.

3.2.2.4. Coordinate with the EOD Operations Section to ensure appropriate representation at Safety Review Boards (SRB) and kick-off meetings.

3.2.2.5. The TD section is responsible for the maintenance, training, and operation of the AN/GJQ-34 Remote Fuze Disassembly System (RFDS).

3.2.2.6. Establish, maintain and delete all EOD Livelink user accounts.

3.2.3. EOD Team Leaders will ensure they have all applicable information available on range while supporting a test mission.

3.3. Test Directive Folder. Test Directive folders are established in a uniform manner for accuracy and standardization, all folders are created and maintained on Livelink (https://livelink2.eglin.af.mil/livelink/llisapi.dll?func=ll&objId=23896729&objAction=browse&viewType=1). All Test Directives are digital and accessed with tablets located in the TD's office or AEODPS laptops located in the vault.

3.3.1. Following is a list with a brief description of what should be included in each folder. Required templates are located at S:\Files\Test Directives\Procedures Library\Electronic Sharps\Templates.

3.3.1.1. Safe Handling and Recovery Procedures and Approval Cover Letter. Detailed procedures will be accomplished for all tests requiring EOD support; no generalized procedures will be included.

3.3.1.2. Test Directive Overview/SRB notes. This is a locally generated form highlighting information about the mission. Information is derived from a variety of sources including, the TD and appendices, notes from the Safety Review Board (SRB) and conversations with the Project Engineer. This form should be completed and signed upon initial receipt by the member assigned to that project.

3.3.1.3. Test History. This section is vital to the accuracy of the TD and continuity of the test. It will be annotated, signed and dated after every meeting, action or conversation with a Project or Test Engineer. It will also be used for entering detailed information about the events that occurred on a mission that a team has provided support to. As a minimum, include who was on the mission, what significant events took place during the mission and number of misfires or clean-up shots that took place. Be as descriptive as possible, and include any changes that may take place in the future, e.g. future SRBs, mission cancellations, etc.

3.3.1.4. Test Directive parent folder link. Test Directives are documents used by the 96 TW/CC to direct and authorize the conduct of a test program. It contains the detailed method of test and necessary supporting appendices such as Safety Appendixes (SA), contractor data, etc.

3.3.1.5. All technical information provided by the contractor, any photographs, diagrams and schematics used in developing a SHRP are also included in this folder.

3.3.2. All Tablets will be signed out on an AF Form 614, *Charge Out Record*. After mission completion, all Tablets will be returned to the appropriate slot in the server cabinet.

3.4. Test Directive Development Procedures.

3.4.1. An invite to Kickoff Meeting/SRB is sent and reviewed for its application to EOD procedures or support. Once the need for EOD support has been determined, the TD element will create a TD folder at S:\Files\Test Directives\Procedures Library\Electronic Sharps. All relevant documents, emails, etc. will be kept in this folder and transferred to Livelink once the SHRP is approved. The test is then assigned to an individual that will become the lead for any developments of the test.

3.4.2. The responsible individual will attend a kick off meeting, which will highlight the details of the test. During this meeting, all safety concerns should be addressed and any information that will be required from the contractor or Air Force personnel for the development of a SHRP should be requested. Request a source data package from the Test Engineer using the sample memorandum at S:\Files\Test Directives\Procedures Library\Electronic Sharps\Templates.

3.4.3. After receipt of the contractor data and before the SRB, the responsible individual will analyze the information to highlight any areas of EOD concern. Contractor data should be given to EOD 45 days prior to delivery of test assets.

3.4.4. The SRB is where principle members of the test come together to discuss resolutions to safety concerns of the test. The SRB must be attended by minimum 7-skill level SSgt or a member of the Test Directives Section.

3.4.5. A draft SHRP must completed no later than 5 duty days after SRB has concluded.

3.4.6. After development of a SHRP, the TD Section, Flight Management, and 96 TW Weapons Safety will review and sign via Livelink workflow process.

3.4.7. After the SHRP has been reviewed and signed by all required personnel a class will be given to shop personnel on the next training day.

3.5. Use of Test Directives for Range Missions.

3.5.1. No later than the day prior to an assigned mission, the team providing support to a JON will contact the project officer to get a schedule of events and compare that information to the contained in the EOD JON and parent TD folders and download all available information to a tablet for use on range, https://livelink2.eglin.af.mil/livelink. This is also the time to thoroughly review the SHRP, Method of Test (MOT), Safety Appendixes (SA), misc. supporting documents and review any referenced 60-series TOs and OIs.

3.5.2. If the SHRP requires the use of a 60-series TO to make the procedures complete, the team leader must ensure AEODPS is available while supporting the mission. This guarantees the latest revision of the applicable 60-series TO will be used on the next mission.

3.5.3. If a test mission utilizes non-modified production ordnance, a EOD JON folder will not be created and contain a MFR directing AEODPS use and a link to the parent JON folder at a minimum ; team will use 60-series TOs.

3.5.4. Upon completion of the test the team will accomplish the Test History and ensure they upload the changes to Livelink, return the tablet to the server cabinet and connect the LAN and power prior to leaving for the day. The history should include all information up to and including FOUO which will benefit teams on future missions and document test progression from an EOD standpoint.

Chapter 4

MUNITIONS STORAGE

4.1. Location. Explosive storage locations are Bldgs 1249, 1250, 1251, and 1252 in the Munitions Storage Area (MSA), and Bldg 1334.

4.2. Personnel limits. The explosive safety concept of minimum personnel on-site will be adhered to at all times.

4.2.1. Maximum. Limit entry in Bldgs 1249 Bays A, B and F, 1250, 1251 Bay A, and 1252 Bay B, to five personnel; one must be at least a 3E851 or a munitions account custodian.

4.2.2. Minimum. One person, who must be at least a 3E851 or a munitions account custodian, in Bldgs 1249 Bays A, B and F, 1250, 1251 Bay A, and 1252 Bay B while completing an inventory. Two personnel are required when moving explosives; one must be at least a 3E851.

4.2.3. There are no personnel limits in Bldg 1334.

4.2.4. The senior qualified EOD member will ensure compliance with all storage limitations.

4.2.5. Unescorted entry is limited to those listed on the entry authorization list (EAL).

4.3. Explosive Limits. Explosives are distributed between the munitions storage area and the EOD shop. The BSERV is used to store ready stocks of emergency response and training munitions.

4.3.1. Bldg 1249 (Bays A, B &F), 1250, 1251 and 1252. **Note:** Do not store HCD 1.1 in any bay in Bldg 1249 except Bay F due to compatibility issues.

Table 4.1. Authorized Storage Quantities Bldg 1249, 1250, 1251, & 1252.

NEW	1.1	1.2.1.	1.2.2.	1.2.3	1.3	1.4
1249	1800[1]	None	None	None	24,500	Capacity
1250	100,000	200,000	200,000	200,000	200,000	Capacity
1251	5,000	5,000	5,000	5,000	5,000	Capacity
1252[2]						

Note:

1 – HCD 1.1 will only be stored in Bldg 1249, Bay F, with coordination from Munitions Storage.

2 – Bldg 1252 is only used to store caliber .50 RAUFOSS rounds, HCD 1.2G at capacity.

4.3.2. Bldg 1334. **Note:** Only HCD 1.4 is authorized to be stored in Bldg 1334. Do not store HCD 1.1, 1.2 or 1.3 in Bldg 1334.

Table 4.2. Authorized Storage Quantities Bldg 1334.

NEW Limits	Mk 274[1]	Mk 275[2]	Mk 276[3]	Mk 277[4]	Mk 279[5]	Mk 280[6]	Med. Velocity	Shock Tube	9mm Ball	Cal .50 Blank
Cat D	40	60	50	60	0	0	50	5,000’	0	24
Cat T	40	40	40	40	40	40	40	5,000’	60	24
Note: 1 – Ultra Velocity; 2 – AVON; 3 – Low Velocity; 4 – Enhanced; 5 – Steel; 6 - Aluminum										

4.4. Safety Precautions and General Information.

4.4.1. Do not mix operational and training stocks. Operational stocks will be solely used for real-world operations.

4.4.2. BSERV stocks will be replaced as soon as possible.

4.4.3. EOD emergency response and training munitions expenditures will be reported to the EOD Resource Element after each operation.

4.4.4. Refer to emergency procedures listed in paragraph 2.3., as needed.

4.4.5. Storage bays will be kept clean and orderly; free of excess dunnage and debris.

4.4.6. Reseal and accurately remark the containers after the completion of each mission. Record the changes on the HE Inventory Sheet(s).

4.4.7. Inform the Primary Munitions Custodian of any shortages so orders can be made through the Munitions Operations Element.

4.4.8. Resources Section.

4.4.8.1. Ensure set-up boxes are stocked and ready for use. There will be at a minimum, three explosive set-up boxes; one for caps, one for igniters and one for time fuze.

4.4.8.2. Maintain an accurate count of all explosives on-hand, issued or expended; provide these figures to the Primary Munitions Custodian at the end of the week.

4.4.8.3. Ensure adequate levels of explosives are on hand to support normal operations.

4.5. Key Control. Keys for all EOD facilities containing High Risk Munitions require dual signatures.

4.5.1. Individuals withdrawing explosives must have their personal issue MSA access badges and Restricted Area Badge. Shop members that are on the key log will sign out all access keys from Munitions Control, Building 1108. The key access listing will be maintained by EOD Munitions custodians. Munitions Control will be given an updated copy monthly. After withdrawing explosives, all keys will be returned to Munitions Control by the same individual that signed them out.

4.5.2. Daily Operations.

4.5.2.1. Responsibility for withdrawing explosives falls on the teams.

4.5.2.2. Obtain all required keys from Munitions Control upon entering the MSA.

4.5.2.3. Only personnel listed on the Key Control Roster in Munitions Control will be allowed to sign out keys on the Key Issue Log.

4.5.2.4. Maintain positive control of all keys signed out.

4.5.2.5. When all explosives are accounted for (either consumed or returned) return all keys to Munitions Control and sign them back in on the Key Issue Log.

4.5.3. After-hours Operations. Coordinate with Munitions Control to pull keys after-hours. Contact the standby Munitions Controller or have the Command Post contact them.

4.6. Withdrawing Explosives. A minimum of two flight members are required to sign for explosives. One individual must be at least a 3E851.

4.6.1. Sign out keys to required buildings from Munitions Control.

4.6.2. Once at the storage facility, perform the following steps.

4.6.1.1. Shut off the vehicle, set vehicle parking brake and chock rear tire. Park vehicles not being loaded with explosives a minimum of 25 feet from storage facility.

4.6.1.2. Gain access to the required bays.

4.6.1.3. Secure all explosives in the vehicle cargo compartment, cover explosives with tarp and placard vehicle.

4.6.1.4. Ensure all explosives withdrawn are entered in the Explosive Control Log and signed for by two personnel.

4.6.1.5. Return any unused explosives in the same manner outlined above.

4.6.1.6. Ensure all storage facilities are secured when complete with operation.

4.6.1.7. Report all explosives expended or returned to the Resources Section.

4.6.3. Munitions containers will not be opened for the purpose of issuing items from storage locations.

4.6.4. The following operations are authorized in explosives storage spaces.

4.6.4.1. Palletizing, removing and replacing shipping crates incidental to transportation.

4.6.4.2. Replacing unserviceable strapping on boxes.

4.6.4.3. Opening outer containers to remove inner packages. Complete any further processing of these items in an approved operating location.

4.6.4.4. Opening “lite” boxes for inventory purposes.

4.6.4.5. Opening containers of HD 1.4 explosives to allow inventory. Unpack, inspect, and repack in the storage location if building content is limited to HD 1.4 items.

4.7. Gaining Access to Building 1250. Note: If the alarm malfunctions or the wrong code is entered causing the alarm to function while opening or securing the building, immediately contact the Security Forces desk utilizing the phone on the side of the building and identify yourself and your location. The phone numbers are written inside the cover. You will be tasked to authenticate your PIN.

4.7.1. Accessing Building.

4.7.1.1. Press face of touch screen to pull up keypad.

4.7.1.2. Enter the four digit building code number (located on wall above keypad) into the keypad.

4.7.1.3. Enter your three-digit personal identification number (PIN).

4.7.1.4. Press "ENTER" on the alarm system panel.

4.7.1.5. Screen will indicate that "Security is Off". If this does not work, repeat the above steps.

4.7.2. Securing Building.

4.7.2.1. Close door while remaining inside Building 1250.

4.7.2.2. Press face of touch screen, Press "Turn On" to turn on alarm.

4.7.2.3. Enter the four digit building code number located on wall above keypad and your three digit PIN.

4.7.2.4. Press "ENTER".

4.7.2.5. Screen will display "Arming in 40 Seconds" and begin counting down.

4.7.2.6. You should hear a continuous beep; exit the building and secure the door.

4.7.3. Entry under duress. At any time you come under duress, enter the four-digit duress code number into the keypad, then enter your three-digit PIN and press "ENTER" on the alarm system panel.

Chapter 5

SECURITY

5.1. Personnel.

5.1.1. A primary and alternate(s) Controlled Area Monitor, Key and Lock Custodian, and Safe Custodian will be appointed in writing.

5.1.2. The Controlled Area Monitor will conduct annual self-inspections and forward to security forces.

5.1.3. All assigned personnel will receive initial security training within 30 days of being assigned to the work center. Annual security training is also required. Documentation will be maintained by the Resource Protection Monitor. Combinations will be changed upon reassignment/separation of assigned personnel.

5.2. Facility.

5.2.1. Entry Authorization.

5.2.1.1. Building 1334 uses cipher lock secured doors to control entry. Additionally, the secure storage area in Bldg 1334 is secured with cipher lock (separate code) and an X-09 electronic lock. Inside the secure storage, the firearms vault with a GSA Class 5-A Armory Door and monitored intrusion alarm panel.

5.2.1.2. At no time will there be temporary access granted to the above areas.

5.2.1.3. Assigned personnel will not receive combinations until they have been properly trained on security measures, alarm systems, emergency procedures, and personal accountability. Training will be documented in the Resource Protection folder.

5.2.1.4. At a minimum, combinations will be changed when individuals PCS or separate.

5.2.2. Escorts. Escorts will verify that an official reason exists before allowing visitors actual entry into Bldg 1334 and or the secured storage area. Visitors will be escorted at all times by personnel granted unescorted access to the secure storage area.

5.2.2.1. Visitors will be logged on an AF Form 1109, *Visitor Register Log*.

5.2.2.2. Escorts will brief visitors where the designated smoking area is.

5.2.2.3. Escorts will brief visitors on emergency evacuation procedures and actions.

5.2.2.4. Escorts will accompany visitors until they depart the facility.

5.2.3. Emergency Procedures. Verify all emergencies prior to allowing unrestricted access. Once verified, emergency response personnel (e.g., security forces, medical technicians, fire protection, etc.) will be granted unimpeded access to controlled areas when responding to emergencies.

5.2.3.1. Personnel assigned to controlled areas will ensure all emergency response personnel and/or vehicles remain under constant surveillance except during evacuation.

5.2.3.2. Once the emergency situation has been terminated, the responding personnel will take a head count to ensure all personnel are accounted for prior to departing.

5.2.4. Evacuation. In the event of an evacuation from Bldg 1334, personnel will assemble at the evacuation location and the senior member present will account for all personnel. Notify Flight Management as soon as practical.

5.3. Combination and Lock Control.

5.3.1. Access to munitions facilities is defined as any structure or room assigned to the flight designed for munitions storage or maintenance. EOD Management will appoint the Combination and Lock custodians within the Flight. The EOD Flight Chief authorizes personnel to issue and/or receive Combinations to munitions facilities within the EOD facility. A master key system will be used for weapons racks located inside the Bldg 1334 weapons vault.

5.3.2. A mandatory semiannual inventory of keys and locks will be maintained.

5.3.3. Keys to weapon racks in Bldg 1334 weapons vault must be maintained separately from other keys and accessible to only those individuals whose official duties require access to them. A current roster or letter of these individuals must be kept with the key custodian. The letter or roster will be protected from public view.

5.3.4. Keys to weapon racks in Bldg. 1334 weapons vault must not be left unsecured or unattended at any time.

5.3.5. When not in use, keys to weapon racks can be stored in Bldg. 1334, rm. 120 in a designated safe and equipped with a GSA-approved, changeable combination lock.

5.3.6. Key control registers must be maintained on AF Form 2432, *Key Issue Log.* Accountability records must contain the name and signature of the individual receiving the key, date and hour of issuance, serial number or other identifying information of the key, signature of individual issuing the key, keys return date and hour and name and signature of individual receiving returned keys.

5.3.7. Locks must be secured when the area container is opened to prevent theft, loss, or substitution of the lock.

5.3.8. In the event of lost, misplaced or stolen keys, the affected locks or cores must be replaced immediately. The facility must be inventoried and guarded by owner/user personnel until the area can be properly secured.

5.4. Classified Material.

5.4.1. Ensure all classified media/hardware is properly marked and secured when not in use.

5.4.2. Notes prepared for classified briefings and training classes will be properly marked as derivative information according to DoDM 5200.01, Vol 1, *DoD Information Security Program: Overview, Classification, and Declassification*. They will be properly classified according to DoDM 5200.01, Vol 2, *DoD Information Security Program: Marking of Classified Information*.

5.4.3. Each classified computer will have an authorized user list indicating those individuals that have been granted access to the system.

5.4.4. Prior to beginning classified processing, doors and windows will be secured to prevent unauthorized viewing and a classified processing sign will be posted on the door.

5.4.5. Users must remain EMSEC conscious at all times and maintain at least one meter of separation between classified and unclassified equipment and six inches between classified and unclassified power and transmit lines.

5.4.6. Only process classified information on an approved computer system.

5.4.7. Do not move or rearrange classified systems without approval of the Computer System Security Officer (CSSO).

5.4.8. Do not place telephones, communications equipment, or any other non-TEMPEST electronics equipment within one (1) meter of any portion of the system. This includes government or personal cellular and or radio frequency (RF), infrared (IR) wireless devices, and other devices such as cell phones and tablets, and devices that have photographic or audio recording capabilities. Report this activity as a security incident if discovered.

5.4.9. Do not attach any peripheral device not listed in your original request for Designated Approving Authority (DAA) approval.

5.4.10. Control classified in a means to prevent unauthorized personnel from viewing it.

5.4.11. Refer to paragraph 6.9. for guidance in the event of fire, natural disaster, civil disturbance, terrorist activities, or enemy action based on the threats/risks of these incidents occurring.

5.4.12. Comply with the requirements in AFI 16-1404, *Air Force Information Security Program*, and AFMAN 17-1201, *User Responsibilities and Guidance for Information Systems*.

5.5. Weapons and Arming.

5.5.1. Accountability.

5.5.1.1. A monthly serialized inventory will be accomplished and annotated using the AF IMT 1473, *Gun Equipment Room Inventory*.

5.5.1.2. Issued weapons will be signed out using an AF IMT 1297, *Temporary Issue Receipt.*

5.5.1.3. Weapons and ammunition will be inventoried each time the safe is opened.

5.5.2. Handling of weapons.

5.5.2.1. Arming will be performed IAW AFMAN 31-129, *USAF Small Arms and Light Weapons Handling Procedures*.

5.5.2.2. Contact Base Defense Operations Center (BDOC) each time weapons are to be transported from the EOD facility and advise them when they have safely reached their intended destination.

5.5.3. Refer to emergency procedures listed in paragraph 2.3. to 2.5., as needed.

5.6. Duress Procedures.

5.6.1. Do not attempt to activate one of the duress switches unless you can do so without being detected. Make every effort to pass the wing duress code to munitions control, security forces, or any personnel available and capable of relaying your situation to BDOC.

5.6.2. When safe and practical to do so, dial 911 to alert security forces.

5.6.3. Involved personnel must follow the anti-robbery procedures contained in the emergency action checklist and this instruction.

5.7. Bomb Threat Procedures. In the event of bomb threat against the EOD facilities, perform the following minimum procedures.

5.7.1. Notification.

5.7.1.1. Complete the AF Form 440, *Bomb Threat Aid Card.*

5.7.1.2. Notify BDOC.

5.7.2. Evacuation.

5.7.2.1. Evacuate all personnel to the nearest EOD facility not affected by the threat.

5.7.2.2. Evacuate surrounding facilities, as deemed necessary.

5.8. Anti-Robbery Procedures. In the event of robbery, or attempted robbery, against the EOD facilities perform the following minimum procedures.

5.8.1. Actions.

5.8.1.1. Fake compliance and activate the duress alarm if safe to do so.

5.8.1.2. Observe physical characteristics of the perpetrator and determine direction and mode of travel.

5.8.1.3. Cease all activities and stand-by until a Security Forces patrol responds.

5.8.1.4. Perform a complete inventory of the affected asset(s).

5.8.2. Notification.

5.8.2.1. Notify the BDOC.

5.8.2.2. Complete the AF Form 439, *Robbery Checklist.*

5.9. Force Protection Conditions (FPCON). The EOD Operations Section is the focal point during periods of increased security.

5.9.1. During increased security measures the EOD Operations Section will issue instructions on proper procedures to follow.

5.9.2. All sections will take implement designated measures.

5.9.3. Any person discovering a possible or confirmed security violation will report their findings to the EOD Operations Section.

5.10. Intrusion Detection System (IDS). Personnel whose duties require them to access alarmed facilities will be trained in alarm access procedures by their duty section prior to being authorized to access to these facilities. Procedures listed below will be used for both alarm testing and inadvertent alarms.

5.10.1. Contact BDOC and inform them of your name, rank, organization, alarm account number, state your intentions to test the alarm system and prepare to authenticate using the matrix.

5.10.2. Maintain constant contact with BDOC during the testing process.

5.10.3. In the event an alarm fails testing, implement appropriate security measures through Munitions Control and immediately notify Civil Engineering to request a work order to effect repairs.

5.10.4. If an alarm will not reset after three attempts, personnel will immediately notify Security Forces and EOD Management who will call alarm maintenance.

5.10.5. If an alarm is still inoperative at the completion of the duty day, arrangements must be made to relocate assets or post guards for the facility.

5.10.6. Testing will be performed by quarterly and documented using an AF IMT 2530, *Alarm System Test Record*. Maintain the test record in Resources Protection Folder.

Chapter 6

RESERVED

Chapter 7

USE OF EOD TOOLS AT OFF-RANGE LOCATIONS

7.1. Personnel limits. The explosive safety concept of minimum personnel on-site will be adhered to at all times. Only two qualified EOD personnel will be present during capping-in procedures.

7.1.1. A minimum of two qualified EOD members are required to perform explosive operations. At least one member will possess a minimum 7-skill level.

7.1.2. The senior qualified EOD Craftsman/Supervisor/Officer will serve as the Range Safety Officer (RSO).

7.1.3. Casuals. Casuals are persons not normally part of an explosives operation but have duties that require their presence, such as quality assurance, medical, safety or inspection personnel. **Note:** When conducting live explosive operations, (e.g., EOD operations, range clearance, or other demolition and munitions destruction) emergency medical support must be available within 30 minutes while the operations are being performed. The medical support must be analogous to the expected trauma resulting from an accident.

7.1.4. Visitors. Visitors are non-essential personnel with limited access. Stop operations when visitors are present. Operations will not continue until all visitors are off the EOD range and outside the fragmenting AE hazard area of K328 minimum distance.

7.1.5. Visitors will be determined by the Team Leader/RSO.

7.2. Explosive Limits. EOD personnel may use the explosive items listed below for off-range training, inspection and evaluation operations. Quantities shown are the maximums authorized for each inspection or evaluation scenario.

7.2.1. Two .50 caliber impulse cartridges.

7.2.2. Two .50 caliber ball, M2 cartridges (projectile extracted).

7.2.3. Two electric or non-electric blasting caps.

7.2.4. Twenty feet of standard detonating cord (DODIC M456).

7.2.5. Thirteen feet of safety fuse.

7.2.6. Three M60 fuse lighters.

7.2.7. Three AN-M14 thermite grenades.

7.2.8. Five Percussion Actuated Neutralizer (PAN) cartridges.

7.2.9. Shock tube as required.

7.2.10. Igniters (Shock Tube Initiators, DODIC YY35), as required.

7.3. Authorized Tools. EOD personnel may use the tools listed below for off-range training, inspection and evaluation operations.

7.3.1. Mk 1 Remote Wrench.

7.3.2. Mk 2 .50 Caliber Dearmer.

7.3.3. Improvised Dearmer.

7.3.4. Robotic Platforms.

7.3.5. Percussion Actuated Neutralizer (PAN).

7.3.6. Explosively propelled water charges (commercially produced or improvised).

7.4. Location. Off-range training procedures utilizing live explosives may be conducted at any location on the installation so long as it is outside of any explosive prohibited zone and in a location free of fire hazards. Take positive measures to prevent collateral damage when operating tools inside a building.

7.5. Procedures.

7.5.1. Agencies listed in Attachment 3 will be notified prior to commencing the operation.

7.5.2. The Team Leader for the operation will ensure a pre-task safety briefing is delivered to all personnel present utilizing Attachment 2 and any item specific publications. Step-by-step procedures for completing the operation will be briefed by the Team Leader.

7.5.3. Place a minimum of three filled sand bags in front and behind tools that project slugs, fluids or shot to limit directional force. When utilizing a robotic platform, the requirement for three sandbags behind tools is eliminated.

7.5.4. Use only slugs that will disintegrate on impact.

7.5.5. Ensure the safety procedures and emergency procedures in Chapter 2 are adhered to.

7.5.6. Do not initiate explosive tools during exercises until authorized by the EOD evaluator.

7.5.7. Use only inert training ordnance or IED concealment devices.

7.5.8. Evacuate personnel to the applicable withdrawal distances required for an actual situation.

7.5.9. Maintain radio contact with the EOD Operations Section during the entire operation.

7.5.10. Ensure all the applicable tech data is on site prior to and during all explosive operations.

7.5.11. Ensure a suitable first aid kit and all safety equipment is on site prior to and during all explosive operations.

7.5.12. Control, or delegate control, of all firing devices during explosive operations.

7.5.13. Ensure all personnel are located in the safe area prior to initiation of tools or explosives.

Chapter 8

EGLIN AFB EOD PROFICIENCY RANGE

8.1. Personnel limits. Refer to paragraph 7.1.

8.2. Explosive Limits. A maximum of 2.5 lbs. net explosive weight for quantity-distance (NEWQD) IAW DDESB-approved site plan. Detonations in the scope of this chapter are only authorized in the predesignated destruction point within the six foot high barricade. Holding areas approved for 10lbs NEW each. Chapter 7 applies for operations conducted outside of the barricade.

8.3. Location. The Eglin AFB EOD Proficiency Range is located at approximately crash grid 6.5, F.5 in the area commonly referred to as Base Tango, or the former Ground Combat Training Squadron Exercise Site. MGRS coordinates are 16REU 43357116.

8.4. Required Equipment. The following minimum equipment is required during all range operations.

8.4.1. EOD Range Book.

8.4.2. Two (2) each portable radios with spare batteries.

8.4.3. First aid kit.

8.4.4. Demolition gear/kit.

8.4.5. Two (2) each fire extinguishers rated 2A:10BC.

8.5. Procedures.

8.5.1. Complete notifications as prescribed in Attachment 3 prior to conducting operations.

8.5.2. Firefighting equipment will be available on the range.

8.5.3. The Team Leader for the operation will ensure a pre-task safety briefing is delivered to all personnel present utilizing Attachment 2 and any item specific publications. Step-by-step procedures for completing the operation will be briefed by the Team Leader.

8.5.4. Munitions will be maintained in the designated holding areas until ready for use.

8.5.5. Ensure the range flag is flown for the duration of the operation.

8.5.6. Maintain radio contact with the EOD Operations Section during the entire operation.

8.5.7. Ensure the safety procedures and emergency procedures in Chapter 2 are adhered to.

8.5.8. Compensatory measures.

8.5.8.1. Ensure all entrances to the EOD range are closed or blocked prior to detonation.

8.5.8.2. Notify AAFES Shoppette, 850-651-6741 and Eglin Elementary School, 850-833-4320.

8.5.8.3. Post personnel along the running path at north end of training area and main vehicle entrance along Shoppette exit road to alert others of explosive operation and potential for loud noise.

8.5.8.4. Request that the Command Post sends out a base-wide notification.

8.5.9. Evacuate personnel to the applicable withdrawal distances required for explosives or tools used.

8.5.10. Do not initiate explosives or tools during exercises until authorized by the EOD evaluator.

8.5.11. Ensure all the applicable tech data is on site prior to and during all explosive operations.

8.5.12. Control, or delegate control, of all firing devices during explosive operations.

8.5.13. Ensure all personnel are located in the safe area prior to initiation of tools or explosives.

8.5.14. Ensure munitions expenditures are promptly reported to the EOD Logistics Element.

Chapter 9

EGLIN TEST AND TRAINING COMPLEX RANGE OPERATIONS

9.1. Personnel limits. The explosive safety concept of minimum personnel on-site will be adhered to at all times when operating on the ETTC Range. Allow only essential personnel down range during munitions preparation operations. Only two qualified EOD personnel will be present during capping-in procedures. Only one EOD Technician will check the detonation location following a shot.

9.1.1. Test Support and Open Burn/Open Detonation (OB/OD). A minimum of two EOD technicians (one 7-skill level and one 5-skill level) will support scheduled tests. A 5-skill level SSgt may be used as a team leader if all 7-skill level requirements have been met with the exception of 7-skill level school and the individual is task qualified. Any 3-skill level, qualified on tasks pertaining to the mission, may be used in place of 5-skill levels, as long as a 7-skill level acts as Team Leader for the operation. For operations performed on static fire ranges, one EOD technician will act as the safety backup. During periods of low manning, two qualified 5-skill levels may support missions when approved by flight management.

9.1.2. Range Clearance, Demolition and Recovery. EOD requirements are the same as listed in 9.1.1.

9.1.2.1. Limit maximum participants to a number consistent with a safe and efficient operation.

9.1.2.2. Minimum EOD technician to non-EOD technician (workers/test support personnel) ratio during range clearance operations is 1/5.

9.1.3. Escort Missions. A minimum of two EOD technicians (one 7-skill level and one 5-skill level or one 3-skill level qualified on tasks pertaining to mission) will support scheduled missions. Qualified 5-skill levels may Team Leader missions if approved through flight supervision. **Note:** For escort missions not involving demolition operations, a 5-skill level qualified on tasks pertaining to mission may serve as Team Leader without explicit flight supervision approval.

9.1.4. Operations Section. The EOD Operations Sections will be monitored at all times when an EOD team is operating on the ETTC Range. Deviations for special circumstance will only be approved by flight management.

9.1.5. The senior qualified EOD Craftsman will serve as the Range Safety Officer (RSO).

9.1.6. Visitors/casuals will be determined by the Team Chief/RSO.

9.2. Explosive Limits. A maximum of 3,000 lbs net explosive weight (NEW) of class/division 1.1 and 1.2. Notify Site C-6 anytime a controlled detonation on the Eastern Complex exceeds 1,000 lbs NEW during the months of November through March. Do not exceed 2,000 lbs NEW during low cloud cover or other unfavorable weather conditions.

9.3. Location. The ETTC Range land area is 724 square mile area in Northwest Florida.

9.3.1. General. The specific location and or target will be specified by range scheduling and through the daily operations order in the EOD Operations Section.

9.3.2. OB/OD. Conduct open detonations within the marked areas on ranges C-52N and C-62 only. Conduct open burns in the Transportable Burn Kettle Processor (TBKP) on range C-62 only.

9.4. Procedures.

9.4.1. A copy of the test directive and associated publications will be carried on all test support missions. Consult with the project officer and the EOD Operations Section to ensure mission requirements have not changed at least 24 hours prior to assigned mission.

9.4.2. The Team Leader for the operation will ensure a pre-task safety briefing is delivered to all personnel present utilizing Attachment 2 and any item specific publications. Step-by-step procedures for completing the operation will be briefed by the Team Leader.

9.4.3. Check in with range controller upon arrival.

9.4.4. Inform the range controller and the EOD Operations Section when complete. Upon return to the shop, fill out the TD history and mission slip. Return the TD to file, mission slip to operations, and brief operations on any unusual incidents. If the same project is scheduled for the next day, contact the appropriate team and brief on planned activities

9.4.5. Explosive operations will not commence until 1/2 hour after sunrise. Explosive operations will cease 1/2 hour prior to official sunset. **Exception:** coordinate with 96 TW/SEW for any necessary explosive operations during darkness.

9.4.6. Obtain clearance from the Joint Test and Training Operations Control Center (JTTOC) prior to initiating any shot. JTTOC can be reached via radio call sign "Wolfcall" or via the range controller. If range controller is unavailable, request a clearance directly from JTTOC or via EOD Operations. For unscheduled missions, request "Z" clearance. Notify JTTOC upon entering and exiting designated clearance area.

9.4.7. Observe withdrawal distances IAW Attachment 7, or approved SHRP.

9.5. Static Fire Range Procedures. These procedures apply to exploding bridge wire (EBW) firing systems including, but not limited to, High Voltage Firing Sets (FS).

9.5.1. Safety Precautions.

9.5.1.1. Wait 30 minutes for EBW system misfires. After applicable wait time, one EOD technician, with a second technician acting as a safety backup, will approach the test munition(s) to determine what caused the misfire.

9.5.1.2. Prior to returning the arm/safe key(s) to the designated fire control system operator, ensure all personnel have returned to the range firing bunker or safe area and the range controller can account for everyone involved with the mission.

9.5.1.3. In the event of an aborted firing attempt, if system has been charged, wait 5 minutes prior to handling. Do not reinsert shorting plug if it is removed prior to wait time as the circuit may fire.

9.5.1.4. If initiating devices were installed and can be removed, do so prior to connecting test item to firing line. If they cannot be removed, the EOD Team Leader can elect to have a lead wire installed onto the EBW to allow personnel to utilize protective cover before final hookup to the firing system.

9.5.1.5. All systems must have the capability to monitor voltage on the capacitor discharge unit.

9.5.2. Procedures.

9.5.2.1. Review hookup/arming procedures with electronic technicians who set up firing system prior to hooking up live components.

9.5.2.2. Ensure firing system is/has been tested.

9.5.2.3. Ensure range console arm/safe switch or control box is in the "SAFE" position

9.5.2.4. Obtain firing system and/or x-ray key(s). Maintain control of key(s) until ready to fire shot.

9.5.2.5. Ensure shorts, shunts, or physical disconnects are in place. 9.5.2.6. Clear unnecessary personnel from the test site and verify clearance has been obtained from the range controller.

9.5.2.7. Perform continuity check of initiation device(s).

9.5.2.8. Connect initiating device(s) to main firing line. Install the initiating device(s) into the munition(s).

9.5.2.9. Remove shorts, shunts, or physical disconnects in the order indicated during the walk through.

9.5.2.10. Return to the main firing bunker and report to the range controller/designated firing system operator. After accounting for all personnel, return the console key(s) and shorts, shunts or physical disconnects, if applicable, to the fire system operator.

9.5.2.11. After the shot, obtain console firing keys and x-ray system key, if applicable. Clear down range area of explosive hazards before allowing project/range personnel to enter area.

9.5.2.12. When second event systems are integrated into the firing circuit, they must be disconnected prior to final hookup. This isolation must be at sufficient distance from the shot so personnel reconnecting the second event system will be protected if the shot inadvertently fires.

9.5.3. Misfire Procedures.

9.5.3.1. Obtain the short to discharge plug(s)/key(s) from the range controller.

9.5.3.2. Ensure firing line is disconnected/shorted in control, if applicable.

9.5.3.3. Observe voltage monitor to ensure voltage drops off of the system.

9.5.3.4. Observe a 30 minute wait period.

9.5.3.5. Proceed down range. Insert the shorts, shunts, or physical disconnects, if applicable.

9.5.3.6. Remove the EBW detonator from the main charge/test item or disconnect EBW detonator from firing circuit if EBW cannot be removed from item.

9.5.3.7. Investigate reason for misfire before proceeding with any other shots.

9.5.3.8. Refer to Chapter 2, as needed.

9.5.4. Emergency Procedures.

9.5.4.1. Perform immediate care procedures for injured personnel. First Aid kits are located in each of the EOD truck tool kits.

9.5.4.2. Check for other hazards in the area and evacuate to safe location, if necessary.

9.5.4.3. Notify supporting agencies, including the EOD Operations Section on the Primary EOD net, Range Control (call-sign Wolfcall) on the WOLFCALL net or the appropriate range controller (e.g., 72 Control) on the frequency in use at the location of the emergency.

9.5.4.4. Secure the site and unused explosives for later investigation or storage.

9.5.4.5. If appropriate, coordinate Life Flight or ambulance evacuation of injured personnel through Range Control or EOD Operations. EOD Operations maintains locations on the Eglin Range complex capable of handling helicopter extraction.

9.6. Disposal of Unexploded Munitions.

9.6.1. Make positive identification before moving any munitions item by hand.

9.6.2. Dispose of in place or clearly mark for later disposal dud munitions that cannot be safely moved.

9.6.3. Expose the munition fill at nose and tail of all inert bombs prior to removal from range or transportation to scrap yards. **Exception:** Not required for BDU-50s.

9.6.4. Probe BDU-33 and MK-106 practice bombs IAW TO. Segregate and detonate bombs containing live spotting charges prior to removal from range.

9.7. Priming Operations.

9.7.1. Maintain a minimum distance of 100 feet between sites used to prepare charges and the closest known dud.

9.7.2. Do not exceed a maximum of 25 individual shots per operation.

9.7.3. The maximum number of shots to be placed by any one individual is five.

9.7.4. Do not use trucks to transport primed charges.

9.8. Recovery of Munitions from Ranges.

9.8.1. Recovery.

9.8.1.1. Coordinate the use of heavy equipment for excavation on any Eglin testing area with 96 TW/SE. Do not attempt recovery of ordnance from below the surface in areas where live ordnance may exist except as specifically approved.

9.8.1.2. Subsurface Recovery.

9.8.1.2.1. If using heavy equipment (manually operated) to gain access to inert munitions suspected of containing live fuzing, dig to within 2 feet (no closer) of buried munitions.

9.8.1.2.2. The excavation should be 4 feet in diameter for every 1 foot of depth and be of a sufficient size to permit easy access by EOD personnel. Accomplish final excavation manually, conduct additional probing as required. **Note:** If in the opinion of the senior EOD technician present, hazards exist such that safe access to the munition/fuze cannot be performed, the item will not be recovered.

9.8.1.2.3. Perform recovery of inert munitions (identified by known mission or test with which the item is associated) with inert fuzing by manual or mechanical means.

9.8.1.2.4. Perform recovery and fuze removal of inert munitions with live fuzes and inert boosters (known by the mission) by manual means only if the fuze is hand-safe. Remotely perform recovery and fuze removal of inert munitions with live fuzes and inert boosters (not hand-safe) or with live fuzes and live boosters unless otherwise stated in TDs or approved by 96 TW/SEW.

9.8.1.2.5. Do not manually recover live bombs or other live munitions suspected of containing live fuzes and live boosters, especially fuzes containing delayed action or cocked striker. Accomplish recovery of such items with special equipment so EOD procedures can be completed remotely.

9.8.2. Assumption of liability for damages and replacement costs for robotics systems should be addressed at test planning meetings or Safety Review Boards prior to the commencing of operations. If assumption of liability has not been confirmed, ensure the project officer is aware that future support could be impeded in the event of robotics system damage.

9.8.3. Demilitarization. Accomplish demilitarization of munitions items that could possibly contain or disclose classified components or information.

9.9. Range 74. Operations typically consist of recovery of fuzes, disposal of explosives residue and disposal of dud fired rocket motors. After check-in with the range and receiving mission support requirements from the range controller or test officer, stand by until assistance is requested. Contractor personnel are responsible for preparation, final hook-up and misfires of test items on the sled track.

9.10. Open Burn/Open Detonation. This paragraph outlines and establishes procedures for Open Burn/Open Detonation (OB/OD) operations on the ETTC Range. These procedures are formulated to provide a safe and efficient method for conducting explosive disposal operations on Eglin Test and Training Complex ranges.

9.10.1. Munitions disposal operations are normally conducted for units assigned to Eglin AFB on a quarterly basis.

9.10.2. Special disposal operations may be scheduled to meet the needs of Eglin AFB generators. Any military organization outside Eglin AFB that wishes to use the Eglin munitions disposal facility must have a current support agreement. Special disposals will not be arranged for these outside agencies, but they will be given the opportunity to participate in disposals for Eglin AFB units. The term Ammunition Disposal Request (ADR) hereafter is synonymous with OB/OD operations.

9.10.3. Responsibilities.

9.10.3.1. EOD Management. With the guidance of the base environmental office, ensure that an authorized disposal facility is available for use on Eglin AFB. Also ensure that personnel are sufficiently trained to conduct safe and legitimate disposal operations.

9.10.3.2. EOD Operations Section. Serve as focal point for all disposal operations. Coordinate and schedule with required outside agencies. Act as the focal point for all questions regarding which items may or may not be destroyed in accordance with the range permit.

9.10.3.3. EOD Flight Environmental Coordinator (FEC). Arrange for recovery and analysis of residue when necessary. Residue from the Transportable Burn Kettle Processor (TBKP) will be placed in a 55-gallon drum and base environmental will be notified. This will normally be required for open burn operations only. Provide an initial (within six months of employment) and annual briefing to all EOD Flight personnel on local procedures for conducting ADRs on Eglin Air Force Base and serve as the training focal point for all personnel requiring ADR Team Leader Certification.

9.10.3.4. EOD Team Leader for the ADR. Ensure that all safety and documentation requirements are met. Inventory all munitions designated for disposal by the generators.

9.10.3.5. Munitions Generators. Ensure that all required documentation is completed correctly prior to transporting munitions to the range for disposal. Transport or arrange for transport munitions to the disposal facility.

9.10.4. Documentation. The documents listed in paragraphs 9.10.4.1. through 9.10.4.4. are the generator's responsibility. If not properly prepared, the associated munitions will not be destroyed.

9.10.4.1. AF Form 191, *Ammunition Disposition Request* and DD Form 1348-1, *DoD Single Line Item Release/Receipt Document*. Military munitions items marked for disposal must have required supply documentation (AF Form 191 and DD Form 1348-1 or service equivalent).

9.10.4.2. High Explosive Research Development (HERD) Explosive Waste Manifest. Test munitions items from the Energetic Materials Branch of Wright Laboratory are normally listed on the High Explosive Research Development (HERD) Explosive Waste Manifest with no accompanying supply documentation.

9.10.4.3. Environmental Protection Agency (EPA) Form 8700-22, *Uniform Hazardous Waste Manifest* and DRMS Form 1851, *Restricted Waste Notification*. If the waste explosive material is not a specific munitions item and use of DoD shipping controls is not appropriate, the required documentation is Environmental Protection Agency Form 8700-22 and DRMS Form 1851.

9.10.4.4. Other acceptable and commonly used form are the DD Form 1907, *Signature and Tally Record*, SF 1103, *U.S. Government Bill of Lading*, and SF 1109, *U.S. Government Bill of Lading – Continuation Sheet*.

9.10.4.5. Explosive Ordnance Disposal Incident Management System (EODIMS) Report. Complete an EOD Report using the Explosive Ordnance Disposal Incident Management System (EODIMS) database, for each disposal operation. Include an accurate list of items destroyed and a brief narrative describing the operation. Prepare and submit two copies of each of the following forms for base environmental and the FEC. Attach the forms electronically to the EODIMS report.

9.10.4.5.1. Cover sheet listing quantity treated provided by the FEC.

9.10.4.5.2. EPA Form(s) 8700-22.

9.10.4.5.3. DRMS Form(s) 1851.

9.10.4.5.4. AF IMT 3803, *Surface Weather Observations.*

9.10.4.5.5. Site Inspection Record (Attachment 5).

9.10.5. Sequence of Events. See Attachment 6.

9.11. Emergency Procedures. Refer to Chapter 2.

9.11.1. Perform immediate care procedures for injured personnel. First Aid kits are located in each of the EOD truck tool kits.

9.11.2. Check for other hazards in the area and evacuate to safe location, if necessary.

9.11.3. Notify supporting agencies, including the EOD Operations Section on the Primary EOD net, Range Control (call-sign Wolfcall) on the WOLFCALL net or the appropriate range controller (e.g., 72 Control) on the frequency in use at the location of the emergency.

9.11.4. Secure the site and unused explosives for later investigation or storage.

9.11.5. If appropriate, coordinate Life Flight or ambulance evacuation of injured personnel through Range Control or EOD Operations. EOD Operations maintains locations on the Eglin Range complex capable of handling helicopter extraction.

9.12. Guidance and Publications. The following publications and guidance provide details on EOD support to the ETTC RANGE. All assigned personnel will become familiar with the contents. They can be located at S:\Files\Operations\Pub & Guide Library\Range Documentation

9.12.1. AFI 13-212 V1, *Range Planning and Operations*.

9.12.2. EGLINAFBI 13-204, *Eglin Range Mission Scheduling and Control.*

9.12.3. EGLINAFBI 13-212, *Range Planning and Operations*.

9.12.4. Eglin Comprehensive Range Plan (CRP).

Chapter 10

ROBOTICS

10.1. General. The Robotics section is responsible for all remote recovery and remote disassembly operations developed and employed. The operation of DoD unique, locally developed, large platform robotics requires additional guidance to be set forth in this FOI. Safety standards have been created to address new hazards, and directives have been created to address new robotic capabilities. This chapter will be utilized in conjunction with applicable technical manuals and publications.

10.2. Responsibilities.

10.2.1. Flight Management. Reviews and approves training standards for unique robotic platforms and tools.

10.2.2. Robotics Section. Perform all robotic platform remote recoveries and/or disassembly of test munition ordnance items to include pre- and post-operational checks of robotic platforms and oversee the outsourcing of required maintenance and/or repairs as required.

10.2.3. Electronics Technicians. Execute design, procurement, construction, maintenance, and troubleshooting of electronics packages and modifications. Manage Precision Measurement Equipment Laboratory (PMEL) account, bench stock, HAZMAT, and Radio Frequency Authorization (RFA) accounts.

10.3. General Procedures.

10.3.1. Prior to commencing robotic operations the Team Leader will conduct a risk management (RM) assessment utilizing, SHRPs, JEOD 60-series T.O.s, commercial off- the-shelf (COTS) publications, Team Leader guides and locally developed procedures

10.3.2. Applicable T.O.s and locally developed checklists will be on-site and utilized when performing any operations, including maintenance and training.

10.3.3. All procedures will be observed to the fullest extent possible. Only the most senior ranking individual may authorize deviations and must perform applicable RM.

10.3.4. Ensure the area surrounding the robotic platforms is clear prior to commencing operations. A 20 foot clear zone will be maintained around the All-Purpose Remote Transport System (ARTS) and a 40 foot clear zone will be maintained around the excavator.

10.3.5. Store platforms in climate controlled/environmentally protected spaces, to the maximum extent possible.

10.3.6. Use only one spotter. If hand signals are not understood the operator and spotter will seek clarification prior to continuing the operation. Cease all vehicle movement if anyone besides the spotter or operator is within the safety zone of the vehicle. The spotter will remain clear of the platform while it is in operation and avoid any position between the vehicle and another obstacle. The operator will remain in the vehicle to maintain control while it is running unless manual controls/levers are disabled (via ignition or hydraulic disconnect).

10.3.7. If the spotter or a worker is required to move within the safe distance to communicate or alter something, the operator will disengage the hydraulics and remove his hands from the controls and show safe by keeping his/her hands in view of the spotter to show safe. The only exception to “showing safe” is when the operator must maintain control of the equipment to combat drift. Movement into the safety zone in those circumstances will be kept to the bare minimum to meet mission needs if a suitable work around cannot be found.

10.4. All-Purpose Remote Transport System (ARTS).

10.4.1. **ARTS Safety Precautions**.

10.4.1.1. A minimum of two people required when attaching and detaching the platform accessories. Personnel are permitted to mount and manually operate the ARTS only to conduct limited movement of the unit for transportation loading/unloading, EOD attachment mounting/dismounting, or maintenance operations such as refueling.

10.4.1.2. Prior to approach the vehicle during a remote or tether operation, the operator must turn the IOCS or Tether’s actuator switch to Off and give a verbal confirmation (in person or via voice radio) prior to approach. Upon approach, the actuator switch on the Platform Mode Control Station must be switched to the Off position. The operator is not to touch any other control until the down range team gives a verbal confirmation that it is safe to do so. The operator must still watch the video feed and sensor readings (if available) during this time and use the emergency stop if a dangerous condition arises.

10.4.2. **Predator Arms Safety Precautions**.

10.4.2.1. Maintain a 10ft, 270 degree clear area around arms chassis when hydraulic motor is powered. Arms move with enough force to cause serious injury.

10.4.2.2. Attach mounting braces prior to transit, and remove before operation. Do not stand in front of the arms when removing braces as they may fall.

10.4.2.3. Be sure to properly connect hydraulic feed and return lines when attaching arms chassis to ARTS. Improperly connecting lines can cause serious damage to hydraulic motor and manipulator arms.

10.4.2.4. Do not over-tighten mounting braces. Tightening the braces beyond the arm’s shoulder maximum will cause severe damage to internal components.

10.4.3. Predator Arms Procedures.

10.4.3.1. When connecting and disconnecting the arms inside of a Bldg or structure the spotter will gain as much safe distance as possible without compromising his responsibility to the manual operator of the platform.

10.4.3.2. The operator will maintain control of the vehicle and remain seated. The operator will NOT exit the vehicle to assist with attaching/detaching the accessory. The operator will not make any movement with the vehicle that the spotter did not command. The spotter will remain cognizant of crush or pinch hazards.

10.5. Excavator.

10.5.1. **Safety Precautions**.

10.5.1.1. An active spotter is required to be in view of the operator for transporting, loading/unloading, and any movement with an obstacle within 40ft other than manual digging operations

10.5.1.2. Avoid contact with power lines and other overhead obstacles. Death or serious injury could result.

10.5.1.3. Make sure the work site has sufficient strength to support the weight of the machine. Do not dig under the machine.

10.5.1.4. When working close to an excavation site, position the machine with the propel motors in the rear.

10.5.1.5. When operating on a slope, keep the bucket low to the ground and close to the machine. The tracks should also be pointed uphill.

10.5.1.6. When climbing or descending a hill keep the bucket on the uphill side. If the machine begins to slip or becomes unstable, lower the bucket.

10.5.1.7. Do not drive the vehicle with any hydraulic cylinder fully collapsed or extended. Sudden physical shock to the vehicle could cause mechanical damage.

10.5.2. Procedures.

10.5.2.1. Prior to approaching the vehicle during a remote operation, the up range operator must completely release the joysticks, put the foot pedal direction slider in parked, and give a verbal confirmation (in person or via voice radio) prior to approach. The operator must watch the video feed and sensor readings (if available) during this time and use the emergency stop/ignition switch if a dangerous condition arises. The operator is not to touch any other control until the team leader gives a verbal “all clear”. Prior to performing the actions required, only one person will approach the platform within the safety zone and their first action will be to disengage the remote switch located in the cab.

10.6. Remote Bandsaw.

10.6.1. **Safety Precautions**.

10.6.1.1. Disconnect bandsaw from power source prior to servicing, to include blade changes.

10.6.1.2. Do not force the band saw to close; allow the bandsaw to drop utilizing the pneumatic feed rate mechanism.

10.6.1.3. Do not use blades that are dull, cracked, badly worn or have missing teeth.

10.6.1.4. Remain clear of the blade and motor mechanism, to include clothing and personal items, when starting.

10.6.1.5. Gloves and safety glasses are required when replacing the blade. Carefully un-coil replacement blades as they may spring away from your grip. Ensure teeth face towards the object to be cut and the blade is installed in the correct cutting direction.

10.6.1.6. Secure item to be cut utilizing available clamps or other improvised means.

10.6.1.7. Loose or unsupported items may jeopardize machine stability, eject as a projectile, or cause machine to resonate, tip, or fall.

10.6.1.8. Only use water for lubrication. Oil or other lubricants will cause the bandsaw's internal mechanics to fail and can also ignite the lubricant from friction.

10.6.2. Procedures.

10.6.2.1. Withdrawal distances will be based on the ordnance or fuze encountered using a K-factor of 328 (K328) if the TD does not specify, while still utilizing adequate frontal and overhead cover.

10.6.2.2. Calculate the fall rate prior to securing ordnance in the bandsaw to ensure you can attain safe separation prior to the blade cutting into the ordnance once secured (it should be barely visible). Too fast of a fall rate can also cause the bandsaw to resonate/bounce violently on the item.

10.6.2.3. For operation, maintenance, storage, operation and transportation refer to the appropriate owner's manual and locally developed guide.

10.7. Transportation.

10.7.1. Members must be currently licensed on the respective vehicle and trailer prior to operation.

10.7.2. The ARTS should only be manually operated to perform transportation loading/unloading, attachment mounting/dismounting, or maintenance operations.

10.7.3. The excavator must be operated manually by trained individuals during loading/unloading required for transportation. Contracted personnel retained to transport the excavator for operational or maintenance purposes may not have proper qualifications for operating but can be used for spotting.

10.7.4. When transporting the Predator arms, ensure the manipulator arms are stowed and secured with the mounting equipment (turnbuckles or straps may be used in an emergency, but do not over-tighten). Failure to do so may cause the arms to drift, collide with other objects, or swing outside the trailer. Using improper mounting equipment or techniques can damage the arms or its internal components.

Chapter 11

RADIATION AND LASER SAFETY

11.1. General. This chapter provides guidance on the minimum requirements for ensuring radiation and laser safety. This chapter also establishes procedures for meeting the supervisor and employee responsibilities IAW AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health program,* AFI 48-139, *Laser and Optical Radiation Protection Program,* AFI 48-148, *Ionizing Radiation Protection*, and applicable Eglin AFB supplements. **Note**: EGLINAFBI 48-102, *Non-Ionizing Radiation Control Program*, and EGLINAFBI 48-103, *Ionizing Radiation Control Program* were rescinded in August 2016. Both will be replaced by AFI48-109_EAFBSUPP and AFI48-139_EAFBSUPP but as of the drafting of this OI, both are in draft form in the review process.

11.2. Responsibilities.

11.2.1. Unit Radiation Safety Officer (RSO) and Laser Safety Officer (LSO).

11.2.1.1. The RSO and LSO will be appointed in writing by the unit commander. A copy of the appointment letter will be maintained in the Radiation Safety Program binder. 11.2.1.2. Receive and document training from the Bioenvironmental Engineering (BEE) Radiation Protection Element.

11.2.1.3. Review the contents of this chapter on an annual basis and update as operations change. Any and all changes must be forwarded to BEE.

11.2.1.4. Perform unit initial and annual training specific to the radiation, laser, and radiofrequency radiation (RFR) hazards that apply to the workers. Ensure training is documented in each individual's AF Form 55.

11.2.1.4. Inform BEE prior to using any new system or employing changes in existing operations. This includes, but is not limited to, changes in Bldg layouts, exposure times, operating parameters, or any other requirements change that could alter the accuracy of hazard surveys.

11.2.1.5. Report any suspected or actual over-exposure to BEE immediately.

11.2.2. Supervisors.

11.2.2.1. Ensure all workers have been trained prior to authorizing them to use systems.

11.2.2.2. Inform unit RSO/LSO and BEE prior to operating a new system to ensure a risk assessment is completed.

11.2.2.3. Mark all radiation hazard areas adequately. Ensure hazards are clearly stated, and positive control is maintained over the hazard area at all times.

11.2.3. Workers.

11.2.3.1. Follow all established procedures, manufacturer data, technical orders, and applicable regulatory standards.

11.2.3.2. Ensure all safety precautions and required hazard areas are marked as required prior to operating systems. Never operate a system without prior training on operating procedures and hazards.

11.2.3.3. Report any hazardous conditions, suspected or actual over-exposures to supervisors, unit RSO/LSO and BEE immediately.

11.3. Procedures. The sources used by EOD personnel are used during emergency response, training for emergency response, and maintenance and calibration of response equipment activities. The following minimum procedures apply.

11.3.1. Personnel use robots to X-ray unidentified packages to determine if there are explosives present. A spotter and warning signs are placed around the area to ensure hazard area is secure. Additionally, the robot communicates through RFR emitters. These emitters are placed on a vehicle that is 15 feet high, and the RFR hazards have been determined by BEE to be minimal. If the package is suspected of containing a radioactive source, the ADM-300 or IdentiFINDER can be utilized as well.

11.3.2. Source Specifics:

11.3.2.1. XRS-3, X-Ray Source. The XRS-3 is a small, lightweight, pulsed x-ray generator that operates using a removable battery. It creates pulses of very short duration (50 nanoseconds) at a relatively low dose rate with up to 270 KVP of energy

11.3.2.1.1. It is unlawful to use this equipment to intentionally expose humans or to use it for medical radiography.

11.3.2.1.2. Untrained and unauthorized personnel must not have access to this device.

11.3.2.2. The IdentiFINDER. The IdentiFINDER is a hand held gamma spectrometer used to locate, identify, measure dose/dose rate and verify neutron presence. It contains a Cs-137 cesium source and uses Ba-133 barium, Cd-109 cadmium, Co-57 & 60 cobalt, Eu-152 Europium, Mn-54 manganese, and Na-22 sodium for calibration.

11.3.2.3. ADM-300, Radiac Set. The ADM-300 is a hand held radiation detection and dose/dose rate measurement device for alpha, beta, gamma, and x-ray. The ADM-300 uses Cs-137 cesium and Th-232 thorium for calibration.

11.4. Precautions.

11.4.1. These sources must always be stored securely in a previously identified and approved area.

11.4.2. Use sources only as directed for calibration, and always return them to the storage area.

11.4.3. Ensure nitrile rubber gloves are used if handling of button sources is required, and immediately wash hands after use.

TYRONE C. MANEGDEG, Maj, USAF
Commander

Attachment 1

GLOSSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

DoDM 5200.01, Vol 1, *DoD Information Security Program: Overview, Classification, and Declassification,* 24 February 2012

DoDM 5200.01, Vol 2, *DoD Information Security Program: Marking of Classified Information,* 24 February 2012

AFPD 32-30, *Explosive Ordnance Disposal*, 21 Jun 2013

AFJI 32-3002, *Interservice Responsibility for Explosive Ordnance Disposal*, 14 February 1992

AFI 10-210, *Prime Base Engineer Emergency Force (Beef) Program*, 21 January 2015

AFI 13-212 V1, *Range Planning and Operations,* 23 April 2015

AFI 16-1404*, Air Force Information Security Program,* 29 May 2015

AFI 32-3001*, Explosive Ordnance Disposal Program,* 20 November 2014

AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health program*, 1 August 2014

AFI 48-139, *Laser and Optical Radiation Protection Program,* 30 September 2014

AFI 48-148, *Ionizing Radiation Protection,* 20 November 2014

AFMAN 31-129*, USAF Small Arms and Light Weapons Handling Procedures,* 29 June 2016

AFMAN 17-1201, *User Responsibilities and Guidance for Information Systems,* 1 June 2012

AFMAN 33-283, *Communications Security (COMSEC) Operations,* 3 September 2014

AFMAN 33-363, *Management of Records,* 1 March 2008

AFMAN 91-201*, Explosive Safety Standards,* 12 January 2011

EGLINAFBI 13-204, *Eglin Range Mission Scheduling and Control,* 14 January 2014

EGLINAFBI 13-212, *Range Planning and Operations,* 30 April 2015

EGLINAFBI 48-102, *Non-Ionizing Radiation Control Program,* 30 June 2011

EGLINAFBI 48-103, *Ionizing Radiation Control Program*, 17 February 2011

TO 00-5-1, *Air Force Technical Order System*, 1 October 2014

Eglin Comprehensive Range Plan (CRP), 28 Oct 2014

Prescribed Forms

None

Adopted Forms

DD Form 626, *Motor Vehicle Inspection*

DD Form 836, *Dangerous Goods Shipping Paper and Emergency Response Information*

DD Form 1348-1, *DoD Single Line Item Release/Receipt Document*

DD Form 1907, *Signature and Tally Record*

AF IMT 68, *Munitions Authorization Record*

AF Form 191, *Ammunition Disposition Request*

AF Form 439, *Robbery Checklist*

AF Form 440, *Bomb Threat Aid Card*

AF Form 614, *Charge Out Record*

AF IMT 623a, *On-The-Job Training Record Continuation Sheet*

AF Form 847, *Recommendation for Change of Publication*

AF Form 978, *Supervisor's Mishap Report*

AF Form 1109, *Visitor Register Log*

AF IMT 1297, *Temporary Issue Receipt*

AF IMT 1473, *Gun Equipment Room Inventory*

AF Form 1800, *Operator's Inspection Guide and Trouble Report*

AF Form 2419, *Routing and Review of Quality Control Reports*

AF Form 2432, *Key Issue Log*

AF IMT 2530, *Alarm System Test Record*

AF IMT 3803, *Surface Weather Observations*

AF Form 4168, *COMSEC Responsible Officer and User Training Checklist*

AFCOMSEC Form 16, *COMSEC Physical Inventory*

SF 153, *COMSEC Material Report*

SF 701, *Activity Security Checklist*

SF 702, *Security Container Check Sheets*

SF 1103, *U.S. Government Bill of Lading*

SF 1109, *U.S. Government Bill of Lading – Continuation Sheet*

DRMS Form 1851, *Restricted Waste Notification*

EPA Form 8700-22, *Uniform Hazardous Waste Manifest*

Abbreviations and Acronyms

AAFES—Army Air Force Exchange Service

ADR—Ammunition Disposal Request

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFPD—Air Force Policy Directive

AFRIMS—Air Force Records Information Management System

AGL—Above Ground Level

ARTS—All Purpose Remote Transport System

BDOC—Base Defense Operations Center

BEE—Bioenvironmental Engineering

BSERV—Bomb Squad Emergency Response Vehicle

CAM—COMSEC Account Manager

CAP—Cryptographic Access Program

CCI—Controlled Cryptographic Items

CDU—capacitor discharge unit

CES—Civil Engineer Squadron

CLS—Combat Life Saver

COMSEC—Communications Security

COT—Commercial Off-the-Shelf

CRO—COMSEC Responsible Officer

CRP—Comprehensive Range Plan

CSSO—Computer System Security Officer

DAA—Designated Approving Authority

DODIC—DoD Identification Code

EAL—Entry Authorization List

EAP—Emergency Action Plan

EBW—Exploding Bridge Wire

ECC—Emergency Communications Center

ECC—Enhanced Cryptographic Cards

EED—Electro Explosive Device

EMSEC—Emission Security

EOD—Explosive Ordnance Disposal

EODIMS—EOD Information Management System

ETTC—Eglin Test and Training Complex

FDSER—Fuse Disassembly System, EOD, Remote

FEC—Flight Environmental Coordinator

FPCON—Force Protection Condition

GSA—General Services Agency

HAZMAT—Hazardous Materials

HCD—Hazard Class Division

HERD—High Explosive Research Facility

IDS—Intrusion Detection System

IED—Improvised Explosive Device

IR—Infrared

JON—Job Order Number

JTTOC—Joint Test and Training Operations Control Center

LSO—Laser Safety Officer

MSA—Munitions Storage Area

NEW—Net Explosive Weight

OB/OD—Open Burn/Open Detonation

OPR—Office of Primary Responsibility

PAN—Percussion Actuated Neutralizer

PMEL—Precision Measurement Equipment Laboratory

PT—Physical Training

RDS—Records Disposition Schedule

RF—Radio Frequency

RFA—Radio Frequency Authorization

RFR—radiofrequency radiation

RM—Risk Management

RSO—Range Safety Officer

RSO—Radiation Safety Officer

SHRP—Safe Handling and Recovery Procedures

SRB—Safety Review Board

STE—Secure Terminal Equipment

SVRO—Secure Voice Responsible Officer

TBKP—Transportable Burn Kettle Processor

TD—Test Directive

TL—Team Leader

TO—Technical Order

USR—Unit Safety Representative

Terms

EOD Flight Management—Normally the Flight Chief and or Flight Commander; Flight SNCOs are included.

Attachment 2

STANDARD PRE-OPERATION SAFETY BRIEFING

NOTE

This pre-operation sheet will be filled out and briefed before conducting any planned explosive operation on the ETTC. The purpose of the checklist is to maximize safety during operations by ensuring personnel are aware of all explosive hazards involved and the appropriate actions to take in the event of an emergency.

A2.1. Explosive and Personnel Limits.

A2.1.1. Operation to be performed: ____

A2.1.1.1. Munitions involved: _____ ____

A2.1.1.2. Number and NEWQD (TNT Equivalent) of Detonations: ______________________

A2.1.1.3. Maximum Fragmentation distance for each Detonation:

A2.1.1.3.1. Maximum Frag Range (MFR): ____

A2.1.1.3.2. Maximum Fragmentation Range – Horizontal (MFR-H):______________________

A2.1.1.3.3. Maximum Fragmentation Range – Vertical (MFR-V):________________________

A2.1.1.4. Explosive Hazards ____

____

A2.1.1.5. Special Ordnance Considerations (orientation, heavy casing, etc.):________________

____

A2.1.2. Location where operation is to be performed (detonation site): ___________________

A2.1.3. Operating Location for Essential Personnel: ___________________________________

A2.1.3.1. Distance from detonation site: ____

A2.1.3.1.1. If distance from detonation is less than MFR:

A2.1.3.1.1.1. Protective measures taken *(AFMAN 91-201 para 12.74.4 and 12.74.8)*:

____

A2.1.3.1.1.2. Note all risk management (RM) assessments: ______________________________

A2.1.3.1.1.3. Commander approving RM assessment based on being inside the maximum case fragment distance (if applicable): ____

A2.1.4. Evacuation Assembly Point / Non-Essential Personnel area: ______________________

A2.1.5. Explosive Limits: ____

A2.1.6. Personnel Limit for the range is: ____

A2.1.6.1. A minimum of three EOD personnel, one who is a PAFSC 3E871 or higher, will be present during planned explosive operations. This does not apply to emergency operations during stand-by functions.

A2.1.6.2. The parameter in A2.1.6.1. may be adjusted to a minimum of two EOD-qualified

personnel one of which is an E-5 that has been awarded a 5-skill level, when approved through Commander RM determination during periods of critical manning or other unique circumstances to meet mission requirements. Eglin AFB EOD FOI 32-3001 serves as the commander RM data.

A2.1.7. Personnel/Duty assignments (name/rank):

A2.1.7.1. Range Safety Officer (RSO): ____

A2.1.7.2. EOD Team Leader (TL): ____

A2.1.7.3. EOD Team Members (TM): ____

____

A2.1.7.4. Support Team / Medical: ____

A2.1.7.5. Non-Essentials (Stop all ops when non-essentials are present: ___________________

A2.1.7.6. Non Essential Escort: ____

A2.1.8. Conduct briefing to ensure personnel are familiar with all the hazards involved prior to commencing.

A2.2. Equipment Requirements.

A2.2.1. General Safety Equipment Requirements:

____ Water ____ Portable radios

____ Gloves ____ First Aid Kit

____ Sun-screen (as needed) ____ Fire Extinguishers

____ Safety glasses (explosive ops)

A2.2.2. Special personnel protective equipment (e.g., laser goggles, helmet, body armor):

____________________________ ____________________________

____________________________ ____________________________

A2.2.3. Special operational equipment (e.g., Mk-series tools, robotics, etc):

____________________________ ____________________________

____________________________ ____________________________

A2.3. Pre-operational Safety Assessment.

A2.3.1. EOD operations will be conducted under the supervision and control of the EOD TL.

A2.3.2. The RSO, normally the senior (rank/skill) locally-assigned EOD technician present, is responsible for ensuring all safety aspects of the operation are properly applied in support of the TL. The RSO will not participate as a worker during the explosive operation.

A2.3.2.1. The TL will conduct a briefing to cover tasks to be performed, safety precautions and emergency procedures.

A2.3.2.2. The duties of the RSO and TL will not be performed by the same person.

WARNING

Ground yourself prior to handling initiating explosives; work on grounded surfaces if possible. Personnel handling electrically initiated explosive devices will avoid wearing clothes made of material, which have high static generating characteristics. Use available frontal/overhead protection during detonation – do not stand in view of the munitions to be detonated.

CAUTION

Remember Cardinal Principal of Explosive Safety: "Expose the minimum amount of people to the minimum amount of explosives for the minimum amount of time."

A2.3.2.3. The TL will brief visiting personnel on type of ordnance and associated hazards.

Provide specific instructions on where to drive, park, and walk; and not to touch items they may encounter (*"if you didn't drop it, don't pick it up"*). Show specific frontal/overhead protected area in which to take cover.

A2.3.3. Non-Essential Personnel Escort. If visitors are on range, assign an escort to ensure safety rules are followed. Escort to visitor ratio will not exceed 1:5. The RSO may be the Escort.

NOTE

All personnel wanting to proceed down range after commencement of the operation will do so only after obtaining approval from the TL and RSO. Personnel will then be briefed on all hazards present. Any unsafe actions observed by EOD personnel will be immediately brought to the attention of the RSO. The RSO will cease operations until unsafe condition is corrected. If unable to resume safe operations, withdraw to a safe distance and inform EOD Operations [and appropriate Range Control Office] that the EOD operation is terminated.

A2.3.4. The TL will ensure two-way radio (or phone) communication is operational and available (for both TL and RSO) during all explosive operations. Both a primary and a secondary means communication are preferred.

WARNING

Do not conduct hand-held radio transmissions within 50 feet (100 feet when using vehicle radios) of electro-explosive devices (EEDs). Modern Mobile Emitters (MME) such as key fobs and cellular phones will not be operated within 10 feet of EEDs.

A2.3.5. Remove rings and watches prior to starting any explosive operation.

A2.3.6. Do not handle munitions roughly (e.g., rolled, tumbled, dropped, dragged or thrown).

A2.3.7. If an abnormal condition occurs, stop the operation until the condition is corrected.

A2.3.8. Do not begin explosive operations on ranges until 1/2 hour after sunrise; cease operations 1/2 hour prior to official sunset.

A2.3.9. Observe wait times of **30 minutes** for electrically primed misfires and **1 hour** for non-electrically primed misfires.

A2.3.10. **Local Lightning Watch, Warning and Advisories.** When operating on the ETTC, lightning monitoring and notification is primarily the responsibility of the Test Area Range Controller. When operating at other locations, on or off the ETTC, the EOD Team Leader is responsible for consulting the supporting weather unit and monitoring for advisories, watches, and warnings. The EOD Operations Section and or the Joint Test and Training Operations Control Center (JTTOC) monitor and notify personnel of hazardous weather conditions. The 96 OSS Weather Flight or the 26th Operational Weather Squadron may be contacted for weather information. Refer to Atch 3. Refer to AFMAN 91-201, *Explosive Safety Standards*, Section 7H – *Procedures in the Event of Electrical Storms*, for further information.

A2.3.10.1. Weather Advisory. A weather advisory is a special notice to notify operational users of environmental conditions impacting operations. Team leaders will evaluate individual advisories and determine the potential impact on planned operations and whether to proceed, delay, or cancel those operations.

A2.3.10.2. Lightning Watch. A lightning watch will be in effect 30 minutes prior to thunderstorms being within 5 nautical miles (5.75 land miles) of the affected area. If a lightning watch is issued, the team leader and or range safety officer will initiate an orderly termination of all explosive operations.

A2.3.10.3. Lightning Warning. A lightning warning will be issued when lightning is within 5 nautical miles of the affected area. This may be observed by roughly a 28 second count of the observed lightning flash. Personnel will seek protective shelter immediately. An acceptable distance is equivalent to K24 and is calculated as 24 times the cube root of the NEW (24 x NEW ^1/3).

A2.3.10.4. Areas not served by lightning warnings and watches. When operating in an area not served by the Air Force-approved local lightning warning system, explosives operations must be terminated before a thunderstorm is within 10 miles.

A2.3.11. **Only one EOD technician** will check the detonation point after a planned detonation with a second person acting as a safety backup. This rule also applies when checking items kicked out by a detonation. Deviation for the sake of training is not authorized.

A2.3.12. Do not proceed directly down range if the detonation results in a range fire. If it can be ascertained that the fire can be contained, immediately respond and try to control the fire while the FD is responding (AFMAN 91-201, para 10.9.4). If the decision is made not to fight the fire, the area should be evacuated and remain so until it has cooled for at least 24 hours. Inform the range controller or other local authorities as to the extent of the fire so appropriate notifications can be made. Follow the safety measures outlined in AFTO 60A-1-1-31 prior to returning to the detonation site.

A2.3.12.1. Wait at least 24 hours after the fire has been extinguished to check the detonation point.

A2.3.12.2. Do not approach a pyrotechnic or incendiary ordnance burn area for 24 hours after the cessation of burning.

A2.3.13. Make positive identification before taking any action on a munitions item.

A2.3.14. Destroy in place or clearly mark for later destruction any dud munitions that cannot be safely moved.

A2.3.15. Identify all guests and casuals.

A2.3.16. Required Technical Orders and publications are on hand and will be used.

A2.3.17. Electric caps will be connected to the firing wire before being placed in the charge; secure the firing wire near the explosive charge or tool.

A2.3.18. Secure the time fuse to ensure it does not coil.

A2.3.19. No smoking within 50 feet of explosive; TL or RSO will designate a smoking area.

A2.4. Emergency Procedures.

A2.4.1. In the event of an accident or fire, ______________________ (normally the RSO) will notify the appropriate agency (e.g. fire department, ambulance, range controller or EOD Operations).

A2.4.1.1. Evacuate all nonessential personnel _______________ feet as required.

A2.4.1.2. The Evacuation Assembly Point is ____

A2.4.2. Fire extinguishers/equipment are located ____

A2.4.3. First Aid Kit is located ____

A2.4.4. ______________________ and ______________________ will fight the fire and note the time if any munitions become engulfed in flames.

WARNING

Do not fight fires involving 1.1 munitions engulfed in flames unless attempting a rescue.

A2.4.5. ____________________ will sound the alarm and go to the Evacuation Assembly Point and direct emergency responding personnel to the scene.

A2.4.6. ____________________ and ____________________ will secure the site of unused explosives for storage or later disposition.

A2.4.7. When evacuation is accomplished, RSO will account for everyone involved in the operation.

Attachment 3

EXPLOSIVE OPERATIONS NOTIFICATION CHECKLIST

A3.1. The below information will be utilized when making explosive use notifications IAW Chapters 7 and 8 of this instruction. Refer to Attachment 6 for Chapter 9 notifications.

A3.1.1. NAME OF PERSON MAKING RANGE CALLS: ______________________________

A3.1.2. OPERATION START TIME: ____

A3.1.3. OPERATION END TIME: ____

A3.1.4. LOCATION OF OPERATION: ____

A3.1.5. # OF DETONATIONS: ____

A3.1.6. N.E.W.:____

A3.1.7. TIME NOTIFICATIONS COMPLETE: _______________________________________

A3.2. Agencies listed below will be notified telephonically prior to conducting operations utilizing live explosives. **Note:** When conducting operations IAW Chapter 7, *Use of EOD Tools at Off-Range Locations*, only notify agencies listed in A3.2.1. through A3.2.3.

Agency	**Phone Number**	**Contacted Initials**
A3.2.1. BDOC	882-2502	________________
A3.2.2. Command Post	883-4020	________________
A3.2.3. Weapon Safety	882-8234/2540 x3	________________
A3.2.4. Fire Department	882-5856	________________
A3.2.5. Base Operations	882-2614	________________
A3.2.6. Hospital	883-8227	________________
A3.2.7. Weather	882-4800/5449	________________
A3.2.8. Public Affairs	882-3933	________________
A3.2.9. West Gate Shoppette	850-651-6741	________________
A3.2.10. Eglin Elementary School	850-833-4320	________________

A3.3. Additional weather information may be obtained from 26th Operational Weather Squadron (OWS), Barksdale Air Force Base, Louisiana. They may be contacted as follows:

A3.3.1. 26 OWS (DSN)	(312) 331-2651/2652	_________________
A3.3.2. 26 OWS (Comm)	(318) 529-2651/2652	_________________

Attachment 4

EXPLOSIVE CONTROL LOG

		Date:	
Explosive Control Log			
Team Leader:		Can #:	
Mission #:	Issued	Returned	Used
C-4			
Lot #: Location:			
M7 Non-Electric Caps			
Lot #: Location:			
M60 Igniters			
Lot #: Location:			
M700 Time Fuse			
Lot #: Location:			
Det Cord			
Lot #: Location:			
.50 Cal Electric M174			
Lot #: Location:			
Item:			
Lot #: Location:			
Item:			
Lot #: Location:			

OUT/1022	LOGGED	IN/1022
	MSI DATE	

Attachment 5

OPEN BURN/OPEN DETONATION SITE INSPECTION LOG

AREA/LOCATION	DATE/TIME				INSPECTOR NAME AND SIGNATURE	EOD NCOIC SIGNATURE
SECURITY DEVICES (before/after each use)	**SAT**	**UNSAT**	**N/A**	**NOT INSP**	**PROBLEMS OBSERVED**	**DATE CORRECTIVE ACTION TAKEN/ DESCRIPTION OF ACTION**
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						
Portable Eye Wash Station						
Leather Gloves, Boots, Face Shields, Protective Glasses						

Vehicles and Other Mobile Equipment (Before Use)	**SAT**	**UNSAT**	**N/A**	**NOT INSP**	**PROBLEMS OBSERVED**	**DATE CORRECTIVE ACTION TAKEN/ DESCRIPTION OF ACTION**
Routine Maintenance						
Brakes						
Tires						
Hydraulics						
Emergency Lights						
Horns/Sirens						
On-Board Emergency Equipment						
Other						
OB/OD AREAS (before/after each use)						
TBKP for obvious damage						
Detonation Pits						
Deterioration of Roadway						
Gate Areas/Boundary markers						
Other						

I certify that all items were completed as per checklist.

Name (print) ___________________________ Signature ____________________________

Date ______________________

Attachment 6

OPEN DETONATION FLOW OF EVENTS CHECKLIST

A6.1. Note: Munitions items designated in T.O. 11A-1-42 as disposal by burning will not be disposed of by detonation. These items must be disposed of by burning only. Any deviation from this requirement must be coordinated in advance with base environmental. Deviations may be approved for such issues where the overall disposal operation would take in excess of 10 total man-days.

A6.2. NLT 21 Days Out.

A6.2.1._____ Contact range scheduling at 882-2991 to schedule range time. **Note:** A minimum of two days will be scheduled for detonation and three days for the Thermal Treatment Processor, one of which will be a post-operation cleanup day.

A6.2.2._____ Ensure range control schedules support from Jackson Guard, medical, weather, and heavy equipment (fork lift and a 40-foot tractor-trailer to move TBKP), as needed.

A6.2.3._____ Advise the EOD Resources Section what explosives will be required and initiate a request for issue, as needed.

A6.2.5._____ Check the amount of diesel fuel in the TBKP. If more is needed, schedule to have filled. Do not forget the unit's Bulk Fuel Issue Card before going to the range.

A6.2.5._____ Check the amount of propane in the TBKP. If more is needed, notify the EOD Resources Section to have the bottles filled.

A6.2.6._____ Notify other generators and request list of pending ADR items. Be sure to separate detonable items from items that must be burned in the TBKP. The generators must include explosive class/division and NEW on their list.

GENERATORS	PHONE #	PERSON NOTIFIED
96 MXS/WMA	882-3979	__________________
919 MXS/LGMVW	883-6321	__________________
AFRL/MMNE	882-2079/5969	__________________
1 SOMXG/MXMW	884- 6706	__________________
780 TS/OGMTG/TAMS A-24	882-2086	__________________
AFRL/MNMW	882-5705/8410	__________________
Duke Field Ammo	883-7895	__________________

A6.2.6._____ Notify the appropriate agencies.

AGENCY	PHONE #	PERSON NOTIFIED
96 CEG/CEV	2-7667/2-7668/ 699-9936/855-0869	__________________
96 TW/SEW	882-8234/2540x3	__________________

A6.3. 5 Days Out. Notify the following if fuels are required in the TBKP.

AGENCY	PHONE #	PERSON NOTIFIED
96 LRS/LGR	882-2159	__________________

A6.4. 2 - 3 Days Out.

A6.4.1._____ Ensure all parties are aware of date, time and place of operation. It is recommended that all participants meet at the incoming explosive cargo pad near the MSA before convoying to the range.

A6.4.2._____ Confirm with EOD Resources Section on the type and amount of explosives required.

A6.4.3._____ Confirm with the EOD Operations Section to ensure that all required support has been scheduled in CSE.

A6.4.4._____ If conducting burn operations, have the FEC arrange for recovery drums and coordinate residue analysis with Bio-Environmental Engineering.

A6.4.5._____ Notify the appropriate agencies.

AGENCY	PHONE #	PERSON NOTIFIED
96 TW/PA	882-3931	__________________
96 SFS/SFO/Range Patrol	882-2502/2000	__________________
Range Complex C-6	883-7867/4786	__________________
Jackson Guard	882-6233	__________________

A6.5. Range Day.

A6.5.1._____ Load/Inspect all necessary equipment and explosives.

A6.5.2._____ At predetermined meeting place, verify that required documentation has been completed by all generators.

A6.5.3._____ Convoy to range using proper explosive movement routes.

A6.5.4._____ Establish contact with the appropriate range control. Ensure they have a radio with the EOD net and verify that access to the range has been restricted.

A6.5.5._____ Obtain initial weather report. Ensure weather parameters are within the EPA permit requirements: No forecast of major storms and no lightning within 5 nautical miles. Obtain a copy of the report for the EOD FEC.

A6.5.6._____ Give safety briefing to all personnel on site.

A6.5.7._____ Fill out OB/OD Site Inspection Log (Attachment 5). Return to EOD FEC.

A6.5.8._____ Unpack and sort munitions for disposal. **Note:** Munitions personnel may be used during unloading/inventory operations if properly briefed and supervised. All empty containers and packing material will be removed from the range by munitions personnel/generators.

A6.5.9._____ Check container quantities with documentation. If quantities do not match, do not accept them for disposal.

A6.5.10._____ Prepare munitions for disposal IAW TO 60A-1-1-31 or specific item T.O. **Note:** A maximum of three detonation points may be set up at one time. Ensure each detonation will not disrupt subsequent detonations. Position munitions so the major fragment hazard is pointing hazard is pointing away from the safe area.

Attachment 7

SAFETY DISTANCES FOR PERSONNEL AND AIRCRAFT

A7.1. To establish a safe horizontal withdrawal distance for personnel and vertical danger areas for aircraft, EOD personnel will ensure the following distances are used as a guide when obtaining clearance for disposal operations on all Eglin ranges. It is the responsibility of the JTTOC to clear the airspace above the detonation point and the responsibility of EOD and the range chief to ensure ground space is clear before shots are fired. The following distances have been approved by 96 TW/SEW and are used as a guide when destroying ordnance in support of test missions.

A7.2. All EOD personnel essential to an operation should be at the greater of the "Maximum Horizontal" fragmentation distance or K328 w/200 ft minimum blast distance, identified by the EOD Tactical Decision Aid (TDA) or be provided overhead and frontal protection. Non-essential personnel will be located at the minimum distances IAW AFMAN 91-201, paragraph 12.74.3. Protect the equipment/vehicles from any possible range fire.

TYPE ITEM	SAFETY DISTANCE
Test Items	See Test Directive / Safety Annex
Any non-frag producing shot minimum distance	1,250 ft
Any frag producing shot minimum distance	2,500 ft
Dispensers / Submunitions	
Full Dispenser	7,500 ft
Armor Defeating CBU dispenser items	See Test Directive / Safety Annex
Submunitions	2,500 ft
Projectiles	
Ammunition up to 40mm	2,500 ft
Projectile larger than 40mm to 5"	4,000 ft
Rockets	
2.75" Rockets warheads and equivalent items	2,500 ft
Rocket warheads up to 5"	4,000 ft
Missiles	
AIM –7 Sparrow	4,000 ft
AIM – 9 Sidewinder	4,000 ft
AIM – 120 AMRAAM	4,000 ft
AGM-65 Maverick (blast warhead)	5,000 ft
Bombs	
750 lb Demo bomb w/ spotting charge	3,500 ft
Bombs & Projectiles up to 5"	4,000 ft
MK series bombs up to MK 83	7,500 ft
MK 84 / BLU-109	10,000 ft

Attachment 8

PHYSICAL FITNESS PROGRAM

A8.1. The below physical fitness program guidelines will be utilized in part or total during flight physical fitness training.
A8.2. The list below has been approved IAW AFI 32-3001.

EXERCISE	REPS/TIME	REMARKS
DYNAMIC WARM-UP		**PREP FOR HIGHER INTENSITY EXERCISE IN A SAFE AND PROGRESSIVE MANNER**
SHOULDER ROLLS	15 SECS/SIDE	ROLL SHOULDER FORWARD AND BACKWARD IN A CIRCULAR MOTION
ARM CIRCLES	60 SECS/PER	EXTEND ARMS TO SIDE; ROTATE ARMS IN SMALL CIRCLES FORWARD THEN BACKWARD
HIGH KNEE LIFTS / HEEL KICKS	≈1/4 MILE	LIFT KNEES TOWARD CHEST OR KICK HEELS TO BUTT TO INCREASE BLOOD FLOW BUT NOT CAUSE SHORTNESS OF BREATH
CALISTHENICS		
SQUATS	25	STAND WITH FEET SHOULDER WIDTH APART; LOWER TORSO BY BENDING KNEES THEN STAND UPRIGHT; DO NOT LET KNEES EXTEND IN FRONT OF TOES
JUMPING JACKS	25 (4 CNT)	
PUSH-UPS (REG)	20 (4 CNT)	
SIT-UPS (REG)	25 (4 CNT)	LAY ON BACK WITH LEGS IN THE AIR, BENT AT THE KNEES, ARMS CROSSED ACROSS CHEST; BRING ELBOWS TO THE KNEES
PUSH-UPS (TRI)	20	PUSH-UPS WITH INDEX FINGERS AND THUMBS FORMING A TRINAGLE OR DIAMOND
SIT-UPS (SIDE)	20 (4 CNT / SIDE)	LAY ON SIDE; SIT UPWARDS TOWARD TOP KNEE
PLANK	60 SECS	WEIGHT PLACED ON TOES AND FOREARMS; HOLD ABDOMINALS TIGHT KEEPING BACK STRAIGHT
PUSH-UPS (WIDE)	20	PUSH-UPS WITH HANDS PLACED BEYOND SHOULDER WIDTH
LUNGES	20	WHILE STANDING, STEP FORWARD AND LOWER BODY UNTIL THE REAR KNEE IS ALMOST TOUCHING THE GROUND THEN RETURN TO STANDING; DO NOT LET KNEE OF LEADING LEG EXTEND IN FRONT OF TOES
WALKING LUNGES	20	SAME AS ABOVE WHILE MOVING FORWARD
STRETCHING		
ARM / SHOULDER	15 SECS/ARM	GRAB OPPOSITEELBOW WITH HAND AND PULL ACROSS BODY; ALTERNATE
CHEST	15 SECS/ARM	PLACE HAND ON WALL ABOUT SHOULDER HEIGHT; TURN AWAY FROM WALL IN OPPOSITE DIRECTION; ALTERNATE
LOWER BACK	30 SECS	LAY ON BACK AND BRING KNEE TO CHEST; HEAD TOWARDS KNEE; ALTERNATE
GROIN	30 SECS	SIT WITH SOLES OF FEET TOUCHING; GRAB ANKLES AND PUSH DOWN ON KNEES
ITB	15 SECS/LEG	SIT WITH LEGS EXTENDED; PULL LEG UP WITH OPPOSITE ARM; ALTERNATE
THIGHS	15 SECS/LEG	LAY ON SIDE; GRAB ANKLE BEHIND BODY AND PULL TO BUTT; ALTERNATE
HAMSTRING	15 SECS/LEG	SIT WITH LEGS EXTENDED; BEND KNEE AND PLACE SOLE OF FOOT TO INSIDE OF OPPOSITE KNEE; ALTERNATE
TOES	30 SECS	STANDING OR SITTING WITH FEET TOGETHER; BEND AT WAIST AND GRAB BACK OF CALVES WITH BOTH HANDS
CALVES	30 SECS/LEG	STANDING ≈4 FEET FROM WALL; PLACE BULK OF WEIGHT ON ONE LEG AND LEAN TO WALL; ALTERNATE
CALVES	30 SECS/LEG	SAME AS ABOVE BUT BEND BACK KNEE SLIGHTLY; ALTERNATE
ABS	30 SECS	LAY ON STOMACH WITH ELBOW UNDER CHEST; SLOWLY LIFT HEAD AND SHOULDER UP
CARDIO		**STAMINA**
RUN / RUCK	3 - 4 MILE	RECOMMEND THREE TIMES PER WEEK
STRENGTH		**WEIGHT RESISTANCE**
WEIGHTS	30 - 40 MINS	RECOMMEND TWICE PER WEEK

DEPARTMENT OF THE AIR FORCE
Headquarter US Air Force
Washington DC 20330-5000

CFETP 3E8X1
Part I and II
1 MAR 2016
(Incorporating Change 2
Dated 1 FEB 2017)

Air Force Specialty Code (AFSC) 3E8X1

EXPLOSIVE ORDNANCE DISPOSAL

CAREER FIELD EDUCATION AND TRAINING PLAN

ACCESSIBILITY: Publications and forms are available on the e-publishing website at www.e-publishing.af.mil for downloading or ordering.

RELEASABILITY: There are no releasability restrictions on this publication.

CAREER FIELD EDUCATION AND TRAINING PLAN
EXPLOSIVE ORDNANCE DISPOSAL (EOD) SPECIALTY
AFSC 3E8X1

TABLE OF CONTENTS

Attachments

OPR: HAF/A4C
Certified by: CMSgt Douglas Moore (HQ AFCEC/CXD)
Supersedes: CFETP 3E8X1, 1 Mar 2016

Pages: 92

PREFACE

This Career Field Education and Training Plan (CFETP) is a comprehensive education and training document that identifies life-cycle education/training requirements and training support resources for the Explosive Ordnance Disposal (EOD) specialty. The CFETP will provide our Airmen with a clear career path to success and instill consistency in all aspects of our career field training.

The CFETP consists of two parts used by the supervisor to plan, manage, and control training within the career field.

Part I provides information necessary for overall management of the specialty.

- Section A provides general information about how the CFETP will be used.
- Section B identifies career field progression information, duties and responsibilities, training strategies, and the career field path.
- Section C associates each skill-level with specialty qualifications (knowledge, education, and training).
- Section D indicates resource contraints.
- Section E identifies transition training guide requirements for SSgt through MSgt.

Part II includes the following:

- Section A identifies the Specialty Training Standard (STS) to include duties, tasks, and technical references to support Air Education and Training Command (AETC) conducted training, wartime course, and correspondence course requirements.
- Section B contains the course objective list and training standards supervisors will use to determine if an Airman has satisfied training requirements.
- Section C identifies available support materials.
- Section D identifies a training course index supervisors can use to determine resources available to support training. Included here are both mandatory and optional courses, and exportable courseware.
- Section E identifies MAJCOM-unique training requirements supervisors can use to determine additional training required for the associated qualification needs.
- Section F identifies home station training references and courses material required for this specialty in support of contingency/wartime training.
- Section G identifies the EOD Standard Training Package which prescribes the minimum monthly/semi-annual/annual training/exercise requirements for all active duty EOD personnel assigned below wing level.
- Section H advertises Advanced EOD Training Course Training Standards.

Note: At unit level, supervisors and trainers must use Part II to identify, plan, and conduct training commensurate with the overall goals of this guide.

Using guidance provided in the CFETP will ensure individuals in this specialty receive effective and efficient training at the appropriate point in their careers. This plan will enable us to train today’s work force for tomorrow’s jobs. At the unit level, supervisors and trainers will use Part II to identify, plan, and conduct training commensurate with the overall goals of this guide.

ABBREVIATIONS/TERMS EXPLAINED

Advanced Distributive Learning (ADL). Anytime, anyplace learning within DoD consisting of instructional modules comprised of sharable content objectives in an Internet/Intranet environment.

Advanced Training (AT). A formal course training toward a technical or supervisor level Air Force Specialty (AFS). Training is for selected career Airmen in the advanced technology level of the AFS. Graduates are not awarded a new AFSC.

Air Force Career Field Manager (AFCFM). An individual on the Air Staff charged with the responsibility for overseeing all training and career field management aspects of an Air Force specialty or group of specialties.

Air Force Enlisted Classification Directory (AFECD) – The Official directory for all military enlisted classification descriptions, codes, and identifiers. The specialty descriptions and codes will be used to identify each Air Force job (valid requirements) and describes the minimum mandatory qualifications of personnel to fill these jobs. The updated AFECD is available at AF Personnel Center's web site located at http://ask.afpc.randolph.af.mil/ under the military classification menu.

Air Force Civil Engineer Center (AFCEC). Formerly, Air Force Civil Engineer Support Agency (AFCESA), the focal point for all Civil Engineer training development. All individual AFSC Force Development Managers (FDM) are located at AFCEC.

Air Force Credentialing Opportunities On-Line (AF COOL) Program. AF COOL replaced the CCAF Credentialing and Education Research Tool (CERT). The AF COOL Program can be accessed through the AF Virtual Education Center (AFVEC). The site provides a research tool designed to increase an Airman's awareness of national professional credentialing and CCAF education opportunities available for all Air Force occupational specialties.

Air Force Institute of Technology (AFIT). Provides vital, relevant, and connected education that enables Airmen to be ready engineers and great leaders who know how to build sustainable installations to last while leading the change for the Civil Engineer career field. Course list can be accessed at http://www.afit.edu/cess/index.cfm.

Air Force Training Record (AFTR). Electronic training data base to document training and access is located at the Civil Engineer Virtual Learning Center (CE-VLC).

