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FINAL TECHNICAL MEMORANDUM WORK PLAN FOR ADDITIONAL DELINEATION SAMPLING AT THE MACHINE GUN BORESIGHT RANGES AT UNEXPLODED ORDNANCE 5 (UXO-5) AND UNEXPLODED ORDNANCE 10 (UXO -10) NAS OCEANA VA

09/12/2014

CH2M HILL

Work Plan for Additional Delineation Sampling at the Machine Gun Boresight Ranges at Naval Air Station Oceana (UXO-5) in Virginia Beach, Virginia, and Naval Auxiliary Landing Field Fentress (UXO-10) in Chesapeake, Virginia

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Introduction

This memorandum presents the technical approach and field procedures for additional delineation of metals contamination at the Naval Air Station (NAS) Oceana (UXO-5) and Naval Auxiliary Landing Field (NALF) Fentress (UXO-10) Machine Gun Boresight Ranges (MGBRs) in Virginia. The investigation effort will include field screening of soil using X-ray fluorescence (XRF) methodology and laboratory analysis of samples collected at a subset of the screened locations. CH2M HILL prepared this document under the Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic, Comprehensive Long-Term Environmental Action – Navy (CLEAN) 8012 Contract N62470-11-D-8012, Contract Task Order (CTO) WE68, for submittal to NAVFAC Mid-Atlantic and the Virginia Department of Environmental Quality (VDEQ).

The objective of the additional expanded site inspection (SI) activities is to further delineate the lateral and vertical extent of soil contamination for the constituents of potential concern (COPCs) identified at each MGBR during the SI. COPCs at each MGBR were identified during the SI based on human health and ecological risk screening values. The results of the contaminant delineation will be used to develop an Engineering Evaluation / Cost Analysis (EE/CA) to address the soil contamination.

The proposed field activities consist of XRF screening of soil at each MGBR to delineate the horizontal and vertical extents of site COPCs. Soil samples from a subset of the XRF screening locations (15 percent) will be sent to a laboratory for confirmation of the XRF results. The investigation approach was presented in a scoping session with NAVFAC Mid-Atlantic and VDEQ on May 1, 2014 (Attachment 1). The collection of soil samples for laboratory analysis will follow the procedures outlined in the *Tier II Sampling and Analysis Plan Expanded Site Inspection Machine Gun Boresight Ranges (UXO-5 and UXO-10), Naval Air Station Oceana and Naval Auxiliary Landing Field Fentress, Virginia Beach and Chesapeake, Virginia* (CH2M HILL, 2013).

Site Description

NAS Oceana

NAS Oceana is near the Atlantic Ocean, within the southeastern portion of the city of Virginia Beach, Virginia (Figure 1). The installation encompasses just over 5,300 acres, as well as approximately 3,600 acres in restrictive easements. In addition, NAS Oceana maintains control over several annex properties and outlying fields in the surrounding Virginia and North Carolina area. The mission of the facility is to support the Navy's Atlantic and Pacific fleet forces of strike-fighter aircraft and joint and interagency operations.

The NAS Oceana MGBR (Figure 2) covers approximately 1.7 acres and is north of Dorr Place and west of Runway 14. The site initially was used as a maintenance and testing range for aircraft-mounted machine guns and later was converted to a small arms firing range (Malcolm Pirnie, 2008). Ammunition used at the former MGBR likely was limited to .50 and .30 caliber rounds for aircraft guns, as well as 9-millimeter (mm) rounds for small

arms. A concrete backstop is still in place on the western portion of the site, which suggests the direction of fire was toward the west. The concrete backstop is overgrown with trees and brush and is deteriorating. The former firing point is approximately 900 feet east of the backstop (Malcolm Pirnie, 2008). No wetlands or water bodies are on the site.

NALF Fentress

NALF Fentress is in Chesapeake, Virginia, approximately 7 miles southwest of NAS Oceana (Figure 1). Established in 1940, the installation encompasses just over 2,500 acres and approximately 8,700 acres in restrictive easements. The facility is used primarily by squadrons stationed at NAS Oceana or Naval Station Norfolk Chambers Field for field carrier landing practice operations (Malcolm Pirnie, 2008).

The NALF Fentress MGBR (Figure 3) encompasses about 1 acre and lies southwest of Runway 1-19, on the northern portion of the facility. The site initially was used as a maintenance and testing range for aircraft-mounted machine guns, but later was converted to a pistol range (Malcolm Pirnie, 2008). Ammunition used at the former MGBR likely was limited to .50 and .30 caliber rounds for aircraft guns, as well as 9-mm rounds for small arms (Malcolm Pirnie, 2008). Additionally, expended 7-mm, 9-mm, .38 caliber, .30 caliber, and shotgun rounds were observed during site reconnaissance by Malcolm Pirnie in 2007 (Malcolm Pirnie, 2008) and CH2M HILL during subsequent site visits. The former MGBR is oriented northeast-southwest, with the former firing point at the northernmost end. The southwestern half of the site is overgrown with brush and trees, while the northeastern half is generally flat and consists of maintained grass along the border of an active aircraft runway. A concrete backstop is still in place on the southwestern portion and is showing signs of deterioration. Although no water bodies are on the site, shrub wetlands are within the site boundaries. The range backstop and the northeastern half of the site, consisting of maintained grass, are not located in a wetland area.

Investigation History

A preliminary assessment (PA) was conducted for the NAS Oceana and NALF Fentress MGBRs to identify possible sources of munitions and explosives of concern (MEC) and metals-related contamination at the sites. The PA did not identify any potential MEC sources; however, it identified potential metals-related contamination including lead, antimony, arsenic, copper, nickel, and zinc consistent with the use of small arms ammunition (Malcolm Pirnie, 2008).

CH2M HILL conducted an SI at the former MGBRs in June 2010 to evaluate the presence or absence of elevated metals concentrations in surface and subsurface soil. During the SI, surface soil (0 to 1 feet below ground surface [bgs]) and subsurface soil (1 to 2 feet bgs) samples were collected from eight locations within the berm at each MGBR. The samples were analyzed for lead, antimony, arsenic, copper, nickel, and zinc. Based upon the sampling results from the SI, metals exceeding human health and/or ecological screening values were identified as COPCs (CH2M HILL, 2012). At the NAS Oceana MGBR, antimony, copper, lead, and zinc were identified as COPCs. At the NALF Fentress MGBR, copper, lead, and zinc were identified as COPCs. The horizontal and vertical extents of the COPCs exceeding ecological and/or human health screening values were not fully delineated during the SI.

Consequently, an expanded SI was conducted at each site in December 2013 to delineate the horizontal and vertical extents of COPCs exceeding human health and/or ecological screening values. Subsurface soil samples from 2- to 3-foot and 3-to 4-foot depth intervals were collected from the eight SI sampling locations within the berm at each site. Surface (0 to 1 foot bgs) and subsurface (1 to 2 feet bgs) soil samples also were collected from the toe of the berm at NAS Oceana (24 locations) and NALF Fentress (22 locations). Surface and subsurface background samples were collected near each MGBR to evaluate site background concentrations and support the establishment of appropriate cleanup goals.

The analytical results for site COPCs from the June 2010 and December 2013 sampling efforts were compared to human health and ecological screening values. These site data and exceedances of screening values are presented in Table 1 (NAS Oceana) and Table 2 (NALF Fentress).

Lead was the primary COPC observed at the MGBRs, exceeding the human health and/or ecological screening values throughout much of each site. The lead results from the 2010 and 2013 sampling effort are presented on Figures 4 and 5. The horizontal and vertical extents of the soil COPCs exceeding screening values could not be fully determined based on existing site data, thus an additional delineation effort is necessary.

Investigation Approach

XRF screening will be performed on soil samples to delineate the horizontal and vertical extents of site COPCs at each MGBR. The XRF screening locations were selected based on the June 2010 and December 2013 analytical results. Horizontal and vertical delineation of surface soil with COPC screening value exceedances will be performed in a step-wise fashion until two locations with concentrations less than human health and ecological screening values are identified in any given direction laterally, as well as vertically.

At NAS Oceana, concentrations of antimony, copper, lead, and zinc will be measured in soil samples using XRF screening techniques; and copper, lead, and zinc will be measured at NALF Fentress. Samples from a subset of the XRF screening locations (15 percent of the surface soil samples, and 15 percent of the subsurface soil samples) will be sent to a laboratory for analysis of the same compounds to confirm the XRF results.

Field Investigation Activities

This section presents the field sampling procedures for the additional delineation sampling at the NAS Oceana and NALF Fentress MGBRs. The site health and safety plan (HASP) will be updated to include the activities described below.

Sampling Tasks

Sample Collection

Surface and subsurface soil sampling will be performed in general accordance with the standard operating procedures (SOPs) included in Appendix B of the expanded SI Sampling and Analysis Plan (SAP) (CH2M HILL, 2013). Surface soil samples will be collected using a trowel, shovel, or hand auger from 0 to 1 foot in depth at all surface sampling locations. Surface soil samples will be collected for horizontal delineation of COPCs. Subsurface soil samples will be collected in 1-foot depth intervals using a stainless steel hand auger for vertical delineation.

Samples will be inspected for debris, and debris will be removed from the sample media before filling the sampling containers. Relevant site-specific observations, onsite conditions, and sampling activities will be recorded in the field logbook, as described in the SOP included in Appendix B of the expanded SI SAP (CH2M HILL, 2013). The soil sample locations will be surveyed using a global positioning system (GPS) unit.

XRF Field Screening

Surface and subsurface soil samples will be screened in 1-foot sample intervals using XRF techniques as defined in United States Environmental Protection Agency (EPA) Method 6200. XRF screening will be performed in general accordance with the SOP included in Attachment 2. Surface and subsurface samples collected at NAS Oceana will be screened for antimony, copper, lead, and zinc. Surface and subsurface samples collected at NALF Fentress will be screened for copper, lead, and zinc.

The human health and ecological screening values, and the desired XRF detection levels are as follows:

Analyte	Human Health Screening Level (mg/kg)	Ecological Screening Level (mg/kg)	XRF Detection Level (mg/kg)
Antimony	31	--	15
Copper	3,100	70	35
Lead	400	120	60
Zinc	**--**	**120**	**60**

Detection Levels are ½ of the lower of the ecological or human health screening level.

XRF results collected in the field will be compared to human health and ecological screening values to determine if site COPCs exceeding screening values have been delineated horizontally and vertically. Surface soil samples will be collected in a step-wise fashion, working outwards from the berm (the primary source area), and screened with XRF until two locations with concentrations less than human health and ecological screening values are identified in all directions. For horizontal delineation, surface soil samples will be collected at a minimum of 36 locations at NAS Oceana and 38 locations at NALF Fentress. The initial XRF screening locations are shown on Figures 6 and 7. Tables 3 and 4 present the initial screening locations, depths, and GPS coordinates. Additional screening locations will be determined in the field as needed to delineate COPC concentrations exceeding screening values. Human health and ecological screening values are presented in Tables 1 and 2.

Vertical delineation will be performed at a subset of the locations within the previous investigation footprint that exceeded screening values and at additional locations where soil contamination is identified at concentrations exceeding screening values. Vertical delineation will not be performed at all locations within the previous investigation footprint that exceeded screening values, as that level of resolution is not necessary to estimate the soil volume exceeding screening values. Vertical delineation will continue at the selected locations until two consecutive 1-foot depth intervals have concentrations less than the screening values for all site COPCs. Additional screening locations will be determined in the field as needed to delineate COPC concentrations exceeding screening values. If the water table is encountered, no additional sample intervals will be collected at that sample location.

Laboratory Analysis

Analytical laboratory samples for confirmation of the XRF screening results will be collected at a 15 percent of the XRF sampling locations. Samples collected at NAS Oceana will be analyzed for antimony, copper, lead, and zinc. Samples collected at NALF Fentress will be analyzed for copper, lead, and zinc. Tables 3 and 4 identify which screening locations have been randomly selected for laboratory analysis at each MGBR. If additional surface or subsurface samples for XRF screening are necessary for horizontal or vertical delineation of site COPCs, 15 percent of those additional samples will be submitted for laboratory analysis.

Quality assurance (QA)/quality control (QC) samples shall be collected at the frequency indicated in the expanded SI SAP (CH2M HILL, 2013). Proposed QA/QC sample locations are identified in Tables 3 and 4. Equipment blank samples will be collected from non-disposable sampling equipment at a frequency of one per day.

Samples will be collected in laboratory-prepared sampling containers, packed on ice, and shipped overnight to Emax Laboratories in Torrence, California. Laboratory reporting limits, methods, SOPs, and data verification and validation requirements are presented in the expanded SI SAP (CH2M HILL, 2013).

Equipment Decontamination

Non-disposable sampling equipment will be decontaminated before use and immediately after each use as described in the SOPs included as an attachment to the expanded SI SAP (CH2M HILL, 2013). Equipment will be decontaminated with alternating rinses of deionized water, phosphate-free laboratory detergent, and methanol, and allowed to dry between each use. Disposable equipment will be disposed of immediately following use.