Air Force Job Qualification Standard/Command Job Qualification Standard (AFJQS/CJQS). A comprehensive task list that describes a particular job type or duty position. Used by supervisors to document task qualifications. The tasks on the AFJQS/CJQS are common to all persons serving in the described duty position.

Air Force Qualification Training Package (AFQTP). A required instructional package designed for use at the unit to qualify, or aid qualification, in a duty position or program, or on a piece of equipment. AFQTPs identify the Air Force's standardized method for performing the task. The AFQTP may be printed (paper-based), computer-based, in other audiovisual media formats, or all three.

Career Field Education and Training Plan (CFETP). A comprehensive, multipurpose document encapsulating the entire spectrum of education and training for a career field. It outlines a logical growth plan that includes training resources and is designed to make career field training identifiable, to eliminate duplication, and to ensure this training is budget defensible.

Chief, Civil Engineer Force Development (CCEFD). Located at AFCEC, this individual is responsible for all force development education and training associated within the 3E0 to 3E6 AFSCs.

Civil Engineer Virtual Learning Center (CE-VLC). Anytime, anyplace learning within the Civil Engineer Community consisting of instructional modules and skill-level awarding course material specific to the AFSC.

Commercial Off The Shelf (COTS). Commercially-procured training products.

Computer-Based Training (CBT). A self-paced stand-alone computer product used to deliver interactive subject and task knowledge.

Core Tasks (*). Mandatory tasks which the AFCFM has identified as a minimum qualification requirement within an Air Force specialty or duty position. These tasks exemplify the essence of the career field.

Critical Tasks. Tasks that have been identified by the work center supervisor as having a detrimental effect on mission accomplishment if not performed correctly. Critical tasks may or may not be the same as core tasks but are mandatory if identified as 'critical' to the individual's position by the supervisor or work center.

Diamond Tasks (♦). Diamond tasks are extremely important to the career field. Diamond tasks are the same as core tasks with one exception--equipment shortfalls at most locations have created problems with the actual **hands-on** training/certification of these tasks. In instances where required equipment is not available for instruction, completion of the task's technical references is required for upgrade training. Hands-on certification will be accomplished at the first opportunity when equipment is available.

Distance Learning (DL). Includes Video Tele-seminar (VTS), Video Tele-training (VTT), and CBT. Formal courses that a training wing or a contractor develops for export to a field location (in place of resident training) for trainees to complete without the on-site support of the formal school instructor. For instance, courses are offered by Air Force Institute of Technology, Air University, and Training Detachment.

Duty Position Tasks. The tasks assigned to an individual for the position currently held. These include as a minimum all core tasks, diamond tasks, critical tasks and any other tasks assigned by the supervisor.

Enlisted Professional Military Education (EPME). EPME is an Air Force time in service (TIS) based model. EPME requirements are developed in three phases. EPME ensures a target delivery of institutional competencies (ICs) throughout the Continuum of Learning across an enlisted airman's career.

Expeditionary Combat Support-Training Certification Center (ECS-TCC). Total Force training center managed by the Air Force Reserve Command.

Force Development Manager (FDM). An individual assigned to the Air Force Civil Engineer Center (AFCEC) charged with the responsibility for overseeing all training and career field management aspects of a specific Air Force Civil Engineer specialty.

Initial Skills Training. AFS-specific training an individual receives upon entry into the Air Force or upon retraining into this specialty for award of the 3-skill level. Normally, this training is conducted by AETC at one of the technical training wings.

Just-in-Time (JIT) Training – Training required just prior to a selected deployment or tasking that delivers training necessary for mission accomplishment. It is typically predicated on hard-to-obtain contingency skills.

MAJCOM Functional Managers (MFMs). Senior leaders, designated by the appropriate functional authority (FA) who provide day-to-day management and responsibility over specific functional communities at the MAJCOM, FOA, DRU, or ARC level. While they should maintain an institutional focus in regards to resource deployment and distribution, FMs are responsible for ensuring their specialties are equipped, developed, and sustained to meet future needs of the total Air Force mission.

Occupational Analysis Report (OAR). A detailed report showing the results of an occupational survey of tasks performed within a particular AFS. The information collected from this survey is used to make changes to upgrade training and Weighted Airman Promotion Exams.

On-the-Job Training (OJT). Hands-on, over-the-shoulder training conducted to certify personnel in both upgrade (skill-level award) and job qualification (duty position certification) training.

Proficiency Training. Additional training, either in-residence, advanced/supplemental training courses, or on-the-job training provided to personnel to increase their skills and knowledge beyond the minimum required for upgrade.

Qualification Training (QT). Actual hands-on task performance training designed to qualify an individual in a specific duty position. This portion of the dual channel on-the-job training program occurs both during and after the upgrade training process. It is designed to provide the performance skills required to do the job.

Regional Training Site (RTS). Total Force training centers managed by the Air National Guard.

Resource Constraints. Resource deficiencies, such as money, facilities, time, manpower, or equipment that precludes desired training from being delivered.

Specialty Training. A mix of formal training (technical school) and informal training (on-the-job) to qualify and upgrade airmen in the award of a skill level.

Specialty Training Standard (STS). Describes skills and knowledge that airmen in a particular AFS need on the job. It further serves as a contract between the Air Education and Training Command (AETC) and the user to show the overall training requirements for an AFS taught in the resident and nonresident courses.

Specialty Training Requirements Team (STRT) – Subject Matter Experts from each MAJCOM conduct research prior to Utilization and Training Workshop (U&TW), develops training, recommends delivery methods and determines if a full fledge U&TW is required. The team finalizes the CFETP, specialty description and develops a standard for all courses.

Subject Matter Expert (SME) – An individual with expertise in a particular subject matter, tasked to represent the subject matter to an individual or group for technical accuracy.

Supplemental Training. A formal course which provides individuals who are qualified in one or more positions of their Air Force Specialty (AFS) with additional skills/knowledge to enhance their expertise in the career field. Training is for selected career airmen at the advanced level of the AFS.

Total Force. All collective Air Force components (Active Duty, Reserve, Guard, and Civilian elements) of the United States Air Force.

Upgrade Training (UGT). Identifies the mandatory courses, task qualification requirements, and correspondence course completion requirements for award of the 5-, 7-, and 9-skill levels.

Utilization and Training Workshop (U&TW). An executive decision meeting to vote on funding for instructor authorizations, equipment and facilities needed to support any new or revised training coming from the STRT. They will also determine which organizations will furnish resources and establish commitment and delivery dates in writing, document equipment availability dates and any problems and establish training delivery dates.

PART I

SECTION A - GENERAL INFORMATION

A1. Purpose: This CFETP provides information necessary for Air Force Career Field Managers (AFCFMs), MAJCOM functional managers (MFMs), commanders, education and training managers, supervisors/trainers, and certifiers to plan, develop, manage, and conduct an effective career field training program. This plan outlines the training personnel in an AFS require to develop and progress throughout their careers. It identifies initial skills, upgrade, qualification, advanced, and proficiency training.

A1.1. **Initial Skills Training** is the AFS-specific training an individual receives upon entry into the Air Force or upon retraining into this specialty for award of the 3-skill level. For our career field, this training is provided in a joint environment with Navy being the lead service. The training is conducted at Naval School EOD located at Eglin AFB, FL.

A1.2. **Upgrade Training.** Identifies the mandatory courses, task qualification requirements, and correspondence course completion requirements for award of the 5-, 7-, and 9-skill levels.

A1.3. **Qualification Training.** Actual hands- on task performance training designed to qualify an airman in a specific duty position. This training program occurs both during and after the upgrade training process. It is designed to provide the performance skills and knowledge required to do the job.

A1.4. **Advanced Training.** A formal course for training personnel towards a technical or supervisory level in an AFS. Training is for selected career Airmen in the advanced technology of the AFSs. Graduates are not awarded a new AFSC.

A1.5. **Proficiency Training.** Additional training either in-residence, exportable advanced training courses, or on-the-job training, provided to people to increase their skills and knowledge beyond the minimum required for upgrade.

A1.6. The CFETP has several purposes –some are:

A1.6.1. Serves as a management tool to plan, manage, conduct, and evaluate a career field training program. It is used to help supervisors identify training at the appropriate point in an individual's career.

A1.6.2. Identifies task and knowledge training requirements for each skill level in this specialty and recommends education/training throughout each phase of an individual's career.

A1.6.3. Lists training courses available in this specialty and identifies sources of training and the delivery methods.

A1.6.4. Identifies major resource constraints that impact full implementation of the desired career field training process.

A2. Uses. MFMs and supervisors will use the plan at all levels to ensure comprehensive and cohesive training programs are available for each individual in the specialty.

A2.1. AETC training personnel will develop/revise formal resident, non-resident, field, and exportable training based on requirements established by the users and documented in Part II of the CFETP. They will also work with the EOD AFCFM and Air Force Civil Engineer Center EOD Division (HQ AFCEC/CXD) to develop acquisition strategies for obtaining resources needed to provide the identified training.

A2.2. MFMs will ensure their training programs complement the CFETP mandatory initial, upgrade, qualification, and proficiency training requirements and identify requirements that can be satisfied by OJT, resident training, contract training, or exportable courses. MAJCOM-developed training to support this AFS must be identified for inclusion into the plan.

A2.3. Unit Education and Training managers and supervisors must ensure each individual completes the mandatory training requirements (including MAJCOM supplemental requirements) for the upgrade training specified in this plan.

A2.4. Each individual will complete mandatory training requirements specified in this plan. The list of courses in Part II of this CFETP will be used as a reference to support training.

A3. Coordination and Approval. The EOD AFCFM is the approval authority for the 3E8X1 EOD CFETP. MAJCOM representatives and AETC personnel will identify and coordinate on the career field training requirements. The AETC training manager for this specialty will initiate an annual review of this document by AETC and EOD AFCFM to ensure currency and accuracy. Using the list of courses in Part II, they will eliminate duplicate training.

PART I

SECTION B - CAREER FIELD PROGRESSION AND INFORMATION

B1. Specialty Descriptions. This information supplements what is presented in the *Air Force Enlisted Classification Directory*.

CEM Code 3E800, Civil Engineer EOD Manager	**AFSC 3E851, Journeyman**
AFSC 3E891, Superintendent	**AFSC 3E831, Apprentice**
AFSC 3E871, Craftsman	**AFSC 3E811, Helper**

B1.1. Specialty Summary. Performs EOD operations to protect personnel, resources, and the environment from the effects of hazardous explosive ordnance (EO), improvised explosive devices (IED) and weapons of mass destruction (WMD) which may include; incendiary, chemical, biological, radiological, and nuclear (CBRN) hazards. Employs specialized tools, techniques and personal protective equipment to detect/identify EOD objectives and to accomplish diagnostics, monitoring, evaluation, interrogation, mitigation, render safe, recovery, and disposal operations on ordnance/devices delivered, placed, or made dangerous by accident/incident or other circumstance. Utilizes and maintains advanced equipment, such as, robotics, x-ray, landmine and CBRN detection equipment. Transports demolition explosives and equipment to authorized disposal areas, fabricates explosive demolition charges, and disposes of hazardous devices, ordnance and explosives. EOD may be employed alone or as part of an AF, Joint, Interagency, or Coalition force, to support Combatant Commander and/or Air Force objectives. Provides rapid response capability and operates in five geographic disciplines: mountain, desert, arctic, urban and jungle, day or night, to include austere combat environments independent of an established airbase or its perimeter defenses in mounted, dismounted and limited airborne/aerial insertion operations. EOD at the five, seven, and nine level plan, organize, and direct EOD operations.

B1.2. Duties and Responsibilities.

B1.2.1. Plans, organizes, and directs EOD operations. Develops operational orders/plans, instructions, concepts of operation, and safety plans (ORM Assessments) concerning EOD employment. Translates commander's objectives/mission taskings into effective employment of EOD capability. Uses advanced technological and manual methods to perform long range/close-in reconnaissance, identification, assessment of ordnance/hazardous device conditions and filler materials, then advises commanders on recommended EOD actions and safe withdrawal distances. Prepares personnel and equipment for military operations.

B1.2.2. Supports U.S. and foreign aerospace systems/vehicles and conventional munitions operations; sortie generation and space launch operations by responding to airfield/launch complex explosive related ground/in-flight emergencies or crash situations; and research and development testing of weapons, aircraft, and space systems.

B1.2.3. Executes counter-IED (CIED) operations. Eliminates or mitigates explosive hazards and terrorist/criminal devices, to include missions outside the base boundary or Base Security Zone to enable freedom of maneuver for air or surface operations. Performs IED defeat actions to include (but not limited to) the following: recover/destroy weapon caches; perform immediate actions to defeat emplaced IEDs; conduct post-blast analysis of IED events; provides military authorities with technical intelligence, analysis and exploitation; and provide key insights to enable development of CIED tactics, techniques and procedures to mitigate IED effectiveness.

B1.2.4. Executes counter-WMD operations. Peacetime EOD force WMD response efforts are limited in scope to provide initial threat confirmation, risk mitigation, situational awareness and site stabilization; however EOD forces may also provide additional technical support as required. During contingencies, EOD forces provide full-spectrum response capability to incidents involving CBRN, incendiary and explosive devices.

B1.2.5. Conducts nuclear weapon response. Provides immediate initial support to nuclear weapon accidents or incidents in order to evaluate nuclear weapon/delivery status, mitigate risk, provide site stabilization and situational awareness. Custodial units certified on specific weapon systems and aerospace platforms form the core of weapons recovery teams and must respond in conjunction with the Tactical Response Force to explosively overcome obstacles, conduct passive diagnostics and provide technical assessments through secure communications with National Render Safe assets while supporting the National Military Command Center and Response Task Force (RTF) incident/accident or recapture/recovery efforts.

B1.2.6. Performs unexploded explosive ordnance (UXO) recovery operations. Provides emergency response (on or off installation) to neutralize hazards posed by EO related incidents presenting a threat to operations, installations, personnel or materiel, including but not limited to, excavation and renders safe, evaluation of individual ordnance items, exploitation for technical intelligence value, support of developmental and operational ordnance/weapons system testing, and large-scale recovery of airbases, forward operating locations, landing zones, and drop zones denied by ordnance operations. Maintains capability to identify, stabilize and contain chemical/biological ordnance and provide disposition support to follow-on organizations. Transports demolition explosives and equipment to authorized disposal areas, fabricates explosive demolition charges, and disposes of hazardous devices, ordnance and explosives.

B1.2.7. Engaged in explosive range activities and operational range clearances. Establishes, operates, and maintains EOD explosive proficiency, training and disposal ranges. Evaluates extent of explosive contamination on AF property, and on bombing and gunnery, research and development, and munitions test ranges. Prepares clearance/logistical plans and cost estimates for operational range clearance operations. Performs surface-removal, or disposal, of unexploded ordnance, classified ordnance, inert ordnance debris, training projectile debris, and any other range material fired on, or upon a military range from the targets and surrounding areas.

B1.2.8. Combat enabler for irregular warfare. Provide EOD support for General Purpose and Special Operations Forces in the execution of various IW missions to include security force assistance, counterinsurgency (COIN), stability operations, and building partnership capacity. Supports specialized Joint Service task force operations.

B1.2.9. Understands war fighter tactics, techniques and procedures (TTPs). Integrates EO, IED and WMD threat information into the decision-making process at all levels to mitigate and exploit the enemy's TTPs to maximize combat power. Performs tactical mission planning and preparation. Participates in Military Decision Making Process. Briefs joint force commanders and staff on EO threats affecting operations.

B1.2.10. Supports Defense Support to Civil Authorities activities. Provides emergency or lifesaving EOD operational capability to the Federal, state, and local civil authorities requesting support to mitigate or eliminate hazards associated with explosives (IEDs, military munitions, etc.). Provides hazardous materials (HAZMAT) response capability for incidents involving explosive ordnance.

B1.2.11. Conducts Very Important Person/special protective activities. Supports U.S. Secret Service (USSS), Department of Homeland Security (DHS) and the Department of State (DoS) by providing counter explosive search teams in support of National Security Special Events, White House Complex and the protection of the President, Vice President, and other dignitaries.

B1.2.12. EOD Flight Sustainment Operations. Identifies requirements for and maintains tools, equipment, supplies, and technical data. Orders, inventories, stores, mobilizes, and maintains specialized tools, equipment, supplies, and EOD publications. Uses computers to support flight activities. Develops notional concepts, mission need statements, and operational requirements documents, and estimates for clearance operations. Establishes, operates, and maintains EOD explosive proficiency ranges.

B1.3. Skill Level Duties and Responsibilities.

B1.3.1. **EOD Apprentice and Journeyman.**

B1.3.1.1. Performs EOD functions.

B1.3.1.2. Conducts area reconnaissance for detecting and identifying unexploded ordnance.

B1.3.1.3**.** Determines distances to which personnel and material must be evacuated.

B1.3.1.4. Photographs all unknown explosive ordnance for technical intelligence and reporting requirements.

B1.3.1.5. Removes earth and debris surrounding unexploded ordnance, using mechanical tools, hand tools, and appropriate equipment.

B1.3.1.6. Estimates depth of buried explosive ordnance by using probing techniques or detection equipment.

B1.3.1.7. Performs constructing, sinking, and timbering of shafts for access to buried explosive ordnance and to protect personnel during recovery operations.

B1.3.1.8. Performs necessary rendering safe procedures, using special tools and techniques, including remote controlled devices and shaped charges.

B1.3.1.9. Removes safe explosive ordnance by using winches, pulleys, cables, or cranes.

B1.3.1.10. Operates and interprets radiation and other detecting instruments in monitoring areas adjacent to unexploded ordnance suspected of containing toxic or radioactive contamination.

B1.3.1.11. Neutralizes, leak seals, packages, and disposes of chemical and biological munitions.

B1.3.1.12. Disposes of explosive ordnance rendered exceptionally hazardous by damage or deterioration.

B1.3.1.13. Disposes of unserviceable explosives by thermal treatment.

B1.3.1.14. Notifies authorities when areas are free of danger.

B1.3.1.15. Secures explosive ordnance and equipment to vehicles and plans evacuation routes.

B1.3.1.16. Prepares reports concerning EOD activities.

B1.3.1.17. Fabricates and uses explosive charges.

B1.3.1.18. Neutralizes and disposes of improvised explosive devices.

B1.3.1.19. Performs as a specialized member of the Disaster Response Force.

B1.3.1.19.1. Provides guidance and advice to the Incident Commander in detecting, monitoring, evaluating, and decontaminating radioactive, chemical, or biological hazards.

B1.3.1.19.2. Safes, removes, and disposes of explosives, explosive devices, and explosive ordnance rendered hazardous due to accident or incident to include ejection and catapult devices, squibs, explosive bolts, warheads, bombs, rockets, guided missiles, guns, and gun ammunition.

B1.3.1.19.3. Conducts explosive ordnance ancillary training for base populace and other agencies.

B1.3.1.20. Performs related munitions and weapons functions.

B1.3.1.20.1. Performs functions relating to EOD munitions, weapons, or nuclear weapons activities as directed.

B1.3.1.20.2. Maintains explosive ordnance publications and administrative publication libraries pertaining to explosive ordnance functions.

B1.3.1.20.3. Inventories, stores, and maintains supplies, tools, and equipment relative to EOD.

B1.3.1.20.4. Complies with environmental and safety regulations while conducting EOD operations.

B1.3.2. EOD Craftsman (In addition to Apprentice/Journeyman Responsibilities).

B1.3.2.1. Advises on EOD related problems.

B1.3.2.1.1. Resolves EOD problems and provides other activities with advice and guidance on EOD matters.

B1.3.2.1.2. Organizes and conducts EOD operations.

B1.3.2.1.3. Determines procedures to be used in detecting, identifying, rendering safe, recovering, or destroying explosive, incendiary, and nuclear ordnance.

B1.3.2.2. Performs EOD Functions.

B1.3.2.2.1. Determines area from which personnel and materials must be evacuated, and ensures it is cleared before proceeding with disposal.

B1.3.2.2.2. Plans and conducts neutralizing and disposing of improvised explosive devices

B1.3.2.2.3. Plans and directs removing safe explosive ordnance, and ensures areas adjacent to unexploded ordnance suspected of containing toxic or radioactive contamination are properly monitored.

B1.3.2.2.4. Coordinates EOD activities and movements with other interested military and civilian agencies.

B1.3.2.3. Performs as a specialized member of the Disaster Response Force.

B1.3.2.3.1. Plans, organizes, directs, and assists in safing, removing, and disposing of explosives, explosive devices, and explosive ordnance rendered hazardous due to accident or incident to include ejection and catapult devices, squibs, explosive bolts, warheads, bombs, rockets, guided missiles, guns, and gun ammunition.

B1.3.2.3.2. Plans, establishes, and conducts explosive ordnance ancillary training programs for base populace and other agencies.

B1.3.2.4. Supervises related munitions and weapons functions.

B1.3.2.4.1. Ensures functions relating to EOD, weapons, and nuclear weapons activities are coordinated and performed as directed.

B1.3.2.4.2. Monitors and determines the proper procedures for turn-in or disposal of unserviceable supplies, tools, and equipment.

B1.3.2.4.3. Complies with environmental and safety regulations in performing EOD operations.

B1.3.3. EOD Superintendent/Civil Engineer EOD Manager.

B1.3.3.1. Plans and organizes EOD activities.

B1.3.3.1.1. Obtains and controls the resources necessary to conduct EOD operations.

B1.3.3.1.2. Coordinates with base, local, and federal agencies in matters concerning EOD operations.

B1.3.3.1.3. Coordinates deployment taskings through MAJCOM and unit deployment manager.

B1.3.3.2. Directs EOD activities.

B1.3.3.2.1. Checks methods and techniques employed in detecting, identifying, rendering safe, recovering, and destroying explosive ordnance.

B1.3.3.2.2. Supervises preparing, maintaining, and disposing of records concerning EOD activities.

B1.3.3.3. Inspects and evaluates EOD activities.

B1.3.3.3.1. Inspects EOD activities to ensure compliance with policies, regulations, and technical publications.

B1.3.3.3.2. Interprets inspection findings, implements corrective actions, and conducts follow-up inspections.

B1.3.3.4. Performs EOD functions.

B1.3.3.4.1. Interprets publications and resolves problems encountered, pertaining to detecting, identifying, rendering safe, recovering, transporting, and disposing of explosive, incendiary, chemical, biological, and nuclear ordnance.

B2. Skill and Career Progression. Adequate training and timely progression from the apprentice to the superintendent level play an important role in the Air Force's ability to accomplish its mission. It is essential that everyone involved in training must do his or her part to plan, manage, and conduct an effective training program. The guidance provided in this part of the CFETP will ensure each individual receives viable training at appropriate points in their career.

B2.1. **Apprentice (AFSC 3E831 / 3-Level).**

B2.1.1. On completion of initial skills training at the Naval School EOD, the EOD trainee will work with a trainer to enhance their knowledge and skills to progress to the 5-level.

B2.1.2. Utilize the CDC, Air Force Qualification Training Packages (AFQTP), web-based courses, and other exportable courses for subject and task fundamentals in the career field.

B2.1.3. Once trained and task certified, a trainee may perform the task unsupervised.

B2.1.4. After all upgrade training requirements are completed, supervisors and Unit Training Managers (UTMs) coordinate upgrade procedures.

B2.1.5. Trainees awarded the primary AFSC receive automatic enrollment in the Community College of the Air Force (CCAF).

B2.2. **Journeyman (AFSC 3E851 / 5-Level).**

B2.2.1. A journeyman may be assigned job positions such as team member, team leader by exception, shift supervisor, and task trainer.

B2.2.2. Complete Civil Engineer (CE) 5-Level Common Core Concepts Course located on the CE-VLC prior to ordering Career Development Courses (CDCs).

B2.2.3. Completion of 5-level CDC's, 100% 5-level core and diamond tasks are basic prerequisites for five skill level award.

B2.2.4. Must complete, as a **minimum**, twelve months OJT before award of the 5-level (nine months for re-trainees that were awarded a five level in a previous AFSC).

B2.2.5. Active duty Air Force personnel must attend the Phase 1 Resident Airman Leadership School (ALS) in their time in service (TIS) window. Air Reserve Component (ARC) personnel may accomplish ALS by using distance learning (DL) and/or the resident or satellite program. Airmen must complete Phase 1 to be eligible to enroll in Phase 2 Enlisted Professional Military Education (EPME).

B2.2.6. Enter into continuation training to broaden technical experience base.

B2.2.7. Use CDCs and other reference material identified by the EOD CFM to prepare for Weighted Airman Performance System (WAPS) testing.

B2.2.8. Continue pursuing a Community College of the Air Force (CCAF) degree.

B2.2.9. After all upgrade training requirements are completed, supervisors and UTMs coordinate upgrade procedures.

B2.3. **Craftsman (AFSC 3E871 – 7-Level).**

B2.3.1. A craftsman can expect to fill various supervisory and management positions such as shift leader, team leader, supervisor, or task certifier.

B2.3.2. Completion of CE 7-Level Common Core Concepts Course located on the CE-VLC and 100% core/diamond tasks are basic prerequisites for seven skill level award.

B2.3.3. Graduation from the 7-level in-resident EOD Craftsman Course is required.

B2.3.4. Must complete, as a **minimum**, twelve months OJT before award of the 7-level (six months for re-trainees that were awarded a seven level in a previous AFSC).

B2.3.5. Must complete Phase 2 Enlisted Professional Military Education (EPME). All active duty and ARC personnel must enroll within the TIS window.

B2.3.6. Should take continuation training courses to broaden technical knowledge or management of resources and personnel.

B2.3.7. Use CDCs and other reference material to prepare for Weighted Airman Performance System (WAPS) testing.

B2.3.8. Continue academic education through CCAF and higher degree programs is encouraged.

B2.3.9. After all upgrade training requirements are completed, supervisors and UTMs coordinate upgrade procedures.

B2.3.10. Pursue career broadening opportunities that include, but are not limited to, special duty assignments such as an EOD Technical Training Instructor at Naval School EOD/EOD Preliminary Course or a Silver Flag Exercise Site EOD Instructor.

B2.4. **Superintendent. (AFSC 3E891 / 9-Level)**

B2.4.1. A superintendent can be expected to fill positions such as Flight Chief, Superintendent, and various staff positions.

B2.4.2. Completion of Civil Engineer Superintendent Course (AFIT WMGT 570) is mandatory for Active Duty and Air Force Reserve SMSgt's. This course is highly encouraged for Air National Guard SMSgt's and mandatory to be promoted to CMSgt.
Note: This is not a skill level awarding course.

B2.4.3. Must complete Phase 3 EPME DL between the 12 to 18 year TIS window. All active duty and ARC personnel must enroll within the TIS window.

B2.4.3.1 Active duty personnel failing to enroll, complete, and pass EPME Phase 3 within one (1) year of enrollment are ineligible to reenlist and compete for promotion until the requirement is met.
B2.4.3.2. ARC determines the consequences for their personnel failing to complete the required EPME Phase 3 DL within the established timeframe.

B2.4.4. Should take continuation training course to increase knowledge of budget, manpower, resources, and personnel management.

B2.4.5. Continue academic development through higher education is recommended.

B2.4.6. Must be a SMSgt for award of the 9-skill level.

B2.5. **Civil Engineer EOD Manager (Chief Enlisted Manager (CEM) Code 3E800).**

B2.5.1. CEMs work in a variety of similar jobs and functional areas where general managerial and supervisory abilities can be most effectively used and challenged.

B2.5.2. Must be selected for CMSgt and possess qualifications as a 3E891.

B3. Training Decisions. The CFETP uses a building block approach (simple to complex) to encompass the entire spectrum of training requirements for the EOD career field. The spectrum includes a strategy for when, where, and how to meet the training requirements. The strategy must be apparent and affordable to reduce duplication of training and eliminate a disjointed approach to training. The training RECOMMENDATIONS were made by members of the 9-13 July 2012 Specialty Training Requirements Team (STRT) conducted at Eglin AFB, training DECISIONS were accomplished by the 8-11 July 2013 Utilization and Training Workshop (U&TW) conducted via telecom.

B3.1. **Initials Skills Training.** The initial skill course was reviewed for content. Additions, deletions, and modifications were made to the course. Wartime training tasks were identified and validated.

B3.1.1. EOD Preliminary Course: Preliminary Course training requirements were included in the Specialty Training Standard, which will enable training management to structure the course to best meet the needs of the career field.

B3.1.2. Naval School EOD Course: The Specialty Training Standard (STS) was adjusted to represent current curriculum. Due to this being an Inter-Service school with the Navy being the executive manager, training decisions are made by the Technical Training Acceptance Board and the School's Commanding Officer. Recommendations can be made by the U&TW, however, it requires Joint EOD Program acceptance.

B3.2. **Five Level Upgrade Training Requirements.** Full training requirements review was conducted and change needs were identified for 5-Level upgrade requirements.

B3.2.1. The STRT recommended additional 5-Level Core Tasks and the U&TW confirmed the addition. The additional 5-Level Core Tasks was the result of the inclusion of additional wartime related tasks, line item detailed sub-tasks and National Fire Prevention Agency training requirements.

B3.2.2. 3E8X1 EOD Journeyman Career Development Course (CDC) Program.

B3.2.2.1. The 3E8X1 EOD Journeyman CDC program is being reformatted as an Electronic Resource-CDC (ER-CDC). The ER-CDC program will replace the current written material contained within the CDC with references for trainees to research and self-study. The overall structure will remain the same, however, the scope of coverage will grow vastly and better mirror 5-Skill Level upgrade requirements.

B3.2.2.2. The 3E8X1 CDC writer is tasked to develop and use, in coordination with Air Force Career Development Academy Course Development, a syllabus study guide format for future CDC materials in lieu of the traditional CDC manuscript style. The new format will focus on the knowledge component of the 5 Level Core Task and will incorporate measurements that will be used as part of 5-Level Upgrade. The EOD CDC Study Guide and referenced study material (EOD Technical Orders, AFIs, and EOD Joint Publications) will be the backbone of this transformed program. Standardized learning objectives will be identified within the syllabus and individual module study sheets. The program course number with formatted study exercises, unit review exercises and end of course tests will be maintained with this transformation.

B3.3. **Seven Level Upgrade Training Requirements.** Full training requirements review was conducted and change needs were identified for 7-Level upgrade requirements.

B3.3.1. The STRT recommended additional 7-Level Core Tasks and the U&TW confirmed the addition. The additional 7-Level Core Tasks was the result of the inclusion of additional wartime related tasks and National Fire Prevention Agency training requirements.

B3.3.2. 7-Level Craftsman Course Restructure. Course change initiative history was reviewed and training requirements for "operationally" focused curriculum were validated. The change to operational requirements was unanimously decided. 366 TRS/TRR is tasked to develop an "operationally" focused course based on the proficiency codes identified by the U&TW. The course development will include curriculum, infrastructure, materials and the equipment necessary to accomplish instruction and exercises relative to in-garrison EOD operations.

B3.4. **Proficiency Training.** Any additional knowledge and skill requirements that were not taught through initial skills or upgrade training are assigned as continuation training. Purpose of continuation training is to provide training exceeding minimum upgrade training requirements with emphasis on present and future duty positions. MAJCOMs must develop a continuation-training program that ensures personnel in the EOD career field receive the necessary training at the appropriate point in their careers. The training program will identify both mandatory and optional training requirements.

B3.5. **Supplemental Training.** Subject Matter Experts (SMEs) and the Training Committee reviewed supplemental training courses for technical accuracy and validated the courses were deemed necessary to fully support AFSC career progression/operational capability.

B4. Community College of the Air Force (CCAF) Academic Programs. Airmen are automatically enrolled in CCAF upon completion of basic military training. CCAF is one of several federally chartered degree-granting institutions; however, it's the only 2-year institution exclusively serving military enlisted personnel. The college is regionally accredited through Air University by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) to award Associate of Applied Science (AAS) degrees designed for specific Air Force occupational specialties and is the largest multi-campus community college in the world.

Upon completion of basic military training and assignment to an AF career field, all enlisted personnel are registered in a CCAF degree program and are afforded the opportunity to obtain an AAS degree. In order to be awarded, degree requirements must be successfully completed before the Airman separates/retires from the Air Force or is commissioned as an officer. See the CCAF website: http://www.au.af.mil/au/barnes/ccaf/ for details regarding the AAS degree programs: In addition to its Associates degree program, CCAF offers the following programs. Complete details can be found at http://www.au.af.mil/au/barnes/ccaf/certifications.asp. In addition to its degree program, CCAF offers the following:

B4.1. **CCAF Instructor Certification (CIC) Program.** The CIC is a professional credential that recognizes the instructor's extensive faculty development training, education and qualification required to teach a CCAF course, and formally acknowledges the instructor's practical teaching experience. Qualified officer, enlisted, civilian and other service instructors are eligible for this certification. Complete details for the instructor certification program can be found at http://www.au.af.mil/au/barnes/ccaf/certifications.asp.

B4.2. **The Professional Manager Certification (PMC).** This professional credential is awarded by CCAF and formally recognizes an individual's advanced level of education and experience in leadership and management, as well as professional accomplishments. The PMC is primarily designed for Air Force SNCO's. However, any enlisted Airmen who meet all program requirements may be nominated and awarded the PMC. Once an individual retires, separates or is commissioned, they are no longer eligible for the PMC. Complete details can be found at http://www.au.af.mil/au/barnes/ccaf/certifications.asp.

B4.3. **CCAF offers the Instructional Systems Development (ISD) Certification.** The ISD Certification is a professional credential that recognizes the writer's or manager's extensive training, education, qualifications and experience required to develop and manage CCAF courses. The certification also recognizes the individual's ISD qualifications and experience in planning, developing, implementing and managing instructional systems. The program is designed to broaden faculty and professional development. Complete details can be found at http://www.au.af.mil/au/barnes/ccaf/certifications.asp.

B4.4. **Air Force Credentialing Opportunities On-Line (AF COOL) Program.** AF COOL replaced the CCAF Credentialing and Education Research Tool (CERT). The AF COOL Program can be accessed at https://afvec.langley.af.mil/afvec/Public/COOL/Default.aspx. The site provides a research tool designed to increase an Airman's awareness of national professional credentialing and CCAF education opportunities available for all Air Force occupational specialties. The AF COOL Program also provides information on specific occupational specialties, civilian occupational equivalencies, CCAF degree programs, and AFSC-related national professional credentials available to enlisted members through credentialing agencies and professional organizations. The AF COOL Program contains a variety of information about credentialing and licensing and can be used to:

B4.4.1. Get background information about civilian licensure and certification in general and specific information on individual credentials including eligibility requirements and resources to prepare for an examination.

B4.4.2. Identify licenses and certifications relevant to an AFSC.

B4.4.3. Learn how to fill gaps between Air Force training and experience and civilian credentialing requirements.

B4.4.4. Get information on Tuition Assistance and GI Bill eligible funding opportunities to pay for credentialing examinations and associated fees.

B4.4.5. Learn about resources available to you that can help gain civilian job credentials.

B4.5. **Trade Skill Certification.** When a CCAF student separates or retires, a trade skill certification is awarded for the primary occupational specialty. The College uses a competency-based assessment process for trade skill certification at one of three proficiency levels: Apprentice, Journeyman, Craftsman/Supervisor. All are transcribed on the CCAF transcript.

B4.6. **Air University Associate to Baccalaureate Cooperative (AU-ABC).** AU-ABC directs Airmen with associate in applied science degrees from the CCAF to a collection of accredited "military friendly" colleges and universities to consider when completing a four-year degree. The program maximizes the application of military career education and training, and provides a multitude of online academic and support services for the enlisted member.

B5. CCAF Degree Completion Requirements (64 Semester Hours). The EOD Associates Degree (4VRC) applies to the 3E8X1 AFSC. Prior to completing a CCAF degree, the individual must be awarded a 5-level and the following requirements must be met:

Course	**Semester Hours**
Technical Education	**24**
Leadership, Management, and Military Studies	**6**
Physical Education	**4**
General Education	**15**

Program Elective Technical Education; Leadership, Management, and Military Studies or General Education	**15**
Total	**64**

B5.1. **Technical Education. (24 semester hours)** A minimum of 12 semester hours of technical core subjects or courses must be applied and the remaining semester hours applied from technical core or technical elective subjects or courses. Requests to substitute comparable courses or to exceed specified semester hour values in any subject or course must be approved in advance.

Technical Core Requirements	**Semester Hours**
Algebra-Based Physics	8
CCAF Internship	18
Electricity/Electronics	9
Explosive Ordnance Disposal	24
General Chemistry	8
Hazardous Materials	6

B5.2. **Technical Electives.**

Technical Electives	**Semester Hours**
Accident Prevention	3
Basic Photography (Camera/Video Operations)	3
Blueprint Reading/Schematic Diagrams	3
Computer Science	6
Emergency Medicine	3
Heavy Equipment Operation	3
Industrial Safety	3
Industrial X-Ray/Nondestructive Inspection	3
Inventory Management	3
Investigative Techniques	3
Map and Compass Reading	3
Nuclear Science	4
Principles of Marksmanship	3
Statistics	3
Technical Mathematics (College Algebra or Higher)	3
Technical Writing	3

B5.3. **Leadership, Management, and Military Studies (LMMS)** (6 Semester Hours): Professional military education, civilian management courses accepted in transfer and/or by testing credit.

B5.4. **Physical Education** (4 Semester Hours): This requirement is satisfied by completion of Basic Military Training.

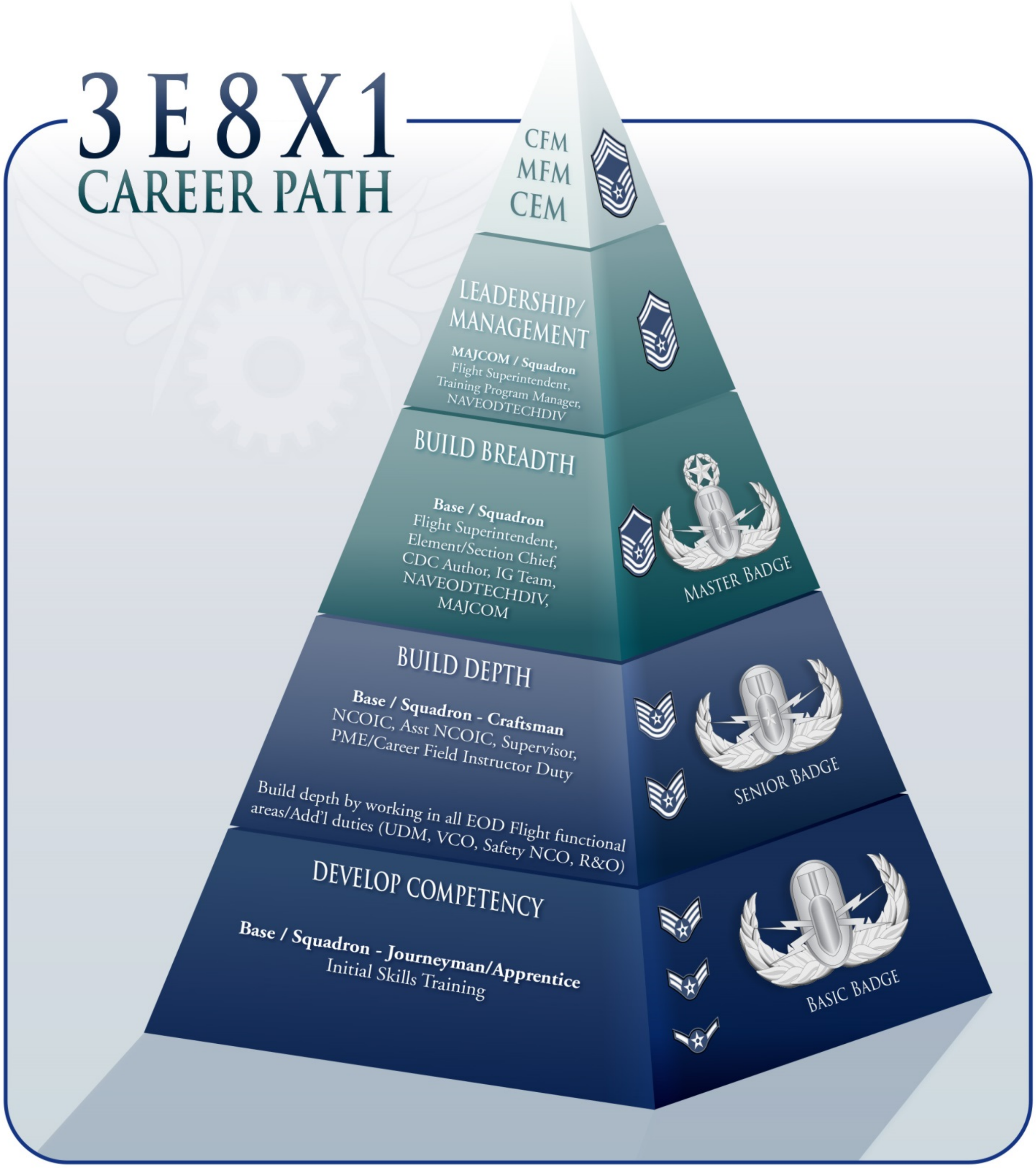
B5.5. **General Education (15 Semester Hours):** Applicable courses must meet the criteria for application of courses to the general education requirements and be in agreement with the definitions of applicable general education subjects/courses as provided in the *CCAF General Catalog*.

General Education Subjects/Courses	**Semester Hours**
Oral Communication	3
Speech	
Written Communication	3
English Composition	
Mathematics	3
Intermediate algebra or a college-level mathematics course satisfying delivering institution's mathematics graduation requirement-if an acceptable mathematics course applies as technical or program elective, you may substitute a natural science course for mathematics.	
Social Science	3
Anthropology, archaeology, economics, geography, government, history, political science, psychology, and sociology.	
Humanities	3
Fine arts (criticism, appreciation, historical significance), foreign language, literature, philosophy, and religion.	

B5.6. **Program Elective.** (15 semester hours) Courses applying to technical education, LMMS or general education requirements; natural science courses meeting general education requirement application criteria; foreign language credit earned at Defense Language Institute or through Defense Language Proficiency Test; maximum 9 semester hours of CCAF degree-applicable technical course credit otherwise not applicable to program of enrollment.

B5.7. Additional off-duty education is a personal choice that is encouraged for all. Individuals desiring to become an AETC Instructor should be actively pursuing an associate degree. A degreed faculty is necessary to maintain accreditation through the Southern Association of Colleges and Schools (SACS).

B6. Enlisted Career Field Pyramid. The EOD Pyramid illustrates the AFS 3E8X1 career field path.



B7. Enlisted Training Path.

ENLISTED CAREER PATH				
	GRADE REQUIREMENTS			
Education and Training Requirements	Rank	Average Sew-On	Earliest Sew-On	High Year Of Tenure (HYT) (Active Duty Only)
Basic Military Training School				
Upgrade To Apprentice (3-Skill Level) – Complete Technical School	Amn A1C	6 months 16 months		
Upgrade To Journeyman (5-Skill Level) – Complete all 5-level core/duty related tasks – Complete CE 5-Level Common Core Concept web-based course – Complete 5-level CDC – Specific AFQTPs for duties at assigned location – Supplemental Courses (MAJCOM Determined)	SrA	3 years	28 months BTZ (22 Months)	8 years
Trainer – Must be qualified and certified to the perform tasks to be trained. – Attend AF Training Course – Recommended by the supervisor				
Upgrade To Craftsman (7-Skill Level) – Minimum rank of SSgt – Complete all core/duty related tasks – Complete CE 7-Level Common Core Concept web-based course – Complete EOD Craftsman Course (Team Leader Crs) – Supplemental Courses (MAJCOM Determined) – Minimum 12 months OJT (6 months OJT for retrainees)	SSgt	5 years	3 years	15 years
Certifier – SSgt with 5-skill level or civilian equivalent – Attend AF Training Course – Appointed by commander – Be a person other than the trainer (for core and critical tasks only)				
Upgrade To Superintendent (9-Skill Level) – Minimum rank of SMSgt – CE Superintendents Course (WMGT570) (AD/AFR Only, not skill level awarding)	SMSgt	20 years	11 years	26 years
EOD Manager – Chief Orientation Course (AFR Only) – CE Superintendents Course (WMGT 570) (ANG Only)	CMSgt	22 years	14 years	30 years

B8. AF EOD Nuclear Training Path.

B8.1.1 Joint Nuclear EOD Course (JNEODC), J5AZO3E87100DA. This is a DNWS/DOE course that provides detailed sustainment training for nuclear EOD operators in nuclear EOD operations; emphasis on nuclear weapons design information including nuclear physics, safety, component subsystems, and identification features as well as detailed component familiarization; general foreign systems information; consideration of radiation effects, potential hazards, and protection methods; and scope of actions of an initial response force EOD team member. This course is conducted by Defense Nuclear Weapons School and the Department of Energy at Kirtland AFB NM or via MTT.

B8.1.1.1. Prerequisite: See the Education & Training Announcements (ETCA) website (https://etca.randolph.af.mil).

B8.1.1.2. This course is a one-time requirement for EOD personnel and attendance is mandatory for all personnel assigned to a custodial unit or an assignment supporting the nuclear enterprise. Seat allocations priority is given to personnel assigned to custodial units and attendance will be triggered once assigned. ARC EOD forces tasked to support nuclear weapons during contingencies will attend training.

B8.1.2. Advanced Improvised Explosive Device Disposal Course (AIEDDC), JBAZN3E871 00NA. This course is designed to provide advanced IED Tactics, Techniques and Procedures to EOD Technicians and Officers to diagnose, disable, contain and dispose of sophisticated IED's in varied environments; including battlefield operations, peacekeeping operations and homeland defense.

B8.1.2.1. Prerequisite: See the ETCA website (https://etca.randolph.af.mil). Completion of the EOD Basic Electronics CBT.

B8.1.2.2. This course is a one-time requirement for EOD personnel and attendance is mandatory for all personnel assigned to a custodial unit or an assignment supporting the nuclear enterprise.

B8.1.3. Advanced Diagnostics Training I (ADT-1), J5AAD3E8510A1A. This is a five-day unclassified course of instruction that focuses on WMD threat awareness, interagency policy, national response architecture, nuclear science, radiation detector theory, and crisis communications. This course meets interagency training standards for national crisis response. Course consists of lectures, facilitated discussions, individual technical hands-on classes, and group technical hands-on classes.

B8.1.3.1. Prerequisite: See the ETCA website (https://etca.randolph.af.mil).

B8.1.3.2. This course is a one-time requirement for EOD personnel and attendance is mandatory for all personnel assigned to a custodial unit or an assignment supporting the nuclear enterprise. Seat allocations priority is given to personnel assigned to custodial units and attendance will be triggered once assigned.

B8.1.4. Advanced Diagnostics Training 2 (ADT-2), J5AAD3E8510A2A. This is a classified five-day course of instruction which focuses on steady-state operations threat assessment of Nuclear Materials of Concern. This course also focuses on interagency policy, threat design concepts, nuclear science, tactics, techniques, procedures, and crisis communications. This course meets interagency training standards for national crisis response. The format of this course is lectures, facilitated discussions, individual technical hands-on classes, and group technical hands-on classes.

B8.1.4.1. Prerequisite: See the ETCA website (https://etca.randolph.af.mil).

B8.1.4.2. This course is a one-time requirement for EOD personnel and attendance is mandatory for all personnel assigned to a custodial unit or an assignment supporting the nuclear enterprise. Seat allocations priority is given to personnel assigned to custodial units and attendance will be triggered once assigned.

B8.2. **Prerequisite Waiver Authority.**

B8.2.1. Waiver Authority for course prerequisites rests with the EOD Career Field Manager or his delegated representative.

B8.2.2. For custodial units, JNEODC rank prerequisite waiver authority has been delegated to the owning MAJCOM EOD Functional Area Managers.

B9. Enlisted Professional Military Education (EPME).

B9.1. Basic EPME (Distance Learning). Air Force EPME is a time-in-service (TIS)-based model that ensures targeted delivery of institutional competencies (ICs) throughout the Continuum of Learning across an enlisted Airman's career through distance learning. Basic EPME Requirements will be developed in three phases across an Airman's career. Refer to AFI 36-2301, *Developmental Education*, for the most current guidance and TIS requirements.

B9.1.1. Phase 1. Phase 1 is the resident Airman Leadership School (ALS), which meets all EPME requirements (basic and comprehensive). RegAF Airmen must complete and pass Phase 1 to be eligible to enroll in Phase 2 EPME. Air Reserve Component (ARC) Airmen may accomplish ALS via DL and/or via the resident or satellite program.

B9.1.2. Phase 2. Phase 2 (Course 15) meets the basic requirements for NCOs. All RegAF and ARC Airmen must enroll within the TIS window. Failure to enroll, complete, and pass Phase 2 within one year of enrollment renders Airmen ineligible to reenlist and compete for promotion until this requirement is met. The ARC will determine the consequences for failure to complete required Phase 2 within established timeframes.

B9.1.3. Phase 3. Phase 3 (Course 14, Version 6) meets the basic requirements for SNCOs. RegAF Airmen must complete and pass Phase 2 to be eligible to enroll in Phase 3. See promotion policy for guidance related to course completion and senior rater endorsement.

B9.2. Comprehensive EPME (In-residence). The comprehensive learning experience EPME are in-residence courses that builds upon the Basic EPME requirements to achieve higher proficiency levels and is delivered in three phases. Refer to AFI 36-2301, *Developmental Education*, for the most current guidance and TIS requirements.

B9.2.1. Phase 1 EPME. The ALS resident program delivers both basic and comprehensive learning requirements. The ALS DL course is available for ARC Airmen and meets all basic requirements.

B9.2.2. Phase 2 EPME NCOA Intermediate Learning Experience (ILE) is a resident opportunity that delivers comprehensive learning requirements. This opportunity is available to Airmen, who meet minimum requirements.

B9.2.3. Phase 3 EPME SNCOA Advanced Learning Experience (ALE) is the advanced resident opportunity that delivers comprehensive learning requirements. This opportunity is available to Airmen; who meet minimum requirements.

B10. EOD and Civil Engineer (CE) Occupational Badges. The Civil Engineer Badge is the occupational badge for all 3E AFSs'. The EOD badge is a joint service badge awarded at the completion of Tech School with the CE badge. The criteria for subsequent awards (senior and master) are based on qualifications and leadership in EOD tasks in order to more closely align with sister service award criteria and maintain joint service parity. Further information on the wearing of the badge can be located in AFI 36-2903, *Dress and Personal Appearance of Air Force Personnel.*

B10.1. **CE Occupational Badge.** The Civil Engineer badge reflects a great history and tradition. By wearing it, you will be recognized by your fellow airmen as having achieved an expected level of competence. The multitude of engineers before you established this expectation through excellent service in both peace and war. Eligibility criteria for award and wear of AF occupational badges can be found in AFI 36-2903, *Dress and Personal Appearance of Air Force Personnel*.

B10.1.1. **CE Badge Heraldry.** Historically, the gearwheel and compass represent the engineering profession in both the military and civilian sector. The gear represents the essence of engineering—applying scientific principles and technology to practical ends. To Air Force engineers, the gear symbolizes an element (representing the built environment) that complements other environments (weapon systems and trained personnel) to enable the Air Force to perform its mission. The compass is a precision tool used by engineers to design and construct facilities and equipment. Together, the gear and compass symbolize all the diverse specialties within Air Force Civil Engineer. Beyond doubt, the wings helped to portray the fundamental linkage between the engineering and aviation components—the built environment is the foundation supporting the Air Force mission and people.

B10.1.2. **CE Badge Wear Criteria.**

B9.1.2.1. **Basic Badge.** The basic badge is awarded upon successful completion of the apprentice course.

B9.1.2.2. **Senior Badge.** The senior badge adds a star to the top of the badge. Wear the senior badge after award of the 7-skill level.

B9.1.2.3. **Master Badge.** The master badge adds a wreath around the star. The Master Badge is awarded to Master Sergeant or above with 5 years in the specialty from award of the 7-skill level.

B10.2. **EOD Occupational Badge.** The EOD badge reflects the achievements and laurels gained in eliminating or minimizing accident potentials of hazardous ordnance, through the ingenuity and devotion to duty of our fellow EOD professionals. It also serves as a living memorial of our fellow EOD professionals who gave their lives while performing EOD duties. Eligibility criteria for award and wear of AF occupational badges can be found in AFI 36-2903.

B10.2.1. **EOD Badge Heraldry.**

B10.2.1.1. Wreath. Symbolic of the achievements and laurels gained in minimizing accident potentials, through the ingenuity and devotion to duty of its members. It is in the memory of those EOD professionals who gave their lives while performing EOD duties.

B10.2.1.2. Bomb. Copied from the design of the World War II, Bomb Disposal Badge, represents the historic and major objectives of the EOD attack, the unexploded bomb.

B10.2.1.3. Three Fins. Represent the major areas of nuclear, conventional and chemical/ biological interest.

B10.2.1.4. Lightning Bolts. Symbolize the potential destructive power of the bomb and the courage and professionalism of EOD personnel in their endeavors to reduce hazards as well as to render safe explosive ordnance harmless.

B10.2.1.5. Shield. Represents the EOD mission-prevent a detonation and protect the surrounding area and property to the utmost.

B10.2.2. EOD Badge Wear Criteria. EOD Airmen will wear their specific duty badges in addition to the CE Craftsmen Badge. If filling an active EOD billet, the EOD badge takes precedence over the CE Craftsman badge. Use the following criteria for the award of the basic, senior and master EOD duty badges for enlisted and officer personnel.

B10.2.2.1. Award of basic EOD badge is achieved with successful graduation of EOD Technical School, Det 3, 366 TRS, Eglin Air Force Base, Florida.

B10.2.2.2. Award of the senior EOD badge is achieved four years from award of the basic EOD badge filling an active EOD billet, certified as a team leader in the CFETP and upon certification letter signed by EOD flight chief and approved by commander.

B10.2.2.3. Award of the master EOD badge is achieved after eight years from award of the basic EOD badge filling an active EOD billet, met all requirements for the senior EOD badge, and upon certification by EOD flight chief and approved by commander.

PART I

SECTION C - SKILL LEVEL TRAINING REQUIREMENTS

C1. Purpose. The various skill levels in the career field are defined in terms of tasks and knowledge requirements for the EOD career ladder. They are stated in broad, general terms and establish the standards of performance. An all-encompassing core task list has been developed for this specialty because of the diversity of the missions supported and the equipment installed to meet mission requirements. Core tasks, knowledge items, and skill requirements for this specialty are identified in the STS. Completion of the mandatory 3-level awarding course, the mandatory completion of CDCs, the mandatory completion of applicable AFQTPs, and the mandatory 7-level Craftsman course, comprise Air Force requirements.

C2. Skill Level Training Requirements.

C2.1. **Apprentice (3-Level) Training Requirements. (3E831).**

KNOWLEDGE	Completion of the EOD Preliminary course, J3AQR3E831 01AB at Sheppard AFB, TX and the NAVSCOLEOD Apprentice course, JBABN3E831 00NC at Elgin AFB, FL
EDUCATION	For entry into this specialty, completion of high school general educational development (GED) equivalency with courses in physics, mechanics, and basic electronic theory are desirable.
TRAINING	Completion of the apprentice pipeline course (J3AQR3E831 01AB) and US Naval EOD School (JBABN3E831 00NC) course is mandatory for award of this skill level.
EXPERIENCE	None required.
OTHER	*For entry, award and retention of AFSC 3E8X: - No record of emotional instability - Normal depth perception as defined in AFI 48-123, *Medical Examinations and Standards* - Normal Color vision as defined in AFI 48-123 - Must maintain local network access IAW AFMANs 33-152, *User Responsibilities and Guidance for Information Systems*, and 33-282, *Computer Security* - Requires a Secret clearance; refer to AFI 31-501, *Personnel Security Program Management* for further details - Must maintain qualification for EOD IAW AFI 32-3001, EOD Program
IMPLEMENTATION	The 3-skill level is awarded upon graduating the apprentice pipeline course (J3AQR3E831 01AB), US Naval EOD School (JBABN3E831 00NC) course and submission by the Unit Training Manager at the member's unit of assignment.

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

C2.2. **Journeyman (5-Level) Training Qualifications. (3E851)**

KNOWLEDGE	EOD flight organization; applied principles of electronics, physics, chemistry and mechanics; peacetime-wartime accident/incident response procedures; operational principles for specialized EOD tools, equipment and personal protective equipment; explosive and demolition procedures; access and recovery operations; explosive ordnance reconnaissance and assessment; weapons technical intelligence; post blast analysis; protection of personnel and property; render safe techniques; dynamic charges and explosive entry tools; range clearance operations; proficiency, training and demolition range management; treatment of explosives and related hazardous materials; identification, safety precautions, render safe, and disposal fundamentals for U.S and foreign munitions/aerospace systems; identification, response planning, tactical considerations, render safe and disposal fundamentals for improvised explosive devices and homemade explosives; procedural fundamentals for weapons of mass destruction response; equipment and procedures for chemical/biological warfare and nuclear weapons; airbase recovery operations; deployment procedures; movement by aircraft; small arms and crew served weaponry; joint service and special force support requirements; combat operations.
EDUCATION	N/A
TRAINING	- Completion of 3E851 CDCs is mandatory - Completion of the CE 5-Level Common Core Concept web-based course located on the CE-VLC is mandatory for award of this skill level - Certification of all 5-skill level core tasks identified with an asterisk (*) in the 5-skill level column of the STS - Certification of all 5-skill level diamond tasks identified with a diamond (♦) in the 5-skill level core task column of the STS **if** the equipment is available - Certification of duty position requirements identified by the supervisor
EXPERIENCE	- Qualification in and possession of AFSC 3E831 - Experience operating EOD tools/equipment, executing aerospace system response, rendering safe munitions, removing and treating hazardous unexploded ordnance or decontaminating activities - Minimum 12 months OJT (9 months for retrainees) before award of 5-skill level
OTHER	*For entry, award and retention of AFSC 3E8X1: - No record of emotional instability - Normal depth perception as defined in AFI 48-123, *Medical Examinations and Standards* - Normal Color vision as defined in AFI 48-123 - Must maintain local network access IAW AFMANs 33-152, *User Responsibilities and Guidance for Information Systems*, and 33-282, *Computer Security* - Requires a Secret clearance; refer to AFI 31-501, *Personnel Security Program Management* for further details - Must maintain qualification for EOD IAW AFI 32-3001, EOD Program

IMPLEMENTATION	Entry into 5-level upgrade training is initiated after the individual has completed all 3-level requirements. Qualification training is initiated any time individuals are assigned duties they are not certified to perform. Use OJT, CDCs, and AFJQSs concurrently to obtain the necessary qualifications

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

C2.3. **Craftsman (7-Level) Training Requirements. (3E871)**

KNOWLEDGE	All 3- and 5-level knowledge requirements apply to 7-level
EDUCATION	- To assume the grade of SSgt, individuals must successfully complete Phase 1 of Enlisted Professional Military Education (EPME) - To assume the grade of MSgt, individuals must successfully complete Phase 2 of EPME - Completion of the AFIT WMGT 433 EOD Flight Commanders/Chiefs Course is recommended for MSgt's - Possession of an Associate in Applied Sciences Degree in EOD is desirable
TRAINING	- Completion of in-residence 7-level Craftsman Course (J3ACR3E871 01AA Current Course / J3ACR3E871 01AB New Course June 2016) - Completion of the CE 7-Level Core Concept web-based course located on the CE-VLC is mandatory for award of this skill level - Certification of all 5-and 7- skill level core tasks identified with an asterisk (*) in the 5 and 7-skill level column of the STS - Certification of duty position requirements identified by the supervisor
EXPERIENCE	- Qualification in and possession of AFSC 3E851 - Performing or supervising EOD functions and operations, such as, preparing operational orders/plans, training/organizing/equipping personnel, and conducting response activities - Must be SSgt with minimum 12 months OJT (6 months for retrainees)
OTHER	*For entry, award and retention of AFSC 3E8X1: - No record of emotional instability - Normal depth perception as defined in AFI 48-123, *Medical Examinations and Standards* - Normal Color vision as defined in AFI 48-123 - Must maintain local network access IAW AFMANs 33-152, *User Responsibilities and Guidance for Information Systems,* and 33-282, *Computer Security* - Requires a Secret clearance; refer to AFI 31-501, *Personnel Security Program Management* for further details - Must maintain qualification for EOD IAW AFI 32-3001, EOD Program
IMPLEMENTATION	Entry into 7-level training is initiated when an individual is selected for SSgt and is fully qualified in the AFSC 5-skill level. Qualification training is initiated any time individuals are assigned duties they are not qualified to perform. Use OJT, CDCs, and AFJQSs concurrently to obtain the necessary qualifications.

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

C2.4. **Superintendent (9-Level) Training Requirements. (3E891)**

KNOWLEDGE	EOD flight organization; applied principles of electronics, physics, chemistry and mechanics; peacetime-wartime accident/incident response procedures; operational principles for specialized EOD tools, equipment and personal protective equipment; explosive and demolition procedures; access and recovery operations; explosive ordnance reconnaissance and assessment; weapons technical intelligence; post blast analysis; protection of personnel and property; render safe techniques; dynamic charges and explosive entry tools; range clearance operations; proficiency, training and demolition range management; treatment of explosives and related hazardous materials; identification, safety precautions, render safe, and disposal fundamentals for U.S and foreign munitions/aerospace systems; identification, response planning, tactical considerations, render safe and disposal fundamentals for improvised explosive devices and homemade explosives; procedural fundamentals for weapons of mass destruction response; equipment and procedures for chemical/biological warfare and nuclear weapons; airbase recovery operations; deployment procedures; movement by aircraft; small arms and crew served weaponry; joint service and special force support requirements; combat operations.
EDUCATION	- Must complete EMPE Phase 3 - Completion of AFIT WMGT 570 Civil Engineer Superintendent Course is mandatory for Active Duty and Air Force Reserve SMSgts (not a skill level awarding course) - Completion of AFIT WMGT 570 Civil Engineer Superintendent Course is highly encouraged for Air National Guard SMSgts and mandatory to be promoted to CMSgt (not a skill level awarding course) - Completion of the AFIT WMGT 433 EOD Flight Commanders/Chiefs Course is highly encouraged - Possession of an Associate in Applied Sciences Degree in EOD is desirable, and/or a bachelor's degree in any other related field
TRAINING	Completion of duty position training requirements and certification of all 5- and 7-skill level core tasks identified with an asterisk (*) in the 5- and 7-level core columns of the STS is mandatory
EXPERIENCE	- Qualification in and possession of AFSC 3E871 - Managing EOD functions or operations, such as, evaluating, planning, organizing and leading EOD activities in the fulfillment of the broad scope of EOD duties and responsibilities
OTHER	*For entry, award and retention of AFSC 3E8X1: - No record of emotional instability - Normal depth perception as defined in AFI 48-123, *Medical Examinations and Standards* - Normal Color vision as defined in AFI 48-123 - Must maintain local network access IAW AFMANs 33-152, *User Responsibilities and Guidance for Information Systems*, and 33-282, *Computer Security* - Requires a Secret clearance; refer to AFI 31-501, *Personnel Security Program Management* for further details - Must maintain qualification for EOD IAW AFI 32-3001, EOD Program

IMPLEMENTATION	Entry into 9-level training is initiated when an individual is selected for SMSgt and is a fully qualified 7-Level. Qualification training is initiated any time an individual is assigned duties they are not certified to perform.

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

C2.5. EOD Manager. (3E800)

KNOWLEDGE	Knowledge in EOD flight organization; applied principles of electronics, physics, chemistry and mechanics; peacetime-wartime accident/incident response procedures; operational principles for specialized EOD tools, equipment and personal protective equipment; explosive and demolition procedures; access and recovery operations; explosive ordnance reconnaissance and assessment; weapons technical intelligence; post blast analysis; protection of personnel and property; render safe techniques; dynamic charges and explosive entry tools; range clearance operations; proficiency, training and demolition range management; treatment of explosives and related hazardous materials; identification, safety precautions, render safe, and disposal fundamentals for U.S and foreign munitions/aerospace systems; identification, response planning, tactical considerations, render safe and disposal fundamentals for improvised explosive devices and homemade explosives; procedural fundamentals for weapons of mass destruction response; equipment and procedures for chemical/biological warfare and nuclear weapons; airbase recovery operations; deployment procedures; movement by aircraft; small arms and crew served weaponry; joint service and special force support requirements; combat operations.
EDUCATION	Possession of an Associate in Applied Sciences Degree in EOD is desirable, and/or a bachelor's degree in any other related field.
TRAINING	NA
EXPERIENCE	- Possess qualifications in feeder specialty (3E891) prior to award of Civil Engineer EOD Manger code 3E800 - Managerial ability to plan, direct, coordinate, implement, and control a wide range of work activity
OTHER	*For entry, award and retention of AFSC 3E8X1: - No record of emotional instability - Normal depth perception as defined in AFI 48-123, *Medical Examinations and Standards* - Normal Color vision as defined in AFI 48-123 - Must maintain local network access IAW AFMANs 33-152, *User Responsibilities and Guidance for Information Systems*, and 33-282, *Computer Security* - Requires a Secret clearance; refer to AFI 31-501, *Personnel Security Program Management* for further details - Must maintain qualification for EOD IAW AFI 32-3001, EOD Program
IMPLEMENTATION	Entry into Civil Engineer Manager Code 3E800 is initiated when an individual is selected for CMSgt and possess qualifications in a feeder specialty 3E891.

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

PART I

SECTION D - RESOURCE CONSTRAINTS

D1. Purpose. This section identifies known resource constraints, which preclude optimal and desired training from being developed or conducted, including information such as cost and manpower. Narrative explanations of each resource constraint and an impact statement describing what effect each constraint has on training are included. Also included in this section are actions required, office of primary responsibility, and target completion dates. Resource constraints will be, as a minimum, reviewed and updated annually.

D2. Apprentice (3-Level) Training:

D2.1. Constraints. None.

D2.1.1 Impact. None.

D2.1.2. Resources Required. None.

D2.1.3. Action Required. None.

D2.2. OPR/Target Completion Date. None.

D3. Journeyman (5-Level) Training:

D3.1. Constraints. None.

D3.1.1. Impact. None.

D3.1.2. Resources Required. None.

D3.1.3. Action Required. None.

D3.2. OPR/Target Completion Date. None.

D4. Craftsman (7-Level) Training. None.

D4.1. Constraints. To implement training as outlined in the contained Specialty Training Standard; EOD Career Field Manager must deliver identified funding and equipment.

D4.1.1. Impact. Training cannot be accomplished at the levels identified in the Specialty Training Standard if funding/equipment/manpower is not coordinated/delivered via AETC Training Pipeline Manager to Sheppard AFB 366 Training Squadron.

D4.1.2. Resources Required. Identified funding, equipment and one additional manpower authorization/fill is required to implement course as agreed upon in this Specialty Training Standard. The Course Resource Estimate (CRE) delivered to the Training Pipeline Manager and

EOD Career Field Manager October 2012 provides a comprehensive listing and explanations of the resources required.

D4.1.3. Action Required. Agreement of delivery of resources identified in the CRE by the EOD Career Field Manager and by the AETC Training Pipeline Manager. Once the proceeding actions occur – curriculum development can begin.

D4.2. OPR/Target Completion Date. None.

PART I

SECTION E – TRANSITIONAL TRAINING GUIDE

“There are no transition training requirements at this time. This section is reserved.”

PART II

SECTION A - SPECIALTY TRAINING STANDARD

A1. Implementation. This STS will be used to identify technical training provided by AETC for the 3-level Naval School EOD Apprentice pipeline course and the 7-level Team Leader Course.

A2. **Purpose.** As prescribed in AFI 36-2201, *Air Force Training Program,* and in collaboration with the Civil Engineer, Air Force Career Field Manager (AFCFM), it is mandatory for all civil engineers, regardless of duty assignment, to use an automated training record. The automated training record currently being utilized to document upgrade and qualification training is the Air Force Training Record (AFTR) and the application is located on the CE-VLC.

A2.1. **Column 1 (*Tasks, Knowledge, and Technical References*).** Lists the most common tasks, knowledge, and supporting technical references (TR) necessary for Airmen to perform duties in the 3-, 5-, and 7-skill level.

A2.2. **Column 2 (*Core Tasks*)**. Identifies core tasks (specialty-wide training requirements) by an asterisk (*) in the appropriate skill level sub-column. **As a minimum, trainees must complete hands-on certification on all core, critical and diamond tasks for skill level upgrade.**

A2.2.1. **Wartime Tasks.** All tasks in the 3-level course column are considered wartime tasks. In response to a wartime scenario, these tasks will be taught in the 3-level course in a streamlined training environment.

A2.2.2. **Diamond Tasks.** Tasks identified by a diamond (♦) are considered contingency/war task and are critical to the career field. Equipment shortfalls at most locations have created problems with actual hands-on certification of these tasks. In instances where required equipment is not available for hands-on training, reading the applicable EOD technical orders/manufacturer manuals as references until equipment becomes available is all that is required for upgrade training.

A2.3. **Column 3 (Certification for OJT)**. Used to record completion of tasks and knowledge training requirements. Use the automated training record application to document individual qualifications. **Task certification of core, critical and diamond tasks** require a training completion date and initials of the trainee, trainer, and certifier. All non-core tasks require training completion date and initials of the trainee and trainer only.

A2.4. **Column 4 (Proficiency Codes Used to Indicate Training/Information Provided).** Indicates formal training and correspondence course requirements. It shows the proficiency to be demonstrated on the job by the graduate as a result of training on the task, knowledge and the career knowledge provided by formal courses, CDC, distance learning (DL) and web-based training (WBT). See CADRE/AFSC/CDC listing maintained by the unit education and training manager for current CDC listings.

A2.5. **Qualitative Requirements.** Contains the proficiency code key used to indicate the level of training and knowledge provided by WBT, resident training and career development courses.

PART II

A2.6. **Job Qualification Standard (JQS).** The STS becomes the JQS for OJT when placed in automated training application and used according to AFI 36-2201. For OJT, the tasks in Column 1 are trained and qualified to the go/no go level. "Go" means the individual can perform the task without assistance and meets local requirements for accuracy, timeliness, and correct use of procedures. When used as a JQS, the following requirements apply:

A2.6.1. **Documentation.** Document and certify completion of training.

A2.6.1.1. **Duty position.** Duty position titles and task requirements will be developed and identified by the workcenter supervisor and loaded into the automated training application. Completion of core, critical and diamond tasks are mandatory for all duty positions. Ensure the correct duty position title is listed under Profile 1 section of the trainee's automated training record.

A2.6.1.2. **Duty position change.** To change a trainee duty position title select the Profile section under the trainee record and select the new duty position from the dropdown box, entry the date entered new duty position and save the update. Under the trainee JQS section you will see the new tasks associated with the selected duty position. The trainee and trainer/certifier will need to sign off the tasks associated with the new position.

A2.6.3. **Transcribing from previous versions to the new CFETP.** Most items should transcribe automatically during the update of the new CFETP. The UTM and supervisor must conduct a review of the new STS to identify any new core, diamond, or non-core tasks and add those tasks to their duty positions.

A2.6.3.1. **Previous training certification not listed** If previous training certification is not listed in the individual record, select the parent task to be transcribed, check the task title(s) block, and click on the transcribe button. Enter the date of the original certification and sign off the task(s). The trainee will then sign off the task(s) to finalize the transcription of previous training certification. The automated application will place an entry into the trainee 623a and must be acknowledged by the transcriber and trainee.

A2.6.3.2. **Transcribing external training certification.** If a trainee attended a formal training course and received appropriate accreditation, select the 623 III section of the user's automated training record and locate the course title in the master task list, then enter the completion date. If the course title is not listed, contact the UTM to have it loaded from the master catalog. If it is not listed in the master catalog contact the EOD CFM at AFCEC to have it loaded in the master catalog.

A2.6.4. **Documenting Career Knowledge.** When a CDC is not available, the supervisor identifies STS training references that the trainee requires for career knowledge IAW AFI 36-2201, *Air Force Training Program* and ensures, as a minimum, that trainees cover all mandatory items specified in AFI 36-2101, *Classifying Military Personnel (Officer and Enlisted).* For two-time CDC exam failures, the unit commander will take appropriate action IAW AFI 36-2201. **Note:** Career knowledge must be documented prior to submitting a CDC waiver.

A2.6.5. **Decertification.** When an Airman is found to be unqualified on a task, the supervisor shall identify the task in the JQS and check the box next to the task title. The supervisor shall select the Decertify button on the screen menu and enter a 623a comment explaining why the task was decertified, and then enter the Airman into qualification training. The individual is recertified using the normal certification process.

A2.6.6. **Recertification.** When an Airman is required to be recertified on a previous task due to annual or bi-annual requirements. The supervisor shall identify the task in the JQS and check the box next to the task title and select the Recertify button on the screen and entry the dates the recertification was completed.

A2.6.7. **Training Standard.** Tasks are trained and certified to the "go" level. Go means the individual can perform the task without assistance and meets the local requirements for accuracy, timeliness, and correct use of procedures. This equates to a 3c in the proficiency code key.

A2.7. **Specialty Training Standard.** The STS is a guide for development of promotion tests used in the Weighted Airman Promotion System (WAPS). Specialty Knowledge Tests are developed at the USAF Airman Advancement Division by senior NCOs with extensive practical experience in their career fields. The tests sample knowledge of STS subject matter areas judged by test development team members as most appropriate for promotion to higher grades. Questions are based upon study references listed in the Enlisted Promotions References and Requirements Catalog. Individual responsibilities are in AFI 36-2605, *AF Military Testing System.* WAPS is not applicable to the Air National Guard or Air Reserve Forces.

A3. Recommendations. Comments and recommendations are invited concerning quality of training AETC graduates receive. Reference this STS and address your correspondence regarding changes to 782 TRG/TGE, 917 Missile Road, Rm 1A300, Sheppard AFB TX 76311-2368 or E-mail 782csil@us.af.mil. A Customer Service Information Line (CSIL) has been installed for the supervisor's convenience to identify graduates who may have received over or under training on tasks/knowledge items listed in this STS. For a quick response to problems, call the CSIL at DSN 736-2574 any time day or night.

PART II

SECTION B - COURSE OBJECTIVE LIST (COL)

B1. Measurement. Measurement of each objective is indicated as follows:

B1.1. Written Test (W) indicates task or subject knowledge that is measured using a written test.

B.1.2. Performance Test (P) indicates required task performance that is measured with a performance test.

B1.3. Progress Check (PC) indicates separate measurement of both knowledge and performance elements measured with a performance progress check.

B2. Standard.

B2.1. **EOD Preliminary Course (J3AQR3E831 01AB) Sheppard AFB TX.** The standard is 80% on written examinations. Standards for performance measurement are indicated in the objectives and delineated on the individual progress checklist. Instructor assistance is provided as needed during the progress check or performance test, and students may be required to repeat all or parts of the behavior until satisfactory performance is attained.

B2.2. **NAVSCOLEOD Apprentice Course (JBABN3E831 00NC) Eglin AFB, FL.** The minimum passing score is 85%. Standards for student measurements are indicated in the objectives. Students are normally afforded a retest if at least 85% is not attained. A Naval School EOD Joint Academic Review Board (ARB) is normally conducted for students that do not attain a passing score on retest. Training continuation is decided by the Commanding Officer, Naval School EOD, based on academic records, recommendations from ARB and 366 TRS Detachment 3 Commander.

B3. Proficiency Level. Most task performance is taught to the “2b” proficiency level, which means the student can do most parts of the task, but does need assistance on the hardest parts of the task (partially proficient). The student can also determine step-by-step procedures for doing the task.

B4. Course Objective List. These objectives are listed in the sequence taught by Blocks of Instruction, per AETCI 36-2641, *Technical and Basic Military Training Development*.

B4.1. Initial Skills Course. A detailed listing of the initial skills course objectives may be obtained by written request to 366 TRS/DO, 727 Missile Road, Sheppard AFB TX 76311- 2254.

B4.2. B4.2. 7-Skill Level Course. A detailed listing of the Craftsman course objectives may be obtained by written request to 366 TRS/DO, 727 Missile Road, Sheppard AFB TX 76311- 2254.

PART II

SECTION C - SUPPORT MATERIAL

C1. Purpose. The following list of support materials is not all-inclusive; however, it covers the most frequently referenced areas.

C1.1. Computer-based and Web-based Air Force Qualification Training Packages (AFQTPs).

Specialized Training	Source
Large-scale Munitions Disposal Procedures	CE VLC
Explosive Entry Tools	CEVLC
EOD Homemade Explosive's (HME)	CE VLC
EOD Basic Electronics	CE VLC
Nuclear Weapons	AFNWC

SECTION D – EDUCATION AND TRAINING COURSE INDEX

D1. Purpose. This section of the CFETP identifies training courses available for the electrical systems specialty. Refer to Education and Training Course Announcements (ETCA) web site for information on the Air Force in-residence courses. The web site address is https://etca.randolph.af.mil/.

D2. Air Force In-Residence Courses/Mobile Training Team (MTT) Courses.

Course Number	Title	Source/Location	Requirement
J3AQR3E831 01AB	EOD Preliminary (New)	366TRS, Sheppard AFB TX	Core (Mission Essential)
JBABN3E831 00NC	EOD Apprentice	NAVSCOLEOD, Eglin AFB FL	Core (Mission Essential)
J3ACR3E871 01AA	EOD 7-Level Craftsman	366 TRS, Eglin AFB, FL (Will be phased out when EOD Team Leader Course FMC)	Core (Mission Essential)
J3ACR3E871 01AB	EOD Team Leader Course (New 7-level)	366TRS, Sheppard AFB TX (Estimated June 2016)	Core (Mission Essential)
J5AAD3E851 0A1A	Advanced Diagnostics Training (ADT) 1	Defense Nuclear Weapons School, Kirtland AFB NM	Core (Mission Essential)
J5AAD3E851 0A2A	Advanced Diagnostics Training (ADT) 2	Defense Nuclear Weapons School, Kirtland AFB NM	Core (Mission Essential)
J5AZ03E871 00DA	Joint Nuclear EOD (JNEOD)	Defense Nuclear Weapons School, Kirtland AFB NM	Core (Mission Essential)
JBAZN3E871 00NA	Advanced Improvised Explosive Device (AIEDD) Defeat	NAVSCOLEOD, Eglin AFB FL	Core (Mission Essential)
J5AZD3E851 00LA	Joint EOD Military Homemade Explosive Course	Joint EOD Program/AF EOD CFM Endorsed; Los Alamos Labs, NM	Core (Mission Critical)
J5AZA3E851 00RA	Domestic Homemade Explosives Course	ATF Training Site; Redstone Arsenal, AL	Core (Mission Critical)
N/A	Global CIED Threat Assessment Course	Silver Flag Site; Tyndall AFB, FL	Core (Mission Critical)
N/A	Mission Skills Tactics Training (MSTT)	Silver Flag Site; Tyndall AFB, FL	Core (Mission Critical)
WMGT 433	EOD Flight Chief	AFIT, Wright Patterson AFB OH	Core (Action Item) (Mission Essential)
WMGT 570	CE Superintendent	AFIT, Wright Patterson AFB OH	Core (Mission Essential)
S-V88-AL	Evasion, Conduct After Capture	AETC/A3TX, Lackland AFB TX	Core (Mission Essential)
J5AZD3E851 00FA	FBI National Improvised Explosives Familiarization (NIEF)	Redstone Arsenal, Huntsville AL	Core (Mission Essential)

D3. Air Force Career Development Academy (AFCDA).

Course Number	Title	Status
CDC 3E851 B	EOD Journeyman	Aug 97 (Deactivated date)
CDC 3E851 G	EOD Journeyman	Mar 04 (Deactivated date)
CDC 3E851 H	EOD Journeyman	Mar 04 (Deactivated date)
CDC 3E851	EOD Journeyman	Aug 03 – Edit Code 2
CDC 3E851	EOD Journeyman	May 07 – Edit Code 3

D4. Multi-Media Training (MMT).

Requirement	Course	Source
One Time	AF Emergency Management Program	Advanced Distributed Learning Service (ADLS) (https://golearn.adls.af.mil)
One Time	HazMat Awareness	Total Force Virtual Learning Center (TFVLC) (http://totalforcevlc.golearnportal.org)
One Time	HazMat Ops Certification	
One Time	Confined Space General Worker: Entrant, Attendant, and Supervisors	**Civil Engineer Virtual Learning Center (CE-VLC)** (https://afcec.adls.af.mil)
One Time	EOD Homemade Explosive's (HME)	
One Time	EOD Basic Electronics	
Annual	EOD Large-scale Munitions Disposal	
One Time	EOD Explosive Entry Tools	
As needed	EOD Andros F6A Familiarization	
As needed	Joint EOD Satellite Communications (SATCOM)	
As needed	Joint EOD CREW Vehicle Receiver/Jammer Operator's	
As needed	EOD B-1B Aircraft Familiarization	
As needed	EOD B-2 Aircraft Familiarization	
As needed	EOD B-52H Aircraft Familiarization	
As needed	EOD F-22A Aircraft Familiarization	

D5. Courses/CDCs Under Development/Revision.

Course Number	Title	Developer	Date Due
JCACP3E871 00AA	EOD 7-Level Craftsman	366 TRS, Eglin AFB, FL	6 June 2016
N/A	Global C-IED Threat Assessment	AFCEC	1 April 2016
N/A	Mission Skills Tactics Training (MSTT)	AFCEC (To Replace TOIC)	1 April 2016

D6. Courses Rescinded.

<table>
<tr><th>Course Number</th><th>Title</th><th>Developer</th><th>Conversion</th></tr>
<tr><td>L3AQR3E831 0E0A</td><td>EOD Preliminary</td><td>342 TRS, Lackland AFB, TX</td><td>EOD Preliminary J3AQR3E831 01AA</td></tr>
<tr><td>JCABP3E831 00AA</td><td>EOD Air Force Unique Course</td><td>366 TRS, Eglin AFB FL</td><td>None</td></tr>
<tr><td>J5AZO3E871 00EA (DETS)</td><td>Air Force Nuclear Enhancement Course (AFNEC)</td><td>Sandia National Laboratories, Kirtland AFB NM</td><td rowspan="2">Joint EOD Level 3 Incident Response – Nuclear (L3IR(N)), J5OZD32 E3G 01DA</td></tr>
<tr><td>J5OZD32E3G 01DA</td><td>Joint EOD Improvised Nuclear and Radiological Dispersal Device Recognition Course (JEIRRC)</td><td>Sandia National Laboratories, Kirtland AFB NM</td></tr>
<tr><td>J5OZD32E3G 01DA</td><td>Joint EOD Level 3 Incident Response – Nuclear (L3IR(N))</td><td>Defense Nuclear Weapons School, Kirtland AFB NM</td><td>Advanced Diagnostics Training (ADT) 1 & 2</td></tr>
<tr><td>J3AQR3E831 01AA</td><td>EOD Preliminary (Old Curriculum)</td><td>366TRS, Sheppard AFB TX</td><td>Core (Mission Essential)</td></tr>
</table>

D7. Other EOD Mission Related Courses.

Course Number	Title	Source/Location	Requirement
N/A	Tactics and Operations Integration Course (TOIC)	AFCEC EOD Division Bowman, SC	Core (Mission Critical) (Ends Sept 2016; Replaced with MSTT)
Multi-Venue	Advanced Tactics Training	AFCFM/MAJCOM Approved	Sustainment
Multi-Venue	Post-Blast Analysis	* FBI Local SABT * ATF MTT/Redstone * MAJCOM/AF EOD CFM Endorsed	Core (Mission Critical)
Course Number	**Title**	**Source/Location**	**Requirement**
Multi-Venue	Weapons Technical Intelligence	MAJCOM/AF EOD CFM Approved	Sustainment (Discretionary)
Multi-Venue	Combat Lifesaver/Tactical Combat Casualty Care	MAJCOM/AF EOD CFM Approved	Sustainment (Discretionary)
J5OZD32E3G 00DA	Nuclear Emergency Team Operations	Defense Nuclear Weapon School, Kirtland AFB NM	Enhancement (Discretionary)
JBOZD21A1A 00DA	Nuclear Weapons Orientation Course (NWOC)	Defense Nuclear Weapon School, Kirtland AFB NM	Enhancement (Discretionary)
JBOZD32E1D 00DA	Joint DoD/DoE Nuclear Surety Exec Course (JNSEC)	Defense Nuclear Weapon School, Kirtland AFB NM	Enhancement (Discretionary)
J5OZD13B4 04DA	Theater Nuclear Operation Course (TNOC)	Defense Nuclear Weapon School, Kirtland AFB NM	Enhancement (Discretionary)
SOED-DIT PDS code X9D	Dynamics of International Terrorism	Special Operations University, Hurlburt Field FL	Enhancement (Discretionary)
M02M729	Methods of Entry Course (Breachers)	Methods of Entry School (MOES), Weapons Training Battalion, Quantico, VA	Enhancement (Discretionary)
Multi-Venue	Helicopter Rope Suspension Techniques (HRST)	MAJCOM/AFCFM Approved	Enhancement (Discretionary)
2E-SI5P/SQI7/011-SQIP	Airborne School	1st Battalion, 507th Parachute Infantry Regiment, Fort Benning, GA	Enhancement (Discretionary)
419/420	Air Assault School	Fort Drum/Fort Hood	Enhancement (Discretionary)

M24M7A	USMC Basic Mountain Leader	Mountain Warfare Training Center, Bridgeport CA	Enhancement (Discretionary)
M24YAK	USMC Assault Climbers	Mountain Warfare Training Center, Bridgeport CA	Enhancement (Discretionary)
Multi-Venue	Foreign or Civilian IED or Bomb Disposal Schools	MAJCOM/AFCFM Approved	Enhancement (Discretionary)
N/A	REMOTEC Robot Maintenance	REMOTEC, Clinton TN	Enhancement (Discretionary)
N/A	Barrett M107 Armorer's	Barrett Firearms Mfg. Inc. Murfreesboro, TN	Enhancement (Discretionary)

PART II

SECTION E – MAJCOM UNIQUE REQUIREMENTS

E1. Purpose. This section of the CFETP identifies MAJCOM unique training requirements for EOD.

E2. MAJCOM Unique Training.

E2.1. Global Strike Command.

Course Number	Title	Source / Location
M02M729	Methods of Entry Course	Methods of Entry School (MOES), Weapons Training Battalion, Quantico, VA
Multi-Venue	Helicopter Rope Suspension Techniques (HRST) Operations	MAJCOM Approved

E2.2. Air Combat Command (820 COS Moody AFB).

Course Number	Title	Source / Location
2E-SI5P/SQI7/011-SQIP	Army Airborne	1st Battalion, 507th Parachute Infantry Regiment, Fort Benning, GA
419/420	Air Assault	Fort Drum/Fort Hood

E2.3. Air Force Special Operations Command.

Course Number	Title	Source / Location
2E-SI5P/SQIP/011-SQIP	Army Airborne	Fort Benning, GA
A-431-0135	Navy Parachute Static Line	Coronado, CA
419/420	Air Assault	Fort Drum/Fort Hood
Multi-Venue	Helicopter Rope Suspension Techniques (HRST) Operations	MAJCOM Approved
J4AMP2W1X1 M17A	AC-130 Hot-Gun Course	Hurlburt Field, FL

E2.4. US Air Force Europe.

Course Number	Title	Source / Location
M02M729	Methods of Entry Course	Methods of Entry School (MOES), Weapons Training Battalion, Quantico, VA

PART II

SECTION F - HOME STATION TRAINING

F1. Purpose. The purpose of this section is to identify the tasks, training references, and training sources available in support of contingency/wartime training. Civil Engineer forces will train to meet the full range of tasks expected in the contingency environment. Training ranges from knowledge-type training conducted in a classroom, to task-oriented hands-on training conducted in the field. These training requirements, frequencies, and sources are listed in AFI 10-209, *RED HORSE Program* and AFI 10-210, *Prime Base Emergency Engineer Force (BEEF) Program*.

F2. Home Station Training (HST). HST training is knowledge-based and hands-on training. The CE Commander ensures training is provided and documented and arranges for subject matter experts to conduct training as required. This includes training primarily accomplished during Prime BEEF training days. Units must make every effort to incorporate realism into their respective HST training programs. Field gear (to include primary weapons) must be used as the "norm" rather than the exception whenever training requirements such as security activities, convoy operations, defensive fighting positions, etc. are accomplished. Units will use demonstration performance packages, qualification training packages, other multimedia training packages, and AF CE standardized lesson plans to present the material. MAJCOMs and the ANG may develop and require other training materials to accomplish knowledge-based training.

F2.1. EOD (3E8X1) Specific Training. Exercises are to be accomplished, at a minimum, on an annual basis. EOD Flights are encouraged to increase the frequency in areas they feel are necessary.

F2.2. Aerospace System/Vehicles Exercise. See AFI 32-3001 and Aerospace Vehicle Launch and Recovery AFTTPs for performance expectations

F2.3. Conventional Ordnance (Peacetime) Exercise. See AFI 32-3001 and UXO Recovery Operations AFTTPs for performance expectations.

F2.4. Recovery of Airbases Denied by Ordnance (RADBO). See AFI 32-3001 and RADBO CONOPS/AFTTPs for performance expectations.

F2.5. Counter-Improvised Explosive Device (IED) Exercise (One Peacetime/One Contingency). See AFI 32-3001, IED, and Force Protection CONOPS/AFTTPs for performance expectations.

F2.6. Weapon of Mass Destruction (WMD) Exercise. See AFI 32-3001 and WMD CONOPS/AFTTPs for performance expectations.

F2.7. Nuclear Weapon Response - Broken Arrow Exercise. See AFI 32-3001 and Nuclear Accident/Incident Response CONOPS/AFTTPs for performance expectations. ARC may complete this requirement via a table-top exercise vice a practical exercise in the field.

F2.8. Chemical/Biological Exercise (Contingency – including disposal). See AFI 32-3001 and Chemical/Biological CONOPS/AFTTPs for performance expectations.

F2.9. Active Range Clearance War Skills. Complete Range Support Tasking within 48 months after graduating from EOD School. Complete one-time follow-on training within 60 months after award of 7-skill level. See AFI 32-3001 and Range Clearance Operations AFTTP for performance expectations.

F3. Combat Skills Training (CST). CST must be institutionalized as an integral part of any HST program. Observations, innovations and lessons learned (OIL) have taught us the importance of maintaining a higher level of combat readiness. Although the inclusion of combat skills-focused training into HST does not fully prepare CE personnel to work in a high threat combat environment, the steps taken to enhance training will help elevate units to a readiness level capable of supporting safe and effective operations in low to medium threat combat environments.

F4. Mission Essential Equipment Training (MEET). Wartime or contingency environments often involve the use of specialized and unique mission-essential equipment that civil engineers do not use in their day-to-day operations. Due to the cost and complexity, mission essential contingency equipment and trainer expertise are not commonly found at CONUS installations. Personnel must be hands-on certified and the certification documented in their CFETP. AFI 10-210, Attachment 4, identifies minimum number of personnel to be trained, positions by specialty, frequencies and Chapter 2 identifies the locations of training sites. Inadequate training on these key equipment items can negatively impact Air Force contingency operations.

F5. Silver Flag Exercise Training. Focus is on performance of critical contingency tasks in a team environment. The training focuses on bare base bed-down and sustainment operations using hands-on training with basic expeditionary airfield resources (BEAR) equipment in a realistic bed-down environment. Where possible, combat skills are added to the curriculum to ensure realism and help fortify a warrior mentality throughout the training. All CE personnel who fill Unit Type Code (UTC) positions will receive team training at Silver Flag Exercise Sites.

F6. AF Expeditionary (ES) Training Requirement. AETC, as lead MAJCOM for AF ES training, revamped ancillary home-station and advanced (mission specific) expeditionary skills training plans to standardize and synchronize training across the force. Detailed requirements for AF ES training is available in AFI 36-2201, *Air Force Training Program,* Chapter 8.

F7. EOD Combat Skills Training – 823 RED HORSE SQ DET 1/Combat Battlefield Ready Airman (CoBRA). It delivers critical skills and brings individuals and teams together to form a unit prior to deploying into a high risk combat environment in support of Air Component and Joint Force Commanders.

F8. Expeditionary Combat Support-Training and Certification Center (ECS-TCC). The ECS-TCC located at Dobbins ARB, GA enlists AFRC Professional Development Center certified instructors to administer and facilitate MEET training courses for Civil Engineer personnel (classroom and hands-on). The EOD training is individual-focused and specifically targets specialized training to include: CFETP Core Task certification, STP exercise support, ARTs familiarization, multiple detector IED detector training and just in time requested specialized training.

F9. Training References.

F9.1. AFI 10-209, *RED HORSE Program*, Chapter 3 and Attachments 2-6 identify the RED HORSE recurring training requirements.

F9.2. AFI 10-210, *Prime Base Engineer Emergency Force (BEEF) Program*, Chapter 4 and Attachments 2-6 identify the Prime BEEF recurring training requirements.

F9.3. AFI 36-2201, *Air Force Training Program*, Chapter 8 identify ES training requirements.

F9.4. Web-based Products. Web-based products are available on the CE Virtual Learning Center (VLC) website at https://afcec.adls.af.mil. Personnel completing these courses can receive credit for HST. CBT products can be used in a classroom setting to train as many personnel as possible. Attendance must be documented on a sign-in roster. The sign-in roster must be maintained IAW AFI 10-210.

F9.5. Air Force Education Training Course Announcement (ETCA). It is located at the following URL: https://etca.randolph.af.mil and lists additional training/educational opportunities available for civil engineer personnel. This catalog contains information on formal education and training courses. The catalog is updated quarterly.

F9.6. AFCEC/CXX. Maintains a comprehensive listing of multi-media products that support the contingency training program. To view this listing as well as gain information on how to order specific audiovisual products, please consult the AFCEC Contingency Support page.

PART II

SECTION G – EOD STANDARD TRAINING PACKAGE

G1. Objective. Ensure we provide our customers with the best EOD capability in DoD. We accomplish this by producing highly qualified and technically proficient EOD technicians capable of safely and efficiently performing the EOD peacetime and wartime missions.

G1.1. All active duty EOD personnel at flight level will participate in flight training per AFI 32-3001 *EOD Program*. If management duties prevent the senior officer and senior non-commissioned officer of the flight from full participation in training, the following training as a minimum will be completed: monthly proficiency, nuclear weapons training, and SORTS reportable training.

G1.2. EOD personnel assigned above wing level and those assigned special duty, i.e. instructor duty, Silver Flag Exercise Sites, or other authorized EOD billets, should accomplish Group I requirements as a minimum. Accomplishment of Group II through Group IV is not mandatory however; individuals are highly encouraged to complete additional training when possible.

G1.2. Air National Guard (ANG) and Air Force Reserve Command (AFRC) EOD personnel will accomplish training as noted by an asterisk (*) next to the line item.

G2. Group I Training Requirements (Monthly Qualification Training). Training or operations involving the use of cartridge-actuated tools, demolition explosives, or pyrotechnic devices used to perform render-safe procedures (RSP) or general demolition using live-explosives. Subjects listed in this section are taught as practical (hands on) training for all team members utilizing flight training explosive, tools and equipment inventories. List provides expectations for the minimum explosive training that will occur and does not require accomplishment in any specific order.

Line Item	Subject Name	ARC Requirement
I-1	General Demolition Procedures	*
I-2	Non-Electric Firing System	*
I-3	Electric Firing System	*
I-4	Detonating Cord Firing Systems	*
I-5	Disposal Techniques	*
I-6	Shaped Charge Procedures	*
I-7	Cartridge Actuated Explosive Tools	*
I-8	Dynamic Charges, i.e. WBC, MLVD, Hydra-Jet, Bootbanger…	*
I-9	Unserviceable Munitions Disposal Practical	*
I-10	Thermite Burn Procedures	*
I-11	EXROD Procedures	*
I-12	Explosive Access Techniques	*

G3. Group II Training Requirements (Semiannual Training Requirements). Subjects listed in this section are taught in a classroom setting followed by practical (hands on) training for all team members. During the classroom training tools are assembled, unique features and safety precautions briefed, and equipment applications and limitations discussed. Classroom instruction on procedures should coincide with Group IV practical exercise schedule.

PART II

Line Item	Subject Name	ARC Requirement
Specialized EOD Tools		
II-1	MK 2 Dearmer	*
II-2	Percussion Actuated Non-electric (PAN) Disrupter	*
II-3	MK 1 Remote Wrench	*
II-4	Hook and Line Kit	*
II-5	Assigned Robotics	*
II-6	Remote Firing Device	*
II-7	Assigned Mine Detector	*
II-8	MK 26 Ordnance Locator	*
II-9	Ground Penetrating Radar	*
II-10	Assigned C.R.E.W.	*
II-11	Assigned Portable Radiograph	*
II-12	ADM 300	*
II-13	AN-PDX 2 Kit	
II-14	AN-PDR 74 (Custodial Units)	
II-15	Chemical/Biological Detectors	*
II-16	Explosive/Chemical Identification Kit	
II-17	Night Vision Equipment	*
II-18	Tactical Global Positioning System (TGPS)	*
II-19	Assigned Tactical Radios	*
EOD Personal Protective Equipment		
II-20	Assigned Bomb Suit	*
II-21	Assigned Self-Contained Breathing Apparatus (SCBA)	*
II-22	Level A/Level B Protective Suit	*
II-23	Assigned Chemical Protective Mask	*
II-24	Chemical Protective Over-garment (CPO)	*
II-25	Individual Issued Equipment	*
EOD Mission Requirements		
II-26	Locally Assigned or Supported Aircraft/Aerospace platform	*
II-27	Locally Assigned or Supported Munitions - Unit Committed Munitions Listing (UCML) (current flying operations apply to AFRC)	*
II-28	Nuclear Weapons (Custodial Units)	
II-29	Homemade Explosives	*
EOD Procedural/Conceptual Training		
II-30	General EOD Safety Precautions	*
II-31	Electromagnetic Radiation (EMR) Grounding/Shielding Procedures	*
II-32	Gagging and Immobilization Procedures	*
II-33	Explosive Properties and Effects	*
II-34	Protection of Personnel and Property and Collateral Damage Assessment	*
Line Item	**Subject Name**	**ARC Requirement**
EOD Response Procedures		
II-35	Response Procedures for Force Protection (IED Permissive Environment)	*
II-36	Response Procedures for Force Protection (IED Non-Permissive Environment)	*
II-37	Response Procedures for WMD (may be combined w/Force Protection)	*

II-38	Response Procedures for Aerospace System/Vehicle Accident/Incident	*
II-39	Response Procedures for UXO Recovery (Chem/Bio/Conventional)	*
EOD Reporting Procedures		
II-40	EOD Information Management System	*
II-41	Asymmetric Threat and Tactical Analysis Casebook	
II-42	9-Line Medevac	
Tactical Operations		
II-43	Small Team Tactics	
II-44	Land Navigation – Map and Compass	*
II-45	Medevac Procedures	

G4. Group III Training Requirements (Annual Training Requirements). Classroom and practical (when applicable) training on specific items listed.

Line Item	Subject Name	ARC Requirement
III-1	Risk Management (RM)	*
EOD Equipment/Resources		
III-2	Assigned Cameras	*
III-3	Field Fabricated Dearmer	
III-4	Assigned Response Vehicles	
III-5	Assigned Tactical Vehicles	
III-6	Assigned IED/Explosive/CB Containment Vessel	
Ordnance Categories Training class should include key concepts of safety, identification and functioning for the type by function varieties. (Note: Incorporate current threat area Ordnance Order of Battle (OOB) in foreign ordnance training.)		
III-6	US MK-Series and M-Series Bombs	*
III-7	US Bomb Fuzes (FMU-Series), (MK-Series), (M-Series)	*
III-8	US Guided Bomb Units	
III-9	Foreign Bombs	
III-10	Foreign Bomb Fuzes	
III-11	US Dispensers	
III-12	US Submunitions	
III-13	Foreign Dispensers	
III-14	Foreign Submunitions	
III-15	US Projectiles	*
III-16	US Projectile Fuzes	*
III-17	Foreign Projectiles	
III-18	Foreign Projectiles Fuzes	
Line Item	**Subject Name**	**ARC Requirement**
III-19	US Grenades	*
III-20	Foreign Grenades	
III-21	US Rockets	*
III-22	US Rocket Fuzes	*
III-23	Foreign Rockets	

III-24	Foreign Rocket Fuzes	
III-25	US Guided Missiles	
III-26	Foreign Guided Missiles	
III-27	US Land Mines	*
III-28	Foreign Land Mines	
III-29	US Aircraft and Associated Hazards	*
III-30	Egress Training—presented by qualified Egress personnel	*
III-31	US A/C Flares and Dispensers	
III-32	US A/C Chaff and Dispensers	
III-33	US A/C LAU-Series Launchers	
III-34	US A/C Dispensed Markers	
III-35	Foreign Aircraft	
III-36	Nuclear Weapons	
EOD Procedural/Conceptual Training		
III-37	Tape and Line Procedures	*
III-38	Access and Recovery Procedures	*
III-39	Large-scale Munitions Disposal Procedures (EOD LMD CBT)	*
III-40	Standoff Munitions Disrupter/Assigned Disruption Weapons (SMUD) Procedures	*
EOD Response Procedures		
III-41	Response Procedures for IND/RDD	
III-42	Response Procedures for Chemical Weapons and Disposal	*
III-43	Response Procedures for Nuclear Weapons (Broken Arrow)	*
III-44	Procedures for Air Base Recovery	*
III-45	Secure Voice Over Communication Equipment Procedures	
III-46	Secure Satellite Communication (SATCOM) System Procedures	
Defense Support to Civil Authorities		
III-47	Hazardous Device Counter Measures Procedures	*
III-48	Off Base Response Procedures	
III-49	Local Civil/Sister-Service EOD Partnering/Capabilities (MOUs, etc)	
General Procedural/Conceptual Training		
III-50	Secure Voice Over Communication Equipment Procedures	
III-51	Secure Satellite Communication (SATCOM) System Procedures	

G5. Group IV Training Requirements.

G5.1. Practical Training and Exercise Requirements. Team exercises allow members to apply knowledge learned in the classroom to formulate plans, select and use equipment, manage personnel, and direct operations to resolve incidents or accident situations involving explosive ordnance. Exercise will be conducted to enhance realism and incorporate all equipment and procedures associated with the scenario. Exercise participation, as an observer, instructor, evaluator, or participant will fulfill minimum training requirements.

G5.2. Practical Training and Exercise Physicality Expectations. Physical fitness is core of a combat warrior, ensures mission readiness, and supports the Airman Warrior ethos. Mission, equipment, and TTPs; EOD requirements are physically demanding which requires a high level of physical fitness. Practical training and exercises should test the physical capabilities relative to EOD mission and provide an avenue to evaluate EOD Airmen's physical performance.

G5.3. EOD practical training and exercises, specifically: Weapon of Mass Destruction; Nuclear Weapon Response; Chemical/Biological Weapon, utilizing SCBA and personal protective equipment fulfills intent of eight hour HAZMAT Operation Core w/PPE Annual Refresher Training.

Line Item	Subject Name	ARC Requirement
IV-1	Aerospace System/Vehicles	*
IV-2	Conventional Ordnance (Peacetime)	*
IV-3	Recovery of Airbases Denied by Ordnance	*
IV-4	Counter-Improvised Explosive Device (One–Peacetime/One-Contingency)	*
IV-5	Weapon of Mass Destruction	*
IV-6	Nuclear Weapon Response–Broken Arrow (Non-Custodial: Annual/Custodial: Semi-Annual)	*
IV-7	Chemical/Biological Weapon (Contingency – including disposal)	*
Section B - 48 Months of award of the 3-skill level/60 months of award of the 7-skill level.		
IV-8	Active Range Clearance on a live ordnance tactical target	*****
IV-9	Large Scale Demolition Practical Application	*****

G6. Group V Training Requirements (Supplementary Training). Ancillary or other specialized training required by directive to perform general or specific additional military duties. This section may also be used to record training conducted in excess of STP requirements.

Line Item	Subject Name	ARC Requirement
V-1	Cargo Preparation (Designate one person on each XD UTC as the Cargo Prep Rep to get the training)	
Line Item	**Subject Name**	**ARC Requirement**
V-2	Local Environmental Protection/RCRA Requirements	
V-3	Weapons/Explosive Safety	*
V-4	Job Safety Training Outline	
V-5	Respiratory Protection	
V-6	ALARA	

BY ORDER OF THE SECRETARY OF THE AIR FORCE

OFFICIAL

JOHN B. COOPER, Lieutenant General, USAF
DCS/Logistics, Installation and Mission Support

3 Attachments
1. Qualitative Requirements (Proficiency Code Key)
2. 3E8X1 Specialty Training Standard
3. 3E8X1 Advanced EOD Course Training Standard

Attachment 1

A1. Qualitative Requirements (Proficiency Code Key)

This Block Is For Identification Purposes Only.		
Name Of Trainee		
Printed Name (*Last, First, Middle Initial*)	**Initials (Written*)***	**SSAN (Last four)**

Printed Name Of Trainer, Certifying Official And Written Initials	
N/I	*N/I*
N/I	*N/I*
N/I	*N/I*

Note: Place a continuation sheet behind the CFETP when additional space is required.

Proficiency Code Key		
	Scale Value	**Definition: The individual:**
Task Performance Levels	1	Can do simple parts of the task. Needs to be told or shown how to do most of the task. (Extremely Limited)
	2	Can do most parts of the task. Needs only help on hardest parts. (Partially Proficient)
	3	Can do all parts of the task. Needs only a spot check of completed work. (Competent)
	4	Can do the complete task quickly and accurately. Can tell or show others how to do the task. (Highly Proficient)
*Task Knowledge Levels	a	Can name parts, tools, and simple facts about the task. (Nomenclature)
	b	Can determine step by step procedures for doing the task. (Procedures)
	c	Can identify why and when the task must be done and why each step is needed. (Operating Principles)
	d	Can predict, isolate, and resolve problems about the task. (Advanced Theory)
**Subject Knowledge Levels	A	Can identify basic facts and terms about the subject. (Facts)
	B	Can identify relationship of basic facts and state general principles about the subject. (Principles)
	C	Can analyze facts and principles and draw conclusions about the subject. (Analysis)
	D	Can evaluate conditions and make proper decisions about the subject. (Evaluation)

Explanations

* A task knowledge scale value may be used alone or with a task performance scale value to define a level of knowledge for a specific task. (Example: b and 1b)

** A subject knowledge scale value is used alone to define a level of knowledge for a subject not directly related to any specific task, or for a subject common to several tasks.

- This mark is used alone instead of a scale value to show that no proficiency training is provided in the course or CDC.

X - This mark is used in course columns to show that training is required but not given due to resource constraints. / Lower code (3c/2b) indicates that a task is being trained to a level that is lower than required.

♦ - This symbol indicates the task is a diamond task due to equipment constraint at some units.

Specific tasks not identified with a symbol or proficiency code key (blank) indicates that no training is provided in the course or CDC. Major commands and /or units may establish scale values and combat training as dictated by mission requirements.

Note 1: BLK #4: Columns (1) & (2) can be relabeled to meet Career Field Requirements; i.e., 2 phase 3-skill level course, 5- and 7- level AFQTP

Note 2: All tasks and knowledge items shown with a proficiency code are trained during wartime.

Attachment 2

3E8X1 Specialty Training Standard

A2. 3E8X1 Specialty Training Standard.

A2.1. Identification. In the automated training record User Profile section the UTM will assign individuals to the correct workcenter upon in processing into the unit.

A2.1.1. For new trainee the UTM will assist them in creating a training record on the CE-VLC and placing them in the correct workcenter and specialty within their unit. Additional information will need to be entered into the following areas:

A2.1.1.1. **User Administrators:**

A2.1.1.1.1. Individual UTM

A2.1.1.1.2. Workcenter Supervisor

A2.1.1.1.3. Immediate Supervisor

A2.1.1.2. **User Training Information:**

A2.1.1.2..1 Duty Position

A2.1.1.2.2. Date Entered Duty Positions

A2.1.1.2.3. Training Status Code

A2.1.1.2.4. Date Entered Upgrade Training (UGT)

A2.1.2. For all other the UTM will need to place the individual into the correct workcenter and specialty. If the individual record is not available contact the losing unit to have the record transferred. If this fails, contact the AFCEC-VLC helpdesk for assistance. Additional information will need to be entered into the following areas:

A2.1.2.1. **User Administrators:**

A2.1.2.1.1. Individual UTM

A2.1.2.1.2. Workcenter Supervisor

A2.1.2.1.3. Immediate Supervisor

A2.1.2.2. **User Training Information:**

A2.1.2.2..1 Duty Position

A2.1.2.2.2. Date Entered Duty Positions

A2.1.2.2.3. Training Status Code

Attachment 2

3E8X1 Specialty Training Standard

A2.2. Specialty Tasks. The following are tasks the workcenter supervisor will use to create the duty task list for each duty position created for their workcenter.

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
1. CIVIL ENGINEER (CE) COMMON CORE CONCEPTS COURSES TR: CE Virtual Learning Center (CE-VLC) Note: QTP required for UGT													
1.1. Accomplish CE 5-Level Core Concepts Course	*							-	B	-	-	-	-
1.2. Accomplish CE 7-Level Core Concepts Course		*						-	-	-	-	-	B
2. EOD FLIGHT MANAGEMENT TR: AFIs 10-201, 10-206, 10-208, 10-210, 10-401 Vol 1 & 2, 10-402, 10-403, 10-404, 16-1404, 21-101, 21, 31-501, 24-204(I), 32-3001, 38-101, 38-201, 38-204, 38-601, 65-601 Vol 1, 91-101, 91-201, 91-204, 91-207; AFJI 32-3002; AFOSH STD 48-137; AFPD 32-30, 91-1, 91-2, 91-3; AFCAT 21-209, Vol 1 & 2; DoDD 5160.62, 5230.11; 3150.8M, 5200.1R, 5200.2R, 5200.8R, 6055.5M; 29 CFR 1910; TOs 00-5-1, 00-5-2, 00-5-18, 00-35D-54, 60A Series and 0-1 Series Indexes													
2.1. History, Duties and Responsibilities of EOD								-	-	-	-	-	-
2.2. Air Force EOD Program													
2.2.1. Air Staff, Air Force Civil Engineering Center (AFCEC), and MAJCOM EOD Responsibilities								-	-	-	-	-	-
2.2.2. EOD Mission Areas								-	-	-	-	-	-
2.2.3. EOD Flight Organizational Structure								-	-	-	-	-	-
2.2.4. Specialized EOD Unit/Command Responsibilities								-	-	-	-	-	-
2.2.5. Duties of AFSCs 3E831/51/71								-	-	-	-	-	-
3. EOD OPERATIONS TR: AFIs 10-207, 10-404, 10-801, 10-802, 10-2501, 32-3001, AFJI 32-3002; AFMAN 10-2502, DoDD 3025.1, 3025.12, 3150.8, 5100.3, DoD 3025.1M; 49 CFR; TOs 60 Series and 11N Series													
3.1. Incident Response TR: AFI 10-2501, 32-3001, 90-802; AFJI 32-3002; EOD AFTTPs													
3.1.1. Principles								-	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
3.1.2. Apply Risk Management (RM) Principles to EOD Operations								b	-	-	-	-	-
3.1.3. Select Incident Categories		*						-	-	-	-	-	-
3.1.4. Identify Response Options by Incident Type	*							-	-	B	-	-	-
3.1.5. Identify Requirements For Off-Base Responses													
3.1.5.1. Emergency Response		*						-	-	-	-	-	-
3.1.5.2. Identify USAF EOD Responsibilities in Operations Involving Support to Federal, State, and Local Agencies		*						-	-	-	-	-	-
3.1.6. Describe other agencies role during incident response													
3.1.6.1. Operational Responsibility	*							A	-	-	-	-	-
3.1.6.2. Investigative Responsibility	*							A	-	-	-	-	-
3.2. Perform Team Leader Operations TR: EOD CONOPs													
3.2.1. Unexploded Ordnance (UXO) Recovery Operations		*						-	-	-	-	2b	-
3.2.2. Aerospace Platforms		*						-	-	-	-	2b	
3.2.3. IED Response		*						-	-	-	-	2b	
3.2.4. Chemical/Biological Exercise		*						-	-	-	-	-	-
3.2.5. Nuclear Weapon Accident Response		*						-	-	-	-	-	-
3.2.6. WMD/CBRN Response		*						-	-	-	-	2b	-
3.3. Presidential and VIP Support TR: DoDDs 3025.13, 5210.55; AFI 32- 3001; TOs 60A Series; HDCM Manual; VIPPSA OPORD; 60L-1-1-1-1													
3.3.1. VIP Support Procedures	*							-	-	B	-	-	-
3.3.2. Identify Responsibilities													
3.3.2.1. Motorcade Vehicle Sweeps								-	-	-	-	-	-
3.3.2.2. Building Sweeps								-	-	-	-	-	-
3.3.2.3. Mission Objectives								-	-	-	-	-	-
3.3.2.4. Credentials/Identification Pin Accountability													
3.3.2.4.1. Control Procedures								-	-	-	-	-	-
3.3.2.4.2. Destruction and Disposition								-	-	-	-	-	-
4. EOD SECURITY REQUIREMENTS TR: AFI 3 1-501, AFI 3 1-101, AFI 10-701, 16-1404													
4.1. Identify Security Violations								-	-	-	-	-	-
4.2. Report Security Violations								-	-	-	-	-	-
4.3. Storage of Classified Information								-	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
4.4. Control/Access Procedures for Classified Information								-	-	-	-	-	-
4.5. Destruction and Disposition of Classified Information								-	-	-	-	-	-
4.6. Transportation of Classified Information								-	-	-	-	-	-
4.7. COMSEC Vulnerabilities of AFSC 3E8X1								-	-	-	-	-	-
4.8. Protection of Firearms and Munitions								-	-	-	-	-	-
4.9. OPSEC Vulnerabilities of AFSC 3E8X1								-	-	-	-	-	-
5. TRAINING TR: AFIs 36-2101, 36-2201; AFMAN 36-2201; AFECD; Air Force Training Record (AFTR) Quick Reference Guide; NFPA 472													
5.1. Overview								-	-	-	-	-	-
5.2. Evaluate personnel to determine need for training/on-the-job training								-	-	-	-	-	-
5.3. Enlisted specialty training standard													
5.3.1. Prepare Master Training Plan (MTP) / Master Task List (MTL)								-	-	-	-	-	-
5.3.2. Prepare job qualification standards								-	-	-	-	-	-
5.3.3. Conduct training								-	-	-	-	-	-
5.3.4. Counsel trainees on their progress								-	-	-	-	-	-
5.4. Monitor training effectiveness													
5.4.1. Career knowledge								-	-	-	-	-	-
5.4.2. Job proficiency upgrade								-	-	-	-	-	-
5.4.3. Qualification								-	-	-	-	-	-
5.4.4. Maintain training records - Use and Documentation of CFETP								-	-	-	-	-	-
5.4.5. Evaluate training programs effectiveness								-	-	-	-	-	-
5.4.6. Recommend people for advanced training								-	-	-	-	-	-
5.4.7. Formal training system (Training Allocation Process)								-	-	-	-	-	-
5.4.8. Managing Certification								-	-	-	-	-	-
5.4.9. National/DoD Certification requirements								-	-	-	-	-	-
5.4.10. Air Force Qualification Training Package (AFQTP) requirements								-	-	-	-	-	-
6. EOD PHYSICAL TRAINING STANDARDS TR: AFI 10-3502, AFI 32-3001													
6.1. Maintain Physical Training Standard	*							-	-	-	-	-	-
6.2. Exercise Physiology								-	-	-	-	-	-
6.3. Sports Nutrition Facts								-	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
7. EOD INFORMATION MANAGEMENT SYSTEM (EODIMS) TR: EOD CONOPS and User's Manual													
7.1. Use EODIMS								-	-	-	-	-	-
7.2. Understand User Roles								-	-	-	-	-	-
7.3. Create User Profiles								-	-	-	-	-	-
7.4. Navigate through System Modules								-	-	-	-	-	-
7.5. Create EOD Incident Reports	*							-	-	b	-	-	-
8. TECHNICAL ORDERS (TOs) TR: AFTO 00-5-1, AFI 21-203													
8.1. Technical Order System								A	-	-	-	-	
8.2. Indexes to Locate Information								-	-	-	-	-	-
8.3. Use TOs When Performing Tasks	*							2b	-	-	-	-	
8.4. TO Files maintenance and establishment								-	-	-	-	-	-
8.5. TO Requisitions								-	-	-	-	-	-
8.6. TO Improvement Reports								-	-	-	-	-	-
8.7. Principles of Posting and Tracking USAF TOs								-	-	-	-	-	-
8.8. EOD Mobile Field Kit (MFK)													
8.8.1. Systems familiarization								-	-	-	-	-	-
8.8.2. Use AEODPS								2b	-	-	-	-	-
9. PUBLICATIONS TR: AFI 33-360													
9.1. Military								A	-	-	-	-	-
9.2. Commercial								A	-	-	-	-	-
9.3. Engineering Technical Letters (ETL)								-	-	-	-	-	-
10. RESOURCES													
10.1. Assess manpower requirements								-	-	-	-	-	-
10.2. Identify budget requirements								-	-	-	-	-	-
10.3. Determine equipment requirements								-	-	-	-	-	-
10.4. Use Allowance Standards (AS)								-	-	-	-	-	-
10.5. AFEMS								-	-	-	-	-	-
10.6. Battlefield Airman Management System								-	-	-	-	-	-
10.7. COLTS								-	-	-	-	-	-
10.8. ACES-RM								-	-	-	-	-	-
10.9. Assess vehicle requirements								-	-	-	-	-	-
11. RESEARCH, DEVELOPMENT AND ACQUISITION (RD&A) TR: DoDD 5000.1; AFI 10-601, 63-114													

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
11.1. Process								-	-	-	-	-	-
11.2. Unit responsibilities								-	-	-	-	-	-
11.3. Major command responsibilities								-	-	-	-	-	-
11.4. Urgent Operational Needs Statement / Joint Urgent Operational Needs Statement								-	-	-	-	-	-
11.5. Notional Concept								-	-	-	-	-	-
12. MOBILIZATION TR: AFI 10-210, 10-211, 10-401, AFI 10-402, 16-1404, 31-101, AFPAM 32-2004; ; AFH 32-2005; AFMAN 24-204; AFPAM 10-219, Vol 1-8; War Mobilization Plan (WMP)-1, Annex S; DoD 5100.76-M													
12.1. Identify the Elements of the UTCs								-	-	-	-	-	-
12.2. Use Time-Phased Force Development List (TPFDL)								-	-	-	-	-	-
12.3. War and Mobilization Plan (WMP)								-	-	-	-	-	-
12.4. Assign AEF assignments								-	-	-	-	-	-
12.5. AEF Reporting Tool (ART)								-	-	-	-	-	-
12.6. Develop Contingency Munitions Storage Area Plans								-	-	-	-	-	-
12.7. Requirements for Situation Reports (SITREP)								-	-	-	-	-	-
12.8. Status of Resources and Training System (SORTS) for EOD Functions								-	-	-	-	-	-
12.9. Defense Readiness Reporting System (DRRS)								-	-	-	-	-	-
12.10. Develop Contingency Plans Input								-	-	-	-	-	-
12.11. Contingency Operations/Mobility Planning and Execution System (COMPES)								-	-	-	-	-	-
13. AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES TR: AFIs 10-210, 10- 211, 32-2004; AFH 32-2005; AFPAM 10-219, Vol 1-8; War Mobilization Plan (WMP)-1, Annex S													
13.1. Personnel Deployment													
13.1.1. Personnel accountability documents; MRRR, DRMD and related automated products								-	-	-	-	-	-
13.1.2. Recall procedures and Pyramid Alerting								-	-	-	-	-	-
13.2. UTC Posturing													
13.2.1. Identify procedures to posture teams and CE substitution rules								-	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
13.2.2. Utilize personnel products such as Air Force Personnel Desire List (AFPDL)								-	-	-	-	-	-
13.2.3. Courier Requirements								-	-	-	-	-	-
13.3. Equipment Deployment													
13.3.1. UTC specific requirements/inventory								-	-	-	-	-	-
13.3.2. Prime BEEF pallets								-	-	-	-	-	-
13.3.3. Hazardous Cargo Documentation								-	-	-	-	-	-
13.3.4. WRM concepts								-	-	-	-	-	-
13.4. Unit Deployment Management													
13.4.1. Installation deployment orders								-	-	-	-	-	-
13.4.2. Schedule of events								-	-	-	-	-	-
14. APPLIED PRINCIPLES OF PHYSICS AND CHEMISTRY													
14.1. Properties of Matter								B	-	-	-	-	-
14.2. Laws of Motion								B	-	-	-	-	-
14.3. Simple Machines								B	-	-	-	-	-
14.4. Measurement Systems													
14.4.1. English System								B	-	-	-	-	-
14.4.2. Metric System								B	-	-	-	-	-
14.4.3. Convert Between Systems													
14.4.3.1. Mass								B	-	-	-	-	-
14.4.3.2. Volume								B	-	-	-	-	-
14.4.3.3. Lengths								B	-	-	-	-	-
14.4.3.4. Temperature								B	-	-	-	-	-
14.5. Chemistry													
14.5.1. Elements								-	-	-	-	-	-
14.5.2. Compounds								-	-	-	-	-	-
14.5.3. Bonding								-	-	-	-	-	-
15. TOOLS AND EQUIPMENT TR: 60A-2-1 -3; 60A-2-1-3-2; 60A-2-1-42; 60A-2-1-46; 60A-2-1-58; 60A-2-1-74; 60A-2-1-76; 60A-2-1-77; 60A-2-1-90; 1 1A8-7-1; 1 1W3-5-1-1 11; 14S5-36-1; 31R4-2PSN13-1; 32-1-2; 32-1-101; 32-1-51; 34-1-3; TM 11-5855- 3 06-10; Manufacturer's Manuals													
15.1. Common Hand Tools TR: 32-1-2; 32-1-101; 32-1-151; 34-1-3													
15.1.1. Select Proper Tools								2b	-	-	-	-	-
15.1.2. Use Tools Properly								2b	-	-	-	-	-
15.1.3. Maintain Tools								2b	-	-	-	-	-

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
15.2. Specialized EOD Tools													
15.2.1. EOD Tool set Identification								-	-	-	-	-	-
15.2.2. Mk 2 TR: 60A-2-1-3													
15.2.2.1. Operational Principles	*							B	-	C	-	-	
15.2.2.2. Inspect, Maintain and Use	*							b	-	c	-	-	
15.2.3. Percussion Actuated Non-electric (PAN) Disrupter TR: 60A-2-1-77													
15.2.3.1. Operational Principles	*							B	-	C	-	-	-
15.2.3.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
15.2.4. Mk 1 TR: 60A-2-1-46													
15.2.4.1. Operational Principles	*							B	-	C	-	-	-
15.2.4.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
15.2.5. Field Fabricated Dearmer/Improvised Disposable Dearmer TR: 60A-2-1-3-2													
15.2.5.1. Operational Principles								-	-	-	-	-	-
15.2.5.2. Inspect, Maintain and Use Properly								-	-	-	-	-	-
15.2.6. Dragon TR: 1 1A8-7-1 1													
15.2.6.1. Operational Principles								-	-	-	-	-	-
15.2.6.2. Inspect, Maintain and Use Properly								-	-	-	-	-	-
15.2.7. Hook and Line Kit													
15.2.7.1. Operational Principles	*							-	-	-	-	-	-
15.2.7.2. Inspect, Maintain and Use Properly	*							1a	-	-	-	-	-
15.2.8. M107 Barrett TR: Manufacturer's Manual													
15.2.8.1. Operational Principles	♦							-	-	-	-	-	-
15.2.8.2. Inspect, Maintain and Use Properly	♦							-	-	-	-	-	-
15.2.9. Robotics Systems													
15.2.9.1. Tactical Robot TR: Manufacturer's Manual													
15.2.9.1.1. Operational Principles	♦							B	-	-	-	-	-
15.2.9.1.2. Inspect, Maintain and Use Properly	♦							2b	-	-	-	-	-
15.2.9.2. Medium Robot (AFMSR) TR: Manufacturer's Manual													
15.2.9.2.1. Operational Principles	*							-	-	C	-	-	-
15.2.9.2.2. Inspect, Maintain and Use Properly	*							-	-	c	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
15.2.9.3. Large Robot (F6A) TR: Manufacturer's Manual													
15.2.9.3.1. Operational Principles	*							-	-	C	-	-	-
15.2.9.3.2. Inspect, Maintain and Use Properly	*							-	-	c	-	-	-
15.2.9.4. All-Purpose Remote Transport System (ARTS) TR: 11A8-7-1													
15.2.9.4.1. Operational Principles								-	-	-	-	-	-
15.2.9.4.2. Inspect, Maintain and Use Properly								-	-	-	-	-	-
15.2.10. Remote Firing Device (RFD) TR: Manufactures Manual													
15.2.10.1. Operational Principles	*							B	-	C	-	-	-
15.2.10.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
15.2.11. Sub-Surface Hand Held Detector TR: Manufactures Manual													
15.2.11.1. Operational Principles	*							B	-	C	-	-	-
15.2.11.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
15.2.12. Ferrous Ordnance Locator TR: 60A-2-1-58													
15.2.12.1. Operational Principles	*							B	-	C	-	-	-
15.2.12.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
15.2.13. Ground Penetrating Radar Detector TR: Manufacturer's Manual (Minehound QTP CBT)													
15.2.13.1. Operational Principles	*							-	-	C	-	-	-
15.2.13.2. Inspect, Maintain and Use Properly	*							-	-	c	-	-	-
15.2.14. Counter Radio Controlled Improvised Explosive Device (RCIED) Electronic Warfare (C.R.E.W.) Equipment TR: System Publications/TTPs													
15.2.14.1. Operational Principles	*							-	-	B	-	-	-
15.2.14.2. Inspect, Maintain and Use Properly	*							-	-	b	-	-	-
15.2.15. Cameras TR: Manufacturer's Manual													
15.2.15.1. Operational Principles								-	-	-	-	-	-
15.2.15.2. Inspect, Maintain and Use Properly								-	-	-	-	-	-
15.2.16. Portable Radiograph TR: 60A-2-1-74/2-1-90													
15.2.16.1. Operational Principles	*							B	-	C	-	-	-
15.2.16.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
15.2.17. ADM 300 Kit C and E Radiacs													

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
15.2.17.1. Operational Principles	*							B	-	C	-	-	-
15.2.17.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
15.2.18. AN/PDX-2 Radiac Kit													
15.2.18.1. Operational Principles	*							B	-	C	-	-	-
15.2.18.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
15.2.19. AN-PDR 74 Radiacs TR: T.O. 11 N-74A-2													
15.2.19.1. Operational Principles								B	-	-	-	-	-
15.2.19.2. Inspect, Maintain and Use Properly								2b	-	-	-	-	-
15.2.20. Joint Chemical Agent Detector													
15.2.20.1. Operational Principles	*							B	-	C	-	-	-
15.2.20.2. Inspect, Maintain and Use Properly	*							2b	-	c	-		-
15.2.21. Explosive/Chemical/Bio Identification Kit (General Category Identification)													
15.2.21.1. Operational Principles	*							-	-	C	-	-	-
15.2.21.2. Inspect, Maintain and Use Properly	*							-	-	c	-	-	-
15.2.22. Night Vision Equipment TR: TM 11-5855-306-12													
15.2.22.1. Operational Principles	*							-	-	-	-	-	-
15.2.22.2. Inspect, Maintain and Use Properly	*							-	-	-	-	-	-
15.2.23. Tactical Global Positioning System TR: Manufacturer's Manual													
15.2.23.1. Operational Principles	*							-	-	-	-	-	-
15.2.23.2. Inspect, Maintain and Use Properly	*							-	-	-	-	-	-
15.2.24. Tactical Radios TR: Manufacturer's Manual													
15.2.24.1. Operational Principles	*							-	-	-	-	-	-
15.2.24.2. Inspect, Maintain and Use Properly	*							-	-	-	-	-	-
15.2.25. Secure Satellite Communication System TR: Manufacturer's Manual													
15.2.25.1. Operational Principles								-	-	-	-	-	-
15.2.25.2. Inspect, Maintain and Use Properly								-	-	-	-	-	-
15.2.26. Explosive (IED) Containment Vessel TR: Manufactures Manual/TTP													
15.2.26.1. Operational Principles	♦							-	-	B	-	-	-
15.2.26.2. Inspect, Maintain and Use Properly	♦							-	-	b	-	-	-
16. PERSONAL PROTECTIVE EQUIPMENT													
16.1. Select Personal Protective Equipment to perform diagnostics/disablement/disruption								2b	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
16.2. Bomb Suit TR: Manufacturer's Manual													
16.2.1. Operational Principles	*							B	-	C	-	-	-
16.2.2. Inspect, Maintain and Use Properly	*							2b	-	c	-	-	-
16.3. SCBA TR: Owner's Manual; NFPA 472													
16.3.1. Operational Principles	*							B	-	-	-	-	-
16.3.2. Inspect, Maintain and Use Properly	*							2b	-	-	-	-	-
16.4. Level A & B Protective Suits TR: Manufacturer's Manual/NFPA 472													
16.4.1. Operational Principles	*							B	-	-	-	-	-
16.4.2. Inspect, Maintain and Use Properly	*							2b	-	-	-	-	-
16.5. Individual Issued Equipment TR: Manufacturer's Manual													
16.5.1. Operational Principles	*							-	-	-	-	-	-
16.5.2. Inspect, Maintain and Use Properly	*							-	-	-	-	-	-
17. DEMOLITION PROCEDURES TR: 60A-1-1-13/14/15, 60A-1-1-9, 60A1-1-31, 60A-2-1-33; AFMAN 91-201													
17.1. Grounding													
17.1.1. Principles of Grounding	*							2b	-	C	-	-	-
17.1.2. Grounding Procedures	*							2b	-	c	-	-	-
17.2. Electromagnetic Radiation Precautions													
17.2.1. Principles of EMR	*							2b	-	C	-	-	-
17.2.2. Apply EMR precautions	*							2b	-	c	-	-	-
17.3. Prepare Firing Systems TR: AFQTP; 60A-1- 1-31													
17.3.1. Electric Firing System Principles	*							b	-	C	-	-	-
17.3.2. Electric Demolition Procedures	*							2b	-	c	-	-	-
17.3.3. Non-electric Firing System Principles	*							b	-	C	-	-	-
17.3.4. Non-electric Demolition Procedures	*							2b	-	c	-	-	-
17.3.5. Use Det-Cord in Firing System	*							2b	-	c	-	-	-
17.4. Disposal Techniques													
17.4.1. Principles of disposal	*							-	-	C	-	-	-
17.4.2. Perform Detonation	*							2b	-	-	-	2b	-
17.4.3. Perform Thermite	*							2b	-	-	-	-	-
17.4.4. Burn Procedures	*							2b	-	c	-	-	-
17.4.5. Shaped Charge Procedures	*								-	c	-	-	-
17.4.6. Insensitive Explosives Disposal (Training Reference) 60A-1-1-31	*							A	-	B	-	-	-
17.5. Demilitarization								A	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
18. ACCESS AND RECOVERY TR: 60A-1-1-5; FM 5-145													
18.1. Soil Characteristics								A	-	-	-	-	-
18.2. Identify terrain changes due to unexploded ordnance								a	-	-	-	-	-
18.3. Locate UXOs TR: 60A-1-1-4; FM 3-97.61; MCRP 3-35.2B; TC 21-24													
18.3.1. Surface	*							2b	-	b	-	-	-
18.3.2. Sub-surface	*							2b	-	b	-	-	-
18.4. Ordnance/IED Access Methods								A	-	-	-	-	-
18.5. Tie Knots, Bends, and Hitches								1a	-	-	-	-	-
18.6. Perform Field Rigging and Improvised Hoisting								1a	-	-	-	-	-
18.7. Rappel Techniques TR: FM 3-97.61; MCRP 3-35.2B; TC 21-24													
18.7.1. Perform Rope Management								-	-	-	-	-	-
18.7.2. Care for Rappel Equipment								-	-	-	-	-	-
18.7.3. Use Belay Systems								-	-	-	-	-	-
18.7.4. Construct Anchors								-	-	-	-	-	-
18.7.5. Rappel Using Standard and Non- Standard Techniques								-	-	-	-	-	-
19. EXPLOSIVE ORDNANCE RECONNAISSANCE AND ASSESSMENT TR: 60A-1-1-2; 60A-1-1-4; 60A-1-1-7; 60A- 1-1-22													
19.1. Identify Hazards													
19.1.1. Reconnaissance Fundamentals								-	-	-	-	-	-
19.1.2. Reconnaissance Actions													
19.1.2.1. Perform Reconnaissance	*							-	-	-	-	-	-
19.1.2.2. Interpret Reconnaissance	*							-	-	-	-	-	-
19.1.3. Weather and Terrain Analysis								-	-	-	-	-	-
19.2. Munitions Safety Precautions TR: 60A-1-1- 22													
19.2.1. Determine								2b	-	-	-	-	-
19.2.2. Demonstrate								2b	-	-	-	-	-
19.3. Weapons Technical Intelligence (WTI) TR: 60A-1-1-7, 60A-1-1-7-1; WTI lexicon;													
19.3.1. Destructive Exploitation		*						A	-	-	-	-	-
19.3.2. Non-Destructive Exploitation		*						A	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
19.3.3. Explosive Remnants of War/Captured Enemy Ammunition								-	-	-	-	-	-
19.3.4. Ordnance Order of Battle Concept								-	-	-	-	-	-
19.3.5. Data Collection	*							b	-	B	-	-	-
19.3.6. Reporting Requirements	*							-	-	A	-	-	-
19.4. Post Blast Analysis TR: 60A-1-1-7, 60A-1-1- 7-1; WTI lexicon; Dismounted													
19.4.1. Identify Secondary Hazards	*							2b	-	-	-	-	-
19.4.2. Site Preservation		*						-	-	-	-	-	-
19.4.3. Sensitive Site Exploitation (SSE)		*						-	-	-	-	-	-
19.4.4. Identify Biometric Evidence		*						-	-	-	-	-	-
19.4.5. Collect and preserve evidence		*						-	-	-	-	-	-
19.4.6. Site Analysis/Exploitation		*						-	-	-	-	-	-
19.4.7. Determine UXO/IED Characteristics		*						-	-	-	-	-	-
20. PROTECTION OF PERSONNEL AND PROPERTY TR: T.O.60A-1-1-4, AFMAN 91-201													
20.1. Determine Hazard Distances	*							2b	-	c	-	-	-
20.2. Use Tactical Decision Aid	*							2b	-	-	-	-	-
20.3. Determine Collateral Damage	*							2b	-	-	-	-	-
20.4. Protective Works	*							A	-	B	-	-	-
21. RENDER SAFE TECHNIQUES TR: 60A-2-1 -51; 60A-2-1-60; 60A-2-1-91; 60A-2-1-73													
21.1. Immobilize Fuzes TR: 60A-2-1-60	*							2b	-	b	-	-	-
21.2. Remove Fuzes	*							2b	-	b	-	-	-
21.3. Disable Electrical Components	*							2b	-	b	-	-	-
21.4. Disrupt Firing Trains	*							2b	-	b	-		
21.5. SMUD Techniques TR: 60A-2-1-73								A	-	-	-	-	-
21.6. Advanced Access/Render Safe Techniques													
21.6.1. Dynamic Charges TR: Explosive Entry Tools Computer Based Training, 60A-2-1-73-2; 60A-2-1-81; 60A-2-1 -82	*							-	-	-	-	-	-
21.6.2. Mechanical access								-	-	-	-	-	-
21.6.3. Dynamic access								-	-	-	-	-	-

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
22. RANGES TR: AFI 13-212; AFMAN 91-201; AFI 32-3001; 11A-1-42; 11A-1-60; 11A-1-66; 60A- 1-1-22; CFR 40; CFR 49; EOD Range AFTTP													
22.1. Develop Plans for Range Clearance Operations		*						-	-	-	-	-	-
22.2. Perform Active Range Clearance Operations								1a	-	-	-	-	-
22.3. Proficiency, Training, and Demolition Ranges TR: AFMAN 91-201													
22.3.1. Explosive Site Planning		*						-	-	-	-	-	-
22.3.2. Range maintenance	*							-	-	B	-	-	-
22.3.3. Range Operations Plans		*						-	-	-	-	-	-
23. TREATMENT OF EXPLOSIVES AND RELATED HAZARDOUS MATERIALS TR: AFH 10-222 vol 1; AFI 31-117, 32-7001, 90-803; AFMAN 91-201;AFPD 32-70; DoDD 5210.56; DoDI 4715.08; DoD 5100.76; DOD 6055.9E; 40 CFR; 49 CFR; 11A-1-42; 11A-1-60; 11A-1-66; 60A-1-1-31, EO 12856													
23.1. EPA/RCRA													
23.1.1. Transportation								-	-	-	-	-	-
23.1.2. Treatment								-	-	-	-	-	-
23.1.3. Storage								-	-	-	-	-	-
23.1.4. Inspect								-	-	-	-	-	-
23.1.5. Certify								-	-	-	-	-	-
23.1.6. Environmental Protection Consideration													
23.1.6.1. Identify Requirements for EPA Permits and Applications	*							-	-	B	-	-	-
23.1.6.2. Identify Environmental Impacts Caused by EOD								-	-	-	-	-	-
23.1.6.3. EPA Regulations and Directives Pertaining to EOD Operations													
23.1.6.3.1. Military Munitions Rule (Emergency Response and Operational Ranges)	*							-	-	B	-	-	-
23.1.6.3.2. Military Munitions Response Program (FUDS, BRAC, Clean-up)								-	-	-	-	-	-
23.1.6.4. Determine EPA Documentation Requirements for:													
23.1.6.4.1. Transportation								-	-	-	-	-	-
23.1.6.4.2. Treatment								-	-	-	-	-	-

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
23.1.7. Ammunitions Disposition Request (ADR) Operation													
23.1.7.1. Plan								-	-	-	-	-	-
23.1.7.2. Perform								-	-	-	-	-	-
23.2. Non-RCRA													
23.2.1. Transportation								A	-	-	-	-	-
23.2.2. Disposal	*							2b	-	c	-	-	-
24. Explosives TR: 60A-series													
24.1. Identification								A	-	-	-	-	-
24.2. Explosive Effects								B	-	-	-	-	-
24.3. Safety Precautions								B	-	-	-	-	-
24.4. Explosive Train								B					
24.4.1. Detonator/Primer								B					
24.4.1.1. Military								B	-	-	-	-	-
24.4.1.2. Commercial								-	-	-	-	-	-
24.4.1.3. Improvised								-	-	-	-	-	-
24.4.2. Booster/Igniter								A	-	-	-	-	-
24.4.3. Bursting Charge/Main Charge/Propellant													
24.4.3.1. General Explosives													
24.4.3.1.1. High Explosives													
24.4.3.1.1.1. Primary	*							2b	-	B	-	-	-
24.4.3.1.1.2. Secondary	*							2b	-	B	-	-	-
24.4.3.1.1.3. Main	*							2b	-	B	-	-	-
24.4.3.1.2. Low Explosives	*							2b	-	B	-	-	-
24.4.3.2. Propellants								B	-	-	-	-	-
24.4.3.3. Current threat foreign and domestic explosives (such as: Semtex, Binary, Dynamite)								B	-	-	-	-	-
24.5. Explosive Application and Use								B	-	-	-	-	-
24.6. Homemade explosives													
24.6.1. Types								A	-	-	-	-	-
24.6.2. Characteristics								A	-	-	-	-	-
24.6.3. Precursors								A	-	-	-	-	-
24.6.4. Field Testing													
24.6.4.1. Identification techniques	*							-	-	B	-	-	-
24.6.4.2. Field Test Procedures	*							-	-	B	-	-	-
24.6.5. Improvised Explosive Laboratory Hazards	*							-	-	B	-	-	-
24.6.6. Desensitization and disposal techniques	*							-	-	B	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
25. U.S. AND FOREIGN MUNITIONS TR: AEODPS/60A-1-1-22													
25.1. U.S. AND FOREIGN DROPPED MUNITIONS TR: 60B-series; 60C-series													
25.1.1. Bombs and Bomb Fuzes TR: 60B-series													
25.1.1.1. Identify	*							2b	-	B	-	-	-
25.1.1.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.1.3. Render Safe	*							2b	-	B	-	-	-
25.1.1.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.2. Dispensers and Payloads TR: 60C- series													
25.1.2.1. Identify	*							2b	-	B	-	-	-
25.1.2.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.2.3. Render Safe	*							2b	-	B	-	-	-
25.1.2.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.3. U.S. AND FOREIGN PROJECTED MUNITIONS TR: 60D-series; 60E-series; 60F- series													
25.1.3.1. Projectiles and Projectile Fuzes TR: 60D- series													
25.1.3.1.1. Identify	*							2b	-	B	-	-	-
25.1.3.1.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.3.1.3. Render Safe	*							2b	-	B	-	-	-
25.1.3.1.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.3.2. Grenades and Grenade Fuzes TR:													
25.1.3.2.1. Identify	*							2b	-	B	-	-	-
25.1.3.2.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.3.2.3. Render Safe	*							2b	-	B	-	-	-
25.1.3.2.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.3.3. Rockets and Rocket Fuzes TR: 60F- Series													
25.1.3.3.1. Identify	*							2b	-	B	-	-	-
25.1.3.3.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.3.3.3. Render Safe	*							2b	-	B	-	-	-
25.1.3.3.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.4. U.S. AND FOREIGN GUIDED MISSILES TR: 60G-series													

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
25.1.4.1. Identify	*							2b	-	B	-	-	-
25.1.4.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.4.3. Render Safe	*							2b	-	B	-	-	-
25.1.4.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.5. U.S. AND FOREIGN PLACED MUNITIONS TR: 60H-series, FM 5-25; FM 5-34; FM 5-102													
25.1.5.1. Minefield TR: 60A-1-1-22; FM 5-34; FM 20-32; FM-5-1 02													
25.1.5.1.1. Concepts								A	-	-	-	-	-
25.1.5.1.2. Breaching Charges								A	-	-	-	-	-
25.1.5.2. Landmines and Landmine Fuzes													
25.1.5.2.1. Identify	*							2b	-	B	-	-	-
25.1.5.2.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.5.2.3. Render Safe	*							2b	-	-	-	-	-
25.1.5.2.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.5.3. Booby Traps and Booby Trap Fuzes													
25.1.5.3.1. Identify	*							2b	-	B	-	-	-
25.1.5.3.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.5.3.3. Render Safe	*							2b	-	-	-	-	-
25.1.5.3.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.6. U.S. AND FOREIGN PYROTECHNICS TR: 60K-series													
25.1.6.1. Identify	*							2b	-	B	-	-	-
25.1.6.2. Observe Safety Precautions	*							2b	-	B	-	-	-
25.1.6.3. Render Safe	*							2b	-	B	-	-	-
25.1.6.4. Perform Disposal Procedures								2b	-	-	-	-	-
25.1.7. U.S. AND FOREIGN UNDERWATER ORDNANCE TR: 60Q-series; 60R-series; 60S- series													
25.1.7.1. Identify								1a	-	-	-	-	-
25.1.7.2. Observe Safety Precautions								1a	-	-	-	-	-
26. AEROSPACE SYSTEMS TR: 00-105-E9; 60J- series; Aerospace Vehicle EOD AFTTP													
26.1. Egress Systems and System Components													
26.1.1. Principles								-	-	-	-	-	-
26.1.2. Identify	*							2b	-	B	-	-	-
26.1.3. Observe Safety Precautions	*							2b	-	B	-	-	-
26.1.4. Render Safe	*							2b	-	B	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	**2. Core Tasks**		**3. Certification For OJT**					**4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)**					
	A	**B**	**A**	**B**	**C**	**D**	**E**	**A 3 Skill Level**		**B 5 Skill Level**		**C 7 Skill Level**	
	5 Level	**7 Level**	**Tng Start**	**Tng Comp**	**Trainee Initials**	**Trainer Initials**	**Certifier Initials**	**(1) Course**	**(2) DL**	**(1) CDC**	**(2) Course**	**(1) Course**	**(2) DL**
26.1.5. Perform Disposal Procedures								2b	-	-	-	-	-
26.2. Gun Systems													
26.2.1. Principles									-		-	-	-
26.2.2. Identify	*							2b	-	B	-	-	-
26.2.3. Observe Safety Precautions	*							2b	-	B	-	-	-
26.2.4. Render Safe	*							2b	-	B	-	-	-
26.3. Munition Release and Launching Systems													
26.3.1. Principles								-	-	-	-	-	-
26.3.2. Identify	*							2b	-	B	-	-	-
26.3.3. Observe Safety Precautions	*							2b	-	B	-	-	-
26.3.4. Render Safe	*							2b	-	B	-	-	-
26.4. Flare and Chaff Countermeasure Systems													
26.4.1. Identify	*							2b	-	B	-	-	-
26.4.2. Observe Safety Precautions	*							2b	-	B	-	-	-
26.4.3. Render Safe	*							2b	-	B	-	-	-
26.4.4. Disposal								2b	-	-	-	-	-
26.5. Space Launch Platforms													
26.5.1. Observe Safety Precautions													
26.5.1.1. Space System Hazards								-	-	-	-	-	-
26.5.1.2. Launch Facility Hazards								-	-	-	-	-	-
26.5.2. Render Safe													
26.5.2.1. Space System								-	-	-	-	-	-
26.5.2.2. Launch Facility								-	-	-	-	-	-
26.5.3. Perform Disposal Procedures								-	-	-	-	-	-
27. NUCLEAR WEAPONS, EQUIPMENT, AND PROCEDURES TR: AFIs 44-102, 44-110, 91 Series; AFMAN 13-501, AFPD 21-2; DoDD 3150.02, 3150.08; DoD 3150.2M, 3150.8M; DoDI 4540.05, 5210.42, 6055.08; DoDM 5210.41 volumes 1-3; TOs 1 1H Series, 1 1N Series, 14P Series, 60N Series, and Army FM 3-11.3; T.O. 11N-74A-2; Nuclear Response CONOP/AFTTP													
27.1. Nuclear Weapons													
27.1.1. Identify	*							2b	-	-	-	-	-
27.1.2. Hazards													
27.1.2.1. Explosives								B	-	-	-	-	-
27.1.2.2. Toxic								B	-	-	-	-	-
27.1.2.3. Radiological								B	-	-	-	-	-
27.1.3. Observe Safety Precautions/Warnings	*							2b	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
27.1.4. Fuzing and Firing Systems								B	-	-	-	-	-
27.1.5. Render Safe and Continuation Procedures								2b	-	-	-	-	-
27.1.6. Identify Classified Components								2b	-	-	-	-	-
27.1.7. Package Components								2b	-	-	-	-	-
27.1.8. Disposition of Components								2b	-	-	-	-	-
27.2. Use Protective Clothing and Equipment	*							2b	-	-	-	-	-
27.3. Foreign Nuclear Systems Technologies								A	-	-	-	-	-
27.4. Nuclear Surety Program								-	-	-	-	-	
27.5. Bombs: B61-3, 4, 7, 10, 11; B83-1													
27.5.1. Identify								2b	-	-	-	-	-
27.5.2. Hazards													
27.5.2.1. Explosives								B	-	-	-	-	-
27.5.2.2. Toxic								B	-	-	-	-	-
27.5.2.3. Radiological								B	-	-	-	-	-
27.5.3. Observe Safety Precautions/Warnings								2b	-	-	-	-	-
27.5.4. Fuzing and Firing Systems								B	-	-	-	-	-
27.5.5. Render Safe and Continuation Procedures								2b	-	-	-	-	-
27.6. Missiles: ALCM, W80													
27.6.1. Identify								2b	-	-	-	-	-
27.6.2. Hazards													
27.6.2.1. Explosives								B	-	-	-	-	-
27.6.2.2. Toxic								B	-	-	-	-	-
27.6.2.3. Radiological								B	-	-	-	-	-
27.6.3. Observe Safety Precautions/Warnings								2b	-	-	-	-	-
27.6.4. Fuzing and Firing Systems								B	-	-	-	-	-
27.6.5. Render Safe and Continuation Procedures								2b	-	-	-	-	-
27.7. Reentry Vehicles (W62, W78, W87)													
27.7.1. Identify								2b	-	-	-	-	-
27.7.2. Hazards													
27.7.2.1. Explosives								B	-	-	-	-	-
27.7.2.2. Toxic								B	-	-	-	-	-
27.7.2.3. Radiological								B	-	-	-	-	-
27.7.3. Observe Safety Precautions/Warnings								2b	-	-	-	-	-
27.7.4. Fuzing and Firing Systems								B	-	-	-	-	-
27.7.5. Render Safe and Continuation Procedures								2b	-	-	-	-	-
27.8. Operational and Developmental Test Units TR: Test Plans													
27.8.1. Identify								-	-	-	-	-	-
27.8.2. Hazards													

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
27.8.2.1. Explosives								-	-	-	-	-	-
27.8.2.2. Toxic								-	-	-	-	-	-
27.8.2.3. Radiological								-	-	-	-	-	-
27.8.3. Observe Safety Precautions/Warnings								-	-	-	-	-	-
27.8.4. Fuzing and Firing Systems								-	-	-	-	-	-
27.8.5. Render Safe and Continuation Procedures								-	-	-	-	-	-
28. IMPROVISED EXPLOSIVE DEVICES TR: 60A-1-1-9; 60A-1-1-15; 60A-1-1-31; 60A-2-1-73- 2; 60A-2-1-81; 60A-2-1-82; 60A-2-1-83, 60L-series; NFPA; EOD IED CONOP/AFTTP													
28.1. Types	*							A	-	B	-	-	-
28.2. IED Construction													
28.2.1. Firing System (Switch)	*							-	-	-	-	-	-
28.2.2. Initiators	*							A	-	B	-	-	-
28.2.3. Main Charge (Filler)	*							A	-	B	-	-	-
28.2.4. Enhancements	*							A	-	B	-	-	-
28.3. Plan Incident Response													
28.3.1. Non-Vehicle Borne/Vehicle Borne													
28.3.1.1. Identify Hazards	*							A	-	B	-	-	-
28.3.1.2. Safety Procedures	*							A	-	B	-	-	-
28.3.1.3. Observe safety precautions	*							2b	-	B	-	-	-
28.4. Perform IED Threat Assessment		*						2b	-	-	-	-	-
28.5. Locating IED threat	*							2b	-	-	-	-	-
28.6. Gaining access	*							2b	-	B	-	-	-
28.7. Perform render safe techniques	*							2b	-	-	-	-	-
28.8. Perform disposal techniques	*							2b	-	-	-	-	-
28.9. IED Tactical Approach TR: IED Dismounted Handbook, COIN, TTPS, 60 Series L-1-1-9													
28.9.1. Establish Site Security		*						-	-	-	-	-	-
28.9.2. Safe Area Search Procedures	*							-	-	B	-	-	-
28.9.3. Secondary Search Procedures	*							-	-	B	-	-	-
28.9.4. Ground Sign Identification	*							-	-	B	-	-	-
28.9.5. Isolate Threat		*						-	-	-	-	-	-
28.9.6. Enemy Targeting Principles		*						-	-	-	-	-	-
28.9.7. Establish/Review SOPs/TTPs		*						-	-	-	-	-	-
29. WEAPONS OF MASS DESTRUCTION TR: 60A-1-1-9; 60A-1-1-15; 60A-1-1-31; 60A-2-1-73- 2; 60A-2-1-81; 60A-2-1-82; 60A-2-1-83, 60L-series; NFPA; EOD WMD CONOP/AFTTP													

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
29.1. Types								-	-	-	-	-	-
29.2. Incident Complexity Determination	*							-	-	B	-	-	-
29.3. Detection Techniques	*							-	-	B	-	-	-
29.4. Dispersal Device Methods	*							2b	-	B	-	-	-
29.5. Delivery Method Categorization	*							2b	-	B	-	-	-
29.6. Identify and Categorize Hazards by Type	*							2b	-	B	-	-	-
30. CHEMICAL AND BIOLOGICAL WARFARE AGENTS, EQUIPMENT, AND PROCEDURES TR: AFIs 10-2501, AFH 10-222 vol 10, 44 Series; DoD 6050.5M DoDI 6050.05; TOs 1 1H Series, 14P4 Series, and 60 Series; Army FM 3- 11.3, 3-11.9, 3-11.21, 3-11; Chemical and Biological CONOP/AFTTP													
30.1. Chemical and Biological Agents TR: 60A-1-1-11; FM 3-11.3, 3-11.9, 3-11.21, 3-11													
30.1.1. Types	*							B	-	-	-	-	-
30.1.2. Physical State	*							A	-	B	-	-	-
30.1.3. Physiological Action	*							A	-	B	-	-	-
30.1.4. Persistence	*							A	-	B	-	-	-
30.2. Decontaminants and Decontamination Equipment													
30.2.1. Use								-	-	-	-	-	-
30.2.2. Decontamination process	*							A	-	B	-	-	-
30.3. Apply First Aid and Self Aid								1a	-	-	-	-	-
30.4. Transport Hazardous Chemical or Biological Munitions								1b	-	-	-	-	-
30.5. Dispose of Chemical or Biological Munitions TR: 60A-1-1-11								1b	-	-	-	-	-
31. AIRBASE RECOVERY TR: AFDD Annex 3-2; AFI 10-210; AFI 10-211; AFH 10-222, vol 1; AFTTP 3-4, 10-219 vol 4; 60A-2-1-39, EOD RADBO CONOP/AFTTP													
31.1. Base Recovery Process	*							-	-	B	-	-	-
31.2. Pre-attack								-	-	-	-	-	-
31.3. Trans-attack								-	-	-	-	-	-
31.4. Post-attack								-	-	-	-	-	-
32. TACTICAL OPERATIONS TR: FM 3-21.8, 90- 7; STP 21-1-SMCT; Airmen's Manual TTP													

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
32.1. Perform Immediate 9-line Medevac Procedures	*							-	-	c	-	-	-
32.2. Perform Day Navigation Using Map, Compass and GPS								-	-	-	-	-	-
32.3. Perform Night Navigation Using Map, Compass and GPS								-	-	-	-	-	-
32.4. Use Personal Camouflage For Tactical Operations								-	-	-	-	-	-
32.5. Use Cover and Concealment								-	-	-	-	-	-
32.6. Construct Improvised Shelter								-	-	-	-	-	-
32.7. Weapons Tactics								-	-	-	-	-	-
32.8. Perform Small Team Tactics													
32.8.1. Arm and Hand Signals								-	-	-	-	-	-
32.8.2. Danger Area Crossing								-	-	-	-	-	-
32.9. Conduct Objective Reconnaissance								-	-	-	-	-	-
32.10. Close Quarters Combat													
32.10.1. Enter Structure								-	-	-	-	-	-
32.10.2. Move in Structure								-	-	-	-	-	-
32.10.3. Engage Targets With Weapons								-	-	-	-	-	-
32.10.4. Perform Expedient Entry and Exit Procedures								-	-	-	-	-	-
32.10.5. Prepare Structure For a Defensive Position								-	-	-	-	-	-
32.10.6. Move Casualties From Immediate Danger Area								-	-	-	-	-	-
32.11. Field Security													
32.11.1. Perform Safe Passage Procedures								-	-	-	-	-	-
32.11.2. Perform Noise, Light, and Movement Discipline								-	-	-	-	-	-
32.11.3. Perform Immediate Action Drills								-	-	-	-	-	-
32.11.4. Perform Live Fire Team Maneuvers								-	-	-	-	-	-
32.11.5. Perform Defensive Fire Techniques								-	-	-	-	-	-
32.11.6. Use Alert Pyrotechnics and Munitions TR: FM 3-23.30								-	-	-	-	-	-
32.11.7. Perform Imminent Capture Actions								-	-	-	-	-	-
32.11.8. Sanitize or Destroy Sensitive Equipment and Materials								-	-	-	-	-	-
32.11.9. Perform Team Casualty Procedures								-	-	-	-	-	-
32.11.10. Perform Military Operations on Urbanized Terrain (MOUT)								-	-	-	-	-	-

Attachment 2

3E8X1 Specialty Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
32.11.11. Perform Obstacle Explosive Breaching								-	-	-	-	-	-
32.11.12. Tactical Mounted Operations													
32.11.12.1. CREW Served Weapons								-	-	-	-	-	-
32.11.12.2. Vehicle Posturing								-	-	-	-	-	-
32.11.12.3. Actions on Contact													
32.11.12.3.1. Down Vehicle Actions								-	-	-	-	-	-
32.11.12.3.2. Exfil procedures								-	-	-	-	-	-
32.12. Perform Combatives TR: Air Force Combat Program													
32.12.1. Defensive Hand To Hand								-	-	-	-	-	-
33. AIRCRAFT (HELICOPTER) OPERATIONS TR: AFI 16-1202 Chap 9/AFTTP 3-3.8/MCRP 3-114A													
33.1. General Safety Rules								-	-	-	-	-	-
33.2. Perform Aircraft Emergency and Egress Procedures on Mission Aircraft								-	-	-	-	-	-
33.3. Cargo Loading/Unloading and Utilization of Cargo Restraint Devices								-	-	-	-	-	-
33.4. Operate Aircraft Intercom System								-	-	-	-	-	-
33.5. Hoist System Safety								-	-	-	-	-	-
33.6. Day Rappel								-	-	-	-	-	-
33.7. Night Rappel								-	-	-	-	-	-
33.8. Day Rope Ladder								-	-	-	-	-	-
33.9. Night Rope Ladder								-	-	-	-	-	-
33.10. Day Fast Rope Insertion (FRIES)								-	-	-	-	-	-
33.11. Night Fast Rope Insertion (FRIES)								-	-	-	-	-	-

Attachment 3

3E8X1 Advanced EOD Course Training Standard

A3. 3E8X1 Advanced EOD Course Training Standard.

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
34. ADVANCED IMPROVISED EXPLOSIVE DEVICE DEFEAT COURSE TR: 60A-1-1-11, 60A-2-1-77, 60A-2-1-83, 60A-2-1-90, 60L-1-1-1, 60L-1-1-1-1, 60L-1-1-3, 60L-1-1-4, National Response Plan, Applicable Manufacturers Documentation													
34.1. Analyze IED/WMD electronic circuitry TR													
34.1.1. Identify electronic components and their associated functions								-	-	-	-	-	-
34.1.2. Compare electronic circuit diagnostic equipment								-	-	-	-	-	-
34.1.3. Construct electronic circuits								-	-	-	-	-	-
34.1.4. Identify type and operational characteristics of sensors								-	-	-	-	-	-
34.1.5. Identify type and operational characteristics of remote control devices								-	-	-	-	-	-
34.1.6. Perform circuit diagnostics								-	-	-	-	-	-
34.1.7. Employ ECM equipment								-	-	-	-	-	-
34.2. Conduct advanced IED access and disablement													
34.2.1. Identify composition and application of homemade explosives (HME)								-	-	-	-	-	-
34.2.2. Describe IED/WMD Design								-	-	-	-	-	-
34.2.3. Explain IED/WMD disablement logic								-	-	-	-	-	-
34.2.4. Describe advanced IED access and disablement techniques								-	-	-	-	-	-
34.2.5. Perform advanced IED access and disablement								-	-	-	-	-	-
34.3. Conduct WMD Monitoring and Detection													
34.3.1. Describe Toxic industrial chemicals/materials and military chemical, biological, and nuclear hazards								-	-	-	-	-	-
34.3.2. Compare chemical, biological, and radiological detection equipment								-	-	-	-	-	-
34.3.3. Perform WMD monitoring and detection								-	-	-	-	-	-
34.4. Conduct advanced IED render safe, neutralization, and disposal													
34.4.1. Summarize National Response Plan								-	-	-	-	-	-
34.4.2. Describe terrorist tactics and methodology								-	-	-	-	-	-

Attachment 3

3E8X1 Advanced EOD Course Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
34.4.3. Compare current intelligence sources								-	-	-	-	-	-
34.4.4. Explain IED/WMD threat assessment								-	-	-	-	-	-
34.4.5. Perform IED/WMD threat assessment								-	-	-	-	-	-
34.4.6. Perform advanced IED render safe, neutralization, and disposal								-	-	-	-	-	-
34.5. Conduct mechanical access TR: 60L-1-1-1, 60L-1-1-1-1, 60L-1-1-4, 60A-2-1-83, 60A-2-1-77, Applicable Manufacturers Documentation													
34.5.1. Describe building access techniques								-	-	-	-	-	-
34.5.2. Describe vehicle access techniques								-	-	-	-	-	-
34.5.3. Perform mechanical access								-	-	-	-	-	-
34.5.4. Describe lock manipulation techniques								-	-	-	-	-	-
34.5.5. Perform lock manipulation techniques								-	-	-	-	-	-
34.6. Conduct X-Ray procedures on IED/WMD													
34.6.1. Compare current X-Ray systems								-	-	-	-	-	-
34.6.2. Interpret IED/WMD X-Ray								-	-	-	-	-	-
34.6.3. Perform X-Ray procedures on IED/WMD								-	-	-	-	-	-
35. JOINT NUCLEAR EOD COURSE													
35.1. Basic Nuclear Principles								-	-	-	-	-	-
35.2. Nuclear Weapon Hazards								-	-	-	-	-	-
35.3. AF & F/ENDS								-	-	-	-	-	-
35.4. Accident Response Group/Joint Technical								-	-	-	-	-	-
35.5. DOE Response/Weapons Recovery								-	-	-	-	-	-
35.6. US Nuclear Weapon Inventory													
35.6.1. W80								-	-	-	-	-	-
35.6.2. W84								-	-	-	-	-	-
35.6.3. W61								-	-	-	-	-	-
35.6.4. W83								-	-	-	-	-	-
35.6.5. W78								-	-	-	-	-	-
35.6.6. W87								-	-	-	-	-	-
35.6.7. W76								-	-	-	-	-	-
35.6.8. W88								-	-	-	-	-	-
35.6.9. Transportation and Containers								-	-	-	-	-	-
35.7. Nuclear Weapon Accident history								-	-	-	-	-	-
35.8. DoD Response to a Nuclear Weapon Accident								-	-	-	-	-	-
35.9. Office of Secure Transportation								-	-	-	-	-	-
35.10. Nuclear EOD Operations								-	-	-	-	-	-

Attachment 3

3E8X1 Advanced EOD Course Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
35.11. DOE Response								-	-	-	-	-	-
35.12. Weapons Recovery Operations								-	-	-	-	-	-
35.13. Radiation Detector Theory/Equipment								-	-	-	-	-	-
35.14. ECCS Operations								-	-	-	-	-	-
35.15. Personal Protective Equipment								-	-	-	-	-	-
35.16. Explain Emergency Decontamination Control Station Procedures								-	-	-	-	-	-
35.17. Perform Emergency Decontamination Control Station operations								-	-	-	-	-	-
35.18. Calculate Inverse Square								-	-	-	-	-	-
35.19. Calculate Stay Times								-	-	-	-	-	-
35.20. Joint Nuclear Weapons Publications								-	-	-	-	-	-
35.21. Explain Nuclear Weapons Accident Response plan of action								-	-	-	-	-	-
35.22. Conduct Nuclear Weapons Accident Response								-	-	-	-	-	-
36. JOINT EOD MILITARY HOMEMADE EXPLOSIVE COURSE													
36.1. Generalize HME Fundamentals													
36.1.1. Enumerate HME general safety precautions								-	-	-	-	-	-
36.1.2. Describe HME precursor hazards								-	-	-	-	-	-
36.1.3. Contrast HME types (Primary/Secondary) and initiators								-	-	-	-	-	-
36.1.4. Describe monomolecular products characteristics								-	-	-	-	-	-
36.1.5. Describe fuels and oxidizers (FOX) characteristics								-	-	-	-	-	-
36.1.6. Determine HME explosive weight calculations								-	-	-	-	-	-
36.1.7. Contrast sensitivity and reaction for HME types and their precursors								-	-	-	-	-	-
36.1.8. Contrast HME variances								-	-	-	-	-	-
36.1.9. Differentiate between explosive effects of equal size charges of HME and standard military/commercial grade explosives								-	-	-	-	-	-
36.1.10. Summarize current and historic threats (Worldwide)								-	-	-	-	-	-
36.2. Ascertain HME Identification													
36.2.1. Compare operational capabilities and limitations of HME detection equipment								-	-	-	-	-	-
36.2.2. Employ HME detection equipment								-	-	-	-	-	-

Attachment 3

3E8X1 Advanced EOD Course Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
36.2.3. Apply field detection techniques								-	-	-	-	-	-
36.2.4. Identify precursors, product, processes, and post-blast residue								-	-	-	-	-	-
36.2.5. Identify explosive and chemical hazards for HME and precursors								-	-	-	-	-	-
36.2.6. Identify improvised initiators								-	-	-	-	-	-
36.2.7. Recognize indicators and differences between HME and narcotics clandestine labs								-	-	-	-	-	-
36.3. Ascertain HME Production													
36.3.1. Recognize HME precursors								-	-	-	-	-	-
36.3.2. Recognize HME production equipment								-	-	-	-	-	-
36.3.3. Describe HME production processes								-	-	-	-	-	-
36.3.4. Select HME PPE								-	-	-	-	-	-
36.3.5. Perform HME materials/precursors handling techniques wearing PPE								-	-	-	-	-	-
36.3.6. Execute safety precautions for handling HME materials/precursors								-	-	-	-	-	-
36.3.7. Manufacture primary and secondary HME								-	-	-	-	-	-
36.3.8. Manufacture improvised initiators								-	-	-	-	-	-
36.4. Conduct HME Testing and Analysis													
36.4.1. Execute safety precautions for testing and analyzing HME								-	-	-	-	-	-
36.4.2. Explain results of high/low speed energetic tools against HME targets								-	-	-	-	-	-
36.4.3. Explain effects of desensitizing agents on HME targets								-	-	-	-	-	-
36.4.4. Perform field susceptibility tests on HME targets (Burn/Shock/Friction/Reactivity)								-	-	-	-	-	-
36.4.5. Perform radiographic analysis of HME targets								-	-	-	-	-	-
36.4.6. Explain results of explosive tests on HME (Primary/Secondary)								-	-	-	-	-	-
36.4.7. Explain results of explosive tests on improvised initiators								-	-	-	-	-	-
36.4.8. Perform post blast analysis sample collection								-	-	-	-	-	-
36.5. Demonstrate HME Response Operations													
36.5.1. Determine HME hazards								-	-	-	-	-	-
36.5.2. Discuss HME sampling procedures								-	-	-	-	-	-
36.5.3. Discuss HME desensitization and disposal techniques								-	-	-	-	-	-

Attachment 3

3E8X1 Advanced EOD Course Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
36.5.4. Perform HME sampling, desensitization, collection, and final disposition								-	-	-	-	-	-
36.5.5. Employ energetic tools against HME								-	-	-	-	-	-
36.5.6. Conduct EOD operations on clandestine labs (Worldwide)								-	-	-	-	-	-
36.5.7. Explain chain of custody								-	-	-	-	-	-
37. Global C-IED Threat Assessment Course													
37.1. Initial Planning													
37.1.1. Troop Leading Procedures													
37.1.1.1. Discuss/incorporate troop leading procedures in completion of C-IED mission planning								-	-	-	-	-	-
37.1.2. IED scene assessment principles (Pre-Response)													
37.1.2.1. Analyze/discuss area threat based on provided historical information								-	-	-	-	-	-
37.1.2.2. Analyze/discuss area threat/risk based on METT-T								-	-	-	-	-	-
37.1.3. Military Decision Making Process													
37.1.3.1. Develop course of action options based on assessed threat, i.e. Immediate/delayed EOD response, kinetic strike, no action.								-	-	-	-	-	-
37.1.3.2. Analyze/discuss consequences of developed courses of actions								-	-	-	-	-	-
37.1.3.3. Analyze/discuss resources required to accomplish selected course of action								-	-	-	-	-	-
37.1.3.4. Advise/select best course of action based on assessment/resources								-	-	-	-	-	-
37.1.3.5. Analyze/select best course of action when faced with deviation from planned capability								-	-	-	-	-	-
37.1.4. Response Planning								-	-	-	-	-	-
37.1.4.1. Select appropriate response equipment based on provided threat information								-	-	-	-	-	-
37.1.4.2. Identify personnel requirements, i.e. EOD and security								-	-	-	-	-	-
37.1.4.3. Identify additional resource requirements, i.e. aerial/vehicular support								-	-	-	-	-	-
37.2. Actions Upon Arrival Onscene													
37.2.1. Onscene EOD Team Posturing													
37.2.1.1. Discuss EOD team onscene positioning - vulnerabilities								-	-	-	-	-	-
37.2.1.2. Select appropriate EOD ECP								-	-	-	-	-	-

Attachment 3

3E8X1 Advanced EOD Course Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
37.2.2. Establish Site Security													
37.2.2.1. Advise on security size/formation based on intelligence								-	-	-	-	-	-
37.2.2.2. Advise on possible Vulnerable points, Vulnerable Areas (Danger Areas)								-	-	-	-	-	-
37.2.2.3. Advise on security posturing based on METT-T								-	-	-	-	-	-
37.2.2.4. Posture team appropriately within troop movement								-	-	-	-	-	-
37.2.3. Witness Questioning													
37.2.3.1. Discuss questioning principles								-	-	-	-	-	-
37.2.4. Enemy Targeting Principles													
37.2.4.1. Discuss enemy targeting capability based on historically available resources/technical proficiency/past								-	-	-	-	-	-
37.2.4.2. Discuss enemy targeting concepts, i.e. criminal, terrorist, radical								-	-	-	-	-	-
37.2.4.3. Posture team based on recognized environmental/atmospheric conditions								-	-	-	-	-	-
37.2.5. Threat Assessment - Deduction								-	-	-	-	-	-
37.2.6. IED Scene Situational Analysis								-	-	-	-	-	-
37.2.7. C-IED CREW Utilization													
37.2.7.1. Utilize CREW to ensure threat coverage								-	-	-	-	-	-
37.2.7.2. Identify CREW limitations, i.e. shadowing/masking/rules of usage/safety								-	-	-	-	-	-
37.2.8. Search Techniques													
37.2.8.1. Demonstrate effective visual search techniques								-	-	-	-	-	-
37.2.8.2. Demonstrate effective use of advanced optical search equipment								-	-	-	-	-	-
37.2.8.3. Demonstrate proper detector search techniques								-	-	-	-	-	-
37.2.8.4. Demonstrate manual search techniques								-	-	-	-	-	-
37.2.9. Ground Sign Identification (Reading)													
37.2.9.1. Discuss ground sign indicators								-	-	-	-	-	-
37.2.9.2. Recognize IED "disturbance" indicators (Ant Trails)								-	-	-	-	-	-
37.2.9.3. Recognize IED "discardable" indicators								-	-	-	-	-	-
37.2.9.4. Recognize IED "color change" indicators								-	-	-	-	-	-
37.2.9.5. Recognize IED "reqularity" indicators								-	-	-	-	-	-

Attachment 3

3E8X1 Advanced EOD Course Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
37.2.9.6. Recognize IED "flattening" indicators								-	-	-	-	-	-
37.2.9.7. Recognize IED "transference" indicators								-	-	-	-	-	-
37.2.9.8. Recognize IED "marker" indicators								-	-	-	-	-	-
37.2.10. Threat Isolation Principles													
37.2.10.1. Perform Safe Area ("distances") search													
37.2.10.1.1. Identify Vulnerable points, Vulnerable Areas (Danger Areas)								-	-	-	-	-	-
37.2.10.1.2. Select safe area based on vulnerability assessment								-	-	-	-	-	-
37.2.10.1.3. Conduct long range visual search								-	-	-	-	-	-
37.2.10.1.4. Conduct short range visual search								-	-	-	-	-	-
37.2.10.1.5. Conduct physical clearance search using applicable mine detection								-	-	-	-	-	-
37.2.11. Conduct Secondary Searches													
37.2.11.1. Identify Vulnerable points, Vulnerable Areas (Danger Areas)								-	-	-	-	-	-
37.2.11.2. Conduct long range visual search								-	-	-	-	-	-
37.2.11.3. Conduct short range visual search								-	-	-	-	-	-
37.2.11.4. Conduct physical clearance search using applicable mine detection								-	-	-	-	-	-
37.2.12. Conduct primary IED target isolation - Op BARMA/"Box"-360 Drills								-	-	-	-	-	-
37.2.13. Identify Tertiary/Mass IED Contamination Threat								-	-	-	-	-	-
37.3. RSP Planning													
37.3.1. Identify IED triggering/firing systems								-	-	-	-	-	-
37.3.2. Identify course of action options, i.e. render safe, BIP, PUCA, circumvention								-	-	-	-	-	-
37.3.3. Analyze/Discuss consequences of developed courses of actions								-	-	-	-	-	-
37.3.4. Select appropriate course of action								-	-	-	-	-	-
37.3.5. Discuss course of action collateral concerns/issues								-	-	-	-	-	-
37.4. RSP Execution													
37.4.1. Prepare appropriate tools/equipment materials to accomplish course of action option								-	-	-	-	-	-
37.4.2. Posture team effectively to accomplish course of action option								-	-	-	-	-	-
37.4.3. Execute appropriate course of action								-	-	-	-	-	-
37.4.4. Conduct course of action option reconnaissance								-	-	-	-	-	-

Attachment 3

3E8X1 Advanced EOD Course Training Standard

1. Tasks, Knowledge And Technical References	2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training / Information Provided (See Explanations)					
	A	B	A	B	C	D	E	A 3 Skill Level		B 5 Skill Level		C 7 Skill Level	
	5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(2) DL	(1) CDC	(2) Course	(1) Course	(2) DL
37.4.5. Determine after action threat status								-	-	-	-	-	-
37.5. Final Action													
37.5.1. Prepare appropriate tools/equipment materials to accomplish site exploitation								-	-	-	-	-	-
37.5.2. Posture team effectively to accomplish site exploitation								-	-	-	-	-	-
37.5.3. Execute site exploitation								-	-	-	-	-	-
37.5.4. Determine key evidence collection items, i.e. biometric related and design related materials								-	-	-	-	-	-
37.5.5. Conduct additional threat area clearance								-	-	-	-	-	-
37.5.6. Discuss limitations/risks related to scene release								-	-	-	-	-	-

Human Health Risk Assessment
Open Burn/Open Detonation Units
Range C-52 North and Range C-62
Eglin Air Force Base, Florida
Operational Permit No. 006176-HO-007

Prepared For:
Eglin Air Force Base
96 CEG/CEIEC
700 Range Road, Building 592
Eglin Air Force Base, Florida 32542

Prepared by:
LRS Federal, LLC
8221 Ritchie Highway, Suite 300
Pasadena, Maryland 21122
(410) 544-3570

Prepared Under Contract to:
Air Force Civil Engineer Center
Contract Number: FA8903-15-F-0006

February 2019

This page intentionally left blank.

TABLE OF CONTENTS

FIGURES

TABLES

ATTACHMENTS

This page intentionally left blank.

LRS Federal LLC (LRS), in conjunction with Arcadis, conducted this human health risk assessment (HHRA) for octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) detected in groundwater of the surficial aquifer at the Open Burn/Open Detonation (OB/OD) Units Range C-52 North (C-52N) and Range C-62 (location shown on **Figure 1**). The HHRA follows guidance outlined in the USEPA's Risk Assessment Guidance for Superfund (RAGS): Volume I, Human Health Evaluation Manual, Part A (USEPA, 1989), which is consistent with USACE guidance EM-200-1-15 (USACE, 2015), EM 200-1-4: Risk Assessment Handbook - Volume I: Human Health Evaluation (USACE, 1999), and other relevant USEPA guidance cited throughout the assessment. Accordingly, the HHRA is presented in a series of tables in RAGS Part D format (USEPA, 2001) and consists of the following four components:

1) Hazard Identification
2) Exposure Assessment
3) Toxicity Assessment, and
4) Risk Characterization.

In the Hazard Identification, relevant data are compiled and chemicals of potential concern (COPCs) are identified based on a comparison of maximum detected concentrations to human health risk-based screening levels. In the Exposure Assessment, actual or potential chemical release and transport mechanisms are identified; potentially exposed human populations and possible exposure pathways and routes are described; COPC concentrations at points of potential human contact are determined; and human exposures to the COPCs are estimated. In the Toxicity Assessment, quantitative and qualitative toxicity data used to characterize the potential for adverse health effects are identified. In the Risk Characterization, the likelihood and magnitude of adverse health effects are estimated for each applicable exposure scenario. Sources of uncertainty in the HHRA are then noted and discussed. Lastly, alternate concentration limits are derived to be protective of offsite receptors.

Supporting documentation for this HHRA are included in **Attachment 1**.

1.0 HAZARD IDENTIFICATION

This section identifies the COPCs in sampled environmental media based on a comparison of maximum detected concentrations to human health risk-based screening levels. The selected screening levels are protective of adverse health effects; therefore, chemicals present at concentrations below the corresponding screening levels are not anticipated to pose human health risks.

1.1 Available Data

Range C-52N and Range C-62 are currently used as active test and training ranges. Refer to **Figure 2** and **Figure 3** for the range features, including monitoring well locations, surface water drainage locations, the target areas (historically referred to as the 'Cat's Eye'), open burn units (OBU), and open detonation units (ODU).

As described in previous site investigation reports (LRS 2018), three groundwater monitoring wells, including one upgradient background well (MW-94-52-01) and two point of compliance (POC) wells (MW-94-52-01 and MW-94-52-03) were installed at Range C-52N, and five monitoring wells, including one upgradient background well (MW-94-62-01) and four POC wells (MW-94-62-02 through MW-94-62-05 were installed at Range C-62. During quarterly, biannual, and annual sampling events between 1994 and 2018, groundwater data representing the area around the 'Cat's Eye' (the target area) open burn (OB) unit from the three monitoring wells at Range C-52N were collected. During the same time period, groundwater data representing the area surrounding the OB/OD units from the five monitoring wells at Range C-62 were also collected. Depending on timeframe, groundwater samples from both areas were analyzed for explosives, nitrate and nitrite, metals, and semi-volatile organic compounds (SVOCs). Samples at Range C-62 were also analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX). In addition to HMX and RDX, other explosive compounds detected at Ranges C-52N and/or C-62 include 2-amino-4, 6-Dinitrotoluene, and 4-amino-2, 6-Dinitrotoluene.

Currently, annual groundwater sampling for the OB/OD facilities is required in accordance with Part IV, Subpart A of Permit 006176-HO-007 issued by Florida Department of Environmental Protection (FDEP) on March 29, 2016. The Groundwater Cleanup Target Levels (GCTLs) are included in the updated 2016 Permit and the previous permit. In particular, the selected screening levels for HMX and RDX in groundwater are the FDEP GCTLs: 350 µg/L and 0.3 µg/L, respectively (FDEP, 2005). The GCTLs used are based on a target cancer risk of 1×10^{-6} (i.e., one-in-a-million excess lifetime cancer risk) or a non-cancer hazard quotient (HQ) of 1.

During the 2018 sampling event, BTEX compounds, nitrite, and nitrate were either not detected or did not exceed the GCTLs at Range C-52N or C-62. However, HMX and/or RDX was detected at both ranges. **Table 1** summarizes the available groundwater data from monitoring wells from Range C-52N and Range C-62. At Range C-52N, HMX was not detected in any of the 5 samples in the data set, with detection limits ranging from 0.078 µg/L to 0.13 µg/L. At the same range, RDX was detected in 4 of 5 samples in the data set from 0.72 µg/L to 1.5 µg/L. At Range C-62, both HMX and RDX were detected in all 10 samples included in the data set, ranging from 22.6 µg/L to 59 µg/L for HMX and 13.2 µg/L to 72 µg/L for RDX.

1.2 Selection of Chemicals of Potential Concern

As shown in **Table 1**, RDX is the only constituent detected at concentrations greater than the screening level and is selected as a COPC for both Range C-52N and Range C-62. HMX was also selected as a COPC for this HHRA. For the purposes of this HHRA, only the most recent RDX and HMX data from the sampling rounds from 2014 to 2018 were selected to provide the most representative data sets for evaluation.

1.3 Exposure Point Concentrations

Consistent with USEPA guidance on calculating exposure point concentrations (EPCs) for groundwater (USEPA, 2014a), monitoring wells representative of being within the 'core of the plume' were used to estimate EPCs for RDX in groundwater. The data for Range C-52N were limited to results from MW-94-52-01 because, as shown in Attachment 2, Table 1, RDX was not detected in the other two monitoring wells at Range C-52N (i.e., MW-94-52-02 and -03). The data for Range C-62 were limited to results from MW-94-62-04 and MW-94-62-05 because, as shown in Attachment 2, Table 1, RDX was detected in the other monitoring wells at Range C-62 (i.e., MW-94-62-01, MW-94-62-02, and MW-94-62-03) at concentrations approximately one order of magnitude or more lower than in MW-94-62-04 and MW-94-62-05. The following lists the monitoring wells and sample dates in the two data sets used for EPC calculations. The monitoring well locations are shown on **Figure 2** and **Figure 3**.

Range C-52 North	Range C-62
MW-94-52-01 (6/12/14)	MW-94-62-04 (5/23/14)
MW-94-52-01 (6/19/15)	MW-94-62-05 (5/23/14)
MW-94-52-01 (6/6/16)	MW-94-62-04 (5/19/15)
MW-94-52-01 (5/11/17)	MW-94-62-05 (5/19/15)
MW-94-52-01 (5/12/18)	MW-94-62-04 (6/6/16)
	MW-94-62-05 (6/6/16)
	MW-94-62-04 (5/11/17)
	MW-94-62-05 (5/11/17)
	MW-94-62-04 (5/12/18)
	MW-94-62-05 (5/12/18)

1.4 Fate and Transport Modeling

In order to estimate concentrations of COPCs in groundwater at the point of contact with downgradient surface water bodies, a BIOSCREEN-AT assessment was conducted using groundwater data collected at Range C-52N OB, Range C-62 OB, and Range C-62 OD. The BIOSCREEN-AT assessment is described in detail in the memorandum 'BIOSCREEN-AT Evaluation and Alternate Concentration Limits Ranges C-52N and C-62 Eglin Air Force Base, Florida', provided in **Attachment 2.**

2.0 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to estimate the type and magnitude of human exposure to COPCs in groundwater within Range C-52N and Range C-62, as well as in offsite surface water bodies. This is accomplished by establishing assumptions about the potential for human exposure (e.g., exposed populations, exposure frequency) to groundwater within the two areas. For COPCs, representative EPCs are calculated and used to model potential human exposure in the form of daily chemical intakes and dermally absorbed doses (DAD). Since RDX is not volatile, inhalation is not a relevant route of exposure. These exposure estimates are combined in the Risk Characterization with chemical-specific toxicity values to calculate incremental lifetime cancer risks and non-cancer hazards.

Consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990) and USEPA guidance (1989; 1995), estimates of COPC intake and exposure were developed to portray reasonable maximum exposure (RME) scenarios. The RME scenario considers the highest exposure that might reasonably be expected to occur, one that is well above the average case of exposure but within the range of possibility. Use of the RME individual to model human health risks is a conservative approach, in that it yields upper-bound cancer risk and non-cancer hazard estimates (USEPA, 1989).

2.1 Human Health Conceptual Site Model

Table 2 presents the human health conceptual site model (CSM) for the site. The human health CSM illustrates the current understanding of the potential for human exposure to the COPCs at the site. The CSM includes the exposure media of concern, potential human receptor populations, and the pathways through which human exposure may occur. In accordance with USEPA (1989) guidance, a complete exposure pathway includes: [1] a chemical source and release mechanism, [2] a transport or retention medium, [3] an exposure point where human contact with the contaminated medium may occur, and [4] an exposure route (i.e., ingestion, dermal absorption, or inhalation) at the contact point. If any one of these elements is missing, the pathway is considered incomplete.

2.1.1 Groundwater

The OB/OD units are located on both Range C-52N and C-62 (i.e., OD on C-52N and OB/OD on C-62), and site conditions on both ranges enable site-related munitions constituents to enter the groundwater system. However, groundwater in the surficial aquifer is currently not used as a potable water supply at Eglin AFB. Therefore, potentially complete exposure pathways at the site include hypothetical future onsite worker exposure to groundwater via future potable wells and hypothetical future onsite resident exposure to groundwater via future potable wells. Exposure to RDX in tap water includes ingestion and dermal contact.

2.1.2 Groundwater Discharge to Surface Water

Bay Head Branch Creek is located downgradient of the OB unit on Range C-52N, and Blount Mill Creek is located downgradient of the OB/OD unit plumes on Range C-62. Based on BIOSCREEN-AT modeling (refer to **Attachment 2**), RDX in surficial groundwater beneath the site has the potential for migration into downgradient surface water bodies. Therefore, additional exposure pathways associated with the site include future recreator exposure to groundwater discharged to downgradient surface water bodies and, although it is highly unlikely, offsite residential exposure to downgradient surface water used as a potable supply. These hypothetical exposure pathways are more conservative than base personnel occasional exposure during work or training. Exposure to RDX in both tap water and surface water includes ingestion and dermal contact.

2.2 Exposure Point Concentrations

2.2.1 Onsite Groundwater

EPCs used to model human exposure to onsite groundwater were calculated using the data sets as described above and are summarized in **Table 3.1** for Range C-52N and in **Table 3.2** for Range C-62. The USEPA (1992, 1989) recommends that the arithmetic average concentration of the data be used for evaluating long-term exposure and, because of the uncertainty associated with estimating the true average concentration at a site, the 95% upper confidence limit (UCL) on the arithmetic average be used as the EPC. The 95% UCL concentration provides reasonable confidence that the true average will not be under-estimated. The USEPA also indicates that where there is a question about the distribution of the data, a statistical test should be used to identify the best distributional assumption for the data set (USEPA, 1992). The USEPA (2014a) also recommends that in estimating EPCs for groundwater, recent data from the core of the plume are preferred.

Consistent with USEPA guidance on calculating EPCs for groundwater (USEPA, 2014a), monitoring wells identified within the ‘core of the plume’ were used to estimate EPCs for RDX in the two ranges. Groundwater samples collected from MW-94-52-01 were used in determining EPCs for Range C-52N, and MW-94-62-04 and MW-94-62-05 were used in determining EPCs for Range C-62.

The ProUCL® 5.1 (ProUCL) program developed by the USEPA’s Technology Support Center for Monitoring and Site Characterization was used to calculate 95% UCL concentrations for the data sets for each range. When entering data into ProUCL, if RDX was not detected in a sample, the sample reporting limit was entered as a proxy concentration and the sample result was coded as non-detect. ProUCL contains rigorous parametric and nonparametric statistical methods that can be used on full or uncensored data sets and on data sets with below detection limit observations (also called left-censored data sets). Depending on the distribution and 95% UCL estimation method, ProUCL will use only detected data or will incorporate detection limits (USEPA, 2015).

2.2.2 Groundwater Discharge to Surface Water

EPCs used to estimate human exposure to surface water conservatively assume that receptors will be exposed to the modeled concentrations expected in groundwater at the confluence with the surface water bodies downgradient of Range C-52N and Range C-62. The most conservative (i.e. highest) modeled RDX concentrations expected at the point of discharge was selected as the surface water EPC for each respective range.

The inputs, methods, and assumptions for the BIOSCREEN evaluation are described in detail in the memorandum 'BIOSCREEN-AT Evaluation and Alternate Concentration Limits Ranges C-52N and C-62 Eglin Air Force Base, Florida', provided in **Attachment 2**.