Investigation-Derived Waste

Investigation-derived waste (IDW) generated at the MGBRs will include disposable personal protective equipment (PPE), sampling supplies, and soil cuttings. Soil cuttings will be containerized in approved 55-gallon drums and will be managed using the procedure described below. It is anticipated that one drum of soil cuttings will be generated at each MGBR. CH2M HILL will coordinate with the Navy Remedial Project Manager (RPM) to identify IDW storage locations at NAS Oceana and NALF Fentress. Used PPE and sampling supplies will be placed in opaque contractor's bags and disposed of in an on-base dumpster.

The process for filling and storing IDW drums will include:

- Drums used for IDW must be new or reconditioned 55-gallon Department of Transportation (DOT)-approved drums with open top.

- Drums may only be filled to approximately three-fourths full to meet weight requirements for transport.
- Excess material will be cleaned from the side of each drum.
- The cover of the drum will be secured to prevent leakage from the drum should it be placed on its side.
- The filled drum will be placed on a pallet for storage.
- Labels will be affixed to the drum so they are facing outward where they can be read.

The process for characterizing, profiling, and removing IDW from the base includes:

- CH2M HILL will collect samples of the IDW which will be analyzed for the parameters specified by the contracted receiving facility.
- Sampling results received by CH2M HILL will be forwarded to the IDW receiving facility, and a waste profile will be generated to make the determination regarding the material being considered hazardous or nonhazardous.
- Sampling results and the waste profile will be forwarded to the Navy RPM for review.
- Once the Navy approves of the profile, CH2M HILL will schedule a pickup date and time. This will be coordinated with the Navy RPM to be sure a Navy representative is present to sign the appropriate disposal forms.

Data Evaluation and Reporting

The results of the XRF screening and soil sampling for each MGBR, including the December 2013 delineation effort, will be presented in a technical memorandum. The overall data set will be evaluated in terms of delineating the spatial area of contamination at each site. The results of the delineation sampling will be used to support preparation of an Engineering Evaluation/Cost Analysis for each site.

References

CH2M HILL. 2012. *Final Revised Site Inspection Report, Former Small Arms Firing Ranges, Naval Air Station Oceana, Fleet Combat Training Center Dam Neck Annex, and Naval Auxiliary Landing Field Fentress, Virginia Beach, Virginia.* January

CH2M HILL. 2013. *Tier II Sampling and Analysis Plan Expanded Site Inspection Machine Gun Boresight Ranges (UXO-5 and UXO-10),* Naval Air Station Oceana and Naval Auxiliary Landing Field Fentress, Virginia Beach and Chesapeake, Virginia. November.

Malcolm Pirnie. 2008. *Final Preliminary Assessment*, Naval Air Station Oceana, Virginia. October.

Tables

TABLE 1

Soil Sample Analytical Results

NAS Oceana Machine Gun Boresight Range

June 2010 and December 2013

			SO01			
Sample ID			**OCMGBR-SS01-0610**	**OCMGBR-SB01-0610**	**OCMGBR-SB01-0203-1213**	**OCMGBR-SB01-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	0.924 U	0.924 R	1.48 / 1.06	2.38
Copper	3,100	70	24.8	4.55 L	37.3 / 26.0	22.0
Lead	400	120	239	13.4	380 / 268	263
Zinc	NC	120	18.3	14.3	22.3 / 19.3	19.5

			SO02			
Sample ID			**OCMGBR-SS02-0610**	**OCMGBR-SB02-0610**	**OCMGBR-SB02-0203-1213**	**OCMGBR-SB02-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	4.66	4.31	0.886	0.175
Copper	3,100	70	582	251	28.4	6.2
Lead	400	120	9,210	4,900	327	41.6
Zinc	NC	120	87.6	49.7	18.9	13.8

			SO03			
Sample ID			**OCMGBR-SS03-0610**	**OCMGBR-SB03-0610**	**OCMGBR-SB03-0203-1213**	**OCMGBR-SB03-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	7.32	0.288	7.79	8.58
Copper	3,100	70	187	78.7	426	781
Lead	400	120	3,770	593	2,930	2,610
Zinc	NC	120	35.3	21.9	60.9	61.6

			SO04			
Sample ID			**OCMGBR-SS04-0610**	**OCMGBR-SB04-0610**	**OCMGBR-SB04-0203-1213**	**OCMGBR-SB04-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	0.955 U	0.926 J	2.97 / 5.35	1.49
Copper	3,100	70	65.5	102	153 / 72	322
Lead	400	120	668	970	601 / 983	444
Zinc	NC	120	26.5	31.1	29.1 / 31.5	26.7

			SO05			
Sample ID			**OCMGBR-SS05-0610**	**OCMGBR-SB05-0610**	**OCMGBR-SB05-0203-1213**	**OCMGBR-SB05-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	7.73	57.1	0.525 J	0.338 J
Copper	3,100	70	1,100	721	15.1	12.4
Lead	400	120	13,500	16,000	117	75.4
Zinc	NC	120	195	159	23.5	21.3

			SO06			
Sample ID			**OCMGBR-SS06-0610**	**OCMGBR-SB06-0610**	**OCMGBR-SB06-0203-1213**	**OCMGBR-SB06-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	4.93	0.588 J	44.0	61.7 / 21.3
Copper	3,100	70	1,830	1,060	62.3	160 / 292
Lead	400	120	3,500	747	19,400	4,730 / 12,200
Zinc	NC	120	371	216	38.8	51.7 / 63.0

TABLE 1

Soil Sample Analytical Results

NAS Oceana Machine Gun Boresight Range

June 2010 and December 2013

			SO07			
Sample ID			**OCMGBR-SS07-0610**	**OCMGBR-SB07-0610**	**OCMGBR-SB07-0203-1213**	**OCMGBR-SB07-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	0.934	0.804 U	27.6	34.7
Copper	3,100	70	253	40.2	584	1,230
Lead	400	120	2,750	286	8,790	28,400
Zinc	NC	120	63.0	24.1	136	248

			SO08			
Sample ID			**OCMGBR-SS08-0610**	**OCMGBR-SB08-0610**	**OCMGBR-SB08-0203-1213**	**OCMGBR-SB08-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	13.1	0.301 J	6.49	0.685
Copper	3,100	70	4,310	806	172	22.9
Lead	400	120	19,500	740	1,330	170
Zinc	NC	120	524	281	55.6	15.7

			SO09		SO10	
Sample ID			**OCMGBR-SS09-0001-1213**	**OCMGBR-SB09-0102-1213**	**OCMGBR-SS10-0001-1213**	**OCMGBR-SB10-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	0.357 J	0.253 U	0.239	0.234 U
Copper	3,100	70	13.2	8.0	11.3	8.0
Lead	400	120	85.1	20.4	83.5	22.1
Zinc	NC	120	20.9	20.7	19.4	42.0

			SO11		SO12	
Sample ID			**OCMGBR-SS11-0001-1213**	**OCMGBR-SB11-0102-1213**	**OCMGBR-SS12-0001-1213**	**OCMGBR-SB12-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	0.231	0.256 U	0.267 U	0.249 U
Copper	3,100	70	20.8	12.9	9.5	7.9
Lead	400	120	143	25.1	59.8	40.2
Zinc	NC	120	25.9	19.8	21.6	23.7

			SO13		SO14	
Sample ID			**OCMGBR-SS13-0001-1213**	**OCMGBR-SB13-0102-1213**	**OCMGBR-SS14-0001-1213**	**OCMGBR-SB14-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	1.12	0.471	3.39	2.84
Copper	3,100	70	35.9	23.1	115	54.5
Lead	400	120	537	276.0	1,740	895
Zinc	NC	120	35.5	28	47.4	33.8

			SO15		SO16	
Sample ID			**OCMGBR-SS15-0001-1213**	**OCMGBR-SB15-0102-1213**	**OCMGBR-SS16-0001-1213**	**OCMGBR-SB16-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	28.0	4.04	44.4	13.3
Copper	3,100	70	564	503	1,440	788
Lead	400	120	5,130	2,290	12,100	3,950
Zinc	NC	120	100	132	158	233

TABLE 1

Soil Sample Analytical Results

NAS Oceana Machine Gun Boresight Range

June 2010 and December 2013

			SO17		SO18	
Sample ID			**OCMGBR-SS17-0001-1213**	**OCMGBR-SB17-0102-1213**	**OCMGBR-SS18-0001-1213**	**OCMGBR-SB18-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	7.17 / 9.45	3.06	18.0	14.2
Copper	3,100	70	702 / 660	365	896	1,370
Lead	400	120	3,520 / 3,580	1,630	8,450	9,250
Zinc	NC	120	107 / 105	102	163	237

			SO19		SO20	
Sample ID			**OCMGBR-SS19-0001-1213**	**OCMGBR-SB19-0102-1213**	**OCMGBR-SS20-0001-1213**	**OCMGBR-SB20-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	1.26	0.493 J	0.287	0.248 U
Copper	3,100	70	132	64.8	25.2	16.3
Lead	400	120	656	276	159	56.5
Zinc	NC	120	60.0	31.3	22.4	18.2

			SO21		SO22	
Sample ID			**OCMGBR-SS21-0001-1213**	**OCMGBR-SB21-0102-1213**	**OCMGBR-SS22-0001-1213**	**OCMGBR-SB22-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	1.19 / 1.34	0.68	1.83	3.06
Copper	3,100	70	46.3 / 49.1	28.6	79.7	151
Lead	400	120	413 / 435	228	1,820	1,270
Zinc	NC	120	32.5 / 44.4	31.8	49.7	49.3

			SO23		SO24	
Sample ID			**OCMGBR-SS23-0001-1213**	**OCMGBR-SB23-0102-1213**	**OCMGBR-SS24-0001-1213**	**OCMGBR-SB24-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	5.27	2.68	2.63 / 3.00	40.6
Copper	3,100	70	147	65.6	105 / 92.2	221
Lead	400	120	2,180	759	1,030 / 931	4,910
Zinc	NC	120	59.4	47.1	37.6 / 33.4	43.4

			SO25		SO26	
Sample ID			**OCMGBR-SS25-0001-1213**	**OCMGBR-SB25-0102-1213**	**OCMGBR-SS26-0001-1213**	**OCMGBR-SB26-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	1.33	0.637	9.47	5.12
Copper	3,100	70	42.6	30.7	672	444
Lead	400	120	472	240	4,020	1,900
Zinc	NC	120	22.4	16.8	89.7	86.2

			SO27		SO28	
Sample ID			**OCMGBR-SS27-0001-1213**	**OCMGBR-SB27-0102-1213**	**OCMGBR-SS28-0001-1213**	**OCMGBR-SB28-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	1.14	1.17	0.55 J	0.466 J
Copper	3,100	70	170	104	82.6	57.1
Lead	400	120	1,060	361	245	174
Zinc	NC	120	78.9	63.1	44.2	39.8

TABLE 1

Soil Sample Analytical Results

NAS Oceana Machine Gun Boresight Range

June 2010 and December 2013

			SO29		SO30	
Sample ID			**OCMGBR-SS29-0001-1213**	**OCMGBR-SB29-0102-1213**	**OCMGBR-SS30-0001-1213**	**OCMGBR-SB30-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	1.45 / 1.20	0.674	10.7	5.1
Copper	3,100	70	91.5 / 81.1	53.5	280	191
Lead	400	120	419 / 382	227	3,080	1,080
Zinc	NC	120	50.6 / 47.3	43.6	155	171

			SO31		SO32	
Sample ID			**OCMGBR-SS31-0001-1213**	**OCMGBR-SB31-0102-1213**	**OCMGBR-SS32-0001-1213**	**OCMGBR-SB32-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/11/13	12/11/13	12/11/13	12/11/13
Total Metals (mg/kg)						
Antimony	31	--	1.51	0.581 / 0.592 J	1.16	0.26 J
Copper	3,100	70	63.4	31.4 / 31.9	78.5	31.3
Lead	400	120	402	166 / 163	353	84.6
Zinc	NC	120	45.7	34.1 / 35.9	54.7	43.9

			SO33		SO34	
Sample ID			**OCMGBR-SS33-0001-1213**	**OCMGBR-SB33-0102-1213**	**OCMGBR-SS34-0001-1213**	**OCMGBR-SB34-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/12/13	12/12/13	12/12/13	12/12/13
Total Metals (mg/kg)						
Antimony	31	--	0.597	0.632	0.283 U	0.252 U
Copper	3,100	70	4.27	3.13	3.90	2.26
Lead	400	120	55.3	15.6	16.1	12.8
Zinc	NC	120	17.2	12.9	10.7	9.8

			SO35		SO36	
Sample ID			**OCMGBR-SS35-0001-1213**	**OCMGBR-SB35-0102-1213**	**OCMGBR-SS36-0001-1213**	**OCMGBR-SB36-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/12/13	12/12/13	12/12/13	12/12/13
Total Metals (mg/kg)						
Antimony	31	--	0.268 U	0.257 U	0.271 U	0.252 U
Copper	3,100	70	4.91	3.62	3.39	2.56
Lead	400	120	23.7	14.7	16.9	10.0
Zinc	NC	120	17.6	17.2	11.2	10.8