The EPCs for RDX in groundwater and surface water at Range C-52N and Range C-62 are presented in **Tables 3.1** and **3.2**, respectively. The ProUCL output sheet is provided **in Attachment 1**.

2.3 Exposure Equations and Parameter Values

The exposure equations and receptor-specific parameter values used to estimate COPC intakes and DADs are presented in **Table 4** for ingestion and dermal contact exposure. The exposure parameters used to estimate COPC intakes and DADs under the RME scenarios evaluated in this HHRA are based on USEPA (2014b, 2011, 2004, and 1989) guidance.

For future site workers, residents, and recreators, application of the exposure equations results in chronic daily intake for ingestion exposure or DAD for dermal contact exposure, expressed in milligrams per kilogram of body weight per day (mg/kg-day). The estimated daily intake is the amount of chemical at the exchange boundary (i.e., stomach for ingestion and skin for dermal absorption). A fundamental assumption in the estimate of the DAD is that absorption continues long after the exposure has ended (USEPA, 2004). As such, the final absorbed dose is estimated to be the total dose dissolved in the skin at the end of the exposure. Application of these equations requires a COPC concentration, or the average concentration contacted over the exposure period (e.g., mg/L water). These equations also require a contact rate (i.e., the amount of COPC contacted per unit time or event), body weight (i.e., the average body weight over the exposure period), and averaging time (i.e., the time over which exposure is averaged).

The averaging time depends on the type of toxic effect being assessed. When evaluating exposures for potential non-cancer health effects, intakes are calculated by averaging over the period of exposure. This is equivalent to the receptor-specific exposure duration multiplied by 365 days/year. When evaluating potential cancer risks, intakes are calculated by prorating the total cumulative intake over a lifetime (i.e., lifetime average daily intake). For calculation purposes, this is equal to 70 years multiplied by 365 days/year (i.e., 25,550 days). This distinction is consistent with the hypothesis that the mechanism of action for each of these health effects endpoints is different. The approach for carcinogens assumes that a high dose received over a short period of time is equivalent to a corresponding low dose spread over a lifetime.

3.0 TOXICITY ASSESSMENT

The toxicity assessment, also termed the dose-response assessment, characterizes the relationship between the magnitude of exposure and the potential that an adverse health effect will occur. Toxicity assessment involves determining whether exposure to a chemical can cause an increase in the incidence of a particular adverse health effect and characterizing the nature and strength of the evidence of causation. The toxicity information is then quantitatively evaluated, and the relationship between the dose of chemical received and the incidence of adverse health effects in the exposed population is evaluated.

3.1 Sources of Toxicity Values

The USEPA and other regulatory agencies have performed toxicity assessments for numerous chemicals, and their guidance was used in this HHRA. Toxicity values include reference doses (RfDs) and reference concentrations for the evaluation of non-cancer health effects from chronic and sub-chronic exposure to chemicals, and cancer slope factors and inhalation unit risks for evaluating incremental cancer risk from exposure to chemicals prorated over a lifetime (i.e., excess lifetime cancer risks).

Sources of toxicological information and toxicity values, in order of preference consistent with USEPA (2003) guidance, include:

- Tier 1 - Integrated Risk Information System (IRIS) (USEPA, 2018b). IRIS is an USEPA administered internet database that has received internal and external scientific review and contains current information on human health effects that may result from exposure to chemicals in the environment.
- Tier 2 - Provisional Peer-Reviewed Toxicity Values (PPRTV) (USEPA, 2018c). PPRTVs were developed by the USEPA Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center, as presented in a series of chemical-specific issue papers.
- Tier 3 - Additional USEPA and non-USEPA sources of toxicity information, including but not limited to the California Environmental Protection Agency Office of Environmental Health Hazard Assessment's chronic reference exposure levels and cancer potency values, the Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels (ATSDR, 2018), and toxicity values published in the Health Effects Assessment Summary Tables (USEPA, 2018d).

3.1.1 Adverse, Non-cancer Health Effects

The NCP (USEPA, 1990) indicates that acceptable exposure levels for chemicals with non-cancer health effects should represent concentration levels to which the human population, including sensitive subpopulations (e.g., the elderly, young children), may be exposed without adverse health effects during a lifetime or part of a lifetime, incorporating an adequate margin of safety. The potential for non-cancer health effects associated with oral and dermal exposures is evaluated by comparing an estimated chemical intake or DAD over a specified time period with an RfD derived for a similar exposure period. The RfD is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Therefore, the ratio of the intake or DAD to the RfD, termed the HQ, assumes there is a level of exposure (i.e., the RfD) below which it is unlikely for even sensitive subpopulations to experience adverse health effects. For child receptors, where exposure is assumed to occur over the six-year exposure duration, the subchronic RfD for RDX was used

Table 5 presents the non-cancer toxicity data for RDX, including the RfD, primary target organ(s), and uncertainty/modifying factors. Generally, order-of-magnitude uncertainty factors reflect the various types of toxicological data (e.g., a laboratory animal study extrapolated to the human condition) used to estimate the RfDs. Modifying factors, which can range from greater than zero to 10, reflect qualitative professional judgment regarding scientific uncertainties (e.g., the completeness of the overall database) not covered by the uncertainty factors. Application of the uncertainty and modifying factors is intended to result in RfDs that are protective of human health.

RfDs are not available to evaluate dermal exposure. In their absence, oral RfDs were used and adjusted following USEPA (2004) guidance to reflect absorbed dose. This allows for comparison between exposures estimated as absorbed doses and toxicity values expressed as absorbed doses.

3.1.2 Carcinogenic Effects

Regardless of the mechanism of effect, risk evaluation methods employed by the USEPA generally derive from the hypothesis that thresholds for cancer induction by carcinogens do not exist and that the dose-response relationship is linear at low doses. Based on this hypothesis, USEPA has derived estimates of incremental cancer risk from lifetime exposure to potential carcinogens. This is accomplished by establishing the carcinogenic potency of the chemical through critical evaluation of the various test data and fitting dose-response data to a low-dose extrapolation model. The slope factor, which describes the dose-response relationship at low doses, is expressed as a function of intake [i.e., $(\text{mg/kg-day})^{-1}$].

Excess lifetime cancer risks were estimated by multiplying an estimated daily intake or DAD prorated over 70 years by the slope factor. The resulting risk estimate is expressed as a unitless probability (e.g., 2×10^{-5} or 2 in 100,000) of an individual developing cancer. The unitless probability represents the incremental (or increased) lifetime cancer risk associated with the estimated exposure above the background risk of developing cancer. This linear equation is valid only at low risk levels (i.e., below estimated risks of 0.01). According to the USEPA (1989), this approach does not necessarily give a realistic prediction of risk. The true value of the risk at trace ambient concentrations is unknown and may be as low as zero.

Table 6 presents the cancer toxicity data for RDX, including: the slope factor and weight-of-evidence classifications under USEPA's 2005 guidelines for carcinogen risk assessment (USEPA, 2005). As with RfDs, USEPA has not derived slope factors to evaluate dermal exposure. In their absence, slope factors for oral exposure were used and adjusted per USEPA guidance to reflect absorbed dose. This allows for risk estimation based on exposures estimated as absorbed doses and slope factors expressed as absorbed doses.

4.0 RISK CHARACTERIZATION

Risk characterization involves combining exposure estimates with toxicity information to assess the potential for adverse health effects from exposure to groundwater by the receptor groups evaluated in the HHRA. In this section, the non-cancer hazards and cancer risks for each exposure scenario are presented and discussed.

As described in the Toxicity Assessment section, the potential for non-cancer health effects is evaluated by calculating the ratio of an estimated intake or DAD over a specified time period with a chemical-specific RfD derived for a similar exposure period. The RfD is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. The non-cancer HQ therefore assumes there is a level of exposure below which it is unlikely for even sensitive subpopulations to experience adverse health effects. The total individual HQs are summed for each route of exposure and exposure medium to yield hazard indices (HIs) representative of the potential for adverse, non-cancer health effects from cumulative exposure. For the non-cancer assessment, exposure scenarios with an HI greater than 1 are of potential concern.

Individual cancer risks are expressed as unitless probabilities of a person developing cancer. The cancer risks were summed for each exposure route to arrive at an estimate of the total receptor cancer risk. For known or suspected carcinogens, like RDX, the NCP established that acceptable exposure levels are generally concentration levels that represent an incremental upper-bound lifetime cancer risk in the range from 1×10^{-4} (i.e., 1 in 10,000) to 1×10^{-6} (i.e., 1 in 1,000,000) or less (USEPA, 1990). The cancer risks estimated for each exposure scenario are therefore compared to this risk range established by the NCP.

4.1 Future Onsite Site Worker Non-Cancer Hazards and Cancer Risks

Table 7.1.1 presents the cancer risk estimates and non-cancer HIs for the future onsite site worker at Range C-52N. As shown, the estimated cancer risk for future onsite site worker exposure to tap water via ingestion and dermal contact ($9x10^{-7}$) does not exceed the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (0.008) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

Table 7.1.2 presents the cancer risk estimates and non-cancer HIs for the future onsite site worker at Range C-62. As shown, the estimated cancer risk for future onsite site worker exposure to tap water via ingestion and dermal contact ($2x10^{-5}$) is within the USEPA acceptable cancer risk range of 1×10^{-4} to 1×10^{-6}. Additionally, the HI (0.2) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

4.2 Future Hypothetical Onsite Resident Non-Cancer Hazards and Cancer Risks

Table 7.2.1 presents the cancer risk estimates and non-cancer HIs for the future hypothetical onsite resident at Range C-52N. As shown, the estimated cancer risk for future hypothetical onsite resident child and adult exposure to tap water via ingestion and dermal contact ($1x10^{-6}$) does not exceed the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (child exposure only of 0.0007) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

Table 7.2.2 presents the cancer risk estimates and non-cancer HIs for the future hypothetical onsite resident at Range C-62. As shown, the estimated cancer risk for future hypothetical onsite resident child and adult exposure to tap water via ingestion and dermal contact ($4x10^{-5}$) is within the USEPA acceptable cancer risk range of 1×10^{-4} to 1×10^{-6}. Additionally, the HI (child exposure only of 0.02) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

4.3 Offsite Recreator Non-Cancer Hazards and Cancer Risks

Table 7.3.1 presents the cancer risk estimates and non-cancer HIs for the future offsite recreator downgradient of Range C-52N. As shown, the estimated cancer risk for future child and adult offsite recreator exposure to surface water via ingestion and dermal contact ($9x10^{-9}$) is less than the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (child exposure only of 0.00001) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

Table 7.3.2 presents the cancer risk estimates and non-cancer HIs for the future offsite recreator downgradient of Range C-62. As shown, the estimated cancer risk for future child and adult recreator exposure to surface water via ingestion and dermal contact ($1x10^{-5}$) is within the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (child exposure only of 0.001) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

4.4 Offsite Resident Non-Cancer Hazards and Cancer Risks

Table 7.4.1 presents the cancer risk estimates and non-cancer HIs for the future hypothetical offsite resident at Range C-52N. As shown, the estimated cancer risk for future hypothetical offsite resident child and adult exposure to tap water via ingestion and dermal contact ($2x10^{-7}$) does not exceed the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (child exposure only of 0.00008) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

Table 7.4.2 presents the cancer risk estimates and non-cancer HIs for the future hypothetical offsite resident at Range C-62. As shown, the estimated cancer risk for future hypothetical offsite resident child and adult exposure to tap water via ingestion and dermal contact ($2x10^{-5}$) is within the USEPA acceptable cancer risk range of 1×10^{-4} to 1×10^{-6}. Additionally, the HI (child exposure only of 0.008) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

5.0 UNCERTAINTIES

Risk assessment entails the integration of complex analyses of chemical concentrations in the environment, the fate and transport of chemicals in the environment, the potential for and extent of human exposure, and the chemical's toxicity. Some degree of uncertainty is associated with each component of the risk assessment process. Uncertainty can be quantitatively addressed by identifying specific sources of uncertainty and characterizing whether the potential for risk may be over-stated or under-stated. The intent of most risk assessments, including this HHRA, is to err on the side of conservatism, so the potential for risk is over-stated rather than under-stated. However, for this HHRA, major assumptions made and the potential impact on risk estimates are qualitatively discussed.

5.1 Environmental Sampling and Analysis

This HHRA is based on groundwater data for a limited number of monitoring wells at both Range C-52N and Range C-62. Data for soil at these sites were not reviewed for this HHRA. Based on the understanding that the areas around these sites are used for active testing missions, it may be that these activities also contribute as sources of explosives like RDX. RDX is consistently detected in the hydraulically upgradient well (MW-94-52-01) at Range C-52N at higher concentrations than at the two downgradient wells (MW-94-52-02 and MW-94-52-03). The RDX detections are likely due to the proximity of MW-94-52-01 to the 'Cat's Eye' target area and the presence of substantial debris/exploded ordinances in the vicinity of MW-94-52-01. However, as the HHRA assumed exposure was to concentrations in or migrating from that upgradient well it is not likely that EPCs for C-52N were underestimated. As indicated in the BIOSCREEN evaluation provided in **Attachment 2**, concentrations of RDX in groundwater of the surficial aquifer at C-52N are decreasing, while at C-62 increasing trends are observed in groundwater at monitoring wells MW-94-62-04 and MW-94-62-05. Therefore, if concentrations at C-62 continue to increase, EPCs were underestimated. Yet, the assumption that concentrations in surface water would be equal to those modeled at the point of groundwater discharge is highly conservative as mixing with surface water and photodegradation of RDX would occur. Therefore, EPCs were likely overestimated overall.

5.2 Exposure Assessment

The exposure assessment relies on a series of assumptions regarding the potential for human exposure, outlined in the CSM and approximated in the daily intake calculation by parameters such as the groundwater EPC and receptor-specific exposure duration, frequency, and time. This HHRA attempted to address some of the uncertainty in these assumptions by conservatively evaluating the potential for cancer risk and non-cancer hazard to individuals under RME conditions in the hypothetical future exposure scenarios. The surficial aquifer in the Citronelle Formation, referred to as the 'Sand and Gravel Aquifer,' the 'Miocene-Pliocene Aquifer,' or the 'Citronelle Aquifer', is the primary source of water for the population of Santa Rosa and Escambia Counties in the Florida Panhandle (United States Geologic Survey [USGS], 2016). However, groundwater in the surficial aquifer is not currently used as a potable water supply at Eglin AFB, and no potable wells within the surficial aquifer will be allowed in the future at Eglin AFB. Both ranges are located well within the Eglin AFB boundary, with the closest off-base boundary being approximately 6 miles downgradient for C-52 and approximately 4 miles downgradient for C-62 (refer to **Figure 1**). In addition, surface water in the area is not used as a potable source. As described in **Attachment 2**, RDX in groundwater of the surficial aquifer is likely to degrade significantly within 1 mile downgradient of the units. Therefore, potable water scenarios are highly unlikely.

Eglin AFB is an active military facility engaged in testing and training activities and the primary mission in this portion of the Eglin Test and Training Complex (ETTC) or "Range" is expected to remain the same into the foreseeable future. In addition, wildlife and forest conservation activities are also conducted in this area of the Range. However, as the OB/OD units are within training ranges, the areas are closed to hunting, fishing and recreation, and all public access. Although base personnel may access these areas, the recreation user scenario with child exposure is highly unlikely. Therefore, this HHRA likely overestimates the potential for risk overall.

The HHRA primarily relied on the USEPA's standard default exposure assumptions which are used at Superfund sites across the country with appropriate modifications to reflect site-specific conditions. The intention is to over-estimate the potential for risk and hazards, so that actual risks are less than those predicted in this HHRA.

Uncertainties associated with the fate and transport modeling are discussed in **Attachment 2**. The HHRA did not include evaluation of RDX degradation products such as the nitroso derivatives including MNX, DNX, and TNX, as they were not analyzed for in groundwater samples and which form more readily under aerobic conditions and which undergo mineralization to hydrazines and methanol under anaerobic conditions. These compounds are not commonly analyzed constituents. Toxicity values (reference doses and cancer slope factors) are not available for MNX, DNX, and TNX. The cancer slope factor for hydrazine indicates it is 27 times more potent a carcinogen than RDX. However, based on groundwater sampling logs (from May 2018) aquifer conditions are likely aerobic. Therefore, while risks may be underestimated due to the lack of information on RDX degradation products, human exposure in this HHRA is probably still overestimated, overall.

5.3 Toxicity Assessment

The derivation of the toxicity values that form the basis of the risk characterization can result in over- or under-estimates of the potential for adverse health effects. As in most cases, the toxicity values for RDX are derived from extrapolation from laboratory animal data to humans. As indicated in **Table 4**, the oral RfD for RDX contains uncertainty factors totaling to 300.

Following USEPA guidance, the RfD and cancer slope factor for oral exposure were adjusted and used to assess risks from dermal absorption of RDX in water. However, the oral absorption was assumed to be 100 percent which may under-estimate dermal contact exposure for some chemicals. Consideration was not given to the absorption efficiency of the exposure vehicle used in the studies on which the factors are based. This may over-estimate or under-estimate dermal contact risks.

6.0 ALTERNATE CONCENTRATION LIMITS

Alternate concentration limits (ACLs) were developed for both HMX and RDX in groundwater that are protective of hypothetical future potable use of groundwater as it discharges to nearby streams. While hypothetical and highly unlikely, this scenario is conservative. The ACLs were derived considering migration from the source to the receptor (i.e., point of groundwater discharge for hypothetical future potable water users) as provided in **Attachment 2**. The ACLs derived are shown in the table below; for further details see the memorandum in **Attachment 2**.

Area	Chemical	Distance to Receptor (feet)	Alternate Concentration Limit (ug/L)	Notes
Range C-52 N				
Cat's Eye	RDX	310	0.32	distance from well MW-94-C52-02 to creek
Cat's Eye	HMX	310	580	distance from well MW-94-C52-02 to creek
Range C-62 OBU				
OBU	RDX	150	0.31	distance from well MW-94-C62-03 to creek
OBU	HMX	150	430	distance from well MW-94-C62-03 to creek
Range C-62 ODU				
ODU	RDX	380	0.87	distance from well MW-94-C62-04 to creek
ODU	HMX	380	21,000	distance from well MW-94-C62-04 to creek

Notes:
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
OBU = Open Burn Unit
ODU = Open Detonation Unit
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
ug/L = micrograms per liter

6.1 Comparison of Site Data to ACLs

The ACLs were derived to be protective of potable use of groundwater in the surficial aquifer as it discharges to surface water downstream of C-52N and C-62. As shown in **Table 8**, the maximum detected concentrations and 95% UCLs of RDX at both C-52N and C-62, and the modeled RDX concentration at the point of surface water discharge for C-62 exceed the ACLs developed for protection of potable use. The modeled RDX concentration at the point of discharge to surface water for C-52N is below the ACL for protection of potable use.

The results of the BIOSCREEN-AT modeling suggest that:

- The groundwater RDX concentration at C-52N would drop below the FDEP GCTL by 1,800 feet downgradient from MW-94-52-01.

- The groundwater RDX concentration at C-62 is likely to attenuate significantly within one mile downgradient of the OB and OD Units, and is not expected to contribute to offsite groundwater exceedances of the FDEP GCTL for RDX further downgradient.
- It is likely that groundwater that daylights in the headwaters of Blount Mill Creek downgradient of C-62 would not pose a threat to potential receptors.

The recreator exposure scenario is also unlikely. Although instream concentrations were not modeled for this HHRA, comparing data to the FDEP Freshwater Surface Water Cleanup Target Levels (SWCTLs) (FDEP, 2005) can provide some perspective for protection of recreator exposure to surface water. As shown in **Table 8**, the maximum detected concentrations and 95% UCLs of both HMX and RDX, and the modeled concentrations of RDX at the point of discharge for both C-52N and C-62 are all less than the FDEP SWCTLs.

7.0 SUMMARY

The HHRA evaluated conservative hypothetical exposure scenarios to err on the side of conservatism and to over-state rather than under-state the potential for risk. Estimated cancer risks and noncancer HIs for all receptors were below or within the USEPA acceptable risk levels. RDX will not migrate offsite above the GCTL, with the possible exception of groundwater that daylights into the headwaters of Blount Mill Creek downgradient of the OD Unit at C-62. However, mixing with surface water and photodegradation of RDX are anticipated to limit any potential impacts to surface water from this source area. Additionally, since exposure to RDX in the surficial aquifer via a potable use scenario is highly unlikely, comparing modeled concentrations at the point of groundwater discharge (into the downgradient streams) to the FDEP SWCTLs (i.e., 180 µg/L for RDX and 1,300 µg/L for HMX (FDEP, 2005) provides useful information. Although exposure to surface water is also less likely than assumed in this HHRA, maximum detected concentrations of both RDX and HMX are less than the SWCTLs. Based on these considerations and the results of this HHRA, RDX and HMX in the surficial aquifer at C-52N and C-62 are unlikely to pose unacceptable risk to human receptors.

8.0 REFERENCES

ATSDR, 2018. Minimal Risk Levels for Hazardous Substances. (June 2018). Accessed online: https://www.atsdr.cdc.gov/mrls/mrllist.asp

Florida Department of Environmental Protection (FDEP). 2005. Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, F.A.C., Final. Prepared by Center for Environmental and Human Toxicology, University of Florida, Gainesville, FL. Prepared for the Division of Waste Management. February.

FDEP. 2016. Florida Surface Water Quality Criteria, Chapter 62-302.530, FAC. Effective 2/17/2016. Accessed at: https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-302

United States Army Corps of Engineers (USACE). 1999. EM 200-1-4: Risk Assessment Handbook - Volume I: Human Health Evaluation. 31 January 1999.

USACE. 2015. EM 200-1-15. Technical Guidance for Military Munitions Response Actions. 30 October 2015.

United States Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund (RAGS): Volume 1, Human Health Evaluation Manual, Part A. EPA/5401-89/002. Office of Emergency and Remedial Response, Washington, DC. December.

USEPA. 1990. National Oil and Hazardous Substances Pollution Contingency Plan. Final Rule. 40 CFR Part 300. Federal Register 55(46): 8665-8866. March.

USEPA. 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. Publication 9285.7-08. Office of Solid Waste and Emergency Response, Washington, DC. May.

USEPA. 1995. Guidance for Risk Characterization. Science Policy Council, Washington, DC. February.

USEPA. 2001. Risk Assessment Guidance for Superfund: Volume 1- Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments), Final. 9285.7-01D. Office of Emergency and Remedial Response, Washington, D.C. December.

USEPA. 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. EPA/540/R/99/005. Office of Superfund Remediation and Technology Innovation, Washington, DC. July.

USEPA. 2005. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001F. Risk Assessment Forum, Washington, DC. May.

USEPA. 2011. Exposure Factors Handbook: 2011 Edition. EPA/600/R-90/05F. Office of Research and Development, Washington, DC. December.

USEPA. 2014a. Determining Groundwater Exposure Point Concentrations. OSWER Directive 9283.1-42. Office of Solid Waste and Emergency Response. Washington DC. February.

USEPA. 2014b. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. Office of Solid Waste and Emergency Response, Washington, DC. February.

USEPA. 2015. ProUCL Version 5.1 User Guide. EPA/600/R-07/041. Office of Research and Development, Washington, DC. October.

USEPA. 2018a. Regional Screening Level Summary Table, May 2018. Accessed online: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

USEPA. 2018b. Integrated Risk Information System. Accessed online: http://www.epa.gov/IRIS/

USEPA. 2018c. Provisional Peer Reviewed Toxicity Values (PPRTV) for Superfund, PPRTV Assessments Electronic Library. Accessed online: http://hhpprtv.ornl.gov/

USEPA. 2018d. Health Effects Assessment Summary Tables, HEAST On-line Repository (Current as of 2011). Accessed online: https://epa-heast.ornl.gov/.

USGS, 2016. Groundwater Atlas of the United States: Alabama, Florida, Georgia, and South Carolina HA 730-G, The Sand and Gravel Aquifer.

FIGURES

From Figure 1 in LRS (2018)

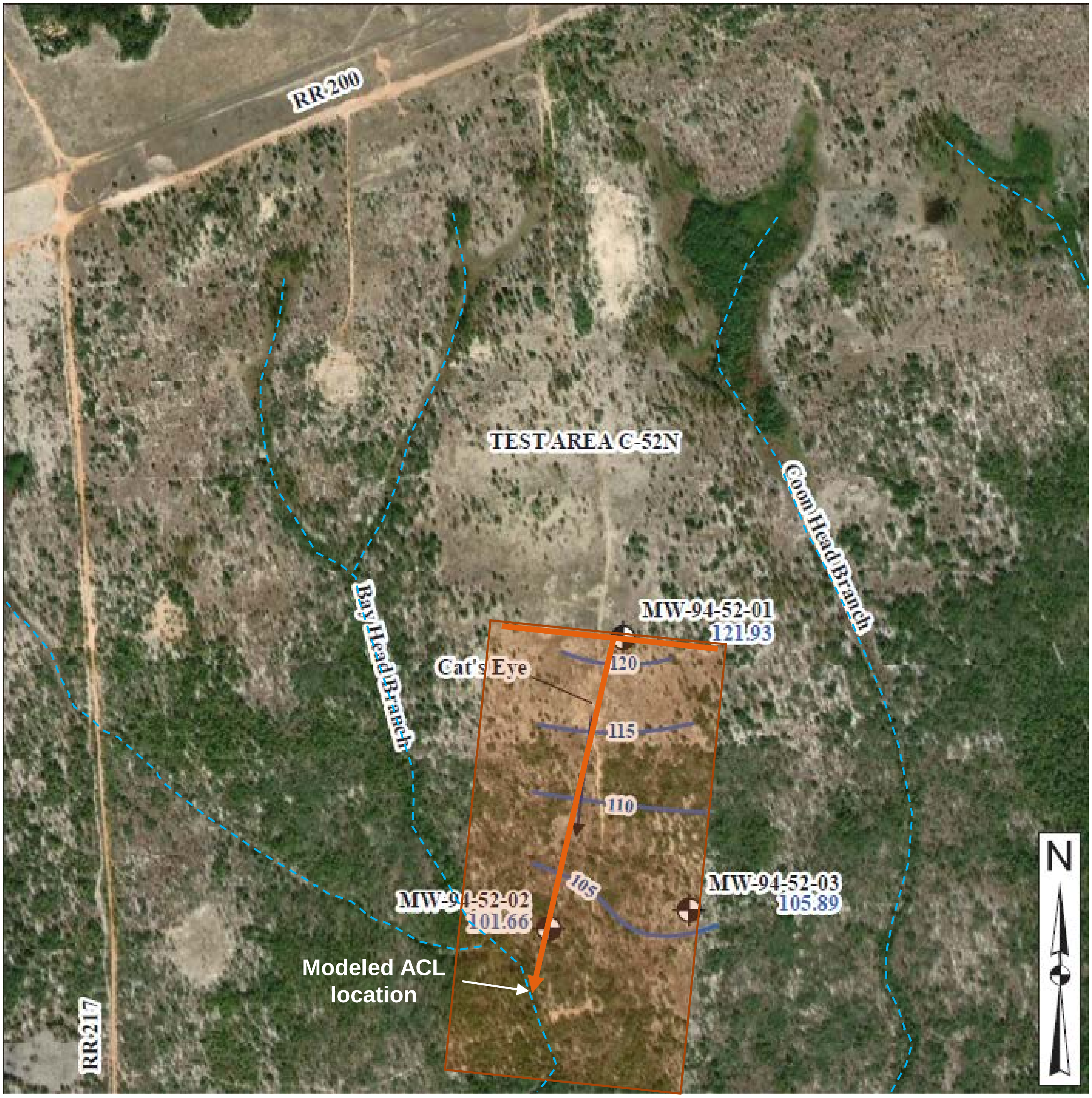
RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

12/10/2018 11:58:07 AM



From Figure 8 in LRS (2018)

0 250 500 1,000
Feet

Monitoring Well

Estimated Groundwater Flow Direction

120 Groundwater Elevation Contour (ft NGVD)

Modeled Plume Length

Modeled Domain Area

Modeled Source Width

Surface Water Drainage

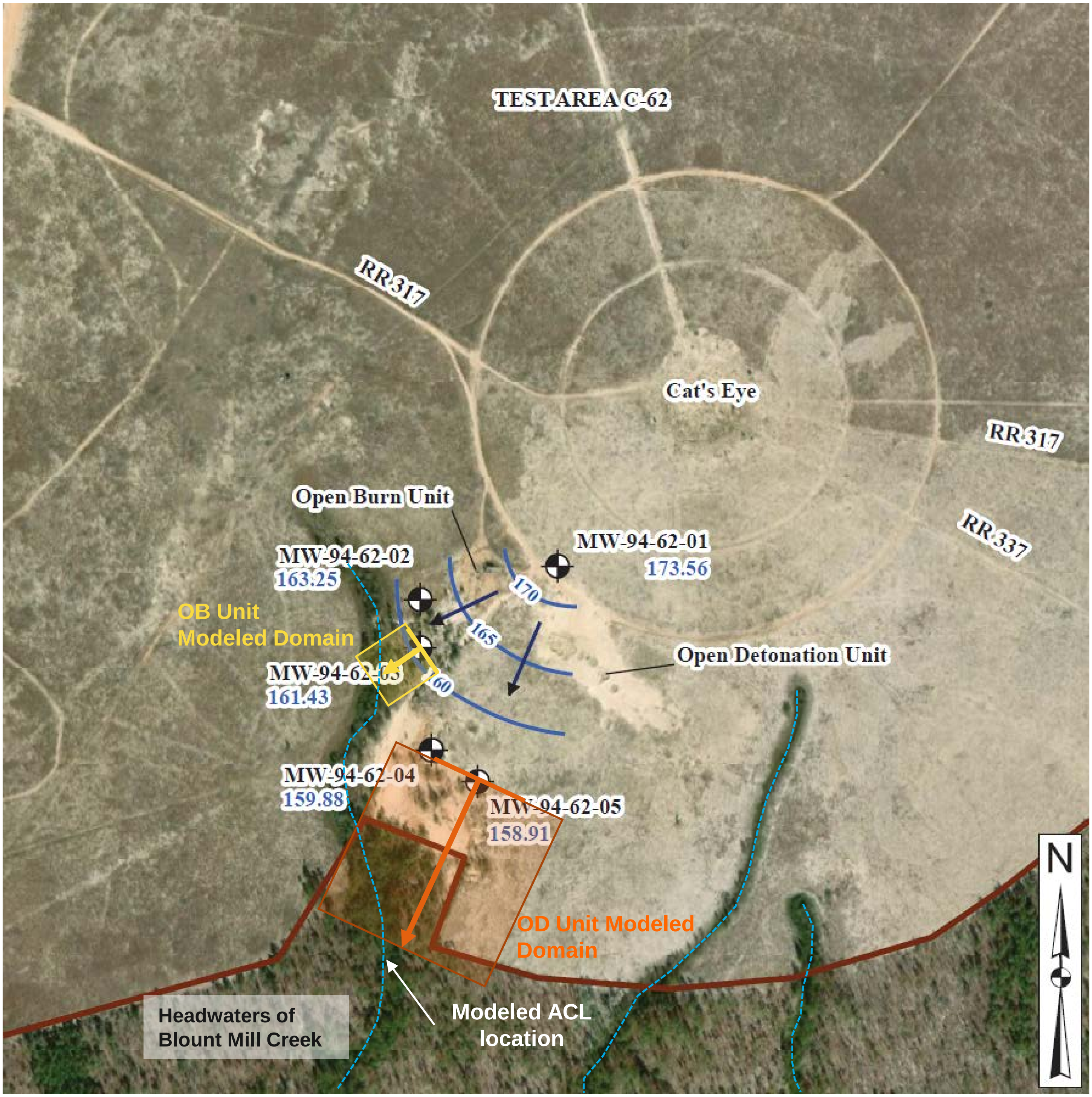
RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

RANGE C-52N
POTENTIOMETRIC CONTOUR MAP
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

12/10/2018 11:58:07 AM



From Figure 9 in LRS (2018)

0 250 500 1,000 Feet

Legend:

- Monitoring Well
- 170 Groundwater Elevation Contour (ft NGVD)
- Estimated Groundwater Flow Direction
- Surface Water Drainage
- Modeled OB Unit Plume
- Modeled OD Unit Plume
- OB Unit Modeled Domain
- OD Unit Modeled Domain
- Modeled OB Unit Source Width
- Modeled OD Unit Source Width

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

RANGE C-62
POTENTIOMETRIC CONTOUR MAP
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3

12/10/2018 11:58:07 AM

TABLES

Table 1
RAGS Part D Table 2
Occurrence, Distribution, and Selection of Chemicals of Potential Concern in the OB/OD Units
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater and Surface Water

Exposure Point	CASRN	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value	Screening Toxicity Value (2)		Screening Toxicity Value (3)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
C-52 North	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	ND	ND	µg/L	ND	0/5	0.078 - 0.13	ND	NA	350	nc	FDEP	N	BSC
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.72	1.5	µg/L	MW-94-52-01(6/19/2015)	4/5	0.17 - 0.17	1.5	NA	0.3	c	FDEP	Y	ASC
C-62	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	22.6	59	µg/L	MW-94-62-05(5/12/2018)	10/10	NA	59	NA	350	nc	FDEP	N	BSC
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	13.2	72	µg/L	MW-94-62-05(5/12/2018)	10/10	NA	72	NA	0.3	c	FDEP	Y	ASC

Notes:

(1) Maximum concentration.

(2) The screening toxicity value is the lower of the United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) for Tapwater (USEPA, November 2018a) or the Florida DEP Groundwater Cleanup Target Level (2005)

(3) Codes used for Screening Toxicity Value Source

FDEP - Florida Department of Environmental Protection

(4) Codes used for the "Rationale for Selection or Deletion":

ASC - Above Screening Criterion

BSC - Below Screening Criterion

CASRN = Chemical Abstract Services Registry Number.

µg/L = microgram(s) per liter.

NA = not available.

N/A = not applicable.

ND = not detected.

Table 2
RAGS Part D Planning Table 1
Selection of Exposure Pathways
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Human Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Tapwater	Range C-52N	Site Worker	Adult	Incidental Ingestion	Quantitative	Site worker exposure to tap water from future potable wells is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
			Range C-62	Site Worker	Adult	Incidental Ingestion	Quantitative	Site worker exposure to tap water from future potable wells is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
			Range C-52N	Resident	Adult	Incidental Ingestion	Quantitative	Residential exposure to tap water from future private potable wells is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
			Range C-62	Resident	Adult	Incidental Ingestion	Quantitative	Residential exposure to tap water from future private potable wells is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
	Surface Water	Surface Water	Points of C-52N Groundwater Discharge	Recreational Users	Adult	Incidental Ingestion	Quantitative	Recreator exposure to surface water is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
			Points of C-62 Groundwater Discharge	Recreational Users	Adult	Incidental Ingestion	Quantitative	Recreator exposure to surface water is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
		Tapwater	Points of C-52N Groundwater Discharge	Resident	Adult	Incidental Ingestion	Quantitative	Residential exposure to surface water as potable water is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
			Points of C-62 Groundwater Discharge	Resident	Adult	Incidental Ingestion	Quantitative	Residential exposure to surface water as potable water is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	

Table 3.1
RAGS Part D Table 3
Exposure Point Concentration Summary: Groundwater at C-52N
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	

Exposure Point	Receptor	Exposure Medium	CAS RN	Chemical of Potential Concern	Units	Arithmetic Mean [1]	95% UCL Concentration [2] (Distribution)		Maximum Concentration	Exposure Point Concentration			
										Value	Units	Statistic	Rationale
C-52 North	Worker	Tapwater	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	0.000891	0.001447	KM (t) UCL	0.0015	0.001447	mg/L	95% UCL	ProUCL v5.1
	Resident	Tapwater	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	0.000891	0.001447	KM (t) UCL	0.0015	0.001447	mg/L	95% UCL	ProUCL v5.1
	Recreator	Surface Water	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	--	--	--	0.00015	0.00015	mg/L	Modeled	BIOSCREEN
	Offsite Resident	Surface Water	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	--	--	--	0.00015	0.00015	mg/L	Modeled	BIOSCREEN

Notes
[1] For the arithmetic mean, where constituents were not detected half the detection limit was included in the calculation.
[2] The 95% Upper Confidence Level (UCL) on the arithmetic average concentration (*i.e.,* the 95% UCL concentration) was calculated using ProUCL version 5.1.

mg/L = milligram(s) per liter.

Data Distribution Codes:
G = Gamma
LN = Lognormal
N = Normal
NP = Nonparametric

Table 3.2
RAGS Part D Table 3
Exposure Point Concentration Summary: Groundwater at C-62
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	

Exposure Point	Receptor	Exposure Medium	CAS RN	Chemical of Potential Concern	Units	Arithmetic Mean [1]	95% UCL Concentration [2] (Distribution)		Maximum Concentration	Exposure Point Concentration			
										Value	Units	Statistic	Rationale
C-62	Worker	Tapwater	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	0.0279	0.04069	Adjusted G UCL	0.072	0.04069	mg/L	95% UCL	ProUCL v5.1
	Resident	Tapwater	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	0.0279	0.04069	Adjusted G UCL	0.072	0.04069	mg/L	95% UCL	ProUCL v5.1
	Recreator	Surface Water	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	--	--	--	0.015	0.015	mg/L	Modeled	BIOSCREEN
	Offsite Resident	Surface Water	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	--	--	--	0.015	0.015	mg/L	Modeled	BIOSCREEN

Notes
[1] For the arithmetic mean, where constituents were not detected half the detection limit was included in the calculation.
[2] The 95% Upper Confidence Level (UCL) on the arithmetic average concentration (*i.e.,* the 95% UCL concentration) was calculated using ProUCL version 5.1.

mg/L = milligram(s) per liter.

Data Distribution Codes:
G = Gamma
LN = Lognormal
N = Normal
NP = Nonparametric

Table 4
RAGS Part D Table 4
Values Used for Daily Exposure Calculations (Ingestion and Dermal Contact) - Reasonable Maximum Exposure
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:
Medium: Groundwater
Exposure Medium:

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Notes	Intake Equation/ Model Name
Ingestion	Worker	Adult	Tapwater	C_W	RDX Concentration in Groundwater	--	mg/L	--	See Tables 3.1 and 3.2	Chronic Daily Intake (CDI) (mg/kg-day) = CW × IR-W × EF × ED × 1/BW × 1/AT
				IR-W	Ingestion Rate	2.5	liters/day	USEPA, 2014		
				EF	Exposure Frequency	250	days/year	USEPA, 2014		
				ED	Exposure Duration	25	years	USEPA, 2014		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989		
Dermal	Worker	Adult	Tapwater	Cw	RDX Concentration in Groundwater	--	mg/L	--	See Tables 3.1 and 3.2	Dermally Absorbed Dose (DAD) (mg/kg-day) = DA_{event} × EV × ED × EF × SA × 1/BW × 1/AT where for organic chemicals: Absorbed Dose per Event (DAevent) (mg/cm2-event) = If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi} or If t-event > t*, then: DAevent = FA x Kp x CW x CF x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 +
				DA_{event}	Absorbed dose per event	calculated	mg/cm^2-event	USEPA, 2004	See Table 4.1	
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		
				SA	Skin Surface Area Available for Contact	3,527	cm^2	USEPA, 2014		
				t-event	Event Duration	0.0083	hours/event	Professional judgment		
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		
				EV	Event Frequency	4	events/day	USEPA, 2011; Professional judgment		
				EF	Exposure Frequency	250	days/year	USEPA, 2014		
				ED	Exposure Duration	25	years	USEPA, 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm^3	--		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989		

Table 4
RAGS Part D Table 4
Values Used for Daily Exposure Calculations (Ingestion and Dermal Contact) - Reasonable Maximum Exposure
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:
Medium: Groundwater
Exposure Medium:

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Notes	Intake Equation/ Model Name
Ingestion	Resident	Adult	Tapwater	C_W	RDX Concentration in Groundwater	--	mg/L	--	See Tables 3.1 and 3.2	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate	2.5	liters/day	USEPA, 2014		CW × IR-W × EF × ED × 1/BW × 1/AT
				EF	Exposure Frequency	350	days/year	USEPA, 2014		
				ED	Exposure Duration	20	years	USEPA, 2014		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	7,300	days	USEPA, 1989		
		Child (0-6 years old)	Tapwater	C_W	RDX Concentration in Groundwater		mg/L	--	See Tables 3.1 and 3.2	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate	0.78	liters/day	USEPA, 2014		CW × IR-W × EF × ED × 1/BW × 1/AT
				EF	Exposure Frequency	350	days/year	USEPA, 2014		
				ED	Exposure Duration	6	years	USEPA, 2014		
				BW	Body Weight	15	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989		
Dermal	Resident	Adult	Tapwater	Cw	RDX Concentration in Groundwater		mg/L	--	See Tables 3.1 and 3.2	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DA_{event}	Absorbed dose per event	calculated	mg/cm^2-event	USEPA, 2004	See Table 4.1	DA_{event} × EV × ED × EF × SA × 1/BW × 1/AT
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		where for organic chemicals:
				SA	Skin Surface Area Available for Contact	20,900	cm^2	USEPA, 2014		Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				t-event	Event Duration	0.71	hours/event	USEPA, 2014		If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		or
				EV	Event Frequency	1	events/day	Professional judgment		
				EF	Exposure Frequency	350	days/year	USEPA, 2014		If t-event > t*, then: DAevent = FA x Kp x CW x CF x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				ED	Exposure Duration	20	years	USEPA, 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm^3	--		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	7,300	days	USEPA, 1989		
		Child (0-6 years old)	Tapwater	Cw	RDX Concentration in Groundwater		mg/L	--	See Tables 3.1 and 3.2	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DA_{event}	Absorbed dose per event	calculated	mg/cm^2-event	USEPA, 2004	See Table 4.1	DA_{event} × EV × ED × EF × SA × 1/BW × 1/AT
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		where for organic chemicals:
				SA	Skin Surface Area Available for Contact	6,378	cm^2	USEPA, 2014		Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				t-event	Event Duration	0.54	hours/event	USEPA, 2014		If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		or
				EV	Event Frequency	1	events/day	Professional judgment		
				EF	Exposure Frequency	350	days/year	USUSEPA, 2014		If t-event > t*, then: DAevent = FA x Kp x CW x CF x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				ED	Exposure Duration	6	years	USEPA, 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm^3	--		
				BW	Body Weight	15	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989		

Table 4
RAGS Part D Table 4
Values Used for Daily Exposure Calculations (Ingestion and Dermal Contact) - Reasonable Maximum Exposure
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:
Medium: Groundwater
Exposure Medium:

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Notes	Intake Equation/ Model Name
Ingestion	Recreator	Adult	Surface Water	C_W	RDX Concentration in Surface Water		mg/L	--	See Tables 3.1 and 3.2	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate	0.43	liters/day	USEPA, 2014		CW × IR-W × EF × ED × 1/BW × 1/AT
				EF	Exposure Frequency	50	days/year	Professional judgment		
				ED	Exposure Duration	20	years	USEPA, 2014		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	7,300	days	USEPA, 1989		
		Child	Surface Water	C_W	RDX Concentration in Surface Water		mg/L	--	See Tables 3.1 and 3.2	
				IR-W	Ingestion Rate	0.72	liters/day	USEPA, 2014		
				EF	Exposure Frequency	50	days/year	Professional judgment		
				ED	Exposure Duration	6	years	USEPA, 2014		
				BW	Body Weight	15	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989		
Dermal	Recreator	Adult	Surface Water	Cw	RDX Concentration in Surface Water		mg/L	--	See Tables 3.1 and 3.2	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DA_{event}	Absorbed dose per event	calculated	mg/cm^2-event	USEPA, 2004	See Table 4.1	DA_{event} × EV × ED × EF × SA × 1/BW × 1/AT
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		where for organic chemicals:
				SA	Skin Surface Area Available for Contact	5,419	cm^2	Professional judgment		Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				t-event	Event Duration	6	hours/event	Professional judgment		If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		or
				EV	Event Frequency	1	events/day	Professional judgment		If t-event > t*, then: DAevent = FA x Kp x CW x CF x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				EF	Exposure Frequency	50	days/year	Professional judgment		
				ED	Exposure Duration	20	years	USEPA 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm^3	--		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	7,300	days	USEPA, 1989		
		Child	Surface Water	Cw	RDX Concentration in Surface Water		mg/L	--	See Tables 3.1 and 3.2	
				DAevent	Absorbed dose per event	calculated	mg/cm2-event	USEPA, 2004	See Table 4.1	
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		
				SA	Skin Surface Area Available for Contact	2,058	cm2	Professional judgment		
				t-event	Event Duration	6	hours/event	Professional judgment		
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		
				EV	Event Frequency	1	events/day	Professional judgment		
				EF	Exposure Frequency	50	days/year	Professional judgment		
				ED	Exposure Duration	6	years	USEPA, 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm3	--		
				BW	Body Weight	15	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989		

References:
USEPA. 2014. HumanHealth Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. February.
USEPA. 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part A). Interim Final. USEPA/540/1-89/002. Office of Emergency and Remedial Response, Washington, DC. December.
USEPA. 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. USEPA/540/R/99/005. Office of Superfund Remediation and Technology Innovation, Washington, DC. July.

Table 4.1
RAGS Part D Table 4.1
Values Used for Dermal Absorbed Dose (DAevent) Calculations
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

If t-event < t*

Chemical of Potential Concern	CAS RN	t*	FA	Kp	CF	tau-event
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	4.43	1	3.36E-04	0.001	1.84

Scenario	Event Duration	DAevent
Worker	0.00833	1.15E-07
Adult Resident	0.71	1.06E-06
Child Resident	0.54	9.27E-07

If t-event > t*

Chemical of Potential Concern	CAS RN	t*	FA	Kp	CF	B	tau-event
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	4.43	1	3.36E-04	0.001	1.93E-03	1.84

Scenario	Event Duration	DAevent
Recreator	6	3.25E-06

Note:
DAevent values shown here are multiplied by the EPC (Cw) for final DAD calculations.

Table 5
RAGS Part D Table 5.1
Non-Cancer Toxicity Data - Oral/Dermal
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Chemical of Potential Concern	CASRN	Chronic/ Subchronic	Oral Reference Dose (RfD)		Oral Absorption Efficiency for Dermal	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD	
			Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	Chronic	4E-03	mg/kg-day	1	4E-03	mg/kg-day	Nervous System	300	IRIS	8/30/2018
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	Subchronic	1E-01	mg/kg-day	1	1E-01	mg/kg-day	Nervous System	30	ATSDR	1/1/2012

Notes:
NA = not available.

Hierarchy of Sources:
IRIS = Integrated Risk Information System (https://cfpub.epa.gov/ncea/iris2/atoz.cfm).
NCEA = National Center for Environmental Assessment, Provisional Peer-Reviewed Toxicity Value (http://hhpprtv.ornl.gov/).
CalEPA = California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (https://oehha.ca.gov/chemicalsp).
ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (https://www.atsdr.cdc.gov/mrls/index.asp).
HEAST = Health Effects Assessment Summary Tables (https://epa-heast.ornl.gov/).

Table 6
RAGS Part D Table 6.1
Cancer Toxicity Data - Oral/Dermal
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Chemical of Potential Concern	CASRN	Oral Cancer Slope Factor (CSF)		Oral Absorption Efficiency for Dermal	Absorbed CSF for Dermal		USEPA Weight of Evidence Classification / Cancer Guideline Description	Oral CSF	
		Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	8E-02	(mg/kg-day)-1	1	8.0E-02	$(mg/kg\text{-}day)^{-1}$	Suggestive Evidence of Carcinogenic Potential	IRIS	8/30/2018

Notes:
NA = not available.

Hierarchy of Sources:
IRIS = Integrated Risk Information System (https://cfpub.epa.gov/ncea/iris2/atoz.cfm).
NCEA = National Center for Environmental Assessment, Provisional Peer-Reviewed Toxicity Value (http://hhpprtv.ornl.gov/).
CalEPA = California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (https://oehha.ca.gov/chemicalsp).
ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (https://www.atsdr.cdc.gov/mrls/index.asp).
HEAST = Health Effects Assessment Summary Tables (https://epa-heast.ornl.gov/).

Table 7.1.1
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Current/Future Adult Onsite Worker Exposure to Groundwater at C-52N
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Receptor Population:	Onsite Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tapwater	C-52N	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.4E-03	mg/L	1.1E-05	mg/kg-day	8.0E-02	(mg/kg-day)$^{-1}$	9E-07	3.1E-05	mg/kg-day	4.0E-03	mg/kg-day	8E-03
			Exp. Route Total								9E-07					8E-03
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.4E-03	mg/L	7.2E-09	mg/kg-day	8.0E-02	(mg/kg-day)$^{-1}$	6E-10	2.0E-08	mg/kg-day	4.0E-03	mg/kg-day	5E-06
			Exp. Route Total								6E-10					5E-06
							Total of Receptor Risks Across All Media				9E-07	Total of Receptor Hazards Across All Media				8E-03

Notes:
-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
(mg/kg-day)$^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.1.2
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Current/Future Adult Onsite Worker Exposure to Groundwater at C-62
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Receptor Population:	Onsite Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tapwater	C-62	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.1E-02	mg/L	3.1E-04	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	2E-05	8.7E-04	mg/kg-day	4.0E-03	mg/kg-day	2E-01
			Exp. Route Total								2E-05					2E-01
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.1E-02	mg/L	2.0E-07	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	2E-08	5.7E-07	mg/kg-day	4.0E-03	mg/kg-day	1E-04
			Exp. Route Total								2E-08					1E-04
							Total of Receptor Risks Across All Media				2E-05	Total of Receptor Hazards Across All Media				2E-01

Notes:
-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.2.1
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Onsite Resident Exposure to Groundwater C-52N
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Hypothetical Onsite Resident
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tapwater	C-52N	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.4E-03	mg/L	1.9E-05	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	1E-06	7.2E-05	mg/kg-day	1.0E-01	mg/kg-day	7E-04
			Exp. Route Total								1E-06					7E-04
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.4E-03	mg/L	1.6E-07	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	1E-08	5.5E-07	mg/kg-day	1.0E-01	mg/kg-day	5E-06
			Exp. Route Total								1E-08					5E-06
							Total of Receptor Risks Across All Media				1E-06	Total of Receptor Hazards Across All Media				7E-04

Notes:
-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.2.2
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Onsite Resident Exposure to Groundwater at C-62
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Hypothetical Onsite Resident
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tapwater	C-62	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.1E-02	mg/L	5.2E-04	mg/kg-day	8.0E-02	(mg/kg-day)⁻¹	4E-05	2.0E-03	mg/kg-day	1.0E-01	mg/kg-day	2E-02
			Exp. Route Total								4E-05					2E-02
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.1E-02	mg/L	4.4E-06	mg/kg-day	8.0E-02	(mg/kg-day)⁻¹	4E-07	1.5E-05	mg/kg-day	1.0E-01	mg/kg-day	2E-04
			Exp. Route Total								4E-07					2E-04
							Total of Receptor Risks Across All Media				4E-05	Total of Receptor Hazards Across All Media				2E-02

Notes:
-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.3.1
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Offsite Recreator Exposure to Groundwater at C-52N
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Offsite Recreator
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Surface Water	C-52N	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-04	mg/L	1.2E-07	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	9E-09	9.9E-07	mg/kg-day	1.0E-01	mg/kg-day	1E-05
			Exp. Route Total								9E-09					1E-05
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-04	mg/L	2.1E-09	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	2E-10	9.2E-09	mg/kg-day	1.0E-01	mg/kg-day	9E-08
			Exp. Route Total								2E-10					9E-08
							Total of Receptor Risks Across All Media				9E-09	Total of Receptor Hazards Across All Media				1E-05

Notes:
-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.3.2
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Offsite Recreator Exposure to Groundwater at C-62
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Offsite Recreator
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Surface Water	C-62	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-02	mg/L	1.2E-05	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	9E-07	9.9E-05	mg/kg-day	1.0E-01	mg/kg-day	1E-03
			Exp. Route Total								9E-07					1E-03
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-02	mg/L	2.1E-07	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	2E-08	9.2E-07	mg/kg-day	1.0E-01	mg/kg-day	9E-06
			Exp. Route Total								2E-08					9E-06
							Total of Receptor Risks Across All Media				9E-07	Total of Receptor Hazards Across All Media				1E-03

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.4.1
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Offsite Resident Exposure to Surface Water at C-52N
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Hypothetical Offsite Resident
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Tapwater	C-52N	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-04	mg/L	1.9E-06	mg/kg-day	8.0E-02	(mg/kg-day)$^{-1}$	2E-07	7.5E-06	mg/kg-day	1.0E-01	mg/kg-day	7E-05
			Exp. Route Total								2E-07					7E-05
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-04	mg/L	1.6E-08	mg/kg-day	8.0E-02	(mg/kg-day)$^{-1}$	1E-09	5.7E-08	mg/kg-day	1.0E-01	mg/kg-day	6E-07
			Exp. Route Total								1E-09					6E-07
							Total of Receptor Risks Across All Media				2E-07	Total of Receptor Hazards Across All Media				8E-05

Notes:
-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
(mg/kg-day)$^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.4.2
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Offsite Resident Exposure to Surface Water at C-62
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Hypothetical Offsite Resident
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Tapwater	C-62	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-02	mg/L	1.9E-04	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	2E-05	7.5E-04	mg/kg-day	1.0E-01	mg/kg-day	7E-03
			Exp. Route Total								2E-05					7E-03
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-02	mg/L	1.6E-06	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	1E-07	5.7E-06	mg/kg-day	1.0E-01	mg/kg-day	6E-05
			Exp. Route Total								1E-07					6E-05
							Total of Receptor Risks Across All Media				2E-05	Total of Receptor Hazards Across All Media				8E-03

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 8
Summary of Groundwater Data and Modeled Concentrations at Points of Discharge
Human Health Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Exposure Point	CASRN	Chemical	Units	Maximum Concentration	95 Upper Confidence Limit	Modeled Concentration at Point of Discharge into Surface Water (1)	Alternate Concentration Limit (2)	Surface Water Cleanup Target Level (3)
C-52 North	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	µg/L	ND	NA	NA	580	1300
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	µg/L	1.5	1.45	0.15	0.32	180
C-62	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	µg/L	59	41.6	NA	430	1300
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	µg/L	72	40.7	15	0.31	180

Notes:

(1) Most conservative modeled concentration at point of discharge location
C-52N: Bay Head Branch Creek
C-62: Blount Mill Creek
(2) Most conservative (lowest) ACL calculated for each range
(3) Surface Water Cleanup Target Level (SWCTL) from Florida DEP

CASRN = Chemical Abstract Services Registry Number.
µg/L = microgram(s) per liter.
NA = not available.
ND = not detected.

ATTACHMENTS

Attachment 1

ProUCL Output

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

ARCADIS Design & Consultancy for natural and built assets

Constituent	UCL Units	Distribution for UCL Selection	Total Sample Size	% ND	FOD%	SDp of ln Detected - Skewness (p)	Gamma K star (bias corrected)	Selected UCL Method
HMX	µg/L	insufficient data	5	--	0%	NA	NA	insufficient data
RDX	µg/L	Nonparametric	5	20%	80%	0.340347984	2.399	95% KM (t) UCL

Notes:
When the RPD is <5% of multiple suggested/potential UCLs provided by ProUCL, the maximum value is shown in Column J
When the RPD is >5% of multiple suggested/potential UCLs provided by ProUCL, review of those UCLs is recommended.
FOD - frequency of detection
ND - non-detect
mg/kg - miligrams per kilogram
µg/kg - micrograms per kilogram
RPD = Relative Percent Difference = (MaxUCL - MinUCL) / ((MaxUCL + MinUCL) * 0.5)
UCL - upper confidence limit

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

Constituent	UCL Units	Sel UCL Value	# Detects	# NDs	Num Distinct Observations	Num Distinct Detects	Minimum Detected	Maximum Detected
HMX	µg/L	**NA**	0	5	5	0	--	--
RDX	µg/L	**1.447**	4	1	5	4	0.72	1.5

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

Constituent	UCL Units	Mean Detected	SD of ln Detected - Skewness	KM Mean	KM SD	Minimum ND	Maximum ND	GOF Test Result
HMX	µg/L	--	NA	NA	NA	NA	NA	NA
RDX	µg/L	1.093	0.393	0.908	0.489	0.17	0.17	Detected Data appear Normal Distributed at 5% Significance Level

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

ARCADIS Design & Consultancy for natural and built assets

Constituent	UCL Units	# Pot. UCLs	Potential UCL(s) to Use	Pot UCL Val	UCL Flags - See Notes
HMX	µg/L	NA	NA	NA	NA
RDX	µg/L	1	95% KM (t) UCL	1.447	

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

Constituent	UCL Units	Warning
HMX	µg/L	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
RDX	µg/L	

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

ARCADIS Design & Consultancy for natural and built assets

Constituent	UCL Units	Selected 95% UCL to Use	Selected 95% UCL Method	Min Suggested UCL	Min Suggested UCL Method	Version
HMX	µg/L					ProUCL version 5.1
RDX	µg/L	1.447	95% KM (t) UCL	1.447	95% KM (t) UCL	ProUCL version 5.1

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Distribution for UCL Selection	Total Sample Size	% ND	FOD%	SDp of ln Detected - Skewness (p)	Gamma K star (bias corrected)	Selected UCL Method
HMX	µg/L	Normal	10	0%	100%	0.292194456	8.089	95% Student's-t UCL
RDX	µg/L	Gamma	10	0%	100%	0.458214033	3.129	95% Adjusted Gamma UCL

Notes:
When the RPD is <5% of multiple suggested/potential UCLs provided by ProUCL, the maximum value is shown in Column J
When the RPD is >5% of multiple suggested/potential UCLs provided by ProUCL, review of those UCLs is recommended.
FOD - frequency of detection
ND - non-detect
mg/kg - miligrams per kilogram
µg/kg - micrograms per kilogram
RPD = Relative Percent Difference = (MaxUCL - MinUCL) / ((MaxUCL + MinUCL) * 0.5)
UCL - upper confidence limit

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

ARCADIS Design & Consultancy for natural and built assets

Constituent	UCL Units	Sel UCL Value	# Detects	# NDs	Num Distinct Observations	Num Distinct Detects	Minimum Detected	Maximum Detected
HMX	µg/L	**41.56**	10	0	10	10	22.6	59
RDX	µg/L	**40.69**	10	0	9	9	13.2	72

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Mean Detected	SD of ln Detected - Skewness	KM Mean	KM SD	Minimum ND	Maximum ND	GOF Test Result
HMX	µg/L	34.94	0.308	NA	NA	NA	NA	Data appear to follow a Discernible Distribution at 5% Significance Level
RDX	µg/L	27.86	0.483	NA	NA	NA	NA	Data appear to follow a Discernible Distribution at 5% Significance Level

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

ARCADIS Design & Consultancy for natural and built assets

Constituent	UCL Units	# Pot. UCLs	Potential UCL(s) to Use	Pot UCL Val	UCL Flags - See Notes	Warning
HMX	µg/L	1	95% Student's-t UCL	41.56		
RDX	µg/L	1	95% Adjusted Gamma UCL	40.69		

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Selected 95% UCL to Use	Selected 95% UCL Method	Min Suggested UCL	Min Suggested UCL Method	Version
HMX	µg/L	41.56	95% Student's-t UCL	41.56	95% Student's-t UCL	ProUCL version 5.1
RDX	µg/L	40.69	95% Adjusted Gamma UCL	40.69	95% Adjusted Gamma UCL	ProUCL version 5.1

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Distribution for UCL Selection	Total Sample Size	% ND	FOD%	SDp of ln Detected - Skewness (p)	Gamma K star (bias corrected)	Selected UCL Method
HMX	µg/L	Normal	5	0%	100%	0.341671187	3.726	95% Student's-t UCL
RDX	µg/L	Normal	5	0%	100%	0.626099034	1.129	95% Student's-t UCL

Notes:
When the RPD is <5% of multiple suggested/potential UCLs provided by ProUCL, the maximum value is shown in Column J
When the RPD is >5% of multiple suggested/potential UCLs provided by ProUCL, review of those UCLs is recommended.
FOD - frequency of detection
ND - non-detect
mg/kg - miligrams per kilogram
µg/kg - micrograms per kilogram
RPD = Relative Percent Difference = (MaxUCL - MinUCL) / ((MaxUCL + MinUCL) * 0.5)
UCL - upper confidence limit

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Sel UCL Value	# Detects	# NDs	Num Distinct Observations	Num Distinct Detects	Minimum Detected	Maximum Detected
HMX	µg/L	**53.12**	5	0	5	5	23	59
RDX	µg/L	**53.95**	5	0	5	5	13.2	72

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Mean Detected	SD of ln Detected - Skewness	KM Mean	KM SD	Minimum ND	Maximum ND	GOF Test Result
HMX	µg/L	39.36	0.382	NA	NA	NA	NA	Data appear to follow a Discernible Distribution at 5% Significance Level
RDX	µg/L	30.66	0.7	NA	NA	NA	NA	Data appear to follow a Discernible Distribution at 5% Significance Level

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	# Pot. UCLs	Potential UCL(s) to Use	Pot UCL Val	UCL Flags - See Notes	Warning
HMX	µg/L	1	95% Student's-t UCL	53.12		
RDX	µg/L	1	95% Student's-t UCL	53.95		

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

ARCADIS Design & Consultancy for natural and built assets

Constituent	UCL Units	Selected 95% UCL to Use	Selected 95% UCL Method	Min Suggested UCL	Min Suggested UCL Method	Version
HMX	µg/L	53.12	95% Student's-t UCL	53.12	95% Student's-t UCL	ProUCL version 5.1
RDX	µg/L	53.95	95% Student's-t UCL	53.95	95% Student's-t UCL	ProUCL version 5.1

Attachment 2

BIOSCREEN-AT Evaluation and Alternate Concentration Limits Ranges C-52N and C-62 Eglin Air Force Base, Florida

Attachment 2 – BIOSCREEN-AT Evaluation and Alternate Concentration Limits

Open Burn/Open Detonation Units
Range C-52 North and Range C-62
Eglin Air Force Base, Florida
Operational Permit No. 006176-HO-007

Prepared For:
Eglin Air Force Base
96 CEG/CEIEC
700 Range Road, Building 592
Eglin Air Force Base, Florida 32542

Prepared by:
LRS Federal, LLC
8221 Ritchie Highway, Suite 300
Pasadena, Maryland 21122
(410) 544-3570

Prepared Under Contract to:
Air Force Civil Engineer Center
Contract Number: FA8903-15-F-0006

February 2019

This page intentionally left blank.

TABLE OF CONTENTS

FIGURES

TABLES

ATTACHMENTS

LRS Federal LLC (LRS) conducted this Draft BIOSCREEN-AT evaluation of the hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) concentrations and alternate concentration limit (ACL) calculations for RDX and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) in groundwater at the C-52 North (C-52N) and C-62 ranges on the Eglin Air Force Base (AFB) in Florida (the Site). This memorandum summarizes Arcadis' review of the previous BIOSCREEN modeling conducted by CH2M Hill (CH2M Hill 2000, 2002a, and 2002b), summarizes an updated modeling scenario, and provides ACLs for RDX and HMX in groundwater.

1.0 SITE BACKGROUND

1.1 Release and Monitoring History

The Site is located in the northwest portion of the Florida Panhandle (Figure 1), occupying a large portion of Santa Rosa, Okaloosa, and Walton counties (LRS 2018). The Site is comprised of cantonments, ranges/live-fire areas, and undeveloped landscape. Bombing ranges at the Site have been operated since 1950. Ranges C-52N and C-62 are primarily used for testing and training of air-to-land bombing, gunnery, and rocketry training exercises. Range C-52N is located on an active mission target range, whereas Range C-62 is located on a practice mission target range. C-52N is located approximately 6 miles north of Niceville, Florida and 2.5 miles east of the Okaloosa-Walton County line. Range C-62 is situated approximately 6 miles southwest of Defuniak Springs, Florida in Walton County. The C-62 range is also secondarily used as open burn/open detonation (OB/OD) units for treatment of unserviceable and/or excess serviceable munitions, items, and/or waste explosives, as permitted by the Florida Department of Environmental Protection (FDEP; Permit No. HO46-286388). Range C-52N contains a 100-foot by 200-foot area known as the Cat's Eye target, which is also used for OD activities. The southern end of Range C-62 (a 100-yard by 200-yard area) contains an OD unit and two 20-foot by 9-foot covered burn kettles for OB operations. There are no current plans to change the land use at either of these ranges (CH2M Hill 2000, 2002a, and 2002b, LRS 2018).

Two constituents of potential concern from site operations include the explosive compounds RDX and HMX. In November 1994, three groundwater monitoring wells were installed at C-52N (MW-94-52-01 through MW-94-52-03), and five wells were installed at C-62 (MW-94-62-01 through MW-94-62-05). Three rounds of quarterly baseline sampling, including soil sampling, were conducted in November and December 1994 and March and May 1995. At Range C-52N, no explosive compounds were reported above detection limits for any of the six surface or subsurface soil samples. At Range C-62, explosive compounds were not detected at 19 of 20 surface soil samples, with only a trace amount of 1,3-dinitrobenzene (0.42 milligrams per kilogram [mg/kg]) was detected at concentrations below the United States Environmental Protection Agency Region III risk-based concentration of 0.78 mg/kg in one sample. In the subsurface soil samples collected from Range C-62, only nitrobenzene was detected at 0.26 mg/kg, below the United States Environmental Protection Agency Region III risk-based concentration of 3.9 mg/kg.

Twenty-two rounds of quarterly groundwater monitoring events were performed between September 1996 and January 2002 to establish baseline groundwater conditions at the site. Groundwater samples were analyzed for explosives (including RDX and HMX), nitrate, and nitrite. In addition to these parameters, groundwater samples collected from Range C-62 were analyzed for benzene, toluene, ethylbenzene, and total xylenes. Since 2002, groundwater monitoring at Range C-52N has consisted of one upgradient background well (MW-94-52-01) and two point of compliance (POC) wells (MW-94-52-01 and MW-94-52-03). Monitoring at Range C-62 has consisted of sampling one upgradient background well (MW-94-62-01) and four POC wells (MW-94-62-02 through MW-94-62-05; LRS 2018).

1.2 Site Setting

Topography at Range C-52N varies from elevations of near 170 feet above mean sea level (ft amsl) in the north to nearly 70 ft amsl at the southern end of the Range. Range Road 200 tracks a ridge dissecting the northern portion of the site with a bearing roughly southwest/northeast. Two drainages lie on the either side of the Cat's Eye (the target area): Bay Head Branch to the west and Coon Head Branch to the east. These drainages eventually flow south into the Basin Bayou via Basin Creek. Two downgradient monitoring wells at C-52N are located south of the Cat's Eye, at elevations of approximately 100 to 120 ft amsl (Figure 2)

A large open flatland dominates the central portion of the C-62 range. Drainages in the northern and southern extremes of the range drop off in elevation from near 200 ft amsl to 100 ft amsl. Downgradient monitoring wells at C-62 are located southwest of the Cat's Eye, upgradient of the headwaters of Blount Mill Creek (Figure 3). Both bombing ranges are deforested.

1.3 Geology and Hydrogeology

The Site is situated in the Gulf Coastal Plain and is underlain by deltaic deposits of the Plioceneage Citronelle Formation (Florida Geological Survey [FGS] 2001). This formation is characterized by very fine to very coarse, poorly sorted, clean to clayey sands. Clay, silt, and gravel frequently occur as variable and discontinuous lenses. The Citronelle Formation is 20 to 50 feet thick on the eastern half of the Site where the two ranges are located (FGS 2001). The surficial aquifer in the Citronelle Formation is referred to as the 'Sand and Gravel Aquifer,' the 'Miocene-Pliocene Aquifer', or the 'Citronelle Aquifer'. Specifically, this aquifer is approximately 60 feet thick at Range C-52N and 100 feet thick at Range C-62 (FDEP 2001). The Sand and Gravel Aquifer is comprised of fine to coarse sand, clay, silt, and gravel. While the aquifer is typically unconfined above with permeable material exposed at ground surface, lenses of less permeable material including fine sand, clay, and silt create discontinuous confined zones that result in localized 'leaky confined' conditions. Groundwater flow in the Sand and Gravel Aquifer is typically controlled by topography, with flow generally trending south towards the Gulf of Mexico. Flow patterns are locally influenced by streams and rivers which dissect the aquifer and serve as potential discharge boundaries (LRS 2018).

Underlying the Citronelle Formation on the eastern side of the base is the Miocene-age Alum Bluff Group. These sediments are characterized by clays, sands, and shell beds, with variable grain size (from very fine to very coarse). The Alum Bluff Group is approximately 180 feet thick below the eastern half of the Site (FGS 2001). The Pensacola Clay, which forms part of the Alum Bluff group, has low permeability and functions as a confining unit that separates the surficial Sand and Gravel Aquifer in the Citronelle Formation from the underlying Floridian aquifer (LRS 2018).

1.3.1 Range C-52N

Three monitoring wells were installed at Range C-52N (EA Engineering 1995). The monitoring wells were triangulated around the Cat's Eye and installed in the surficial aquifer of the Citronelle Formation. MW-94-52-01 was intended to be the upgradient "background" well, and monitoring wells MW-94-52-02 and MW-94-52-03 were intended to be downgradient POC wells (installed downgradient to the south). The lithology at C-52N consists of fine- to coarse-grained moderate- to well-sorted sands with minor amounts of silt. The sands appear to be continuous across the range, with occasional discontinuous peat lenses present near the top of the water table (EA Engineering 1995). Locally at Range C-52N, the groundwater flow direction appears to flow to the south away from the Cat's Eye (Figure 2).

1.3.2 Range C-62

Five monitoring wells were installed in the surficial aquifer of the Citronelle Formation at Range C-62 (EA Engineering 1995). The monitoring wells were set to surround the OB and OD units. MW-94-62-01 was intended to be the upgradient "background" well for both the OB and OD units. Monitoring wells MW-94-62-02 and MW-94-62-03 were installed downgradient of the OB unit (to the west-southwest) and upgradient of the headwaters of Blount Mill Creek. Monitoring wells MW-94-62-04 and MW-94-62-05 were installed downgradient of the OD Unit (to the south-southwest) and upgradient of the headwaters of Blount Mill Creek. The lithology of Range C-62 consists of continuous fine- to coarse-grained moderate- to well-sorted sands with minor amounts of silt. Locally at Range C-62, the groundwater flow direction appears to flow to the west-southwest from the OB Unit, while flowing more toward the southwest from the OD Unit toward the headwater of Blount Mill Creek (Figure 3).

1.4 RDX and HMX in Groundwater

Available historical sampling results (from May 2003 through May 2018; LRS 2018b) are presented in Table 1. The results from the last four years of monitoring data (May 2014 through May 2018) are summarized below.

Range C-52N

At Range C-52N, HMX has not been detected in the groundwater samples and are below the 350 μg/L FDEP Groundwater Cleanup Target Levels (GWCTL). RDX concentrations at Range C-52N in the last four years ranged from nondetect to a maximum detected concentration of 1.5 µg/L in June 2015 at MW-94-52-01, which exceeds the FDEP GWCTL (0.3 µg/L). Concentrations of RDX in downgradient monitoring wells MW-94-52-02 and MW-94-52-03 have been nondetect below the FDEP GWCTL since May 2005, with the exception of one sampling qualified due to blank contamination (June 2016 at MW-94-52-03). The calculated 95 percent UCL (95 UCL) for RDX is 1.45 µg/L, with the arithmetic mean at 0.891 µg/L. The 95 UCL was not calculated for HMX, but the arithmetic mean was 0.0474 µg/L. Concentrations of HMX and RDX in groundwater appear to have stable to decreasing trends.

Range C-62

At Range C-62, in the past four years of monitoring data, concentrations of HMX have ranged from not detected (at MW-94-62-01) to a maximum detected HMX concentration at MW-94-62-05 of 59 µg/L in May 2018. RDX concentrations have ranged 0.19 µg/L (at MW-94-62-01 in May 2017) to a maximum detected concentration of 72 µg/L in May 2018 at MW-94-62-05. RDX concentrations have exceeded the FDEP GWCTL at MW-94-62-04 and MW-94-62-05 during each sampling event in the past four years. The calculated 95 UCL for RDX (at monitoring wells MW-94-62-02 through MW-94-62-05) is 32.3 µg/L, with the arithmetic mean at 15.6 µg/L. At MW-94-62-05 alone, the calculated 95 UCL was 0.054 µg/L. For HMX, The 95 UCL was not calculated for HMX, the calculated 95 UCL at monitoring wells MW-94-62-02 through MW-94-62-05 is 61.1 µg/L, with the arithmetic mean at 17.5 µg/L. Concentrations of HMX and RDX in groundwater appear to have potentially increasing trends at monitoring wells MW-94-62-04 and MW-94-62-05.

2.0 FATE AND TRANSPORT OF RDX

RDX is commonly deposited as discrete particles with strongly heterogeneous distributions, and soil concentrations can vary by more than an order of magnitude for samples collected less than a meter apart (USEPA 2014a; USACE 2002). Dissolution from explosives particles is often the controlling factor for fate and transport of RDX as it has a low water solubility (Furey et al. 2008; United States Environmental Protection Agency [USEPA] 2014a). Following dissolution, RDX is not strongly retained by soil and migrates in groundwater, with a low to moderate organic carbon sorption coefficient (Koc ranging from 42 to 167 liters per kilogram). Soils rich in organic carbon, clay, or iron increase sorption to soil and decrease mobility in groundwater (Furey et al. 2008; Sharma et al. 2013).

Photolysis of RDX by ultraviolet light is the primary mechanism that degrades aqueous RDX, and consequently, RDX does not persist in surface waters and sediments (USEPA 2014a). In soil and groundwater, however, photolysis is not significant. Nitroso derivatives, nitrate, nitrite, nitrogen-monoxide, ammonium, formaldehyde, formamide, and N-nitroso-methylenediamine have been identified as products of RDX photodegradation in surface water (Gorontzy et al. 1994).

Microbial biodegradation (i.e., mineralization) and transformation to organic derivatives are the primary attenuation processes for RDX in groundwater under typical subsurface conditions (Nishino et al. 2000). In laboratory experiments, RDX generally biodegrades most effectively under anaerobic conditions and mineralization is favored, yielding several nitroso and nitramine intermediates and, ultimately, hydrazines and methanol (Pennington et al. 1999; Hawari 2000). Under aerobic conditions, RDX undergoes biotransformation to mono-, di-, and tri-nitroso derivatives (hexahydro-1-nitroso-3,5- dinitro-1,3,5-triazine [MNX], hexahydro1,3-dinitroso-5-nitro-1,3,5-triazine [DNX], and hexahydro1,3,5-trinitroso-1,3,5-triazine [TNX]) (Pennington et al. 1999).

3.0 REVIEW OF PREVIOUS BIOSCREEN MODEL

In 2000 and 2002, CH2M Hill (2000, 2002a, and 2002b) used BIOSCREEN Natural Attenuation Decision Support System Version 1.4 (USEPA 1997) to estimate the potential risk posed to potential downgradient receptors from RDX in groundwater at Ranges C-52N and C-62 at the site. The input parameters for the updated BIOSCREEN-AT model is presented in Table 2A, and the previous BIOSCREEN model inputs (CH2M Hill 2002b) are summarized in Table 2b. CH2M Hill concluded that RDX would not migrate in groundwater more than 1,600 feet at Range C-52N and 2,500 feet at Range C-62 at concentrations greater than the 0.1 µg/L. (CH2M Hill 2000 and 2002a). However, as described above, recent groundwater monitoring data indicates that RDX concentrations at Ranges C-52N and C-62 have exceeded the current FDEP GWCTL and that concentrations appear to be increasing through time at Range C-62 downgradient from the OD Unit. Therefore, an updated, revised BIOSCREEN model is warranted. Arcadis, on behalf of LRS, reviewed the CH2M Hill BIOSCREEN model input parameters, assumptions and output and offers the following observations:

- BIOSCREEN Version 1.4 was updated in 2006 (BIOSCREEN Natural Attenuation Decision Support System AT Version 1.45 [BIOSCREEN-AT]) and offers a more exact solution (S.S. Papadopoulos, Inc. 2006). CH2M Hill's use of an earlier version of BIOSCREEN is expected to include a slightly higher degree of numerical error, but, may not be significant.
- CH2M Hill prepared three, independent, BIOSCREEN models to simulate the RDX concentrations: one for Range C-52N and two for Range C-62 (modeling the OB and OD unit plumes). The results from the two BIOSCREEN models at Range C-62 were then superimposed on each other.
- It is unclear how source area input parameters were derived. Available soil data (EA Engineering 1995) did not find RDX or HMX concentrations above the method detection limits, and cross-gradient groundwater data (to help delineate plume dimensions) are limited. CH2M Hill used the maximum detected concentration at the groundwater monitoring wells (through the 16th quarterly monitoring event) to estimate a source concentrations and estimated source widths from isopleth maps (which could not be independently verified). RDX concentrations have increased downgradient from the Range C-62 OD Unit. Since these models were constructed using lower HMX and RDX concentrations and concentrations appear to be increasing at Range C-62 and decreasing at range C-52N, a revised BIOSCREEN model is advisable.

4.0 UPDATED BIOSCREEN-AT MODEL

The most recent groundwater data that were available (from 2003 through 2018) at Ranges C-52N and C-62 were evaluated for an updated BIOSCREEN model using the BIOSCREEN-AT tool, Version 1.45 (S.S. Papadopoulos, Inc. 2014). RDX was the only constituent selected for a BIOSCREEN model, since HMX concentrations have not exceeded the FDEP GWCTL.

BIOSCREEN-AT assumes RDX concentrations in all wells (targets) downgradient from the source area are zero at time zero. Typically, historical and/or current analytical data from soil borings or groundwater monitoring wells in the center of the source area would be used to define the source area. However, at Ranges C-52N an C-62, RDX was not detected in the historical soil samples (EA Engineering 1995), and the existing monitoring wells with the highest RDX concentrations are installed either upgradient or downgradient of the source areas. Thus, the potential source area concentrations could not be defined for the ranges. Thus, the typical modeling approach of entering source area data and calibrating the model using downgradient monitoring well data could not be used. Instead, the updated BIOSCREEN-AT model established source concentrations as follows:

- Range C-52N – the source concentration was established at upgradient monitoring well MW-94-52-01, where the maximum RDX concentration was detected. The plume was then modeled downgradient to MW-94-52-02 to the potential confluence of the groundwater flow path with surface water in Bay Head Branch.
- Range C-62 – Given the two source areas at Range C-62 (i.e., the OB and OD units) have slightly different groundwater flow directions, two BIOSCREEN-AT models were developed for Range C-62: one for the OB unit and one for the OD unit. The source concentrations were established at the downgradient monitoring wells for the OB unit (at MW-94-62-03) and the OD Unit (at MW-94-62-05), where the maximum RDX concentrations were detected for each source area. The plume was then modeled downgradient from those monitoring wells to two potential receptors: the intersection of the groundwater flow path from OB or OD units with the headwaters of Blount Mill Creek (to assess potential impacts to surface water receptors) and approximately 5,000 feet downgradient from the OD Unit (to assess potential impacts to groundwater receptors).

This approach will provide a reasonable and conservative assessment of the likelihood of RDX to migrate to potential receptors under current conditions at the Site. However, using this approach, the BIOSCREEN-AT model will need to be periodically re-evaluated through time as new site data become available, particularly if RDX or HMX concentrations continue to display increasing trends. The input parameters for these BIOSCREEN-AT models are presented in Table 2A and described below. The previous input parameters for the 2002 BIOSCREEN evaluation (CH2M Hill 2002b) are included in Table 2B.

4.1 Input Parameters

4.1.1 Hydrogeology

The seepage velocity (v_x) was calculated by the BIOSCREEN-AT model using the horizontal hydraulic conductivity, (K), the hydraulic gradient (i), and the effective porosity (n_e) using the following equation in consistent units:

$$v_x = \frac{K \cdot i}{n_e}$$

Hydraulic Conductivity

For the updated BIOSCREEN-AT model, Arcadis calculated the average hydraulic conductivity values based on the slug test data collected in August 2001 (CH2M Hill 2002b). The average hydraulic conductivity for each range was calculated using the results from both the Bouwer and Rice and Hvorselv analytical solutions for the slug tests. At Range C-52N, the average hydraulic conductivity was $1.4X10^{-2}$ cm/sec (approximately 33 feet per day [ft/day]). This is slightly higher than that previously used by the BIOSCREEN model ($8.1X10^{-3}$ cm/sec; CH2M Hill 2002b). At Range C-62, hydraulic conductivities were calculated for both the OD Unit (MW-94-62-04 and MW-94-62-05) and the OB Unit (MW-94-62-02 and MW-94-62-03) The average hydraulic conductivity at the OD Unit was $6.32X10^{-04}$ cm/sec (1.8 ft/day), and at the OB Unit the average hydraulic conductivity was $7.68X10^{-03}$ cm/sec (22 ft/day). These hydraulic conductivities are higher (i.e., more conservative) than that previously used by the BIOSCREEN model ($5.3X10^{-4}$ cm/sec; CH2M Hill 2002b).

Hydraulic Gradient

Hydraulic gradients were calculated using the May 2018 potentiometric contour maps (LRS 2018a). For Range C-52N, the calculated hydraulic gradient between MW-94-52-01 and MW-94-52-02 was 0.01 ft/ft. For Range C-62, the calculated hydraulic gradients were 0.018 ft/ft for the OB Unit and 0.017 ft/ft for the OD Unit, based on the May 2018 groundwater water elevations between MW-94-62-01 and MW-94-62-03 (for the OB Unit) and between MW-94-62-01 and MW-94-62-05 (for the OD Unit; Figure 3; LRS 2018a). These values are comparable to the hydraulic gradients used in the previous BIOSCREEN models (approximately 0.017 ft/ft).

Effective Porosity

The previous BIOSCREEN model used an n_e of 30 percent as a default value. For the updated BIOSCREEN-AT model, the n_e was estimated at 20 percent based on the correlation between soil types (poorly graded sands at the Site) and n_e according to USEPA guidance (USEPA 1989). This results in a higher v_x.

Seepage Velocity

Based on these parameters, a v_x of 538 feet per year was used for Range C-52N, and a v_x of 55.6 feet per year (OD unit) and 715 feet per year was calculated and used for Range C-62. These v_x estimate are higher than those used in the previous BIOSCREEN model (279 ft/year and 23 ft/year, for Ranges C-52N and C-62, respectively; CH2M Hill 2002b) and thus is considered slightly more conservative (protective).

4.1.2 Dispersion

The longitudinal and transverse dispersivity values are calculated by BIOSCREEN-AT following the Xu and Eckstein (1995) and the Gelhar et al. (1992) relationships (USEPA 1996a), respectively, based on an approximated plume length. For Range C-52N, Arcadis estimated the plume length to be 2,650 feet, based on the distance from MW-94-52-01 to Bay Head Branch along the groundwater flow path. This results in longitudinal and transverse dispersivities of 35.8 feet and 3.58 feet, respectively. At Range C-62, Arcadis modeled the plume lengths for the OB and OD Units as the distances between the downgradient monitoring wells (MW-94-62-03 and MW-94-62-05, respectively) and the headwaters of the Blount Mill Creek (Figure 3). For the OD unit, the estimated plume length was approximately 500 feet, resulting in longitudinal and transverse dispersivities of 17.9 and 1.9 feet, respectively. For the OB Unit, the estimated plume length was 170 feet, resulting in longitudinal and transverse dispersivities of 10.0 and 1.0 feet, respectively.

Vertical dispersivities were estimated using the relationship in American Society of Testing and Materials (ASTM; 1995), where the vertical dispersivity is equal to 5 percent of the longitudinal dispersivity. This results in a vertical dispersivity of 1.79 feet for Range C-52N, and 0.90 ft and 0.50 feet for the OD and OB Units, respectively, at Range C-62.

4.1.3 Adsorption and Chemical Retardation

The BIOSCREEN-AT model uses the soil bulk density (ρ_b), total porosity (n), partitioning coefficient (K_{oc}), and fraction of organic carbon (f_{oc}) to determine the retardation factor (r_f):

$$r_f = 1 + \frac{\rho_b K_{oc} f_{oc}}{n}$$

The ρ_b was estimated to be 1.5 kg/L and the f_{oc} was estimated to be 0.002 grams per gram based on USEPA's Soil Screening Guidance default values for potential migration to groundwater assessments (USEPA 1996b). Total porosity was estimated at 35 percent based on literature values for sand (Freeze and Cherry 1979). The K_{oc} was determined using the USEPA chemical-specific parameters table for regional screening level assessments (USEPA 2018). For RDX, the K_{oc} is estimated to be 89.07 L/kg. Using the same n_e as before, this results in an estimated r_f value of 1.76 for the BIOSCREEN-AT models at both ranges. The retardation factor used is potentially biased low based on more recent studies that indicate the soil-water partitioning coefficient

(K_d=K_{oc}·f_{oc}) used is on the lower range of observed values. Recent literature values indicate the K_d is 0.37 and 1.5 (Yammamoto et al. 2004) for sorption and desorption processes, which would result in an r_f between 2.0 to 5.3.

4.1.4 Biodegradation and Natural Attenuation Half-Life *($t_{1/2}$)*

BIOSCREEN-AT calculates a first order decay coefficient based on a user-supplied solute half-life. The half-lives of RDX in groundwater is a highly uncertain input, but the value is expected to be relatively high. RDX does not readily degrade in aerobic systems (Speitel et al. 2001 and Hawari 2000), and groundwater monitoring data from the Site indicate that the shallow aquifer system is aerobic (LRS 2018a). Half-lives of RDX on the order of years to over a hundred years have been reported in the literature for aerobic systems (Speitel et al. 2001 and Ronen et al. 2008). However, some *in-situ* studies have shown that the half-life of RDX can range between four and 13 years under aerobic conditions in shallow (less than 15 meters) portions of the aquifer (Bernstein et al. 2010).

The previous BIOSCREEN model estimated the first order decay coefficient during model calibration at 60 to 75 years (CH2M Hill 2000, 2002a, 2002b). However, site-specific estimates of constituent half-lives are preferable to estimates made through model calibration. To estimate the half-life of RDX using site-specific data, linear regression was performed on the analytical data from monitoring wells at the C-52N Site where source area concentrations appear to be more stable and/or declining. Monitoring wells at Range C-62 could not be utilized for this evaluation because they display increasing RDX concentrations through time. However, monitoring well MW-94-52-01 at Range C-52N display decreasing RDX concentrations through time. Monitoring wells MW-94-52-02 and MW-994-52-03 were not selected for linear regression analysis because of the high percentage of nondects. Linear regression was performed using the RDX concentrations observed from May 2003 to May 2018 at monitoring well MW-94-52-01 at Range C-52N to estimate the attenuation half-life ($t_{1/2}$) in years for RDX on a 1st order decay rate. The linear regression analysis is provided as Attachment 1. The calculated half-life was 8 years, which corresponds to a first order decay coefficient (k) of 0.087 year^{-1} based on the following relationship:

$$k = \frac{ln(2)}{t_{\frac{1}{2}}}$$

This half-life was used in the BIOSCREEN-AT models for both range and within reasonable, expected ranges.

4.1.5 General (Modeled Domain)

Modeled area lengths for both ranges were determined based on the distances from the modeled source areas to the nearest surface water receptor. Although there is no known evidence that groundwater is discharging to surface water at the Site (CH2M Hill 2000, LRS 2018a), the surface water drainages are the closest potential receptors to the source areas, and thus provided a conservative estimate of groundwater concentrations at potential receptors.

Range C-52N

The modeled area length was 3,000 feet ensure the modeled plume would be captured along the centerline extending from monitoring wells MW-94-52-01 and MW-94-52-02 to the intersection with the Bay Head Branch (Figure 2). Modeled area widths were set to 1,500 feet, slightly longer than the modeled source area width (described below). However, this value is arbitrary and has no significant effect on the results, as only the centerline concentration was used in this evaluation. The simulation time was set to 100 years to model steady-state conditions.

Range C-62

Modeled area lengths of 600 feet for the ODU and 200 feet for the OBU were used to ensure the modeled plume would be captured along the centerline extending from monitoring wells MW-94-62-05 and MW-94-62-03, respectively, to their intersection with the headwaters of Blount Mill Creek (Figure 3). Modeled area widths were set equal to the modeled area lengths for these scenarios. However, this value is arbitrary and has no effect on the results, as only the centerline concentration was used in this evaluation. The simulation time was set to 100 years to model steady-state conditions.

Two additional model runs were conducted for the OB and OD units where the modeled area length was set to 5,000 feet to simulate the potential for RDX to migrate to potential receptor wells (currently located approximately 3.6 and 4.4 miles potentially downgradient from the Site). The simulation time for these models was set to 500 years to simulate steady-state conditions.

4.1.6 Source Data

Source Thickness in Saturated Zone and Width

The source zone thickness at Range C-52N was set to 30 feet, and the source zone thickness at Range C-62 was set to 75 feet, based on the FDEP Comments (FDEP 2001) and revisions to the previous BIOSCREEN model (CH2M Hill 2002a and 2002b). The source zone widths used in the previous BIOSCREEN model could not be independently verified (1,400 feet at Range C-52 and 625 and 665 feet for both the OD and OB units at Range C-62). For Range C-52N, the revised BIOSCREEN-AT model used the same source zone width as the previous model. For Range C-62, the revised BIOSCREEN-AT model a source zone width of 300 feet and 170 feet for the OD unit and OB unit, respectively. These values were based on the visually-distinguishable widths of the OD and OB units on aerial images from May 2018 (Figure 3). However, the modeled source width has almost no impact on the results of the BIOSCREEN-AT models at this site; increasing the source width by an order of magnitude results in no change in the steady-state concentrations at the downgradient edge of the modeled area. Given the low horizontal and vertical dispersivity and the reliance on the centerline concentration output, these parameters do not have significant effects on the results.

Source Zone Concentrations

At Range C-52, the source zone concentration was set to 0.0015 mg/L, which is the maximum concentration detected at MW-84-52-01 in the past four years of monitoring. At range C-62, the source concentration at the OB unit was set to 0.0043 mg/L (the maximum detected concentration at MW-94-62-03). At the OD Unit, given the uncertainty in the source area concentrations, the models were run with two source concentrations to provide an estimated range of the expected groundwater concentrations along the plume centerline. The more conservative source concentration estimates used the maximum detected RDX concentrations at MW-94-62-05 (0.072 mg/L). A lower estimate of source area RDX concentrations was estimated using the 95 UCL at MW-94-62-05 (0.054 mg/L) in the OD Unit model.

4.2 BIOSCREEN-AT Results

The results of the BIOSCREEN-AT model are presented in Table 3 and Attachment 2 and are discussed below.

4.2.1 Range C-52N

The BIOSCREEN-AT model for Range C-52N was simulated over 100 years in 5-year time steps. The model indicates that steady-state conditions would be achieved within 15 years. The groundwater analytical results coupled with the chemical transport velocities (i.e., RDX should have reached the downgradient POC wells given the historical usage of this site) indicated that attenuation is occurring between MW-94-52-01 and the Bay Head Branch drainage. The predicted groundwater concentration at the point where the groundwater flow path potentially intersects Bay Head Branch is predicted to be 0.00015 mg/L, below the FDEP GWCTL of 0.0003 mg/L (0.3 micrograms per liter [ug/L]). The model predicts that the groundwater RDX concentration would drop below the FDEP GWCTL by 1,800 feet downgradient from MW-94-52-01.

4.2.2 Range C-62

Open Burn Unit Results

The BIOSCREEN-AT OB Unit model was simulated over 100 years in 5-year time steps. The model indicates steady-state conditions would be achieved within 5 years. The results indicate that minimal attenuation is occurring in the OB Unit plume between MW-94-62-03 and the headwaters of Blount Mill Creek. This is likely due to the short distance of the plume from MW-94-62-03 and the surface water drainage. However, the maximum predicted concentration with first order decay is 0.0041 mg/L, which is above the FDEP GWCTL (0.0003 mg/L). However, this BIOSCREEN-AT assessment is conservative because it does not take into account any potential mixing of groundwater with unimpacted surface water or potential photodegradation of RDX in surface water. When the model was simulated for 500 years with a model area length of 5,000 feet to simulate the potential impact on downgradient groundwater receptors, steady-state conditions would be achieved in less than 25 years, with a predicted maximum RDX concentration at the downgradient edge of the modeled area (with first order decay) of 0.00064 mg/L, suggesting that RDX is likely to attenuate significantly within one mile downgradient of the OB Unit, and is not expected to contribute to exceedances of the FDEP GWCTL for RDX at downgradient receptors or offsite.

Open Detonation Unit Results

The BIOSCREEN-AT OD Unit model was simulated over 100 years in 5-year time steps, using two different source concentrations (maximum detected RDX concentration and the 95 UCL). The model indicates steady-state conditions would be achieved within 45 years. The results indicate that attenuation is occurring in the OD Unit plume between MW-94-62-05 and the headwaters of Blount Mill Creek, although the predicted groundwater concentration (with first order decay) is still above the FDEP GWCTL (between 0.011 and 0.015 mg/L). However, given that the model does not account for mixing of predicted groundwater concentrations with unimpacted surface water and that RDX readily photodegrades in surface waters, it is likely that groundwater that daylights in the headwaters of Blount Mill Creek would not pose a threat to potential receptors.

When the model was simulated for 500 years with a model area length of 5,000 feet, steady-state conditions would be achieved in less than 225 years, with a predicted RDX concentrations (with first order decay) dropping below the FDEP GWCTL in less than 2,000 feet downgradient of the OD Unit. These results indicated that RDX is likely to attenuate significantly within one mile downgradient of the OD Unit, and is not expected to contribute to of the FDEP GWCTL at downgradient receptors or offsite.

4.3 Modeling Assumptions and Uncertainty

The BIOSCREEN-AT model, like any model, requires the use of some simplifying assumptions regarding subsurface conditions, flow processes, and chemical processes that result in inherent limitations and uncertainty when compared to an actual flow system. In this case, uncertainty may be related to:

- assuming that the hydraulic conductivity of the aquifer is uniform; the actual hydraulic conductivity at the site may vary especially downgradient from the monitoring well, and heterogeneities are expected
- assuming monitoring well concentrations are representative of source area concentrations
- assuming an infinite source mass that may be increasing in the case of C-62 and decreasing in the case of C-52N
- uncertainties in the calculation of the RDX half-life

The model predictions are considered reasonable but may have a high bias considering the conservative assumptions used for some parameters. Thus, actual concentrations are expected to be less than or equal to the modeled concentrations.

5.0 ALTERNATIVE CONCENTRATION LIMIT CALCULATIONS

A series of industry standard chemical transport equations were used to calculate *ACLs* for HMX and RDX in groundwater (ACL_{gw}) for point of compliance wells at each of the respective source areas as illustrated in Attachment 3 - Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors. The assessment was similar to a BIOSCREEN-AT evaluation, however, instead of predicting what concentrations will be in the future the assessment back-calculated a groundwater concentration at a monitoring well or point of compliance that will not result in a groundwater quality concentration greater than the targeted groundwater concentration at a receptor. For purposes of this assessment the receptor was the closest stream and the monitoring well was the monitoring well (point of compliance well) closest to the stream. It was also assumed the streams could be used for drinking water purposes and the Florida GWCTL was used as the target concentration at the receptor (stream). Figures 2 and 3 illustrate the monitoring well used and the distance to the stream.

The calculations accounted for chemical retardation and degradation in groundwater and were based on USEPA guidance and *Contaminant Hydrogeology*[1]. Many of the equations are also summarized in the GA EPD's Guidance: Groundwater Contaminant Fate and Transport Modeling[2]. The equations were combined in a stepwise approach as follows to estimate the ACL_{gw} for downgradient monitoring wells for each of the respective areas and chemicals:

1. **Average seepage water velocity (V_s)** in ft/day. The transport rate (velocity) of groundwater was calculated using site-specific groundwater properties K, i, and θ_e; $V_s=[K*i]\div \theta_e$). V_s was used in step 3.
2. **Soil-water partition coefficient (K_d) and chemical-specific retardation factor (r_f)** in liters per kilogram (L/kg) and dimensionless, respectively. The K_d along with soil properties (ρ_b and n) were used to calculate r_f in groundwater ($r_f=1+K_d[\rho_b\div n]$).
3. **Chemical-specific transport rate in groundwater (v_c) and the time to reach the receptor (t_x)** in ft/day and days, respectively. The r_f (from step 2) in conjunction with the v_s (from step 1) were used to calculate the chemical transport velocity in groundwater ($v_c=v_s\div r_f$). Then, the time (in days) to reach the receptor was calculated using the distance (feet) from the monitoring well to the receptor and the v_c ($t_x=d_x\div v_c$).
4. **Chemical degradation rate constant (k) and allowable initial groundwater concentration ($C_{0\text{-}gw}$ or ACL_{gw})** in days^{-1} and micrograms per liter (ug/L), respectively. The respective chemical half-life (λ) from the BIOSCREEN-AT model, the resulting degradation constant (k), the target groundwater concentration (C) equal to the respective

[1] Fetter, C.W. 1999. Contaminant Hydrogeology. Second Edition. Waveland Press, Inc. Long Grove, IL.

[2] GA EPD. 2016. Guidance: Groundwater Contaminant Fate and Transport Modeling, Revision 1. October.

Florida GWCTL, and the time to reach the receptor (t_x) were used to estimate the initial chemical concentration at the monitoring well needed to equal C downgradient at the receptor ($C_{0\text{-}gw}=ACL_{gw}=C \div e^{\wedge}[k \cdot t_x]$).

The equations, inputs, calculations, and assumptions are included in Attachment 3 and follow the four primary steps outlined above. The ACL_{gw} results for each chemical and area are summarized in Table 4.

The equation inputs and parameters were based on site-specific data, default USEPA values, or on literature values that were considered representative of the site conditions (soil type, etc.). The assumptions used in simulating fate and transport of target analytes are detailed in Attachment 3 and the primary assumptions are summarized below:

- Infinite soil source mass*
- V_s was based on site-specific i and the average K for respective source areas[3]
- foc of 0.002* for K_{oc} based on USEPA default values[4,5]
- Groundwater transport calculations do not include dispersion, diffusion, or volatile losses*
- Chemical degradation rate (first order decay)* in groundwater based on literature values and site-specific rates as estimated in the Biodegradation and Natural Attenuation Half-Life ($t_{1/2}$) Section.
- Calculations estimate a centerline, peak concentration*. Thus, the average groundwater discharge concentration (and equivalent mass flux) would be lower than estimated herein.
- Mixing and degradation in the creeks* were not assessed but would significantly dilute and degrade the discharge concentration.

Assumptions with an asterisk (*) are considered conservative (i.e., more protective of human health and the environment).

Site-specific groundwater concentrations at the downgradient monitoring wells at the C-52N area as well as environmental studies indicate that RDX and HMX will attenuate in groundwater and that relative attenuation rates are greater (faster) than estimated since those concentrations have decreased and been less than the laboratory reporting limit for 8 years (see Updated BIOSCREEN-AT Model discussion).

The groundwater flow advection equations are linear in nature with the exception of the degradation equation ($C_{0\text{-}gw}$) which is exponential. Therefore, the parameters generally will have

---

[3] LRS. 2018. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational Permit No. 006176-H)-007. July.

[4] USEPA 1996b. Soil Screening Guidance: User's Guide. Second Edition. July.

[5] USEPA, 2018. Chemical Specific Parameters Table, May 2018: https://www.epa.gov/risk/regionalscreening-levels-rsls-generic-tables. Accessed December 2018.

an exponential effect on the ACL_{gw}. However, given the conservative approach, the predictions likely underestimate the ACL_{gw} concentration.

6.0 CONCLUSIONS

CH2M Hill's BIOSCREEN (2000, 2002a, 2002b) and Arcadis's BIOSCREEN-AT model indicate that the RDX is attenuating and that RDX will not migrate off-site or reach groundwater receptors above the FDEP GWCTL. However, some of the groundwater could daylight in the headwaters of Blount Mill Creek downgradient of the OD Unit at C-62 at concentrations above the FDEP GWCTL of 0.0003 mg/L (0.3 micrograms per liter) but below the FDEP surface water cleanup target levels of 0.180 mg/L (180 ug/L). However, mixing with surface water and photodegradation of RDX are anticipated to mitigate any potential impacts to surface water over the FDEP GWCTL a short distance downstream from this source area. Given the potentially increasing RDX concentration trends in C-62 groundwater, continued groundwater monitoring of this area is recommended. If concentrations increase significantly, an update to the BIOSCREEN-AT model or equivalent may be appropriate.

7.0 REFERENCES

Bernstein, Anat, Eilon Adar, Zeev Ronen, Harald Lowag, Willibald Stichler, and Rainer U. Meckenstock. 2010. Quantifying RDX biodegradation in groundwater using $\delta^{15}N$ isotope analysis. Journal of Contaminant Hydrology. 111:25-35.

CH2M Hill. 2000. Aquifer Quality Evaluation and Fate and Transport Models for OB/OD Units, Ranges C-52N and C-62, Egling AFB. Technical Memorandum. August 7.

CH2M Hill. 2002a. Eglin AFB Response to FDEP 1Feb01 comment letter on the Aquifer Quality Evaluation and Fate and Transport Models for OB/OD Units. March 11.

CH2M Hill, 2002b. Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.

EA Engineering, Science and Technology. 1995. Data Summary Report For Ranges C-52N and C-62, Open Burn/Open Detonation (OB/OD) Units, Eglin Air Force Base, Florida. March

FDEP, 2001. Review of the Technical Memorandum: Aquifer Quality Evaluation and Fate Transport Models for OB/OD Units, Ranges C-52N and C-62, Eglin AFB, August

FGS. 2001. Open File Report No. 80, Text to Accompany the Geologic Map of Florida.

Freeze, R. Allen and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., Upper Saddle River, NJ. 604p.

Furey, J.S., Frederickson, H.L., Richmond, M, J., Michael, M. 2008. Effective elution of RDX and TNT from particles of Comp B in surface soil. Chemosphere, 70(7): 1175-1181.

Gorontzy, T., Drzyzga, O., Kahl, M.W., Bruns-Nagel, D., Breitung, J., von Loew, E., and

Blotevogel, K.H., 1994. Microbial Degradation of Explosives and Related Compounds. Critical Reviews in Microbiology, 20(4): 265-284.

Hawari, J. 2000. Biodegradation of RDX and HMX: From Basic Research to Field Application.

In Biodegradation of Nitroaromatic Compounds and Explosives, edited by J.C. Spain, J.B. Hughes, and H. Knackmuss.

LRS. 2018a. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational Permit No. 006176-H)-007. July.

Nishino, S.F., J.C. Spain, and Z. He, 2000. Strategies for Aerobic Degradation of Nitroaromatic Compounds by Bacteria: Process Discovery to Field Application. In Biodegradation of Nitroaromatic Compounds and Explosives, edited by J.C. Spain, J.B. Hughes, and H. Knackmuss.

Pennington, J.C., R. Bowen, Brannon, J.M., Zakikhani, J., Harrelson, D.W., Gunnison, D., Mahannah, J., Clarke, J., Jenkins, T.F., and S. Gnewuch. 1999. Draft Protocol for

Evaluating, Selecting, and Implementing Monitored Natural Attenuation at Explosives-Contaminated Sites. U.S. Army Corps of Engineers, Technical Report EL-99-10.

Sharma, P., Mayes, M.A., Tang, G. 2013. Role of soil organic carbon and colloids in sorption and transport of TNT, RDX and HMX in training range soils. Chemosphere, 92(8): 993-1000.

Speitel, Jr., G. E., T. L. Engels, D. C. McKinney. 2001. Biodegradation of RDX in unsaturated soil. Bioremediation Journal 5(1): 1-11.

S.S. Papadopulos & Associates, Inc. 2014. Software. BIOSCREEN-AT Documentation, Version 1.45. March 10.

USACE, 2002, Energy Research and Development Center, 2002. Distribution and Fate of Energetics on DoD Test and Training Ranges: Interim Report 2. Pennington et al. October 2002.

USEPA. 1996a. BIOSCREEN Natural Attenuation Decision Support System User's Manual Version 1.3, August 1996.

USEPA. 1996b. Soil Screening Guidance: User's Guide. Second Edition. July.

USEPA. 1997. BIOSCREEN Version 1.4, Natural Attenuation Decision Support System, July 1997.

USEPA. 2018. Chemical Specific Parameters Table, May 2018: https://www.epa.gov/risk/regionalscreening-levels-rsls-generic-tables.

USEPA. 2014a. Office of Solid Waste and Emergency Response, 2014. Technical Fact Sheet - Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). EPA 505-F-14-008. January 2014a. https://www.epa.gov/sites/production/files/201403/documents/ffrrofactsheet_contaminant_rdx_january2014_final.pdf

USGS. 2016. Groundwater Atlas of the United States: Alabama, Florida, Georgia, and South Carolina HA 730-G, The Sand and Gravel Aquifer.

Yammamoto, H., M.C. Morely, G. E. Speitel Jr., and J. Clausen. 2004. Fate and Transport of High Explosives in a Sandy Soil: Adsorption and Desorption. Soil and Sediment Contamination. 13:361-379.

FIGURES

From Figure 1 in LRS (2018)

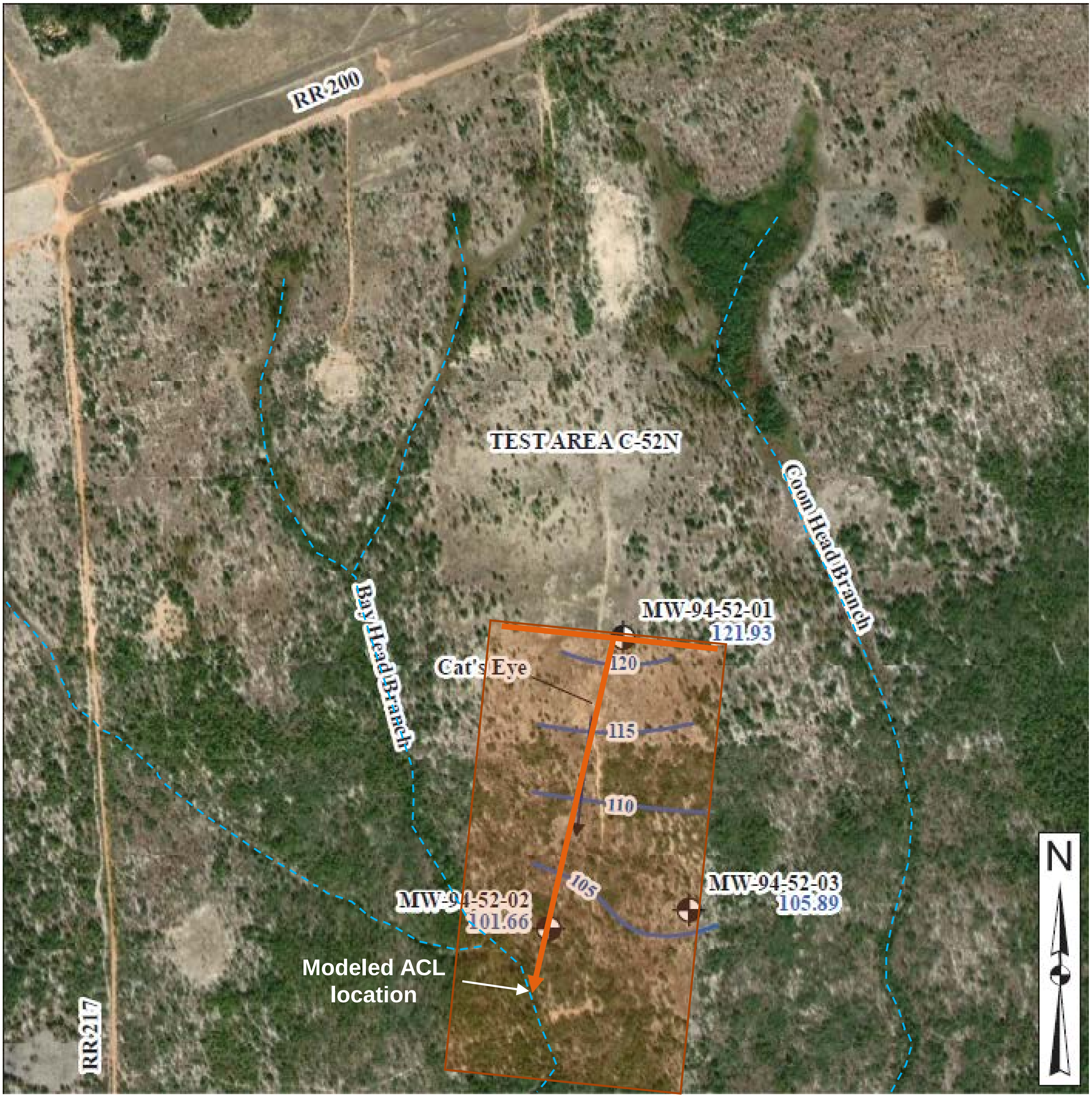
RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

12/10/2018 11:58:07 AM



From Figure 8 in LRS (2018)

0 250 500 1,000 Feet

Monitoring Well

Estimated Groundwater Flow Direction

120 Groundwater Elevation Contour (ft NGVD)

Modeled Plume Length

Modeled Domain Area

Modeled Source Width

Surface Water Drainage

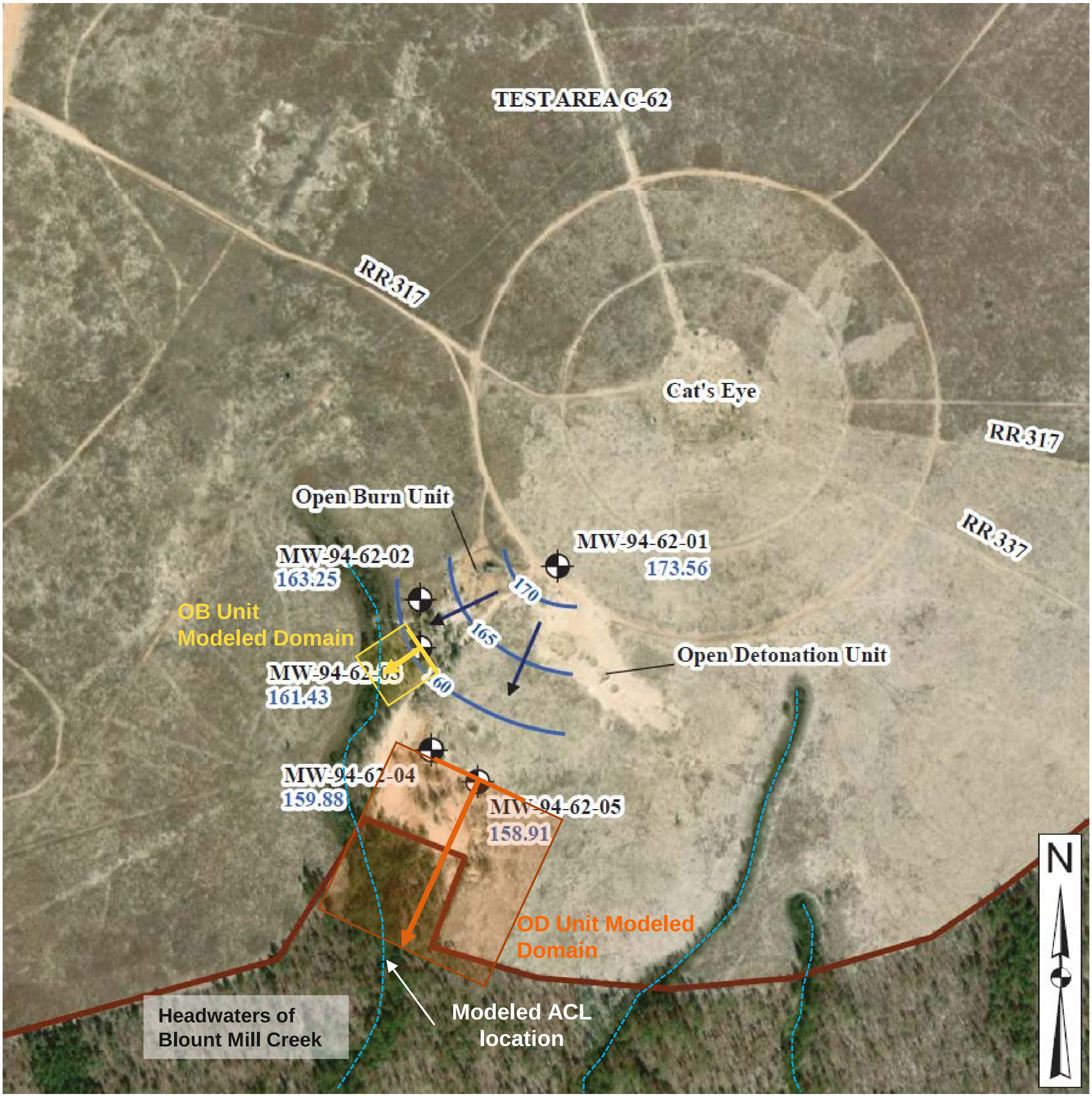
RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

RANGE C-52N
POTENTIOMETRIC CONTOUR MAP
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

12/10/2018 11:58:07 AM



From Figure 9 in LRS (2018)

0 250 500 1,000 Feet

Legend:

- Monitoring Well
- 170 Groundwater Elevation Contour (ft NGVD)
- Estimated Groundwater Flow Direction
- Surface Water Drainage
- Modeled OB Unit Plume
- Modeled OD Unit Plume
- OB Unit Modeled Domain
- OD Unit Modeled Domain
- Modeled OB Unit Source Width
- Modeled OD Unit Source Width

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

RANGE C-62
POTENTIOMETRIC CONTOUR MAP
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3

12/10/2018 11:58:07 AM

TABLES

Table 1
Historical Sampling Results - May 2003 through May 2018
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Sampling Date	Range C-52 North										Range C-52 North				
	MW-94-52-01					MW-94-52-02					MW-94-52-03				
	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD
5/23/2003	0.40		4.6		126.74	0.20	U	0.20	U	104.41	0.20	U	0.22		109.53
11/13/2003	0.33		2.1		126.24	0.20	U	0.20	U	103.96	0.21	U	0.26		109.05
5/14/2004	0.18		1.1		121.94	0.17		1.1		101.86	0.21	U	0.21	U	106.03
11/22/2004															
5/16/2005	0.27		1.8		129.98	0.20	U	0.20	U	106.31	0.21	U	0.21	U	112.32
12/2/2005	0.11	J	0.79		122.18	0.19	U	0.19	U	101.81	0.20	U	0.20	U	105.78
5/24/2006	0.06	U	0.34		118.68	0.067	U	0.083	U	100.64	0.067	U	0.084	U	104.33
11/16/2006	0.27		3.9		120.43	0.057	U	0.071	U	100.36	0.058	U	0.072	U	104.02
5/21/2007	0.057	U	0.61		118.42	0.057	U	0.071	U	99.73	0.057	U	0.071	U	103.38
6/17/2008	0.11	U	1.3		122.24	0.11	U	0.074	U	102.24	0.11	U	0.27		106.01
5/12/2009	0.19	U	1.5		123.75	0.10	U	0.071	U	102.75	0.11	U	0.073	U	107.16
6/1/2010	0.035	U	0.99		124.98	0.035	U	0.695		103.74	0.035	U	0.067	U	108.4
6/10/2011	0.036	U	0.068	U	118.79	0.035	U	0.067	U	99.83	0.035	U	0.067	U	103.5
5/18/2012	0.214	U	0.191	U	120.99	0.214	U	0.191	U	101.01	0.223	U	0.199	U	104.87
5/3/2013	0.212	U	0.189	U	123.63	0.212	U	0.189	U	103.04	0.212	U	0.189	U	112.71
6/12/2014	0.13	U	0.17	U	129.48	0.13	U	0.17	U	105.95	0.13	U	0.17	U	111.91
6/19/2015	0.078	U	1.5		122.46	0.076	U	0.076	U	101.24	0.076	U	0.076	U	105.18
6/6/2016	0.085	U	1.4		125.97	0.086	U	0.052	U	103.61	0.085	U	0.21	B	108.43
5/11/2017	0.097	U	0.75		120.94	0.087	U	0.052	U	101.39	0.088	U	0.052	U	105.35
5/12/2018	0.084	U	0.72		121.93	0.084	U	0.05	U	101.66	0.084	U	0.05	U	105.89

Notes:
GCTL for HMX = 350 µg/L
GCTL for RDX = 10 µg/L
µg/L= micrograms per liter
B = Analyte detected in the method blank
ft NGVD = feet National Geodetic Vertical Datum
GCTL = groundwater concentraiton threshold limit
GWE = groundwater elevation
I = Reported value is between lab method detection limit and the laboratory practical quantitation limit.
J = Estimated Value
Q = qualifier
U = Compound was analyzed for but not detected
Shaded = detected concentration exceeds the screening level

Table 1
Historical Sampling Results - May 2003 through May 2018
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

ARCADIS Design & Consultancy for natural and built assets

Sampling Date	Range C-62														
	MW-94-62-01					MW-94-62-02					MW-94-62-03				
	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD
5/14/2003			0.53		175.37	0.20	U	1.9		163.85	0.21	U	1.5		161.95
11/6/2003	0.21	U	0.33		174.93	0.21	U	1.8		163.62	0.21	U	1.5		161.67
5/26/2004	0.20	U	0.52		171.51	0.20	U	1.9		162.11	0.20	U	2.0		160.34
11/22/2004	0.20	U	0.18			0.087		2.3			0.20	U	2.2		
5/23/2005	0.19	U	0.87		180.17	0.20	U	2.1		165.53	0.20	U	2.6		164.29
11/21/2005	0.19	U	0.34		173.71	0.20	U	2.1		163.23	0.20	U	1.96		161.26
5/17/2006	0.075	U	0.34		170.86	0.077	U	2.4		162.36	0.079	U	2.3		160.64
11/10/2006	0.057	U	0.54	J	170.1	0.083		2.0	J	161.75	0.057	U	1.9	J	160.35
6/8/2007	0.057	U	0.6		167.15	0.057	U	2.6		159.97	0.057	U	2.3		158.52
6/20/2008	0.11	U	0.33		173.73	0.11	U	2.7		162.76	0.1	U	2.9		160.91
5/14/2009	0.10	U	0.43		175.5	0.10	U	2.3		163.77	0.11	U	2.1		162.1
5/20/2010	0.035	U	0.918		178.4	0.058	I	3.53		164.68	0.061	I	3.8		162.58
5/9/2011	0.036	U	0.068	U	171.03	0.036	U	0.067	U	161.94	0.035	U	1.63		160.18
5/1/2012	0.149	U	0.095	U	172.78	0.152	U	0.097	U	162.08	0.146	U	0.093	U	160.71
5/23/2013	0.212	U	0.189	U	173.5	0.212	U	0.189	U	162.71	0.212	U	0.189	U	161.07
5/23/2014	0.13	U	0.864	I	181.23	0.13	U	2.56		165.75	0.44	I	2.31		163.68
5/19/2015	0.075	U	0.28		175.59	0.19	U	3.4		164.01	0.19	U	4		162.1
6/6/2016	0.092	U	0.42	I	176.43	0.14	I	3.6		164.3	0.19	I	3.9		162.22
5/11/2017	0.085	U	0.19		173.52	0.11	I	3.1		163.22	0.18	I	4.3		161.36
5/12/2018	0.084	U	0.30		173.56	0.13	I	3.1		163.25	0.13	I	3.8		161.43

Notes:
GCTL for HMX = 350 µg/L
GCTL for RDX = 10 µg/L
µg/L= micrograms per liter
B = Analyte detected in the method blank
ft NGVD = feet National Geodetic Vertical Datum
GCTL = groundwater concentraiton threshold limit
GWE = groundwater elevation
I = Reported value is between lab method detection limit and the laboratory practical quantitation limit.
J = Estimated Value
Q = qualifier
U = Compound was analyzed for but not detected
Shaded = detected concentration exceeds the screening level

Table 1
Historical Sampling Results - May 2003 through May 2018
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

ARCADIS Design & Consultancy for natural and built assets

Sampling Date	Range C-62									
	MW-94-62-04					MW-94-62-05				
	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD
5/14/2003	1.4		5.1		160.71	1.8		2.8		159.81
11/6/2003	1.6		5.1		159.99	1.2		2.4		158.8
5/26/2004	1.5		4.6		158.45	1.1		3.2		157.28
11/22/2004	2.1		6.2			0.82		3.6		
5/23/2005	1.9		5.8		162.99	0.86		3.9		162.72
11/21/2005	1.8		5.4		158.99	0.77		4.7		157.73
5/17/2006	1.9		9.3		158.53	0.71		7.1		156.31
11/10/2006	2.3		12.9	J	158.38	1.2		17.5	J	157.12
6/8/2007	2.3		14		156.55	2.0		26.2		154.19
6/20/2008	2.3		16.1		159.24	4.3		30.2		158.06
5/14/2009	3.0		23.2		161.14	2.3		16.8		160.48
5/20/2010	3.07		19.6		161.35	2.38		14		160.64
5/9/2011	0.039	U	0.073	U	158.38	0.036	U	0.068	U	155.86
5/1/2012	0.151	U	0.096	U	159.17	0.149	U	0.095	U	158.1
5/23/2013	0.212	U	0.189	U	159.58	0.212	U	0.189	U	158.61
5/23/2014	22.6		17.9		163.47	23		13.2		163.34
5/19/2015	28		26.4		160.97	27.8		14.1		160.19
6/6/2016	31		26.0		161.08	41		21.0		159.42
5/11/2017	32		26.0		159.89	46		33.0		158.83
5/12/2018	39		29.0		159.88	59		72.0		158.91

Notes:

GCTL for HMX = 350 µg/L

GCTL for RDX = 10 µg/L

µg/L= micrograms per liter

B = Analyte detected in the method blank

ft NGVD = feet National Geodetic Vertical Datum

GCTL = groundwater concentraiton threshold limit

GWE = groundwater elevation

I = Reported value is between lab method detection limit and the laboratory practical quantitation limit.

J = Estimated Value

Q = qualifier

U = Compound was analyzed for but not detected

Shaded = detected concentration exceeds the screening level

Table 2A
2018 BIOSCREEN-AT Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

	2018 C-52N BIOSCREEN-AT ASSESSMENT		
Parameter	**Value**	**Units**	**Notes/ Data Sources**
Hydrogeology			
Seepage velocity	538	ft/year	Calculated by model
Effective Porosity	0.20	--	Estimated using soil types on boring logs (EPA 1989)
Hydraulic Conductivity	1.04E-02	cm/sec	Average of slug test results at MW-94-52-01 , MW-94-52-02, and MW-94-52-03 as reported in the 2002 Human Health Risk Assessment (CH2M Hill 2002b)
Hydraulic Gradient	0.010	ft/ft	May 2018 Groundwater Elevations (calculated between MW-94-52-01 and MW-94-52-02)
Dispersion			
Longitudinal dispersivity	35.8	ft	Calculated by model
Transverse dispersivity	3.58	ft	Calculated by model
Vertical transverse dispersivity	1.79	ft	Equal to 0.05 times longitudinal dispersivity (ASTM1995)
Estimated Plume Length	2650	ft	Distance from MW-94-52-01 to Bay Head Brach along May 2018 flow path
Adsorption			
Retardation Factor	1.76	--	Calculated same as model excep used total porosity (not effecitve porosity)
Soil Bulk density	1.5	kg/L	USEPA 1996a default value
Partitioning coefficient (Kd)	0.18	L/kg	Calculated (Koc*foc)
Total Porosity	0.35	--	Sands with fines. Freeze and Cherry (1979)
Soil-Water partitioning coefficient (Koc)	89.07	L/kg	May 2018 EPA Chemical Parameters Tables
Fraction Organic Carbon (foc)	0.002	g/g	Equation 10 (USEPA 1996a). Soil Screening Level Paritioning Equation for Migration to Groundwater default foc value
Biodegradation			
First-order Decay Coefficient	8.70E-02	$year^{-1}$	Calculated by model if half-life input
Solute half-life	8.00	year	Calculated using site-specific data from Range C-52N
General			
Modeled Area Length	3000	ft	
Modeled Area Width	1500	ft	
Simulation Time	100	year	Attempt to model steady-state

Table 2A
2018 BIOSCREEN-AT Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

	2018 C-52N BIOSCREEN-AT ASSESSMENT		
Parameter	**Value**	**Units**	**Notes/ Data Sources**
Source Data			
Source Thickness in Saturated Zone	30	ft	Used in previous model based on FDEP comments (FDEP 2001)
Source Half-Life	infinite	year	Based on current and planned site operations
Source Width	1400	ft	Previous modeled width (CH2M Hill 2002b)
Source Concentration - Maximum	0.0015	mg/L	Maximum concentration detected at MW-94-52-01 in the past four years of monitoring data (June 2015)
Source Concentration - 95 UCL	--	mg/L	

Notes:
ASTM = American Society for Testing and Materials
cm/sec = centimeters per second
ft = feet
ft/year = feet per year
kg = kilograms
L = liters
mg = milligrams
95 UCL = 95 percent upper confidence limit
$year^{-1}$ = per year

Table 2A
2018 BIOSCREEN-AT Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Parameter	2018 C-62 BIOSCREEN-AT ASSESSMENT					
	Open Detonation Unit Model			Open Burn Unit Model		
	Value	Units	Notes/ Data Sources	Value	Units	Notes/ Data Sources
Hydrogeology						
Seepage velocity	55.6	ft/year	Calculated by model	715	ft/year	Calculated by model
Effective Porosity	0.20	--	Estimated using soil types on boring logs (EPA 1989)	0.20	--	Estimated using soil types on boring logs (EPA 1989)
Hydraulic Conductivity	6.32E-04	cm/sec	Average of slug test results at MW-94-62-04 and MW-94-62-05 as reported in the 2002 Human Health Risk Assessment (CH2M Hill 2002b)	7.68E-03	cm/sec	Average of slug test results at MW-94-62-01, MW-94-62-02, and MW-94-62-03 as reported in the 2002 Human Health Risk Assessment (CH2M Hill 2002b)
Hydraulic Gradient	0.017	ft/ft	May 2018 Groundwater Elevations (calculated between MW-94-62-01 and MW-94-62-05)	0.018	ft/ft	May 2018 Groundwater Elevations (calculated between MW-94-62-01 and MW-94-62-03)
Dispersion						
Longitudinal dispersivity	17.9	ft	Calculated by model	10.0	ft	Calculated by model
Transverse dispersivity	1.79	ft	Calculated by model	1.00	ft	Calculated by model
Vertical transverse dispersivity	0.90	ft	Equal to 0.05 times longitudinal dispersivity (ASTM1995)	0.50	ft	Equal to 0.05 times longitudinal dispersivity (ASTM1995)
Estimated Plume Length	500	ft	Distance from MW-94-62-05 to headwaters of Blount Mill Creek along May 2018 flow path	170	ft	Distance from MW-94-62-03 to headwaters of Blount Mill Creek along May 2018 flow path
Adsorption						
Retardation Factor	1.76	--	Calculated same as model excep used total porosity (not effecitve porosity)	1.76	--	Calculated same as model excep used total porosity (not effecitve porosity)
Soil Bulk density	1.5	kg/L	USEPA 1996a default value	1.5	kg/L	USEPA 1996a default value
Partitioning coefficient (Kd)	0.18	L/kg	Calculated (Koc*foc)	0.18	L/kg	Calculated (Koc*foc)
Total Porosity	0.35	--	Sands with fines. Freeze and Cherry (1979)	0.35	--	Sands with fines. Freeze and Cherry (1979)
Soil-Water partitioning coefficient (Koc)	89.07	L/kg	May 2018 EPA Chemical Parameters Tables	89.07	L/kg	May 2018 EPA Chemical Parameters Tables
Fraction Organic Carbon (foc)	0.002	g/g	Equation 10 (USEPA 1996a). Soil Screening Level Paritioning Equation for Migration to Groundwater default foc value	0.002	g/g	Equation 10 (USEPA 1996a). Soil Screening Level Paritioning Equation for Migration to Groundwater default foc value
Biodegradation						
First-order Decay Coefficient	8.70E-02	$year^{-1}$	Calculated by model if half-life input	8.70E-02	$year^{-1}$	Calculated by model if half-life input
Solute half-life	8.00	year	Calculated using site-specific data from Range C-52N	8.00	year	Calculated using site-specific data from Range C-52N
General						
Modeled Area Length	600	ft	Plume length or slightly longer	200	ft	Plume length or slightly longer
Modeled Area Width	600	ft	No effect on centerline calcs	200	ft	No effect on centerline calcs
Simulation Time	100	year	Attempt to model steady-state	100	year	Attempt to model steady-state

Table 2A
2018 BIOSCREEN-AT Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

ARCADIS Design & Consultancy for natural and built assets

Parameter	2018 C-62 BIOSCREEN-AT ASSESSMENT					
	Open Detonation Unit Model			Open Burn Unit Model		
	Value	Units	Notes/ Data Sources	Value	Units	Notes/ Data Sources
Source Data						
Source Thickness in Saturated Zone	75	ft	Used in previous model based on FDEP comments (FDEP 2001)	75	ft	Used in previous model based on FDEP comments (FDEP 2001)
Source Half-Life	infinite	year	Based on current and planned site operations	infinite	year	Based on current and planned site operations
Source Width	300	ft	Width of Open Detonation Unit on aerial image, perpendicular to groundwater flow	170	ft	Width of Open Burn Unit on aerial image, perpendicular to groundwater flow
Source Concentration - Maximum	0.072	mg/L	Maximum concentration detected at MW-94-62-05 (May 2018)	0.0043	mg/L	Maximum concentration detected at MW-94-62-03 (May 2017)
Source Concentration - 95 UCL	0.054	mg/L	95 UCL at MW-94-62-05	--	mg/L	Not calculated since maximum detected concentration below screening level

Notes:
ASTM = American Society for Testing a
cm/sec = centimeters per second
ft = feet
ft/year = feet per year
kg = kilograms
L = liters
mg = milligrams
95 UCL = 95 percent upper confidence
$year^{-1}$ = per year

Table 2B
2002 BIOSCREEN Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Parameter	Range C-52N (2002 Human Health Risk Assessment; CH2M Hill 2002b)			Range C-62 (2002 Human Health Risk Assessment; CH2M Hill 2002b)				
				Open Detonation Unit Model		Open Burn Unit Model		
	Value	Units	Notes/ Data Sources	Value	Units	Value	Units	Notes/ Data Sources
Hydrogeology								
Seepage velocity	279	ft/year		23.0	ft/year	23.0	ft/year	Calculated by model
Effective Porosity	0.3	--		0.30	--	0.30	--	Literature Estimate
Hydraulic Conductivity	8.10E-03	cm/sec	Revised based on FDEP (2001) comments	5E-04	cm/sec	5E-04	cm/sec	Aquifer testing results
Hydraulic Gradient	0.01	ft/ft	Water Level measurements	0.013	ft/ft	0.013	ft/ft	Water Level measurements
Dispersion								
Longitudinal dispersivity	37.2	ft		24.7	ft	24.7	ft	Calculated by model
Transverse dispersivity	3.7	ft		2.5	ft	2.5	ft	Calculated by model
Vertical transverse dispersivity	0	ft		0	ft	0	ft	
Estimated Plume Length	2950	ft	Based on RDX concentrations	1020	ft	1020	ft	Based on RDX concentrations
Adsorption								
Retardation Factor	2.4	--		1.00	--	1.00	--	
Soil Bulk density	--	kg/L	Typical default	1.6	kg/L	1.6	kg/L	Typical default
Total Porosity	--	--		--	--	--	--	
Soil-Water partitioning coefficient (Koc)	--	L/kg	Selim and Iskandar 1994	0.07	L/kg	0.07	L/kg	Selim and Iskandar 1994
Fraction Organic Carbon (foc)	--	g/g		1.00E-03	g/g	1.00E-03	g/g	
Biodegradation								
First-order Decay Coefficient	1.20E-01	$year^{-1}$		1.2E-02	$year^{-1}$	1.2E-02	$year^{-1}$	
Solute half-life	6	year		60	year	60		

Table 2B
2002 BIOSCREEN Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

ARCADIS Design & Consultancy for natural and built assets

	Range C-52N (2002 Human Health Risk Assessment; CH2M Hill 2002b)			Range C-62 (2002 Human Health Risk Assessment; CH2M Hill 2002b)				
				Open Detonation Unit Model		Open Burn Unit Model		
Parameter	**Value**	**Units**	**Notes/ Data Sources**	**Value**	**Units**	**Value**	**Units**	**Notes/ Data Sources**
General								
Modeled Area Length	3100	ft		1000	ft	1000	ft	
Modeled Area Width	1500	ft		700	ft	700	ft	
Simulation Time	51	year	Site C-52N in operation since 1950	51	year	51	year	Site C62 in operation since 1950
Source Data								
Source Thickness in Saturated Zone	30	ft		75	ft	75	ft	
Source Half-Life	infinite	year		infinite	year	infinite	year	
Source Width	1400	ft		625	ft	665	ft	
Source Concentration	0.0035	mg/L	Groundwater Monitoring results	0.0028	mg/L	0.00128	mg/L	Groundwater Monitoring results

Notes:
cm/sec = centimeters per second
ft = feet
ft/year = feet per year
kg = kilograms
L = liters
mg = milligrams
year^{-1} = per year

References:
Selim, H.M and I.K. Iskandar. 1994. Sorption-desorption and transport of TNT and RDX in soils. CRREL Report 94-7. U.S. Army Corp of Engineers. May

Table 3
BIOSCREEN-AT Results
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Model	Source Concentration (mg/L)	Modeled Area Length (feet)	RDX Concentration with First-order Decay (mg/L)	Time to Reach Steady-State (years)
Range C-52 N				
OB/OD Unit	0.0015	3,000	0.000150	15
Range C-62				
OB Unit	0.0043	200	0.0041	< 5
	0.0043	5,000	0.00064	< 25
OD Unit	0.072	600	0.015	45
	0.054	600	0.011	45
	0.072	5,000	< 0.00001	225

Notes:
OB = Open Burn
OD = Open Detonation
mg/L = milligrams per liter

Table 4
Alternate Concentration Limits for Downgradient Groundwater Monitoring Wells
Ranges C-52N and C-62
Eglin Air Force Base, Florida

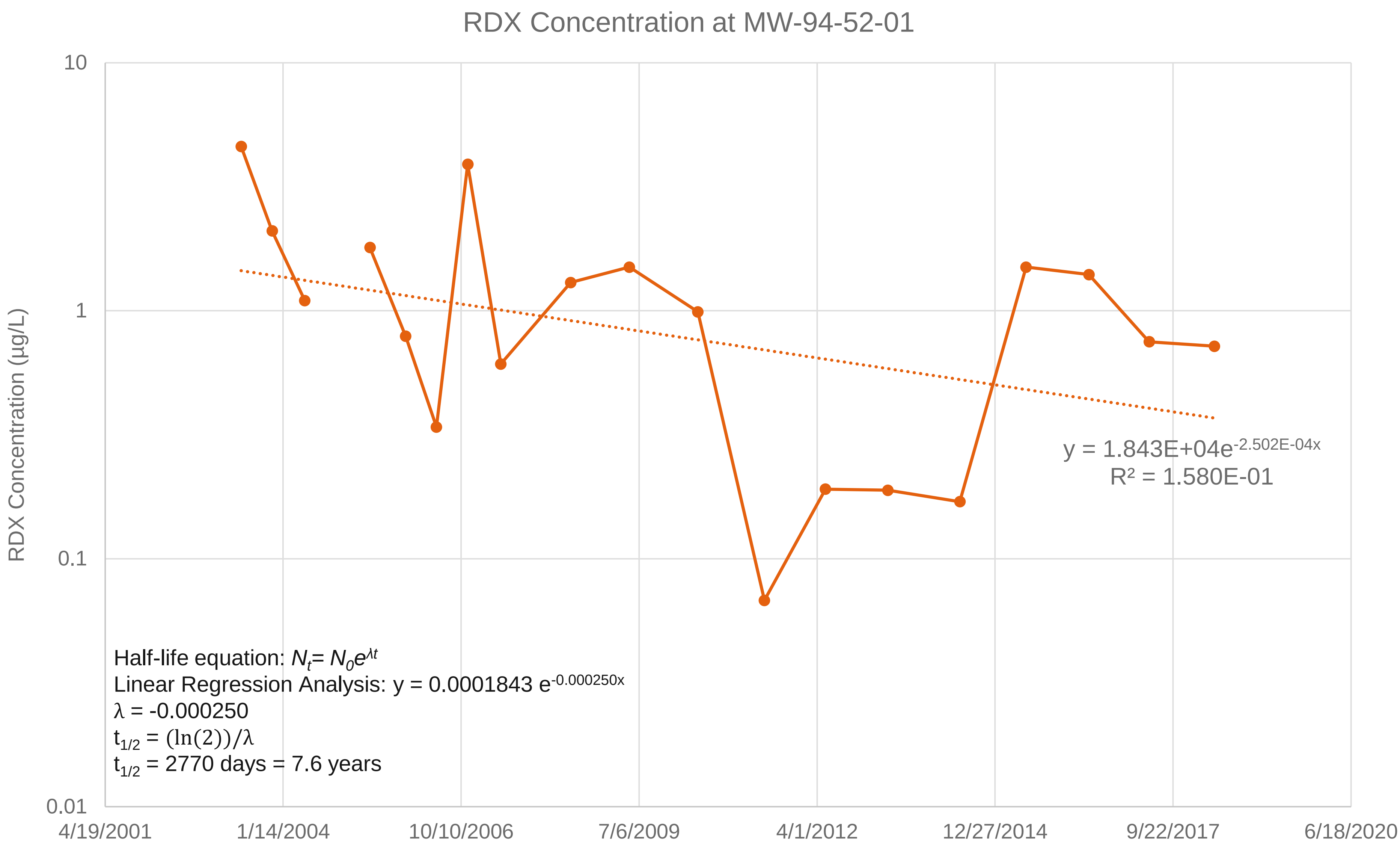
Area	Chemical	Distance to Receptor (feet)	Alternate Concentration Limit (ug/L)	Notes
Range C-52 N				
Cat's Eye	RDX	310	0.32	distance from well MW-94-C52-02 to creek
Cat's Eye	HMX	310	580	distance from well MW-94-C52-02 to creek
Range C-62 OBU				
OBU	RDX	150	0.31	distance from well MW-94-C62-03 to creek
OBU	HMX	150	430	distance from well MW-94-C62-03 to creek
Range C-62 ODU				
ODU	RDX	380	0.87	distance from well MW-94-C62-04 to creek
ODU	HMX	380	21,000	distance from well MW-94-C62-04 to creek

Notes:
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
OBU = Open Burn Unit
ODU = Open Detonation Unit
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
ug/L = micrograms per liter

ATTACHMENTS

Attachment 1

Linear Regression Analysis



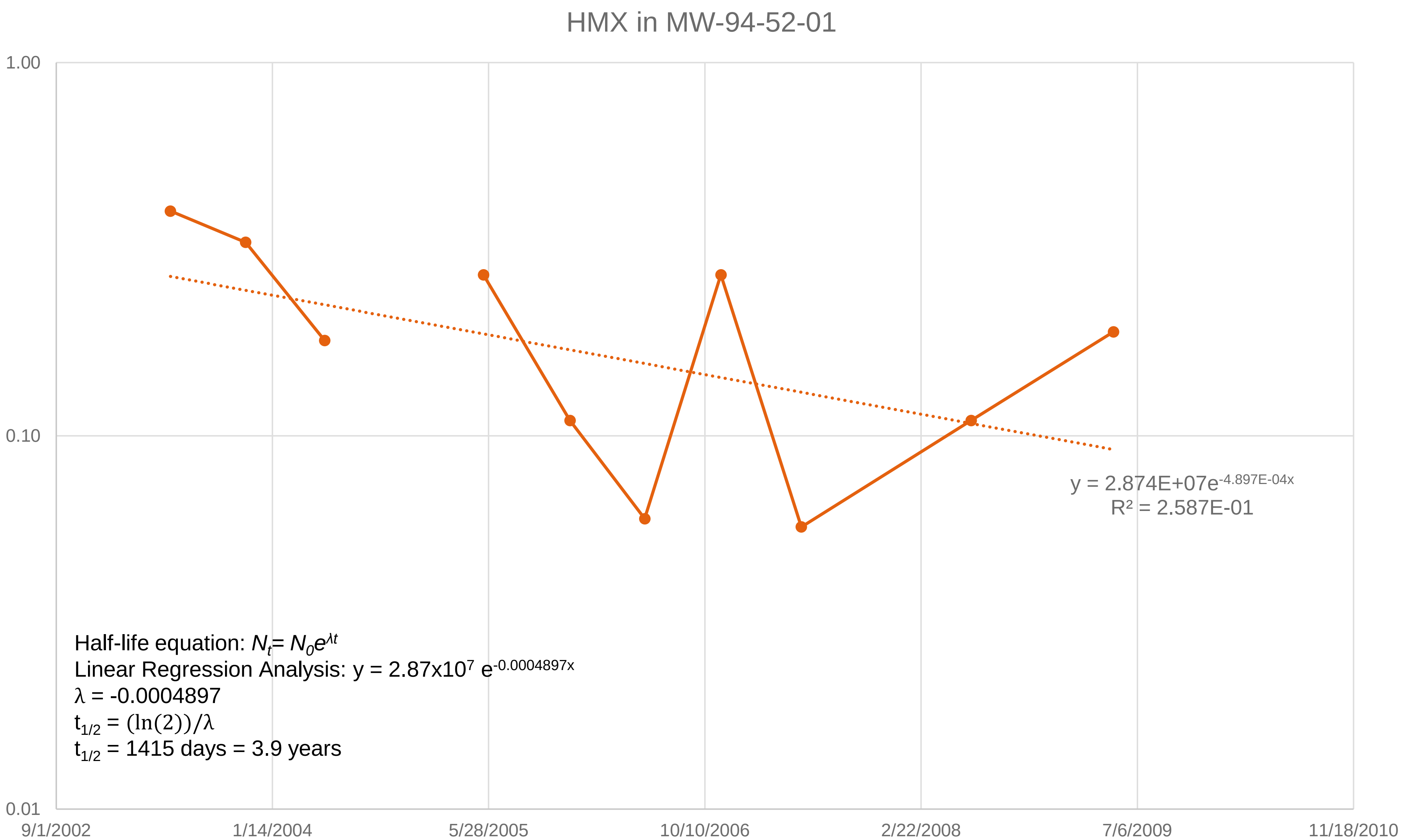
Notes:
µg/L = micrograms per liter
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

LINEAR REGRESSION ANALYSIS
MW-94-52-01

ARCADIS Design & Consultancy for natural and built assets

FIGURE
A1-1



Notes:

µg/L = micrograms per liter

HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

LINEAR REGRESSION ANALYSIS
MW-94-52-01

ARCADIS Design & Consultancy for natural and built assets

FIGURE
A1-2

Attachment 2

BIOSCREEN-AT Models

Attachment 2

BIOSCREEN-AT Models

Range C-52N

MW-94-52-01 to Bay Head Branch

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

C52 - Bay Head Branch

Data Input Instructions:

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	538	*(ft/yr)*
or		or	
Hydraulic Conductivity	*K*	1.0E-02	*(cm/sec)*
Hydraulic Gradient	*i*	0.01	*(ft/ft)*
Porosity	*n*	0.2	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	35.8	*(ft)*
Transverse Dispersivity*	*alpha y*	3.58	*(ft)*
Vertical Dispersivity*	*alpha z*	1.79	*(ft)*
or		or	
Estimated Plume Length	*Lp*	2650	*(ft)*

3. ADSORPTION

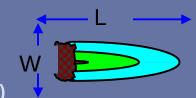
Retardation Factor*	*R*	1.76	*(-)*
or		or	
Soil Bulk Density	*rho*	1.5	*(kg/l)*
Partition Coefficient	*Koc*	89.07	*(L/kg)*
FractionOrganicCarbon	*foc*	2.0E-3	*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	8.7E-2	*(per yr)*
or		or	
Solute Half-Life	*t-half*	8.00	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*		*(mg/L)*
Delta Nitrate*	*NO3*		*(mg/L)*
Observed Ferrous Iron*	*Fe2+*		*(mg/L)*
Delta Sulfate*	*SO4*		*(mg/L)*
Observed Methane*	*CH4*		*(mg/L)*

5. GENERAL

Modeled Area Length*	3000	*(ft)*
Modeled Area Width*	1500	*(ft)*
Simulation Time*	100.00	*(yr)*

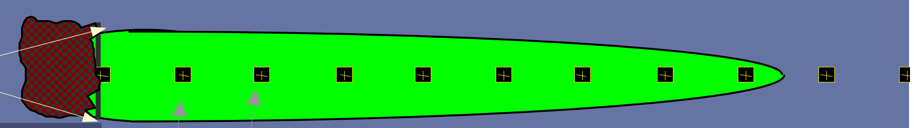


6. SOURCE DATA

Source Thickness	30	*(ft)*

Source	
Width (ft)	Conc.(mg/L)
1400	0.0015

Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	.0015						.0				
Dist. from Source (ft)	*0*	*300*	*600*	*900*	*1200*	*1500*	*1800*	*2100*	*2400*	*2700*	*3000*

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN | **RUN**

View Centerline | **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

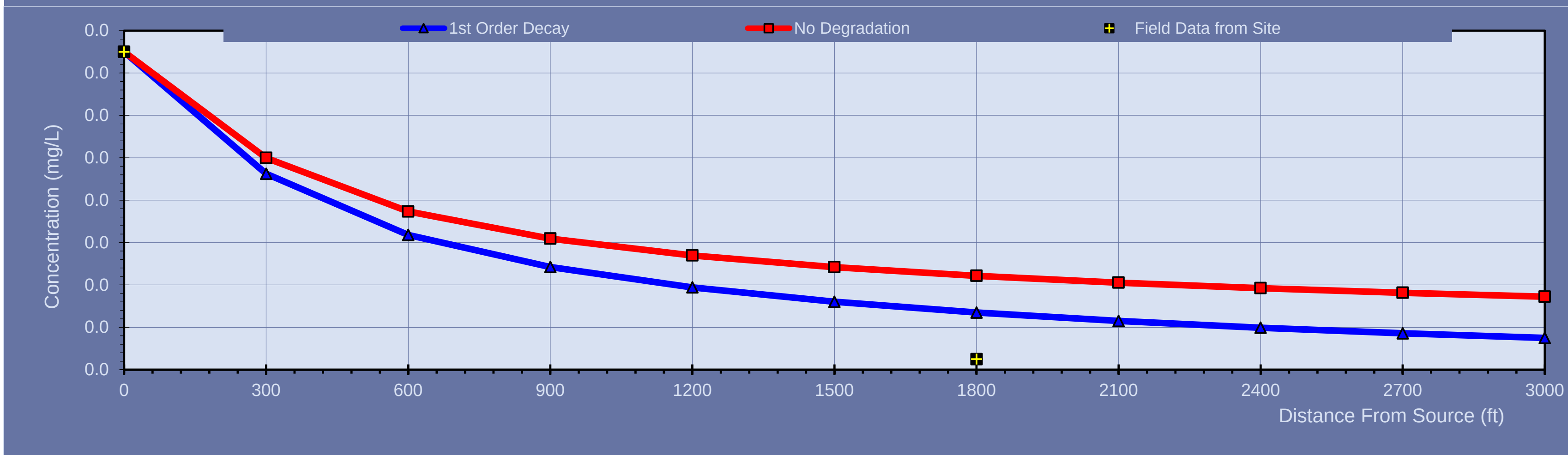
	0	300	600	900	1200	1500	1800	2100	2400	2700	3000
No Degradation	0.00150	0.00100	0.00075	0.00062	0.00054	0.00048	0.00044	0.00041	0.00038	0.00036	0.00034
1st Order Decay	0.00150	0.00092	0.00064	0.00048	0.00039	0.00032	0.00027	0.00023	0.00020	0.000172	0.000150
Field Data from Site	0.00150						0.00005				

# of TimeSteps 20

Displayed Time=100 years

Return to Input

View Plume Output



Attachment 2

BIOSCREEN-AT Models

Range C-62

OBU to Blount Mill Creek

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

OBU to Blount Mill Creek

Data Input Instructions:

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	715.1	(ft/yr)
or		or	
Hydraulic Conductivity	K	7.7E-03	(cm/sec)
Hydraulic Gradient	i	0.018	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	10.0	(ft)
Transverse Dispersivity*	alpha y	1.00	(ft)
Vertical Dispersivity*	alpha z	0.50	(ft)
or		or	
Estimated Plume Length	Lp	170	(ft)

3. ADSORPTION

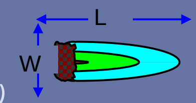
Retardation Factor*	R	1.76	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.7E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

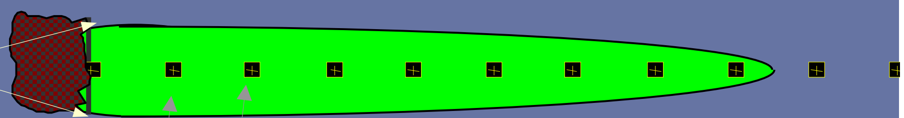
Modeled Area Length*	200	(ft)
Modeled Area Width*	200	(ft)
Simulation Time*	100.00	(yr)



6. SOURCE DATA

Source Thickness	75	(ft)

Source	
Width (ft)	Conc.(mg/L)
170	0.0043



Exponentialy Decaying Conc.

View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	20	40	60	80	100	120	140	160	180	200

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN | RUN

View Centerline | View Plume

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

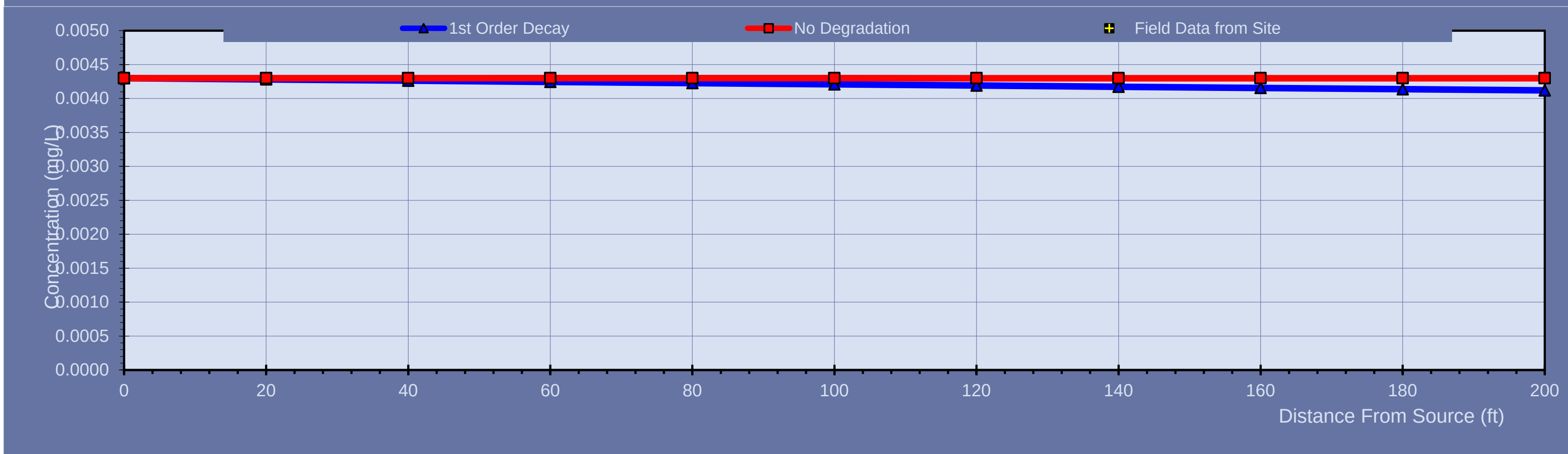
	0	20	40	60	80	100	120	140	160	180	200
No Degradation	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430
1st Order Decay	0.00430	0.00428	0.00426	0.00425	0.00423	0.00421	0.00419	0.00417	0.00416	0.00414	0.00412
Field Data from Site											

\# of TimeSteps **20**

Displayed Time=100 years

Return to Input

View Plume Output



Attachment 2

BIOSCREEN-AT Models

Range C-62

OBU - 5000 feet

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

OBU - 5000 ft model

Data Input Instructions:

115	1. Enter value directly....or
or 0.02	2. Calculate by filling in grey cells below. (To restore formulas, hit button below).
Variable*	Data used directly in model.
20	Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	715.1	(ft/yr)
or		or	
Hydraulic Conductivity	K	7.7E-03	(cm/sec)
Hydraulic Gradient	i	0.018	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	10.0	(ft)
Transverse Dispersivity*	alpha y	1.00	(ft)
Vertical Dispersivity*	alpha z	0.50	(ft)
or		or	
Estimated Plume Length	Lp	170	(ft)

3. ADSORPTION

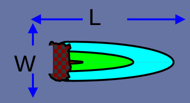
Retardation Factor*	R	1.76	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.7E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	5000	(ft)
Modeled Area Width*	200	(ft)
Simulation Time*	500.00	(yr)

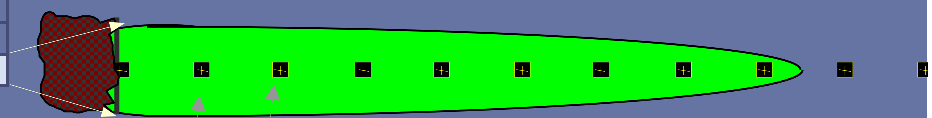


6. SOURCE DATA

Source Thickness	75	(ft)

Source	
Width (ft)	Conc.(mg/L)
170	0.0043

☐ Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN — **View Centerline**

RUN — **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

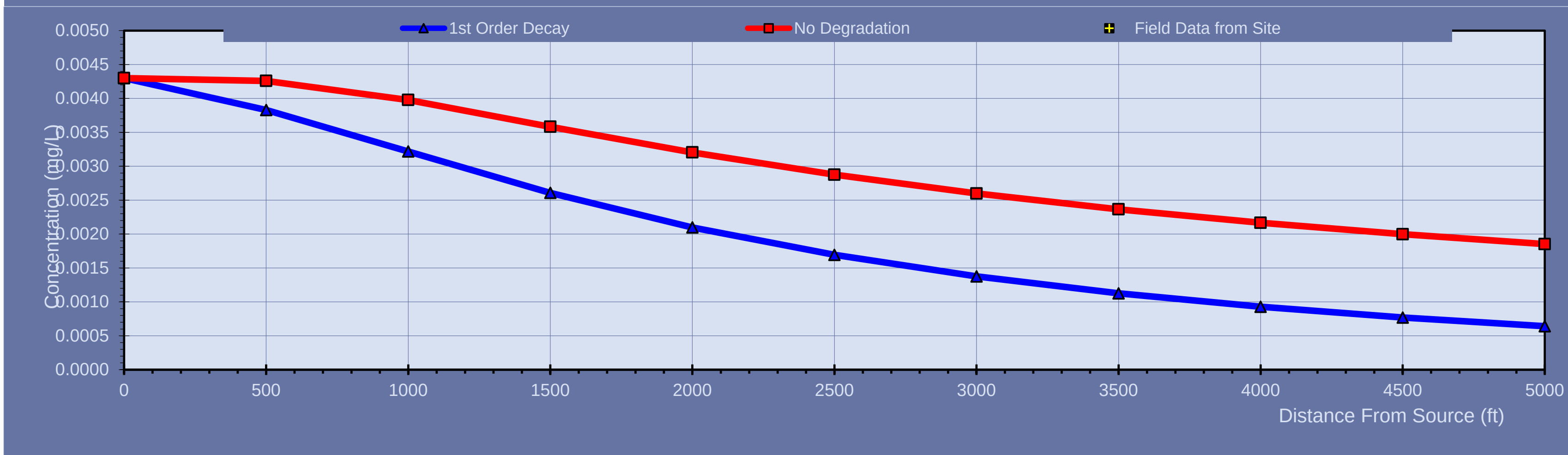
	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
No Degradation	0.00430	0.00426	0.00398	0.00358	0.00320	0.00288	0.00260	0.00236	0.00217	0.00200	0.00185
1st Order Decay	0.00430	0.00383	0.00322	0.00261	0.00210	0.00169	0.00138	0.00113	0.00093	0.00077	0.00064
Field Data from Site											

# of TimeSteps 20

Displayed Time=500 years

Return to Input

View Plume Output



Attachment 2
BIOSCREEN-AT Models
Range C-62
ODU to Blount Mill Creek

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

ODU - Blount Mill Creek

Data Input Instructions:

115	1. Enter value directly....or
or 0.02	2. Calculate by filling in grey cells below. (To restore formulas, hit button below).
Variable*	Data used directly in model.
20	Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	55.6	(ft/yr)
or		or	
Hydraulic Conductivity	K	6.3E-04	(cm/sec)
Hydraulic Gradient	i	0.017	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	17.9	(ft)
Transverse Dispersivity*	alpha y	1.79	(ft)
Vertical Dispersivity*	alpha z	0.90	(ft)
or		or	
Estimated Plume Length	Lp	500	(ft)

3. ADSORPTION

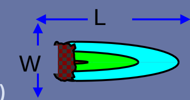
Retardation Factor*	R	1.76	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.70E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	600	(ft)
Modeled Area Width*	600	(ft)
Simulation Time*	100.00	(yr)

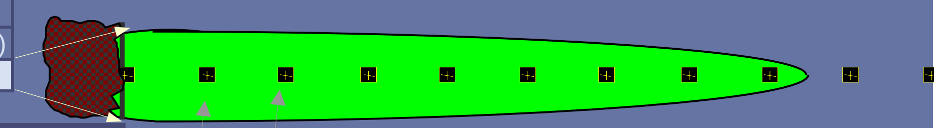


6. SOURCE DATA

Source Thickness	75	(ft)

Source	
Width (ft)	Conc.(mg/L)
300	0.072

Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	60	120	180	240	300	360	420	480	540	600

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN **RUN**

View Centerline **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

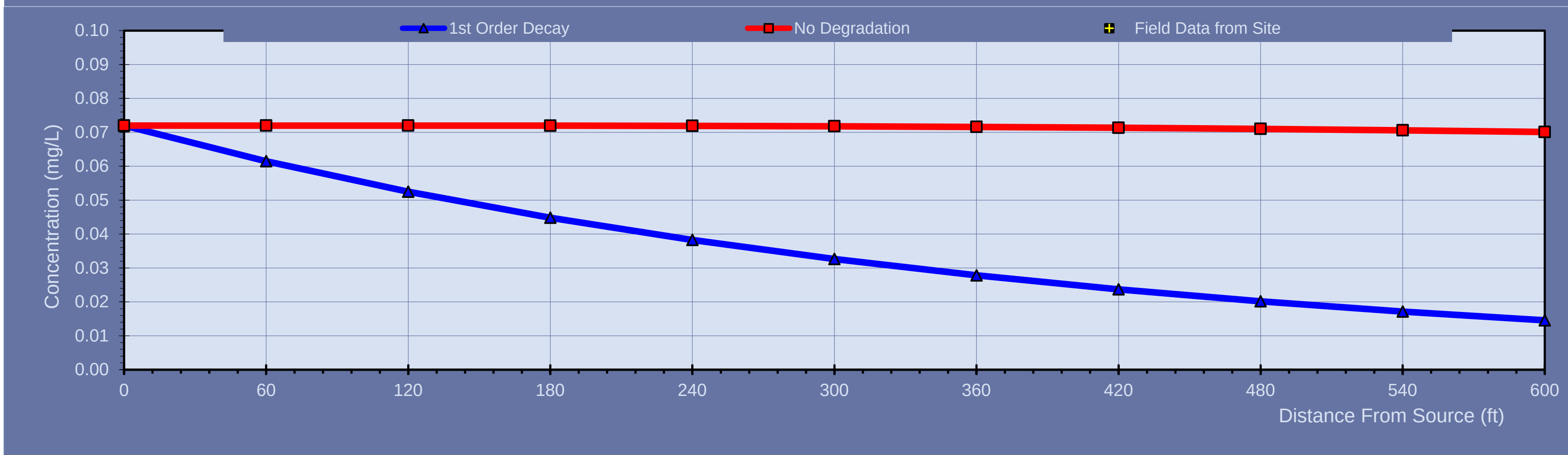
	0	60	120	180	240	300	360	420	480	540	600
No Degradation	0.0720	0.0720	0.0720	0.0720	0.0719	0.0718	0.0716	0.0714	0.0710	0.0706	0.0701
1st Order Decay	0.0720	0.0615	0.0525	0.0448	0.0383	0.0326	0.0278	0.0237	0.0202	0.0171	0.0146
Field Data from Site											

# of TimeSteps **20**

Displayed Time=100 years

Return to Input

View Plume Output



Attachment 2
BIOSCREEN-AT Models
Range C-62
ODU to Blount Mill Creek
95 UCL

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

ODU - BMC 95UCL

Data Input Instructions:

115	1. Enter value directly....or
or 0.02	2. Calculate by filling in grey cells below. (To restore formulas, hit button below).
Variable*	Data used directly in model.
20	Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	55.6	(ft/yr)
or		or	
Hydraulic Conductivity	K	6.3E-04	(cm/sec)
Hydraulic Gradient	i	0.017	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	17.9	(ft)
Transverse Dispersivity*	alpha y	1.79	(ft)
Vertical Dispersivity*	alpha z	0.90	(ft)
or		or	
Estimated Plume Length	Lp	500	(ft)

3. ADSORPTION

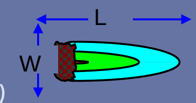
Retardation Factor*	R	1.8	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.7E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	600	(ft)
Modeled Area Width*	600	(ft)
Simulation Time*	100.00	(yr)

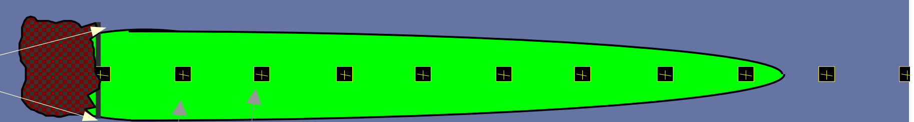


6. SOURCE DATA

Source Thickness	75	(ft)

Source	
Width (ft)	Conc.(mg/L)
300	0.054

Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	60	120	180	240	300	360	420	480	540	600

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN | RUN

View Centerline | View Plume

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

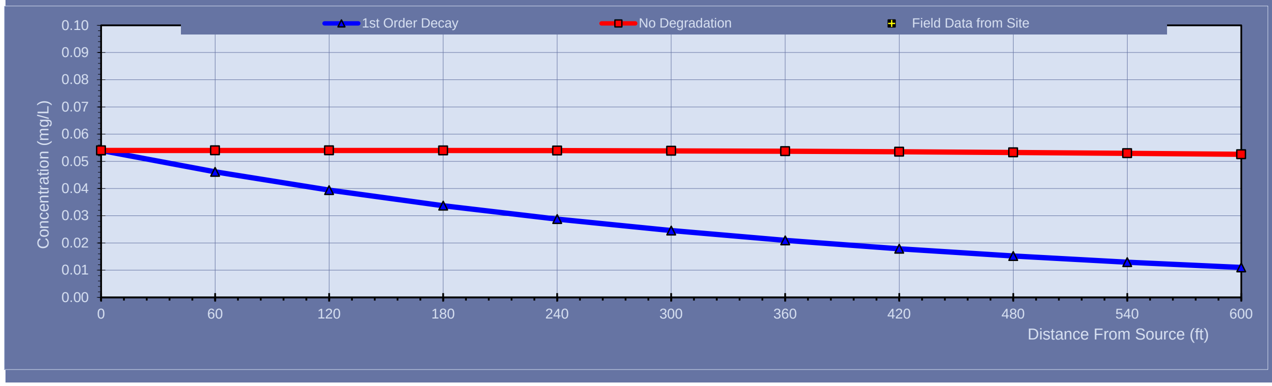
	0	60	120	180	240	300	360	420	480	540	600
No Degradation	0.0540	0.0540	0.0540	0.0540	0.0539	0.0538	0.0537	0.0535	0.0533	0.0530	0.0526
1st Order Decay	0.0540	0.0461	0.0394	0.0337	0.0288	0.0246	0.0210	0.0179	0.0152	0.0129	0.0110
Field Data from Site											

# of TimeSteps 20

Displayed Time=100 years

Return to Input

View Plume Output



Attachment 2

BIOSCREEN-AT Models

Range C-62

ODU - 5000 feet

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

ODU - 5000 ft plume

Data Input Instructions:

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	55.6	(ft/yr)
or		or	
Hydraulic Conductivity	K	6.3E-04	(cm/sec)
Hydraulic Gradient	i	0.017	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	17.9	(ft)
Transverse Dispersivity*	alpha y	1.79	(ft)
Vertical Dispersivity*	alpha z	0.90	(ft)
or		or	
Estimated Plume Length	Lp	500	(ft)

3. ADSORPTION

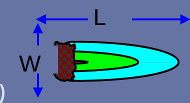
Retardation Factor*	R	1.76	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.7E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	5000	(ft)
Modeled Area Width*	600	(ft)
Simulation Time*	500.00	(yr)

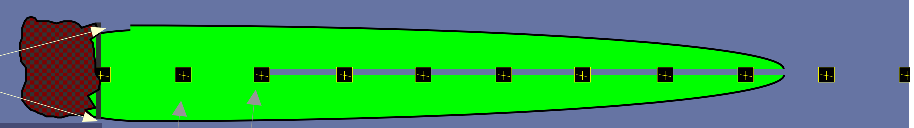


6. SOURCE DATA

Source Thickness 75 (ft)

Source	
Width (ft)	Conc.(mg/L)
300	0.072

☐ Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN — **View Centerline**

RUN — **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

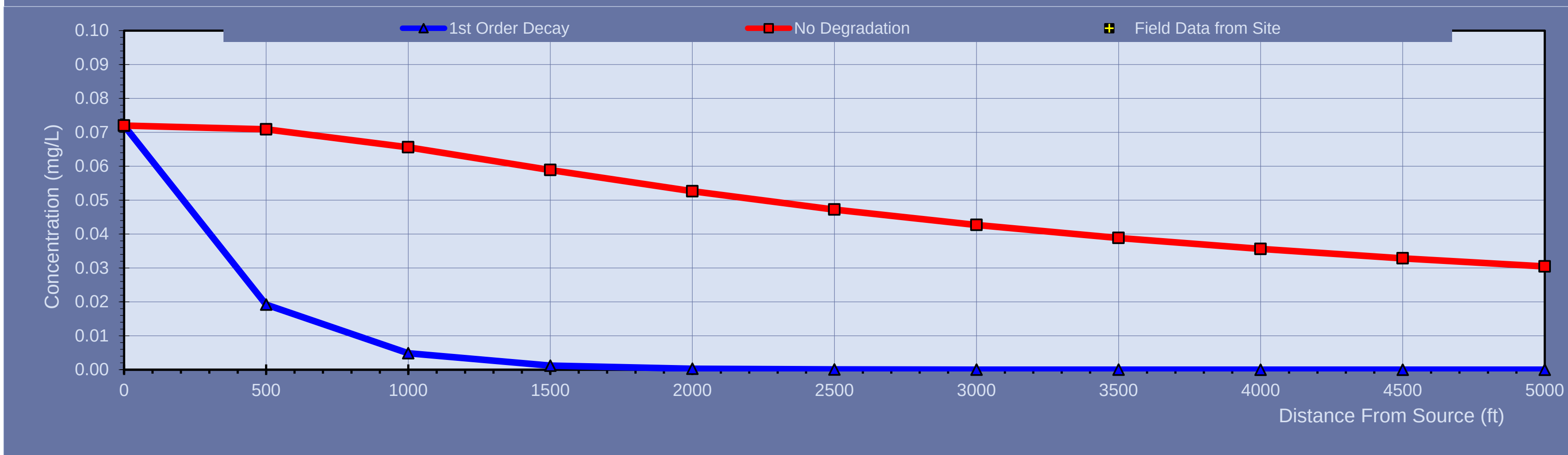
	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
No Degradation	0.0720	0.0709	0.0656	0.0589	0.0526	0.0472	0.0427	0.0389	0.0356	0.0328	0.0305
1st Order Decay	0.0720	0.0192	0.0049	0.0012	0.0003	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Field Data from Site											

# of TimeSteps 20

Displayed Time=500 years

Return to Input

View Plume Output



Attachment 3

Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Attachment 3

Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C-52 North	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	**RDX**	**HMX**	**Units**	**Source**
1) Average Groundwater Linear Velocity: $V_s = \frac{K \cdot i}{\theta_e}$				
Aquifer hydraulic conductivity K	33	33	ft/day	a
Groundwater gradient i	0.010	0.010	ft/ft	b
Effective porosity θ_e	0.2	0.2	dimensionless	c
Seepage velocity V_s	**1.65**	**1.65**	**ft/day**	
2) Soil-Water Partition Coefficient and Retardation Factor $K_d = K_{oc} \cdot f_{oc}$ $r_f = 1 + K_d \frac{\rho_b}{n}$				
organic carbon coefficient K_{oc}	89.07	532	dimensionless	d
fraction of organic carbon f_{oc}	0.002	0.002	g/g	e
soil-water partition coefficient K_d	1.78E-01	1.06E+00	L/kg	
bulk density ρ_b	1.5	1.5	kg/L	e
soil porosity (total) n	0.35	0.35	dimensionless	f
Retardation factor (saturated) r_f	**1.76E+00**	**5.56E+00**	**dimensionless**	
3) Chemical Transport Rate, Distance, and Time $V_c = \frac{V_s}{r_f}$ $t_x = \frac{d_x}{v_c}$				
Seepage velocity v_s	1.65	1.65	ft/day	
Chemical velocity (retarded) v_c	**9.4E-01**	**3.0E-01**	**ft/day**	
Chemical velocity (retarded) v_c	342	109	ft/year	
Distance to receptor d_x	**310**	**310**	ft	g
Transport time to reach receptor t_x	**331**	**1,045**	**days**	
Transport time to reach receptor t_x	1	3	years	
4) Degradation Rate and Allowable Initial Concentration $k = \frac{ln(2)}{\lambda}$ $C_{0-GW} = \frac{C}{e^{-(k \cdot t_x)}}$				
Half-life λ	2,920	1,415	days	h
Target concentration (GCTL) C	0.3	350	ug/L	i
Chemical degradation constant k	**2.37E-04**	**4.90E-04**	**days^{-1}**	
Initial groundwater concentration C_{0-GW}	3.25E-01	5.84E+02	ug/L	j
Alternate concentration limit in groundwater ACL_{gw}	**0.32**	**580**	**ug/L**	
Maximum groundwater concentration in last 4 years C_{tmax}	< 0.21	< 0.088	ug/L	k
Maximum site exceedance factor EF	n/a	n/a	dimensionless	

Attachment 3
Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C-52 North	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	**RDX**	**HMX**	**Units**	**Source**

Notes:
Calculations conservatively assumes an infinite source, no dispersion, and no diffusion
a = Source area average shallow groundwater hydraulic conductivity (CH2MHILL 2002)
b = Source area shallow groundwater gradient in May 2018 (LRS 2018)
c = based on sands with fines (USEPA 1989)
d = USEPA 2018
e = USEPA 1996 default value
f = based on representative soil, sands with fines (Fetter 1994, Freeze and Cherry 1979)
g = distance from monitoring well downgradient of the source area to the nearest stream (parallel to groundwater flow)
h = site-specific, calculated half-lives (see BIOSCREEN model)
j = calculated initial groundwater concentration at source area that would result in a concentration at or below the target receptor point concentration
k = maximum concentration or detection limit observed in the last four years at the downgradient monitoring well(s)

Acronyms
ft = feet
g = grams
GCTL = groundwater concentration target limit
FDEP = Florida Department of Environmental Protection
kg = kilograms
L = liters
mg = milligrams
ug = micrograms
USEPA = United States Environmental Protection Agency

References:
CH2M Hill. 2002. Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.
Fetter, C.W. 1993. Contaminant Hydrogeology. Macmillan Publishing, New York.
Freeze, R. Allen and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., Upper Saddle River, NJ. 604p.
LRS. 2018. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational
USEPA 1996. Soil Screening Guidance: Technical Background Document. July.
USEPA 1998. Chemical Fate Half-Lives for Toxics Release Inventory (TRI) Chemicals. July
USEPA. May 2018 Chemical Parameters Tables. Website: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables . Accessed December 2018.

Attachment 3
Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site: Eglin Air Force Base - C62 OBU
Location: Florida
Chemical(s): See below

Calculated By: Chris Shepherd
Checked By: Ashley Nagle
Date: 12/10/2018

Parameters:	RDX	HMX	Units	Source
1) Average Groundwater Linear Velocity: $V_s = \frac{K \cdot i}{\theta_e}$				
Aquifer hydraulic conductivity K	22	22	ft/day	a
Groundwater gradient i	0.018	0.018	ft/ft	b
Effective porosity θ_e	0.2	0.2	dimensionless	c
Seepage velocity V_s	**1.98**	**1.98**	**ft/day**	
2) Soil-Water Partition Coefficient and Retardation Factor $K_d = K_{oc} \cdot f_{oc}$ $r_f = 1 + K_d \frac{\rho_b}{n}$				
organic carbon coefficient K_{oc}	89.07	532	dimensionless	d
fraction of organic carbon f_{oc}	0.002	0.002	g/g	e
soil-water partition coefficient K_d	1.78E-01	1.06E+00	L/kg	
bulk density ρ_b	1.5	1.5	kg/L	e
soil porosity (total) n	0.35	0.35	dimensionless	f
Retardation factor (saturated) r_f	**1.76E+00**	**5.56E+00**	**dimensionless**	
3) Chemical Transport Rate, Distance, and Time $V_c = \frac{V_s}{r_f}$ $t_x = \frac{d_x}{v_c}$				
Seepage velocity v_s	1.98	1.98	ft/day	
Chemical velocity (retarded) v_c	1.1E+00	3.6E-01	ft/day	g
Chemical velocity (retarded) v_c	**410**	**130**	**ft/year**	
Distance to receptor d_x	150	150	ft	
Transport time to reach receptor t_x	**134**	**421**	**days**	
Transport time to reach receptor t_x	0.4	1.2	years	
4) Degradation Rate and Allowable Initial Concentration $k = \frac{ln(2)}{\lambda}$ $C_{0-GW} = \frac{C}{e^{-(k \cdot t_x)}} = ACL_{gw}$				
Half-life λ	2,920	1,415	days	h
Target concentration (GCTL) C	0.3	350	ug/L	i
Chemical degradation constant k	**2.37E-04**	**4.90E-04**	**days^{-1}**	
Initial groundwater concentration C_{0-GW}	3.10E-01	4.30E+02	ug/L	j
Alternate concentration limit in groundwater ACL_{gw}	**0.31**	**430**	**ug/L**	
Maximum groundwater concentration in last 4 years C_{tmax}	3.6	0.14	ug/L	k
Maximum site exceedance factor EF	12	0.00	dimensionless	l

Attachment 3

Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C62 OBU	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	**RDX**	**HMX**	**Units**	**Source**

Notes:

Calculations conservatively assumes an infinite source, no dispersion, and no diffusion

a = Source area average shallow groundwater hydraulic conductivity (CH2MHILL 2002)

b = Source area shallow groundwater gradient in May 2018 (LRS 2018)

c = based on sands with fines (USEPA 1989)

d = USEPA 2018

e = USEPA 1996 default value

f = based on representative soil, sands with fines (Fetter 1994, Freeze and Cherry 1979)

g = distance from monitoring well downgradient of the source area to the nearest stream (parallel to groundwater flow)

h = site-specific, calculated half-lives (see BIOSCREEN model)

j = calculated initial groundwater concentration at source area that would result in a concentration at or below the target receptor point concentration

k = maximum concentration or detection limit observed in the last four years at the downgradient monitoring well(s)

Acronyms

ft = feet

g = grams

GCTL = groundwater concentration target limit

FDEP = Florida Department of Environmental Protection

kg = kilograms

L = liters

mg = milligrams

OBU = open burn unit

ug = micrograms

USEPA = United States Environmental Protection Agency

References:

CH2M Hill. 2002. Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.

Fetter, C.W. 1993. Contaminant Hydrogeology. Macmillan Publishing, New York.

Freeze, R. Allen and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., Upper Saddle River, NJ. 604p.

LRS. 2018. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational

USEPA 1996. Soil Screening Guidance: Technical Background Document. July.

USEPA 1998. Chemical Fate Half-Lives for Toxics Release Inventory (TRI) Chemicals. July

Attachment 3

Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C62 ODU	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	**RDX**	**HMX**	**Units**	**Source**
1) Average Groundwater Linear Velocity: $V_s = \frac{K \cdot i}{\theta_e}$				
Aquifer hydraulic conductivity K	1.8	1.8	ft/day	a
Groundwater gradient i	0.017	0.017	ft/ft	b
Effective porosity θ_e	0.2	0.2	dimensionless	c
Seepage velocity V_s	**0.15**	**0.15**	**ft/day**	
2) Soil-Water Partition Coefficient and Retardation Factor $K_d = K_{oc} \cdot f_{oc}$ $r_f = 1 + K_d \frac{\rho_b}{n}$				
organic carbon coefficient K_{oc}	89.07	266	dimensionless	d
fraction of organic carbon f_{oc}	0.002	0.002	g/g	e
soil-water partition coefficient K_d	1.78E-01	5.32E-01	L/kg	
bulk density ρ_b	1.5	1.5	kg/L	e
soil porosity (total) n	0.35	0.35	dimensionless	f
Retardation factor (saturated) r_f	**1.76E+00**	**3.28E+00**	**dimensionless**	
3) Chemical Transport Rate, Distance, and Time $V_c = \frac{V_s}{r_f}$ $t_x = \frac{d_x}{v_c}$				
Chemical velocity v_c	8.5E-02	4.6E-02	ft/day	
Distance to receptor d_x	380	380	ft	g
Transport time to reach receptor t_x	**4,467**	**8,309**	**days**	
Transport time to reach receptor t_x	12	23	years	
4) Degradation Rate and Allowable Initial Concentration $k = \frac{ln(2)}{\lambda}$ $C_{0-GW} = \frac{C}{e^{-(k \cdot t_x)}} = ACL_{gw}$				
Half-life λ	2,920	1,415	days	h
Target concentration (GCTL) C	0.3	350	ug/L	i
Chemical degradation constant k	**2.37E-04**	**4.90E-04**	**$days^{-1}$**	
Initial groundwater concentration C_{0-GW}	8.7E-01	2.1E+04	ug/L	j
Alternate concentration limit in groundwater ACL_{gw}	**0.87**	**21,000**	**ug/L**	
laximum groundwater concentration in last 4 years C_{tmax}	72	59	ug/L	k
Maximum site exceedance factor EF	83	0.00	dimensionless	

Attachment 3

Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C62 ODU	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	**RDX**	**HMX**	**Units**	**Source**

Notes:

Calculations conservatively assumes an infinite source, no dispersion, and no diffusion

a = Source area average shallow groundwater hydraulic conductivity (CH2MHILL 2002)

b = Source area shallow groundwater gradient in May 2018 (LRS 2018)

c = based on sands with fines (USEPA 1989)

d = USEPA 2018

e = USEPA 1996 default value

f = based on representative soil, sands with fines (Fetter 1994, Freeze and Cherry 1979)

g = distance from monitoring well downgradient of the source area to the nearest stream (parallel to groundwater flow)

h = site-specific, calculated half-lives (see BIOSCREEN model)

j = calculated initial groundwater concentration at source area that would result in a concentration at or below the target receptor point concentration

k = maximum concentration or detection limit observed in the last four years at the downgradient monitoring well(s)

Acronyms

ft = feet

g = grams

GCTL = groundwater concentration target limit

FDEP = Florida Department of Environmental Protection

kg = kilograms

L = liters

ODU = open detonation unit

ug = micrograms

USEPA = United States Environmental Protection Agency

References:

CH2M Hill. 2002. Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.

Fetter, C.W. 1993. Contaminant Hydrogeology. Macmillan Publishing, New York.

Freeze, R. Allen and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., Upper Saddle River, NJ. 604p.

LRS. 2018. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational Permit No. 006176-H)-007. July.

USEPA 1996. Soil Screening Guidance: Technical Background Document. July.

USEPA 1998. Chemical Fate Half-Lives for Toxics Release Inventory (TRI) Chemicals. July

SAMPLING AND ANALYSIS PLAN

RANGES C-52 NORTH AND C-62
OPEN BURN/OPEN DETONATION (OB/OD) UNITS

96 CEG/CEIEC
EGLIN AIR FORCE BASE, FLORIDA

January 2020

Open Burn/Open Detonation Units
Ranges C-52 North and C-62
Eglin Air Force Base, Florida

Permit No.	006176-009-HO / expiration 09-01-2020
Sampling Matrices	Groundwater
Sampling Frequency	Annual basis (May of each year).

Number of Samples to be Collected from each Matrix

A total of 9 samples, 1 from each well location, and 1 surface water sample from C-62 will be collected.

	C-52N
1.)	MW-94-52-01
2.)	MW-94-52-02
3.)	MW-94-52-03

	C-62
4.)	MW-94-62-01
5.)	MW-94-62-02
6.)	MW-94-62-03
7.)	MW-94-62-04
8.)	MW-94-62-05
9.)	SURF– 62-1

Each sample collected from Range C-52 North will consist of 3 containers.

- 1 (250ml) poly container-unpreserved
- 2 (500ml) glass amber-unpreserved

Each monitoring well sample collected from Range C-62 will consist of 6 containers.

- 3 (40ml) vials preserved w/ HCL
- 1 (250ml) poly container-unpreserved
- 2 (500ml) glass amber-unpreserved

Surface water sample collected from Range C-62 will consist of 2 containers. Sample location is located at confluence of the East and West Fork of Blount Mill Creek. See Attachment 2 for FDEP guidance.

- 2 (500ml) glass amber-unpreserved

Parameters from each Matrix to be Analyzed	

All groundwater monitoring well samples will be analyzed for the following:

Parameter		Method
Field	Turbidity	180.1
	pH	150.1
	Specific Conductance	120.1
Laboratory	nitrate	EPA300
	nitrite	EPA300
Explosives[1]	1,3,5-trinitrobenzene	8330A
	1,3-dinitrobenzene	8330A
	2,4,6-trinitrotoluene	8330A
	2,4-dinitrotoluene	8330A
	2,6-dinitrotoluene	8330A
	2-amino-4,6-dinitrotoluene	8330A
	2-nitrotoluene	8330A
	3-nitrotoluene	8330A
	4-amino-2,6-dinitrotoluene	8330A
	4-nitrotoluene	8330A
	HMX	8330A
	RDX	8330A

[1]Explosives include those listed in Part IV, Subpart C, Requirement 8 of Permit No. 0006176-007-HO.

All groundwater monitoring wells at Range C-62 will be analyzed for the following additional laboratory parameters:

Parameter		Method
BTEX	Benzene	8260B
	Toluene	8260B
	Ethylbenzene	8260B
	Total Xylenes	8260B

C-62 surface water sample collection will be analyzed for the following laboratory parameters:

Parameter	Method
RDX	8330A

Number of Quality Assurance Quality Control (QA/QC) Samples to be Collected	QA/QC samples for this project will consist of the following: • One set of trip blanks will accompany each cooler containing groundwater samples for BTEX analysis • 2 field duplicates (one per site) • 2 Matrix Spike/Matrix Spike Duplicate (one per site) • 2 Equipment Blanks (one per site)

<u>Groundwater Cleanup Target Levels for the current permit</u>

The GCTL's for 4-amino-2,6-dinitrotoluene and 2-amino-4,6-dinitrotoluene is 4.0 µg/L and RDX is 10 µg/L. The GCTL for nitrate is 10 mg/L. The GCTL for nitrite is 1 mg/L. The GCTL for HMX established in the permit is 35 µg/L.

Open Burn/Open Detonation Units Groundwater Purging and Sampling Equipment	
Groundwater Sampling Equipment	• Plastic Sheeting when needed • Electronic Water-Level Probe – Heron* • Graduated measuring cup and 5-gallon bucket • Water quality multi parameter meter – YSI 556* • Turbidity meter – LaMotte 2020* • Stainless Steel electronic submersible pump- Grundfos* • Peristaltic Pump – Geotech* • Polyethylene Tubing • Marine Batteries • Sample coolers with appropriate sample containers (incl. preservative where applicable) and wet ice preservative to 4°C for all samples • Decontamination equipment including tap water, Deionized water, liquinox brand soap, buckets, and brushes

* Equipment specific model numbers and serial numbers are subject to change based on equipment availability and parameters to be collected during the sampling event. Changes will be noted in groundwater monitoring reports.

Disposal of Investigative Derived Waste (IDW)

All purged groundwater removed during groundwater monitoring events will be dumped onto the ground surface at the monitoring well location it was removed from. This procedure was approved by FDEP's Merlin Russell and Michell Smith in the Email Titled "Non-containment of Purge Water Approval FDEP(002).pdf" on September 25, 2019. The corresponding email has been attached in appendix 1 of the Sampling and Analysis Plan. Historical groundwater sampling results do not indicate contaminants above regulatory levels based on the Toxicity Characteristics in 40 CFR 261.24 therefore management of IDW will be disposed of in accordance with solid waste regulations.

Analytical Laboratory Certifications

The chemical analyses of groundwater samples collected for this project will be performed by TestAmerica Laboratories, Inc. of Pensacola, Florida. TestAmerica is accredited through the National Environmental Laboratory Accreditation Program (NELAP), and maintains State Lab I.D. Number E81010 through the Department of Health (DOH), Bureau of Laboratories. The Florida Department of Environmental Protection will be notified if any changes in the selected laboratory occur. All laboratory data will be submitted to FDEP using ADAPT quality assurance software.

Groundwater Sampling Standard Operating Procedures

All groundwater sampling for this project will be in accordance with applicable sections of DEP-SOP-001/01 FS 2200 Groundwater Sampling, Revised March 1, 2014. Any new or alternative field methods will meet the requirements of Chapter 62-160 Quality Assurance, dated July 2014. FDEP Form FD 9000-24: Groundwater Sampling Log will be completed and submitted with the annual monitoring report, and form substitutions must capture all required information in FD 9000-24. Groundwater sampling equipment Calibration logs and maintenance records will be submitted with the annual monitoring report. Surface water sample to be collected from Range C-62. Sample location is located at the confluence of the East and West Fork of Blount Mill Creek. Surface Water Sampling for this project will be in accordance with applicable sections of DEP-SOP-001/01 FS2100 Surface Water Sampling, Revised January 2017.

Collection of Monitoring Well Water Level's and Total Depth's

Depth to groundwater and the current total depth at each monitoring well are to be recorded in accordance with Part IV, Subpart A, Conditions No. 5 and 6 of the permit. Depth to groundwater is measured prior to and during sampling, and total depth is measured after sampling. The purpose is to determine groundwater elevations, groundwater flow directions, groundwater hydraulic gradients, groundwater flow rates, and to monitor siltation effects in each of the wells to determine re-development or replacement needs. Due to the safety hazards of possible unexploded ordinances and limited range access time at each site, initial groundwater depths to water are collected prior to sampling at each well. A full round of measured depths to water for each site were not completed prior to the first sample being collected, as this was not feasible with the time allotted and the safety precautions that are required.