			SO37	
Sample ID			**OCMGBR-SS37-0001-1213**	**OCMGBR-SB37-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/12/13	12/12/13
Total Metals (mg/kg)				
Antimony	31	--	0.284 U	0.256 U
Copper	3,100	70	3.96	2.89
Lead	400	120	19.0	15.6
Zinc	NC	120	11.3	11.2

Value is greater than human health and ecological screening levels

Value is greater than ecological screening level

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

mg/kg - milligrams per kilogram

Background samples collected include OCMGBR-SO33 through OCMGBR-SSO37

TABLE 2

Soil Sample Analytical Results

NALF Fentress Machine Gun Boresight Range

June 2010 and December 2013

			SO01			
Sample ID			**OFMGBR-SS01-0610**	**OFMGBR-SB01-0610**	**OFMGBR-SB01-0203-1213**	**OFMGBR-SB01-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	727	15.0	25.0	23.2 / 53.5
Lead	400	120	5,530	706	67.8	103 / 4,790
Zinc	NC	120	93.7	21.4	18.3	21.2 / 24.9

			SO02			
Sample ID			**OFMGBR-SS02-0610**	**OFMGBR-SB02-0610**	**OFMGBR-SB02-0203-1213**	**OFMGBR-SB02-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	206	366	27.4	29.0
Lead	400	120	406	3,240	174	158
Zinc	NC	120	46.3	43.7	18.1	17.4

			SO03			
Sample ID			**OFMGBR-SS03-0610**	**OFMGBR-SB03-0610**	**OFMGBR-SB03-0203-1213**	**OFMGBR-SB03-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	168	31.2	16.9	17.7
Lead	400	120	242	62.7	58.3	146
Zinc	NC	120	24.4	18.3	17.9	16.7

			SO04			
Sample ID			**OFMGBR-SS04-0610**	**OFMGBR-SB04-0610**	**OFMGBR-SB04-0203-1213**	**OFMGBR-SB04-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	68,400	556	6.87 / 6.68	7.87
Lead	400	120	17,100	8,970	16.0 / 15.2	16.7
Zinc	NC	120	6290	198	15.7 / 15.3	15.0

			SO05			
Sample ID			**OFMGBR-SS05-0610**	**OFMGBR-SB05-0610**	**OFMGBR-SB05-0203-1213**	**OFMGBR-SB05-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	191	100	22.8	10.7
Lead	400	120	1,280	662	97.1	34.6
Zinc	NC	120	47.2	26.1	18.3	14.2

			SO06			
Sample ID			**OFMGBR-SS06-0610**	**OFMGBR-SB06-0610**	**OFMGBR-SB06-0203-1213**	**OFMGBR-SB06-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	457	210	79.2	40.9
Lead	400	120	4,790	2,080	481	355
Zinc	NC	120	93.3	73.6	30.4	24.3

TABLE 2

Soil Sample Analytical Results

NALF Fentress Machine Gun Boresight Range

June 2010 and December 2013

			SO07			
Sample ID			**OFMGBR-SS07-0610**	**OFMGBR-SB07-0610**	**OFMGBR-SB07-0203-1213**	**OFMGBR-SB07-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	72.8	14.6	75.5	183
Lead	400	120	775	83.3	359	93.6
Zinc	NC	120	17.5	12.3	26.8	30.9

			SO08			
Sample ID			**OFMGBR-SS08-0610**	**OFMGBR-SB08-0610**	**OFMGBR-SB08-0203-1213**	**OFMGBR-SB08-0304-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**2 - 3 ft**	**3 - 4 ft**
Sample Date	**SL**	**SL**	6/18/10	6/18/10	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	338	262	54.6	16.8
Lead	400	120	4,050	1,980	1,710	89.2
Zinc	NC	120	80.2 L	54.2	41.3	26.3

			SO09		SO10	
Sample ID			**OFMGBR-SS09-0001-1213**	**OFMGBR-SB09-0102-1213**	**OFMGBR-SS10-0001-1213**	**OFMGBR-SB10-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	69.0	32.4	19.9	12.0
Lead	400	120	361	164	111	48.2
Zinc	NC	120	17.1	17.3	20.6	15.6

			SO11		SO12	
Sample ID			**OFMGBR-SS11-0001-1213**	**OFMGBR-SB11-0102-1213**	**OFMGBR-SS12-0001-1213**	**OFMGBR-SB12-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	248	180	6.95	5.47
Lead	400	120	1,220	1,020	32.6	17.7
Zinc	NC	120	43.3	53.2	13.9	16.6

			SO13		SO14	
Sample ID			**OFMGBR-SS13-0001-1213**	**OFMGBR-SB13-0102-1213**	**OFMGBR-SS14-0001-1213**	**OFMGBR-SB14-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	26.3 / 35.5	14.9	57.3	32.2
Lead	400	120	324 / 704	164	351	270
Zinc	NC	120	20.4 / 30.1	20.9	27.7	22.5

			SO15		SO16	
Sample ID			**OFMGBR-SS15-0001-1213**	**OFMGBR-SB15-0102-1213**	**OFMGBR-SS16-0001-1213**	**OFMGBR-SB16-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	114	23.7	471	139
Lead	400	120	1,150	268	5,080	1,140
Zinc	NC	120	42.3	33.2	115.0	33.8

TABLE 2

Soil Sample Analytical Results

NALF Fentress Machine Gun Boresight Range

June 2010 and December 2013

			SO17		SO18	
Sample ID			**OFMGBR-SS17-0001-1213**	**OFMGBR-SB17-0102-1213**	**OFMGBR-SS18-0001-1213**	**OFMGBR-SB18-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	351	153	291	162 / 160
Lead	400	120	7,420	3,140	3,560	2,400 / 2,600
Zinc	NC	120	111	48.2	59.2	55.5 / 44.3

			SO19		SO20	
Sample ID			**OFMGBR-SS19-0001-1213**	**OFMGBR-SB19-0102-1213**	**OFMGBR-SS20-0001-1213**	**OFMGBR-SB20-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	80.1	28.1	19.0	26.8
Lead	400	120	819	227	117	164
Zinc	NC	120	23.0	16.9	23.6	30.8

			SO21		SO22	
Sample ID			**OFMGBR-SS21-0001-1213**	**OFMGBR-SB21-0102-1213**	**OFMGBR-SS22-0001-1213**	**OFMGBR-SB22-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	26.8	20.3	14.4	9.36
Lead	400	120	207	99.4	91.7	55.1
Zinc	NC	120	23.9	17.5	23.8	19.8

			SO23		SO24	
Sample ID			**OFMGBR-SS23-0001-1213**	**OFMGBR-SB23-0102-1213**	**OFMGBR-SS24-0001-1213**	**OFMGBR-SB24-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	236 / 156	223	3.7	119 / 119
Lead	400	120	845 / 640	839	15.8	948 / 703
Zinc	NC	120	101 / 85.3	92.4	4.4	72.6 / 44.8

			SO25		SO26	
Sample ID			**OFMGBR-SS25-0001-1213**	**OFMGBR-SB25-0102-1213**	**OFMGBR-SS26-0001-1213**	**OFMGBR-SB26-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/13/13	12/13/13	12/13/13	12/13/13
Total Metals (mg/kg)						
Copper	3,100	70	233	135	59.9	24.5
Lead	400	120	1,850	1,370	332	133
Zinc	NC	120	68.9	45.1	28.9	22.9

			SO27		SO28	
Sample ID			**OFMGBR-SS27-0001-1213**	**OFMGBR-SB27-0102-1213**	**OFMGBR-SS28-0001-1213**	**OFMGBR-SB28-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/16/13	12/16/13	12/16/13	12/16/13
Total Metals (mg/kg)						
Copper	3,100	70	430	69.3	361	260
Lead	400	120	474	104	1,190	923
Zinc	NC	120	273	52.5	283	200

TABLE 2

Soil Sample Analytical Results

NALF Fentress Machine Gun Boresight Range

June 2010 and December 2013

			SO29		SO30	
Sample ID			**OFMGBR-SS29-0001-1213**	**OFMGBR-SB29-0102-1213**	**OFMGBR-SS30-0001-1213**	**OFMGBR-SB30-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/16/13	12/16/13	12/16/13	12/16/13
Total Metals (mg/kg)						
Copper	3,100	70	186	213	174	95
Lead	400	120	670	849	659	518
Zinc	NC	120	191	119	135	101

			SO31		SO32	
Sample ID			**OFMGBR-SS31-0001-1213**	**OFMGBR-SB31-0102-1213**	**OFMGBR-SS32-0001-1213**	**OFMGBR-SB32-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/16/13	12/16/13	12/16/13	12/16/13
Total Metals (mg/kg)						
Copper	3,100	70	7.43 / 6.32	4.02	4.71	6.09
Lead	400	120	36.4 / 35.5	20.8	14.5	19.8
Zinc	NC	120	12.8 / 12.1	8.46	9.47	12.9

			SO33		SO34	
Sample ID			**OFMGBR-SS33-0001-1213**	**OFMGBR-SB33-0102-1213**	**OFMGBR-SS34-0001-1213**	**OFMGBR-SB34-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/16/13	12/16/13	12/16/13	12/16/13
Total Metals (mg/kg)						
Copper	3,100	70	3.45	3.39	6.92	4.67
Lead	400	120	12.7	8.63	20.9	13.6
Zinc	NC	120	9.06	10.6	12.5	12.1

			SO35	
Sample ID			**OFMGBR-SS35-0001-1213**	**OFMGBR-SB35-0102-1213**
Sample Depth	**HH**	**ECO**	**0 -1 ft**	**1 -2 ft**
Sample Date	**SL**	**SL**	12/16/13	12/16/13
Total Metals (mg/kg)				
Copper	3,100	70	4.08	2.49
Lead	400	120	12.0	7.09
Zinc	NC	120	9.26	8.0

Value is greater than human health and ecological screening levels

Value is greater than ecological screening level

U: Non-detect

J: Estimated value

L: Value may be biased low

Background Samples collected are OFMGBR-SO31 through OFMGBR-SO35

TABLE 3

Sample Details Summary, Machine Gun Boresight Range - NAS Oceana

NAS Oceana

Station ID	X[1]	Y[1]	Depth / Sampling Interval (feet)	Sample ID	Analysis		Laboratory QC Samples		XRF QC Samples
					XRF Field Screening	Laboratory Analysis[2]	Field Duplicate[3]	MS/MSD[4]	XRF Duplicate[5]
Proposed Samples									
SO01	12203069.19	3470896.66	4 - 5	OCMGBR-SB01-0405-MMYY	X	X			
SO01	12203069.19	3470896.66	5 - 6	OCMGBR-SB01-0506-MMYY	X				
SO02	12203062.35	3470909.47	4 - 5	OCMGBR-SB02-0405-MMYY	X				
SO03	12203055.98	3470921.78	4 - 5	OCMGBR-SB03-0405-MMYY	X				
SO03	12203055.98	3470921.78	5 - 6	OCMGBR-SB03-0506-MMYY	X				
SO04	12203049.14	3470934.59	4 - 5	OCMGBR-SB04-0405-MMYY	X				
SO04	12203049.14	3470934.59	5 - 6	OCMGBR-SB04-0506-MMYY	X				
SO06	12203076.53	3470908.11	4 - 5	OCMGBR-SB06-0405-MMYY	X				
SO06	12203076.53	3470908.11	5 - 6	OCMGBR-SB06-0506-MMYY	X				
SO07	12203069.69	3470920.92	4 - 5	OCMGBR-SB07-0405-MMYY	X				
SO07	12203069.69	3470920.92	5 - 6	OCMGBR-SB07-0506-MMYY	X				
SO08	12203062.85	3470933.72	4 - 5	OCMGBR-SB08-0405-MMYY	X				
SO08	12203062.85	3470933.72	5 - 6	OCMGBR-SB08-0506-MMYY	X	X	X		X
SO11	12203054.43	3470974.41	2 - 3	OCMGBR-SB11-0203-MMYY	X				
SO13	12203105.94	3470887.24	2 - 3	OCMGBR-SB13-0203-MMYY	X				
SO13	12203105.94	3470887.24	3 - 4	OCMGBR-SB13-0304-MMYY	X				
SO15	12203093.69	3470902.36	2 - 3	OCMGBR-SB15-0203-MMYY	X				
SO15	12203093.69	3470902.36	3 - 4	OCMGBR-SB15-0304-MMYY	X				
SO17	12203082.78	3470928.91	2 - 3	OCMGBR-SB17-0203-MMYY	X	X			
SO17	12203082.78	3470928.91	3 - 4	OCMGBR-SB17-0304-MMYY	X				
SO19	12203067.87	3470952.24	2 - 3	OCMGBR-SB19-0203-MMYY	X				
SO19	12203067.87	3470952.24	3 - 4	OCMGBR-SB19-0304-MMYY	X				
SO22	12203111.86	3470903.06	2 - 3	OCMGBR-SB22-0203-MMYY	X				
SO22	12203111.86	3470903.06	3 - 4	OCMGBR-SB22-0304-MMYY	X	X	X		X
SO24	12203095.50	3470923.76	2 - 3	OCMGBR-SB24-0203-MMYY	X				
SO24	12203095.50	3470923.76	3 - 4	OCMGBR-SB24-0304-MMYY	X				
SO26	12203081.19	3470946.05	2 - 3	OCMGBR-SB26-0203-MMYY	X				
SO26	12203081.19	3470946.05	3 - 4	OCMGBR-SB26-0304-MMYY	X				
SO28	12203074.47	3470969.40	2 - 3	OCMGBR-SB28-0203-MMYY	X	X			
SO28	12203074.47	3470969.40	3 - 4	OCMGBR-SB28-0304-MMYY	X				
SO29	12203115.20	3470917.69	2 - 3	OCMGBR-SB29-0203-MMYY	X				
SO29	12203115.20	3470917.69	3 - 4	OCMGBR-SB29-0304-MMYY	X				
SO31	12203101.79	3470940.63	2 - 3	OCMGBR-SB31-0203-MMYY	X				
SO31	12203101.79	3470940.63	3 - 4	OCMGBR-SB31-0304-MMYY	X				
SO32	12203092.71	3470959.36	2 - 3	OCMGBR-SB32-0203-MMYY	X				
SO38	12203038.76	3470996.85	0 - 1	OCMGBR-SS38-0001-MMYY	X	X			
SO39	12203036.20	3470978.76	0 - 1	OCMGBR-SS39-0001-MMYY	X				
SO40	12203047.12	3470985.63	0 - 1	OCMGBR-SS40-0001-MMYY	X				
SO41	12203058.70	3470990.92	0 - 1	OCMGBR-SS41-0001-MMYY	X				
SO42	12203073.49	3470995.94	0 - 1	OCMGBR-SS42-0001-MMYY	X				
SO43	12203029.86	3470967.05	0 - 1	OCMGBR-SS43-0001-MMYY	X	X			X
SO44	12203043.83	3470969.93	0 - 1	OCMGBR-SS44-0001-MMYY	X				
SO45	12203067.20	3470980.52	0 - 1	OCMGBR-SS45-0001-MMYY	X				
SO46	12203078.23	3470983.09	0 - 1	OCMGBR-SS46-0001-MMYY	X				
SO47	12203087.97	3470987.71	0 - 1	OCMGBR-SS47-0001-MMYY	X				
SO48	12203032.55	3470950.73	0 - 1	OCMGBR-SS48-0001-MMYY	X				
SO49	12203039.16	3470958.76	0 - 1	OCMGBR-SS49-0001-MMYY	X				
SO50	12203085.60	3470971.02	0 - 1	OCMGBR-SS50-0001-MMYY	X				
SO51	12203105.98	3470982.49	0 - 1	OCMGBR-SS51-0001-MMYY	X				
SO52	12203043.47	3470946.71	0 - 1	OCMGBR-SS52-0001-MMYY	X				
SO53	12203098.07	3470970.36	0 - 1	OCMGBR-SS53-0001-MMYY	X				
SO54	12203115.80	3470968.13	0 - 1	OCMGBR-SS54-0001-MMYY	X				