Groundwater Reporting Requirements

Annual groundwater monitoring reports must contain the following information:
1. A map/figure showing contaminated site(s) and associated monitoring wells and surface water sampling location (if ultimately used in the monitoring program).
2. Include a determination of ground-water flow rate(s) and direction(s) during each sampling event in each aquifer.
3. Include plume maps for each affected aquifer in a format required by Subparagraph 62-780.600(8)(a)(28), F.A.C..
4. Include ground-water elevations from each well.
5. Include an analysis and evaluation of the current analytical results (e.g., narrative, graphs, statistics, etc.).
6. Include Field Sampling Logs (the samplers' notes).
7. Include Groundwater Sampling Log DEP Form FD 9000-24 or equivalent.
8. Equipment Calibration logs.
9. Include laboratory reports.
10. Include ADaPT files.
11. Include a statement that records will be maintained for a minimum three-year period.

Groundwater Monitoring Well O&M

Groundwater monitoring wells will be visually inspected for monitoring well integrity during yearly groundwater sampling events. Needed repairs will be made as soon as practicable. Repair activities will require range clearance from Eglin Range Control before repairs can be completed. Well re-development will be triggered when occlusion of 20 percent or more of the screened interval with sediment has occurred or when sample turbidity criterion of 10 NTU is not obtained or is difficult to obtain during sampling (e.g. greater than 30 minute purge time).

Groundwater Monitoring Well Security

Groundwater monitoring wells are located inside gated and secured test ranges. Access to C-52 and C-62 ranges requires site specific mission clearance from Eglin Range control. Eglin test ranges are continuously monitored by Eglin Range Patrol. Entrance to test range's is granted through Eglin range control. Prior to entering the Eglin range entrants must watch the UXO Safety Brief video.

Sampling Notifications to Florida Department of Environmental Protection

The Florida Department of Environmental Protection must be notified of the opportunity to observe groundwater sampling and split samples by providing notification either by telephone, letter, or electronically at least seven calendar days prior to each sampling event (Subsection 62-780.220(1), F.A.C.).

References

FDEP, *Chapter 62-160 Quality Assurance, Florida Administrative Code,* July 2014.

FDEP, *Department of Environmental Protection-Standard Operating Procedure for Field Activities-001/01 FS-2200 Groundwater Sampling,* Revised March 2014.

FDEP, *Permit/Certification Number: 0006176-007-HO,* September 1, 2015

FDEP, *Department of Environmental Protection- Standard Operating Procedure for Surface Water Sampling – 001/01 FS 210, Revised January 2017*

Attachment 1

From:	FREEMAN, DANIEL L NH-03 USAF AFMC 96 CEG/CEIEC
To:	DOYLE, KEVIN R GS-12 USAF AFMC 96 CEG/CEIEC
Subject:	FW: Non-Containment of Purge Water Approval FDEP (002).pdf
Date:	Wednesday, September 25, 2019 7:41:02 AM
Attachments:	image002.jpg ~WRD000.jpg

Looks like we have approval to dump purge water.

From: Russell, Merlin <Merlin.Russell@dep.state.fl.us>
Sent: Wednesday, September 25, 2019 6:38 AM
To: FREEMAN, DANIEL L NH-03 USAF AFMC 96 CEG/CEIEC <daniel.freeman@us.af.mil>
Subject: [Non-DoD Source] FW: Non-Containment of Purge Water Approval FDEP (002).pdf

Danny, I thought I'd share this with you so that the disposal method can be written into your renewal.

See you tomorrow.

merlin

From: Smith, Michell M. <Michell.M.Smith@dep.state.fl.us>
Sent: Wednesday, September 25, 2019 7:33 AM
To: Russell, Merlin <Merlin.Russell@dep.state.fl.us>
Cc: Sullivan, Russell <Russell.Sullivan@dep.state.fl.us>
Subject: RE: Non-Containment of Purge Water Approval FDEP (002).pdf

Merlin,

I have no objections either. I have no problem with allowing Eglin to continue their current method of handling the purge water.

FL-DEP-LOGO

Michell Mason Smith
Environmental Administrator
Division of Waste
Florida Department of Environmental Protection
Hazardous Waste Program & Permitting
Michell.M.Smith@FloridaDEP.gov
Office: 850-245-8721

From: Russell, Merlin <Merlin.Russell@dep.state.fl.us>
Sent: Wednesday, September 25, 2019 7:25 AM
To: Smith, Michell M. <Michell.M.Smith@dep.state.fl.us>
Cc: Sullivan, Russell <Russell.Sullivan@dep.state.fl.us>
Subject: FW: Non-Containment of Purge Water Approval FDEP (002).pdf

Michell,

Eglin dug up the attached e-mail approving of disposing of purge water on the ground. In this case, because the OB/OD units are within a bombing range, we really can't consider the soils to be clean, and I have no objection to continuing with this old decision. Let me know if you disagree. Eglin will want to know if we disagree well before the application is due so that it can be written into their Part B. Thanks.

merlin

From: FREEMAN, DANIEL L NH-03 USAF AFMC 96 CEG/CEIEC <daniel.freeman@us.af.mil>
Sent: Tuesday, September 24, 2019 3:47 PM
To: Russell, Merlin <Merlin.Russell@dep.state.fl.us>
Cc: DOYLE, KEVIN R GS-12 USAF AFMC 96 CEG/CEIEC <kevin.doyle.17@us.af.mil>
Subject: Non-Containment of Purge Water Approval FDEP (002).pdf

Merlin, here is the email chain addressing the purge water issue we talked about.

Danny

FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

November 7, 2019

Mr. Danny Freeman
96 CEG/CEIEC
700 Range Road, Bldg. 592
Eglin AFB, Florida 32542-5120
daniel.freeman@us.af.mil

RE: Eglin Air Force Base, FL8570024366, Operation Permit 006176-HO-007, Assessment at Range C-62, Eurofins Test America, Pensacola Laboratory Job ID: 400-177806-1 dated October 30, 2019

Dear Danny:

This is a follow-up to DEP's request, to sample RDX in surface water, dated October 1, 2019. That letter asked for a surface water grab sample just downstream of the confluence of the streams at Target Area C-62.

According to the lab report, the sample arrived in good condition, was properly preserved and, the temperature of the cooler at receipt was 1.4º C. No analytical or quality issues were noted in the case narrative.

The results of the sampling indicated very low levels of RDX in the surface water (0.23 I[1] µg/l), well below the freshwater surface water criterion of 180 µg/l.

Until assessment is complete and a revised monitoring plan is approved, our recommendation is to take a surface water grab sample at the same location annually with your groundwater monitoring program starting in May 2020.

---

[1] The "I" qualifier indicates that the reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

If you should have any questions or would like to discuss, please contact me at 850-245-8796 or merlin.russell@floridadep.gov.

Sincerely,

Merlin D. Russell Jr.
Professional Geologist III
Hazardous Waste Permitting and Programs

MR/mdr

cc:
Ralph Armstrong, Eglin AFB, ralph.armstrong@us.af.mil
Frances Dunham, francesdunham@opendoor.com
Jeff Lockwood, DEP DOD and Brownfields Partnerships, jeff.lockwood@floridadep.gov
Laura Olah, CSWAB, info@cswab.org
Leah J. Smith, FCCM, FDEP Headquarters, Leah.J.Smith@floridadep.gov
Russell Sullivan, DEP Northwest District Office, Russell.sullivan@floridadep.gov

ENVIRONMENTAL MONITORING REPORT

Open Burn/Open Detonation Units

Range C-52 North and Range C-62

Eglin Air Force Base, Florida

FDEP Permit Number 006176-009-HO

July, 2019

This page intentionally left blank.

Annual Environmental Monitoring Report
Open Burn/Open Detonation Units
Range C-52 North and Range C-62
Eglin Air Force Base, Florida
Operational Permit No. 006176-009-HO

Prepared For:
Eglin Air Force Base
96 CEG/CEIEC
700 Range Road, Building 592
Eglin Air Force Base, Florida 32542

Prepared by:
LRS Federal, LLC
8221 Ritchie Highway, Suite 300
Pasadena, Maryland 21122
(410) 544-3570

LRS FEDERAL

Prepared Under Contract to:
Air Force Civil Engineer Center
Contract Number: FA8903-15-F-0006

July 2019

This page intentionally left blank.

Environmental Monitoring Report
Open Burn/Open Detonation Units
Range C-52 North and Range C-62
Eglin Air Force Base, Florida
Operational Permit No. 006176-008-HO

Prepared For:
Eglin Air Force Base
96 CEG/CEIEC
700 Range Road, Building 592
Eglin Air Force Base, Florida 32542

Prepared by:
LRS Federal, LLC
8221 Ritchie Highway, Suite 300
Pasadena, Maryland 21122
(410) 544-3570

I hereby submit that I am currently registered in good standing as a Professional Geologist in the state of Florida. The Environmental Monitoring Report, July 2019, for Eglin Air Force Base, Florida Open Burn/Open Detonation Range C-52 North and Range C-62 was prepared under my supervision and review. To the best of my knowledge, all the work performed for this report is in accordance with applicable State and Federal regulations and accepted professional practices.

Daniel R. Parker, P.G.
LRS Federal, LLC
Florida Professional Geologist Registration No. 2987

7/24/19
24 July 2019

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

˚C	degree Fahrenheit
ADaPT	Automated Data Processing Tool
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
APP	After (Through) Peristaltic Pump
BG	background well
BTEX	benzene, toluene, ethylbenzene, and total xylenes
btoc	below top of casing
C-52N	C-52 North
CCB	continuing calibration blank
CompQAP	Comprehensive Quality Assurance Plan
DoD	Department of Defense
EB	equipment blank
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ESP	electric submersible pump
ETTC	Eglin Test and Training Complex
FAC	Florida Administrative Code
FGS	Florida Geological Survey
FS	Florida Statutes
FDEP	Florida Department of Environmental Protection
ft msl	feet above mean sea level
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
GCTL	Groundwater Cleanup Target Level
gpm	gallons per minute
HHRA	Human Health and Risk Assessment
HMX	octahydro-1,3,5,7-tetranitrotetrazocine
HSWA	Hazardous and Solid Waste Amendments
µg/L	micrograms per liter

LCS	laboratory control samples
LRS	LRS Federal, LLC
m	meters
MDL	Method Detection Limit
mg/L	milligrams per Liter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MW	monitoring well
NELAP	National Environmental Laboratory Accreditation Program
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic Atmospheric Administration
NRCS	Natural Resources Conservation Service
NTU	Nephelometric Turbidity Units
OB	Open Burn
OD	Open Detonation
PEP	propellants, explosives, pyrotechnics
POC	Point of Compliance
QA/QC	Quality Assurance/Quality Control
QSM	Quality System Manual
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,2-5-trinitro-1,2,5-triazine
RL	Reporting Limit
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
TB	trip blank
TBKP	Transportable Burn Kettle Processor
USGS	United States Geologic Survey
USC	United States Code
USEPA	United States Environmental Protection Agency

1.0 Introduction

This 2019 Environmental Monitoring Report for the Open Burn (OB)/Open Detonation (OD) Units, at Ranges C-52 North (C-52N) and C-62, located at Eglin Air Force Base (AFB), Florida has been prepared by LRS Federal, LLC (LRS) for the Air Force Civil Engineer Center (AFCEC). The document is prepared for submission to the Florida Department of Environmental Protection (FDEP).

Annual groundwater monitoring reports for the OB/OD facilities are required in accordance with Part IV, Subpart A of permit 006176-009-HO issued by FDEP. The permit was issued pursuant to authorization obtained under the Resource Conservation and Recovery Act [42 United States Code (USC) 6901, et seq., commonly known as RCRA] and the Hazardous and Solid Waste Amendments (HSWA) of 1984, under the provisions of Section 403.722, Florida Statutes (FS) and Chapters 62-4, 62-160, 62-730, 62-777 and 62-780, Florida Administrative Code (FAC). A copy of the permit is retained, and is also available from the FDEP.

This report presents the results of the 2019 monitoring events conducted at Range C-52N and Range C-62, on May 17 and May 14, 2019 respectively.

1.1 Site Location and Description

Eglin AFB is located in the northwest portion of the Florida panhandle (**Figure 1**), occupying a large portion of Santa Rosa, Okaloosa, and Walton counties. The Base plays host to numerous Department of Defense (DoD) entities who utilize Eglin's resources for mission specific testing and training. Historically, the expanse of Eglin AFB has been regarded as the "Range" or the Eglin Test and Training Complex (ETTC) regarding land assets. The ETTC is generally comprised of cantonments, ranges/live-fire areas, and undeveloped landscape (interstitial areas). Range C-52N and C-62 are both primarily gunnery ranges utilized for testing and training of air to land munitions (Eglin AFB, 2011). These areas are secondarily used as OB/OD unit locations due to their isolation and designated uses.

Range C-52N is situated approximately 6 miles northeast of Niceville, Florida, and 2.5 miles east of the Okaloosa-Walton County line. Topography at Range C-52N varies from elevations of near 170 feet (51.8 meters[m]) above mean sea level (ft msl) in the north to nearly 70 ft msl (21.3 m) at the extreme southern edge of the Range (**Figure 2**). Range Road 200 tracks a ridge dissecting the northern portion of the site, with a bearing roughly southwest/northeast. Two drainages lie on either side of the Cat's Eye (the target area); Bay Head Branch to the west, and Coon Head Branch to the east (**Figure 2** and **3**). These drainages eventually flow into Basin Bayou via Basin Creek. Two downgradient monitoring wells at C-52N are located south of the cat's eye, at elevations of approximately 110 to 120 ft msl (33.5 to 36.6 m) (**Figure 4**).

Range C-62 is situated approximately 6 miles southwest of Defuniak Springs, Florida, in Walton County. A large open flatland dominates the central portion of the range (**Figures 5** and **6**). Drainages in the northern and southern extremes of the Range drop off in elevation from near 200 ft msl (61.0 m) to 100 ft msl (30.5 m). Downgradient monitoring wells at C-62 are located southwest of the cat's eye, upgradient of the headwaters of Blount Mill Creek (**Figure 7**).

Climate

The climate at Eglin AFB is classified as humid subtropical, characterized by short, mild winters and hot, humid summers (National Oceanic and Atmospheric Administration [NOAA], 2019). Afternoon and evening thunderstorms are common during the summer months and the area is prone to tornadoes and hurricanes. Temperatures exceeding 100° Fahrenheit are relatively rare for the region due to the base's proximity to the coast. Freezing temperatures occur on approximately 14 nights out of the year between December and February. The base receives approximately 65 inches of rain per year with the most rain typically falling in July and the driest conditions typically observed in May.

Geology

Eglin AFB is situated in the Gulf Coastal Plain and is underlain by deltaic deposits of the Pliocene-age Citronelle Formation (Florida Geological Survey [FGS], 2001). This formation is characterized by gray to orange-mottled, unconsolidated to poorly consolidated, very fine to very coarse, poorly sorted, clean to clayey sands. Clay, silt, and gravel frequently occur as beds and lenses that can vary dramatically over short distances. Limonite nodules and limonite cemented beds are common. The formation is very permeable and hosts a surficial aquifer. The Citronelle Formation is thicker than 200 feet underneath the westernmost portions of Eglin AFB but thins to 20-50 feet on the eastern half of the base where the two sites are located (FGS, 2001).

Underlying the Citronelle Formation on the eastern side of the base is the Miocene-age Alum Bluff Group. These sediments are characterized by clays, sands, and shell beds with mica as a common constituent and glauconite and phosphate occurring sporadically. Color ranges from cream to olive gray and the sediment weathers to a reddish brown. Grain size varies widely from very fine to very coarse. The Alum Bluff Group is approximately 180 feet thick below the eastern half of Eglin AFB (FGS, 2001). These sediments generally have low permeabilities and function as a confining unit that separates the surficial Sand and Gravel Aquifer in the Citronelle Formation from the underlying bedrock aquifer.

Underlying the Alum Bluff Group at a total depth of 200-250 feet below ground surface on the eastern side of Eglin AFB is the Bruce Creek Limestone (FGS, 2001). This limestone is white to yellowish-gray, sandy, phosphoritic, and fossiliferous, with most fossils generally preserved as molds. The Bruce Creek Limestone is the uppermost water-bearing unit of the Floridan Aquifer in the west-central regions of the Florida Panhandle. Due to this being some of the most deeply-buried bedrock in the state, sinkholes are relatively uncommon in the vicinity of Eglin AFB.

Soil Conditions

The specific soil conditions at both sides are defined primarily by the Lakeland Sand (Natural Resources Conservation Service [NRCS], 2019). The Lakeland Sand is excessively drained, belongs to a very low runoff class, and has a high to very high capacity to transmit water. The typical profile is comprised of very dark grayish-brown crushed, unconsolidated sand grains from 0-3 inches, yellowish brown to pale brown sand from 3 to 64 inches, and pale brown sand with yellowish red iron staining and nodules from 64 to 80 inches. Ponding and flooding are rare due to the soil being so well-drained.

Hydrogeology

The surficial aquifer in the Citronelle Formation is referred to as the ‘Sand and Gravel Aquifer,’ the ‘Miocene-Pliocene Aquifer,’ or the ‘Citronelle Aquifer’. It is the primary source of water for the population of Santa Rosa and Escambia Counties in the Florida Panhandle (United States Geologic Survey [USGS], 2016). This aquifer attains a maximum thickness in the State of Florida of greater than 400 feet in Escambia County but thins eastward towards Eglin AFB, being approximately 200 feet thick on the extreme western side of the base and 100 or fewer feet thick on the eastern side of the base where the two sites are situated (USGS, 2016 and FGS, 2001).

Specifically, this aquifer is approximately 60 feet thick at Range C-52N and 100 feet thick at Range C-62 (FDEP, 2001). The Sand and Gravel Aquifer is comprised of fine to coarse sand, clay, silt, and gravel. While the aquifer is typically unconfined above with permeable material exposed at ground surface, lenses of less permeable material including fine sand, clay, and silt create discontinuous confined zones that result in localized 'leaky confined' conditions. This aquifer is informally divided into three zones and is best defined in and around Escambia Country. Therefore, that is where a majority of the characterization has been done. At the ground surface, the 'surficial zone' is comprised of fine sand that allows the aquifer to recharge via rainfall. In Escambia County, well yields in this zone are as high as 1,000 gallons per minute with transmissivity of 11,000 feet squared per day (USGS, 2016). Underlying the surficial zone is a 'low permeability zone' containing discontinuous clay and silt. Underneath this partially-confining zone is the 'main producing zone' which is comprised primarily of highly-permeable coarse sand and gravel. The main producing zone is confined below by the relatively impermeable sediments of the Alum Bluff Group. In Escambia County, well yields in the high permeability zone typically exceed 1,000 gallons per minute and the transmissivity of is zone is estimated at as much as 20,000 feet squared per day (USGS, 2016). Groundwater flow in the Sand and Gravel Aquifer is typically controlled by topography, with flow generally trending south towards the Gulf of Mexico. Flow patterns are locally influenced by streams and rivers which dissect the aquifer and serve as discharge boundaries. The aquifer is especially vulnerable to contamination due to its high transmissivity and exposure to ground surface.

1.2 Site Operations

Eglin AFB and other DoD entities in the region generate hazardous waste in the form of explosives and military munitions that are no longer suitable for service. The safest method of handling these items is treatment at Eglin AFB. Under the operating permit, Eglin AFB may "open burn" and "open detonate" waste military explosives on Ranges C-52N and C-62.

The OB units are specially-designed burn kettles with a detachable fuel source. The individual burn kettle is designed for thermally treating waste reactives or propellants, explosives, and pyrotechnics (PEP). A burn kettle is a vented, steel box with a removable lid designed to contain metal fragments and much of the solid combustion residue. The PEP-loaded burn kettles are placed onto the retracted carbottom of the Transportable Burn Kettle Processor (TBKP) and the loaded carbottom is moved back into the TBKP's thermal processing chamber. The chamber door is closed and the insulated processing chamber is heated to approximately 1000°F. This temperature ensures that all PEP waste inside the burn kettles is destroyed. This operation occurs primarily on Range C-62, with Range C-52N designated as an approved alternate location.

Open Detonation operations occur at locations across Range C-52N and Range C-62, directly on the ground surface, generally in craters formed by previous OD operations. Following completion of a detonation and a short pause for safety (generally within one hour of detonation), the OD unit is approached and inspected for any remaining items. If found, negligible energetic material is detonated immediately and large metallic items not containing energetic materials are transported to the Defense Reutilization and Marketing Office for recycling or resale.

1.3 Regulatory Background

A RCRA Subpart X Permit to perform OB/OD treatment for munitions was approved by the FDEP and became effective December 12, 2001. The 2001 permit specified that the Detection Monitoring Program should be continued to assess the potential for elevated levels of constituents of concern to enter the environment because of OB/OD operations at Eglin AFB. In August 2004, the operational permit was modified and re-issued to reflect several changes to the Detection Monitoring Program, which were negotiated with the FDEP, February 2004 (Bhate, 2004). Among these changes were the establishment of regulatory criteria for several explosive constituents, including; hexahydro-1,2-5-trinitro-1,2,5-triazine (RDX), octahydro-1,3,5,7-tetranitrotetrazocine (HMX), 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and 2,4-dinitrotoluene.

The monitoring frequency was modified to occur semiannually, with sampling to be performed during May and November, with reports due to FDEP at the end of July and January. A permit issued in 2007 changed the monitoring frequency to an annual basis. The current permit, modified 5 February 2019, stipulates annual sampling in May, with the associated report due to FDEP by the end of July.

1.4 Previous Investigations

In November 1994, three groundwater monitoring wells (MW) were installed at C-52N (MW-94-52-01 through -03), and five wells were installed at C-62 (MW-94-62-01 through -05). Three rounds of quarterly baseline sampling were conducted in November and December 1994, and the following March and May 1995. Twenty-two rounds of quarterly groundwater monitoring events were performed between September 1996 and January 2002. The purpose of these quarterly sampling events was to establish baseline conditions for each site. Based on the first three quarters of baseline groundwater sampling and analyses, a set of analytical parameters was established by Eglin AFB and the FDEP to monitor groundwater quality. These parameters included explosives, nitrate, and nitrite. In addition to these parameters, groundwater samples collected from the OB/OD unit at Range C-62 were analyzed for benzene, ethylbenzene, toluene, and total xylenes (BTEX).

Since 2002, the groundwater monitoring plan at the OB/OD unit at Range C-52N has consisted of one upgradient background (BG) well (MW-94-52-01) and two Point of Compliance (POC) wells (MW-94-52-02 and -03). Monitoring at Range C-62 has included sampling from one upgradient background well (MW-94-62-01) and four POC wells (MW-94-62-02 through -05).

2.0 Groundwater Monitoring Requirements

The C-52N and C-62 annual environmental monitoring reports document detection monitoring in accordance with 40 Code of Federal Regulations 264.98 and include groundwater monitoring information pursuant to Part IV, Subparts A, B, C and D of the current permit. Sampling and analytical procedures are conducted in accordance with the following documents:

- FDEP Permit No. 006176-009-HO, Part IV Environmental Monitoring Conditions
- Sampling and Analysis Plan, Ranges C-52 North and C-62 Open Burn/Open Detonation (OB/OD) Units (Eglin AFB, December 2017)
- Standard Operating Procedure (SOP) for Groundwater Sampling, DEP-SOP-001-01 FS 2200, Revised (FDEP, January 2017)
- Chapter 62-160 Quality Assurance (FDEP, April 2019)
- Base Wide Environmental Restoration Work Plan, Revision 6, Eglin AFB, FL, October 2017

The permit requires that the environmental monitoring report should include the following minimum information:

- A map showing all contaminated sites and associated monitoring wells and piezometers (including recovery or extraction, point of compliance, temporary point of compliance, and background wells), surface water features pertinent to the contaminated site and surface water sampling locations, and any areas subject to soil or sediment sampling.
- Reports of any necessary repairs or redevelopment of the wells since the last report.
- Maps of groundwater flow direction(s) and plume delineation(s) (if any) and a table of groundwater elevation data.
- An analysis and evaluation of the current analytical results, including maps, figures, graphs and tables.
- Field sampling logs.
- Laboratory analytical data sheets for the sampling event(s) (electronic copy only).

- An analysis and evaluation of the comprehensive effectiveness of the environmental monitoring program including recommendations to enhance and refine the environmental monitoring plan.
- An updated table(s) containing the information in Part IV.A.3.d. The table shall also indicate the recommendations made in Part IV.A.11.g.
- Automated Data Processing Tool (ADaPT) quality assurance electronic files.

2.1 Monitoring Wells

Monitoring wells were sampled in accordance with Part IV, Subpart C of the current permit. Wells sampled at Range C-52N include MW-94-52-01 (background) and POC wells MW-94-52-02, and MW-94-52-03. At Range C-62, MW-94-62-01 (background), and POC wells MW-94-62-02 through MW-94-62-05 were sampled. Monitoring well locations at each site are presented on **Figure 4** (C-52N) and **Figure 7** (C-62). Monitoring well construction details are provided in **Table 2-1**.

2.2 Groundwater Evaluation

Depth to groundwater and the current total depth at each monitoring well are to be recorded in accordance with Part IV, Subpart A, Conditions No. 5 and 6 of the permit. Depth to groundwater is measured prior to and during sampling, and total depth is measured after sampling. The purpose is to determine groundwater elevations, groundwater flow directions, groundwater hydraulic gradients, groundwater flow rates, and to monitor siltation effects in each of the wells to determine re-development or replacement needs. Due to the safety hazards of possible unexploded ordinances and limited range access time at each site, initial groundwater depths to water were only collected prior to sampling at each well. A full round of measured depths to water for each site were not completed prior to the first sample being collected, as this was not feasible with the time allotted and the safety precautions that are required.

2.3 Analytical Requirements

The updated 2018 permit provides groundwater monitoring concentration levels for a list of analytes that have been historically analyzed, but does not provide specific instruction to analyze for that list of compounds. Therefore, each site was sampled and analyzed in accordance with the

Groundwater Cleanup Target Level (GCTL) list, the analyte list from the previous permit, and in keeping with historical reporting activity. Range C-52N was sampled for explosives and nitrate and nitrite constituents, and C-62 was sampled for explosives, nitrate and nitrite, and BTEX. The list of parameters and analytes are provided in **Table 2-2**.

3.0 Summary of Field Activities

Groundwater monitoring activities occurred on Range C-52N and Range C-62, on May 17 and May 14, 2019 respectively. Representatives from the FDEP were present and conducted a field audit at C-62 (MW-94-62-04) on May 14, 2019 to “determine if the personnel performing the sampling at the facility capably collected samples according to established FDEP/SOP criteria.”

Wells were purged and sampled using an After (Through) Peristaltic Pump (APP) or an electric submersible pump (ESP). At C-52N, MW-94-52-01 was sampled with an ESP while MW-94-52-02 and MW-94-52-03 were sampled with an APP. It was necessary to sample MW-94-52-01 with an ESP due to the depth to water. At C-62, all monitoring wells were sampled with an APP.

Decontamination was performed in accordance with DEP-SOP-001-01, FC 1000. The ESP and APP were decontaminated with Liquinox and distilled water prior to use. The water level probe and associated measuring tape were also decontaminated with Liquinox and distilled water before initial use and between each monitoring well. Dedicated high density polyethylene tubing was used at each well regardless whether the ESP or APP was utilized. Water quality indicator parameters collected prior to sampling include pH, specific conductance, temperature, dissolved oxygen, and turbidity. Indicator parameters, along with well condition, water level, total well depth, and other pertinent data were recorded on Groundwater Sampling Logs (FDEP Form FD 9000-24, January 2017). Logs and calibration forms are provided in **Appendix A**.

Groundwater purging and sampling was performed in accordance with DEP-SOP-001-01, FS 2200, using the “minimal purge volume” technique (Scenario 1, Option 1). Quality Assurance/Quality Control (QA/QC) samples collected included field duplicates for all analyses from MW-94-52-02 and MW-94-62-02, equipment blanks from MW-94-52-01 and MW-94-62-04, and one trip blank (TB) associated with the BTEX samples from C-62. Matrix Spike (MS) and Matrix Spike Duplicates (MSD) were collected at MW-94-52-03 and MW-94-62-03.

Sample analysis for the 2019 Annual Monitoring Event was performed by Eurofins TestAmerica (TestAmerica), Pensacola, Florida. TestAmerica is accredited through the DoD Environmental Laboratory Accreditation Program (ELAP) as detailed in the DoD Quality System Manual for Environmental Laboratories (QSM). TestAmerica is accredited through the National Environmental Laboratory Accreditation Program (NELAP) Comprehensive Quality Assurance Plan (CompQAP), Certifications Number E81010 (Pensacola, FL) and E87667 (Denver, CO).

4.0 Results

This section provides a presentation of field observations, data interpretation, and analytical results.

4.1 Field Observation and Data

Well Condition

Field personnel recorded visible monitoring well conditions for each well sampled. Monitoring wells at both sites (C-52N and C-62) are relatively accessible, marked by four corner posts, and in suitable condition to provide representative groundwater samples.

Depth to water, total depth of monitoring well, and observable well head conditions were measured and/or recorded during the sampling events. Sampling results are incorporated into **Table 3-1** (C-52N) and **Table 3-2** (C-62). Slight differences in total well depth from year to year can be attributed to siltation, settling, instrument inconsistencies, and measurements being taken by different personnel. Each well has been marked to provide a reference point from which to measure, however this marking may not coincide with the measuring point used when the wells were initially installed. Comparison of current well depths to previously recorded well depths indicates a negligible difference between recent measurements. In addition, current depths compared to depths recorded at the time of well installation demonstrate no appreciable difference.

Groundwater Flow (C-52N)

Depth to groundwater and calculated groundwater elevations determined from the sampling event at C-52N are provided in **Table 3-1**. The groundwater flow direction at C-52N on May 17, 2019 was to the south, with a hydraulic gradient measured between MW94-52-01 and MW94-52-02 of approximately 0.010 feet per foot (ft/ft) (**Figure 8**). The flow direction and hydraulic gradient are consistent with previous sampling events. Groundwater flow velocity was calculated utilizing the current calculated groundwater gradient, an assumed 30% effective porosity[1], and hydraulic conductivity of 9.75 feet per day (ft/day) (calculated by FDEP in *Review of the Technical Memorandum: Aquifer Quality Evaluation and Fate Transport Models for OB/OD Units, Ranges C-52N and C-62, Eglin AFB* (FDEP, 2001) using Waterloo

[1] See *Data Summary Report, 2nd Quarter Groundwater Monitoring Data Detection Monitoring Program, Ranges C-52N and C-62* (EA Engineering, 1997).

Hydrogeologic's "Aquifer Test" software), is approximately 0.325 ft/day or 118.6 feet per year (ft/yr). Flow velocity is calculated using the following equation:

Groundwater Velocity = (Hydraulic Conductivity x Hydraulic Gradient) / Porosity

Groundwater Flow (C-62)

Depth to groundwater and calculated groundwater elevations determined from this sampling event are provided in **Table 3-2**. Groundwater flow direction at C-62 on May 14, 2019 was to the southwest, with a hydraulic gradient measured between wells MW94-62-01 and MW94-62-05 of approximately 0.018 feet per foot (ft/ft) (**Figure 9**). The flow direction and hydraulic gradient are consistent with previous sampling events. Groundwater flow velocity calculated utilizing the current calculated groundwater gradient, an assumed 30% effective porosity (EA Engineering, 1997), and a hydraulic conductivity of 0.028 ft/day (FDEP, 2001), is approximately 0.0017 ft/day or 0.62 ft/yr.

4.2 C-52N Analytical Results

Groundwater samples were collected from the three monitoring wells at C-52N on May 17, 2019 and delivered to TestAmerica Pensacola the same day for analysis.

Analytical data was validated against the laboratory's QA/QC limits using the general guidelines and practices promulgated in the United States Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, January 2017) and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (USEPA, January 2017). Analyses are complete, no data qualifications were necessary, and no data was rejected due to QC failure. Analytical data is included in **Appendix A**; a data validation report is included in **Appendix B**; and the analytical data for C-52N is summarized on **Table 3-1**.

Explosive Compounds

Laboratory analysis yielded detections for three explosive compounds at MW-94-52-01 (background well), including 4-amino-2,6-dinitrotoluene (0.14 micrograms per liter [µg/L]), 2-amino-4,6-dinitrotoluene (0.17 µg/L) and RDX (0.58 µg/L). All concentrations are below their respective GCTL. The GCTL's for 4-amino-2,6-dinitrotoluene and 2-amino-4,6-dinitrotoluene is

4.0 µg/L and RDX is 10 µg/L. All concentrations were detected at lower levels than the previous 2018 sampling event.

Nitrate/Nitrite

Nitrate was reported at an estimated value (between the Method Detection Limit [MDL] and Reporting Limit [RL]) in samples collected from MW-94-52-01 (0.047 milligrams per liter [mg/L]) and MW-94-52-02 (0.017 mg/L). The GCTL for nitrate is 10 mg/L. Nitrate was detected at lower levels than the previous 2018 sampling event.

Nitrite was not reported detected in any sample collected from the monitoring network. The GCTL for nitrite is 1 mg/L.

Analytical results for the 2019 C-52N sampling event are consistent with recent historical data.

4.3 C-62 Analytical Results

Groundwater samples were collected from the five C-62 monitoring wells on May 14, 2019 and transported to TestAmerica Pensacola the same day for analysis. Analytical data was validated as described in Section 4.2. Analyses are complete and no data was rejected due to QC failure. Analytical data is included in **Appendix A**; a data validation report is included in **Appendix B**; and the analytical data for C-62 is summarized on **Table 3-2**.

Explosive Compounds

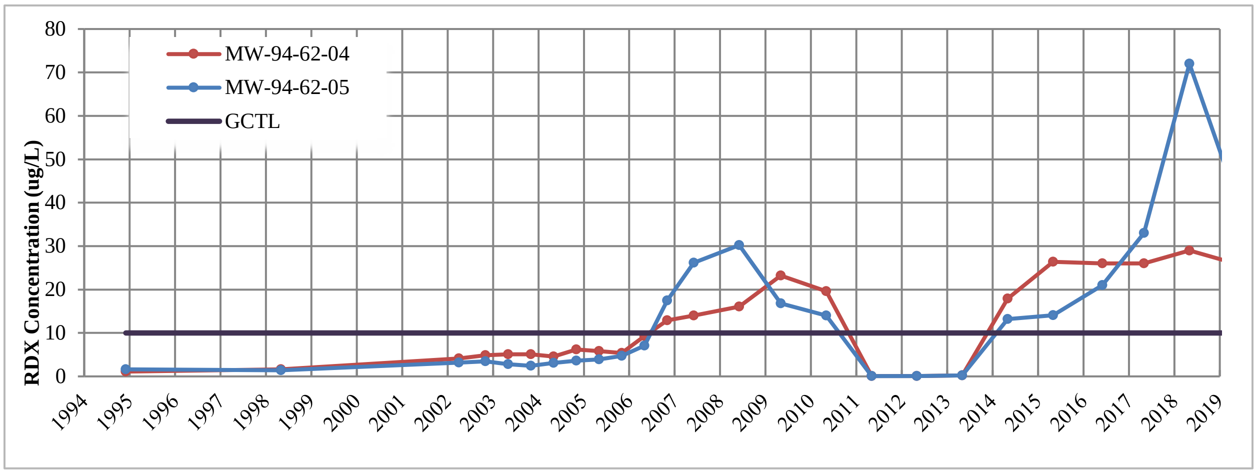
There were reported detections of four explosive compounds in the monitoring network; 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, HMX, and RDX. Laboratory analysis for explosive compounds yielded no detections above respective MDLs for the other compounds analyzed.

Detection of 2-amino-4,6-dinitrotoluene was reported in the duplicate sample at a concentration of 0.40 µg/L. The compound 4-amino-2,6-dinitrotoluene was reported at low levels in samples from MW-94-62-02 and the duplicate sample (0.40 and 0.38 µg/L, respectively). The GCTL for each of these two explosive compounds established in the current permit is 4 µg/L.

HMX was reported at relatively low levels in all samples except MW-94-62-01 (background). Concentrations ranged from an estimated 0.14 µg/L at MW-94-62-02 and 0.15 µg/L at MW-94-

62-03 to 39 µg/L at MW-94-62-04 and 91 µg/L at MW-94-62-05. The GCTL for HMX established in the permit is 350 µg/L.

RDX was reported in samples collected from all five monitoring wells in the network. Concentrations ranged from an estimated 0.17 µg/L at MW-94-62-01 (background), to 52 µg/L at MW-94-62-05. The GCTL established in the permit for RDX is 10 µg/L. Two samples had reported concentrations exceeding the GCTL; MW-94-62-04 (26.0 µg/L) and MW-94-62-05 (52 µg/L). Concentrations of RDX at these two POC wells have had periodic reported exceedances over the years, with reportable concentrations recorded since 1994 (EA, 1995). The accompanying plot summarizes RDX results available since December 1994.



Nitrate/Nitrite

Nitrate was reported at low levels in all samples collected at C-62. Concentrations ranged from 0.012 mg/L to 0.64 mg/L, well below the GCTL of 10 mg/L. However, all reported detections were at concentrations ten times below the GCTL and therefore, positive detections of nitrate were not flagged, and no qualification of the data was required.

Nitrite was not reported detected in any sample collected from the monitoring network. The GCTL for nitrite is 1 mg/L.

BTEX Compounds

Laboratory analysis for BTEX compounds yielded no detections above respective method detection limits for the four compounds analyzed. Analysis of trip blanks for BTEX compounds yielded no detections.

5.0 Conclusions

At Range C-52N, three monitoring wells were analyzed for nitrate, nitrite, and explosive compounds. For this 2019 sampling event, there were no exceedances of the GCTLs provided in the approved 2018 HSWA permit.

At Range C-62, five monitoring wells analyzed for nitrate, nitrite, explosive compounds and BTEX. For this 2019 sampling event, concentrations exceeding the GCTL for RDX (10 µg/L) were reported for two monitoring well locations, MW-94-62-04 (26 µg/L) and MW-94-62-05 (52 µg/L). Detectable concentrations of RDX have been reported since 1995. Concentrations in exceedance of the GCTL were observed from 2006 through 2010, and again since 2014. Concentrations in both monitoring wells were lower than the 2018 sampling results of MW-94-62-04 (29 µg/L) and MW-94-62-05 (72 µg/L) No other analytes were detected at concentrations exceeding permitted GCTLs.

Eglin AFB performed a Human Health and Risk Assessment (HHRA) and submitted to FDEP in February, 2019 for review. The HHRA, modeling data and alternate concentration limits were presented which concluded (LRS, 2019):

- The groundwater RDX concentration at C-52N would drop below the FDEP GCTL by 1,800 feet downgradient from MW-94-52-01.
- The groundwater RDX concentration at C-62 is likely to attenuate significantly within one mile downgradient of the OB and OD units, and is not expected to contribute to offsite groundwater exceedances of the FDEP GCTL for RDX further downgradient.
- It is likely that groundwater that daylights in the headwaters of Blount Mill Creek downgradient of C-62 would not pose a threat to potential receptors.

6.0 References

Bhate, 2004. *Fifth Semi-Annual Monitoring Report – May 2004, Range C-52 North and Range C-62 – Open Burn/Open Detonation Units, Operation Permit No. 0006176-003-HO, Eglin Air Force Base, Florida*. June

CH2M Hill, 2002. *Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.*

EA Engineering, Science and Technology, 1995. *Data Summary Report For Ranges C-52N and C-62, Open Burn/Open Detonation (OB/OD) Units, Eglin Air Force Base, Florida*. March

EA Engineering, Science and Technology, 1997. *Data Summary Report For Ranges C-52N and C-62, Open Burn/Open Detonation (OB/OD) Units, Eglin Air Force Base, Florida*. May

Eglin Air Force Base 2011, *Comprehensive Range Plan – Land Use Plan*.

Eglin Air Force Base, 2017. *Base Wide Environmental Restoration Work Plan*, Revision 6, October.

FDEP, 2001. *Review of the Technical Memorandum: Aquifer Quality Evaluation and Fate Transport Models for OB/OD Units, Ranges C-52N and C-62, Eglin AFB,* August

FDEP, 2010. *Operation Permit 0006176-HO-006*. Florida Department of Environmental Protection, October.

FDEP, 2019. *Chapter 62-160 Quality Assurance,* April.

FDEP, 2017. *Standard Operating Procedure (SOP) FC 1000 Field Decontamination*, January.

FDEP, 2017. *Standard Operating Procedure (SOP) FS 2200 Groundwater Sampling*, January.

FGS, 2001. *Open File Report No. 80, Text to Accompany the Geologic Map of Florida.*

LRS, 2019. *Human Health Risk Assessment, Open Burn/Open Detonation Units, Range C-52N and C-62, Eglin AFB, Florida*.

NOAA, 2019. *National Weather Service Forecast Office – NOAA Online Weather Data for Pensacola Area*. July.

NRCS, 2019. *Web Soil Survey Interactive Map.* Accessed online on July 17, 2019.

USEPA, 2017. *USEPA National Functional Guidelines for Inorganic Superfund Data Review*, January.

USEPA, 2017. *USEPA National Functional Guidelines for Organic Superfund Data Review*, January.

USGS, 2016. *Groundwater Atlas of the United States: Alabama, Florida, Georgia, and South Carolina HA 730-G, The Sand and Gravel Aquifer.*

This page intentionally left blank.

FIGURES

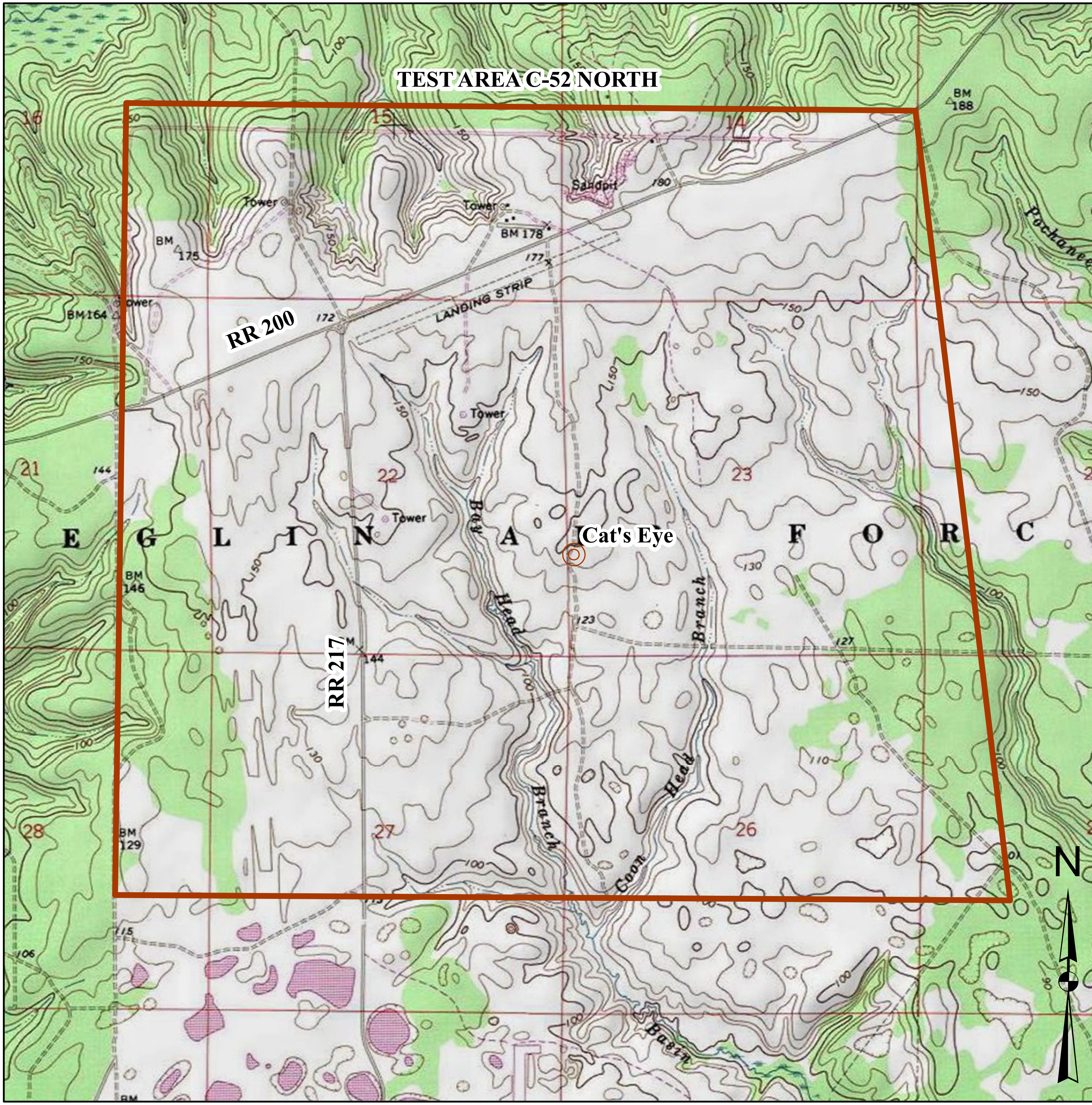
This page intentionally left blank.

ESRI World Topographic Map
(June 2018)

0 15 30 60 90 120 Miles

FIGURE 1
SITE LOCATION MAP

Ranges C-52 North and C-62
Open Burn / Open Detonation
(OB/OD) Unit
Eglin AFB, Florida



USGS Topo Maps
(January 2018)

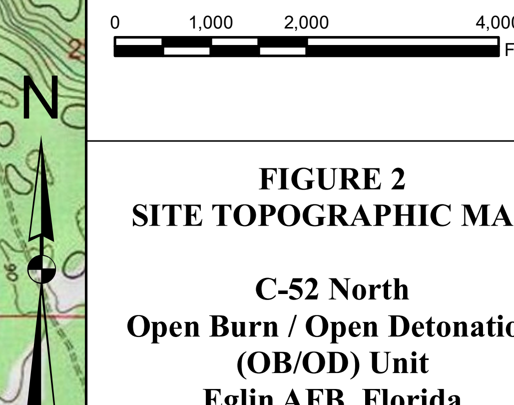
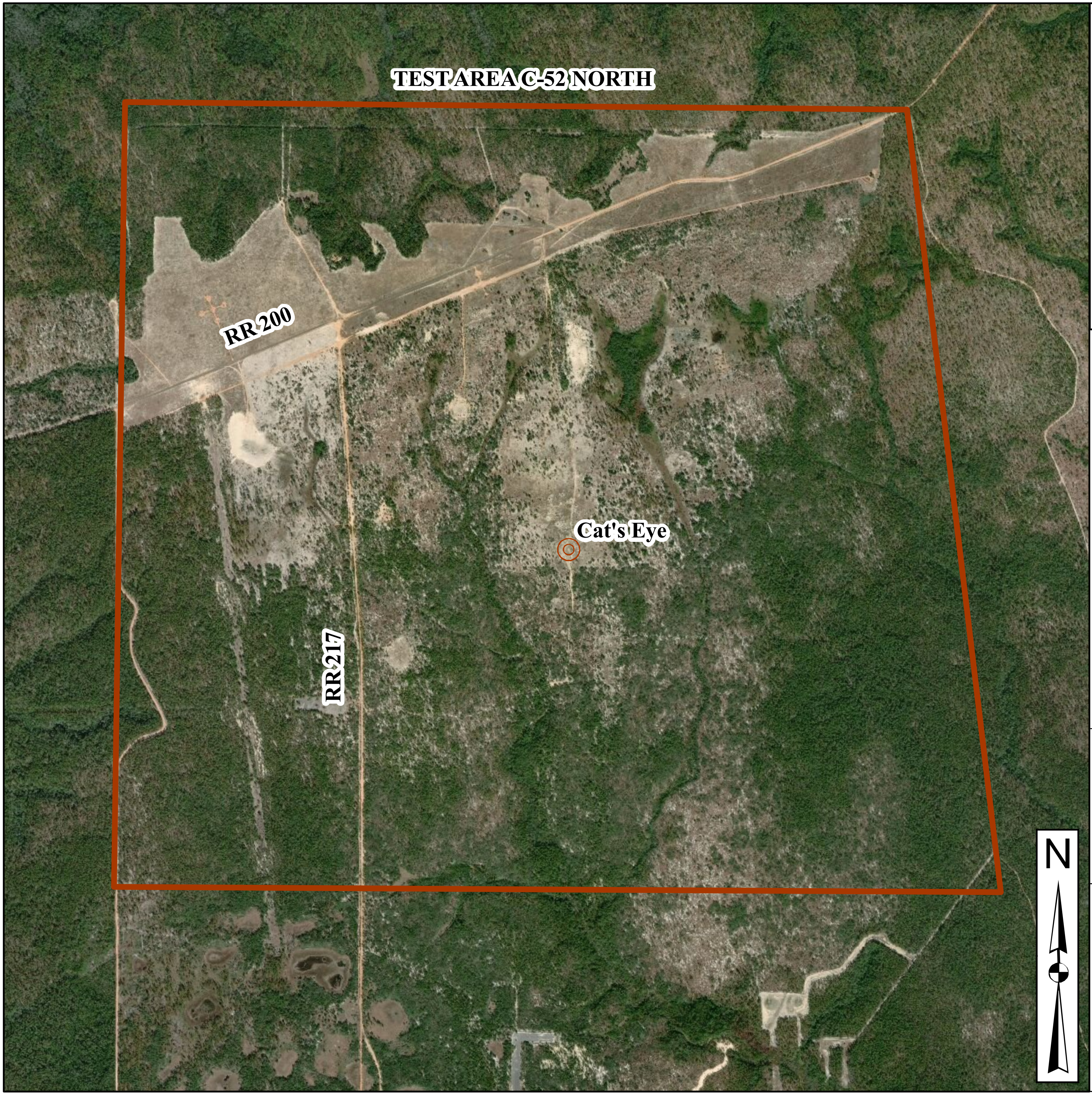
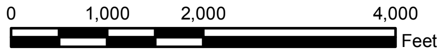


FIGURE 2
SITE TOPOGRAPHIC MAP

C-52 North
Open Burn / Open Detonation
(OB/OD) Unit
Eglin AFB, Florida





DigitalGlobe's WorldView 2 Satellite
(Taken January 29, 2017)

FIGURE 3
SITE AERIAL PHOTOGRAPH

C-52 North
Open Burn / Open Detonation
(OB/OD) Unit
Eglin AFB, Florida

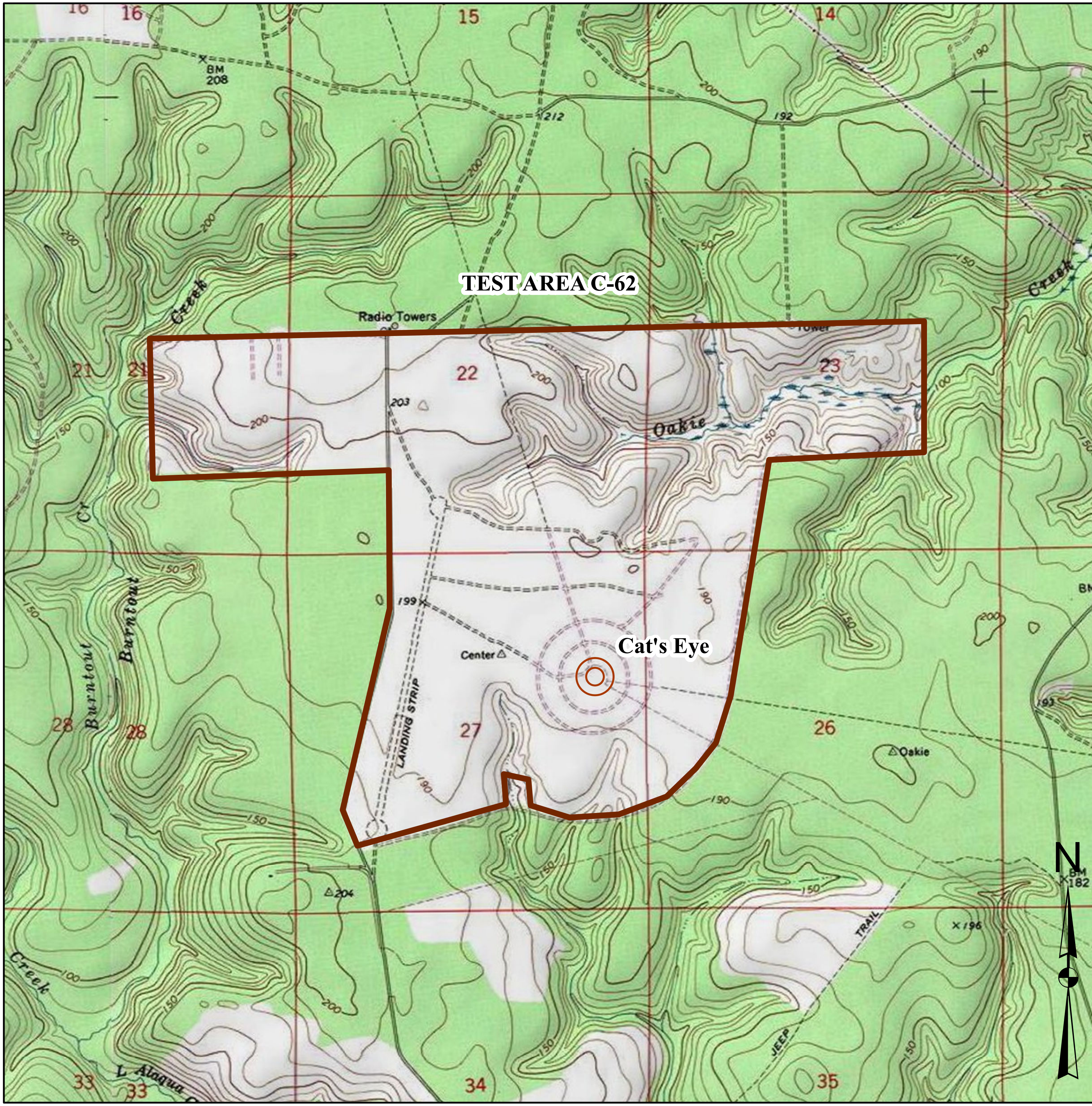
Monitoring Well

DigitalGlobe's WorldView 2 Satellite
(Taken January 29, 2017)

0 250 500 1,000
Feet

FIGURE 4
MONITORING WELL LOCATION

C-52 North
Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



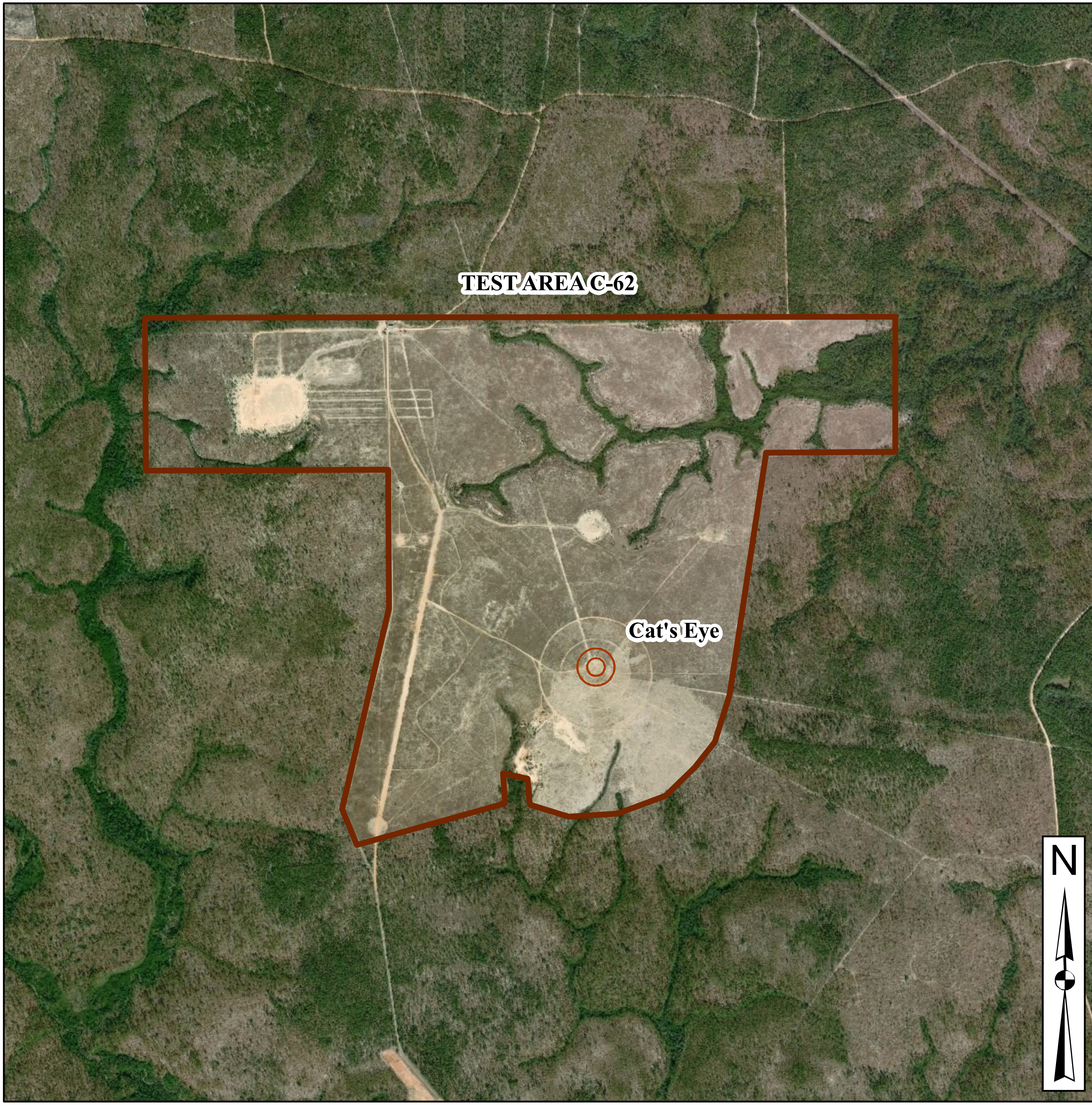
USGS Topo Maps
(January 2018)

0 1,000 2,000 4,000 Feet

N

FIGURE 5
SITE TOPOGRAPHIC MAP

C-62
Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida

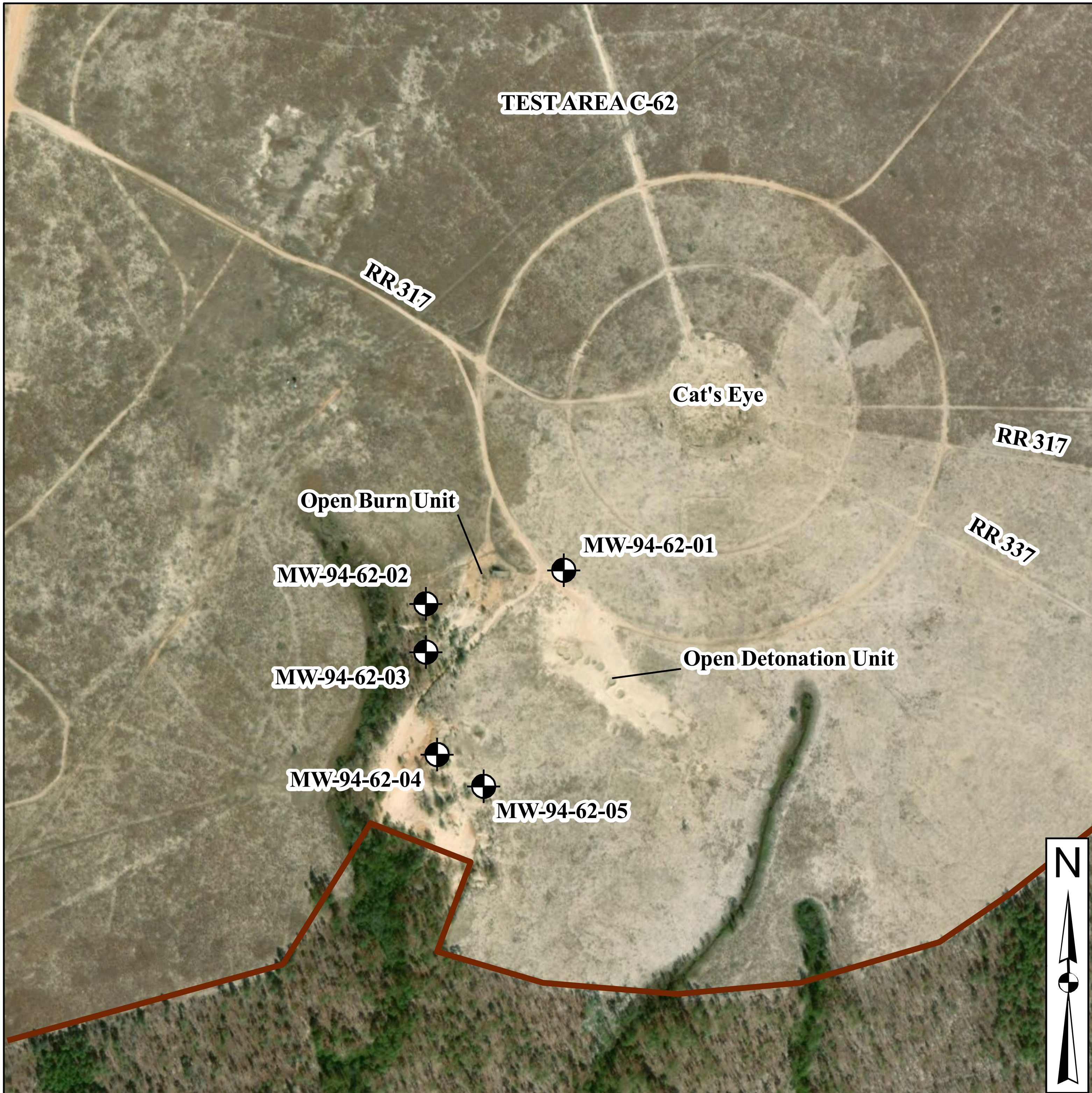


DigitalGlobe's WorldView 2 Satellite
(Taken January 29, 2017)

0 1,000 2,000 4,000 Feet

FIGURE 6
SITE AERIAL PHOTOGRAPH

C-62
Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



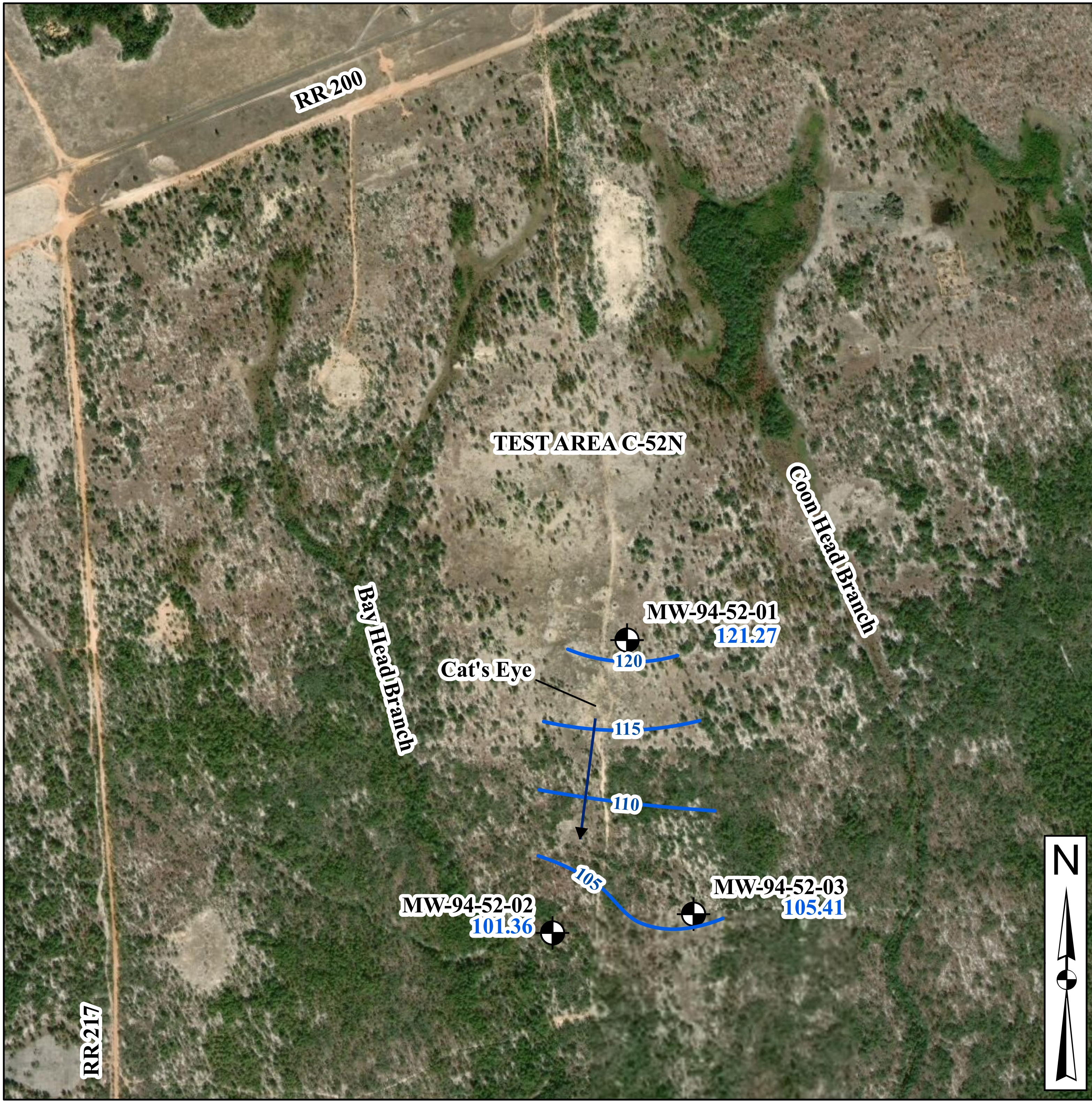
Monitoring Well

DigitalGlobe's WorldView 2 Satellite
(Taken January 29, 2017)

0 250 500 1,000
Feet

FIGURE 7
MONITORING WELL LOCATIONS

C-62
Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



Monitoring Well

Estimated Groundwater Flow Direction

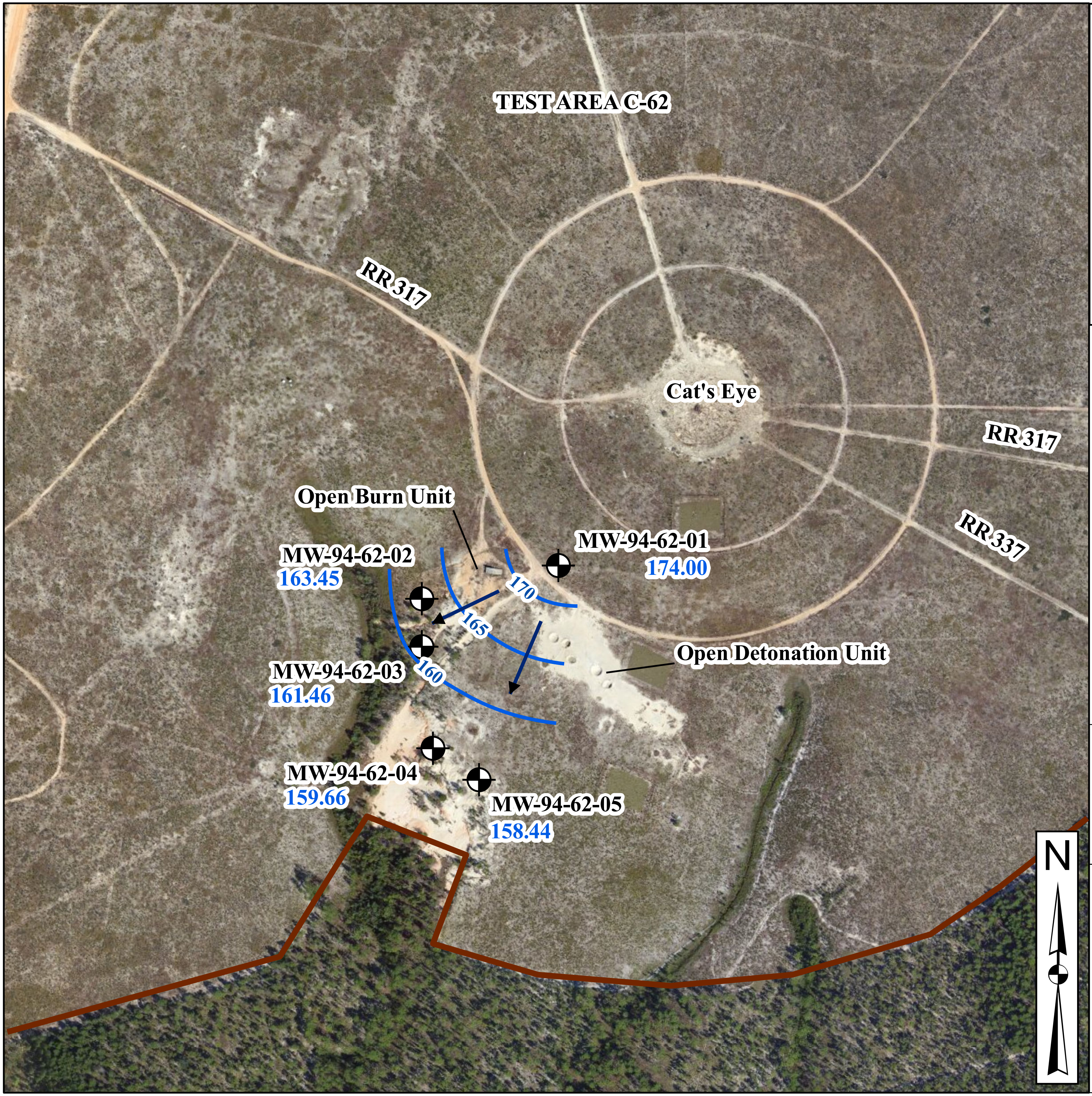
120 Groundwater Elevation Contour (ft NGVD)

DigitalGlobe's WorldView 2 Satellite (Taken January 29, 2017)

0 250 500 1,000 Feet

FIGURE 8
GROUNDWATER FLOW MAP, MAY 2019

C-52 North
Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida



AIR FORCE CIVIL ENGINEER CENTER

Monitoring Well

170 Groundwater Elevation Contour (ft NGVD)

Estimated Groundwater Flow Direction

DigitalGlobe's WorldView 2 Satellite
(Taken January 29, 2017)

0 250 500 1,000
Feet

FIGURE 9
GROUNDWATER FLOW MAP, MAY 2019

C-62
Open Burn / Open Detonation (OB/OD) Unit
Eglin AFB, Florida

This page intentionally left blank.

TABLES

This page intentionally left blank.

TABLE 2-1
Well Construction Details
Range C-52N and C-62
Eglin Air Force Base, Florida

		Well ID	MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-52-01	MW-94-52-02	MW-94-52-03
Location	**WGS 84**	Longitude	-86.2287	-86.2303	-86.2303	-86.2301	-86.2297	-86.3244	-86.3259	-86.3229
	Decimal Degrees	Latitude	30.6414	30.6411	30.6406	30.6396	30.6393	30.5669	30.5616	30.5622
Ground Surface Elevation			188.42	173.80	172.52	178.86	178.13	154.94	115.86	125.53
Top of Casing		ft NGVD	188.22	173.55	172.36	178.50	177.81	156.73	115.54	125.34
Screen Length		feet	10	10	10	10	10	10	10	10
Screen Interval			25' to 35'	30' to 40'	30' to 40'	29' to 39'	30' to 40'	35' to 45'	30' to 40'	30' to 40'
Total Well Depth		ft NGVD	153.22	133.55	132.36	138.50	138.81	111.73	75.54	85.34
Total Well Depth		ft btoc	35.00	40.00	40.00	40.00	39.00	45.00	40.00	40.00
Well Material		---	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Well Diameter		inches	4	4	4	4	4	4	4	4
Permit Designation		---	BG	POC	POC	POC	POC	BG	POC	POC

NGVD = National Geodetic Vertical Datum, btoc = below top of casing, PVC = Polyvinyl Chloride, BG = Background well, POC = Point of Compliance

Table 2-2
Permit Analytical Requirements
Range C-52N and C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-HO-007	MW-94-52-01	MW-94-52-02	MW-94-52-03	MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05
WELL INFORMATION	Permit Designation	Background	POC	POC	Background	POC	POC	POC	POC
	Top of well casing	x	x	x	x	x	x	x	x
	Water level (At time of sampling)	x	x	x	x	x	x	x	x
	Water elevation	x	x	x	x	x	x	x	x
	Well condition	x	x	x	x	x	x	x	x
	Well ID.	x	x	x	x	x	x	x	x
	Well depth	x	x	x	x	x	x	x	x
FIELD PARAMETERS	pH	x	x	x	x	x	x	x	x
	Specific Conductance	x	x	x	x	x	x	x	x
	Temperature	x	x	x	x	x	x	x	x
	Dissolved oxygen	x	x	x	x	x	x	x	x
	Turbidity	x	x	x	x	x	x	x	x
	Purging data	x	x	x	x	x	x	x	x
	Notes	x	x	x	x	x	x	x	x
GENERAL PARAMETERS	Nitrate	x	x	x	x	x	x	x	x
	Nitrite	x	x	x	x	x	x	x	x
EXPLOSIVES PARAMETERS	HMX	x	x	x	x	x	x	x	x
	RDX	x	x	x	x	x	x	x	x
	1,3-Dinitrobenzene	x	x	x	x	x	x	x	x
	2,6-Dinitrotoluene	x	x	x	x	x	x	x	x
	2,4-Dinitrotoluene	x	x	x	x	x	x	x	x
	2-amino-4, 6-Dinitrotoluene	x	x	x	x	x	x	x	x
	4-amino-2, 6-Dinitrotoluene	x	x	x	x	x	x	x	x
	2-Nitrotoluene	x	x	x	x	x	x	x	x
	3-Nitrotoluene	x	x	x	x	x	x	x	x
	4-Nitrotoluene	x	x	x	x	x	x	x	x
	1,3,5 Trinitrobenzene	x	x	x	x	x	x	x	x
	2,4,6 Trinitrotoluene	x	x	x	x	x	x	x	x
BTEX	Benzene				x	x	x	x	x
	Ethylbenzene				x	x	x	x	x
	Toluene				x	x	x	x	x
	Total Xylenes				x	x	x	x	x

Field Duplicates, Equipment Blanks, MS/MSD and Trip Blanks analyzed under the same requirements as the associated wells.

TABLE 3-1
Water Quality Summary - May 2019
Range C-52N
Eglin Air Force Base, Florida

	FDEP Permit # 006176-009-HO				MW-94-52-01	MW-94-52-02	MW-94-52-03	MW-94-52-02-DUP	C-52N EB
	Parameter	**Method**	**Unit**	**GCTL**	Sampled May 17, 2019				Equipment Blank
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	---
	Top of Casing	---	feet NGVD	---	156.73	115.54	125.34	115.54	---
	Water level (Day of sampling)	EPA SOP	feet BTOC	---	35.46	14.18	19.93	14.18	---
	Water elevation	calculation	feet NGVD	---	121.27	101.36	105.41	101.36	---
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	---
	Well Inside Diameter	---	inches	---	4	4	4	4	---
	Well depth	EPA SOP	feet BTOC	---	45.15	39.36	39.71	39.36	---
FIELD PARAMETERS	Color	observation	---	---	lt. brown tint	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	4.53	4.40	4.08	4.40	---
	Specific Conductance (field)	120.1	mS/cm	---	0.013	0.015	0.015	0.015	---
	Temperature	170.1	˚C	---	24.34	21.44	21.49	21.44	---
	Dissolved oxygen	360.1	3	---	6.74	3.80	5.19	3.80	---
	Turbidity	180.1	NTU	---	8.10	1.85	0.51	1.85	---
	Purging rate	---	gpm	---	0.20	0.10	0.10	0.10	---
GENERAL PERAMETERS	Nitrogen, Nitrate	EPA 300.0	mg/L	10	*0.047*	*0.017*	0.012	*0.015*	0.012
	Nitrogen, Nitrite	EPA 300.0	mg/L	1	0.021	0.021	0.021	0.021	0.021
	Final pH (lab)	150.1	standard units	6.5-8.5	5.5	5.6	5.4	5.7	5.6
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.20	0.20	0.20	0.20	0.20
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.7	0.088	0.089	0.089	0.089	0.09
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.160	0.160	0.160	0.160	0.16
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.6	0.084	0.084	0.084	0.084	0.085
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.2	0.064	0.064	0.065	0.064	0.065
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	*0.17*	0.051	0.051	0.051	0.051
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.085	0.085	0.086	0.085	0.087
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.19	0.19	0.20	0.19	0.20
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	*0.14*	0.058	0.058	0.058	0.058
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.20	0.20	0.20	0.20	0.20
	HMX	SW846 8330	µg/L	350	0.087	0.087	0.088	0.088	0.089
	RDX	SW846 8330	µg/L	10	0.58	0.160	0.160	0.160	0.16

Notes:
Grayscale indicates value less than or equal to method detection limit (MDL)
Italics indicate result between MDL and reporting limit (RL)
Underlined results are estimated low
Redscale indicates an exceedance of GCTL
GCTLs are from current FDEP Permit # 0006176-009-HO
Laboratory: Test America, Pensacola, FL and Denver, CO
MS/MSD volume collected

POC: Point of Compliance
GCTL: Groundwater Cleanup Target Level
NGVD: National Geodetic Vertical Datum
EPA: Environmental Protection Agency
SOP: Standard Operation Procedure
mS/cm: millisiemens per centimeter
˚C: degree Celsius

mg/L: milligrams per liter
mV: millivolts
NTU: Nephelometric Turbidity Unit
gpm: gallons per minute
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and total xylenes

TABLE 3-2
Water Quality Summary - May 2019
Range C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-009-HO				MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-62-02-DUP	C-62 EB	C-62 TD
	Parameter	Method	Unit	GCTL	Sampled May 14, 2019						Equipment Blank	
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	POC	POC	---	---
	Top of Casing	---	feet NGVD	---	188.22	173.55	172.36	178.50	177.81	173.55	---	---
	Water level (Day of Sampling)	EPA SOP	feet BTOC	---	14.22	10.10	10.90	18.84	19.37	10.10	---	---
	Water elevation	calculation	feet NGVD	---	174.00	163.45	161.46	159.66	158.44	163.45	---	---
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	Okay	Okay	---	---
	Well Inside Diameter	---	inches	---	4	4	4	4	4	4	---	---
	Well depth	EPA SOP	feet BTOC	---	34.25	38.90	39.63	38.90	39.41	38.90	---	---
FIELD PARAMETERS	Color	observation	---	---	clear	clear	clear	clear	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	4.04	4.38	4.35	5.69	4.44	4.38	---	---
	Specific Conductance (field)	120.1	mS/cm	---	0.008	0.012	0.012	0.024 **	0.016 **	0.012	---	---
	Temperature	170.1	˚C	---	22.54	22.65	22.28	22.20	22.46	22.65	---	---
	Dissolved oxygen	360.1	mg/L	---	7.56	7.25	6.85	7.62	7.93	7.25	---	---
	Turbidity	180.1	NTU	---	0.45	1.96	1.57	2.44	1.51	1.96	---	---
	Purging rate	---	gpm	---	0.10	0.10	0.10	0.10	0.10	0.10	---	---
GENERAL PARAMETERS	Nitrogen, Nitrate	EPA 300.0	mg/L	10	0.012	0.15	*0.10*	0.64	0.42	0.16	0.012	---
	Nitrogen, Nitrite	EPA 300.0	mg/L	1	0.021	0.021	0.021	0.021	0.021	0.021	0.021	---
	Final pH (lab)	150.1	standard units	6.5-8.5	5.5	5.9	6.3	6.7	5.7	5.3	5.5	
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.20	0.20	0.21	0.21	0.20	0.20	0.22	---
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.70	0.088	0.089	0.095	0.094	0.09	0.089	0.098	---
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.160	0.160	0.17	0.170	0.16	0.16	0.18	---
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.60	0.083	0.084	0.089	0.088	0.085	0.084	0.093	---
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.20	0.064	0.065	0.069	0.068	0.066	0.064	0.072	---
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.05	0.051	0.054	0.054	0.052	0.40	0.056	---
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.085	0.086	0.091	0.090	0.087	0.085	0.095	---
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.190	0.20	0.21	0.210	0.20	0.19	0.22	---
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.057	0.40	0.062	0.061	0.059	0.38	0.064	---
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.20	0.20	0.21	0.21	0.20	0.20	0.22	---
	HMX	SW846 8330	µg/L	350	0.087	0.14	0.15	39	91	0.55	0.097	---
	RDX	SW846 8330	µg/L	10	*0.17*	2.90	3.90	**26**	**52**	2.90	0.18	---
BTEX	Benzene	SW846 8260B	µg/L	1	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	Ethylbenzene	SW846 8260B	µg/L	30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Toluene	SW846 8260B	µg/L	40	0.41	0.41	0.50	0.41	0.41	0.41	0.41	0.41
	Total Xylenes	SW846 8260B	µg/L	20	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60

Notes:

Grayscale indicates value less than or equal to method detection limit (MDL)
Italics indicate result between MDL and reporting limit (RL)
Underlined results are estimated low
Redscale indicates an exceedance of GCTL
GCTLs are from current FDEP Permit # 0006176-009-HO
Laboratory: Test America, Pensacola, FL and Denver, CO
MS/MSD volume collected

POC: Point of Compliance
GCTL: Groundwater Cleanup Target Level
NGVD: National Geodetic Vertical Datum
EPA: Environmental Protection Agency
SOP: Standard Operation Procedure
mS/cm: millisiemens per centimeter
˚C: degree Celsius

mg/L: milligrams per liter
mV: millivolts
NTU: Nephelometric Turbidity Unit
gpm: gallons per minute
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and total xylenes

** In the process of calibrating the two YSI meters used to obtain groundwater parameters, one unit was calibrated to a value in which the decimal point was omitted for the value for specific conductance. The value of 1409 was entered during calibration, rather than 1.409, resulting in the reported values during sampling being multipled by 1,000 (ex. 16 v. 0.016).

APPENDIX A
Water Quality

Groundwater Sampling Logs
&
Calibration Forms

LRS FEDERAL

Instrument Calibration Log

Project Name: C-52N

Date: 5-17-19

Project Number:

Calibrating Personnel: J. Williams

Time of Calibration: 05:39

Weather Conditions: Clear

Barometric Pressure: 30.02 inches Hg x 25.4 = 762.5 mm Hg

Taken @ 11:35

CALIBRANT	INSTRUMENT	INITIAL READING	VALUE ENTERED	FINAL READING	TIME	TEMP	EOD Reading	EOD TEMP
pH 7.00	556 MPS	7.07	7.0	7.00	5:43	24.16	7.12	32.85
pH 4.00	" "	3.90	4.0	4.00	5:47	24.66	4.06	33.12
PH 10.0	" "	10.02	10.0	10.01	5:49	24.81	9.94	31.74
Conductivity: 1.409	" "	1.347	1.409	1.409	5:55	24.73	1.423	31.38
Turbidity (0.0 NTU)	2020WE	0.2	0.0	0.2	5:55	24.58	0.23	30.1
Turbidity (10.0 NTU)	2020 WE	~~10.0~~ 9.84	10.0	10.02	5:54	24.58	10.16	30.1
DO (mg/L)	" "	8.14	~~762.5~~ JW	8.34	6:05	24.73	7.30	31.19
DO%	" "	98.0	~~762.5~~ JW	100.4	6:05	24.73	98.5	31.19

Notes:

Copy of LRS Field Forms.xls
Inst Calibration

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: C-52N		SITE LOCATION: Eglin AFB, FL			
WELL NO: MW-94-52-01		SAMPLE ID: MW-94-52-01		DATE: 5/~~16~~ 17/19	

PURGING DATA

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/8	WELL SCREEN INTERVAL DEPTH: 35 feet to 45 feet	STATIC DEPTH TO WATER (feet): 35.46	PURGE PUMP TYPE OR BAILER: ESP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= .04 gallons + (0.006 gallons/foot X 45 feet) + 0.1 gallons = 0.41 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 40	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 40	PURGING INITIATED AT: 1027	PURGING ENDED AT: 1045	TOTAL VOLUME PURGED (gallons): 3.6

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) μmhos/cm or μS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1035	1.8	1.8	0.2	35.51	4.46	24.24	0.013	6.67	10.5	slight brown tint	None
1038	0.6	2.4	0.2	35.51	4.49	24.23	0.013	6.93	9.8		
1041	0.6	3.0	0.2	35.51	4.48	24.17	0.013	6.89	8.5		
1044	0.6	3.6	0.2	35.51	4.53	24.34	0.013	6.74	8.1		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016
PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: LRS Federal	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1050	SAMPLING ENDED AT: 1052
PUMP OR TUBING DEPTH IN WELL (feet): 40	TUBING MATERIAL CODE: HDPE	FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: ____ μm
FIELD DECONTAMINATION: PUMP Y N	TUBING Y N (replaced)	DUPLICATE: Y N	

SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME mL	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW-94-52-01	2	AG	500	None, Ice	0	Check w/lab	8330 A	ESP	757
MW-94-52-01	1	HDPE	250	None, Ice	0		NO_3 NO_2	ESP	757

REMARKS:
Total depth: 45.15 Lat/Long: 30.5669/-86.3247

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Equipment Blank time: 1055

Field Blank @ 1105

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: C-52N		SITE LOCATION: Eglin AFB, FL	
WELL NO: MW-94-52-02	SAMPLE ID: MW-94-52-02		DATE: 5/~~16~~17/19

PURGING DATA

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL DEPTH: 30 feet to 40 feet	STATIC DEPTH TO WATER (feet): 14.18	PURGE PUMP TYPE OR BAILER: APP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= 0 gallons + 0.0014 gallons/foot X 42 feet) + 0.1 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 34	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 34	PURGING INITIATED AT: 8:25	PURGING ENDED AT: 8:40	TOTAL VOLUME PURGED (gallons): 1.4

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) μmhos/cm or μS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
8:30	0.5	0.5	.1	14.29	4.53	21.46	0.015	3.91	1.53	clear	none
8:33	0.3	0.8	.1	14.29	4.46	21.46	0.015	3.88	1.99		
8:36	0.3	1.1	.1	14.29	4.40	21.44	0.015	3.87	1.95		
8:39	0.3	1.4	.1	14.29	4.40	21.44	0.015	3.80	1.85		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016
PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: LRS Federal	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 8:45 am	SAMPLING ENDED AT: 850
PUMP OR TUBING DEPTH IN WELL (feet): 34	TUBING MATERIAL CODE: HDPE	FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: ____ μm
FIELD DECONTAMINATION: PUMP Y N	TUBING Y N (replaced)	DUPLICATE: Y	

SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME mL	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW-94-52-02	2	AG	500	None, Ice	0	Check w/ lab	8330A	APP	378
MW-94-52-02	1	HDPE	250	None, Ice	0		NO_3, NO_2	APP	378

REMARKS:
Total depth: 39.35 Duplicate collected time: 9:00am

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

* Replaced well cap w/ 4" cap

Lat 30.5622 / -86.3257 Long

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: C-52N		SITE LOCATION: Eglin AFB, FL	
WELL NO: MW-94-52-03	SAMPLE ID: MW-94-52-03		DATE: 5/17/19

PURGING DATA

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL DEPTH: 30 feet to 40 feet	STATIC DEPTH TO WATER (feet): 19.93	PURGE PUMP TYPE OR BAILER: APP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= 0 gallons + 0.0014 gallons/foot X 45 feet) + 0.1 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 34	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 34	PURGING INITIATED AT: 907	PURGING ENDED AT: 931	TOTAL VOLUME PURGED (gallons): 2.3

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) μmhos/cm or μS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
912	0.5	0.5	0.1	19.96	3.98	21.37	0.015	4.83	0.90	clear	none
915	0.3	0.8	0.1	19.96	3.77	21.40	0.015	4.69	0.80		
918	0.3	1.1	0.1	19.96	3.94	21.41	0.015	4.77	0.75		
921	0.3	1.4	0.1	19.96	3.88	21.40	0.015	5.09	0.65		
924	0.3	1.7	0.1	19.96	~~4.34~~ 4.19	21.34	0.015	5.13	0.60		
927	0.3	2.0	0.1	19.96	4.18	21.35	0.015	5.09	0.50		
930	0.3	2.3	0.1	19.96	4.08	21.49	0.015	5.19	0.51		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016
PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: LRS Federal	SAMPLER(S) SIGNATURE(S): [signatures]	SAMPLING INITIATED AT: 935	SAMPLING ENDED AT: 946
PUMP OR TUBING DEPTH IN WELL (feet): 34	TUBING MATERIAL CODE: HDPE	FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: ____ μm
FIELD DECONTAMINATION: PUMP Y N	TUBING Y N (replaced)	DUPLICATE: Y N	

SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW-94-52-03	6	AG	500	None, Ice	0	check w/ lab	8330 A	APP	378
MW-94-52-03	3	HDPE	250	None, Ice	0		NO_3 NO_2	APP	378

REMARKS:
Total Well depth: 39.71 MS/MSD collected: 935

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Lat/Long: 30.5626/-86.3238

GW Sampling @ Eglin AFB
Site: C-52N

5/17/19*

Check-in w/ EOD personnel: 6:40a
Arrived on location: 8:17a

Completed/Left site: 12:03 pm

Loaded mule w/ equipment & completed calibration; discussed safety

EOD Escorts
SSgt Chad Bennett
SSgt Ryan Burks

Sampling Team
Kevin Doyle, Karen Pearson
Jessica Williams

Note: bring spray paint/markers to better indicate where wells are located.

Replaced well cap at MW-94-52-02.
Field blank collected @ 11:05

Upon completion, chain of custody forms were reviewed/completed. Samples were delivered to Test America in Pensacola.

Sampling logs & calibration forms were reviewed & discussed.

* Mission for sampling was originally scheduled for 5/16/19. This was cancelled & rescheduled for 5/17/19.

This page intentionally left blank.