TABLE 3

Sample Details Summary, Machine Gun Boresight Range - NAS Oceana

NAS Oceana

Station ID	X[1]	Y[1]	Depth / Sampling Interval (feet)	Sample ID	Analysis		Laboratory QC Samples		XRF QC Samples
					XRF Field Screening	Laboratory Analysis[2]	Field Duplicate[3]	MS/MSD[4]	XRF Duplicate[5]
SO55	12203110.40	3470951.06	0 - 1	OCMGBR-SS55-0001-MMYY	X	X			
SO56	12203127.20	3470947.71	0 - 1	OCMGBR-SS56-0001-MMYY	X				
SO57	12203121.77	3470932.19	0 - 1	OCMGBR-SS57-0001-MMYY	X				
SO58	12203137.01	3470931.28	0 - 1	OCMGBR-SS58-0001-MMYY	X				
SO59	12203129.84	3470916.47	0 - 1	OCMGBR-SS59-0001-MMYY	X				
SO60	12203143.66	3470913.85	0 - 1	OCMGBR-SS60-0001-MMYY	X				
SO61	12203082.33	3470879.72	0 - 1	OCMGBR-SS61-0001-MMYY	X				
SO62	12203136.18	3470901.64	0 - 1	OCMGBR-SS62-0001-MMYY	X	X			
SO63	12203086.65	3470871.19	0 - 1	OCMGBR-SS63-0001-MMYY	X				
SO64	12203149.88	3470901.34	0 - 1	OCMGBR-SS64-0001-MMYY	X				
SO65	12203090.87	3470860.05	0 - 1	OCMGBR-SS65-0001-MMYY	X				
SO66	12203112.70	3470878.06	0 - 1	OCMGBR-SS66-0001-MMYY	X				
SO67	12203125.30	3470881.61	0 - 1	OCMGBR-SS67-0001-MMYY	X				
SO68	12203141.23	3470888.99	0 - 1	OCMGBR-SS68-0001-MMYY	X				
SO69	12203154.65	3470887.85	0 - 1	OCMGBR-SS69-0001-MMYY	X				
SO70	12203104.38	3470863.72	0 - 1	OCMGBR-SS70-0001-MMYY	X	X		X	
SO71	12203119.54	3470866.86	0 - 1	OCMGBR-SS71-0001-MMYY	X				
SO72	12203134.05	3470871.80	0 - 1	OCMGBR-SS72-0001-MMYY	X				X
SO73	12203149.15	3470875.46	0 - 1	OCMGBR-SS73-0001-MMYY	X	X			
Additional Delineation Samples (locations TBD in the field)[6]									
SOXX	TBD	TBD	0 - 1	OCMGBR-SSXX-TDBD-MMYY	X	3/20 XRF samples[2]	1/10 lab samples[3]	1/20 lab samples[4]	1/20 XRF samples[5]
SOXX	TBD	TBD	TBD (1 foot depth increments below 0 - 1 feet)	OCMGBR-SBXX-TDBD-MMYY	X	3/20 XRF samples[2]	1/10 lab samples[3]	1/20 lab samples[4]	1/20 XRF samples[5]
Equipment Blank (EB) Samples[7]									
EB	NA	NA	NA	OCMGBR-EBMMDDYY	NA	1/day	NA	NA	NA

[1] North American Datum (NAD) 83 State Plane Virginia South - Feet

[2] Laboratory samples will be submitted at a frequency of 3 per 20 XRF (15%) screening locations

[3] Field Duplicate samples will be collected at a frequency of 1 per 10 laboratory samples sent for analysis

[4] MS/MSD samples will be collected at a frequency of 1 pair per 20 laboratory samples sent for analysis (including field QC samples)

[5] XRF Duplicate samples will be collected at a frequency of 1 per 20 XRF samples

[6] Horizontal soil screening will be performed in a step-wise fashion until two locations with concentrations less than screening values are identified in any given direction. Vertical soil screening will be performed if horizontal screening locations have concentrations exceeding screening values. Vertical soil screening will continue at a given location until two consecutive depth intervals have concentrations less than the screening values. Only vertical delineation will be conducted within the berm. Horizontal and vertical delineation will be conducted within the toe of the berm. Locations and depths of any additional delineation samples will be determined in the field.

[7] Equipment blank samples will be collected at a frequency of 1 per day of sampling

EB - Equipment Blank
MMYY - Month & Year of Sampling
MS/MSD - matrix spike/matrix spike duplicate
NA - Not applicable
TBD - to be determined (in the field)
TDBD - Top Depth, Bottom Depth (in feet)
XRF - X-Ray Fluorescence
XX - sample location number

TABLE 4

Sample Details Summary, Machine Gun Boresight Range - NALF Fentress

NALF Fentress

Station ID	X[1]	Y[1]	Depth / Sampling Interval (feet)	Sample ID	Analysis		Laboratory QC Samples		XRF QC Samples
					XRF Field Screening	Laboratory Analysis[2]	Field Duplicate[3]	MS/MSD[4]	XRF Duplicate[5]
Proposed Samples									
SO01	12176950.01	3422557.89	4 - 5	OFMGBR-SB01-0405-MMYY	X				
SO01	12176950.01	3422557.89	5 - 6	OFMGBR-SB01-0506-MMYY	X				
SO02	12176936.50	3422563.20	4 - 5	OFMGBR-SB02-0405-MMYY	X				
SO02	12176936.50	3422563.20	5 - 6	OFMGBR-SB02-0506-MMYY	X				
SO03	12176923.66	3422568.44	4 - 5	OFMGBR-SB03-0405-MMYY	X				
SO03	12176923.66	3422568.44	5 - 6	OFMGBR-SB03-0506-MMYY	X				
SO06	12176948.18	3422571.36	4 - 5	OFMGBR-SB06-0405-MMYY	X				
SO06	12176948.18	3422571.36	5 - 6	OFMGBR-SB06-0506-MMYY	X	X			X
SO07	12176934.66	3422576.67	4 - 5	OFMGBR-SB07-0405-MMYY	X				
SO07	12176934.66	3422576.67	5 - 6	OFMGBR-SB07-0506-MMYY	X				
SO08	12176921.15	3422581.98	4 - 5	OFMGBR-SB08-0405-MMYY	X				
SO09	12176987.10	3422561.59	2 - 3	OFMGBR-SB09-0203-MMYY	X				
SO09	12176987.10	3422561.59	3 - 4	OFMGBR-SB09-0304-MMYY	X				
SO11	12176894.23	3422603.09	2 - 3	OFMGBR-SB11-0203-MMYY	X				
SO11	12176894.23	3422603.09	3 - 4	OFMGBR-SB11-0304-MMYY	X				
SO14	12176969.75	3422574.59	2 - 3	OFMGBR-SB14-0203-MMYY	X				
SO14	12176969.75	3422574.59	3 - 4	OFMGBR-SB14-0304-MMYY	X				
SO16	12176943.80	3422589.28	2 - 3	OFMGBR-SB16-0203-MMYY	X				
SO16	12176943.80	3422589.28	3 - 4	OFMGBR-SB16-0304-MMYY	X				
SO18	12176920.16	3422594.68	2 - 3	OFMGBR-SB18-0203-MMYY	X				
SO18	12176920.16	3422594.68	3 - 4	OFMGBR-SB18-0304-MMYY	X				
SO20	12176984.60	3422580.10	2 - 3	OFMGBR-SB20-0203-MMYY	X				
SO20	12176984.60	3422580.10	3 - 4	OFMGBR-SB20-0304-MMYY	X	X			
SO23	12176950.74	3422595.13	2 - 3	OFMGBR-SB23-0203-MMYY	X	X	X		X
SO23	12176950.74	3422595.13	3 - 4	OFMGBR-SB23-0304-MMYY	X				
SO24	12176937.51	3422601.87	2 - 3	OFMGBR-SB24-0203-MMYY	X				
SO24	12176937.51	3422601.87	3 - 4	OFMGBR-SB24-0304-MMYY	X				
SO26	12176913.10	3422606.03	2 - 3	OFMGBR-SB26-0203-MMYY	X				
SO26	12176913.10	3422606.03	3 - 4	OFMGBR-SB26-0304-MMYY	X				
SO28	12176974.31	3422597.51	2 - 3	OFMGBR-SB28-0203-MMYY	X				
SO28	12176974.31	3422597.51	3 - 4	OFMGBR-SB28-0304-MMYY	X				
SO29	12176947.00	3422610.75	2 - 3	OFMGBR-SB29-0203-MMYY	X				
SO29	12176947.00	3422610.75	3 - 4	OFMGBR-SB29-0304-MMYY	X				
SO30	12176929.27	3422618.76	2 - 3	OFMGBR-SB30-0203-MMYY	X				
SO30	12176929.27	3422618.76	3 - 4	OFMGBR-SB30-0304-MMYY	X	X			
SO36	12176867.81	3422615.40	0 - 1	OFMGBR-SS36-0001-MMYY	X				
SO37	12176877.20	3422627.28	0 - 1	OFMGBR-SS37-0001-MMYY	X				
SO38	12176888.91	3422635.09	0 - 1	OFMGBR-SS38-0001-MMYY	X	X		X	
SO39	12176870.99	3422588.77	0 - 1	OFMGBR-SS39-0001-MMYY	X				
SO40	12176874.92	3422599.83	0 - 1	OFMGBR-SS40-0001-MMYY	X				
SO41	12176880.55	3422608.91	0 - 1	OFMGBR-SS41-0001-MMYY	X	X			
SO42	12176889.72	3422621.82	0 - 1	OFMGBR-SS42-0001-MMYY	X				
SO43	12176900.81	3422628.32	0 - 1	OFMGBR-SS43-0001-MMYY	X				
SO44	12176910.02	3422641.30	0 - 1	OFMGBR-SS44-0001-MMYY	X	X			
SO45	12176921.74	3422651.77	0 - 1	OFMGBR-SS45-0001-MMYY	X				
SO46	12176883.55	3422583.77	0 - 1	OFMGBR-SS46-0001-MMYY	X				
SO47	12176889.12	3422594.91	0 - 1	OFMGBR-SS47-0001-MMYY	X				
SO48	12176903.58	3422615.47	0 - 1	OFMGBR-SS48-0001-MMYY	X				
SO49	12176915.23	3422623.32	0 - 1	OFMGBR-SS49-0001-MMYY	X				
SO50	12176926.25	3422633.93	0 - 1	OFMGBR-SS50-0001-MMYY	X				
SO51	12176938.41	3422642.28	0 - 1	OFMGBR-SS51-0001-MMYY	X				
SO52	12176897.12	3422578.77	0 - 1	OFMGBR-SS52-0001-MMYY	X	X	X		X