LRS FEDERAL

Instrument Calibration Log

Project Name: C-62

Date: 5-14-19

Project Number:

Calibrating Personnel: D. Parker

Time of Calibration: 0645

Weather Conditions: 63°F, Sunny

Barometric Pressure: 29.97 inches Hg x 25.4 = 761.24 mm Hg

(*used for wells 1, 2, 3)

CALIBRANT	INSTRUMENT	INITIAL READING	VALUE ENTERED	FINAL READING	TIME	TEMP	EOD Reading	EOD TEMP
pH 7.00	YSI 556	7.07	7.00	7.00	0649 DP	20.5°C	7.06	26.42
pH 4.00	YSI 556	3.90	4.00	3.98	0656	"	4.09	25.02
PH 10.0	YSI 556	9.91	10.00	10.00	0652	"	10.06	24.85
Conductivity: 1.409	YSI 556	1.477	1.409	1.409	0700	"	1.302	28.12
Turbidity (0.0 NTU)	LaMotte 2020	0.00	0.00	0.00	0824	"	0.43	22.80
Turbidity (10.0 NTU)	LaMotte 2020	10.20	10.00	10.00	0822	"	9.53	22.80
DO (mg/L)	YSI 556	8.33		8.67	0703	"	7.33	28.16
DO%	YSI 556	94.1		100.2	0703	"	93.5	28.16

Notes:

Copy of LRS Field Forms.xls
Inst Calibration

Instrument Calibration Log

LRS FEDERAL

Project Name: C-62

Date: 5-14-19

Project Number:

Calibrating Personnel: Karen Pearson

Time of Calibration: 6:47 am

Weather Conditions: 63°F, Sunny

Barometric Pressure: 29.97 inches Hg x 25.4 = 761.24 mm Hg

(Used for * wells 04 & 05 *)

CALIBRANT	INSTRUMENT	INITIAL READING	VALUE ENTERED	FINAL READING	TIME	TEMP	EOD Reading	EOD TEMP
							@ 12:10	
pH 7.00	YSI 556 MPS	~~7.12~~ 7.02	7.00	7.00	~~6:55~~ 6:59	19.44°C	7.02	25.61
pH 4.00	|	3.93	4.00	3.99	7:03	20.27°C	3.91	24.05
PH 10.0	|	9.96	10.00	10.00	~~10~~ 7:02	20.25°C	9.95	24.21
Conductivity: 1.409	YSI 556 MPS	1404	1409	1409	6:52	19.40°C	1355/ [illegible]	27.38
Turbidity (0.0 NTU)	LaMotte 2020	0.13	0.00	0.00	0826	20.25°C	1.28	22.80
Turbidity (10.0 NTU)	LaMotte 2020	9.97	10.00	10.00	0825	20.25°C	11.00	22.80
DO (mg/L)	YSI 556 MPS	9.17	[illegible]	8.90	7:10	21.21°C	86.66	28.95
DO%	"	103.2	[illegible]	100.2	7:10	21.21°C	86.2	28.95

Notes:

Copy of LRS Field Forms.xls
Inst Calibration

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: C-62		SITE LOCATION: Eglin AFB			
WELL NO: MW-94-62-01		SAMPLE ID: MW-94-62-01		DATE: 5/14/19	

PURGING DATA

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL DEPTH: 25 feet to 35 feet	STATIC DEPTH TO WATER (feet): 14.22	PURGE PUMP TYPE OR BAILER: APP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= 0 gallons + (0.0014 gallons/foot X 37 feet) + 0.1 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 29	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 29	PURGING INITIATED AT: 1131	PURGING ENDED AT: 1156	TOTAL VOLUME PURGED (gallons): 2.1

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) μmhos/cm or μS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1140	0.5	0.5	0.1	14.24	4.17	22.62	0.008	7.77	0.34	clear	none
1143	0.3	0.8	0.1	14.25	4.19	22.66	0.008	7.53	0.39	clear	none
1146	0.3	1.1	0.1	14.25	4.22	22.82	0.008	7.33	0.50	clear	none
1149	0.3	1.4	0.1	14.28	4.16	22.56	0.008	7.60	0.54	clear	none
1152	0.3	1.7	0.1	14.29	4.06	22.53	0.008	7.65	0.77	clear	none
1155	0.3	2.0	0.1	14.30	4.04	22.54	0.008	7.56	0.45	clear	none

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016
PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Don Parker	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1156	SAMPLING ENDED AT: 1202
PUMP OR TUBING DEPTH IN WELL (feet): 29	TUBING MATERIAL CODE: HDPE	FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: ____ μm
FIELD DECONTAMINATION: PUMP Y N	TUBING Y N (replaced)	DUPLICATE: Y N	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION (including wet ice)			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			
MW-94-62-01	3	CG	40 mL	HCL, ice	0	~~4.04~~	8260 B	APP	~~378~~ 100
MW-94-62-01	2	AG	500mL	none, ice	0	~~4.04~~	8330 A	APP	378
MW-94-62-01	1	HDPE	250 mL	none, ice	0	~~4.04~~	NO_3, NO_2	APP	378
						Check			
						by lab			

REMARKS:
Total Depth: 34.25

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: C-62		SITE LOCATION: Eglin AFB, FL	
WELL NO: MW-94-62-02	SAMPLE ID: MW-94-62-02		DATE: 5/14/19

PURGING DATA

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL DEPTH: 30 feet to 40 feet	STATIC DEPTH TO WATER (feet): 10.10	PURGE PUMP TYPE OR BAILER: APP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= 0 gallons + (0.0014 gallons/foot X 41 feet) + 0.1 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 33	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 33	PURGING INITIATED AT: 1023	PURGING ENDED AT: 1045	TOTAL VOLUME PURGED (gallons): 1.8

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~μmhos/cm~~ or μS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1032	0.5	0.5	0.1	10.94	4.48	22.72	0.012	7.53	2.57	clear	none
1035	0.3	0.8	0.1	11.15	4.44	22.61	0.012	7.52	4.48	clear	none
1038	0.3	1.1	0.1	11.32	4.47	22.71	0.012	7.40	2.69	clear	none
1041	0.3	1.4	0.1	11.48	4.45	22.74	0.012	7.35	2.25	clear	none
1044	0.3	1.7	0.1	11.62	4.38	22.65	0.012	7.25	1.96	clear	none

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Dan Parker	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1045	SAMPLING ENDED AT: 1059
PUMP OR TUBING DEPTH IN WELL (feet): 33	TUBING MATERIAL CODE: HDPE	FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: ____ μm
FIELD DECONTAMINATION: PUMP Y N	TUBING Y N (replaced)	DUPLICATE: Y N	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION (including wet ice)			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			
MW-94-62-02	6	CG	40mL	HCl, ice	0	~~4.38~~	8260 B	APP	~~378~~ 100
MW-94-62-02	4	AG	500mL	none, ice	0	~~4.38~~	8330 A	APP	378
MW-94-62-02	2	HDPE	250mL	none, ice	0	~~4.38~~	NO_3 NO_2	APP	378
						Check by lab			

REMARKS:
Total Depth: 38.90 Duplicate time: 1045

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. **The above do not constitute all of the information required by Chapter 62-160, F.A.C.**
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: C-62		SITE LOCATION: Eglin AFB, FL	
WELL NO: MW-94-62-03	SAMPLE ID: MW-94-62-03		DATE: 5/14/19

PURGING DATA

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL DEPTH: 30 feet to 40 feet	STATIC DEPTH TO WATER (feet): 10.90	PURGE PUMP TYPE OR BAILER: APP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= 0 gallons + (0.0014 gallons/foot X 42 feet) + 0.1 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 34	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 34	PURGING INITIATED AT: 0913	PURGING ENDED AT: 0938	TOTAL VOLUME PURGED (gallons): 2.2

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) μmhos/cm or μS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
0921	0.5	0.5	0.1	11.52	4.50	22.21	0.017	7.52	1.69	Clear	none
0924	0.3	0.8	0.1	11.60	4.46	22.19	0.015	7.30	0.89	clear	none
0927	0.3	1.1	0.1	11.67	4.40	22.20	0.013	7.46	0.88	clear	none
0930	0.3	1.4	0.1	11.73	4.39	22.27	0.012	7.12	0.89	Clear	none
0933	0.3	1.7	0.1	11.78	4.33	~~22.30~~	0.012	6.97	1.40	clear	none
0936	0.3	2.0	0.1	11.79	4.35	22.28	0.012	6.85	1.57	clear	none

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Dan Parker/LRS Federal	SAMPLER(S) SIGNATURE(S): [signature]	SAMPLING INITIATED AT: 0943	SAMPLING ENDED AT: 1008
PUMP OR TUBING DEPTH IN WELL (feet): 34	TUBING MATERIAL CODE: HDPE	FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: ____ μm
FIELD DECONTAMINATION: PUMP Y N	TUBING Y N (replaced)	DUPLICATE: Y N	

SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME mL	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW-94-62-03	9	CG	40	HCL/ice	0	~~4.35~~	8260 B	APP	~~378~~ 100
MW-94-62-03	6	AG	500	None, ice	0	~~4.35~~	8330 A	APP	378
MW-94-62-03	3	HDPE	250	None, ice	0	~~4.35~~	NO_3 NO_2	APP	378
					Checked By lab				

REMARKS:
Total Depth: 39.63 MS/MSD time: 943

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: C-62	SITE LOCATION: Eglin AFB, FL	
WELL NO: MW-94-62-04	SAMPLE ID: MW-94-62-04	DATE: 5/14/19

PURGING DATA

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL DEPTH: 29 feet to 39 feet	STATIC DEPTH TO WATER (feet): 18.84	PURGE PUMP TYPE OR BAILER: APP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= 0 gallons + 0.0014 gallons/foot X 42 feet) + 0.1 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 34	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 34	PURGING INITIATED AT: 9:18	PURGING ENDED AT: 9:48	TOTAL VOLUME PURGED (gallons): 1.5

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) µmhos/cm or µS/cm *	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
9:39	0.6	0.6	0.1	19.71	5.68	22.21	24	7.83	4.84	clear	none
9:42	0.3	0.9	0.1	19.73	5.63	22.19	24	7.81	2.87		
9:45	0.3	1.2	0.1	19.81	5.72	22.21	24	7.73	3.35		
9:48	0.3	1.5	0.1	19.84	5.69	22.20	24	7.62	2.44		

* In the process of calibrating the 2 YSI meters, used to obtain groundwater parameters, 1 unit/meter was calibrated to a value in which the decimal point was omitted for the value for specific conductance. The value of 1409 was entered during calibration rather than 1.409 resulting in the reported values being multiplied by 1,000 (ex. 24.0 v. 0.024). *

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: K. Pearson LRS Federal / Kevin Doyle	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 9:56	SAMPLING ENDED AT: 10:05
PUMP OR TUBING DEPTH IN WELL (feet): 34	TUBING MATERIAL CODE: HDPE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y (N) (replaced)	DUPLICATE: Y (N)	

SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME mL	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW-94-62-04	3	CG	40	HCL, ice	0	~~[illegible]~~	8260 B	APP	~~378~~ 100
MW-94-62-04	2	AG	500	None, ice	0	~~[illegible]~~	8330 A	APP	~~378~~ 378
MW-94-62-04	1	HDPE	250	None, ice	0	~~[illegible]~~ check by lab	NO_3 NO_2	APP	~~375~~ 378

REMARKS:
Total Depth: 38.90 Equipment Blank time: 10:15

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. **The above do not constitute all of the information required by Chapter 62-160, F.A.C.**
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: C-62	SITE LOCATION: Eglin AFB, FL
WELL NO: MW-94-62-05	SAMPLE ID: MW-94-62-05 · DATE: 5/14/19

PURGING DATA

WELL DIAMETER (inches): 4 · TUBING DIAMETER (inches): 3/16 · WELL SCREEN INTERVAL DEPTH: 30 feet to 40 feet · STATIC DEPTH TO WATER (feet): 19.37 · PURGE PUMP TYPE OR BAILER: APP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= 0 gallons + (0.0014 gallons/foot X 42 feet) + 0.1 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 34 · FINAL PUMP OR TUBING DEPTH IN WELL (feet): 34 · PURGING INITIATED AT: 10:59 · PURGING ENDED AT: 11:18 · TOTAL VOLUME PURGED (gallons): 1.7

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) μmhos/cm or μS/cm *	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
11:06	0.5	0.5	0.1	19.66	4.53	22.68	16	7.84	2.84	clear	none
11:09	0.3	0.8	0.1	19.76	4.42	22.53	16	7.90	2.02		
11:12	0.3	1.1	0.1	19.82	4.33	22.47	16	8.03	1.46		
11:15	0.3	1.4	0.1	19.88	4.37	22.48	16	7.99	1.46		
11:18	0.3	1.7	0.1	19.90	4.44	22.46	16	7.93	1.51		

* In the process of calibrating the 2 YSI meters used to obtain groundwater parameters, 1 unit was calibrated to a value in which the decimal point was omitted for the value for specific conductance. The value of 1409 was entered during calibration, rather than 1.409 resulting in the reported values being multiplied by 1,000 (ex. 16 v. 0.016). *

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016
PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: LRS Federal / K Doyle K Pearson · SAMPLER(S) SIGNATURE(S): [signatures] · SAMPLING INITIATED AT: 11:20 · SAMPLING ENDED AT: 11:24

PUMP OR TUBING DEPTH IN WELL (feet): 34 · TUBING MATERIAL CODE: HDPE · FIELD-FILTERED: Y N · Filtration Equipment Type: · FILTER SIZE: ___ μm

FIELD DECONTAMINATION: PUMP Y N · TUBING Y N (replaced) · DUPLICATE: Y N

SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
94-62-05	3	CG	40	HCL, ice	0	check by lab	8260 B	APP	100
94-62-05	2	AG	500	None, ice	0		8330 A	APP	378
94-62-05	1	HDPE	250	None, ice	0		NO_3 NO_2	APP	378

REMARKS:
Total depth: 39.41

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

GW Sampling @ Eglin AFB
Site: C-62

5/14/19

Arrived on location @ 8:10 am Completed / Left site @ ≈12:~~30~~45 pm.
Loaded mule w/ equipment & completed calibration; Discussed safety
FDEP inspectors arrived along w/ Eglin AFB personnel
FDEP: Merlin Russell
Amber Igoe (observed sampling at Well 4)
Eglin AFB: Danny Freeman
Ralph Armstrong
Beth Behr

Walked site location & observed sampling

Sampling Teams (all LRS Federal)

Wells 4 & 5	Wells 1, 2, & 3
Kevin Doyle	Dan Parker
Karen Pearson	Tracy Marks
	Jessica Williams

Upon completion, chain of custody forms were reviewed / completed and samples were delivered to Test America in Pensacola by 3:15 pm.

Sampling logs & calibration forms were reviewed and discussed. It was discovered that in the process of calibrating the YSI meters, one of the meters was calibrated to a value which the decimal point was omitted for the value of specific conductance. The value of 1409 was entered, rather than 1.409 resulting in the reported values being multiplied by 1,000 (ex. 24 versus 0.024).

Laboratory Analytical Data
C-52N Analytical Data Report

This page intentionally left blank.

eurofins

Environment Testing
TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Pensacola
3355 McLemore Drive
Pensacola, FL 32514
Tel: (850)474-1001

Laboratory Job ID: 400-170365-1
Client Project/Site: OBOD Annual Monitoring for Eglin=C-52

For:
LRS Federal LLC
8221 Ritchie Highway
Suite 300
Pasadena, Maryland 21122

Attn: Kevin Doyle

Carol M Webb

Authorized for release by:
6/9/2019 1:47:42 PM

Carol Webb, Project Manager II
(850)471-6250
carol.webb@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 400-170365-1

Laboratory: Eurofins TestAmerica, Pensacola

Narrative

Job Narrative
400-170365-1

Comments
No additional comments.

Receipt
The samples were received on 5/17/2019 2:35 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.1º C and 0.2º C.

HPLC/IC
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

LCMS
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Sample Summary

Client: LRS Federal LLC
Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
400-170365-1	MW-94-52-01	Water	05/17/19 10:50	05/17/19 14:35	
400-170365-2	MW-94-52-02	Water	05/17/19 08:45	05/17/19 14:35	
400-170365-3	MW-94-52-03	Water	05/17/19 09:35	05/17/19 14:35	
400-170365-4	MW-95-DUPLICATE	Water	05/17/19 09:00	05/17/19 14:35	
400-170365-5	C-52N FIELD BLANK	Water	05/17/19 11:05	05/17/19 14:35	
400-170365-6	C-52N EQUIPMENT BLANK	Water	05/17/19 10:55	05/17/19 14:35	

1 2 3 4 5 6 7 8 9

Client Sample ID: MW-94-52-01

Lab Sample ID: 400-170365-1

Date Collected: 05/17/19 10:50

Matrix: Water

Date Received: 05/17/19 14:35

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	**0.047**	**I**	0.10	0.012	mg/L			05/17/19 21:46	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/17/19 21:46	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	**0.17**	**I**	0.20	0.051	ug/L		05/23/19 18:38	05/29/19 15:50	1
4-Amino-2,6-dinitrotoluene	**0.14**	**I**	0.20	0.058	ug/L		05/23/19 18:38	05/29/19 15:50	1
2,4-Dinitrotoluene	0.084	U	0.40	0.084	ug/L		05/23/19 18:38	05/29/19 15:50	1
2,6-Dinitrotoluene	0.064	U	0.20	0.064	ug/L		05/23/19 18:38	05/29/19 15:50	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/23/19 18:38	05/29/19 15:50	1
m-Nitrotoluene	0.19	U	0.40	0.19	ug/L		05/23/19 18:38	05/29/19 15:50	1
o-Nitrotoluene	0.085	U	0.40	0.085	ug/L		05/23/19 18:38	05/29/19 15:50	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 15:50	1
Nitrobenzene	0.091	U	0.40	0.091	ug/L		05/23/19 18:38	05/29/19 15:50	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 15:50	1
1,3-Dinitrobenzene	0.088	U	0.40	0.088	ug/L		05/23/19 18:38	05/29/19 15:50	1
HMX	0.087	U	0.40	0.087	ug/L		05/23/19 18:38	05/29/19 15:50	1
RDX	**0.58**		0.30	0.16	ug/L		05/23/19 18:38	05/29/19 15:50	1
Tetryl	0.079	U	0.20	0.079	ug/L		05/23/19 18:38	05/29/19 15:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*94*		*75 - 118*	*05/23/19 18:38*	*05/29/19 15:50*	*1*
1,2-Dinitrobenzene	*88*		*75 - 118*	*05/23/19 18:38*	*05/30/19 17:34*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.5**	**Q**			SU			05/29/19 18:23	1

Client Sample ID: MW-94-52-02 Lab Sample ID: 400-170365-2

Date Collected: 05/17/19 08:45 **Matrix: Water**
Date Received: 05/17/19 14:35

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.017	I	0.10	0.012	mg/L			05/17/19 22:09	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/17/19 22:09	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.051	U	0.20	0.051	ug/L		05/23/19 18:38	05/29/19 16:14	1
4-Amino-2,6-dinitrotoluene	0.058	U	0.20	0.058	ug/L		05/23/19 18:38	05/29/19 16:14	1
2,4-Dinitrotoluene	0.084	U	0.40	0.084	ug/L		05/23/19 18:38	05/29/19 16:14	1
2,6-Dinitrotoluene	0.064	U	0.20	0.064	ug/L		05/23/19 18:38	05/29/19 16:14	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/23/19 18:38	05/29/19 16:14	1
m-Nitrotoluene	0.19	U	0.40	0.19	ug/L		05/23/19 18:38	05/29/19 16:14	1
o-Nitrotoluene	0.085	U	0.40	0.085	ug/L		05/23/19 18:38	05/29/19 16:14	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 16:14	1
Nitrobenzene	0.091	U	0.40	0.091	ug/L		05/23/19 18:38	05/29/19 16:14	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 16:14	1
1,3-Dinitrobenzene	0.089	U	0.40	0.089	ug/L		05/23/19 18:38	05/29/19 16:14	1
HMX	0.087	U	0.40	0.087	ug/L		05/23/19 18:38	05/29/19 16:14	1
RDX	0.16	U	0.30	0.16	ug/L		05/23/19 18:38	05/29/19 16:14	1
Tetryl	0.079	U	0.20	0.079	ug/L		05/23/19 18:38	05/29/19 16:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*89*		*75 - 118*	*05/23/19 18:38*	*05/29/19 16:14*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	5.6	Q			SU			05/29/19 18:23	1

Client Sample Results

Client: LRS Federal LLC
Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Client Sample ID: MW-94-52-03
Lab Sample ID: 400-170365-3

Date Collected: 05/17/19 09:35
Matrix: Water
Date Received: 05/17/19 14:35

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.012	U	0.10	0.012	mg/L			05/17/19 20:37	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/17/19 20:37	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.051	U	0.20	0.051	ug/L		05/23/19 18:38	05/29/19 16:38	1
4-Amino-2,6-dinitrotoluene	0.058	U	0.20	0.058	ug/L		05/23/19 18:38	05/29/19 16:38	1
2,4-Dinitrotoluene	0.084	U	0.40	0.084	ug/L		05/23/19 18:38	05/29/19 16:38	1
2,6-Dinitrotoluene	0.065	U	0.20	0.065	ug/L		05/23/19 18:38	05/29/19 16:38	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/23/19 18:38	05/29/19 16:38	1
m-Nitrotoluene	0.20	U	0.40	0.20	ug/L		05/23/19 18:38	05/29/19 16:38	1
o-Nitrotoluene	0.086	U	0.40	0.086	ug/L		05/23/19 18:38	05/29/19 16:38	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 16:38	1
Nitrobenzene	0.092	U	0.40	0.092	ug/L		05/23/19 18:38	05/29/19 16:38	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 16:38	1
1,3-Dinitrobenzene	0.089	U	0.40	0.089	ug/L		05/23/19 18:38	05/29/19 16:38	1
HMX	0.088	U	0.40	0.088	ug/L		05/23/19 18:38	05/29/19 16:38	1
RDX	0.16	U	0.30	0.16	ug/L		05/23/19 18:38	05/29/19 16:38	1
Tetryl	0.080	U	0.20	0.080	ug/L		05/23/19 18:38	05/29/19 16:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*92*		*75 - 118*	*05/23/19 18:38*	*05/29/19 16:38*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.4**	**Q**			SU			05/29/19 18:23	1

Client Sample Results

Client: LRS Federal LLC　　　　Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Client Sample ID: MW-95-DUPLICATE　　　　Lab Sample ID: 400-170365-4
Date Collected: 05/17/19 09:00　　　　**Matrix: Water**
Date Received: 05/17/19 14:35

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	**0.015**	**I**	0.10	0.012	mg/L			05/17/19 22:31	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/17/19 22:31	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.051	U	0.20	0.051	ug/L		05/23/19 18:38	05/29/19 17:49	1
4-Amino-2,6-dinitrotoluene	0.058	U	0.20	0.058	ug/L		05/23/19 18:38	05/29/19 17:49	1
2,4-Dinitrotoluene	0.084	U	0.40	0.084	ug/L		05/23/19 18:38	05/29/19 17:49	1
2,6-Dinitrotoluene	0.064	U	0.20	0.064	ug/L		05/23/19 18:38	05/29/19 17:49	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/23/19 18:38	05/29/19 17:49	1
m-Nitrotoluene	0.19	U	0.40	0.19	ug/L		05/23/19 18:38	05/29/19 17:49	1
o-Nitrotoluene	0.085	U	0.40	0.085	ug/L		05/23/19 18:38	05/29/19 17:49	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 17:49	1
Nitrobenzene	0.091	U	0.40	0.091	ug/L		05/23/19 18:38	05/29/19 17:49	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 17:49	1
1,3-Dinitrobenzene	0.089	U	0.40	0.089	ug/L		05/23/19 18:38	05/29/19 17:49	1
HMX	0.088	U	0.40	0.088	ug/L		05/23/19 18:38	05/29/19 17:49	1
RDX	0.16	U	0.30	0.16	ug/L		05/23/19 18:38	05/29/19 17:49	1
Tetryl	0.079	U	0.20	0.079	ug/L		05/23/19 18:38	05/29/19 17:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*78*		*75 - 118*	*05/23/19 18:38*	*05/29/19 17:49*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.7**	**Q**			SU			05/29/19 18:23	1

Client: LRS Federal LLC　　Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Client Sample ID: C-52N FIELD BLANK　　**Lab Sample ID: 400-170365-5**
Date Collected: 05/17/19 11:05　　**Matrix: Water**
Date Received: 05/17/19 14:35

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.012	U	0.10	0.012	mg/L			05/17/19 22:54	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/17/19 22:54	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.050	U	0.20	0.050	ug/L		05/23/19 18:38	05/29/19 19:00	1
4-Amino-2,6-dinitrotoluene	0.056	U	0.20	0.056	ug/L		05/23/19 18:38	05/29/19 19:00	1
2,4-Dinitrotoluene	0.082	U	0.39	0.082	ug/L		05/23/19 18:38	05/29/19 19:00	1
2,6-Dinitrotoluene	0.063	U	0.20	0.063	ug/L		05/23/19 18:38	05/29/19 19:00	1
2,4,6-Trinitrotoluene	0.16	U	0.39	0.16	ug/L		05/23/19 18:38	05/29/19 19:00	1
m-Nitrotoluene	0.19	U	0.39	0.19	ug/L		05/23/19 18:38	05/29/19 19:00	1
o-Nitrotoluene	0.084	U	0.39	0.084	ug/L		05/23/19 18:38	05/29/19 19:00	1
p-Nitrotoluene	0.20	U	0.98	0.20	ug/L		05/23/19 18:38	05/29/19 19:00	1
Nitrobenzene	0.089	U	0.39	0.089	ug/L		05/23/19 18:38	05/29/19 19:00	1
1,3,5-Trinitrobenzene	0.20	U	0.98	0.20	ug/L		05/23/19 18:38	05/29/19 19:00	1
1,3-Dinitrobenzene	0.087	U	0.39	0.087	ug/L		05/23/19 18:38	05/29/19 19:00	1
HMX	0.086	U	0.39	0.086	ug/L		05/23/19 18:38	05/29/19 19:00	1
RDX	0.15	U	0.29	0.15	ug/L		05/23/19 18:38	05/29/19 19:00	1
Tetryl	0.078	U	0.20	0.078	ug/L		05/23/19 18:38	05/29/19 19:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*92*		*75 - 118*	*05/23/19 18:38*	*05/29/19 19:00*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.6**	**Q**			SU			05/29/19 18:23	1

Client: LRS Federal LLC	Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Client Sample ID: C-52N EQUIPMENT BLANK

Lab Sample ID: 400-170365-6

Date Collected: 05/17/19 10:55
Matrix: Water
Date Received: 05/17/19 14:35

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.012	U	0.10	0.012	mg/L			05/18/19 01:11	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/18/19 01:11	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.051	U	0.20	0.051	ug/L		05/23/19 18:38	05/29/19 19:24	1
4-Amino-2,6-dinitrotoluene	0.058	U	0.20	0.058	ug/L		05/23/19 18:38	05/29/19 19:24	1
2,4-Dinitrotoluene	0.085	U	0.41	0.085	ug/L		05/23/19 18:38	05/29/19 19:24	1
2,6-Dinitrotoluene	0.065	U	0.20	0.065	ug/L		05/23/19 18:38	05/29/19 19:24	1
2,4,6-Trinitrotoluene	0.16	U	0.41	0.16	ug/L		05/23/19 18:38	05/29/19 19:24	1
m-Nitrotoluene	0.20	U	0.41	0.20	ug/L		05/23/19 18:38	05/29/19 19:24	1
o-Nitrotoluene	0.087	U	0.41	0.087	ug/L		05/23/19 18:38	05/29/19 19:24	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 19:24	1
Nitrobenzene	0.092	U	0.41	0.092	ug/L		05/23/19 18:38	05/29/19 19:24	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 19:24	1
1,3-Dinitrobenzene	0.090	U	0.41	0.090	ug/L		05/23/19 18:38	05/29/19 19:24	1
HMX	0.089	U	0.41	0.089	ug/L		05/23/19 18:38	05/29/19 19:24	1
RDX	0.16	U	0.30	0.16	ug/L		05/23/19 18:38	05/29/19 19:24	1
Tetryl	0.080	U	0.20	0.080	ug/L		05/23/19 18:38	05/29/19 19:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*104*		*75 - 118*	*05/23/19 18:38*	*05/29/19 19:24*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.6**	**Q**			SU			05/29/19 18:23	1

Client: LRS Federal LLC Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
U	Indicates that the compound was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
Q	Sample held beyond the accepted holding time.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client: LRS Federal LLC | Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 400-441370/38 | **Client Sample ID: Method Blank**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 441370

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.012	U	0.10	0.012	mg/L			05/17/19 19:29	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/17/19 19:29	1

Lab Sample ID: LCS 400-441370/39 | **Client Sample ID: Lab Control Sample**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 441370

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	2.26	2.23		mg/L		99	90 - 110
Nitrite as N	3.04	3.25		mg/L		107	90 - 110

Lab Sample ID: LCSD 400-441370/40 | **Client Sample ID: Lab Control Sample Dup**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 441370

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	2.26	2.23		mg/L		99	90 - 110	0	15
Nitrite as N	3.04	3.22		mg/L		106	90 - 110	1	15

Lab Sample ID: 400-170365-3 MS | **Client Sample ID: MW-94-52-03**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 441370

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	0.012	U	2.26	2.14		mg/L		95	80 - 120
Nitrite as N	0.021	U	3.04	3.17		mg/L		104	80 - 120

Lab Sample ID: 400-170365-3 MSD | **Client Sample ID: MW-94-52-03**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 441370

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	0.012	U	2.26	2.15		mg/L		95	80 - 120	1	20
Nitrite as N	0.021	U	3.04	3.14		mg/L		103	80 - 120	1	20

Method: 8330A - Nitroaromatics and Nitramines

Lab Sample ID: MB 280-459226/1-A | **Client Sample ID: Method Blank**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 459770 | **Prep Batch: 459226**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.051	U	0.20	0.051	ug/L		05/23/19 18:38	05/29/19 14:15	1
4-Amino-2,6-dinitrotoluene	0.058	U	0.20	0.058	ug/L		05/23/19 18:38	05/29/19 14:15	1
2,4-Dinitrotoluene	0.084	U	0.40	0.084	ug/L		05/23/19 18:38	05/29/19 14:15	1
2,6-Dinitrotoluene	0.065	U	0.20	0.065	ug/L		05/23/19 18:38	05/29/19 14:15	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/23/19 18:38	05/29/19 14:15	1
m-Nitrotoluene	0.20	U	0.40	0.20	ug/L		05/23/19 18:38	05/29/19 14:15	1
o-Nitrotoluene	0.086	U	0.40	0.086	ug/L		05/23/19 18:38	05/29/19 14:15	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 14:15	1

Method: 8330A - Nitroaromatics and Nitramines (Continued)

Lab Sample ID: MB 280-459226/1-A
Matrix: Water
Analysis Batch: 459770

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 459226

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrobenzene	0.091	U	0.40	0.091	ug/L		05/23/19 18:38	05/29/19 14:15	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/23/19 18:38	05/29/19 14:15	1
1,3-Dinitrobenzene	0.089	U	0.40	0.089	ug/L		05/23/19 18:38	05/29/19 14:15	1
HMX	0.088	U	0.40	0.088	ug/L		05/23/19 18:38	05/29/19 14:15	1
RDX	0.16	U	0.30	0.16	ug/L		05/23/19 18:38	05/29/19 14:15	1
Tetryl	0.079	U	0.20	0.079	ug/L		05/23/19 18:38	05/29/19 14:15	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*93*		*75 - 118*	*05/23/19 18:38*	*05/29/19 14:15*	*1*

Lab Sample ID: LCS 280-459226/2-A
Matrix: Water
Analysis Batch: 459770

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 459226

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Amino-4,6-dinitrotoluene	2.00	1.75		ug/L		87	46 - 124
4-Amino-2,6-dinitrotoluene	2.00	1.58		ug/L		79	43 - 120
2,4-Dinitrotoluene	2.00	1.81		ug/L		90	53 - 127
2,6-Dinitrotoluene	2.00	1.73		ug/L		87	51 - 130
2,4,6-Trinitrotoluene	2.00	1.75		ug/L		87	46 - 139
m-Nitrotoluene	2.00	1.67		ug/L		84	31 - 140
o-Nitrotoluene	2.00	1.30		ug/L		65	37 - 138
p-Nitrotoluene	2.00	1.42		ug/L		71	41 - 137
Nitrobenzene	2.00	1.58		ug/L		79	46 - 144
1,3,5-Trinitrobenzene	2.00	2.03		ug/L		102	62 - 127
1,3-Dinitrobenzene	2.00	1.91		ug/L		95	59 - 131
HMX	2.00	1.84		ug/L		92	66 - 115
RDX	2.00	1.85		ug/L		92	69 - 122
Tetryl	2.00	1.86		ug/L		93	56 - 131

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dinitrobenzene	*91*		*75 - 118*

Lab Sample ID: 400-170365-3 MS
Matrix: Water
Analysis Batch: 459770

Client Sample ID: MW-94-52-03
Prep Type: Total/NA
Prep Batch: 459226

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Amino-4,6-dinitrotoluene	0.051	U	2.08	1.73		ug/L		83	57 - 120
4-Amino-2,6-dinitrotoluene	0.058	U	2.08	1.54		ug/L		74	67 - 127
2,4-Dinitrotoluene	0.084	U	2.08	1.77		ug/L		85	68 - 120
2,6-Dinitrotoluene	0.065	U	2.08	1.68		ug/L		81	67 - 120
2,4,6-Trinitrotoluene	0.16	U	2.08	1.70		ug/L		81	74 - 120
m-Nitrotoluene	0.20	U	2.08	1.28		ug/L		61	57 - 124
o-Nitrotoluene	0.086	U	2.08	1.19		ug/L		57	49 - 124
p-Nitrotoluene	0.20	U	2.08	1.37		ug/L		66	25 - 141
Nitrobenzene	0.092	U	2.08	1.44		ug/L		69	59 - 120
1,3,5-Trinitrobenzene	0.20	U	2.08	1.88		ug/L		90	73 - 120

Client: LRS Federal LLC — Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Method: 8330A - Nitroaromatics and Nitramines (Continued)

Lab Sample ID: 400-170365-3 MS — **Client Sample ID: MW-94-52-03**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 459770 — **Prep Batch: 459226**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,3-Dinitrobenzene	0.089	U	2.08	1.85		ug/L		89	73 - 120
HMX	0.088	U	2.08	1.77		ug/L		85	79 - 120
RDX	0.16	U	2.08	1.88		ug/L		90	79 - 120
Tetryl	0.080	U	2.08	1.83		ug/L		88	10 - 120

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dinitrobenzene	*85*		*75 - 118*

Lab Sample ID: 400-170365-3 MSD — **Client Sample ID: MW-94-52-03**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 459770 — **Prep Batch: 459226**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
2-Amino-4,6-dinitrotoluene	0.051	U	2.12	1.86		ug/L		88	57 - 120	7	20
4-Amino-2,6-dinitrotoluene	0.058	U	2.12	1.64		ug/L		77	67 - 127	6	20
2,4-Dinitrotoluene	0.084	U	2.12	1.94		ug/L		91	68 - 120	9	20
2,6-Dinitrotoluene	0.065	U	2.12	1.80		ug/L		85	67 - 120	7	20
2,4,6-Trinitrotoluene	0.16	U	2.12	1.86		ug/L		88	74 - 120	9	20
m-Nitrotoluene	0.20	U	2.12	1.52		ug/L		72	57 - 124	17	20
o-Nitrotoluene	0.086	U	2.12	1.46		ug/L		69	49 - 124	20	31
p-Nitrotoluene	0.20	U	2.12	1.57		ug/L		74	25 - 141	14	30
Nitrobenzene	0.092	U	2.12	1.68		ug/L		79	59 - 120	16	20
1,3,5-Trinitrobenzene	0.20	U	2.12	2.04		ug/L		96	73 - 120	8	20
1,3-Dinitrobenzene	0.089	U	2.12	2.02		ug/L		95	73 - 120	8	20
HMX	0.088	U	2.12	1.88		ug/L		89	79 - 120	6	20
RDX	0.16	U	2.12	2.07		ug/L		98	79 - 120	10	20
Tetryl	0.080	U	2.12	1.96		ug/L		92	10 - 120	7	50

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dinitrobenzene	*90*		*75 - 118*

Method: 9040C - pH

Lab Sample ID: 400-170365-3 DU — **Client Sample ID: MW-94-52-03**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 442538

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	5.4	Q	5.5		SU		2	5

Client: LRS Federal LLC
Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Client Sample ID: MW-94-52-01
Lab Sample ID: 400-170365-1
Date Collected: 05/17/19 10:50
Matrix: Water
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/17/19 21:46	BAW	TAL PEN
Total/NA	Prep	3535			501.6 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459919	05/30/19 17:34	HKF	TAL DEN
Total/NA	Prep	3535			501.6 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 15:50	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 18:23	DEK	TAL PEN

Client Sample ID: MW-94-52-02
Lab Sample ID: 400-170365-2
Date Collected: 05/17/19 08:45
Matrix: Water
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/17/19 22:09	BAW	TAL PEN
Total/NA	Prep	3535			500.6 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 16:14	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 18:23	DEK	TAL PEN

Client Sample ID: MW-94-52-03
Lab Sample ID: 400-170365-3
Date Collected: 05/17/19 09:35
Matrix: Water
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/17/19 20:37	BAW	TAL PEN
Total/NA	Prep	3535			496.1 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 16:38	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 18:23	DEK	TAL PEN

Client Sample ID: MW-95-DUPLICATE
Lab Sample ID: 400-170365-4
Date Collected: 05/17/19 09:00
Matrix: Water
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/17/19 22:31	BAW	TAL PEN
Total/NA	Prep	3535			500.3 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 17:49	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 18:23	DEK	TAL PEN

Client Sample ID: C-52N FIELD BLANK
Lab Sample ID: 400-170365-5
Date Collected: 05/17/19 11:05
Matrix: Water
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/17/19 22:54	BAW	TAL PEN
Total/NA	Prep	3535			510.8 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 19:00	HKF	TAL DEN

Lab Chronicle

Client: LRS Federal LLC
Job ID: 400-170365-1
Project/Site: OBOD Annual Monitoring for Eglin=C-52

Client Sample ID: C-52N FIELD BLANK
Lab Sample ID: 400-170365-5
Date Collected: 05/17/19 11:05
Matrix: Water
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			442538	05/29/19 18:23	DEK	TAL PEN

Client Sample ID: C-52N EQUIPMENT BLANK
Lab Sample ID: 400-170365-6
Date Collected: 05/17/19 10:55
Matrix: Water
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/18/19 01:11	BAW	TAL PEN
Total/NA	Prep	3535			493.6 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 19:24	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 18:23	DEK	TAL PEN

Client Sample ID: Method Blank
Lab Sample ID: MB 280-459226/1-A
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			500 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 14:15	HKF	TAL DEN

Client Sample ID: Method Blank
Lab Sample ID: MB 400-441370/38
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/17/19 19:29	BAW	TAL PEN

Client Sample ID: Lab Control Sample
Lab Sample ID: LCS 280-459226/2-A
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			500 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 14:39	HKF	TAL DEN

Client Sample ID: Lab Control Sample
Lab Sample ID: LCS 400-441370/39
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	10 mL	1.0 mL	441370	05/17/19 19:52	BAW	TAL PEN

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 400-442538/4

Date Collected: N/A — **Matrix: Water**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 400-441370/40

Date Collected: N/A — **Matrix: Water**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	10 mL	1.0 mL	441370	05/17/19 20:14	BAW	TAL PEN

Client Sample ID: MW-94-52-03 — Lab Sample ID: 400-170365-3 MS

Date Collected: 05/17/19 09:35 — **Matrix: Water**
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/17/19 21:00	BAW	TAL PEN
Total/NA	Prep	3535			480.4 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 17:01	HKF	TAL DEN

Client Sample ID: MW-94-52-03 — Lab Sample ID: 400-170365-3 MSD

Date Collected: 05/17/19 09:35 — **Matrix: Water**
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			441370	05/17/19 21:23	BAW	TAL PEN
Total/NA	Prep	3535			471.5 mL	5 mL	459226	05/23/19 18:38	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459770	05/29/19 17:25	HKF	TAL DEN

Client Sample ID: MW-94-52-03 — Lab Sample ID: 400-170365-3 DU

Date Collected: 05/17/19 09:35 — **Matrix: Water**
Date Received: 05/17/19 14:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			442538	05/29/19 18:23	DEK	TAL PEN

Laboratory References:

TAL DEN = Eurofins TestAmerica, Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100

TAL PEN = Eurofins TestAmerica, Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Eurofins TestAmerica, Pensacola
3355 McLemore Drive
Pensacola, FL 32514
Phone (850) 474-1001 Fax (850) 478-2671

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information	Sampler: LRS Federal LLC	Lab PM: Webb, Carol M	Carrier Tracking No(s):	COC No: 400-84031-29243.1
Client Contact: ~~Gabrielle Johnson~~ Kevin Doyle	Phone: 713 670 4535	E-Mail: carol.webb@testamericainc.com		Page: Page 1 of 1
Company: LRS Federal LLC				Job #:
Address: 8221 Ritchie Highway Suite 300	Due Date Requested:			
City: Pasadena	TAT Requested (days):			
State, Zip: MD, 21122				
Phone: 850-855-7244(Tel)	PO #: Purchase Order Requested			
Email: gjohnson@lrsfederal.com	WO #:			
Project Name: OBOD C-52N	Project #: 40009463			
Site: C-52	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

400-170365 COC

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8330A - Explosives	300_ORGFMS - NO3, NO2	Total Number of containers	Special Instructions/Note:
				Preservation Code:			N	N		
MW-94-52-01	05/17/19	1050	G	Water	N	N	N	N	3	
MW-94-52-02		845		Water		N				
MW-94-52-03		935		Water		Y				
MW-94-52- Duplicate		900		Water		N				
MW-94-52- MS		935		Water		Y				
MW-94-52- MSD		935		Water		Y				
C-52N Field Blank		1105		Water		N				
C-52N Equipment Blank		1055		Water		N				

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ______ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: Measure pH sample of ~~[illegible]~~ samples

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
J. Williams, Kent	05/17/19 @ 1245	LRS Federal	J. Williams	05/17/19 @ 1245	LRS Federal
J. Williams	05/17/19 2:35	LRS Federal	Kathy L Allen	5-17-19 1435	TA

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.: #	Cooler Temperature(s) °C and Other Remarks: 0.1, 0.2°C IR 7

Ver: 01/16/2019

Eurofins TestAmerica, Pensacola
3355 McLemore Drive
Pensacola, FL 32514
Phone (850) 474-1001 Fax (850) 478-2671

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Webb, Carol M	Carrier Tracking No(s):	COC No: 400-210858.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: carol.webb@testamericainc.com	State of Origin: Alabama	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Florida		Job #: 400-170365-1
Address: 4955 Yarrow Street, ,	Due Date Requested: 6/5/2019			
City: Arvada	TAT Requested (days):			
State, Zip: CO, 80002				
Phone: 303-736-0100(Tel) 303-431-7171(Fax)	PO #:			
Email:	WO #:			
Project Name: OBOD Annual Monitoring for Eglin=C-52	Project #: 40009463			
Site:	SSOW#:			

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8330A/3535 DOD Sublist	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
MW-94-52-01 (400-170365-1)	5/17/19	10:50 Central		Water			X	2	
MW-94-52-02 (400-170365-2)	5/17/19	08:45 Central		Water			X	2	
MW-94-52-03 (400-170365-3)	5/17/19	09:35 Central		Water			X	2	
MW-94-52-03 (400-170365-3MS)	5/17/19	09:35 Central	MS	Water			X	2	
MW-94-52-03 (400-170365-3MSD)	5/17/19	09:35 Central	MSD	Water			X	2	
MW-95-DUPLICATE (400-170365-4)	5/17/19	09:00 Central		Water			X	2	
C-52N FIELD BLANK (400-170365-5)	5/17/19	11:05 Central		Water			X	2	
C-52N EQUIPMENT BLANK (400-170365-6)	5/17/19	10:55 Central		Water			X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification
Unconfirmed
Deliverable Requested: I, II, III, IV, Other (specify) — Primary Deliverable Rank: 2

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ______ *Months*
Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: Kathy R Avery	Date/Time: 5-20-19 1600	Company: TA-PEN	Received by: [signature]	Date/Time: 5/21/19 1000	Company: TADEN
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 0.9, 40, IR9, xfued by SB, 5/21/19

Ver: 01/16/2019

Laboratory Analytical Data
C-62 Analytical Data Report

This page intentionally left blank.

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Pensacola
3355 McLemore Drive
Pensacola, FL 32514
Tel: (850)474-1001

Laboratory Job ID: 400-170151-1
Laboratory Sample Delivery Group: C-62
Client Project/Site: OBOD C-62

For:
LRS Federal LLC
8221 Ritchie Highway
Suite 300
Pasadena, Maryland 21122

Attn: Kevin Doyle

Authorized for release by:
5/31/2019 9:17:30 AM
Taylor Bruzzio, Project Manager I
(850)471-6226
taylor.bruzzio@testamericainc.com

Designee for

Carol Webb, Project Manager II
(850)471-6250
carol.webb@testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 400-170151-1

Laboratory: Eurofins TestAmerica, Pensacola

Narrative

Job Narrative
400-170151-1

Comments
No additional comments.

Receipt
The samples were received on 5/14/2019 3:00 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 0.2º C, 0.2º C and 0.4º C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

HPLC/IC
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

LCMS
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Sample Summary

Client: LRS Federal LLC
Project/Site: OBOD C-62

Job ID: 400-170151-1
SDG: C-62

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
400-170151-1	MW-94-62-01	Water	05/14/19 11:56	05/14/19 15:00	
400-170151-2	MW-94-62-02	Water	05/14/19 10:45	05/14/19 15:00	
400-170151-3	MW-94-62-03	Water	05/14/19 09:43	05/14/19 15:00	
400-170151-4	MW-94-62-04	Water	05/14/19 09:56	05/14/19 15:00	
400-170151-5	MW-94-62-05	Water	05/14/19 11:20	05/14/19 15:00	
400-170151-6	MW-94-62-DUPLICATE	Water	05/14/19 10:45	05/14/19 15:00	
400-170151-7	C-62 TD	Water	05/14/19 00:00	05/14/19 15:00	
400-170151-8	C-62 EB	Water	05/14/19 10:15	05/14/19 15:00	

Client Sample Results

Client: LRS Federal LLC
Project/Site: OBOD C-62

Job ID: 400-170151-1
SDG: C-62

Client Sample ID: MW-94-62-01

Date Collected: 05/14/19 11:56
Date Received: 05/14/19 15:00

Lab Sample ID: 400-170151-1

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 12:29	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 12:29	1
Toluene	0.41	U	1.0	0.41	ug/L			05/25/19 12:29	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 12:29	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 12:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*101*		*78 - 118*		*05/25/19 12:29*	*1*
Dibromofluoromethane	*97*		*81 - 121*		*05/25/19 12:29*	*1*
Toluene-d8 (Surr)	*102*		*80 - 120*		*05/25/19 12:29*	*1*

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.012	U	0.10	0.012	mg/L			05/14/19 19:01	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/14/19 19:01	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.050	U	0.20	0.050	ug/L		05/18/19 13:39	05/23/19 05:14	1
4-Amino-2,6-dinitrotoluene	0.057	U	0.20	0.057	ug/L		05/18/19 13:39	05/23/19 05:14	1
2,4-Dinitrotoluene	0.083	U	0.40	0.083	ug/L		05/18/19 13:39	05/23/19 05:14	1
2,6-Dinitrotoluene	0.064	U	0.20	0.064	ug/L		05/18/19 13:39	05/23/19 05:14	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/18/19 13:39	05/23/19 05:14	1
m-Nitrotoluene	0.19	U	0.40	0.19	ug/L		05/18/19 13:39	05/23/19 05:14	1
o-Nitrotoluene	0.085	U	0.40	0.085	ug/L		05/18/19 13:39	05/23/19 05:14	1
p-Nitrotoluene	0.20	U	0.99	0.20	ug/L		05/18/19 13:39	05/23/19 05:14	1
Nitrobenzene	0.090	U	0.40	0.090	ug/L		05/18/19 13:39	05/23/19 05:14	1
1,3,5-Trinitrobenzene	0.20	U	0.99	0.20	ug/L		05/18/19 13:39	05/23/19 05:14	1
1,3-Dinitrobenzene	0.088	U	0.40	0.088	ug/L		05/18/19 13:39	05/23/19 05:14	1
HMX	0.087	U	0.40	0.087	ug/L		05/18/19 13:39	05/23/19 05:14	1
RDX	**0.17**	**I**	0.30	0.16	ug/L		05/18/19 13:39	05/23/19 05:14	1
Tetryl	0.078	U	0.20	0.078	ug/L		05/18/19 13:39	05/23/19 05:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*99*		*75 - 118*	*05/18/19 13:39*	*05/23/19 05:14*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.5**	**Q**			SU			05/29/19 15:05	1
Temperature	**25.7**	**Q**			Degrees C			05/29/19 15:05	1

Client Sample ID: MW-94-62-02

Lab Sample ID: 400-170151-2

Date Collected: 05/14/19 10:45

Matrix: Water

Date Received: 05/14/19 15:00

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 12:56	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 12:56	1
Toluene	0.41	U	1.0	0.41	ug/L			05/25/19 12:56	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 12:56	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 12:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*100*		*78 - 118*		*05/25/19 12:56*	*1*
Dibromofluoromethane	*100*		*81 - 121*		*05/25/19 12:56*	*1*
Toluene-d8 (Surr)	*102*		*80 - 120*		*05/25/19 12:56*	*1*

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	**0.15**		0.10	0.012	mg/L			05/14/19 19:24	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/14/19 19:24	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.051	U	0.20	0.051	ug/L		05/18/19 13:39	05/23/19 05:38	1
4-Amino-2,6-dinitrotoluene	**0.40**		0.20	0.058	ug/L		05/18/19 13:39	05/23/19 05:38	1
2,4-Dinitrotoluene	0.084	U	0.40	0.084	ug/L		05/18/19 13:39	05/23/19 05:38	1
2,6-Dinitrotoluene	0.065	U	0.20	0.065	ug/L		05/18/19 13:39	05/23/19 05:38	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/18/19 13:39	05/23/19 05:38	1
m-Nitrotoluene	0.20	U	0.40	0.20	ug/L		05/18/19 13:39	05/23/19 05:38	1
o-Nitrotoluene	0.086	U	0.40	0.086	ug/L		05/18/19 13:39	05/23/19 05:38	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/18/19 13:39	05/23/19 05:38	1
Nitrobenzene	0.091	U	0.40	0.091	ug/L		05/18/19 13:39	05/23/19 05:38	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/18/19 13:39	05/23/19 05:38	1
1,3-Dinitrobenzene	0.089	U	0.40	0.089	ug/L		05/18/19 13:39	05/23/19 05:38	1
HMX	**0.14**	**I**	0.40	0.088	ug/L		05/18/19 13:39	05/23/19 05:38	1
RDX	**2.9**		0.30	0.16	ug/L		05/18/19 13:39	05/23/19 05:38	1
Tetryl	0.079	U	0.20	0.079	ug/L		05/18/19 13:39	05/23/19 05:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*95*		*75 - 118*	*05/18/19 13:39*	*05/23/19 05:38*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.9**	**Q**			SU			05/29/19 15:05	1
Temperature	**25.5**	**Q**			Degrees C			05/29/19 15:05	1

Client Sample ID: MW-94-62-03
Date Collected: 05/14/19 09:43
Date Received: 05/14/19 15:00

Lab Sample ID: 400-170151-3
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 10:15	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 10:15	1
Toluene	**0.50**	**I**	1.0	0.41	ug/L			05/25/19 10:15	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 10:15	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 10:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*102*		*78 - 118*		*05/25/19 10:15*	*1*
Dibromofluoromethane	*99*		*81 - 121*		*05/25/19 10:15*	*1*
Toluene-d8 (Surr)	*99*		*80 - 120*		*05/25/19 10:15*	*1*

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	**0.10**		0.10	0.012	mg/L			05/14/19 17:52	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/14/19 17:52	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.054	U	0.21	0.054	ug/L		05/18/19 13:39	05/23/19 06:01	1
4-Amino-2,6-dinitrotoluene	0.062	U	0.21	0.062	ug/L		05/18/19 13:39	05/23/19 06:01	1
2,4-Dinitrotoluene	0.089	U	0.43	0.089	ug/L		05/18/19 13:39	05/23/19 06:01	1
2,6-Dinitrotoluene	0.069	U	0.21	0.069	ug/L		05/18/19 13:39	05/23/19 06:01	1
2,4,6-Trinitrotoluene	0.17	U	0.43	0.17	ug/L		05/18/19 13:39	05/23/19 06:01	1
m-Nitrotoluene	0.21	U	0.43	0.21	ug/L		05/18/19 13:39	05/23/19 06:01	1
o-Nitrotoluene	0.091	U	0.43	0.091	ug/L		05/18/19 13:39	05/23/19 06:01	1
p-Nitrotoluene	0.21	U	1.1	0.21	ug/L		05/18/19 13:39	05/23/19 06:01	1
Nitrobenzene	0.097	U	0.43	0.097	ug/L		05/18/19 13:39	05/23/19 06:01	1
1,3,5-Trinitrobenzene	0.21	U	1.1	0.21	ug/L		05/18/19 13:39	05/23/19 06:01	1
1,3-Dinitrobenzene	0.095	U	0.43	0.095	ug/L		05/18/19 13:39	05/23/19 06:01	1
HMX	**0.15**	**I**	0.43	0.094	ug/L		05/18/19 13:39	05/23/19 06:01	1
RDX	**3.9**		0.32	0.17	ug/L		05/18/19 13:39	05/23/19 06:01	1
Tetryl	0.085	U	0.21	0.085	ug/L		05/18/19 13:39	05/23/19 06:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*97*		*75 - 118*	*05/18/19 13:39*	*05/23/19 06:01*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**6.3**	**Q**			SU			05/29/19 15:05	1
Temperature	**25.8**	**Q**			Degrees C			05/29/19 15:05	1

1 2 3 4 5 6 7 8 9

Client Sample ID: MW-94-62-04
Date Collected: 05/14/19 09:56
Date Received: 05/14/19 15:00

Lab Sample ID: 400-170151-4
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 10:41	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 10:41	1
Toluene	0.41	U	1.0	0.41	ug/L			05/25/19 10:41	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 10:41	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 10:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*101*		*78 - 118*		*05/25/19 10:41*	*1*
Dibromofluoromethane	*99*		*81 - 121*		*05/25/19 10:41*	*1*
Toluene-d8 (Surr)	*95*		*80 - 120*		*05/25/19 10:41*	*1*

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	**0.64**		0.10	0.012	mg/L			05/14/19 19:46	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/14/19 19:46	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.054	U	0.21	0.054	ug/L		05/18/19 13:39	05/23/19 08:00	1
4-Amino-2,6-dinitrotoluene	0.061	U	0.21	0.061	ug/L		05/18/19 13:39	05/23/19 08:00	1
2,4-Dinitrotoluene	0.088	U	0.42	0.088	ug/L		05/18/19 13:39	05/23/19 08:00	1
2,6-Dinitrotoluene	0.068	U	0.21	0.068	ug/L		05/18/19 13:39	05/23/19 08:00	1
2,4,6-Trinitrotoluene	0.17	U	0.42	0.17	ug/L		05/18/19 13:39	05/23/19 08:00	1
m-Nitrotoluene	0.21	U	0.42	0.21	ug/L		05/18/19 13:39	05/23/19 08:00	1
o-Nitrotoluene	0.090	U	0.42	0.090	ug/L		05/18/19 13:39	05/23/19 08:00	1
p-Nitrotoluene	0.21	U	1.1	0.21	ug/L		05/18/19 13:39	05/23/19 08:00	1
Nitrobenzene	0.096	U	0.42	0.096	ug/L		05/18/19 13:39	05/23/19 08:00	1
1,3,5-Trinitrobenzene	0.21	U	1.1	0.21	ug/L		05/18/19 13:39	05/23/19 08:00	1
1,3-Dinitrobenzene	0.094	U	0.42	0.094	ug/L		05/18/19 13:39	05/23/19 08:00	1
Tetryl	0.084	U	0.21	0.084	ug/L		05/18/19 13:39	05/23/19 08:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*96*		*75 - 118*	*05/18/19 13:39*	*05/23/19 08:00*	*1*

Method: 8330A - Nitroaromatics and Nitramines - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HMX	**39**		4.2	0.92	ug/L		05/18/19 13:39	05/23/19 13:10	10
RDX	**26**		3.2	1.7	ug/L		05/18/19 13:39	05/23/19 13:10	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*84*	*D1*	*75 - 118*	*05/18/19 13:39*	*05/23/19 13:10*	*10*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**6.7**	**Q**			SU			05/29/19 15:05	1
Temperature	**25.5**	**Q**			Degrees C			05/29/19 15:05	1

Client Sample ID: MW-94-62-05

Date Collected: 05/14/19 11:20
Date Received: 05/14/19 15:00

Lab Sample ID: 400-170151-5

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 11:07	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 11:07	1
Toluene	0.41	U	1.0	0.41	ug/L			05/25/19 11:07	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 11:07	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 11:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*104*		*78 - 118*		*05/25/19 11:07*	*1*
Dibromofluoromethane	*99*		*81 - 121*		*05/25/19 11:07*	*1*
Toluene-d8 (Surr)	*97*		*80 - 120*		*05/25/19 11:07*	*1*

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	**0.42**		0.10	0.012	mg/L			05/14/19 20:09	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/14/19 20:09	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.052	U	0.20	0.052	ug/L		05/18/19 13:39	05/23/19 08:24	1
4-Amino-2,6-dinitrotoluene	0.059	U	0.20	0.059	ug/L		05/18/19 13:39	05/23/19 08:24	1
2,4-Dinitrotoluene	0.085	U	0.41	0.085	ug/L		05/18/19 13:39	05/23/19 08:24	1
2,6-Dinitrotoluene	0.066	U	0.20	0.066	ug/L		05/18/19 13:39	05/23/19 08:24	1
2,4,6-Trinitrotoluene	0.16	U	0.41	0.16	ug/L		05/18/19 13:39	05/23/19 08:24	1
m-Nitrotoluene	0.20	U	0.41	0.20	ug/L		05/18/19 13:39	05/23/19 08:24	1
o-Nitrotoluene	0.087	U	0.41	0.087	ug/L		05/18/19 13:39	05/23/19 08:24	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/18/19 13:39	05/23/19 08:24	1
Nitrobenzene	0.093	U	0.41	0.093	ug/L		05/18/19 13:39	05/23/19 08:24	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/18/19 13:39	05/23/19 08:24	1
1,3-Dinitrobenzene	0.090	U	0.41	0.090	ug/L		05/18/19 13:39	05/23/19 08:24	1
Tetryl	0.081	U	0.20	0.081	ug/L		05/18/19 13:39	05/23/19 08:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*92*		*75 - 118*	*05/18/19 13:39*	*05/23/19 08:24*	*1*

Method: 8330A - Nitroaromatics and Nitramines - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HMX	**91**		4.1	0.89	ug/L		05/18/19 13:39	05/23/19 13:33	10
RDX	**52**		3.1	1.6	ug/L		05/18/19 13:39	05/23/19 13:33	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*98*	*D1*	*75 - 118*	*05/18/19 13:39*	*05/23/19 13:33*	*10*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.7**	**Q**			SU			05/29/19 15:05	1
Temperature	**25.9**	**Q**			Degrees C			05/29/19 15:05	1

1 2 3 4 5 6 7 8 9

Client Sample ID: MW-94-62-DUPLICATE
Date Collected: 05/14/19 10:45
Date Received: 05/14/19 15:00

Lab Sample ID: 400-170151-6
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 11:34	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 11:34	1
Toluene	0.41	U	1.0	0.41	ug/L			05/25/19 11:34	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 11:34	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 11:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*101*		*78 - 118*		*05/25/19 11:34*	*1*
Dibromofluoromethane	*98*		*81 - 121*		*05/25/19 11:34*	*1*
Toluene-d8 (Surr)	*101*		*80 - 120*		*05/25/19 11:34*	*1*

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	**0.16**		0.10	0.012	mg/L			05/14/19 20:32	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/14/19 20:32	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	**0.40**		0.20	0.051	ug/L		05/18/19 13:39	05/23/19 08:48	1
4-Amino-2,6-dinitrotoluene	**0.38**		0.20	0.058	ug/L		05/18/19 13:39	05/23/19 08:48	1
2,4-Dinitrotoluene	0.084	U	0.40	0.084	ug/L		05/18/19 13:39	05/23/19 08:48	1
2,6-Dinitrotoluene	0.064	U	0.20	0.064	ug/L		05/18/19 13:39	05/23/19 08:48	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/18/19 13:39	05/23/19 08:48	1
m-Nitrotoluene	0.19	U	0.40	0.19	ug/L		05/18/19 13:39	05/23/19 08:48	1
o-Nitrotoluene	0.085	U	0.40	0.085	ug/L		05/18/19 13:39	05/23/19 08:48	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/18/19 13:39	05/23/19 08:48	1
Nitrobenzene	0.091	U	0.40	0.091	ug/L		05/18/19 13:39	05/23/19 08:48	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/18/19 13:39	05/23/19 08:48	1
1,3-Dinitrobenzene	0.089	U	0.40	0.089	ug/L		05/18/19 13:39	05/23/19 08:48	1
HMX	**0.55**		0.40	0.087	ug/L		05/18/19 13:39	05/23/19 08:48	1
RDX	**2.9**		0.30	0.16	ug/L		05/18/19 13:39	05/23/19 08:48	1
Tetryl	0.079	U	0.20	0.079	ug/L		05/18/19 13:39	05/23/19 08:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*93*		*75 - 118*	*05/18/19 13:39*	*05/23/19 08:48*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.3**	**Q**			SU			05/29/19 15:05	1
Temperature	**25.4**	**Q**			Degrees C			05/29/19 15:05	1

Client: LRS Federal LLC
Project/Site: OBOD C-62

Job ID: 400-170151-1
SDG: C-62

Client Sample ID: C-62 TD
Date Collected: 05/14/19 00:00
Date Received: 05/14/19 15:00

Lab Sample ID: 400-170151-7
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 12:02	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 12:02	1
Toluene	0.41	U	1.0	0.41	ug/L			05/25/19 12:02	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 12:02	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 12:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*106*		*78 - 118*		*05/25/19 12:02*	*1*
Dibromofluoromethane	*97*		*81 - 121*		*05/25/19 12:02*	*1*
Toluene-d8 (Surr)	*93*		*80 - 120*		*05/25/19 12:02*	*1*

Client Sample Results

Client: LRS Federal LLC
Project/Site: OBOD C-62

Job ID: 400-170151-1
SDG: C-62

Client Sample ID: C-62 EB

Lab Sample ID: 400-170151-8

Date Collected: 05/14/19 10:15
Matrix: Water
Date Received: 05/14/19 15:00

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 09:48	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 09:48	1
Toluene	0.41	U	1.0	0.41	ug/L			05/25/19 09:48	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 09:48	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 09:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*105*		*78 - 118*		*05/25/19 09:48*	*1*
Dibromofluoromethane	*99*		*81 - 121*		*05/25/19 09:48*	*1*
Toluene-d8 (Surr)	*99*		*80 - 120*		*05/25/19 09:48*	*1*

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.012	U	0.10	0.012	mg/L			05/14/19 20:55	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/14/19 20:55	1

Method: 8330A - Nitroaromatics and Nitramines

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.056	U	0.22	0.056	ug/L		05/18/19 13:39	05/23/19 09:12	1
4-Amino-2,6-dinitrotoluene	0.064	U	0.22	0.064	ug/L		05/18/19 13:39	05/23/19 09:12	1
2,4-Dinitrotoluene	0.093	U	0.44	0.093	ug/L		05/18/19 13:39	05/23/19 09:12	1
2,6-Dinitrotoluene	0.072	U	0.22	0.072	ug/L		05/18/19 13:39	05/23/19 09:12	1
2,4,6-Trinitrotoluene	0.18	U	0.44	0.18	ug/L		05/18/19 13:39	05/23/19 09:12	1
m-Nitrotoluene	0.22	U	0.44	0.22	ug/L		05/18/19 13:39	05/23/19 09:12	1
o-Nitrotoluene	0.095	U	0.44	0.095	ug/L		05/18/19 13:39	05/23/19 09:12	1
p-Nitrotoluene	0.22	U	1.1	0.22	ug/L		05/18/19 13:39	05/23/19 09:12	1
Nitrobenzene	0.10	U	0.44	0.10	ug/L		05/18/19 13:39	05/23/19 09:12	1
1,3,5-Trinitrobenzene	0.22	U	1.1	0.22	ug/L		05/18/19 13:39	05/23/19 09:12	1
1,3-Dinitrobenzene	0.098	U	0.44	0.098	ug/L		05/18/19 13:39	05/23/19 09:12	1
HMX	0.097	U	0.44	0.097	ug/L		05/18/19 13:39	05/23/19 09:12	1
RDX	0.18	U	0.33	0.18	ug/L		05/18/19 13:39	05/23/19 09:12	1
Tetryl	0.088	U	0.22	0.088	ug/L		05/18/19 13:39	05/23/19 09:12	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*96*		*75 - 118*	*05/18/19 13:39*	*05/23/19 09:12*	*1*

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**5.5**	**Q**			SU			05/29/19 15:05	1
Temperature	**25.6**	**Q**			Degrees C			05/29/19 15:05	1

Client: LRS Federal LLC
Project/Site: OBOD C-62

Job ID: 400-170151-1
SDG: C-62

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
U	Indicates that the compound was analyzed for but not detected.

HPLC/IC

Qualifier	Qualifier Description
D1	Surrogate or matrix spike recoveries were not obtained because the extract was diluted for analysis
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J3	Estimated value; value may not be accurate. Spike recovery or RPD outside of criteria.
U	Indicates that the compound was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
Q	Sample held beyond the accepted holding time.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Sample Results

Client: LRS Federal LLC
Project/Site: OBOD C-62

Job ID: 400-170151-1
SDG: C-62

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 400-442197/4
Matrix: Water
Analysis Batch: 442197

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.38	U	1.0	0.38	ug/L			05/25/19 09:22	1
Ethylbenzene	0.50	U	1.0	0.50	ug/L			05/25/19 09:22	1
Toluene	0.41	U	1.0	0.41	ug/L			05/25/19 09:22	1
Xylenes, Total	1.6	U	10	1.6	ug/L			05/25/19 09:22	1
Methyl tert-butyl ether	0.74	U	1.0	0.74	ug/L			05/25/19 09:22	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene	*105*		*78 - 118*		*05/25/19 09:22*	*1*
Dibromofluoromethane	*98*		*81 - 121*		*05/25/19 09:22*	*1*
Toluene-d8 (Surr)	*95*		*80 - 120*		*05/25/19 09:22*	*1*

Lab Sample ID: LCS 400-442197/1002
Matrix: Water
Analysis Batch: 442197

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	50.0	49.6		ug/L		99	70 - 130
Ethylbenzene	50.0	45.1		ug/L		90	70 - 130
Toluene	50.0	43.5		ug/L		87	70 - 130
Xylenes, Total	100	91.3		ug/L		91	70 - 130
Methyl tert-butyl ether	50.0	46.3		ug/L		93	66 - 130

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene	*96*		*78 - 118*
Dibromofluoromethane	*101*		*81 - 121*
Toluene-d8 (Surr)	*87*		*80 - 120*

Lab Sample ID: 400-170151-3 MS
Matrix: Water
Analysis Batch: 442197

Client Sample ID: MW-94-62-03
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	0.38	U	50.0	49.1		ug/L		98	56 - 142
Ethylbenzene	0.50	U	50.0	43.0		ug/L		86	58 - 131
Toluene	0.50	I	50.0	44.0		ug/L		87	65 - 130
Xylenes, Total	1.6	U	100	86.7		ug/L		87	59 - 130
Methyl tert-butyl ether	0.74	U	50.0	47.6		ug/L		95	59 - 137

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene	*95*		*78 - 118*
Dibromofluoromethane	*101*		*81 - 121*
Toluene-d8 (Surr)	*91*		*80 - 120*

1 2 3 4 5 6 7 8 9

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 400-170151-3 MSD
Matrix: Water
Analysis Batch: 442197

Client Sample ID: MW-94-62-03
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	0.38	U	50.0	49.4		ug/L		99	56 - 142	0	30
Ethylbenzene	0.50	U	50.0	41.6		ug/L		83	58 - 131	3	30
Toluene	0.50	I	50.0	42.4		ug/L		84	65 - 130	4	30
Xylenes, Total	1.6	U	100	84.3		ug/L		84	59 - 130	3	30
Methyl tert-butyl ether	0.74	U	50.0	49.2		ug/L		98	59 - 137	3	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene	*93*		*78 - 118*
Dibromofluoromethane	*102*		*81 - 121*
Toluene-d8 (Surr)	*90*		*80 - 120*

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 400-440789/4
Matrix: Water
Analysis Batch: 440789

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.012	U	0.10	0.012	mg/L			05/14/19 11:03	1
Nitrite as N	0.021	U	0.10	0.021	mg/L			05/14/19 11:03	1

Lab Sample ID: LCS 400-440789/5
Matrix: Water
Analysis Batch: 440789

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	2.26	2.19		mg/L		97	90 - 110
Nitrite as N	3.04	3.21		mg/L		106	90 - 110

Lab Sample ID: LCSD 400-440789/6
Matrix: Water
Analysis Batch: 440789

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	2.26	2.18		mg/L		97	90 - 110	0	15
Nitrite as N	3.04	3.14		mg/L		103	90 - 110	2	15

Lab Sample ID: 400-170151-3 MS
Matrix: Water
Analysis Batch: 440789

Client Sample ID: MW-94-62-03
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	0.10		2.26	2.29		mg/L		97	80 - 120
Nitrite as N	0.021	U	3.04	3.08		mg/L		101	80 - 120

1
2
3
4
5
6
7
8
9

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 400-170151-3 MSD
Matrix: Water
Analysis Batch: 440789

Client Sample ID: MW-94-62-03
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	0.10		2.26	2.33		mg/L		99	80 - 120	2	20
Nitrite as N	0.021	U	3.04	3.10		mg/L		102	80 - 120	1	20

Method: 8330A - Nitroaromatics and Nitramines

Lab Sample ID: MB 280-458658/1-A
Matrix: Water
Analysis Batch: 459059

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 458658

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Amino-4,6-dinitrotoluene	0.051	U	0.20	0.051	ug/L		05/18/19 13:39	05/23/19 04:03	1
4-Amino-2,6-dinitrotoluene	0.058	U	0.20	0.058	ug/L		05/18/19 13:39	05/23/19 04:03	1
2,4-Dinitrotoluene	0.084	U	0.40	0.084	ug/L		05/18/19 13:39	05/23/19 04:03	1
2,6-Dinitrotoluene	0.065	U	0.20	0.065	ug/L		05/18/19 13:39	05/23/19 04:03	1
2,4,6-Trinitrotoluene	0.16	U	0.40	0.16	ug/L		05/18/19 13:39	05/23/19 04:03	1
m-Nitrotoluene	0.20	U	0.40	0.20	ug/L		05/18/19 13:39	05/23/19 04:03	1
o-Nitrotoluene	0.086	U	0.40	0.086	ug/L		05/18/19 13:39	05/23/19 04:03	1
p-Nitrotoluene	0.20	U	1.0	0.20	ug/L		05/18/19 13:39	05/23/19 04:03	1
Nitrobenzene	0.091	U	0.40	0.091	ug/L		05/18/19 13:39	05/23/19 04:03	1
1,3,5-Trinitrobenzene	0.20	U	1.0	0.20	ug/L		05/18/19 13:39	05/23/19 04:03	1
1,3-Dinitrobenzene	0.089	U	0.40	0.089	ug/L		05/18/19 13:39	05/23/19 04:03	1
HMX	0.088	U	0.40	0.088	ug/L		05/18/19 13:39	05/23/19 04:03	1
RDX	0.16	U	0.30	0.16	ug/L		05/18/19 13:39	05/23/19 04:03	1
Tetryl	0.079	U	0.20	0.079	ug/L		05/18/19 13:39	05/23/19 04:03	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dinitrobenzene	*99*		*75 - 118*	*05/18/19 13:39*	*05/23/19 04:03*	*1*

Lab Sample ID: LCS 280-458658/2-A
Matrix: Water
Analysis Batch: 459059

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 458658

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Amino-4,6-dinitrotoluene	2.00	1.89		ug/L		95	46 - 124
4-Amino-2,6-dinitrotoluene	2.00	1.73		ug/L		87	43 - 120
2,4-Dinitrotoluene	2.00	1.93		ug/L		96	53 - 127
2,6-Dinitrotoluene	2.00	1.82		ug/L		91	51 - 130
2,4,6-Trinitrotoluene	2.00	1.84		ug/L		92	46 - 139
m-Nitrotoluene	2.00	1.61		ug/L		80	31 - 140
o-Nitrotoluene	2.00	1.47		ug/L		73	37 - 138
p-Nitrotoluene	2.00	1.55		ug/L		77	41 - 137
Nitrobenzene	2.00	1.74		ug/L		87	46 - 144
1,3,5-Trinitrobenzene	2.00	2.12		ug/L		106	62 - 127
1,3-Dinitrobenzene	2.00	2.01		ug/L		100	59 - 131
HMX	2.00	1.97		ug/L		99	66 - 115
RDX	2.00	1.95		ug/L		97	69 - 122
Tetryl	2.00	2.01		ug/L		100	56 - 131

Method: 8330A - Nitroaromatics and Nitramines (Continued)

Lab Sample ID: LCS 280-458658/2-A
Matrix: Water
Analysis Batch: 459059

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 458658

Surrogate	LCS %Recovery	LCS Qualifier	Limits
1,2-Dinitrobenzene	94		75 - 118

Lab Sample ID: 400-170151-3 MS
Matrix: Water
Analysis Batch: 459059

Client Sample ID: MW-94-62-03
Prep Type: Total/NA
Prep Batch: 458658

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Amino-4,6-dinitrotoluene	0.054	U	1.95	1.87		ug/L		96	57 - 120
4-Amino-2,6-dinitrotoluene	0.062	U	1.95	1.71		ug/L		87	67 - 127
2,4-Dinitrotoluene	0.089	U	1.95	1.80		ug/L		92	68 - 120
2,6-Dinitrotoluene	0.069	U	1.95	1.68		ug/L		86	67 - 120
2,4,6-Trinitrotoluene	0.17	U	1.95	1.69		ug/L		87	74 - 120
m-Nitrotoluene	0.21	U	1.95	1.14		ug/L		58	57 - 124
o-Nitrotoluene	0.091	U	1.95	1.10		ug/L		56	49 - 124
p-Nitrotoluene	0.21	U	1.95	1.29		ug/L		66	25 - 141
Nitrobenzene	0.097	U	1.95	1.38		ug/L		71	59 - 120
1,3,5-Trinitrobenzene	0.21	U	1.95	1.89		ug/L		97	73 - 120
1,3-Dinitrobenzene	0.095	U	1.95	1.86		ug/L		95	73 - 120
HMX	0.15	I	1.95	1.95		ug/L		92	79 - 120
RDX	3.9		1.95	5.55		ug/L		83	79 - 120
Tetryl	0.085	U	1.95	1.85		ug/L		95	10 - 120

Surrogate	MS %Recovery	MS Qualifier	Limits
1,2-Dinitrobenzene	91		75 - 118

Lab Sample ID: 400-170151-3 MSD
Matrix: Water
Analysis Batch: 459059

Client Sample ID: MW-94-62-03
Prep Type: Total/NA
Prep Batch: 458658

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
2-Amino-4,6-dinitrotoluene	0.054	U	1.96	1.94		ug/L		99	57 - 120	4	20
4-Amino-2,6-dinitrotoluene	0.062	U	1.96	1.75		ug/L		89	67 - 127	2	20
2,4-Dinitrotoluene	0.089	U	1.96	1.81		ug/L		92	68 - 120	1	20
2,6-Dinitrotoluene	0.069	U	1.96	1.65		ug/L		84	67 - 120	2	20
2,4,6-Trinitrotoluene	0.17	U	1.96	1.73		ug/L		88	74 - 120	2	20
m-Nitrotoluene	0.21	U	1.96	1.59	J3	ug/L		81	57 - 124	33	20
o-Nitrotoluene	0.091	U	1.96	1.73	J3	ug/L		88	49 - 124	44	31
p-Nitrotoluene	0.21	U	1.96	1.81	J3	ug/L		92	25 - 141	33	30
Nitrobenzene	0.097	U	1.96	1.29		ug/L		66	59 - 120	7	20
1,3,5-Trinitrobenzene	0.21	U	1.96	1.94		ug/L		99	73 - 120	3	20
1,3-Dinitrobenzene	0.095	U	1.96	1.90		ug/L		97	73 - 120	2	20
HMX	0.15	I	1.96	2.00		ug/L		94	79 - 120	2	20
RDX	3.9		1.96	5.64		ug/L		88	79 - 120	2	20
Tetryl	0.085	U	1.96	1.86		ug/L		95	10 - 120	1	50

Surrogate	MSD %Recovery	MSD Qualifier	Limits
1,2-Dinitrobenzene	92		75 - 118

Method: 9040C - pH

Lab Sample ID: 400-170151-3 DU
Matrix: Water
Analysis Batch: 442538

Client Sample ID: MW-94-62-03
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	6.3	Q		6.3		SU				0	5
Temperature	25.8	Q		25.9		Degrees C				0.4	30

Lab Chronicle

Client: LRS Federal LLC
Project/Site: OBOD C-62

Job ID: 400-170151-1
SDG: C-62

Client Sample ID: MW-94-62-01
Lab Sample ID: 400-170151-1
Date Collected: 05/14/19 11:56
Matrix: Water
Date Received: 05/14/19 15:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 12:29	CAR	TAL PEN
Total/NA	Analysis	300.0		1	10 mL	1.0 mL	440789	05/14/19 19:01	BAW	TAL PEN
Total/NA	Prep	3535			505.1 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 05:14	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: MW-94-62-02
Lab Sample ID: 400-170151-2
Date Collected: 05/14/19 10:45
Matrix: Water
Date Received: 05/14/19 15:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 12:56	CAR	TAL PEN
Total/NA	Analysis	300.0		1			440789	05/14/19 19:24	BAW	TAL PEN
Total/NA	Prep	3535			499.3 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 05:38	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: MW-94-62-03
Lab Sample ID: 400-170151-3
Date Collected: 05/14/19 09:43
Matrix: Water
Date Received: 05/14/19 15:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 10:15	CAR	TAL PEN
Total/NA	Analysis	300.0		1			440789	05/14/19 17:52	BAW	TAL PEN
Total/NA	Prep	3535			468.2 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 06:01	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: MW-94-62-04
Lab Sample ID: 400-170151-4
Date Collected: 05/14/19 09:56
Matrix: Water
Date Received: 05/14/19 15:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 10:41	CAR	TAL PEN
Total/NA	Analysis	300.0		1			440789	05/14/19 19:46	BAW	TAL PEN
Total/NA	Prep	3535			473.8 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 08:00	HKF	TAL DEN
Total/NA	Prep	3535	DL		473.8 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A	DL	10			459059	05/23/19 13:10	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: MW-94-62-05
Lab Sample ID: 400-170151-5
Date Collected: 05/14/19 11:20
Matrix: Water
Date Received: 05/14/19 15:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 11:07	CAR	TAL PEN
Total/NA	Analysis	300.0		1			440789	05/14/19 20:09	BAW	TAL PEN
Total/NA	Prep	3535			490.7 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 08:24	HKF	TAL DEN
Total/NA	Prep	3535	DL		490.7 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A	DL	10			459059	05/23/19 13:33	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: MW-94-62-DUPLICATE
Lab Sample ID: 400-170151-6
Date Collected: 05/14/19 10:45
Matrix: Water
Date Received: 05/14/19 15:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 11:34	CAR	TAL PEN
Total/NA	Analysis	300.0		1	10 mL	1.0 mL	440789	05/14/19 20:32	BAW	TAL PEN
Total/NA	Prep	3535			500.6 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 08:48	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: C-62 TD
Lab Sample ID: 400-170151-7
Date Collected: 05/14/19 00:00
Matrix: Water
Date Received: 05/14/19 15:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 12:02	CAR	TAL PEN

Client Sample ID: C-62 EB
Lab Sample ID: 400-170151-8
Date Collected: 05/14/19 10:15
Matrix: Water
Date Received: 05/14/19 15:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 09:48	CAR	TAL PEN
Total/NA	Analysis	300.0		1			440789	05/14/19 20:55	BAW	TAL PEN
Total/NA	Prep	3535			450.3 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 09:12	HKF	TAL DEN
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: Method Blank
Lab Sample ID: MB 280-458658/1-A
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			500 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 04:03	HKF	TAL DEN

Client Sample ID: Method Blank
Lab Sample ID: MB 400-440789/4
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	10 mL	1.0 mL	440789	05/14/19 11:03	BAW	TAL PEN

Client Sample ID: Method Blank
Lab Sample ID: MB 400-442197/4
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 09:22	CAR	TAL PEN

Client Sample ID: Lab Control Sample
Lab Sample ID: LCS 280-458658/2-A
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			500 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 04:26	HKF	TAL DEN

Client Sample ID: Lab Control Sample
Lab Sample ID: LCS 400-440789/5
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	10 mL	1.0 mL	440789	05/14/19 11:26	BAW	TAL PEN

Client Sample ID: Lab Control Sample
Lab Sample ID: LCS 400-442197/1002
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 08:22	CAR	TAL PEN

Client Sample ID: Lab Control Sample
Lab Sample ID: LCS 400-442538/4
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 400-440789/6
Date Collected: N/A
Matrix: Water
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			440789	05/14/19 11:49	BAW	TAL PEN

Lab Chronicle

Client: LRS Federal LLC
Project/Site: OBOD C-62

Job ID: 400-170151-1
SDG: C-62

Client Sample ID: MW-94-62-03

Lab Sample ID: 400-170151-3 MS

Date Collected: 05/14/19 09:43
Date Received: 05/14/19 15:00
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 13:22	CAR	TAL PEN
Total/NA	Analysis	300.0		1			440789	05/14/19 18:15	BAW	TAL PEN
Total/NA	Prep	3535			511.6 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1	1 mL	1.0 mL	459059	05/23/19 06:25	HKF	TAL DEN

Client Sample ID: MW-94-62-03

Lab Sample ID: 400-170151-3 MSD

Date Collected: 05/14/19 09:43
Date Received: 05/14/19 15:00
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	442197	05/25/19 13:48	CAR	TAL PEN
Total/NA	Analysis	300.0		1			440789	05/14/19 18:38	BAW	TAL PEN
Total/NA	Prep	3535			509.2 mL	5 mL	458658	05/18/19 13:39	KSA	TAL DEN
Total/NA	Analysis	8330A		1			459059	05/23/19 06:49	HKF	TAL DEN

Client Sample ID: MW-94-62-03

Lab Sample ID: 400-170151-3 DU

Date Collected: 05/14/19 09:43
Date Received: 05/14/19 15:00
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			442538	05/29/19 15:05	DEK	TAL PEN

Laboratory References:

TAL DEN = Eurofins TestAmerica, Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100
TAL PEN = Eurofins TestAmerica, Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Eurofins TestAmerica, Pensacola
3355 McLemore Drive
Pensacola, FL 32514
Phone (850) 474-1001 Fax (850) 478-2671

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information	Sampler: LRS Federal LLC	Lab PM: Webb, Carol M	Carrier Tracking No(s):	COC No: 400-84030-29241.1
Client Contact: ~~Gabrielle Johnson~~ Kevin Doyle	Phone: 713 670 4535	E-Mail: carol.webb@testamericainc.com		Page: Page 1 of 2
Company: LRS Federal LLC				Job #:
Address: 8221 Ritchie Highway Suite 300	Due Date Requested:			
City: Pasadena	TAT Requested (days):			
State, Zip: MD, 21122				
Phone: 850-855-7244(Tel)	PO #: Purchase Order Requested			
Email: gjohnson@lrsfederal.com	WO #:			
Project Name: OBOD C-62	Project #: 40009463			
Site: C-62	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

400-170151 COC

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8330A - Explosives	300_ORGFMS - NO3, NO2	8260B - BTEXM 8260	~~300_ORGFMS - NO3,NO2~~ KRD	Total Number of containers	Special Instructions/Note:
				Preservation Code:			N	N	A	N		
MW-94-62-01	05-14-19	1156	G	Water	N	N					6	
MW-94-62-02		1045		Water		N						
MW-94-62-03		943		Water		Y						
MW-94-62-04		9:56		Water		N						
MW-94-62-05		11:20		Water		N						
MW-94-62 Duplicate		1045		Water		N						
MW-94-62 MS		943		Water		Y						
MW-94-62 MSD		943		Water		Y						
				Water								
				Water								
C-62 TD	05-14-19			Water	N				A		3	

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ______ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: Measure sample PH of samples

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment: 1345 KRD

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Doyle (Kevin Doyle)	5/14/19 / 1345	LRS Federal	Tracy Marks	5/14/19 ~~LRS Federal~~	LRS Federal
(Dan Parker)	5/14/19 / 1345	LRS Federal	Tracy Marks	5/14/19 ~~LRS Federal~~	LRS Federal
	5-14-19 1500	LRS Federal	Kathy Owen	5-14-19 1500 ~~1345~~ KRD	TA

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 0.2, 0.4, 0.2°C IR7

Custody seal #'s 692008, 692009, 692010

Ver: 01/16/2019

Eurofins TestAmerica, Pensacola
3355 McLemore Drive
Pensacola, FL 32514
Phone (850) 474-1001 Fax (850) 478-2671

Chain of Custody Record

eurofins Environment Testing TestAmerica

Client Information	Sampler: LRS federal, LLC	Lab PM: Webb, Carol M	Carrier Tracking No(s):	COC No: 400-84030-29241.2
Client Contact: ~~Gabrielle Johnson~~ Kevin Doyle	Phone: 713 670 4535	E-Mail: carol.webb@testamericainc.com		Page: Page 2 of 2
Company: LRS Federal LLC				Job #:
Address: 8221 Ritchie Highway Suite 300	Due Date Requested:			
City: Pasadena	TAT Requested (days):			
State, Zip: MD, 21122				
Phone: 850-855-7244(Tel)	PO #: Purchase Order Requested			
Email: gjohnson@lrsfederal.com	WO #:			
Project Name: OBOD C-62	Project #: 40009463			
Site: C-62	SSOW#:			

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8330A - Explosives	300_ORGFMS - NO3, NO2	8260B - BTEXM 8260	~~300_ORGFMS - NO3,NO2~~ KRD	Total Number of containers	Special Instructions/Note:
				Preservation Code:			N	N	A	N		
~~C-62 FB~~				Water						KRD		
C-62 EB	05-14-19	1015	G	Water	N	N	N	N	A		6	
				Water								

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ______ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: Measure sample PH of samples

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
for (Kevin Doyle) [signature] (Dan Parker)	05/14/19 @ 1345	LRS federal	DM MAD Tracy Matt	05/14/19 @ 1345	LRS Federal
[signature]	5-14-19 1500	LRS Federal	Kathy L Ave	5-14-19 1500	TA

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

Custody Seal Numbers 692008, 692009, 692010

Ver: 01/16/2019

Eurofins TestAmerica, Pensacola
3355 McLemore Drive
Pensacola, FL 32514
Phone (850) 474-1001 Fax (850) 478-2671

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Webb, Carol M	Carrier Tracking No(s):	COC No: 400-210472.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: carol.webb@testamericainc.com	State of Origin: Maryland	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Florida		Job #: 400-170151-1
Address: 4955 Yarrow Street,	Due Date Requested: 5/31/2019	Analysis Requested		Preservation Codes:
City: Arvada	TAT Requested (days):			
State, Zip: CO, 80002				
Phone: 303-736-0100(Tel) 303-431-7171(Fax)	PO #:			
Email:	WO #:			
Project Name: OBOD C-62	Project #: 40009463			
Site:	SSOW#:			

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8330A/3535 DOD Sublist	Total Number of containers	Special Instructions/Note:
				Preservation Code:					
MW-94-62-01 (400-170151-1)	5/14/19	11:56 Eastern		Water			X	2	
MW-94-62-02 (400-170151-2)	5/14/19	10:45 Eastern		Water			X	2	
MW-94-62-03 (400-170151-3)	5/14/19	09:43 Eastern		Water			X	2	
MW-94-62-03 (400-170151-3MS)	5/14/19	09:43 Eastern	MS	Water			X	2	
MW-94-62-03 (400-170151-3MSD)	5/14/19	09:43 Eastern	MSD	Water			X	2	
MW-94-62-04 (400-170151-4)	5/14/19	09:56 Eastern		Water			X	2	
MW-94-62-05 (400-170151-5)	5/14/19	11:20 Eastern		Water			X	2	
MW-94-62-DUPLICATE (400-170151-6)	5/14/19	10:45 Eastern		Water			X	2	
C-62 EB (400-170151-8)	5/14/19	10:15 Eastern		Water			X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ______ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) | Primary Deliverable Rank: 2 | Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: [signature]	Date/Time: 5-15-19 1630	Company: TA	Received by: [signature]	Date/Time: 5-16-19 0855	Company: TA DEW
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks: 4.8, t0, IR9, xfr by ROP 5-17-19		

Ver: 01/16/2019

APPENDIX B
Data Validation Reports

This page intentionally left blank.

Range C-52N: 2019

Data Validation Report

This report contains the results of the review and validation for TestAmerica Report Number 400-170365-1 for samples taken from Range C-52N, Eglin Air Force Base, Florida on May 17, 2019.

Data validation was performed according to guidance from *USEPA National Functional Guidelines for Organic Data Review* (USEPA, 2017), *USEPA National Functional Guidelines for Inorganic Review* (USEPA, 2017), and the analytical methods and the project specific Quality Assurance Project Plan.

Sample Handling and Holding Times

The samples were received on 5/17/2019, 2:35 pm; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the coolers at receipt were 0.1°C and 0.2°C. All samples were properly preserved and transferred under chain-of-custody to the laboratory for analysis. The laboratory prepared and analyzed all sampled within the recommended holding time limits. No qualification of the data was required.

Blanks

Blank samples enable determination of origin of analyte which may be attributed to sampling or laboratory procedures, versus source contamination. One equipment blank was collected. The method blank for analytical batch MB 400-441370/38 contained Nitrate as N equal to the Method Detection Limit (MDL). This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

Laboratory Control Samples (LCS)

Laboratory control samples (blank spikes) indicate laboratory instrument response to a secondary source which helps rule out calibration bias and serves as a measure of instrument performance. No qualification of the data is required based on the laboratory control samples.

Sample Surrogates

Surrogates are added to monitor instrument performance on individual samples and to discern potential matrix interference. Surrogate recovery for all samples were within the control limits. No qualification of the data is required.

Spike Samples and Matrix Spike/Matrix Spike Duplicates (MS/MSD)

MS/MSD was performed on this data group. The Matrix Spike for analytical batch 400-170365-3 MS contained Nitrate as N equal to the MDL. This target analyte concentration was less than the RL; therefore, re-extraction and/or re-analysis of samples was not performed. The Matrix Spike Duplicate for analytical batch 400-170365-3 MSD also contained Nitrate as N equal to the MDL. This target analyte concentration was less than the RL; therefore, re-extraction and/or re-analysis of samples was not performed.

Project Specific Quality Assurance/Quality Control

Field duplicates are performed to gauge replicate precision between non-spiked sample aliquots. There was one field duplicate pair collected as part of this sample group (samples MW-94-52-02 and MW-94-52-DUPLICATE). All relative percent difference (RPD) results for the field duplicate pair were within the recommended control limits. No qualification of the data is necessary.

Compound Quantitation and Reporting Limits

All sample results were reported down to the laboratory MDL and none of the samples associated with this site displayed elevated RL due to dilution or interference. No qualification of the data is required.

Overall Assessment of Data

The data is suitable for continued monitoring at the site. All analytes were performed and the data meets required QC criteria. All analytes were completed, and no data was rejected due to QC failure. The data is 100% complete.

Range C-62: 2019

Data Validation Report
This report contains the results of the review and validation for TestAmerica Report Number 400-170151-1 for samples taken from Range C-52N, Eglin Air Force Base, Florida on May 14, 2019.

Data validation was performed according to guidance from *USEPA National Functional Guidelines for Organic Data Review* (USEPA, 2017), *USEPA National Functional Guidelines for Inorganic Review* (USEPA, 2017), and the analytical methods and the project specific Quality Assurance Project Plan.

Sample Handling and Holding Times
The samples were received on 5/14/2019, 3:00 pm; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the coolers at receipt were 0.2°C, 0.2°C, and 0.4°C. All samples were properly preserved and transferred under chain-of-custody to the laboratory for analysis. The laboratory prepared and analyzed all samples within the recommended holding time limits. No qualification of the data was required.

Blanks
Blank samples enable determination of origin of analyte which may be attributed to sampling or laboratory procedures, versus source contamination. One equipment blank was collected. The method blank for analytical batch MB 400-440789/4 contained Nitrate as N equal to the MDL. This target analyte concentration was less than the RL; therefore, re-extraction and/or re-analysis of samples was not performed.

Laboratory Control Samples (LCS)
Laboratory control samples (blank spikes) indicate laboratory instrument response to a secondary source which helps rule out calibration bias and serves as a measure of instrument performance. No qualification of the data is required based on the laboratory control samples.

Sample Surrogates
Surrogates are added to monitor instrument performance on individual samples and to discern potential matrix interference. Surrogate recovery for all required analyte samples were within the control limits. No qualification of the data is required.

Spike Samples and Matrix Spike/Matrix Spike Duplicates (MS/MSD)
MS/MSD was performed on this data group. The Matrix Spike for analytical batch 400-170151-3 MS contained Nitrate as N, toluene, HMX and RDX above the MDL. These target analyte concentrations were equal to or less than the RL (except for RDX); therefore, re-extraction and/or re-analysis of samples was not performed. The Matrix Spike Duplicate for analytical batch 400-170151-3 MSD matched the MS sample exactly. No re-extraction and/or re-analysis of samples was performed.

Project Specific Quality Assurance/Quality Control
Field duplicates are performed to gauge replicate precision between non-spiked sample aliquots. There was one field duplicate pair collected as part of this sample group (samples MW-94-62-02

and MW-94-62-DUPLICATE). All relative percent difference (RPD) results for the field duplicate pair were within the recommended control limits. No qualification of the data is necessary.

Compound Quantitation and Reporting Limits
All sample results were reported down to the laboratory MDL. The concentration of the HMX and RDX samples were above the calibration range. Therefore, the samples were diluted ten times to quantitate HMX and RDX on the calibration range.

Overall Assessment of Data
The data is suitable for continued monitoring at the site. All analytes were performed and the data meets required QC criteria. All analytes were completed, and no data was rejected due to QC failure. The data is 100% complete.

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB Range C-52N

EPA Identification Number FL 8570024366

Well identification MW94-52-01

Date(s) of installation 6 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

5	7	4	3	4	9		2	7	8		1	4	2	5	7	0	8		2	3	4
~~D~~	~~D~~	~~M~~	~~M~~	~~S~~	S		~~S~~	~~S~~			~~D~~	~~D~~	~~M~~	~~M~~	~~S~~	~~S~~			~~S~~	~~S~~	

Elevation surface 154.94' Elevation TOC 156.73

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLO.

Turbidity N/A Date of reading 0 3 0 8 9 5 (M M D D Y Y)

Static water level (msl) 36.75 Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)
PVC Sch40	2.375"	2.067	0'	35

Screen:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)	Slot Size
PVC Sch40	2.375	2.067	35	45	.010

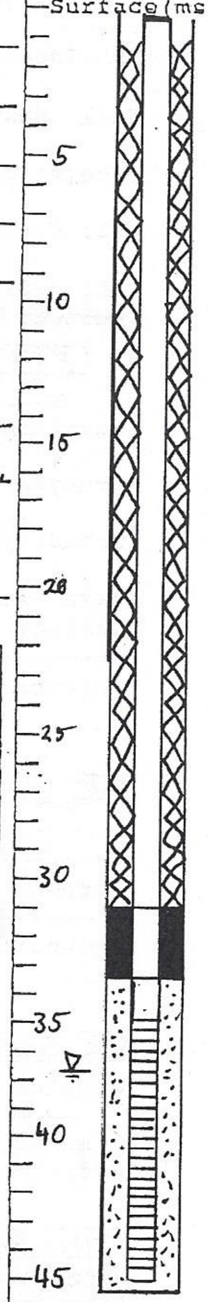
Annulus:

Material including Additives for sealant	Size of Material	Depth From (ft)	Depth To (ft)	Installation Method
Filter Pack; Sand	20/30	33.5	45.5	Drop
Bentonite	chips	31.0	33.5	Drop
Cement bentonite Slurry		0	31	Tremi pipe

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	45.5	Drilling mud water

Well Construction Diagram

Surface (msl) 154.94



scale: 1 unit= 1 Ft.

DER Form 17-730.900(2)(b)
Page 1 of 1 [10-07-93]

Facility Eglin AFB Range C-52N

EPA Identification Number Fl 8570024366

Well identification MW94-52-02

Date(s) of installation 4 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

572666	401	1425374	930
~~D D M M S~~ S	~~S S~~	~~D D M M S S~~	~~S S~~

Elevation surface 115.86 Elevation TOC 115.54

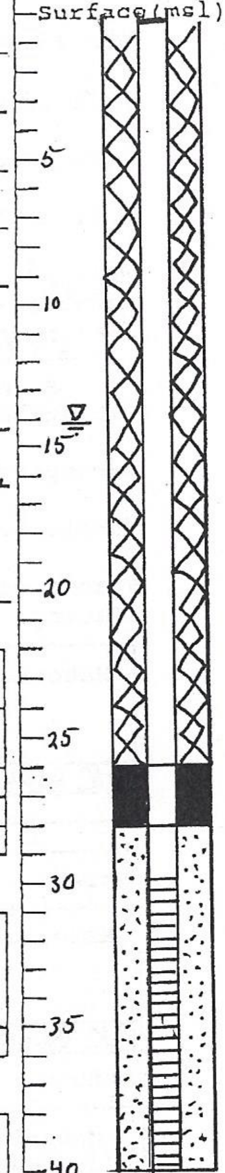
Surveyor's name Middleton Dowden Surveyor's License # 4095 FLO.

Turbidity N/A Date of reading 030895 (M M D D Y Y)

Static water level (msl) 14.18 Field geologist TE Carroll

Well Construction Diagram

Surface (msl) 115.86



scale: 1 unit= 1 Ft.

Casing:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)
PVC Sch40	2.375"	2.067	0'	30'

Screen:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)	Slot Size
PVC Sch40	2.375	2.067	30	40	.010

Annulus:

Material including Additives for sealant	Size of Material	Depth From (ft)	Depth To (ft)	Installation Method
Filter Pack; Sand	20/30	28.0	40.0	Drop
Bentonite	chips	26.0	28.0	Drop
Cement-bentonite slurry		0	26	tremi pipe

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	40.0	Drilling mud water

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB Range C-52N

EPA Identification Number FL8570024366

Well identification MW94-52-03

Date(s) of installation 4 November – 5 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

572786	633	1425991	490
~~D D M M S~~ S	~~S S~~	~~D D M M S~~ S	~~S S~~

Elevation surface 125.53' Elevation TOC 125.34'

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLA.

Turbidity N/A Date of reading 030895 (M M D D Y Y)

Static water level (msl) 19.84 Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth	
			From (ft)	To (ft)
PVC Sch40	2.375"	2.067	0'	30

Screen:

Material	Outside Diameter	Inside Diameter	Depth		Slot Size
			From (ft)	To (ft)	
PVC Sch40	2.375	2.067	30	40	.010

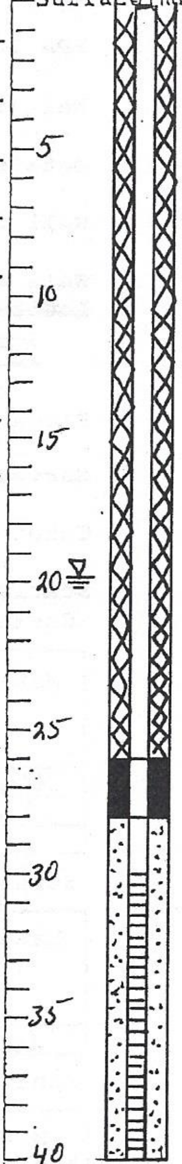
Annulus:

Material including Additives for sealant	Size of Material	Depth		Installation Method
		From (ft)	To (ft)	
Filter Pack: Sand	30/30	28.0	40.0	Drop
Bentonite	chips	26.0	28.0	Drop
Cement-bentonite Slurry		0	26.0	tremi pipe

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	40.0	Drilling Mud & water

Well Constructio Diagram

Surface(msl) 125.5



scale: 1 unit= 1Ft

DER Form 17-730.900(2)(b)

Page 1 of 1 [10-07-93]

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB

EPA Identification Number Fl85700243 66

Well identification Pilot Hole C-52N

Date(s) of installation

Well driller's complete name Groundwater Protection, Inc

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

5 7 3 7 3 0	5 8 3	1 4 2 6 1 8 4	3 7 9
D D M M S S	S S	D D M M S S	S S

Elevation surface 136.0 Elevation TOC N/A

Surveyor's name Middleton Dowden Surveyor's License # 4095 Fla.

Turbidity N/A Date of reading N/A ~~M M D D Y Y~~

Static water level (msl) N/A Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth	
			From (ft)	To (ft)
N/A				

Screen:

Material	Outside Diameter	Inside Diameter	Depth		Slot Size
			From (ft)	To (ft)	
N/A					

Annulus:

Material including Additives for sealant	Size of Material	Depth		Installation Method
		From (ft)	To (ft)	
N/A				

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	70	Drilling mud & water

Well Construction Diagram

Surface(msl)

N/A

scale: 1 unit=

Facility Eglin AFB Range C-52N

EPA Identification Number Fl8570024366

Well identification MW94-62-01

Date(s) of installation 17 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

6 0 0 9 6 5	1 5 8	1 4 5 6 3 3 7	2 3 3
~~D D M M S~~ S	~~S S~~	~~D D M M S S~~	~~S S~~

Elevation surface 188.42' Elevation TOC 188.22'

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLO.

Turbidity N/A Date of reading 0 3 1 6 9 5 (M M D D Y Y)

Static water level (msl) 13.97 Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)
PVC Sch40	2.375"	2.067	0'	25

Screen:

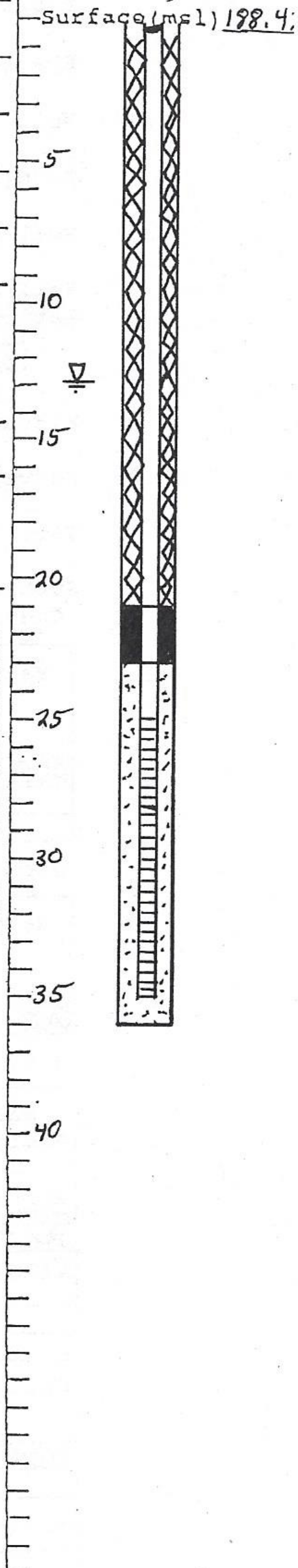
Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)	Slot Size
PVC Sch40	2.375	2.067	25	35	.010

Annulus:

Material including Additives for sealant	Size of Material	Depth From (ft)	Depth To (ft)	Installation Method
Filter Pack: Sand	20/30	23.0	36.0	Drop
Bentonite	Chips	21.0	23.0	Drop
Cement-bentonite slurry		0	21	tremi pipe

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	36'	Drilling mud & water

Well Construction Diagram



scale: 1 unit= 1Ft

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB Range C-52N

EPA Identification Number FL8570024366

Well identification MW94-62-02

Date(s) of installation 17 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

| 6 | 0 | 0 | 8 | 6 | 4 | 9 | 1 | 4 | 1 | 4 | 5 | 5 | 8 | 6 | 0 | 6 | 5 | 7 |

~~D D M M S~~ S ~~S S~~ ~~D D M M S S~~ ~~S S~~

Elevation surface 173.80' Elevation TOC 173.55'

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLA.

Turbidity N/A Date of reading 0 3 1 7 9 5 (M M D D Y Y)

Static water level (msl) 9.68 Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)
PVC Sch40	2.375"	2.067	0'	30

Screen:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)	Slot Size
PVC Sch40	2.375	2.067	30.0	40.0	.010

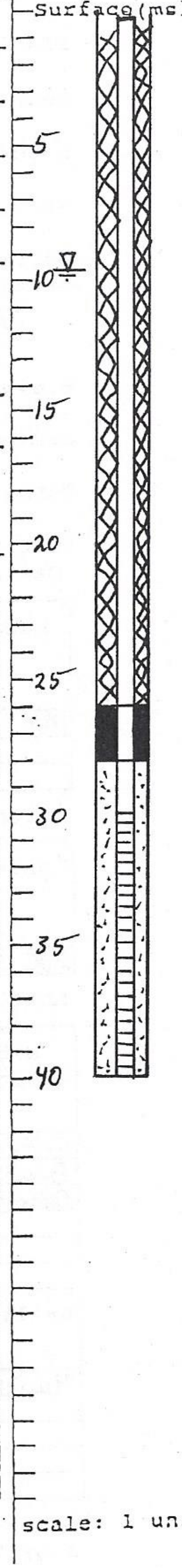
Annulus:

Material including Additives for sealant	Size of Material	Depth From (ft)	Depth To (ft)	Installation Method
Filter Pack: Sand	20/30	28.5	40.0	Drop
BenTonite	Chips	26.0	28.5	Drop
Cement-bentonite slurry		0	26	tremipipe

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	40	Drilling mud & water

Well Construction Diagram

Surface (msl) 173.8



scale: 1 unit= 1Ft

DER Form 17-730.900(2)(b)
Page 1 of 1 [10-07-93]

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB Range C-52N

EPA Identification Number FL 8570024366

Well identification MW94-62-03

Date(s) of installation 16 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

6 0 0 6 8 9	6 0 7	1 4 5 5 8 3 3	5 9 8
~~D D M M S S~~	~~S S~~	~~D D M M S S~~	~~S S~~

Elevation surface 172.52' Elevation TOC 172.36'

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLO.

Turbidity N/A Date of reading 0 3 1 7 9 5 (M M D D Y Y)

Static water level (msl) 10.04 Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth	
			From (ft)	To (ft)
PVC Sch40	2.375"	2.067	0'	30

Screen:

Material	Outside Diameter	Inside Diameter	Depth		Slot Size
			From (ft)	To (ft)	
PVC Sch40	2.375	2.067	30	40	.010

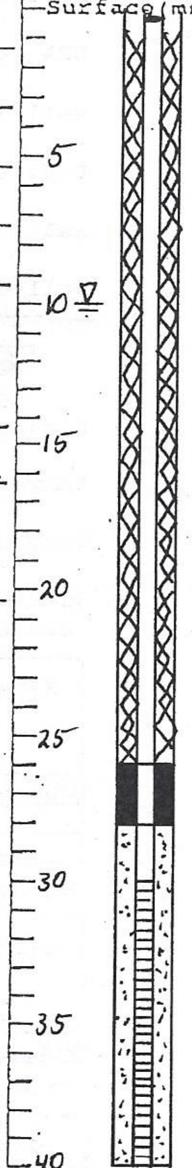
Annulus:

Material including Additives for sealant	Size of Material	Depth		Installation Method
		From (ft)	To (ft)	
Filter Pack: Sand	30/30	28.5	40.0	Drop
BenTonite	Chips	26.0	28.5	Drop
Cement-bentonite Slurry		0	26.0	tremi pipe

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	40	Drilling mud + water

Well Construction Diagram

Surface (msl) 172.5



scale: 1 unit= 1 Ft

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB Range C-52N

EPA Identification Number FI 8570024366

Well identification MW94-62-04

Date(s) of installation 16 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

600319	601	1455885	041
~~D D M M S~~ S	~~S S~~	~~D D M M S S~~	~~S S~~

Elevation surface 178.86' Elevation TOC 178.50'

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLA.

Turbidity N/A Date of reading 031695 (M M D D Y Y)

Static water level (msl) 18.58 Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)
PVC Sch40	2.375"	2.067	0'	29

Screen:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)	Slot Size
PVC Sch40	2.375	2.067	29	39	.010

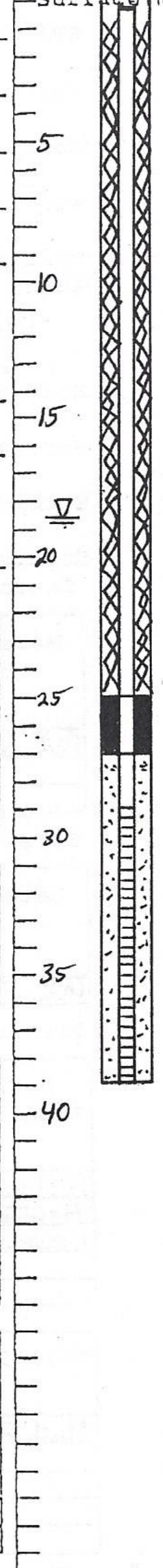
Annulus:

Material including Additives for sealant	Size of Material	Depth From (ft)	Depth To (ft)	Installation Method
Filter Pack; Sand	30/30	27	39	Drop
Bentonite	Chips	25	27	Drop
Cement-bentonite slurry		0	25	tremi pipe

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	39'	Drilling mud & water

Well Construction Diagram

Surface (msl) 178.8



scale: 1 unit= 1Ft

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB Range C-52N

EPA Identification Number FL8570024366

Well identification MW94-62-05

Date(s) of installation 15 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

6 0 0 2 0 8	7 3 2	1 4 5 5 9 9 1	7 9 0
~~D D M M S~~ S	~~S S~~	~~D D M M S S~~	~~S S~~

Elevation surface 178.13 Elevation TOC 177.81

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLO.

Turbidity N/A Date of reading 0 3 1 6 9 5 (M M D D Y Y)

Static water level (msl) 18.85 Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)
PVC Sch40	2.375"	2.067	0'	30

Screen:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)	Slot Size
PVC Sch40	2.375	2.067	30	40	.010

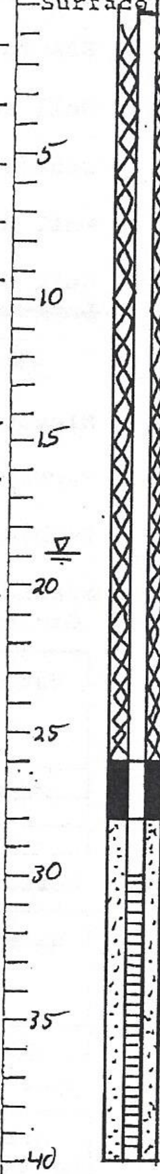
Annulus:

Material including Additives for sealant	Size of Material	Depth From (ft)	Depth To (ft)	Installation Method
Filter Pack: Sand	30/30	28	40	Drop
Bentonite	Chips	26	28	Drop
Cement-bentonite slurry		0	26	tremi pipe

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	40	Drilling mud + water

Well Construction Diagram

Surface (msl) 178.13



scale: 1 unit= 1Ft

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB

EPA Identification Number Fl 8570024366

Well identification Pilot Hole C-62N (Soil Boring)

Date(s) of installation 19 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

6	0	0	7	4	1	2	4	6	1	4	5	6	1	9	5	7	1	7
D	D	M	M	S	S	S	S		D	D	M	M	S	S		S	S	

Elevation surface 184.9' Elevation TOC N/A

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLO.

Turbidity N/A Date of reading N/A (M M D D Y Y)

Static water level (msl) N/A Field geologist T E Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)
N/A				

Screen:

Material	Outside Diameter	Inside Diameter	Depth From (ft)	Depth To (ft)	Slot Size
N/A					

Annulus:

Material including Additives for sealant	Size of Material	Depth From (ft)	Depth To (ft)	Installation Method
N/A				

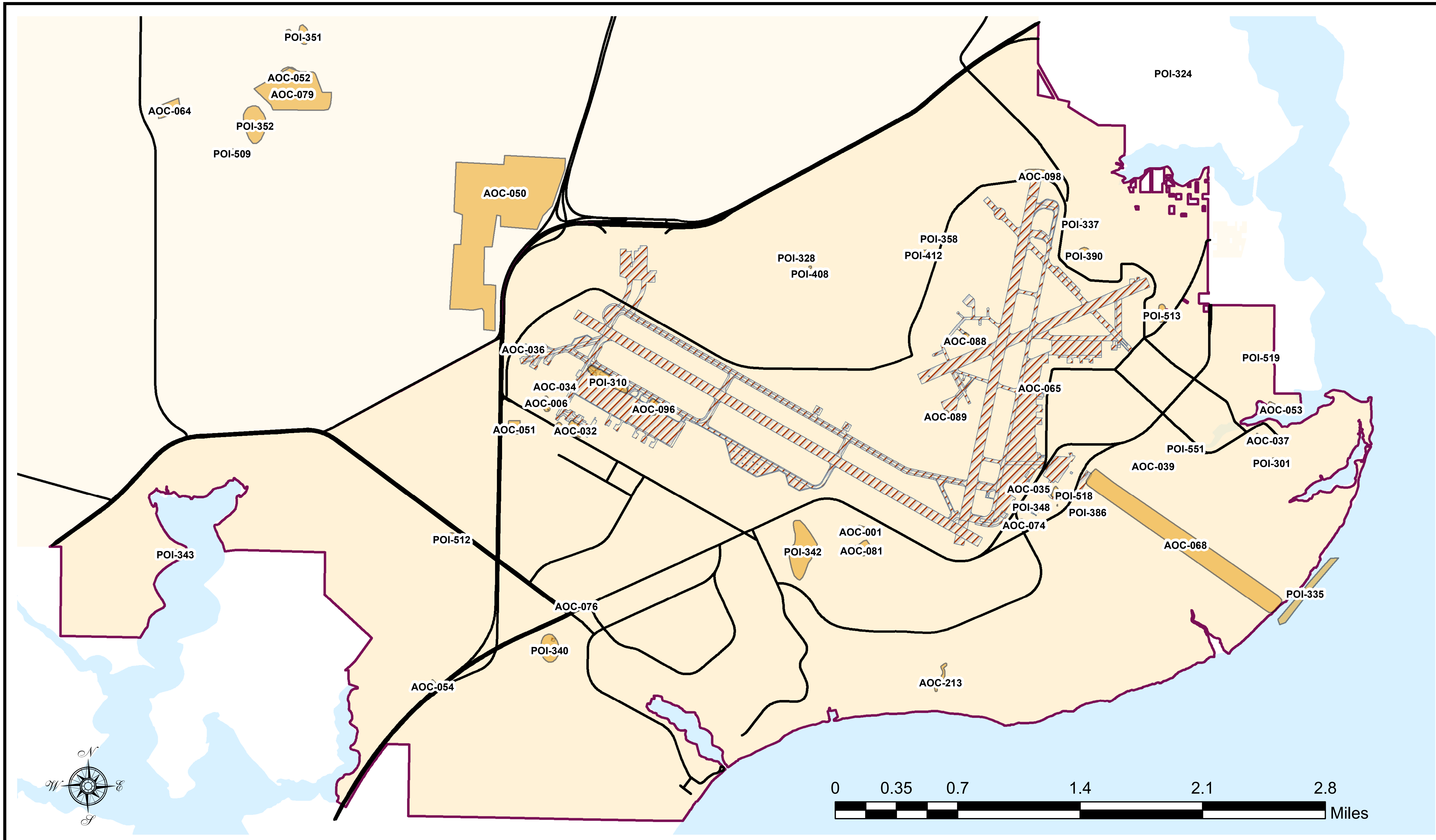
Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	110	Drilling mud & water

Well Construction Diagram

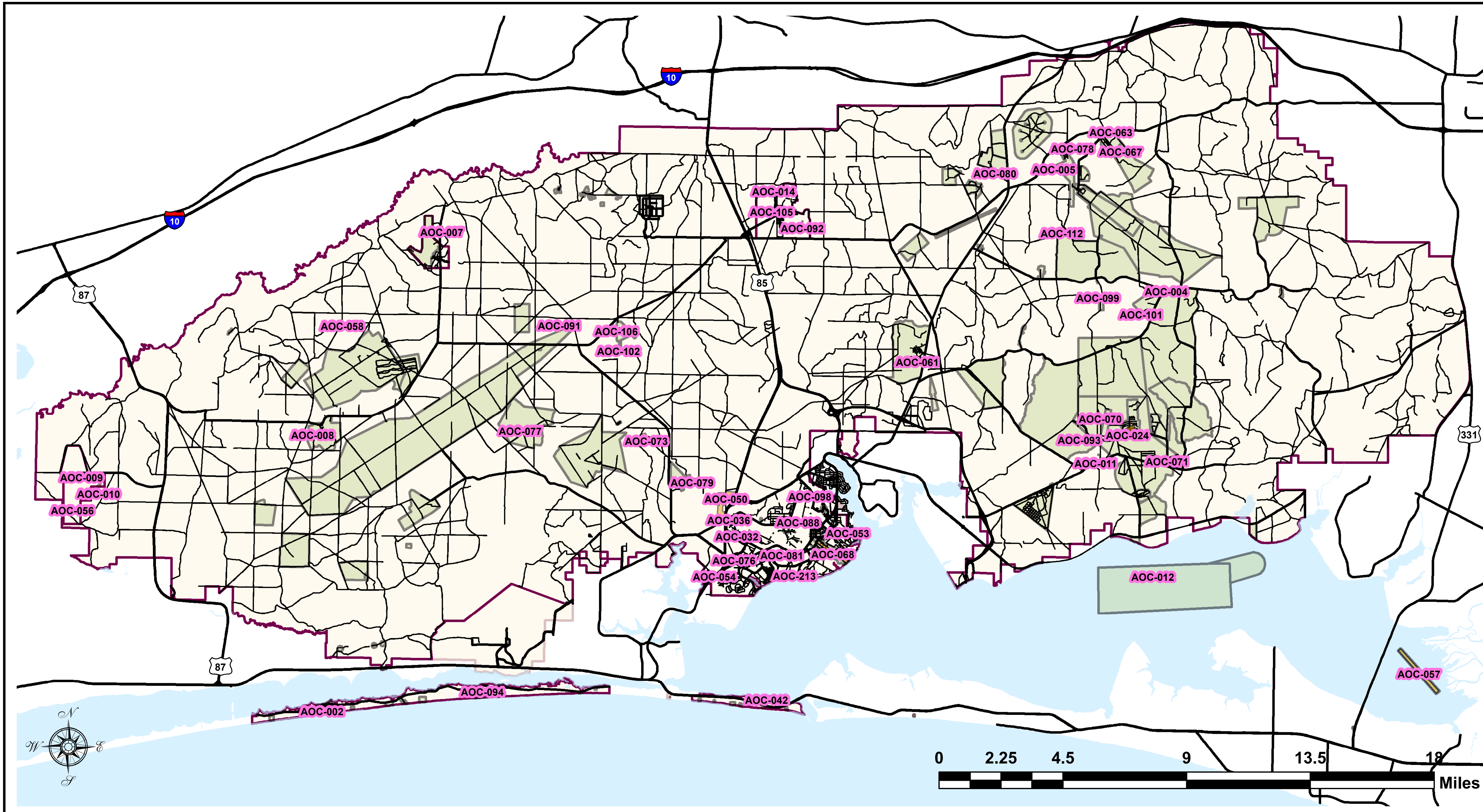
Surface(msl) ______

N/A

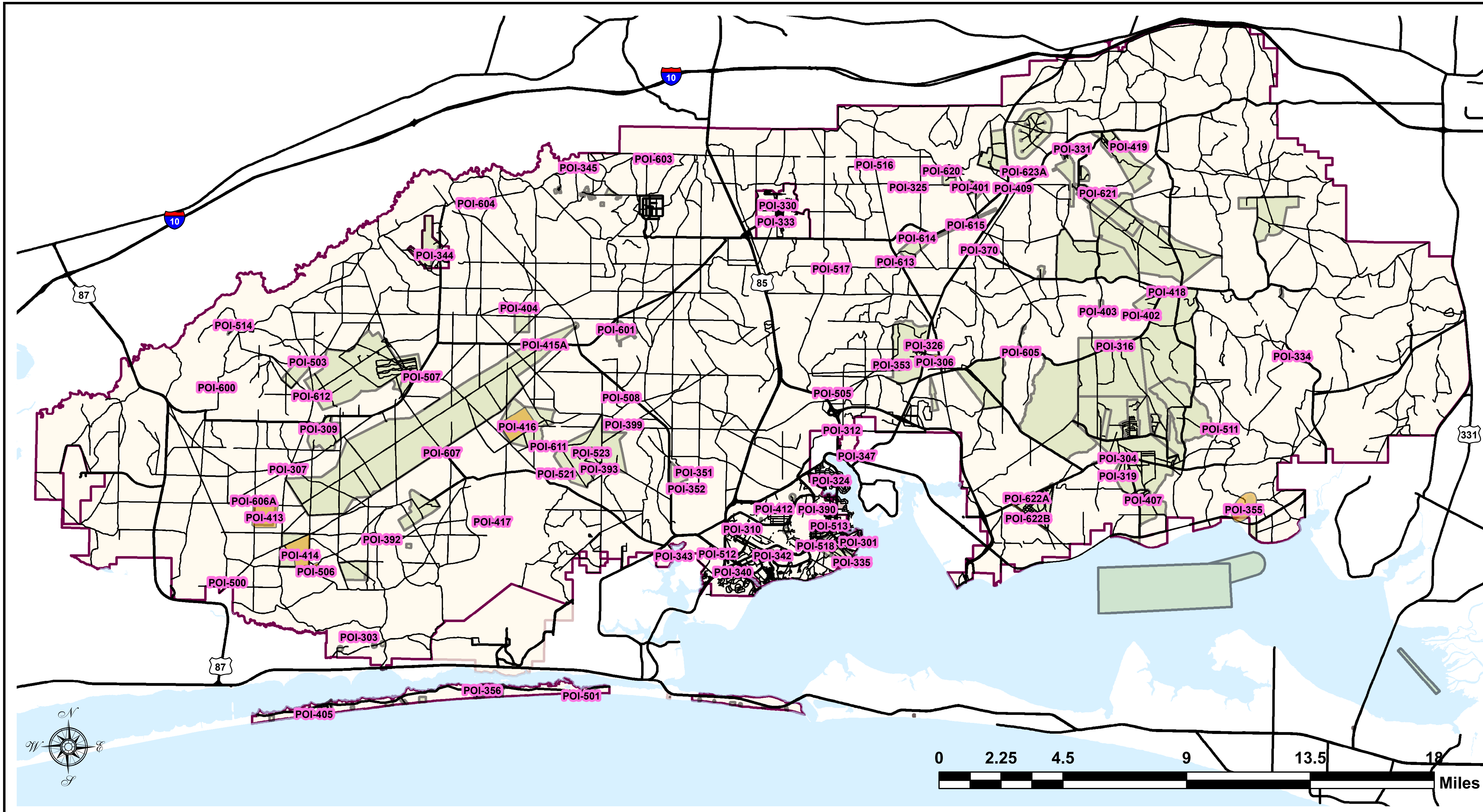
scale: 1 unit= ______



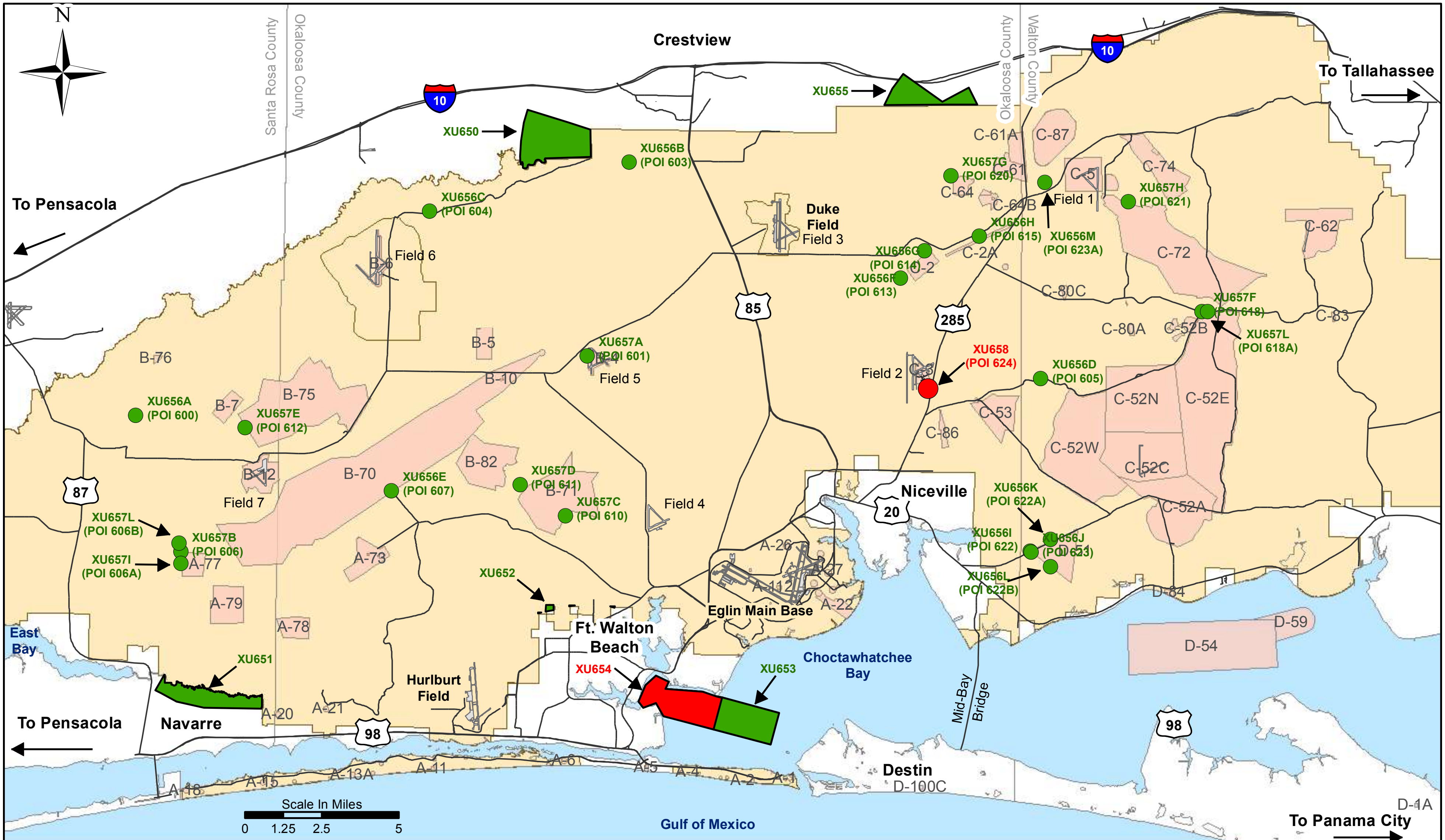
EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
EGLIN MAIN BASE AREAS OF CONCERN (AOC) AND POINTS OF INTEREST (POI)



EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
AREAS OF CONCERN (AOC)



EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
POINTS OF INTEREST (POI)



Legend

- MRS (Active)
- MRS (Closed)
- MRA (Active)
- MRA (Closed)
- Airfield
- Test Area
- Eglin Installation Area

AIR FORCE MATERIEL COMMAND

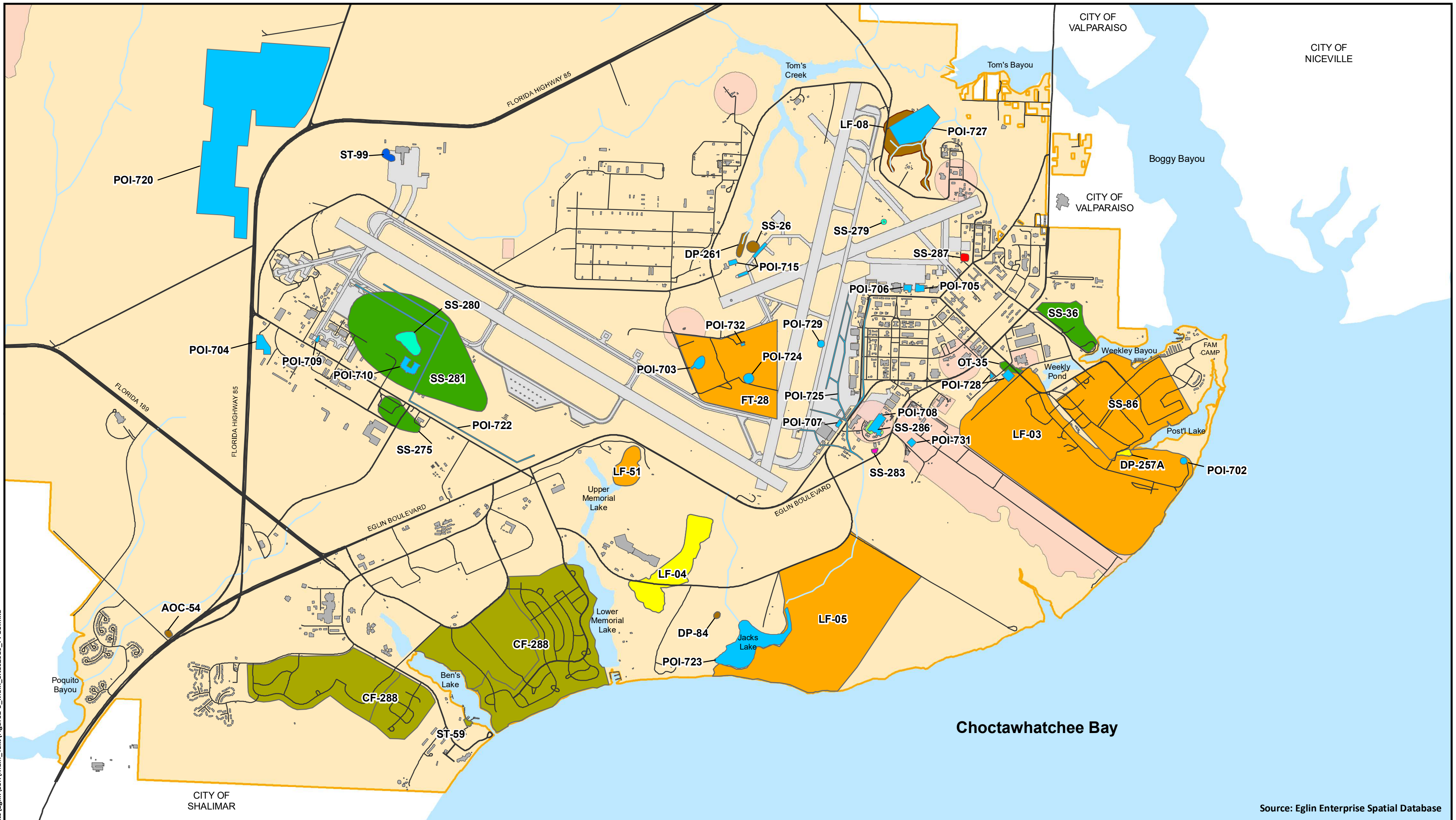
FIGURE 1-1
EGLIN MRAs AND MRSs

EGLIN AIR FORCE BASE, FLORIDA

FIGURE 2-2
EGLIN RESERVATION SITES IN THE ERP

Eglin Air Force Base, Florida

Document Path: L:\Data\work\VT\GIS\Projects\Eglin\SSR\Main_Text\Figure2-2_RES_Sites2019.mxd



N

0 1,300 2,600 5,200
Feet

Legend

- ROAD
- WATER
- TEST AREA
- EGLIN INSTALLATION AREA
- LUCS/ LTM
- LUCS/ RA-O
- RA-O
- RA-C
- COMPLIANCE MONITORING
- LUCS/ LEASED
- DLA/ CMS
- LUCS/ INTERNAL
- DLA/ SITE ASSESSMENT
- RI
- SI
- PFOS/PFOA

FIGURE 2-3
MAIN BASE SITES IN THE ERP

Eglin Air Force Base, Florida

Document Path: L:\Data\work\IT\GIS\Projects\Eglin\SSR\Main_Text\Figure2-3_Main_Sites2019_PFOS.mxd

HAZARDOUS WASTE PERMIT RENEWAL APPLICATION (PART II)

Eglin Air Force Base, Florida

FL8570024366

Permit #: 006076-009-HO

Submitted to:

Florida Department of Environmental Protection
Hazardous Waste Permitting and Programs
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Submitted by:

Mr. Danny Freeman, 96 CEG/CEIEC
Chief, Environmental Compliance
700 Range Road, Bldg. 592
Eglin Air Force Base, FL 32542-5120

This page intentionally left blank.

Table of Contents

List of Figures

List of Tables

List of Acronyms and Abbreviations

2,4-DNT	2,4-dinitrotoluene
ACL	Alternative Concentration Limit
ADLS	Advance Distributed Learning Service
ADR	Ammunition Disposal Request
AFTR	Air Force Training Record
ASTM	American Society of Testing and Materials
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CFETP	Career Field Education & Training Plan
CFR	Code of Federal Regulations
COPC	Chemical of Potential Concern
DoD	Department of Defense
DTR	Defense Transportation Regulation
EAFB	Eglin Air Force Base
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EMR	Environmental Monitoring Report
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FGS	Florida Geological Survey
FOI	Flight Operating Instruction
Ft	Feet
GCTL	Groundwater Cleanup Target Level
gpm	Gallons per minute
HERD	High Explosive Research and Development
HMX	Cyclotetramethylenetetranitramine
HTW	Hazardous and Toxic Waste
HW	Hazardous Waste
In	Inches
IRP	Installation Restoration Program
K_{OC}	Adsorption Coefficient
K_{OW}	Octanol-water Partition Coefficient
lbs	Pounds
MCL	Maximum Contaminant Level
Mi	Mile
mph	Mile per hour
MW	Molecular Weight
NAVSCOLEOD	Naval School Explosive Ordnance Disposal
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
OB	Open Burn
OB/OD	Open Burn/Open Detonation

OD	Open Detonation
OSC	On-Scene Commander
OSHA	Occupational Safety and Health Administration
POC	Point of Compliance
QA	Quality Assurance
R&D	Research and Development
RCO	Range Control Officer
RCRA	Resource Conservation and Recovery Act
RCW	Red-Cockaded Woodpecker
RDX	Cyclotrimethylenetrinitramine
ROCC	Range Operations Control Center
RR	Range Road
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SWCTL	Solid Waste Cleanup Target Level
SWMU	Solid Waste Management Unit
TBKP	Transportable Burn Kettle Processor
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TNT	2,4,6-Trinitrotoluene
TPH	Total Petroleum Hydrocarbons
µg/L	Micrograms per Liter
US	United States
USGS	United States Geological Service

Hazardous Waste Permit Renewal Application (Part II)

As a renewal, this information is provided at the request of Florida Department of Environmental Protection (FDEP) Hazardous Waste (HW) staff. Eglin Air Force Base (EAFB) has not made and is not proposing to make any changes to the current permitted open burn or open detonation locations and facilities. The required application form, certifications and renewal fee are provided.

The following text follows the Table of Contents of the Hazardous Waste Facility Permit Application Instructions and Forms document dated 5/15/96, as provided by FDEP HW personnel. Based on conversations with FDEP personnel, some sections of the application do not apply, and are therefore, stated as such below.

Section A General Facility Information

A Resource Conservation and Recovery Act (RCRA) Part A permit application for Open Burning and Open Detonation (OB/OD) of explosive wastes at EAFB was submitted to Environmental Protection Agency (EPA) Region IV and FDEP in June 1989. Since the original permit was issued, several renewal applications have been applied for and issued, as well as modifications to certain corrective action requirements. The permit currently in effect is 006176-009-HO, dated 2/5/2019.

OB/OD of military munitions and explosives-contaminated items is performed at two designated locations at EAFB. OB activities designated location is on Range C-62. OD activities are performed at designated locations on Ranges C-62 and C-52N.

There are six burn kettles used for OB for which this RCRA permit renewal application applies with up to three burn kettles processing at any one time. No OB has taken place at Range C-62 since November 2000, when the burn kettles were removed. However, EAFB retains the capability to utilize like-size thermal treatment units for open burn, should the need arise.

Section A.1.a Topographic Map

Detailed topographic maps of Ranges C-52N and C-62 showing all site improvements and required information as requested in Section A.1.a of this renewal application are attached as Figures 1 and 2, respectively.

Section A.1.b Wind Rose

Wind data recorded at EAFB indicates that, on an annual basis, winds are predominantly from the north, and are less than 9 knots (10 miles (mi) per hour (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 winds are lighter in velocity and are generally from the south. Annual and seasonal wind roses showing the frequency of wind direction as a function of wind speed for EAFB are presented in Figures 3 through 7.

Section A.1.c Traffic Information (40 CFR 270.14(b)(10)

The C-52N range is located in the middle of the other C-52 ranges and is a restricted access-controlled area. Range Road (RR) 200 runs west to east along the northern end of the range while RR 214 runs from the southern boundary of the range and intersects with RR 200. There are seven (7) range gates that control access to Range C-52N, as illustrated in Figure 8.

Range C-62 is also located in a remote, restricted, access-controlled area with one major road running through the range along the western border, from RR 200 to the south and north to RR 203. Three (3) range gates are used to control access to the range. Two gates are located just south of RR 203 while the third is located just above the RR 200 turnoff (Figure 9). The range is intersected by a number of clay/dirt roads that provide access to target areas and the OB/OD units.

It is estimated that between 30-50 vehicles per day use the range roads in the vicinity of Ranges C-52N and C-62.

Section A.2 Financial Responsibility Information

Since United States (US) Government installations, like EAFB, are exempt from these requirements, they are not addressed in this permit renewal application.

Section A.3 Flood Map

Flood maps of Range C-52N and C-62 as requested in Section A.3 of this renewal application are attached as Figures 10 and 11, respectively.

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 Federal Emergency Management Act (FEMA) Flood Insurance Rate Map-Walton County, Panels 12131 C0265G, 12131 C0380G, 12131 C0385G, 12131 C0390G, 12131 C0395G all dated 9/29/2010. Both OB/OD units are also well beyond the limits of all category-rated storm surge contours as shown on Florida Statewide Regional Evacuation Study Program maps, dated 10/05/2010.

Section A.4 Facility Security Information

Section A.4.a Security Procedures and Equipment Required (40 CFR 264.14)

Access to the main base at EAFB is limited to authorized personnel with proper identification and is controlled by on-base security, manned 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 33 Fighter Wing Gate on Florida Route 85 approximately one mile north of the Air Force Armament Museum. Twenty-four hour security at each gate is provided through a guardhouse, fence, and lockable gates. The gates remain locked when the guardhouse is unmanned. Military police are on patrol throughout the main base and are available 24 hours per day. Visitors to the main base are required to obtain passes from the Visitor Control Center at the East or West gate and must be sponsored onto the base by authorized personnel.

Access to the OB/OD units is controlled through range gates at all entrance points, which 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.”

In addition, 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.

Section A.4.b Contingency Plan (40 CFR 270.14(b)(7))

A copy of the Contingency Plan for Open Burn/Open Detonation Activities at Range C-52N and Range C-62, EAFB is attached as Appendix A, as required by 40 CFR Part 264, Subpart D.

Section A.4.c Procedures, Structures, or Equipment Used at Facility

Section A.4.c.1 Equipment Failure and Power Outages

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. Explosive Ordnance Disposal (EOD) activities are manually prepared and initiated, and, as such, are not potentially impacted by equipment failure or power outage. 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.

Section A.4.c.2 Hazards in Unloading Operations

Munitions loading, unloading, and transportation are common on EAFB. Defense Transportation Regulation (DTR) 4500.09, "Transportation & Traffic Management," contains the procedures that ensure safety for these operations. In addition, there are specific routes for transporting explosives (Figure 12). 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, allowing for sufficient time to arrive at the range at least 15 minutes ahead of schedule. Once the OB/OD mission is complete, residue is inspected to ensure that treatment is complete before being transported for disposal.

The OB area is accessed by a 57-foot (ft) concrete ramp and a six-ft wide reinforced clay loading dock. Trucks containing munitions approach from either RR 200 from the south through Range Gate No. 62 or from RR 203 to the east. Once on the range, munitions are unloaded in the OB/OD units following EOD procedures, in accordance with EOD Flight Operating Instruction (FOI) 32-3001 (attached to the Contingency Plan in Appendix A).

Section A.4.c.3 Undue Exposure to Hazardous Waste

During all OB/OD operations, each member of the EOD team wears appropriate protective clothing as prescribed by Occupational Safety and Health Administration (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 both ignition/detonation operations and burning operations includes long sleeves, high-top boots, and leather gloves.

During OB/OD operations, EOD personnel withdraw to a minimum distance of 2,500 ft from the OB/OD treatment area before initiating operations, as specified in EOD FOI 32-3001. 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 a safe distance. The operation is usually observed from the Range Control Building.

Section A.4.c.4 Prevent Contamination of Water Supplies

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 160 to 250-ft-thick Pensacola clay confining layer, which effectively isolates the sand and gravel aquifer from the underlying Floridian aquifer. The Floridan aquifer averages 1,000 feet thick, and freshwater can extend to a depth of 2,000 feet below land surface. There are no surface water intakes within 15 miles of Range C-52N or C-62.

Section A.4.c.5 Prevent Run-Off

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.

Section A.4.c.6 Prevent Releases to Atmosphere

Release to the atmosphere is unavoidable during OB/OD operations. To minimize air emissions, disposal by open burning is not conducted when wind velocity is less than 3 mph or greater than 15 mph.

Section A.4.c.7 Prevent Accidental Ignition (40 CFR 270.14(b)(9))

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. EOD FOI 32-3001 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 Development (HERD) 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.

Section A.4.d Preparedness and Prevention Procedures (40 CFR 264, Subpart C)

The OB/OD facilities are designed and operated to minimize the possibility of fire, explosion, or any unplanned release of hazardous waste which could threaten human health or the environment. OB activities were conducted in rectangular steel burn kettles within a Transportable Burn Kettle Processor (TBKP). The TBKP was mounted on a flat bed, semi-truck bed.

OD activities do not utilize any type of equipment or 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 (40 CFR 264.31).

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. Communications at the OB/OD treatment areas are maintained by voice or hand- held two-way radio. Communication between EOD personnel and the Range Control Officer (RCO), Range Operating Control Center (ROCC), and EOD Operations are by hand-held two-way radio. Telephones are also available at the RCO and ROCC (40 CFR 364.34).

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 Contingency Plan (Appendix A), the On-Scene Commander (OSC) will be responsible for contacting the RCO and the ROCC, who will notify the Command Post by radio or telephone. The OSC will have the authority to summon the required on-base assistance.

The fire control, spill, and decontamination equipment available at the OB/OD treatment areas and base-wide is described in the Contingency Plan, as is the on-board emergency equipment for EOD vehicles. During OB/OD operations, EOD vehicles containing fire extinguishers, absorbents, and other emergency equipment are located in proximity to 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.

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 gallons per minute (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 (40 CFR 264.32).

All of the communications, alarm, fire protection, spill control, and decontamination equipment will be maintained, checked, and inspected on a regular schedule to ensure proper operation (40 CFR 264.33).

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 (40 CFR 364.35).

EAFB has cooperative agreements with local emergency response services. Arrangements with local police and fire departments, emergency response teams, and hospitals is addressed in the Contingency Plan (Appendix A). In that event local community emergency services are required, the OSC will notify the Command Post, which will authorize the Disaster Preparedness Division to contact the appropriate outside organizations, as required (40 CFR 364.37).

Section A.4.e Introductory and Continuing Training Programs (40 CFR 264.16)

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 (DoD) explosive ordnance personnel must attend the U.S. Naval School, Explosive Ordnance Disposal (NAVSCOLEOD). This school is the DoD 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 Training Record (AFTR) in the Advance Distributed Learning Service (ADLS). The 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 are implemented under the philosophy that unit managers and supervisors are responsible for continuous training and development of their subordinates. Under the Air Force's Career Field Education and Training Plan (CFETP), as implemented for Eglin EOD personnel by CFETP 3E8X1 (attached as Appendix B), supervisors either receive necessary additional training or are augmented by installation support personnel to train their subordinates.

Under this system, the EAFB's Hazardous Waste Program Manager 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 turn, the EOD Branch Chief has developed a hazardous material training program for this unit. These lesson plans were reviewed and approved by the Hazardous Waste Program Manager.

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.

In addition, 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 annual RCRA refresher training.

NAVSCOLEOD training program ensures that EOD personnel receive extensive emergency response training. The CFETP requires that units continue refresher training to maintain EOD proficiency. Each EOD member is required to read and be familiar with various publications covering munitions, which are used during monthly training and during the planning and conducting of all disposal operations.

Individuals involved in emergency response must also have a thorough understanding of the Contingency Plan and EOD Emergency Management.

Section A.5 Chemical and Physical Analyses (40 CFR 270.14(b)(2))

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.

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.

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 TNTO II, III, IV, Comp A-5, Octol 75/25, C-4, Tritonal. R & D explosives include AFX 1100, AFX 453, AFX 931-M, PBXN109, AFX 931-M, and TNT/SNQ. Table 1 presents a list of original, basic compositions for standard energetic materials in general use, as well as HERD-generated experimental explosives, and represents the typical components that make up specific munitions items that may be treated at 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 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 that 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.

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 umeacted 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.

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, oxidizers, 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 styphnate.

High explosives are typically nitrated organic materials that 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 potentially treated ordnance items which may be burned or detonated at the OB/OD units at EAFB and their chemical composition.

Table 1 presents the original 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.

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 (DOO5), 2,4-dinitrotoluene (D030), or lead (D008).

Table 2 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 points, vapor pressure, and chemical degradation half-life. There are numerous 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.

Section A.6 Waste Analysis Plan (40 CFR 270.14(b)(3))

EOD personnel are familiar with the destruction methods of OB/OD waste munitions items. 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 and historic 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 are not applicable. However, the waste analyses of munitions residues generated from the OB treatment of waste munitions is considered applicable.

Section A.6.a Parameters for Analysis

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. Ash generated from OB activities will initially be sampled and analyzed for reactivity characteristics. Subsequent to reactivity characterization, Toxicity Characteristic Leaching Procedure (TCLP) toxicity tests for metals and 2,4-dinitrotoluene (2,4-DNT) will be conducted. 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 groundwater and thus cause munitions residue to be classified as 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 residue items are visually inspected to determine the presence of energetic materials. Chemical analyses are not needed to make this determination. If no energetic material is visible within the OB containment unit after the completion of the burn, residues are removed and placed in sealed 55-gallon drums or larger containers. The waste is sampled and analyzed for reactivity and metals. The waste is classified into hazardous or non-hazardous based upon the analytical results.

Section A.6.b Test Methods

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

Parameter	Analytical Method		
Reactivity	7.3.3.2		7.3.4.2
TCLP Arsenic	1311	6010D	3010A
TCLP Barium	1311	6010D	3010A
TCLP Cadmium	1311	6010D	3010A
TCLP Chromium	1311	6010D	3010A
TCLP Lead	1311	6010D	3010A
TCLP Mercury	1311	7470A	
TCLP Selenium	1311	7000B	3020A
TCLP Silver	1311	6010D	3010A
TCLP 2,4-DNT	extraction method 8310		

Section A.6.c Sampling Methods

If no energetic materials are visible within the OB containment unit after the completion of the burn and at a time determined by EOD personnel, residues are removed from the unit and placed in sealed 55-gallon 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 analyses.

Section A.6.d Frequency of Analysis

For each burn event generating ash, a hazardous waste determination will be made.

Section A.6.e Managing Wastes Generated Offsite

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 US 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 that 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.l(g)(8)(i). 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.

Section A.6.f Methods for Additional Waste Analysis

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

Section A.6.g Off-Site Waste Received

In the rare circumstances when EAFB receives munitions, explosives, and explosive-contaminated items from other military installations, the manifest is reviewed in the same manner in which EOD personnel review AF Form 191s.

Section A.7 Manifest System, Recordkeeping, and Reporting (40 CFR 264.12)

This section does not apply to this permit renewal application, per 40 CFR 266, Subpart M – Military Munitions.

Section A.8 Federal Laws Considered (40 CFR 270.3)

The following Federal laws may be applicable to the issuance of this permit renewal:

NATIONAL HISTORIC PRESERVATION ACT

There are no known structures on Ranges C-52N or C-62 that 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) that 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.

ENDANGERED SPECIES ACT

Forty-two (42) plant and 18 animal endangered/threatened species are known to thrive in Walton County. Examples of the endangered/threatened animal species found in Walton County include: the red-cockaded woodpecker, piping plover, Okaloosa darter, Choctawhatchee beach mouse, Eastern indigo snake, Gopher tortoise, and 5 turtle species.

The Okaloosa darter (Etheostoma okaloosae) is both federally and state-listed as threatened. The entire global population of this species is endemic to the northwest Florida panhandle in Okaloosa and Walton counties. EAFB has management responsibility for 90 percent of the 457-square kilometer (176 square mi) drainage area. This darter occurs in only six small stream systems (249 linear mi) that flow into two bayous of Choctawhatchee Bay. Primary threats to the Okaloosa darter are hydrologic alteration, siltation, and temperature alteration from roads, culverts, clay pits, and beaver dams. Additional issues are prescribed fire and/or wildfire breaks that change or alter hydrologic stream flow. Figure 13 indicates there are no streams with Okaloosa darters in the area of C-62; however, C-52N is located within that area.

The red-cockaded woodpeckers (RCWs) are the only woodpecker species in the southeast to excavate cavities in live pine trees. They require old growth pines for cavity excavation due to the greater presence of heartwood in older trees and they prefer longleaf pines in particular, which have greater incidents of red heart disease and makes cavity construction easier. The EAFB RCW population is divided into two subpopulations: the eastern subpopulation, which comprises all clusters east of Highway 85, and the western subpopulation, which comprises all clusters west of Highway 85 (Figure 14). The two populations are demographically separate, and each subpopulation is in a different state of health. The western subpopulation is large and increasing. The eastern subpopulation is smaller and stable but not increasing. It is expected that the RCW population will continue to grow as a result of habitat improvements associated with prescribed fire and forest restoration efforts.

It is critical that there is population monitoring of RCW activity, reproduction, and survival as well as habitat monitoring of the status and trends in sandhill habitat available for foraging. Habitat scale monitoring of the status and trends in RCW foraging habitat will be accomplished annually through an ecological monitoring program and the following integrated strategies will be used to facilitate population growth and stabilization: cluster rehabilitation (mechanical removal of midstory hardwoods and sand pine), sand pine eradication, hardwood control, thinning of overstocked longleaf pine or slash pine stands, pine plantation management (reforestation), invasive non-native plant control, prescribed burning, artificial cavity construction, and translocation of juveniles.

Figure 14 indicates there are no active RCW trees in the immediate area of Range C-62. Range C-52N has a few active trees to the north boundary of the range.

Section B Containers

Since there are no current containers/equipment in operation at EAFB for OB/OD operations, Sections B.1 through B.3, and Sections B.5 through B.7 do not apply.

Section B.4 Condition, Compatibility and Management of Containers (40 CFR 264.171)

All containers/equipment for OB activities were removed from Range C-62 in November 2000. These kettles were removed under a permit modification dated October 13, 2001. No other equipment exists that requires management.

Should EAFB decide to restart OB activities, similar equipment would be obtained. Burn kettles of the same size, construction, materials, and safeguards would be desired. The burn kettles would be operated, inspected and maintained in accordance with EOD procedures and manufacturer's specifications.

Section C Tank Systems

This section does not apply to this permit renewal application.

Section D Surface Impoundments

This section does not apply to this permit renewal application.

Section E Waste Piles

This section does not apply to this permit renewal application.

Section F Land Treatment

This section does not apply to this permit renewal application.

Section G Landfills

This section does not apply to this permit renewal application.

Section H Incinerators

This section does not apply to this permit renewal application.

Section I Miscellaneous Units (40 CFR 264, Subpart X)

Section I.1 Detailed Description of Units

Two discrete hazardous waste treatment operations are performed at Ranges C-62 and C-52N; OB and OD.

No devices were designed or engineered for use in the OD operations, as these OD units are cleared land 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. Over time, these land areas have formed a shallow depression due to the explosive nature of the materials detonated.

A containment device was engineered for OB operations. The original steel burn kettles used for these activities were designed to meet the following objectives:

- Prevent contact of the soil with the wastes and materials being burned
- Efficiently heats burn kettles used in OB operations to minimize releases to the environment
- Minimize the ejection of materials or wastes from the device onto the ground
- Retain the minor detonations that might occur when munitions are burned

Details of the construction of the six burn kettles:

- Manufactured steel burn kettle with detachable heat source
- Each unit consists of one 8 x 8 x 20 ft reinforced plate steel container
- Sides and bottom are constructed of 2-inch (in.) steel plate continuously welded on the interior with a reinforced 4 x 3 x 1 in. rectangular tubing top rail
- Side walls and bottom are reinforced with 4 in. x 5.4 pound (lb.) structural channel on 30-in. centers
- Equipped with hinged rear doors (doors are 2 in. steel plate with 4-in. x 5.4 lb. structural channel reinforcement)
- Each burn kettle weighs 15,400 lbs.

Basic operation of the burn kettles:

1. Low explosive munitions are placed into the kettle.
2. Approximately 50 to 100 gallons of diesel fuel along with dunnage (wood and fiberboard) are placed in the OB unit and remotely ignited.
3. The fuel and munitions are consumed in the burn.

4. Following a designated cool down period, the residual ash is removed and visually inspected.
5. Any energetic material found in the ash are re-treated.
6. The residual ash removed from the OB unit is characterized and disposed of as described in the Waste Analysis Plan (see Section A.6).

Section I.2 Hydrologic, Geologic, and Meteorological Assessments

Geology

EAFB is situated in the Gulf Coastal Plain and is underlain by deltaic deposits of the Pliocene-age Citronelle Formation (Florida Geological Survey [FGS], 2001). This formation is characterized by gray to orange-mottled, unconsolidated to poorly consolidated, very fine to very coarse, poorly sorted, clean to clayey sands. Clay, silt, and gravel frequently occur as beds and lenses that can vary dramatically over short distances. Limonite nodules and limonite cemented beds are common. The formation is very permeable and hosts a surficial aquifer. The Citronelle Formation is thicker than 200 feet underneath the westernmost portions of EAFB but thins to 20-50 feet on the eastern half of the base where Range C-52N and C-62 are located (FGS, 2001).

Underlying the Citronelle Formation on the eastern side of EAFB is the Miocene-age Alum Bluff Group. These sediments are characterized by clays, sands, and shell beds with mica as a common constituent and glauconite and phosphate occurring sporadically. Color ranges from cream to olive gray and the sediment weathers to a reddish brown. Grain size varies widely from very fine to very coarse. The Alum Bluff Group is approximately 180 feet thick below the eastern half of EAFB (FGS, 2001). These sediments generally have low permeabilities and function as a confining unit that separates the surficial Sand and Gravel Aquifer in the Citronelle Formation from the underlying bedrock aquifer.

Underlying the Alum Bluff Group at a total depth of 200-250 feet below ground surface on the eastern side of Eglin AFB is the Bruce Creek Limestone (FGS, 2001). This limestone is white to yellowish-gray, sandy, phosphoritic, and fossiliferous, with most fossils generally preserved as molds. The Bruce Creek Limestone is the uppermost water-bearing unit of the Floridan Aquifer in the west-central regions of the Florida Panhandle. Due to this being some of the most deeply-buried bedrock in the state, sinkholes are relatively uncommon in the vicinity of EAFB.

Soil Conditions

The specific soil conditions at both ranges are defined primarily by Lakeland Sand (Natural Resources Conservation Service ((NRCS), 2019). Lakeland Sand is excessively drained, belongs to a very low runoff class, and has a high to very high capacity to transmit water. The typical profile is comprised of very dark grayish-brown crushed, unconsolidated sand grains from 0-3 inches, yellowish brown to pale brown sand from 3 to 64 inches, and pale brown sand with yellowish red iron staining and nodules from 64 to 80 inches. Ponding and flooding are rare due to the soil being so well-drained.

Hydrogeology

The surficial aquifer in the Citronelle Formation is referred to as the ‘Sand and Gravel Aquifer,’ the ‘Miocene-Pliocene Aquifer,’ or the ‘Citronelle Aquifer.’ It is the primary source of water for the population of Okaloosa and Walton Counties in the Florida Panhandle (United States Geologic Survey [USGS], 2016). This aquifer attains a maximum thickness in the State of Florida of greater than 400 feet in Escambia County but thins eastward towards EAFB, being approximately 200 feet thick on the extreme western side of the main base and 100 or fewer feet thick on the eastern side of the base where the two ranges are situated (USGS, 2016 and FGS, 2001). Specifically, this aquifer is approximately 60 feet thick at Range C-52N and 100 feet thick at Range C-62 (FDEP, 2001). The Sand and Gravel Aquifer is comprised of fine to coarse sand, clay, silt, and gravel. While the aquifer is typically unconfined above with permeable material exposed at ground surface, lenses of less permeable material including fine sand, clay, and silt create discontinuous confined zones that result in localized ‘leaky confined’ conditions.

This aquifer is informally divided into three hydrologic zones: a surficial zone (water table), an intermediate zone of relatively low permeability, and a main producing zone (artesian). At the ground surface, the surficial zone is comprised of fine sand that allows the aquifer to recharge via rainfall. Regionally, well yields in this zone are as high as 1,000 gallons per minute (generally in the 200 to 400 gpm range) with transmissivity of 11,000 feet squared per day (USGS, 2016). Underlying the surficial zone is the ‘low permeability zone’ containing discontinuous clay and silt. Underneath this partially-confining zone is the ‘main producing zone,’ which is comprised primarily of highly-permeable coarse sand and gravel. The main producing zone is confined below by the relatively impermeable sediments of the Alum Bluff Group. In the area, well yields in the high permeability zone typically exceed 1,000 gallons per minute and the transmissivity of this zone is estimated at as much as 20,000 feet squared per day (USGS, 2016).

Groundwater flow in the Sand and Gravel Aquifer is typically controlled by topography, with flow generally trending south towards the Gulf of Mexico. Flow patterns are locally influenced by streams and rivers that dissect the aquifer and serve as discharge boundaries. The aquifer is especially vulnerable to contamination due to its high transmissivity and exposure to ground surface.

Climate

The climate at EAFB is classified as humid subtropical, characterized by short, mild winters and hot, humid summers (National Oceanic and Atmospheric Administration [NOAA], 2019). Afternoon and evening thunderstorms are common during the summer months and the area is prone to tornadoes and hurricanes. Temperatures exceeding 100° Fahrenheit are relatively rare for the region due its proximity to the coast. Freezing temperatures occur on approximately 14 nights out of the year between December and February. The base receives approximately 65 inches of rain per year with the most rain typically falling in July and the driest conditions typically observed in May.

Land Use

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. Range C-52N (Figure 15) 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. Range C-62 (Figure 16) is bordered to the west and south by an area restricted for use as a ricochet area. The area to the north is a restricted area for 7 mi and is mostly uninhabited, aside from other ranges.

Areas surrounding both ranges are primarily EAFB reservation lands (3-mi radius from Range C-62 and 6-mi radius from OD unit at Range C-52N). Other land uses beyond the military 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. These roads are accessible to permitted, 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.

Section I.3 Potential Pathways to Hazardous Waste

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).

Attached as Appendix C, a 2019 Human Health and Risk Assessment (HHRA) for the OB/OD Operations at Ranges C-52N and C-62 was conducted. The HHRA analyzed HMX and RDX, as detected in groundwater monitoring results. As part of the HHRA, the Risk Characterization reviewed the likelihood and magnitude of adverse health effects that were estimated for each applicable exposure scenario.

The conclusion of the HHRA states: “The HHRA evaluated conservative hypothetical exposure scenarios to err on the side of conservatism and to overstate rather than understate the potential for risk. Estimated cancer risks and noncancer health indices for all receptors were below or within the EPA acceptable risk levels. RDX will not migrate offsite above the Groundwater Cleanup Target Level, with the possible exception of groundwater that daylights into the headwaters of Blount Mill Creek downgradient of the OD unit at Range C-62. However, mixing with surface water and photodegradation of RDX are anticipated to limit any potential impacts to surface water from this source area. Additionally, since exposure to RDX in the surficial aquifer via a potable use scenario is highly unlikely, comparing modeled concentrations at the point of groundwater discharge (into the downgradient streams) to the FDEP Surface Water Cleanup Target Levels (SWCTLs) provides useful information. Although exposure to surface water is also less likely than assumed in this HHRA, maximum detected concentrations of both RDX and HMX are less than the SWCTLs. Based on these considerations and the results of the HHRA, RDX and HMX in the surficial aquifer at C-52N and C-62 are unlikely to pose unacceptable risk to human receptors."

Section I.4 Effectiveness of Treatment

Prior to OB halting, samples of ash residue generated at the OB treatment units at Range C-62 were analyzed. Based on the analytical information collected during OB events, it appears that the effectiveness of the OB/OD treatment process was demonstrated with respect to reactivity and toxicity.

Should OB operations restart, samples of the ash munitions residue will be analyzed for reactivity, TCLP metals (including mercury), and TCLP volatile and semivolatile organic compounds.

Section I.5 General Requirements for Ignitable, Reactive, or Incompatible Wastes

As stated above in Section A.4.c.7, 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.

Section I.6 Closure and Post-Closure Plans

See Section K below for this information.

Section I.7 Groundwater Protection

See Section M below for this information.

Section I.8 Exposure Information

An Exposure Assessment was included as part of the HHRA submitted to FDEP in 2019. The objective of the assessment was to estimate the type and magnitude of human exposure to chemical of potential concern (COPCs) in groundwater with Ranges C-52N and C-62, as well as in offsite surface water bodies. This was accomplished by establishing assumptions about the potential for human exposure to groundwater. For COPCs, representative exposure point concentrations were calculated and used to model potential human exposure in the form of daily chemical intakes and dermally absorbed doses. The HHRA is attached as Appendix C.

Section I.9 Additional Information

No additional information is provided.

Section I.10 Closure Cost Estimates (40 CFR 270.14(b)(14))

This section does not apply to this permit renewal application. At this time, there are no cost estimates available, since EAFB does not anticipate closure of these sites.

Section I.11 Inspection Requirements (40 CFR 264.15)

Inspections of safety, emergency, and operating equipment of the particular OB/OD treatment areas in use for an EOD mission occur both before and after operations at the site. EOD has detailed procedures, personnel safety and responsibility checklists, and emergency procedures. The pre-OB/OD and post-OB/OD inspections are critical to identify/correct deficiencies that may interfere with the safe progress of the treatment process or threaten human health or the environment.

EOD FOI 32-3001 (included as part of the Contingency Plan in Appendix A) 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. OB/OD units will be inspected immediately before and following each use (after the designated cool down period), in addition to regular range inspections performed in conjunction with active bombing/training use of the ranges. 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. Inspection log sheets will be retained at the EAFB EOD office (Building No. 914) for three years from the date of inspection.

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 Contingency Plan (Appendix A).

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. 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.

Section J Containment Buildings

This section does not apply to this permit renewal application.

Section K 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.

Section K.1 Closure Plan (40 CFR 264.111)

Section K.1.a Closure of Each HW Unit

During 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. A final round of groundwater sampling will be conducted. Upon removal of contaminated and Unexploded Ordnance (UXO) materials, the OD pits will be backfilled and regraded. The burn kettles at the OB site, if present, will be decontaminated and recycled or disposed of in accordance with applicable regulations.

Section K.1.b Final Closure of the Facility

Final 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 in partnership with FDEP throughout the process regarding subsequent steps, based on analysis conducted during closure to determine the extent of contamination and effectiveness of closure procedures.

Section K.1.c Maximum Inventory of Wastes

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, then shipped 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. Disposal of any remaining equipment is accomplished through the Defense Reutilization and Marketing Office (DRMO) recycling program.

Section K.1.d Steps to Satisfy the Closure Performance Standard

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 and labeled appropriately, for disposal. Once the residues are removed, the burn kettles will be decontaminated.

Following decontamination, the burn kettles will be sampled with surface wipe testing and analyzed for the parameters listed in Section A.6.b to assure that the decontamination was effective. The analytical suite in Section A.6.b is considered to appropriately address OB/OD degradation products based on results of surface soil and groundwater testing of the OB/OD units. 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. Sampling of ground water and surface soil will be conducted at three separate intervals during the closure period: immediately preceding closure procedures, during closure, and after closure procedures have been completed.

Section K.1.e Other Activities During Closure

A final round of groundwater sampling/analysis for the full suite of parameters will be performed. Section M discusses the groundwater monitoring program for EAFB in more detail. The Sampling and Analysis Plan (SAP) in Appendix D provides detailed description of methodology and procedures for groundwater monitoring.

No leachate is anticipated at the OB/OD units.

During closure activities at the OB/OD units, any rinse water used in decontamination of the OB equipment will be containerized and disposed of according regulations.

Section K.1.f Schedule for Closure

A final round of groundwater sampling/analysis for the 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.

Section K.1.g Trust Funds Sites

This section does not apply to this permit renewal application.

Section K.2 Post-Closure Plan (40 CFR 264.118)

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 at that time to include criteria to ensure that any waste constituents remaining at closure will not cause adverse effects to human health or the environment.

If the OB/OD units have contaminated soil or groundwater that cannot be completely removed or decontaminated during closure, post-closure care mechanisms will ensure that human health and the environment are protected. Groundwater monitoring, reporting, and other related post-closure care requirements will apply. The groundwater monitoring program that was conducted during the active life of the areas would continue into post-closure.

At the time of post-closure, the EAFB Installation Restoration Program (IRP) will become the primary point of contact.

Section K.3 Approved Plans

This section does not apply to this permit renewal application.

Section K.4 Application for Closure

This section does not apply to this permit renewal application.

Section L Compliance Schedule

This section does not apply to this permit renewal application.

Section M Groundwater Protection

Section M.1 Interim Monitoring Data

This section does not apply to this permit renewal application.

Section M.2 Identification of Aquifer, Hydrogeology

See Section I.2 above for a discussion of the area aquifers and hydrogeology.

The uppermost aquifer in the vicinity of both the OB and OD units is the surficial aquifer (encountered at +30 ft below ground surface). At Range C-52N, the aquifer thickness is approximately 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. The surficial aquifer is underlain by the Pensacola clay - a thick, low permeability confining layer (estimated to be 160 ft thick at C-62 and 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.

The groundwater flow direction at C-52N on May 17, 2019 was to the south, with a hydraulic gradient measured between Monitoring Well (MW)94-52-01 and MW94-52-02 of approximately 0.010 feet per foot (ft/ft) (Figure 17). The flow direction and hydraulic gradient were consistent with previous sampling events. Groundwater flow velocity was calculated utilizing the current calculated groundwater gradient, an assumed 30% effective porosity (Data Summary Report, 2nd Quarter Groundwater Monitoring Data Detection Monitoring Program, Ranges C-52N and C-62, EA Engineering, 1997), and hydraulic conductivity of 9.75 feet per day (ft/day) (calculated by FDEP in Review of the Technical Memorandum: Aquifer Quality Evaluation and Fate Transport Models for OB/OD Units, Ranges C-52N and C-62, Eglin AFB (FDEP, 2001) using Waterloo Hydrogeologic's "Aquifer Test" software), is approximately 0.325 ft/day or 118.6 feet per year (ft/yr).

Groundwater flow direction at C-62 on May 14, 2019 was to the southwest, with a hydraulic gradient measured between wells MW94-62-01 and MW94-62-05 of approximately 0.018 feet per foot (ft/ft) (Figure 18). The flow direction and hydraulic gradient are consistent with previous sampling events. Groundwater flow velocity calculated utilizing the current calculated groundwater gradient, an assumed 30% effective porosity (EA Engineering, 1997), and a hydraulic conductivity of 0.028 ft/day (FDEP, 2001), is approximately 0.0017 ft/day or 0.62 ft/yr.

Section M.3 Topographic Maps

Detailed topographic maps of Range C-52N and C-62 showing all site improvements and required information as requested in Section M.2 of this renewal application are attached as Figures 19 and 20, respectively. These maps show the locations of all existing monitoring wells.

Section M.4 Plume of Contamination

The 2019 HHRA, attached as Appendix C, addresses and models plumes of potential contamination for HMX and RDX in the groundwater at Ranges C-52N and C-62.

Section M.4.a Vertical and Horizontal Extent of Plume

Based on the HHRA modelling of potential contamination plumes, the longitudinal and transverse dispersivity values are calculated by BIOSCREEN-AT following the Xu and Eckstein (1995) and the Gelhar et al. (1992) relationships (EPA 1996a), respectively, based on an approximated plume length.

For Range C-52N, the plume length is estimated to be 2,650 feet, based on the distance from MW-94-52-01 to Bay Head Branch along the groundwater flow path. This results in longitudinal and transverse dispersivities of 35.8 feet and 3.58 feet, respectively. At Range C-62, the plume lengths for the OB and OD Units were modeled as the distances between the downgradient monitoring wells (MW-94-62-03 and MW-94-62-05, respectively) and the headwaters of the Blount Mill Creek (Figure 3 of HHRA). For the OD unit, the estimated plume length was approximately 500 feet, resulting in longitudinal and transverse dispersivities of 17.9 and 1.9 feet, respectively. For the OB Unit, the estimated plume length was 170 feet, resulting in longitudinal and transverse dispersivities of 10.0 and 1.0 feet, respectively.

Vertical dispersivities were estimated using the relationship in American Society of Testing and Materials (ASTM; 1995), where the vertical dispersivity is equal to 5 percent of the longitudinal dispersivity. This results in a vertical dispersivity of 1.79 feet for Range C-52N, and 0.90 ft and 0.50 feet for the OD and OB Units, respectively, at Range C-62.

Section M.4.b Concentrations of Hazardous Constituents

A groundwater monitoring program was instituted at Ranges C-52N and C-62 in November 1994, with quarterly sampling events that included all monitoring wells at the sites. Since 2002, sampling has occurred on an annual basis, during the month of May. Groundwater samples are analyzed for explosives and general chemistry parameters at Range C-52N, and for explosives, volatile organic compounds, and general chemistry parameters at Range C-62 as part of the Detection Monitoring program (see Sections A.6a and A.6b).

Section M.5 Groundwater Monitoring Program (40 CFR 264.97)

Groundwater monitoring wells were installed in November 1994. Three wells were installed at Range C-52N (Figure 19). Five groundwater monitoring wells were installed at Range C-62 (Figure 20). Initial “baseline” rounds of groundwater sampling and analysis were performed in November 1994, March 1995 and May 1995. Samples were analyzed for metals, Target Compound List (TCL) semi-volatile organics, explosives, total petroleum hydrocarbons (TPH), cyanide, reactivity, sulfides, total Kjeldahl nitrogen, ammonia nitrogen, an anion suite, total and dissolved metals, and full RCRA Appendix IX analytes.

An updated, detailed SAP is attached as Appendix D, developed in accordance with FDEP’s Standard Operating Procedure (SOP) FS 2200 Groundwater Sampling, January 2017. The SAP describes the current process for groundwater sampling at Ranges C-52N and C-62. Measurements and data from field activities are recorded on FDEP Form FD 9000-24: Groundwater Sampling Log, January 2017. Some of the purging data includes volume purged, initial water depth, purge rate, pH, temperature, conductivity, dissolved oxygen, turbidity, color and odor.

Attached as Appendix E is the July 2019 Environmental Monitoring Report (EMR) for the OB/OD activities at Ranges C-52N and C-62. The annual report presents the analytical results from the May 2019 groundwater sampling events.

The objective of the Monitoring Program is to determine if there is a significant elevated concentration over background of the detected parameters in the individual Point of Compliance (POC, or downgradient) wells from the OB/OD operations. This goal is met by analyzing the groundwater data that has been collected on the POC wells and comparing with the background well data to determine the potential impacts to the regional groundwater quality, human health and the environment.

Quality Assurance procedures were implemented to verify that sample collection and handling processes did not affect the quality of the field samples. Equipment and field blanks, designed to provide a check on field and laboratory procedures, were collected once per site. Trip blanks were collected when samples for volatile organic analysis were collected. Duplicate samples were collected from each of the areas. One duplicate sample per matrix was collected from each area. Laboratory Quality Assurance/Quality Control (QA/QC) samples (including matrix spikes and matrix spike duplicates) were analyzed in accordance with analytical method reporting requirements.

Section M.6 Presence of Hazardous Constituents at Initial Application

This section does not apply to this permit renewal application.

Section M.7 Compliance Monitoring Program (40 CFR 264.99)

EAFB's current groundwater monitoring and assessment program described above in Section M.5, and further in the SAP (Appendix D), constitutes the Compliance Monitoring Program.

Section M.7.a Wastes Handled at the Facility

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.

Obsolete and off-specification munitions 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 (DOO5), 2,4-dinitrotoluene (D030), or lead (D008).

See Section A.5 for additional information.

Section M.7.b Characterization of Contaminated Groundwater

The July 2019 EMR, attached as Appendix E, provides the latest characterization of the groundwater. Table 3 displays the Water Quality data for Range C-52N, and Table 4 displays the data for Range C-62.

At Range C-52N, three monitoring wells were analyzed for nitrate, nitrite, and explosive compounds. For this 2019 sampling event, there were no exceedances of the FDEP-established Groundwater Cleanup Target Levels (GCTLs). The GCTLs for each contaminant are listed in Tables 3 and 4.

At Range C-62, five monitoring wells analyzed for nitrate, nitrite, explosive compounds and benzene, toluene, ethylbenzene, and total xylenes (BTEX). For this 2019 sampling event, concentrations exceeding the GCTL for RDX (10 micrograms per liter (µg/L)) were reported for two monitoring well locations, MW-94-62-04 (26 µg/L) and MW-94-62-05 (52 µg/L). Detectable concentrations of RDX have been reported since 1995. Concentrations in exceedance of the GCTL were observed from 2006 through 2010, and again since 2014. Concentrations in both monitoring wells were lower than the 2018 sampling results of MW-94-62-04 (29 µg/L) and MW-94-62-05 (72 µg/L) No other analytes were detected at concentrations exceeding permitted GCTLs.

A surface water sample was collected at the confluence of the East and West Fork of Blount Mill Creek at Range C-62 in October 2019 at the request of FDEP staff. This sample was analyzed for RDX.

Section M.7.c Hazardous Constituents

The monitoring wells as Ranges C-52N and C-62 are sampled for General and Explosive Parameters. Wells located at Range C-62 are sampled for BTEX as well. EAFB will continue to conduct compliance monitoring for these parameters. In addition, Eglin will sample surface water at Range C-62 for RDX.

The permit indicates that this sampling will occur annually, during the month of May.

This information is also available in the SAP (Appendix D) and the 2019 EMR (Appendix E).

Section M.7.d Concentration Limits

The permitted GCTLs for each hazardous constituent is listed on Tables 3 and 4. RDX and HMX are two of the constituents of concern. The GCTL for RDX is currently 10 µg/L, and the GCTL for HMX is 350 µg/L. The

The HHRA (Appendix C) discusses and proposes alternate concentration limits (ACLs) for RDX and HMX, based on each Range location and use. The ACLs were derived to be protective of potable use of groundwater in the surficial aquifer as it discharges to surface water downstream of Ranges C-52N and C-62. The HHRA's proposed ACLs are:

		ACL
AREA	CONSTITUENT	(µg/L)
RANGE C-52N		
Cat's Eye	RDX	0.32
Cat's Eye	HMX	580
RANGE C-62		
OB Unit	RDX	0.31
OB Unit	HMX	430
RANGE C-62		
OD Unit	RDX	0.87
OD Unit	HMX	21,000

Section M.7.e Groundwater Monitoring System

See Section M.5, and Appendices C and D for this information.

Section M.7.f Sampling and Analysis

See Appendix D for the Sampling and Analysis Plan.

Section M.8 Corrective Action Program

As it is anticipated that OB/OD operations will be ongoing as long as EAFB remains in use, it is unlikely that corrective action will be taken. Due to the nature of the sites as active bombing ranges with the probability of unexploded ordnance, any corrective action would jeopardize the health and safety of personnel, inhibit the mission of the USAF, and would likely not be effective in the long-term. EAFB's testing and training missions are an integral part of the defense system of the United States, and it is not anticipated that closure will occur.

Compliance monitoring will continue throughout the compliance period of the site. Upon ceasing of operations, EAFB will contact and coordinate with FDEP and EPA for appropriate corrective action and plans for closure.

Section M.9 Provisions of Florida Administrative Code 62-4

EAFB will follow the procedures set forth in FAC 62-4 for the renewal application of the existing permit, as well as FAC 62-4.540 that describes the general conditions for all general permits.

Section M.10 Additional Groundwater Monitoring Requirements

Section M.10.a Use of Filters

Filters will not be used when taking groundwater samples. This will be included in the SAP in Appendix D.

Section M.10.b Well Construction Reports

The original Well Construction Summary Reports, from November 1994 are included as Appendix F.

Wells were drilled using continuous-flight hollow stem augers and are constructed of 4-in. PVC Schedule 40. No PVC solvent was used. Threaded well screens were factory slotted with a slot width of 0.010 in. All well screens were approximately 10 ft long. Since the wells are located in an active bombing/training area, provisions were made to assure that the wells are not adversely impacted by ongoing site activities.

Section M.11 Quality Assurance Plan

The QA Plan is not required. However, EAFB will follow QA Rule 62-160 for analytical sampling and field activities.

Section M.12 Florida Administrative Code 62-4.0050(3)

This renewal permit application is signed by a Florida registered Professional Engineer and Professional Geologist.

Section N Research, Development and Demonstration

This section does not apply to this permit renewal application.

Section O Exposure Information

This section does not apply to this permit renewal application.

Section P Potential Releases from Solid Waste Management Units (SWMU)

All information for each SWMU has been submitted and is on file with FDEP.

Appendix G includes several overlapping maps showing all of EAFB's IRP Areas of Concern and Points of Interest.

Section Q Information Requirements for Solid Waste Management Units

All information for each SWMU has been submitted and is on file with FDEP.

Section R Process Vents

This section does not apply to this permit renewal application.

Section S Requirements for Equipment

This section does not apply to this permit renewal application.

Section T Boilers and Industrial Furnaces

This section does not apply to this permit renewal application.

Section U Requirements for Drip Pads

This section does not apply to this permit renewal application.

Section X Equivalency Demonstrations

This section does not apply to this permit renewal application.

Appendix A: Contingency Plan

This page intentionally left blank.

Appendix B: Career Field Education and Training Plan (CFETP)

This page intentionally left blank.

Appendix C: 2019 Human Health and Risk Assessment (HHRA)

This page intentionally left blank.

Appendix D: Sampling and Analysis Plan (SAP)

This page intentionally left blank.

Appendix E: July 2019 Environmental Monitoring Report (EMR)

This page intentionally left blank.

Appendix F: Well Construction Summary Reports, November, 1994

This page intentionally left blank.

Appendix G: Maps of EAFB’s IRP Areas of Concern and Points of Interest

This page intentionally left blank.

Figures

This page intentionally left blank.

Tables

This page intentionally left blank.

APPLICATION FOR A HAZARDOUS WASTE PERMIT
PART I – GENERAL
TO BE COMPLETED BY ALL APPLICANTS

Please Type or Print

A. General Information [40 CFR Part 270.13 (a)]

1. Type of Facility in accordance with Part 270.13(a)
X TREATMENT
☐ Tanks ☐ Piles ☐ Surface Impoundment
☐ Incineration ☐ Containment Building
☐ Boiler / Industrial Furnace Type of Unit ________
X Miscellaneous Unit Type of Unit OB/OD
☐ STORAGE
☐ Containers ☐ Tanks ☐ Piles
☐ Surface Impoundment ☐ Containment Building
☐ Miscellaneous Unit Type of Unit ________
☐ DISPOSAL
☐ Landfill ☐ Land Treatment ☐ Surface Impoundment
☐ Miscellaneous Units Type of Unit ________

2. Type of application [40 CFR Part 270.13 (a)]:
☐ Construction Permit
X Operation Permit
☐ Construction & Operation Permit
☐ Research, Development & Demonstration (RD&D) Permit
☐ Postclosure Permit
☐ Clean Closure Plan
☐ Subpart H Remedial Action Plan
X Corrective Action

3. Revision Number: 1

4. Date Current Operation Began, or is expected to begin: 07/ 01 /1973

5. Facility Name [40 CFR Part 270.13 (b)] Eglin Air Force Base

6. EPA/DEP I.D. No. FL8570024366

7. Facility Location or Street Address [40 CFR Part 270.13 (b)] Eglin AFB, Ranges C-52N and C-62

8. Facility Mailing Address 96 CEG/CEIEC, 700 Range Road, Building 592
Street or P.O. Box
Eglin AFB Florida 32542
City State Zip

9. Contact Person Kevin Doyle Telephone (850) 882-7667

Title Hazardous Waste Program Manager

Mailing Address 700 Range Road, Building 592
Street or P.O. Box
Eglin AFB Florida 32542
City State Zip

Contact E-mail kevin.doyle.17@us.af.mil

10. Operator Name [40 CFR Part 270.13 (d)] _Colonel John D. Schuliger, Commander, 96th Civil Engineer Group

Telephone (_850_) _882-2876____________

Mailing Address __501 Deleon Street
Street or P.O. Box

Eglin AFB Florida 32542
City State Zip

Operator E-mail _john.schuliger@us.af.mil

11. Facility owner's name [40 CFR Part 270.13 (e)] _Brigadier General Scott Cain, Commander, 96th Test Wing

Telephone (_850_) _882-9600______

Mailing address _101 West D. Avenue, Building 1
Street or P.O. Box

Eglin AFB Florida 32542
City State Zip

E-mail address __scott.cain.1@us.af.mil

12. Legal structure [40 CFR Part 270.13 (d)]

☐ Corporation ☐ Non-profit corporation ☐ Partnership ☐ Individual
☐ Local government ☐ State government ☒ Federal government ☐ Other

13. If an individual, partnership, or business is operating under an assumed name, specify the county and state where the name is registered.

County N/A State N/A

14. If the legal structure is a corporation, indicate the state of incorporation.

State of Incorporation N/A

15. If the legal structure is an individual or partnership, list the owners.

Name N/A

Address N/A
Street or P.O. Box City State Zip

Name N/A

Address N/A
Street or P.O. Box City State Zip

16. Site Ownership Status

Owned To be purchased To be leased ______ years
Presently leased; the expiration date of the lease is ____/____/________.

If leased, indicate land owner's name. N/A

Address N/A
Street or P.O. Box City State Zip

E-mail address N/A

17. Name of Engineer Kaye Guille, PE Registration No. ____

Address 8221 Ritchie Highway, Suite 300 Pasadena, MD 21122
Street or P.O. Box City State Zip

Associated with: LRS Federal, LLC

18. Is the facility located on Tribal land [40 CFR Part 270.13 (f)]? ☐ Yes ☒ No

19. Existing or pending environmental permits (attach a separate sheet, if necessary): [40 CFR Part 270.13 (k)]

NAME OF PERMIT	AGENCY	PERMIT NUMBER	DATE ISSUED	EXPIRATION DATE
	See attached list of Existing Permits			

B. Site Information [40 CFR Part 270.13 (b)]

1. The facility is located in Walton county.

The nearest community to the facility is Niceville, Freeport, Defuniak Springs

Latitude 30 degrees, 38 minutes 26" N Longitude 86 degrees, 13 minutes 42" W

Method and datum GIS, WGS84

2. The area of the facility site is 464,000 acres.

3. Attach a scale drawing and photographs of the facility showing the location of all past, present, and future treatment, storage and disposal areas. Include photographs and the locations of all Solid Waste Management Units and Areas of Concern. Also, show the hazardous wastes traffic pattern including estimated volume and control [40 CFR Part 270.13 (h)].

4. Attach a topographic map which shows all the features indicated in the instructions for this part.

5. Is the facility located in a 100-year flood plain? ☐ Yes ☒ No

6. The facility complies with the wellhead protection requirements of Chapter 62-521, F.A.C.

☒ Yes ☐ No

C. Land Use Information

1. The present zoning of the site is Active Military test range, Eglin AFB is not zoned.

2. If a zoning change is needed, what should the new zoning be? N/A.

D. Operating Information

1. Is waste generated on-site? X Yes ☐ No

2. List the NAICS codes (5 to 6 digits) [40 CFR Part 270.13 (c)] 562211

3. Use the codes and units provided in the instructions to complete the following table. Specify [40 CFR Part 270.13 (i and j)]:

   a. Each process used for treating, storing or disposing of hazardous waste (including design capacities) at the facility, and;

   b. The hazardous waste(s) listed or designated in 40 CFR Part 261, including the annual quantities, to be treated, stored, or disposed by each process at the facility.

PROCESS CODE	PROCESS DESIGN CAPACITY AND UNITS OF MEASURE	HAZARDOUS WASTE CODE	ANNUAL QUANITY OF HAZARDOUS WASTE AND UNITS OF MEASURE
T18 Other Thermal Treatment			
	3,000 lbs. NEW/month	D030, D003, D005, D008	36,000 lbs. NEW
	Theoretical Maximum		

4. A brief description of the facility [40 CFR Part 270.13 (m)]:

Eglin Air Force Base (EAFB) is located in Okaloosa, Walton, and Santa Rosa counties, north of Fort Walton Beach, Florida, and east of the city of Pensacola, Florida. EAFB consists of a land area covering more than 720 square miles and an associated joint-use airspace and water area covering 86,500 square miles in the Gulf of Mexico.

5. For hazardous debris, a description of the debris category(ies) and contaminant category(ies) to be treated, stored or disposed of at the facility [40 CFR Part 270.13 (n)]:

N/A. The only debris from activities at the facilities are ash from open burn, and metal fragments from open detonation. Ash is collected, analyzed and disposed of, according to sampling results. Metal fragements are collected and recycled.

APPLICATION FOR A HAZARDOUS WASTE FACILITY PERMIT
CERTIFICATION
TO BE COMPLETED BY ALL APPLICANTS

Signature and Certification

Facility Name _____Eglin Air Force Base____

EPA/DEP I.D. No.____FL8570024366____

The following certifications must be included with the submittal of an application for a hazardous waste authorization. The certifications must be signed by the owner of a sole proprietorship; or by a general partner of a partnership; or by a principal executive officer of at least the level of vice president of a corporation or business association, or by a duly authorized representative of that person. If the same person is a facility operator, facility owner, and real property owner, that person can cross out and initial the signature blocks under "1. Facility Operator" and "2. Facility Owner," and add the words "Facility Owner and Operator" at the line "Signature of the Land Owner or Authorized Representative."

1. Facility Operator

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. Further, I agree to comply with the provisions of Chapter 403, Florida Statutes, and all rules of the Department of Environmental Protection. It is understood that the permit is only transferable in accordance with Chapter 62-730, Florida Administrative Code (F.A.C.), and, if granted a permit, the Department of Environmental Protection will be notified prior to the sale or legal transfer of the permitted facility.

____
Signature of the Operator or Authorized Representative*

John D. Schuliger, Col, USAF, Commander, 96th Civil Engineer Group
Name and Title (Please type or print)

Date __________________________ E-mail address__john.schuliger@us.af.mil________________

Telephone (850) 882-2876

*** Attach a letter of authorization**

2. Facility Owner

This is to certify that I understand this application is submitted for the purpose of obtaining a permit to construct, operate, or conduct remedial activities at a hazardous waste management facility on the property as described. As owner of the facility, I understand fully that the facility operator and I are jointly responsible for compliance with the provisions of Chapter 403, Florida Statutes, and all rules of the Department of Environmental Protection.

____
Signature of the Facility Owner or Authorized Representative*

Scott Cain, BrigGen, USAF, Commander, 96th Test Wing
Name and Title (Please type or print)

Date __________________________ E-mail address scott.cain.1@us.af.mil

Telephone (_850_) _882-9600_____

*** Attach a letter of authorization**

3. Land Owner

This is to certify that I, as land owner, understand that this application is submitted for the purpose of obtaining a permit for the construction, operation, postclosure or corrective actions of a hazardous waste management facility on the property as described. For hazardous waste facilities that close with waste in place, I further understand that I am responsible for providing the notice in the deed to the property required by 40 CFR 264.119 and 265.119, as adopted by reference in Chapter 62-730, F.A.C.

____
Signature of the Land Owner or Authorized Representative*

Scott Cain, BrigGen, USAF, Commander, 96th Test Wing
Name and Title (Please type or print)

Date __________________________ E-mail address scott.cain.1@us.af.mil

Telephone (_850_) _882-9600___________

*** Attach a letter of authorization**

4. Professional Engineer Registered in Florida

Complete this certification when required to do so by Chapter 471, F.S., or when not exempted by Rule 62-730.220(9), F.A.C.

This is to certify that the engineering features of this hazardous waste management facility have been designed or examined by me and found to conform to engineering principles applicable to such facilities. In my professional judgement, this facility, when properly constructed, maintained and operated, or closed, will comply with all applicable statutes of the State of Florida and rules of the Department of Environmental Protection.

____
Signature

_Kaye L. Guille______________________________________
Name (please type)

Florida Registration Number ________________________

Mailing Address ___8221 Ritchie Highway, Suite 300_________________________
Street or P.O. Box

_________________________________Pasadena, MD 21122_____
City State Zip

Date _________________________ E-mail address__ kguille@lrsfederal.com_______

Telephone (_410_) __544-3570_____________

(PLEASE AFFIX SEAL)

5. Professional Geologist Registered in Florida

Complete this certification when required to do so by Chapter 492, F.S., or when not exempted by Rule 62-730.220(10), F.A.C.

This is to certify that the interpretations of geology at this hazardous waste management facility have been examined by me, and the interpretations conform to sound geological principles. In my professional judgement, this facility, when properly constructed, maintained and operated, or closed, will comply with all applicable statutes of the State of Florida and the rules of the Department of Environmental Protection.

____
Signature

__Daniel R. Parker, PG____________________________
Name (please type)

Florida Registration Number __2987______________________

Mailing Address __8221 Ritchie Highway, Suite 300______________
Street or P.O. Box ________________

Pasadena, MD 21122________________
City State Zip

Date __________________________ E-mail address _dparker@lrsfederal.com_______

Telephone (_410_) __544-3570____

(PLEASE AFFIX SEAL)