TABLE 4

Sample Details Summary, Machine Gun Boresight Range - NALF Fentress

NALF Fentress

Station ID	X[1]	Y[1]	Depth / Sampling Interval (feet)	Sample ID	Analysis		Laboratory QC Samples		XRF QC Samples
					XRF Field Screening	Laboratory Analysis[2]	Field Duplicate[3]	MS/MSD[4]	XRF Duplicate[5]
SO53	12176944.32	3422625.78	0 - 1	OFMGBR-SS53-0001-MMYY	X				
SO54	12176957.44	3422633.77	0 - 1	OFMGBR-SS54-0001-MMYY	X				
SO55	12176961.90	3422619.13	0 - 1	OFMGBR-SS55-0001-MMYY	X				
SO56	12176972.11	3422628.59	0 - 1	OFMGBR-SS56-0001-MMYY	X	X			
SO57	12176975.42	3422613.00	0 - 1	OFMGBR-SS57-0001-MMYY	X				
SO58	12176987.35	3422622.49	0 - 1	OFMGBR-SS58-0001-MMYY	X				
SO59	12176988.99	3422606.68	0 - 1	OFMGBR-SS59-0001-MMYY	X				
SO60	12177001.63	3422616.63	0 - 1	OFMGBR-SS60-0001-MMYY	X				
SO61	12177004.56	3422600.68	0 - 1	OFMGBR-SS61-0001-MMYY	X				
SO62	12177016.92	3422610.35	0 - 1	OFMGBR-SS62-0001-MMYY	X				
SO63	12176972.68	3422560.63	0 - 1	OFMGBR-SS63-0001-MMYY	X				
SO64	12176995.96	3422574.63	0 - 1	OFMGBR-SS64-0001-MMYY	X				
SO65	12177003.96	3422582.34	0 - 1	OFMGBR-SS65-0001-MMYY	X				
SO66	12177018.85	3422595.82	0 - 1	OFMGBR-SS66-0001-MMYY	X	X			X
SO67	12176987.39	3422553.63	0 - 1	OFMGBR-SS67-0001-MMYY	X				
SO68	12177000.61	3422559.67	0 - 1	OFMGBR-SS68-0001-MMYY	X				
SO69	12177008.53	3422570.35	0 - 1	OFMGBR-SS69-0001-MMYY	X				
SO70	12177015.60	3422579.33	0 - 1	OFMGBR-SS70-0001-MMYY	X				
SO71	12176987.22	3422541.19	0 - 1	OFMGBR-SS71-0001-MMYY	X	X			
SO72	12176999.68	3422547.21	0 - 1	OFMGBR-SS72-0001-MMYY	X				
SO73	12177014.53	3422555.01	0 - 1	OFMGBR-SS73-0001-MMYY	X				
Additional Delineation Samples (locations TBD in the field)[6]									
SOXX	TBD	TBD	0.0 - 1.0	OFMGBR-SSXX-TDBD-MMYY	X	3/20 XRF samples[2]	1/10 lab samples[3]	1/20 lab samples[4]	1/20 XRF samples[5]
SOXX	TBD	TBD	TBD (1 foot depth increments below 0 - 1 feet)	OFMGBR-SBXX-TDBD-MMYY	X	3/20 XRF samples[2]	1/10 lab samples[3]	1/20 lab samples[4]	1/20 XRF samples[5]
Equipment Blank (EB) Samples[6]									
EB	NA	NA	NA	OFMGBR-EBMMDDYY	NA	1/day	NA	NA	NA

[1] North American Datum (NAD) 83 State Plane Virginia South - Feet

[2] Laboratory samples will be submitted at a frequency of 3 per 20 XRF (15%) screening locations

[3] Field Duplicate samples will be collected at a frequency of 1 per 10 laboratory samples sent for analysis

[4] MS/MSD samples will be collected at a frequency of 1 pair per 20 laboratory samples sent for analysis (including field QC samples)

[5] XRF Duplicate samples will be collected at a frequency of 1 per 20 XRF samples

[6] Horizontal soil screening will be performed in a step-wise fashion until two locations with concentrations less than screening values are identified in any given direction. Vertical soil screening will be performed if horizontal screening locations have concentrations exceeding screening values. Vertical soil screening will continue at a given location until two consecutive depth intervals have concentrations less than the screening values. Only vertical delineation will be conducted within the berm. Horizontal and vertical delineation will be conducted within the toe of the berm. Locations and depths of any additional delineation samples will be determined in the field.

[7] Equipment blank samples will be collected at a frequency of 1 per day of sampling

EB - Equipment Blank

MMYY - Month & Year of Sampling

MS/MSD - matrix spike/matrix spike duplicate

NA - Not applicable

TBD - to be determined (in the field)

TDBD - Top Depth, Bottom Depth (in feet)

XRF - X-Ray Fluorescence

XX - sample location number

Figures

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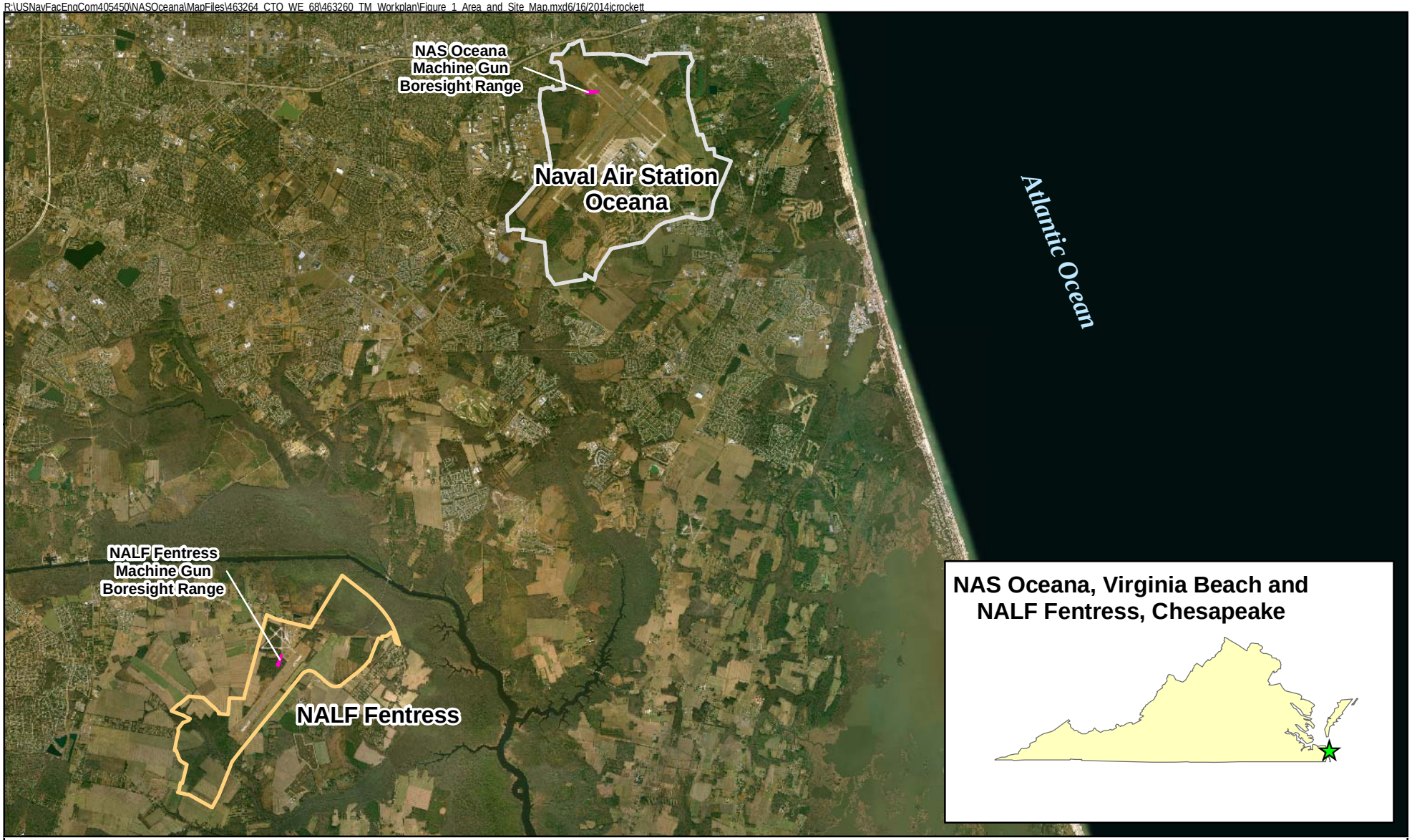

Legend

- NAS Oceana Boundary
- NALF Fentress Boundary
- MRP Sites

N
W E
S

0 1.1 2.2
Miles

Figure 1
Area and Site Location Map
MGBR Technical Memorandum Work Plan
NAS Oceana and NALF Fentress
Virginia Beach and Chesapeake, Virginia

CH2MHILL

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Legend
- MRP Site
- Backstop

N
W E
S

0 100 200
Feet

Figure 2
NAS Oceana MGBR Site Map
MGBR Technical Memorandum Work Plan
NAS Oceana
Virginia Beach, Virginia

CH2MHILL

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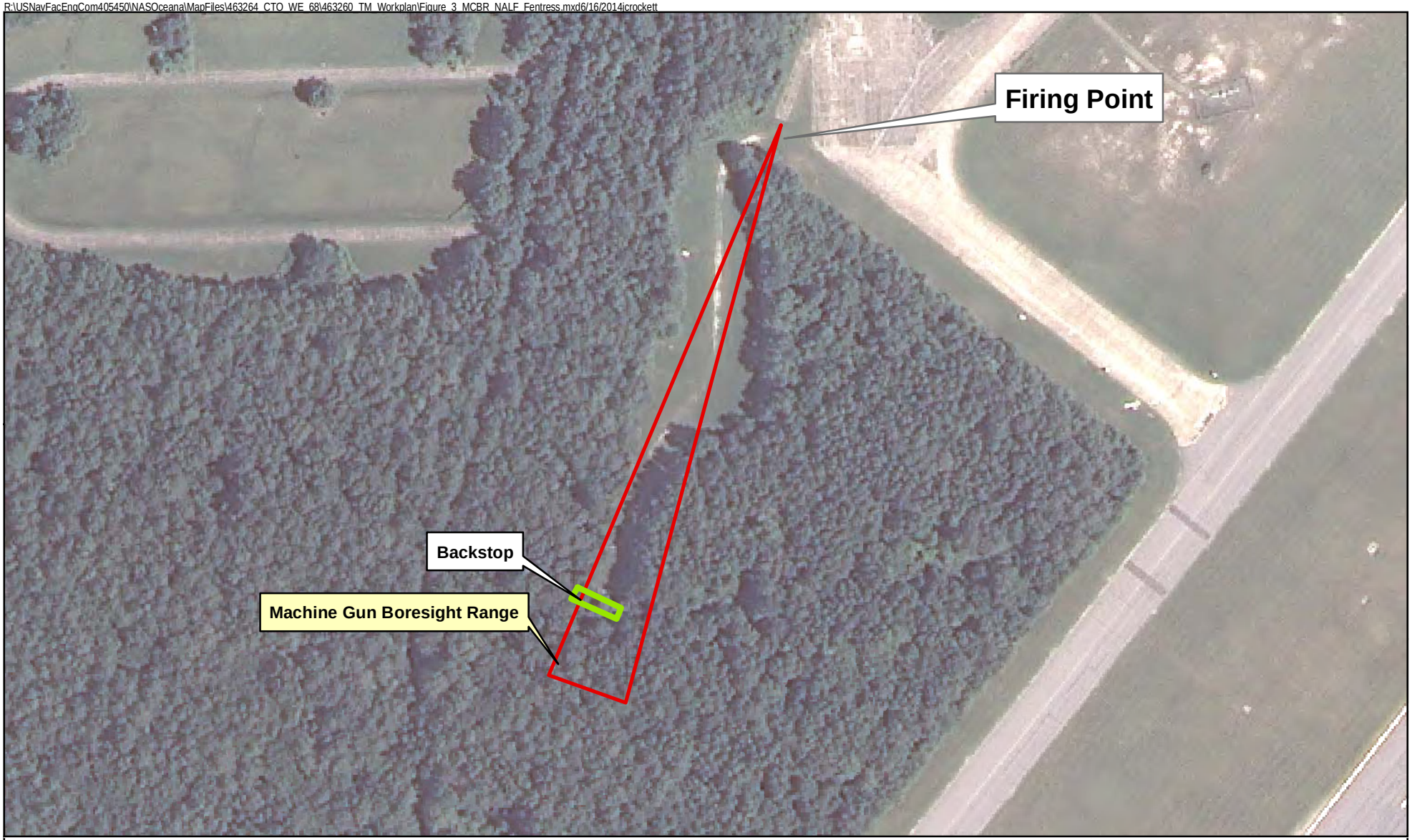

Legend
- MRP Site
- Backstop

N
W E
S

0 100 200
Feet

Figure 3
NALF Fentress MGBR Site Map
MGBR Technical Memorandum Work Plan
NALF Fentress
Chesapeake, Virginia

CH2MHILL

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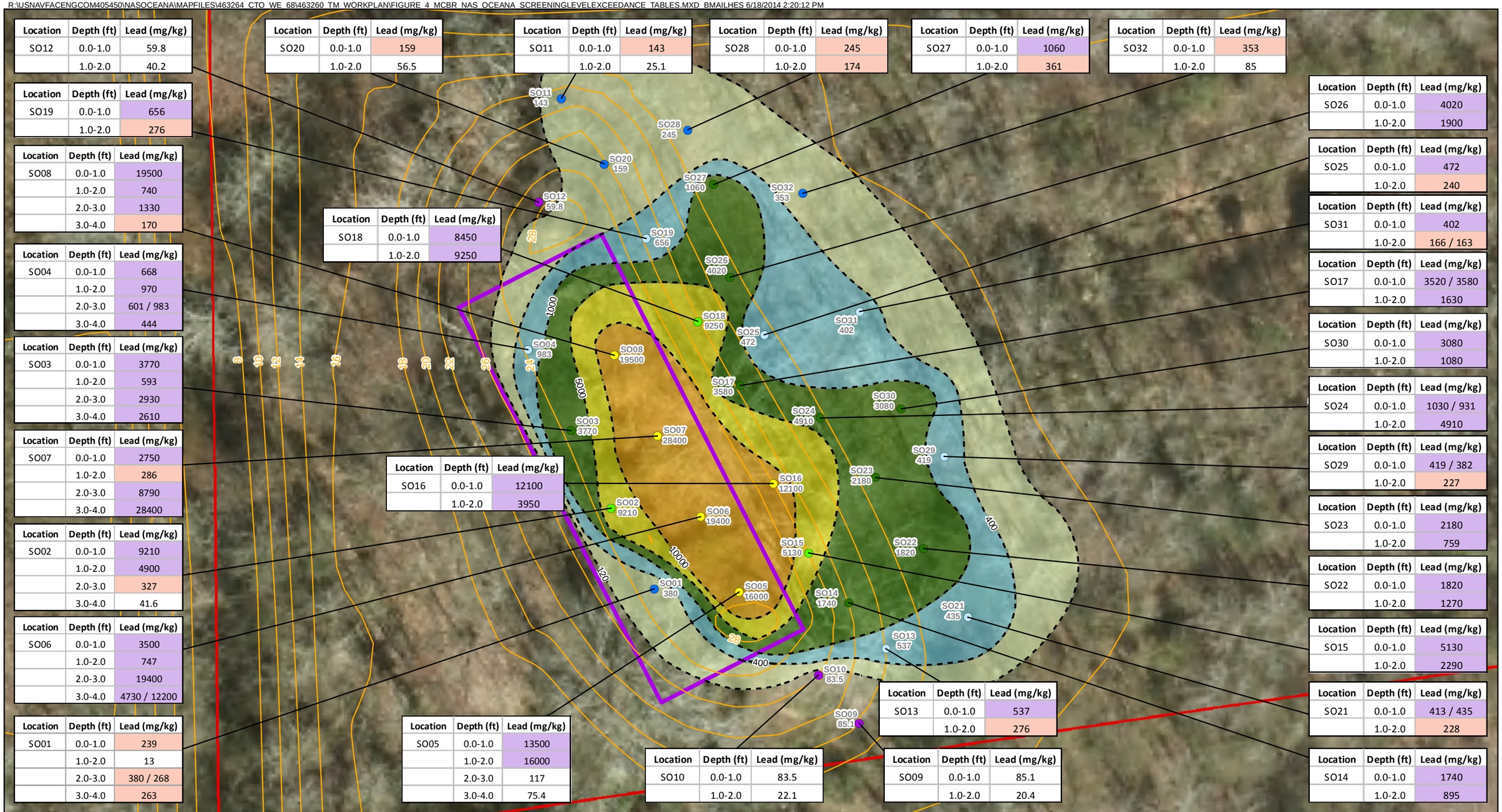

Location	Depth (ft)	Lead (mg/kg)
SO12	0.0-1.0	59.8
	1.0-2.0	40.2

Location	Depth (ft)	Lead (mg/kg)
SO19	0.0-1.0	656
	1.0-2.0	276

Location	Depth (ft)	Lead (mg/kg)
SO08	0.0-1.0	19500
	1.0-2.0	740
	2.0-3.0	1330
	3.0-4.0	170

Location	Depth (ft)	Lead (mg/kg)
SO04	0.0-1.0	668
	1.0-2.0	970
	2.0-3.0	601 / 983
	3.0-4.0	444

Location	Depth (ft)	Lead (mg/kg)
SO03	0.0-1.0	3770
	1.0-2.0	593
	2.0-3.0	2930
	3.0-4.0	2610

Location	Depth (ft)	Lead (mg/kg)
SO07	0.0-1.0	2750
	1.0-2.0	286
	2.0-3.0	8790
	3.0-4.0	28400

Location	Depth (ft)	Lead (mg/kg)
SO02	0.0-1.0	9210
	1.0-2.0	4900
	2.0-3.0	327
	3.0-4.0	41.6

Location	Depth (ft)	Lead (mg/kg)
SO06	0.0-1.0	3500
	1.0-2.0	747
	2.0-3.0	19400
	3.0-4.0	4730 / 12200

Location	Depth (ft)	Lead (mg/kg)
SO01	0.0-1.0	239
	1.0-2.0	13
	2.0-3.0	380 / 268
	3.0-4.0	263

Location	Depth (ft)	Lead (mg/kg)
SO20	0.0-1.0	159
	1.0-2.0	56.5

Location	Depth (ft)	Lead (mg/kg)
SO11	0.0-1.0	143
	1.0-2.0	25.1

Location	Depth (ft)	Lead (mg/kg)
SO28	0.0-1.0	245
	1.0-2.0	174

Location	Depth (ft)	Lead (mg/kg)
SO27	0.0-1.0	1060
	1.0-2.0	361

Location	Depth (ft)	Lead (mg/kg)
SO32	0.0-1.0	353
	1.0-2.0	85

Location	Depth (ft)	Lead (mg/kg)
SO18	0.0-1.0	8450
	1.0-2.0	9250

Location	Depth (ft)	Lead (mg/kg)
SO16	0.0-1.0	12100
	1.0-2.0	3950

Location	Depth (ft)	Lead (mg/kg)
SO05	0.0-1.0	13500
	1.0-2.0	16000
	2.0-3.0	117
	3.0-4.0	75.4

Location	Depth (ft)	Lead (mg/kg)
SO10	0.0-1.0	83.5
	1.0-2.0	22.1

Location	Depth (ft)	Lead (mg/kg)
SO13	0.0-1.0	537
	1.0-2.0	276

Location	Depth (ft)	Lead (mg/kg)
SO09	0.0-1.0	85.1
	1.0-2.0	20.4

Location	Depth (ft)	Lead (mg/kg)
SO26	0.0-1.0	4020
	1.0-2.0	1900

Location	Depth (ft)	Lead (mg/kg)
SO25	0.0-1.0	472
	1.0-2.0	240

Location	Depth (ft)	Lead (mg/kg)
SO31	0.0-1.0	402
	1.0-2.0	166 / 163

Location	Depth (ft)	Lead (mg/kg)
SO17	0.0-1.0	3520 / 3580
	1.0-2.0	1630

Location	Depth (ft)	Lead (mg/kg)
SO30	0.0-1.0	3080
	1.0-2.0	1080

Location	Depth (ft)	Lead (mg/kg)
SO24	0.0-1.0	1030 / 931
	1.0-2.0	4910

Location	Depth (ft)	Lead (mg/kg)
SO29	0.0-1.0	419 / 382
	1.0-2.0	227

Location	Depth (ft)	Lead (mg/kg)
SO23	0.0-1.0	2180
	1.0-2.0	759

Location	Depth (ft)	Lead (mg/kg)
SO22	0.0-1.0	1820
	1.0-2.0	1270

Location	Depth (ft)	Lead (mg/kg)
SO15	0.0-1.0	5130
	1.0-2.0	2290

Location	Depth (ft)	Lead (mg/kg)
SO21	0.0-1.0	413 / 435
	1.0-2.0	228

Location	Depth (ft)	Lead (mg/kg)
SO14	0.0-1.0	1740
	1.0-2.0	895

Legend

Sample Location Concentration (mg/kg)
- <120
- 120-400
- 400-1000
- 1000-5000
- 5000-10000
- >10000

Spatial Distribution of Lead Concentrations (mg/kg)
- 120-400
- 400-1000
- 1000-5000
- 5000-10000
- >10000
- Elevation Contour Lines (feet)

MRP Site
Backstop

Concentrations shown are from the sample interval with the maximum concentration of lead (mg/kg)

Note:
Human health screening level = 400 mg/kg
Ecological screening level = 120 mg/kg
Purple Highlights = detected concentration is greater than human health and ecological screening levels
Pink Highlights = detected concentration is greater than ecological screening levels
Samples with 2 results (ex.- 3250/3580) indicate that a duplicate sample was collected at the location. The normal sample result is reported first.

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Figure 4
NAS Oceana MGBR Lead Concentrations
MGBR Technical Memorandum Work Plan
NAS Oceana
Virginia Beach, Virginia

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Location	Depth (ft)	Lead (mg/kg)
SO25	0.0-1.0	1850
	1.0-2.0	1370

Location	Depth (ft)	Lead (mg/kg)
SO24	0.0-1.0	15.8
	1.0-2.0	948 / 703

Location	Depth (ft)	Lead (mg/kg)
SO30	0.0-1.0	659
	1.0-2.0	518

Location	Depth (ft)	Lead (mg/kg)
SO29	0.0-1.0	670
	1.0-2.0	849

Location	Depth (ft)	Lead (mg/kg)
SO16	0.0-1.0	5080
	1.0-2.0	1140

Location	Depth (ft)	Lead (mg/kg)
SO23	0.0-1.0	845 / 640
	1.0-2.0	839

Location	Depth (ft)	Lead (mg/kg)
SO26	0.0-1.0	332
	1.0-2.0	133

Location	Depth (ft)	Lead (mg/kg)
SO28	0.0-1.0	1190
	1.0-2.0	923

Location	Depth (ft)	Lead (mg/kg)
SO11	0.0-1.0	1220
	1.0-2.0	1020

Location	Depth (ft)	Lead (mg/kg)
SO22	0.0-1.0	91.7
	1.0-2.0	55.1

Location	Depth (ft)	Lead (mg/kg)
SO19	0.0-1.0	819
	1.0-2.0	227

Location	Depth (ft)	Lead (mg/kg)
SO21	0.0-1.0	207
	1.0-2.0	99.4

Location	Depth (ft)	Lead (mg/kg)
SO18	0.0-1.0	3560
	1.0-2.0	2400 / 2600

Location	Depth (ft)	Lead (mg/kg)
SO27	0.0-1.0	474
	1.0-2.0	104

Location	Depth (ft)	Lead (mg/kg)
SO12	0.0-1.0	32.6
	1.0-2.0	17.7

Location	Depth (ft)	Lead (mg/kg)
SO20	0.0-1.0	117
	1.0-2.0	164

Location	Depth (ft)	Lead (mg/kg)
SO17	0.0-1.0	7420
	1.0-2.0	3140

Location	Depth (ft)	Lead (mg/kg)
SO15	0.0-1.0	1150
	1.0-2.0	268

Location	Depth (ft)	Lead (mg/kg)
SO08	0.0-1.0	4050
	1.0-2.0	1980
	2.0-3.0	1710
	3.0-4.0	89.2

Location	Depth (ft)	Lead (mg/kg)
SO14	0.0-1.0	351
	1.0-2.0	270

Location	Depth (ft)	Lead (mg/kg)
SO04	0.0-1.0	17100
	1.0-2.0	8970
	2.0-3.0	16.0 / 15.2
	3.0-4.0	16.7

Location	Depth (ft)	Lead (mg/kg)
SO13	0.0-1.0	324 / 704
	1.0-2.0	164

Location	Depth (ft)	Lead (mg/kg)
SO09	0.0-1.0	361
	1.0-2.0	164

Location	Depth (ft)	Lead (mg/kg)
SO07	0.0-1.0	775
	1.0-2.0	83.3
	2.0-3.0	359
	3.0-4.0	93.6

Location	Depth (ft)	Lead (mg/kg)
SO03	0.0-1.0	242
	1.0-2.0	62.7
	2.0-3.0	58.3
	3.0-4.0	146

Location	Depth (ft)	Lead (mg/kg)
SO02	0.0-1.0	406
	1.0-2.0	3240
	2.0-3.0	174
	3.0-4.0	158

Location	Depth (ft)	Lead (mg/kg)
SO06	0.0-1.0	4790
	1.0-2.0	2080
	2.0-3.0	481
	3.0-4.0	355

Location	Depth (ft)	Lead (mg/kg)
SO01	0.0-1.0	5530
	1.0-2.0	706
	2.0-3.0	67.8
	3.0-4.0	103 / 4790

Location	Depth (ft)	Lead (mg/kg)
SO10	0.0-1.0	111
	1.0-2.0	48.2

Location	Depth (ft)	Lead (mg/kg)
SO05	0.0-1.0	1280
	1.0-2.0	662
	2.0-3.0	97.1
	3.0-4.0	34.6

Legend

Sample Location Concentration (mg/kg)
- <120
- 120-400
- 400-1000
- 1000-5000
- 5000-10000
- >10000

Spatial Distribution of Lead Concentrations (mg/kg)
- 120-400
- 400-1000
- 1000-5000
- 5000-10000
- >10000
- Elevation Contour Lines (feet)

MRP Site
Backstop

Concentrations shown are from the interval with the maximum concentration of lead (mg/kg)

Note:
Human health screening level = 400 mg/kg
Ecological screening level = 120 mg/kg
Purple Highlights = detected concentration is greater than human health and ecological screening levels
Pink Highlights = detected concentration is greater than ecological screening levels
Samples with 2 results (ex.- 3250/3580) indicate that a duplicate sample was collected at the location. The normal sample result is reported first.

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Figure 5
NALF Fentress MGBR Lead Concentrations
MGBR Technical Memorandum Work Plan
NALF Fentress
Chesapeake, Virginia

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Note:
Human health screening level = 400 mg/kg
Ecological screening level = 120 mg/kg

Legend

- New XRF Screening Location
- Previous Sample Location (No additional screening)
- Previous Sample Location (XRF screening)
- Elevation Contour Lines (feet)
- MRP Site
- Backstop

Lead Concentrations (mg/kg)

- 120-400
- 400-1000
- 1000-5000
- 5000-10000
- >10000

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Figure 6
NAS Oceana Proposed XRF Sample Locations
MGBR Technical Memorandum Work Plan
NAS Oceana
Virginia Beach, Virginia

CH2MHILL

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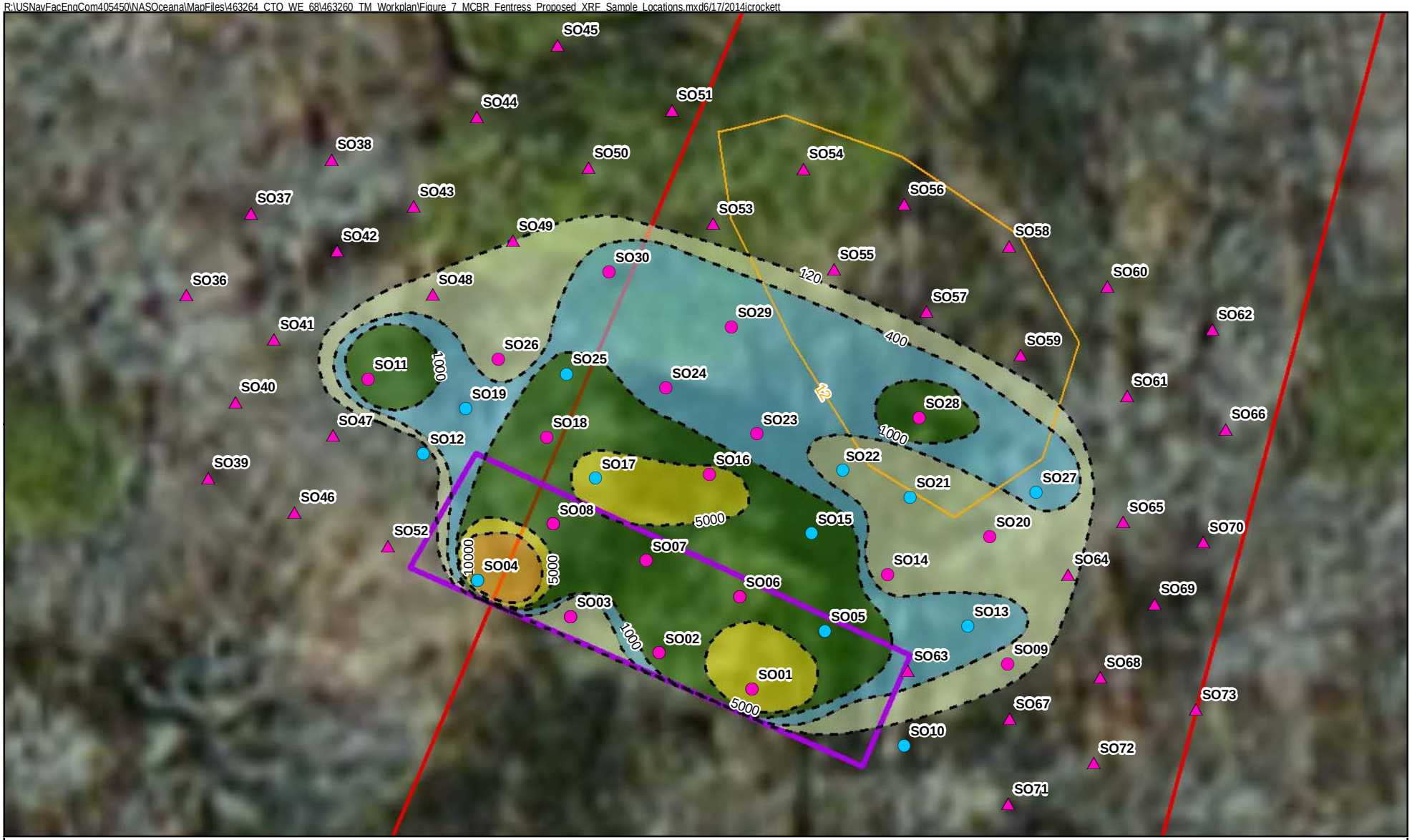

Legend

- New XRF Screening Location
- Previous Sample Location (No additional screening)
- Previous Sample Location (XRF screening)
- Elevation Contour Lines (feet)
- MRP Site
- Backstop

Lead Concentrations (mg/kg)

- 120-400
- 400-1000
- 1000-5000
- 5000-10000
- >10000

Note:
Human health screening level = 400 mg/kg
Ecological screening level = 120 mg/kg

Figure 7
NALF Fentress Proposed XRF Sample Locations
MGBR Technical Memorandum Work Plan
NALF Fentress
Chesapeake, Virginia

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Feet

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Attachment 1
Project Planning Session Participants Sheet

Project Planning Session Participants Sheet

Project Name: Naval Air Station (NAS) Oceana and Naval Auxiliary Landing Field (NALF) Fentress Machine Gun Boresight Range (MGBR) Expanded SI **Projected Date(s) of Sampling**: August 2014 **Project Manager**: Renee Hunt/CH2M HILL	**Site Name**: Machine Gun Boresight Ranges (UXO-5 and UXO-10) **Site Location**: NAS Oceana and NALF Fentress

Date of Session: May 1, 2014

Scoping Session Purpose: Gain team concurrence with the additional soil sampling and XRF screening approach.

Name	Title/Project Role	Affiliation	Phone #	E-mail Address
Bryan Peed	Contracting Officer's Representative	NAVFAC-Mid Atlantic	(757) 341-0480	bryan.peed@navy.mil
Steve Mihalko	Remedial Project Manager	VDEQ	(804) 698-4202	stephen.mihalko@deq.virginia.gov
Stephen Falatko	Munitions Response Manager	CH2M HILL	(703) 376-5099	stephen.falatko@ch2m.com
Renee Hunt	Project Manager	CH2M HILL	(414) 847-0349	renee.hunt@ch2m.com

Comments:

Stephen Falatko and Renee Hunt presented information about the proposed additional delineation sampling at the NAS Oceana and NALF Fentress MGBRs. The objective of the presentation was to review the historical site information and refine and gain team agreement on the investigation objectives and approach.

A site investigation (SI) was conducted in June 2010, and surface (0 to 1 feet) and subsurface (1 to 2 feet) soil samples were collected from eight locations in the berm at each MGBR. Antimony, copper, lead, and zinc were identified as constituents of potential concern (COPCs) at the NAS Oceana MGBR, and copper, lead, and zinc were identified as COPCs at the NALF Fentress MGBR. The results of the SI indicated that the vertical and horizontal extent of contamination at the site was not defined.

Expanded SI sampling was conducted in December 2013 to delineate the lateral and vertical extent of COPCs exceeding human health and ecological risk screening levels at each MGBR. Following the December 2013 sampling effort, it was determined that additional delineation was needed as the metals contamination at the site extends farther from the toe of the berm than anticipated.

The following sampling approach was agreed upon by the Partnering Team for additional delineation at the NAS Oceana and NALF Fentress MGBRs:

- X-Ray fluorescence (XRF) screening techniques will be used in surface samples and subsurface soil samples collected at each MGBR to delineate the horizontal and vertical extent of site COPCs. Surface and subsurface soil samples will be analyzed using XRF screening techniques for antimony, copper, lead, and zinc at the NAS Oceana. Soil samples will be screened for copper, lead, and zinc at the NALF Fentress. The collection of soil samples for laboratory analysis will follow the procedures outlined in the *Tier II Sampling and Analysis Plan Expanded Site Inspection Machine Gun Boresight Ranges (UXO-5 and UXO-10), Naval Air Station Oceana and Naval Auxiliary Landing Field Fentress, Virginia Beach and Chesapeake, Virginia* (CH2M HILL, 2013).
- Surface soil samples (0 to 1 feet) will be collected for XRF screening from the toe of the berm at each MGBR for horizontal delineation of site COPCs. Surface samples will be collected from a minimum of 36 locations at the NAS Oceana and 38 locations at the NALF Fentress.
- Subsurface soil samples will be collected in 1 foot depth intervals. Subsurface soil samples will be collected from select previous SI and extended SI sampling locations at each MGBR for vertical delineation. Subsurface samples will be collected from a minimum of 55 locations at the NAS Oceana and a minimum of 56 locations at the NALF Fentress.

- XRF screening results will be compared to ecological and human health screening levels in the field to determine if concentrations of site COPCs have been delineated horizontally and vertically. Horizontal soil samples will be collected in a step-wise fashion and screened with the XRF unit until two locations with concentrations less than human health and ecological screening levels are identified in any given direction. Vertical soil samples will also be collected at one foot depth intervals at selected locations until two consecutive depth intervals have concentrations less than the screening values for all site COPCs.
- Samples from a subset of the XRF screening locations (15%) will be sent to a laboratory for confirmation of the XRF results.

Action Items:

CH2M HILL: Proceed with the preparation of a technical memorandum work plan

Consensus Decisions:

The Team agreed to move forward with the proposed sampling approach

Attachment 2
Standard Operating Procedures

STANDARD OPERATING PROCEDURE

Decontamination of Personnel and Equipment

I. Purpose

To provide general guidelines for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments.

II. Scope

This is a general description of decontamination procedures.

III. Equipment and Materials

- Demonstrated analyte-free, deionized ("DI") water (specifically, ASTM Type II water or lab-grade DI water)
- Potable water; must be from a municipal water supplier, otherwise an analysis must be run for appropriate volatile and semivolatile organic compounds and inorganic chemicals (e.g., Target Compound List and Target Analyte List chemicals)
- 2.5% (W/W) Liquinox® and water solution
- Concentrated (V/V) pesticide grade isopropanol (DO NOT USE ACETONE)
- Large plastic pails or tubs for Liquinox® and water, scrub brushes, squirt bottles for Liquinox® solution, methanol and water, plastic bags and sheets
- DOT approved 55-gallon drum for disposal of waste
- Personal Protective Equipment as specified by the Health and Safety Plan
- Decontamination pad and steam cleaner/high pressure cleaner for large equipment

IV. Procedures and Guidelines

A. PERSONNEL DECONTAMINATION

To be performed after completion of tasks whenever potential for contamination exists, and upon leaving the exclusion zone.

1. Wash boots in Liquinox® solution, then rinse with water. If disposable latex booties are worn over boots in the work area, rinse with Liquinox® solution, remove, and discard into DOT-approved 55-gallon drum.
2. Wash outer gloves in Liquinox® solution, rinse, remove, and discard into DOT-approved 55-gallon drum.
3. Remove disposable coveralls ("Tyveks") and discard into DOT-approved 55-gallon drum.
4. Remove respirator (if worn).
5. Remove inner gloves and discard.
6. At the end of the work day, shower entire body, including hair, either at the work site or at home.
7. Sanitize respirator if worn.

B. SAMPLING EQUIPMENT DECONTAMINATION—GROUNDWATER SAMPLING PUMPS

Sampling pumps are decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Spread plastic on the ground to keep equipment from touching the ground

3. Turn off pump after sampling. Remove pump from well and remove and dispose of tubing. Place pump in decontamination tube.
4. Turn pump back on and pump 1 gallon of Liquinox® solution through the sampling pump.
5. Rinse with 1 gallon of 10% isopropanol solution pumped through the pump. (DO NOT USE ACETONE). (Optional)
6. Rinse with 1 gallon of tap water.
7. Rinse with 1 gallon of deionized water.
8. Keep decontaminated pump in decontamination tube or remove and wrap in aluminum foil or clean plastic sheeting.
9. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.
10. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in either DOT-approved 55-gallon drums or with solid waste in garbage bags, dependent on Facility/project requirements.

C. SAMPLING EQUIPMENT DECONTAMINATION—OTHER EQUIPMENT

Reusable sampling equipment is decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Before entering the potentially contaminated zone, wrap soil contact points in aluminum foil (shiny side out).
3. Rinse and scrub with potable water.
4. Wash all equipment surfaces that contacted the potentially contaminated soil/water with Liquinox® solution.
5. Rinse with potable water.
6. Rinse with distilled or potable water and isopropanol solution (DO NOT USE ACETONE). (Optional)
7. Air dry.
8. Rinse with deionized water.
9. Completely air dry and wrap exposed areas with aluminum foil (shiny side out) for transport and handling if equipment will not be used immediately.
10. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.
11. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved 55-gallon drums or with solid waste in garbage bags, dependent on Facility/project requirements.

D. HEALTH AND SAFETY MONITORING EQUIPMENT DECONTAMINATION

1. Before use, wrap soil contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with Liquinox® solution, then a towel wet with methanol solution, and finally three times with a towel wet with distilled water. Dispose of all used paper towels in a DOT-approved 55-gallon drum or with solid waste in garbage bags, dependent on Facility/project requirements.

E. SAMPLE CONTAINER DECONTAMINATION

The outsides of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with Liquinox® solution or immerse in the solution AFTER THE CONTAINERS HAVE BEEN SEALED. Repeat the above steps using potable water.
2. Dispose of all used paper towels in a DOT-approved 55-gallon drum or with solid waste in garbage bags, dependent on Facility/project requirements.

F. HEAVY EQUIPMENT AND TOOLS

Heavy equipment such as drilling rigs, drilling rods/tools, and the backhoe will be decontaminated upon arrival at the site and between locations as follows:

1. Set up a decontamination pad in area designated by the Facility
2. Steam clean heavy equipment until no visible signs of dirt are observed. This may require wire or stiff brushes to dislodge dirt from some areas.

V. Attachments

None.

VI. Key Checks and Items

- Clean with solutions of Liquinox®, Liquinox® solution (optional), and distilled water.
- Do not use acetone for decontamination.
- Drum all contaminated rinsate and materials.
- Decontaminate filled sample bottles before relinquishing them to anyone.

STANDARD OPERATING PROCEDURE-A.01

Soil Sample Preparation and Field Portable X-Ray Fluorescence Screening

I. Purpose and Scope

This SOP describes the procedure for preparing soil samples to be analyzed by a Field Portable X-Ray Fluorescence (FP-XRF) instrument as well as the operation of the FP-XRF. Adhering to this procedure provides assurance that the moisture content and particle size of each sample is appropriate and optimized under field conditions for use of FP-XRF technology. United States Environmental Protection Agency (USEPA) Method 6200 provides additional detail and guidance regarding the FP-XRF analysis. Additional details regarding operation of the FP-XRF can be found in the instrument manufacturer's instruction manual.

II. Equipment and Materials

- Standard sized rubber mallet
- Disposable re-sealable one gallon storage bags
- Sharpies to label samples
- Aluminum Trays
- Teflon-coated cookie sheets
- Disposable stainless steel spoons or spatulas, or plastic spoons/scoops
- Stainless-steel sieve
- Small oven with temperature setting capable of 110° F with thermometer.
- Portable work table
- Small (1 square foot) piece of carpet or rubber mat
- Portable electrical generator or alternate power source
- FP-XRF device, holster, and batteries. Niton XL3t®, Innov-X® FP-XRF instrument or equivalent with the following qualities:
  - Portable and designed for use in a field environment
  - X-ray tube source instead of a radioactive source
  - Ability to download data onto a computer
  - Instrument does not pose a health and safety hazard to the operator.
- FP-XRF soil calibration standards set
- Laboratory grade distilled water and supplies for decontamination of non-disposable equipment

III. Health and Safety

A. Wear personal protective equipment, as specified in the Health and Safety Plan.

B. Provide adequate lighting and proper ventilation in the work area, especially around the drying oven (if used in a portable field office or existing structure on site).

C. When the X-ray beam indicator lights are flashing, the primary beam is on, the shutter is open, and radiation is being emitted from the front of the analyzer. (This does not include the brief flash of the lights when first turning on the analyzer.) Adhere to the basic safe handling and operation rules during field operations as follows:

   a. Do not hold the front of the analyzer when the X-ray tube is energized and the shutter is open.

   b. Never point the instrument at yourself or anyone else when the shutter is open and the X-ray tube is energized to prevent exposure.

   c. Never look into the path of the primary beam.

   d. Never have any part of your body between or around the beam pathway and the targeted sample.

   e. Only personnel who have prior experience or personnel who have been trained by such a person in the proper use of the FP-XRF instrument will operate the equipment in the field.

   f. All non-essential personnel are to be at least 10 feet away from the FP-XRF target beam during operation of the device.

D. The instrument operator will refer to the FP-XRF Operating Manual for additional guidance on the proper operation of the instrument under field conditions.

IV. Procedures and Guidelines

FP-XRF Instrument Quality Assurance and Quality Control

A. Quality assurance (QA)/Quality control (QC) procedures will be compliant with manufacturer's operational manual.

B. At the beginning of the project the FP-XRF optimal analysis exposure time will be determined for the instrument. The exact "run" time needed for analysis will be determined in the field by analyzing the manufacturer's supplied standards that have concentrations of the metals of concern near the detection levels. The desired detection levels are summarized in Table 1. Exposure times may be adjusted depending on the type of the media that are being analyzed and the analyte list. The manufacture's operational manual should be consulted for instructions to adjust exposure times.

TABLE 1

Analyte	Detection Level (mg/kg)
Antimony	15
Lead	35
Copper	60
Zinc	60

Detection Levels are ½ of the lowest (ecological or human health) screening levels.

C. At the start of each day the FP-XRF will undergo an operations check of the detector resolution and response as well as other instrument parameters. The operations check is initiated from the general software menu of -the FP-XRF instrument. Refer to the equipment manual for equipment specific instructions of how to perform the operations check. An

operations check will be performed any time the FP-XRF is turned off for more than 25 minutes.

D. At the start of each work day the FP-XRF will be used to analyze the appropriate National Institute of Standards and Technology (NIST) standards set of known elemental concentrations that contain the project specific target analytes. The calibration verification will be performed in accordance with the equipment's operations manual. The supplied NIST standards will be of a range of concentrations per analyte. The analyte result from the XRF must be within 20 percent of the known concentration of each standard as published in the supplied NIST standard certification. This is to confirm and document that the information that the results generated by the XRF are accurate over a range of concentrations.

E. After every 20 analyzed samples an NIST standard of known elemental concentration will be analyzed by the FP-XRF. The calibration verification result from the XRF must be within 20 percent of the known concentration of the standard reference material. This is to document that the results collected from the FP-XRF are consistent throughout the day.

F. FP-XRF duplicate samples will be conducted at a rate of 1 in 20 samples. FP-XRF normal and duplicate sample results must have a relative percent difference of 35 percent or less for the analysis to continue. If the FP-XRF normal and duplicate sample results are not in agreement, then the reason for this discrepancy must be determined before additional measurements are made and a corrective action must be implemented.

FP-XRF Sample Preparation and Screening

Surface and subsurface soil sampling will be performed in accordance with the SOPs provided in Appendix B of the Expanded SI UFP-SAP (CH2M HILL 2013). The sample will be delivered to the XRF sample preparation area in a resalable storage bag.

A. Verify that the re-sealable storage bag is closed and begin mixing the sample by slowly turning the bag over end to end (tumbling) approximately 12 times. During mixing, attempt to reduce larger pieces of clumped soil material by kneading the larger soil pieces through the bag. Do not open the bag and knead soil directly. Tumbling should continue until the soil sample consistency is uniform.

B. Cover a standard size cookie sheet with aluminum foil and label the corner of the foil with the sample ID. Pour the entire sample onto the aluminum foil and spread the sample out evenly unto the cookie sheet using a disposable spoon or spatula. The sample should be no deeper than 0.5 inch thick. Any debris such as lead pellets, wood pieces, rocks, vegetation, or soil clumps greater than 2 millimeters in diameter will be removed from the sample. Materials removed from the sample should be disposed of in the appropriate investigative derived waste (IDW) drum.

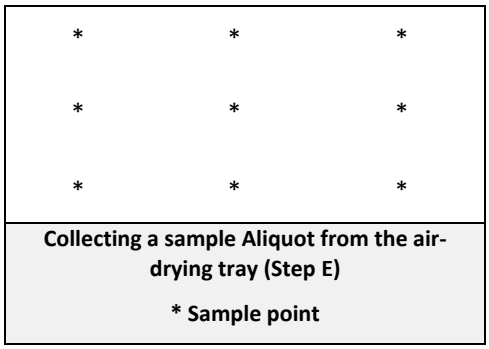
C. Create a lip in the aluminum foil to surround the sample to contain the sample on the cookie sheet.

D. Allow sample to air dry for approximately 1 hour. The objective of air drying is for clay/silt clumps within the sample to crumble and separate from larger grains (coarse sand, gravel). Depending upon initial soil conditions, some samples will require more or less drying time. Use of a hair dryer may expedite drying of wetter samples. The samples should be shielded from potential wind-borne contamination and rain.

E. After the sample has air dried for about an hour, an aliquot of the sample will be collected for further processing. A small tray should be made of aluminum foil to hold the sample aliquot. The small aluminum tray will be labeled with the proper sample ID. Then, using a disposable spoon/spatula, a total volume of approximately 2 cups of soil should be collected from

9 different points from the aluminum foil covered cookie sheet as shown in Diagram 1. After the sample aliquot is collected any remaining sample can be placed in a separate storage bag labeled with sample ID and date and stored in a secure place. Non-reusable equipment can be disposed of in the general refuse. If the sample is dry to the touch with no obvious signs of moisture, skip to Step G.

Diagram 1



F. If the sample is still wet to the touch, place the small aluminum tray containing the sample aliquot to the pre-heated oven (approximately 110°F ±5°). Typically oven drying times are approximately one hour, however the time the sample remains in the drying oven should be minimized to the extent possible. The sample should be stirred periodically with a disposable spoon/spatula to assure uniform drying. When the sample is dry to the touch, the small aluminum tray should be removed from the oven, and the sample should be allowed to cool. Once the sample has cooled to the ambient air temperature, place it in a disposable storage bag. The bag should be labeled with the sample ID and denoted with "XRF" to designate the sample will be screened with the FP-XRF.

G. Lay the storage bag containing the dried sample flat on the piece of carpeting or rubber mat, and gently pound the sample bag using the rubber mallet. The carpet or rubber mat should be placed on a floor or a table sturdy enough to support the pounding. The sample should be tumbled and gently pounded several times to mix the sample thoroughly. Note that pounding is not intended to crush sand in the sample, but to reduce clay/silt soil clumps remaining in the sample. Pounding should continue until the sample has been reduced to a powdery consistency.

H. Mix the sample by tumbling for one minute to improve homogeneity.

I. If sieving is needed to remove large particles from the sample, such as rocks and other debris, the sample will be sieved. Obtain a new piece of aluminum foil (approximately 10 inches long), to sieve the sample onto. Carefully fold the aluminum foil and pour the sieved sample into a new storage bag. If an FP-XRF duplicate sample analysis is to be conducted, the sample should be split into two equal parts, and into two separate storage bags. Each bag should be labeled with the appropriate sample ID.

J. Materials removed from the sample during sieving should be disposed of in the appropriate IDW drum. Non-reusable equipment can be disposed of in the general refuse.

K. Following manufacturer's instructions analyze the sample with the FP-XRF. After the initial analysis, rotate the sample bag approximately 120° in a clockwise direction and re-analyze. Repeat this step twice so that the sample is analyzed a total of 3 times. This final step addresses the innate heterogeneities in each sample. Record the FP-XRF results for the contaminant of potential concern for each of the three orientations. Record sample ID date,

time, and readings in the field sampling forms or log book. Document physical attributes (particle size, color, etc) of the sample.

L. If indicated in the field instructions, the sample will be sent to the laboratory (shipped on ice) for analysis. The sample submitted to the laboratory shall be the same sample analyzed using the FP-XRF. If not sent to the laboratory, retain the sample analyzed by XRF. The bag should be labeled with the sample ID and date.

M. Used storage bags, aluminum foil, and other disposable items should be disposed of in the general refuse.

N. Non-disposable equipment should be decontaminated prior to the next sample analysis. Decontamination procedures will be performed in accordance with the SOP provided in Appendix B of the Expanded SI UFP-SAP (CH2M HILL 2013).

V. Key Checks and Items

- Make sure the sample is homogenous and dry to the touch prior to FP-XRF analysis
- Avoid windblown mixing of samples
- Decontaminate utensils before reuse, or use dedicated, disposable utensils

VI. References

CH2M HILL. 2013. *Tier II Sampling and Analysis Plan Expanded Site Inspection Machine Gun Boresight Ranges (UXO-5 and UXO-10),* Naval Air Station Oceana and Naval Auxiliary Landing Field Fentress, Virginia Beach and Chesapeake, Virginia. November.